Using Earnings Forecasts to Simultaneously Estimate Firm-Specific Cost of Equity and Long-Term Growth

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This version: December 13, 2010

Keywords: Cost of equity, expected return, expected earnings growth, residual income model
JEL Classification: G12, G14, G17, G31, M41

We are thankful to James Ohlson (the editor), an anonymous reviewer, Pervin Shroff, K.R. Subramanyam, and especially Steven Monahan (the discussant), for their insightful comments and suggestions. The paper also benefitted from the comments received from the participants of research seminars at UC Irvine, Santa Clara University, Southern Methodist University, and the 2010 RAST conference. Maria Ogneva acknowledges financial support from the Michelle R. Clayman Faculty Scholar endowment. We are grateful to Suhas Sridharan for her excellent research assistance.

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Abstract

A growing body of literature in accounting and finance relies on implied cost of equity (COE) measures. Such measures are sensitive to assumptions about terminal earnings growth rates. In this paper we develop a new COE measure that is more accurate than existing measures because it incorporates endogenously estimated long-term growth in earnings. Our method extends Easton, Taylor, Shroff, and Sougiannis' (2002) method of simultaneously estimating *sample average* COE and growth. Our method delivers COE (growth) estimates that are significantly positively associated with future realized stock returns (future realized earnings growth). Moreover, the predictive ability of our COE measure subsumes that of other commonly used COE measures and is incremental to commonly used risk characteristics. Our implied growth measure fills the void in the earnings forecasting literature by robustly predicting earnings growth beyond the five-year horizon.

1. Introduction

In this study, we propose a new firm-specific measure of implied cost of equity capital (COE) that is more accurate than existing measures because it incorporates *endogenously* estimated long-term growth in earnings.

Implied COE measures are internal rates of return that equate a firm's current stock price to the sum of discounted future payoffs. Payoffs beyond the short-term horizon are assumed to grow at a certain constant long-term growth rate, which makes growth an important input in COE estimation.[1] Any error in the growth estimate feeds directly into the implied COE. In particular, the more positive (negative) is the error in the long-term growth rate, the more upwardly (downwardly) biased is the implied COE.[2]

Extant implied COE measures assume the same long-term growth rate across all firms (Claus and Thomas 2001; Gode and Mohanram 2003).[3] This assumption is unlikely to hold in practice, however, because a number of factors influence a firm's terminal growth rate, such as the firm's degree of accounting conservatism and expected growth in investment (Feltham and Ohlson 1995; Zhang 2000). Existing measures of implied COE therefore systematically over- or understate growth, which can lead to spurious inferences

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[1] This growth rate is often referred to as the terminal growth rate or the growth rate in perpetuity. Throughout the paper we use the terms long-term growth, terminal growth, and growth in perpetuity interchangeably.

[2] Valuation textbooks emphasize that firm valuation can be highly sensitive to the assumed terminal growth rate of earnings (Penman 2009; Whalen et al. 2010). For example, Damodaran (2002) states that "of all the inputs into a discounted cash flow valuation model, none can affect the value more than the stable growth rate."

[3] Another commonly used COE measure developed by Gebhardt et al. (2001) assumes a convergence in profitability to an industry benchmark over twelve years with a zero terminal growth thereafter. But as Easton (2006) points out, this approach creates systematic biases to the extent that firms with certain characteristics have other expected growth patterns.

(Easton 2006, 2007). Our measure of COE helps avoid such spurious inferences by taking into account a firm's growth rate as *implied by the data*.[4]

Our estimation method builds upon the pioneering work of Easton, Taylor, Shroff, and Sougiannis (2002) (hereafter, ETSS). ETSS develop a method to simultaneously estimate the *average* COE and *average* earnings growth rate for a given portfolio of firms. Despite this method's conceptual and practical appeal, however, it cannot be used in many research settings because it only allows one to estimate the *average* COE and growth rate for a given sample of firms. In this paper we extend the ETSS approach to allow for estimation of COE and expected earnings growth for individual firms. Our approach is motivated by the industry practice of using firm peers when valuing privately-held companies. Practitioners often compare a given firm against firms with similar characteristics to determine an appropriate COE and/or growth rate (Pratt and Niculita 2007; Damodaran 2002). Accordingly, our method estimates a firm's COE (growth) as the sum of the COE (growth) typical of firms with the same risk-growth profile plus a firm-specific component. Empirically, COE and growth are estimated by regressing the ratio of forecasted earnings to book value of equity on the market-to-book ratio and a set of observable risk and growth characteristics.[5]

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[4] Developing a more accurate and less biased implied COE measure is important given the increasing use of implied COE measures in accounting and finance literature. Implied COE measures have been used to shed light on the equity premium puzzle (Claus and Thomas 2001; Easton et al. 2002), the market's perception of equity risk (Gebhard et al. 2001), risk associated with accounting restatements (Hribar and Jenkins 2004), dividend taxes (Dhaliwal et al. 2005), accounting quality (Francis et al. 2004), legal institutions and regulatory regimes (Hail and Leuz 2006), and quality of internal controls (Ogneva et al. 2007), as well as to test intertemporal CAPM (Pastor et al. 2008), international asset pricing models (Lee et al. 2009), and the pricing of default risk (Chava and Purnanandam 2010).

[5] Specifically, we use the CAPM beta, size, book-to-market, and momentum as the observable risk characteristics, and we use analysts' long-term growth forecast, the difference between the industry ROE and the firm's forecasted ROE, and the ratio of R&D expenses to sales as the observable growth characteristics. We take the part of COE (growth) that is not explained by these observable risk (growth)

We test the accuracy of our COE estimates by examining their ability to explain future stock returns for a sample of I/B/E/S firms over the 1980 to 2007 period. The analysis uses unadjusted earnings forecasts as well as forecasts adjusted for predictable analyst biases as in Gode and Mohanram (2009). We find that using either adjusted or unadjusted earnings forecasts our implied COE measure has return predictive ability that is incremental to the benchmark COE measures and commonly used risk proxies (the CAPM beta, size, book-to-market, and past twelve-month stock returns). Specifically, our measure remains significantly positively related to future realized stock returns even after controlling for the benchmark COE measures and commonly used risk proxies. In contrast, none of the benchmark COE measures is significantly related to future stock returns after controlling for our measure. Additional tests that rely on Easton and Monahan's (2005) methodology suggest that our implied COE measure delivers the lowest measurement error compared to the benchmark COE estimates.

Analysis of the cross-sectional determinants of relative predictive ability of our measure compared to the best performing benchmark—COE based on the GLS model (Gebhardt et al. 2001)—suggests that our measure performs markedly better for firms that are very different from other firms in the industry in terms of their profitability, forecasted long-term growth, and past sales growth, or very different from the average firm in the sample in terms of size, book-to-market ratio, CAPM beta, or past returns.

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characteristics to be due to unobservable risk (growth) factors. Examples of such risk factors may include the risk of increased competition and extreme weather, credit risk, and litigation risk as perceived by market participants but not fully captured by the set of observable risk characteristics that we consider. We acknowledge that the set of risk and growth characteristics that we use in the estimation may be incomplete, however the flexibility of our method allows incorporating any number of additional factors pertinent to a specific study.

These findings may guide future empirical research in the choice of an appropriate COE measure.

To examine the accuracy of our implied growth estimates, we test their predictive ability with respect to future earnings growth rates. Specifically, we estimate the realized growth in aggregate four-year cum-dividend earnings from years t+1 to t+4, to years t+5 to t+8. We find that our implied growth estimates are significantly associated with future earnings growth: when we sort stocks into quintiles based on implied growth, the annualized growth spread between the top and bottom quintiles is between 2.5% and 10.4% (5.5% and 8.6%) per annum using our unadjusted (adjusted) measure. Multivariate regression analyses indicate that the predictive ability of our implied growth measure is entirely attributable to the growth characteristics used in its estimation, which leads us to further investigate the role of observable characteristics in our method.

Our method embeds observable risk and growth characteristics into the residual income valuation framework. The valuation equation determines the optimal weights on these characteristics, and allows estimating COE and growth components due to unobservable risk and growth factors. It could be the case however that most of the predictive ability of our COE and growth measures comes from simply relying on observable characteristics. To examine this possibility, we construct a statistically predicted COE (growth) based on the same risk (growth) characteristics that we use in our model [6] and compare its predictive ability to the predictive ability of our implied COE (growth) measure. The analysis shows that (1) the statistically predicted return

[6] Specifically, we use a cross-sectional prediction model that first regresses past realized returns (growth) on past risk (growth) characteristics and then applies the resulting coefficients to current return (growth) characteristics to arrive at a return (growth) forecast.

measure does not have significant return predictive ability, and (2) although the statistically predicted growth is significantly associated with future long-term growth, it does not subsume the predictive ability of our implied growth measure. Therefore, it appears that embedding risk and growth characteristics into the valuation equation is superior to constructing simple statistical predictions using the same characteristics.

In addition to examining COE and growth rates for individual firms, we revisit ETSS' findings with respect to the market-wide levels of COE and earnings growth. Using our method, we obtain estimates of average implied COE and equity risk premia that are significantly lower than those obtained from the ETSS model and more in line with low risk premia from prior theoretical studies (Mehra and Prescott 1985).

Our paper contributes to the literature in several ways. First, we expand the literature on COE estimation by developing an implied COE measure that relies on endogenously determined long-term earnings growth. By taking into account growth rates implied by the data, our implied COE measure is less likely to be biased due to using incorrect terminal growth assumptions. Second, our COE estimation marries the implied COE approach with a long-standing industry practice of using benchmark characteristics in firm valuation. The flexibility of our method allows incorporating any risk and growth characteristics that are pertinent to a specific study. Third, our implied growth measure fills the void in the earnings forecasting literature by robustly predicting earnings growth beyond the five-year horizon.[7] Finally, we contribute to the equity premium literature by

[7] We are not aware of any papers that construct and validate forecasts of terminal growth, or even growth beyond five-year horizon. However, several papers forecast earnings over horizons beyond two years. For example, Chan et al. (2003) and Gao and Wu (2010) forecast earnings growth over the next five years, while Hou et al. (2010) forecast three-year-ahead earnings. Estimates from these models may serve as an alternative to short-term analysts' forecasts.

providing a measure that delivers average firm-level equity risk premia consistent with a theoretically justified low implied market-wide risk premium.

The rest of the paper is organized as follows. Section 2 discusses our estimation of firm-level COE and growth. Section 3 describes the data and variable estimation. In Section 4 we present the empirical results. Section 5 contains robustness checks and additional analyses. Session 6 provides concluding remarks.

2. Estimation of Implied Cost of Equity and Growth

In this section, we develop a method to simultaneously estimate firms' COE and expected earnings growth using stock prices, book values of equity, and earnings forecasts. Our method extends Easton, Taylor, Shroff, and Sougiannis (2002) (ETSS), who simultaneously estimate *average* COE and expected earnings growth for a given sample of firms.

Similar to ETSS, our approach is based on the residual income model (e.g. Ohlson 1995), which expresses firm value as the book value of equity plus the discounted sum of expected residual earnings: [8]

$$P_0^i = B_0^i + \sum_{t=1}^{\infty} \frac{E_t^i - r^i B_{t-1}^i}{(1+r^i)^t} \tag{1}$$

where P_0^i is the market value of equity, B_0^i is the book value of equity, E_0^i is expected earnings for year t given information at t=0, and r^i is the COE (unless

[8] The residual income model is equivalent to the discounted dividend model assuming the clean surplus relation, i.e. the book value of equity at the end of year t+1 is equal to the book value of equity at the end of year t plus net income for year t+1 minus dividends for year t+1.

specifically stated otherwise, we use COE and expected return interchangeably throughout the paper).

Following ETSS, we re-write the valuation equation using finite (four-year) horizon forecasts and define g^i as the perpetual annual growth rate such that:

$$P_0^i = B_0^i + \frac{X_{cT}^i - (R^i - 1)B_0^i}{R^i - G^i} \tag{2}$$

where $G^i = (1+g^i)^4$ is one plus the expected rate of growth in four-year residual income, $R^i = (1+r^i)^4$ is one plus the four-year expected return, $X_{CT}^i = \sum_{t=1}^{4} E_t + \sum_{t=1}^{3}((1+r)^{4-t} - 1)d_t$ is expected aggregate four-year cum-dividend earnings, and d_t is expected dividends in year t given information at t=0.

In order to estimate COE and growth, ETSS re-arrange valuation equation (2) as:

$$X_{CT}^i = G^i - 1 + (R^i - G^i)MB^i \tag{3a}$$

ETSS further observe that the sample average R and G in equation (3a) can be estimated from the intercept and the slope in a cross-sectional regression of the ratio of cumulative earnings to book value on the market-to-book ratio:

$$X_{CT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \varepsilon^i \tag{3b}$$

where $\gamma_0 = \overline{G} - 1$, $\gamma_1 = \overline{R} - \overline{G}$, and $\varepsilon^i = \varepsilon^i_G(1 - MB^i) + \varepsilon^i_R MB^i$. The $\overline{R}$ and $\overline{G}$ are the sample means of R^i and G^i respectively, and $\varepsilon^i_R = R^i - \overline{R}$ and $\varepsilon^i_G = G^i - \overline{G}$ are the firm-specific deviations of R^i and G^i from their sample means.

Estimating regression (3b) using OLS obtains sample means of COE and growth $\overline{R} = \gamma_0 + \gamma_1 + 1$ and $\overline{G} = \gamma_0 + 1$, leaving firm-specific components of R and G unidentified.

Our approach introduces two innovations to the ETSS method. First, we explicitly recognize that COE and growth rates are associated with certain firm characteristics.

Specifically, we express a firm's COE (growth) as the COE (growth) typical of firms with the same risk-growth profile plus a firm-specific component due to unobservable risk (growth) factors:

$$R^i = \overline{R} + \lambda_{\mathbf{R}}{}'\mathbf{x}_{\mathbf{R}}^{\mathbf{i}} + \varepsilon_R^i$$
$$G^i = \overline{G} + \lambda_{\mathbf{G}}{}'\mathbf{x}_{\mathbf{G}}^{\mathbf{i}} + \varepsilon_G^i$$

where $\overline{R}$ ($\overline{G}$) is the sample mean of R^i (G^i) in year t, $\mathbf{x_R}^{\mathbf{i}}$ ($\mathbf{x_G}^{\mathbf{i}}$) is a vector of observable risk (growth) drivers (the drivers are demeaned to ensure that $\overline{R}$ and $\overline{G}$ can be interpreted as sample means) [9], $\boldsymbol{\lambda}_{\mathbf{R}}$ ($\boldsymbol{\lambda}_{\mathbf{G}}$), is a vector of premia (weighs) on the observable risk (growth) drivers, and $\varepsilon^i{}_R$ ($\varepsilon^i{}_G$) is a firm-specific component of R^i (G^i) that is due to unobservable risk (growth) factors.[10]

Incorporating observable risk and growth drivers serves two purposes. First, it provides estimates of firm-specific COE and growth rates conditional on observable firm characteristics. Second, it helps to obtain more accurate estimates of *average* COE and growth rates. To see this, note that the estimates of average COE and growth rate ($\overline{R}$ and $\overline{G}$) are derived from the intercept and slope estimates in (3b). The residuals in (3b) are a linear function of the firm-specific components of COE and growth rate ($\varepsilon^i = \varepsilon^i{}_G(1 - MB^i$ $)+ \varepsilon^i{}_R MB^i$). The residuals are therefore likely to be correlated with firm-specific COE and growth rates, which are in turn correlated with the independent variable in regression (3b) − the market-to-book ratio (e.g. Fama and French 1993; Penman 1996). Note, that

[9] Empirically, we use the CAPM beta, size, book-to-market ratio, and momentum as observable risk drivers, and we use the analyst long-term growth forecast, R&D expenditures and the deviation of firm's forecasted ROE from the industry target ROE as observable growth drivers.

[10] The component due to unobservable risk (growth) factors is defined as the part of COE (growth) that is not explained by the observable risk (growth) drivers. For example, unobservable risk factors may include the risk of increased competition, liquidity risk, credit risk, litigation risk, and political risk as perceived by market participants but not fully captured by the above observable risk drivers.

because the residuals in (3b) are a complex function of the firm-specific COE, growth rate, and market-to-book ratio, it is unclear whether such correlations represent a source of bias in the regression coefficients. Explicitly incorporating observable risk and growth factors in equation (3b) mitigates any concerns regarding the possible bias and may lead to more accurate estimates of average COE and growth rates.

As a second innovation, we decompose residuals ε^i in the cross-sectional regression (3b) into the COE ($\varepsilon^i{}_R$) and expected growth ($\varepsilon^i{}_G$) components by jointly minimizing the components of COE and expected growth due to unobservable risk and growth factors, $\varepsilon^i{}_R$ and $\varepsilon^i{}_G$. For this purpose, we set up the following minimization program:

$$\begin{cases} \underset{\bar{R},\bar{G},\lambda_R,\lambda_G,\varepsilon_R^i,\varepsilon_G^i}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 \\ R^i = \bar{R} + \boldsymbol{\lambda}_{\mathbf{R}}{}'\mathbf{x}_{\mathbf{R}}^{\mathbf{i}} + \varepsilon_R^i \\ G^i = \bar{G} + \boldsymbol{\lambda}_{\mathbf{G}}{}'\mathbf{x}_{\mathbf{G}}^{\mathbf{i}} + \varepsilon_G^i \end{cases} \tag{4}$$

where $w_1{}^i$ and $w_2{}^i$ are some predetermined non-negative weights (with at least one of the two weights being positive), and the other variables are as defined above.

Intuitively, the minimization function in (4) represents a loss (cost) function that increases with the magnitude of unexplained components of COE and growth. Tying the cost function to unexplained components is akin to Occam's razor principle – everything else being equal, estimates that can be explained by observable factors are preferred to estimates that appeal to some unobservable factors. The weights $w_1{}^i$ and $w_2{}^i$ reflect relative importance of components due to unobservable risk and growth factors, respectively. For example, setting $w_1{}^i$ equal to zero, assumes that growth does not vary across firms beyond variation implied by observable growth factors, i.e. $G^i = \bar{G} + \boldsymbol{\lambda}_{\mathbf{G}}{}^{`}\mathbf{x}_{\mathbf{G}}{}^{\mathbf{i}}$.

Appendix A shows that our minimization program (4) is equivalent to the following minimization program that can be estimated using a weighted least squares (WLS) regression:[11]

$$\begin{cases} \underset{\varepsilon^i, \gamma_0, \gamma_1, \lambda_R, \lambda_G}{Min} \sum_i w^i (v^i)^2 \\ \text{s.t.} \quad X^i_{cT} / B^i_0 = \gamma_0 + \gamma_1 MB^i + \boldsymbol{\lambda}_{\mathbf{R}}{}' \mathbf{x}^{\mathbf{i}}_{\mathbf{R}} MB^i + \boldsymbol{\lambda}_{\mathbf{G}}{}' \mathbf{x}^{\mathbf{i}}_{\mathbf{G}} (1 - MB^i) + v^i \end{cases} \tag{5a}$$

where the weights w^i are equal to $w_1{}^i w_2{}^i / (w_1{}^i(1–MB^i)^2 + w_2{}^i(MB^i)^2)$.[12]

Using the coefficient and residual estimates (γ_0, γ_1, $\boldsymbol{\lambda}_{\mathbf{R}}$, $\boldsymbol{\lambda}_{\mathbf{G}}$, and ε^i) from the WLS regression (5a), firm COE (R^i) and growth rate (G^i) are determined as follows (derivation can be found in Appendix A):

$$\begin{aligned} R^i &= \overline{R} + \boldsymbol{\lambda}_{\mathbf{R}}\text{\`{}}\mathbf{x}_{\mathrm{R}}{}^{\mathrm{i}} + \varepsilon^i{}_R \\ G^i &= \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}\text{\`{}}\mathbf{x}_{\mathrm{G}}{}^{\mathrm{i}} + \varepsilon^i{}_G. \end{aligned} \tag{5b}$$

where

$$\overline{R} = \gamma_0 + \gamma_1 + 1$$
$$\overline{G} = \gamma_0 + 1$$

$$\varepsilon^i_R = v^i \frac{w^i_2 MB^i}{w^i_1 (MB^i - 1)^2 + w^i_2 (MB^i)^2}$$

$$\varepsilon^i_G = v^i \frac{w^i_1 (1 - MB^i)}{w^i_1 (MB^i - 1)^2 + w^i_2 (MB^i)^2}$$

[11] Regression (5a) assumes that independent variables are exogenous, i.e. $E[\varepsilon^i \mid MB^i, MB^i x_R{}^i, (1 - MB_i) x_G{}^i] = 0$. A sufficient but not necessary condition for the exogeneity is the assumption that $\varepsilon^i{}_R$ and $\varepsilon^i{}_G$ are independent of MB^i, $x_R{}^i$, and $x_G{}^i$.

[12] Note that the WLS regression restricts neither the magnitudes nor the signs of the risk premia and growth weights, λ_R and λ_G, which are determined endogenously based on earnings forecasts and stock prices.

To summarize, our method allows simultaneously estimating implied COE and terminal growth by incorporating observable risk and growth drivers into the valuation equation, while minimizing COE and growth variation due to unobservable factors.

Estimation Procedure

We estimate firms' COE and growth rates in the two steps detailed below.

Step 1: Each year, we estimate the following cross-sectional regression using WLS with the weights equal to $1 / ((1–MB^i)^2 + (MB^i)^2)$:[13]

$$X^i_{cT} / B^i_0 = \gamma_0 + \gamma_1 MB^i + \underbrace{(\lambda_{Beta} Beta^i + \lambda_{Size} LogSize^i + \lambda_{MB} MB^i + \lambda_{ret} ret^i_{-12})}_{\boldsymbol{\lambda_R}'\mathbf{x^i_R}} MB^i$$
$$+ \underbrace{(\lambda_{Ltg} Ltg^i + \lambda_{dROE} dIndROE^i + \lambda_{RdSales} RdSales^i)}_{\boldsymbol{\lambda_G}'\mathbf{x^i_G}}(1 - MB^i) + v^i \qquad (6)$$

where the vector of risk characteristics, $\mathbf{x^i_R}$, corresponds to the three-factor Fama-French model augmented with Carhart (1997) momentum factor: the CAPM beta (*Beta*), market value of equity (*LogSize*), market-to-book ratio (*MB*), and past twelve months stock return (ret_{12}).[14] The vector of growth characteristics, $\mathbf{x_G^i}$, consists of the analysts' long-term growth forecast (*Ltg*), the difference between industry ROE and the firm's average forecasted ROE over years t+1 to t+4 (*dIndROE*), which serves as a proxy for the mean-reversion tendency in ROEs, and the ratio of R&D expenses to sales (*RDSales*). The latter characteristic serves a dual purpose as a proxy for the extent of accounting

[13] These weights assume equal weighting of the COE and growth components due to unobservable factors in (4), that is $w_1^i = w_2^i = 1$. As a robustness check, we vary the ratio of the weights (w_1^i / w_2^i) from 0.5 to 2. Our inferences are robust to these variations.

[14] Leverage is another characteristic associated with equity risk. We do not include leverage in the estimation because Fama and French (1992) show that the power of leverage to predict future stock returns is subsumed by the CAPM beta, size, and book-to-market ratio.

conservatism, which affects terminal growth in residual income (Zhang 2000), and as one of the known predictors of the long-term growth in earnings (Chan et al. 2003).[15]

Calculation of X_{cT}^{i} requires a COE estimate, R^{i}, which is not known. We use an iterative procedure similar to that described in ETSS to estimate both X_{cT}^{i} and R^{i}. Namely, we first set R^{i} equal to 10% for all firms and calculate the initial values of X_{cT}^{i}. We then use obtained X_{cT}^{i} to estimate the WLS regression, which produces revised estimates of R^{i}. We then re-calculate X_{cT}^{i} using the revised estimates of R^{i} and again re-estimate the WLS regression. The procedure is repeated until the mean (across all firms) of absolute change in R^{i} from one iteration to the next is less than 10^{-7}. The estimation is robust to using other initial values of R^{i} and in most cases involves less than 10 iterations.[16]

Step 2: Using the intercept and the slope of the market-to-book ratio from Step 1, we calculate the mean $\overline{R}$ and $\overline{G}$ as $\overline{R} = \gamma_0 + \gamma_1 + 1$ and $\overline{G} = \gamma_0 + 1$. We use residuals from the same regression to calculate the firm-specific components of R and G, as $\varepsilon^{i}_{R} = v^{i}MB^{i} / ((MB^{i} - 1)^2 + (MB^{i})^2)$ and $\varepsilon^{i}_{G} = v_i\,(1 - MB_i\,)/\,((MB^{i} - 1)^2 + (MB^{i})^2)$. Finally, we combine estimates $\overline{R}$ and $\overline{G}$ and residuals ε^{i}_{R} and ε^{i}_{G}, with estimated $\boldsymbol{\lambda}_{\mathbf{R}}`\mathbf{x}_{R}^{i}$ and $\boldsymbol{\lambda}_{\mathbf{G}}`\mathbf{x}_{G}^{i}$ from

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[15] Our search of growth drivers reveals that the literature on forecasting growth in earnings over long horizons is very sparse. To our knowledge, there are no empirical papers that would forecast growth in *residual* earnings. There are also no papers documenting growth in accounting earnings over horizons exceeding ten years into the future. Chan et al. (2003) explore growth over the ten-year horizon. However, their cross-sectional prediction model forecasts earnings growth only five years into the future. In our sensitivity tests, we have also included other growth predictors suggested in Chan et al. (2003), including past sales growth, earnings-to-price ratio, and alternative conservatism proxies used in Penman and Zhang (2000). Our results are not sensitive to including them in the estimation, and we opt for a parsimonious set of variables to avoid additional sample restrictions.

[16] Note that numerical estimation of implied COE is typical in models that assume different short-term and long-term growth rates in earnings (e.g. Gebhardt et al. 2001, Claus and Thomas 2001). The method proposed here is not more computationally complex than the extant COE estimation methods.

regression (6), and calculate total COE and expected growth as $R^i = \overline{R} + \boldsymbol{\lambda}_{\mathbf{R}}`\mathbf{x}_{\mathrm{R}}^{\mathrm{i}} + \varepsilon^i_R$ and $G^i = \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}`\mathbf{x}_{\mathrm{G}}^{\mathrm{i}} + \varepsilon^i_G$.

3. Data and Variable Estimation

Our sample consists of December fiscal-year-end firms available in *I/B/E/S*, *Compustat*, and *CRSP* from 1980 to 2007. The one- and two-year-ahead analyst earnings forecasts, long-term growth forecasts, realized earnings, stock prices, dividends, and number of shares outstanding are obtained from *I/B/E/S*; book values of common equity are obtained from *Compustat*; CAPM betas, as well as past and future buy-and-hold stock returns are estimated using monthly stock returns from CRSP. We exclude firm-years with negative two-year-ahead earnings forecasts, book-to-market ratios less than 0.01 or greater than 100, or stock prices below one dollar. Our main sample consists of 50,636 firm-year observations. Tests that involve COE based on the PEG model use a smaller sample of 48,033 firm-year observations due to requiring positive earnings forecasts.

Inputs to Simultaneous Estimation of COE and Growth

Our COE and long-term growth measures are estimated by first running the following cross-sectional regression using WLS:

$$\begin{aligned} X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i &+ (\lambda_{Beta} Beta^i + \lambda_{Size} LogSize^i + \lambda_{MB} MB^i + \lambda_{ret} ret_{-12}^i) MB^i x_R^i \\ &+ (\lambda_{Ltg} Ltg^i + \lambda_{dROE} dIndROE^i + \lambda_{RdSales} RdSales^i)(1 - MB^i) x_G^i + v^i \end{aligned} \tag{6}$$

where

X_{cT} = four-year cum-dividend earnings forecast, $\sum_{t=1}^{4} E_t + \sum_{t=1}^{3} ((1+r)^{4-t} - 1) d_t$, where E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year t+1; E_3 and E_4 are three- and four-year-ahead earnings per share forecasts computed using the long-term growth rate from *I/B/E/S* as: $E_3 = E_2(1+Ltg)$ and $E_4 = E_3(1+Ltg)$;[17] d_1 to d_3 are expected dividends per share calculated assuming a constant dividend payout ratio from fiscal year t;

B_0 = book value of equity from *Compustat* at the end of year t divided by the number of shares outstanding from *I/B/E/S*;

MB = market-to-book ratio, calculated as the stock price from *I/B/E/S* as of June of year t+1, divided by per share book value of equity;

Beta = CAPM beta estimated using sixty monthly stock returns preceding June of year t+1 (with at least twenty four non-missing returns required);

LogSize = the log of the market value of equity calculated as stock price from *I/B/E/S* as of June of year t+1 multiplied by shares outstanding from *I/B/E/S*;

Ret_{-12} = twelve-month buy-and-hold stock return preceding June of year t+1;

Ltg = consensus long-term growth forecast from *I/B/E/S* as of June of year t+1;

dIndROE = the industry mean ROE (income before extraordinary items divided by the average book value of equity) minus the firm's average forecasted ROE over years t+1 to t+4. Industries are defined using the Fama and French (1997) 48-industry classification. Industry ROE is calculated as a ten-year moving median ROE after excluding loss firms (Gebhardt et al. 2001);

RDSales = the ratio of R&D expenses to sales.

All variables are demeaned using yearly sample means.

COE from Benchmark Models

We compare the performance of our COE measure to three widely used COE measures derived using an *assumed* long-term earnings growth rate. The first implied COE measure, r_{CT}, is based on Claus and Thomas (2001). It represents an internal rate of return from the residual income valuation model assuming that after five years residual

[17] We substitute missing *Ltg* with *E2/E1* – 1. Values of *Ltg* greater than 50% are winsorized.

earnings will grow at a constant rate equal to the risk-free rate (proxied by the ten-year Treasury bond yield) minus historical average inflation rate of three percent.

The second implied COE measure, r_{GLS}, is developed by Gebhardt et al. (2001) and is frequently used in both accounting and finance studies. It is derived using explicit earnings forecasts for years t=1 and t=2, and assumes that return on equity converges to the industry median ROE from year t=3 to year t=12. A zero growth in residual earnings is assumed afterwards.

The third implied COE measure, r_{PEG}, is taken from Gode and Mohanram (2003). It is based on the abnormal earnings growth model (Ohlson and Juettner-Nauroth 2005) and assumes a zero abnormal earnings growth beyond year t+2.

The details of benchmark COE estimation are in Appendix B.

Adjusting Analysts' Forecasts for Predictable Errors

Prior literature shows that analyst earnings forecasts are systematically biased, with the direction and the magnitude of the bias correlated with various firm-year characteristics (e.g. Guay et al. 2005, Hughes et al. 2008). Using biased earnings forecasts as inputs in the valuation equation inevitably produces biased implied COE estimates (Easton and Sommers 2005). To mitigate the effect of the bias, we follow Gode and Mohanram (2009) and adjust analyst forecasts for predictable errors and then re-compute the implied COE measures using the adjusted forecasts.[18,19]

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[18] We would like to thank Partha Mohanram for sharing his forecast error adjustment codes.

[19] Hughes et al. (2008) suggest that the trading strategy based on exploiting predictable analyst forecast errors does not produce statistically significant returns, which is consistent with the market not being subject to the same biases as analysts. However, it is possible that in some instances stock prices may incorporate earnings expectations biased in the same direction as analyst earnings forecasts. If this is the case, adjusting earnings forecasts for such predictable errors leads to implied COE estimates that do not

We obtain predictable errors in earnings forecasts by first regressing realized forecast error in k-year-ahead earnings scaled by price ($FERR_k$, k = 1, 2, 3, and 4) on the forward earnings-to-price ratio, long-term growth forecast, change in gross PP&E, trailing twelve-month stock return, and the revision of one-year-ahead earnings forecast from the forecast made three months earlier. The regressions are estimated annually based on the hold-out sample lagged by k years. The obtained coefficients are combined with variables in year t to estimate the predictable bias in k-year-ahead earnings forecasts. We then correct earnings forecasts for the predictable bias and calculate the adjusted COE and growth rate based on the corrected forecasts. The obtained COE and implied growth rates are labeled as "*adjusted*".

4. Empirical Analyses

Descriptive Statistics

Table 1 reports descriptive statistics for our sample firms.[20] Consistent with other studies that use *I/B/E/S* analyst earnings forecasts, the firms in our sample are relatively large with the mean (median) market capitalization of \$3,631 (\$517) million. The mean CAPM beta is 1.07 which is comparable to the beta of one for the market value-weighted portfolio. The high average long-term growth forecast of 0.171 and the negative average

represent the market's expectations of future returns, but instead are equal to the market's expectation of future returns plus the predictable return due to subsequent correction of the mispricing. The adjusted COE measure then represents the total COE that the firm faces due to both risk and mispricing. In our empirical analyses, we do not distinguish between the two interpretations of implied COE.

[20] To avoid the influence of extreme observations, we winsorize all variables except future realized returns at the 1st and 99th percentiles.

difference between the industry ROE and the firm's average forecasted ROE, *dIndROE*, are consistent with on-average optimistic bias in analyst earnings forecasts.

Cost of Equity Estimation Results

Our estimation of firms' COE and growth is based on regression (6):

$$X_{cT}^{i} / B_{0}^{i} = \gamma_{0} + \gamma_{1} MB^{i} + (\lambda_{Beta} Beta^{i} + \lambda_{Size} LogSize^{i} + \lambda_{MB} MB^{i} + \lambda_{ret} ret_{-12}^{i}) MB^{i} x_{R}^{i}$$

$$+ (\lambda_{Ltg} Ltg^{i} + \lambda_{dROE} dIndROE^{i} + \lambda_{RdSales} RdSales^{i})(1 - MB^{i}) x_{G}^{i} + v^{i} ,$$

where all variables are previously defined in Section 3. Regressions are estimated by year, with an iterative procedure described in Section 2.[21]

Table 2 Panel A reports regression results. The first (last) three columns use unadjusted analyst earnings forecasts (forecasts adjusted for predictable errors). The panel reports time-series averages of estimated regression coefficients (λ). In addition to assessing statistical significance of regression coefficients, we evaluate economic importance of the risk and growth drivers by calculating standardized regression coefficients. Namely, we multiply regression coefficients by corresponding average yearly standard deviations of risk and growth drivers. The obtained standardized coefficients can be interpreted as changes in COE (implied growth) due to one standard deviation increase in the risk (growth) driver.

The results in Panel A of Table 2 indicate that the most important risk (growth) driver is the market-to-book ratio (difference between industry ROE and firm's

[21] Regression (6) is estimated using WLS. As a robustness check, we have replicated estimation using an OLS regression. The results are similar—implied COE measures predict future realized returns with coefficients significantly different from zero—but the predictive ability is weaker (the coefficient on unadjusted COE measure is significantly different from one). This deterioration in COE predictive ability underscores the importance of utilizing theoretically correct weights for the regression residuals.

forecasted ROE, *dIndROE*). The increase in *MB* (*dIndROE*) by one standard deviation corresponds to a decrease (increase) in four-year COE (growth) by 12.9% (10%) using unadjusted forecasts and 9.8% (8.5%) using adjusted forecasts. On annualized basis, these differences correspond to 3.4% (2.4%) and 2.5% (2.1%), respectively.

The signs of coefficients on *MB* and Ret_{-12} are consistent with prior literature. When using adjusted forecasts, the loading on *Beta* is negative, which is inconsistent with the single-period CAPM. However the effect is economically negligible (one standard deviation increase in *Beta* decreases annualized return by 0.2%) and is in line with negative insignificant coefficient documented in asset-pricing tests based on realized returns (Fama and French 1992; Petkova 2006).[22] The loading on size is negative but not economically significant suggesting that size effect is negligible in I/B/E/S sample (Frankel and Lee 1998). Regression based on unadjusted forecasts suggests a negative relation between past returns and COE consistent with the sluggishness in analyst forecasts (Guay et al. 2005).[23] In contrast, regressions based on adjusted forecasts suggest that COE is positively associated with past returns reflecting momentum in stock returns. [24]

Overall, our estimation produces loadings on risk and growth drivers that are generally consistent with prior literature. In our sample, the book-to-market ratio is the

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[22] The insignificant relation between the CAPM beta and stock returns is a key motivation for alternative asset-pricing models (Merton 1973; Jagannathan and Wang 1996; Lettau and Ludvigson 2001).

[23] When analyst forecasts are sluggish, they do not incorporate the recent positive (negative) earnings news and are therefore biased downward (upward) following recent positive (negative) stock returns. The bias in forecasts mechanically leads to downwardly (upwardly) biased implied COE estimates following positive (negative) stock returns.

[24] Some risk (growth) drivers are not loading significantly in either Unadjusted or Adjusted Forecast regressions. These drivers include CAPM beta, analysts' long-term growth forecast, and size. When we perform estimation excluding these drivers, our validation results are predictably very similar.

most important determinant of COE, while the difference between the firm's forecasted ROE and industry's ROE is the most important determinant of terminal growth.

Panel B of Table 2 reports descriptive statistics of implied COE and terminal growth estimates. The mean (median) of our COE estimate, r_{SE} (where *SE* stands for simultaneous estimation), is 8.2% (7.7%) and the mean (median) of our growth estimate, g_{SE} , is 0.6% (0.4%). Our COE estimates are somewhat lower than those based on the Claus and Thomas model, GLS model, and PEG model (with the means of 11.1%, 10.3%, and 11.1% respectively). When earnings forecasts are corrected for analyst forecast biases, COE estimates from all models decline suggesting that earnings forecasts are on average adjusted downwards to correct for the overall optimistic forecast bias.

Panel C of Table 2 presents means of by-year correlations among the COE estimates. The average correlations between unadjusted (adjusted) r_{SE} and r_{CT}, r_{GLS}, and r_{PEG} are 0.49, 0.71, and 0.53 (0.31, 0.61, and 0.43), respectively. Overall, correlations among all COE measures are positive and significant in majority of sample years, suggesting that they capture the same underlying construct.

Implied COE and Future Realized Returns

In this subsection, we validate the implied COE measures by documenting their association with future realized returns (Guay et al. 2005; Easton and Monahan 2005; Gode and Mohanram 2009).

We first document COE's out-of-sample predictive ability with respect to future stock returns by sorting firms into quintiles of implied COE distribution at the end of June of each year. For each portfolio, we calculate the mean buy-and-hold return for the next twelve months. We also calculate hedge returns as the difference in returns between the top (Q5) and bottom (Q1) quintiles of implied COE.

Figure 1 plots the time-series means of portfolio returns. The magnitudes of hedge returns are reported next to 'Q5-Q1' labels. Panel A reports returns by portfolios based on unadjusted COE measures. Our measure, r_{SE}, exhibits a strong monotonic relation with future realized returns. The difference in returns between the top and bottom quintiles of r_{SE}, Q5-Q1, is equal to 6.5% (statistically significant at the 5% level). In contrast, the predictive ability of r_{CT}, r_{GLS} and r_{PEG} is weak. The hedge returns, Q5-Q1, for r_{CT}, r_{GLS}, and r_{PEG} are only 3.9%, 3.8%, and 0.1% respectively, and not statistically significant for r_{GLS}, and r_{PEG}.

Panel B of Figure 1 plots returns by portfolios based on COE measures adjusted for forecast errors. Performance of all COE measures is markedly improved,[25] with our measure still performing best. The hedge returns, Q5-Q1, increase to 9.3%, 4.4%, 6.8%, and 4.5% for r_{SE}, r_{CT}, r_{GLS}, and r_{PEG} respectively, and are significant at the 1% (5%) level for r_{SE} (all benchmark models). Overall, our COE measure significantly outperforms the benchmark models at the portfolio level.

Next, we investigate the return predictive ability of COE measures at the firm level. Panel A of Table 3 reports the results of cross-sectional regressions of one-year-ahead stock returns on the COE measures. Each slope coefficient has two corresponding *t*-statistics reflecting how significantly different the coefficient is from zero and one. The slope on a valid COE measure should be significantly different from zero, and not

[25] This result is consistent with Gode and Mohanran (2009) and Larocque (2010) who show that COE based on the PEG model improves its return predictability when analysts' forecasts are adjusted for predictable errors.

significantly different from one. Consistent with the evidence from Figure 1, our measure, r_{SE}, is significantly related to future stock returns, with regression coefficient statistically indistinguishable from one. None of the other measures unadjusted for analyst forecast errors can predict future returns. After the forecast error adjustment, the slopes increase for all measures and become (remain) significantly positive for r_{CT} and r_{GLS} (r_{SE}). The slope on r_{PEG}, although positive, remains insignificant.

Next, we examine the incremental explanatory power of r_{SE} and the benchmark COE measures relative to each other by regressing future realized returns on the pairs of COE measures. The results are reported in Panel B of Table 3. Both unadjusted and adjusted r_{SE} have significant explanatory power after controlling for r_{CT}, r_{GLS}, or r_{PEG}. In contrast, neither of the benchmark COE is significant after controlling for r_{SE}, suggesting that r_{SE} subsumes the predictive power of other COE measures.

Finally, we provide evidence on the relative importance of the two information sources underlying our measure, r_{SE}: (1) the risk profile (i.e. risk characteristics) of the company, and (2) residual COE unexplained by risk characteristics, but implied by the valuation equation. Specifically, we regress realized returns on COE proxies controlling for *Beta*, Size, *B/M*, and past stock returns. Results reported Panel C of Table 3 show that the slopes on both adjusted and unadjusted r_{SE} remain statistically significant. That confirms the construct validity of our measure beyond simply capturing the observable risk profile of the company.[26]

[26] We further explore the role of observable risk characteristics in the sub-section on statistical prediction of returns and growth rates.

Overall, the results in Figure 1 and Table 3 demonstrate that our COE measure is significantly positively associated with future realized returns. Furthermore, it contains information about firms' expected returns that is not captured by the CAPM beta, firm size, book-to-market ratio, past stock returns, as well as other implied COE measures.

Implied Growth Rates and Future Realized Earnings Growth

In this subsection, we validate the implied growth rates by documenting their association with future realized growth in earnings.

Our implied growth measure captures expected growth in four-year cum-dividend residual earnings from period *t*+4 onwards. A direct validation test would involve correlating implied growth with earnings growth from *t*+4 to perpetuity. Such test is infeasible in practice. Accordingly, we estimate growth in four-year cum-dividend earnings from [*t*, *t*+4] to [*t*+5, *t*+8] as: [27]

$$GR_{t+4,t+8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1,$$

where $X_T^{cumd} = \sum_{t=T-3}^{T} E_t + \sum_{t=T-3}^{T-1} ((1+r)^{4-t} - 1)d_t$, E_t is realized earnings for year *t*, d_t is dividends declared in year *t*, and *r* is the rate of return at which dividends are

[27] A more direct validation requires estimating realized growth in *residual* earnings. We choose not to use growth in residual earnings in our main tests for two reasons. First, if our implied growth and COE estimates are correlated, using our COE estimate to calculate realized residual earnings may cause the latter to be spuriously correlated with our implied growth estimate. Second, when we use risk-free rates to calculate realized residual earnings, over 50% of cumulative residual earnings before extraordinary items (EBEI) over the first four years are negative and thus cannot be used as a base to estimate growth. Percentage of negative observations is lower when operating income before depreciation (OI) is used to estimate residual earnings. Accordingly, we replicate analyses presented in this subsection using growth in residual OI, and obtain a qualitatively similar set of results (untabulated).

reinvested, which is set equal to the risk-free rate at period *t*.[28] The realized earnings are either earnings before extraordinary items (*EBEI*), or operating income before depreciation (*OI*). Although earnings before extraordinary items correspond more directly to earnings underlying our implied long-term growth, it is frequently negative or close to zero causing problems when used as a basis for calculating growth. Using growth in operating income before depreciation mitigates this problem.

Table 4, Panel A contains descriptive statistics for the growth rates in four-year cum-dividend earnings. The mean (median) growth rates are 0.48 (0.30) for *EBEI* and 0.52 (0.32) for *OI*. These growth rates can be interpreted as a geometric average growth over four years, and they correspond to annualized rates of 10% (7%) for *EBEI* and 11% (7%) for *OI*.[29]

Figure 2 plots mean growth rates by quintiles of the implied growth measures. Casual observation suggests a positive association between the implied and realized growth rates, except when of unadjusted implied growth is used to predict growth in *OI*. These observations are formally confirmed in regression analysis. Specifically, we regress realized growth rates on the quintile rank of unadjusted (adjusted) implied growth, $R(g_{SE})$. The regressions use a pooled sample, with time fixed effects and standard errors clustered by firm and year. The results are reported in Panels B and C of Table 4. The coefficients on the quintile ranks of unadjusted (adjusted) implied growth rate are 0.122 (0.098) and 0.026 (0.060) when predicting growth in *EBEI* and growth in *OI*,

[28] By using a risk-free rate we avoid spurious correlations with implied growth rates that could arise had we used previously estimated implied COE estimates. The results are robust to using a uniform 10% rate as in Penman (1996), or a 0% rate that assumes no dividend reinvestment.

[29] We do not use annualized growth rates in the analysis because we cannot annualize four-year growth rates that are less than negative 100%.

respectively. These slope coefficients multiplied by four can be interpreted as average differences in four-year earnings growth between the extreme quintiles of implied growth. On annualized basis, the above coefficients correspond to 10.4% (8.6%) and 2.5% (5.5%) differences in realized growth rates, respectively. All the slope coefficients, except the of the one from regressing *OI* growth on unadjusted implied growth, are statistically significant at the 1% level. Overall, we find that our implied growth measure is a statistically and economically significant predictor of future growth in earnings.

Next, we investigate whether implied growth retains ability to predict future realized growth after controlling for the growth drivers underlying implied growth estimation. For that purpose, we regress future realized growth rates on quintile ranks of implied growth, $R(g_{SE})$, and control variables – analysts' predicted earnings growth, *Ltg*, deviation of industry's ROE from the firm's forecasted ROE, *dIndROE*, and the ratio of R&D expenses to sales, *RDSales*. The results reported in Panels B and C of Table 4 suggest that the predictive ability of our implied growth measure derives entirely from the growth drivers – none of the coefficients on implied growth ranks remains statistically significant after controlling for growth characteristics. While this result uncovers the ex-post source of predictive ability of implied growth *within our estimation method*, it does not imply that these growth drivers can be successfully combined in a simple statistical prediction model ignoring information contained in the valuation equation. We investigate the relative performance of simple statistical earnings growth prediction in the next subsection.

Overall, the implied growth measures are predictive of future long-term growth in earnings, with predictive ability stemming from the growth drivers. The analyses in this subsection are, however, subject to an inherent survivorship bias, which is unavoidable when measuring growth over long horizons. We further investigate the effects of the bias in Section 5.

Statistical Prediction of Returns and Earnings Growth

The predictive ability of our implied COE and growth measures partly derives from the risk and growth drivers that are embedded in the valuation equation. We next investigate how our valuation-model-based estimates compare to predictions from simple statistical models based on the same risk or growth drivers.

First, we construct statistically predicted returns. For this purpose, we estimate hold-out cross-sectional regressions of realized one-year returns for year t on the risk drivers from year t–1 (market-to-book ratio, logarithm of market value of equity, CAPM beta, and prior twelve-month return). We combine obtained coefficients with risk drivers at time t to come up with a statistical forecast of year t+1 realized return (*Stat_pRet*).

To compare the predictive ability of the obtained return forecasts to our implied COE, we regress future realized returns on quintile ranks of the predicted return measure (implied COE). Due to the hold-out sample requirements, these regressions are based on the 1981 – 2007 sample period. Panel A of Table 5 reports regression results. The slope coefficients multiplied by four can be interpreted as an increase in average one-year-ahead return from the bottom to the top quintile of statistical return forecast (implied COE). The results suggest that statistically predicted returns have little forecasting ability—the average change in realized returns between extreme quintiles is around two percent (=0.005*100%*4) and is not statistically significant. In contrast, implied COE based on unadjusted (adjusted) analysts' forecasts yields an average change of 6.8 (9.6)%

(calculated as 0.017*100%*4 (0.024*100%*4)), significant at least at the 5% level. Overall a simple statistical return forecast based on the same risk drivers as our COE measure, does not achieve the predictive power of the latter.

Next, we construct statistically predicted long-term earnings growth. Each year *t*, we use a hold-out sample lagged by eight years to regress past realized four-year cum-dividend earnings growth rates ($GR_{t-4,t}$) on the growth characteristics (*Ltg*, *dIndROE*, and *RDSales*) from year *t*-8. We then combine the obtained coefficients with the growth characteristics from year *t* to calculate a statistical predictor of future growth in four-year cum-dividend earnings ($Stat\_pGR_{t+4,\ t+8}$).

Panels B and C of Table 5 report regressions of realized growth rates on the quintile ranks of both the implied and statistically predicted growth. Due to the hold-out sample requirements, these regressions are based on the 1987 – 2001 sample period. For this period, the implied growth measure exhibits a stronger predictive ability – the coefficients on $R(g_{SE})$ are higher than in Panels B and C of Table 4, and significant at least at the 1% level. The implied growth measure retains incremental predictive ability after controlling for the statistical predictors. Moreover, it subsumes the predictive ability of the latter with respect to future growth in *EBEI*. Importantly, statistical predictors of growth seem to be "fitted" to a specific earnings measure. Namely, statistically predicted growth in *OI* (*EBEI*) has no power in predicting growth in *EBEI* (*OI*). The above evidence, combined, suggests that while it is possible to predict future realized growth in earnings statistically, the statistical growth measures need to be "fitted" to a specific earnings metric and they do not perform as well as the implied growth at predicting growth in bottom-line earnings. The implied growth measure, on the other hand, provides universal predictive ability, regardless of earnings definition, and contains information beyond simple statistical predictors.

Cross-Sectional Determinants of Return Predictability Relative to GLS

Results in Table 3 show that our COE measure on average surpasses the benchmark COE measures in predicting future returns over a broad cross-section of firms. In this subsection we explore the cross-sectional variation in the relative predictive ability of our measure. Specifically, we focus on our measure's performance relative to the best performing benchmark—COE from the GLS model (r_{GLS}).[30]

We expect to see the largest difference in the two measures' performance in the subsample of firms where the two measures differ from each the other most. Accordingly, we sort firms into portfolios based on absolute values of differences between our measure and r_{GLS}. To evaluate the relative performance of the two measures, we then estimate firm-specific regressions of future realized returns on the COE measures within these portfolios.

Panel A of Table 6 contains regression results. Our measure has significant predictive ability with respect to future returns across all sample partitions—the slope coefficient for r_{SE} is statistically significant at least at the 10% level. In contrast, the slope coefficient for r_{GLS} turns statistically insignificant in the top two quintiles, where r_{GLS} is most different from our measure. Relative to our measure, r_{GLS} performs the worst in quintile five, where the absolute deviation between our measure and r_{GLS} is the highest.

[30] In this subsection, we focus on COE measures adjusted for predictable forecast errors.

Next, we explore the determinants of relatively poor performance of the GLS measure in the quintile with the highest deviation from our measure. There are two main reasons why our measure outperforms r_{GLS} in that quintile. First, our growth assumptions may be relatively more accurate if either the key assumption in the GLS model—firms' ROE convergence to the industry average—is violated, or the terminal growth in residual earnings is not equal to zero. Second, risk characteristics may play a relatively more important role in COE estimation in that quintile, which would be the case if these characteristics are more salient for this subsample, i.e. they are further away from sample averages.

Following the above line of reasoning we calculate by-quintile averages of the following variables. First, to reflect how the firm is different from its industry in terms of its growth prospects, we calculate absolute deviations of firm's growth drivers (R&D expenses over sales, analysts' predicted long term growth, and the current level of ROE) from respective industry averages. Second, to reflect how the implied terminal growth rate is different from zero, we calculate absolute value of our implied growth estimate. Third, to capture the salience of risk characteristics, we calculate absolute deviation of risk drivers (CAPM beta, size, book-to-market ratio, and past one-year stock returns) from respective sample averages. In addition, we report an absolute deviation from the industry average for a growth variable not included into our COE estimation—sales growth over the past five years.

Panel B of Table 6 reports averages of by-year variable means by quintiles of absolute difference in r_{GLS} and r_{SE}. The last two columns report average differences between the top and the bottom quintiles and the corresponding Fama-MacBeth *t*-

statistics with the Newey-West autocorrelation adjustment. As expected, we observe that all growth drivers' deviations from industry averages are significantly higher for quintile five, where our measure is the most different from GLS, compared to quintile one, where the two measures are the closest. The deviation in R&D expenses, however, is higher in quintile four. Also as expected, the deviation of implied growth from zero is the highest in the fifth quintile. Finally, the risk characteristics of the firms in the fifth quintile are furthest away from the sample means, with the book-to-market ratio standing out in terms of the relative magnitude of absolute distance to the mean.

Overall, we uncover several cross-sectional determinants of our measure's relative performance compared to GLS. We find that our measure works relatively better for firms that are further from their industry in terms of profitability, forecasted long-term growth, and past sales growth, or further away from the average firm in terms of size, book-to-market ratio, CAPM beta, or past returns. These findings may guide future empirical research in the choice of an appropriate COE measure.

Comparison with ETSS: Average COE and Growth Rate

One of the main findings in ETSS is that their average COE estimate is significantly higher than average implied COE estimates from prior studies. As discussed in Section 2, our average COE and long-term growth estimates may deviate from those in ETSS because our model explicitly incorporates the observable risk and growth drivers. Next, we compare the average of by-year means of the COE (expected earnings growth) produced by our model to ETSS' estimates.[31] The (untabulated) results suggest that our model yields notably lower COE and earnings growth estimates. When using the ETSS model, the average COE is 11.7% (9.7%) and growth rate is 9.7% (7.4%) before (after) correction for analyst forecast errors. The corresponding values produced by our model are 9% (7.6%) and 6.7% (5.2%). Both our and ETSS' growth estimates are greater than the average historical earnings growth rate for the US market of around 3.2% per annum, with our estimates being closer to the historical rate.[32]

Using the average risk-free rate (proxied by five-year Treasury bond yield) of 7.22% for our sample period, the average implied risk premium from ETSS model is 4.43% (2.50%) compared to 2.50% (0.34%) from our model before (after) correction for analyst forecast errors.[33] Although the average risk premium from our model is significantly lower than the historical premium based on realized returns, it is consistent with theoretically derived equity risk premia (Mehra and Prescott 1985). Moreover, lower estimates of COE are consistent with the finding in Hughes et al. (2009) that, when expected returns are stochastic, the implied COE is lower than the expected return.[34] These results, however, need to be interpreted with caution given the lack of reliable benchmarks of market risk premia, against which model estimates can be judged.

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[31] To derive growth in earnings using growth in residual earnings, we use the formula derived in the appendix in ETSS. Since we assume a constant future dividend payout while ETSS assume constant future dividends, we adjust the formula to make it consistent with our assumption.

[32] The estimate of the average historical rate is based on the data for aggregate nominal earnings of the S&P 500 firms from 1871 to 2009 provided by Robert Shiller at http://www.econ.yale.edu/~shiller/data/ie_data.xls.

[33] Risk premia are often measured relative to the rate on one-month Treasury bills. Based on this measure of the risk free rate, the average implied risk premium from ETSS model is 5.82% (3.89%) compared to 3.89% (1.17%) from our model before (after) correction for analyst forecast errors.

[34] Hughes et al. (2009) provide a ball-park estimate of the difference between expected returns and implied cost of capital of 2.3%. They note that the actual difference can be larger.

5. Robustness Tests and Additional Analyses

Easton and Monahan Tests of Construct Validity

A valid COE proxy should be positively associated with future *expected* stock returns. Our validation tests based on realized returns implicitly assume that realized stock returns on average are equal to expected returns. This assumption may not hold in finite data samples. For example, Elton (1999) argues that historical realized returns deviate from expected returns over long periods of time due to non-cancelling cash flow or discount rate shocks. To address this limitation, Easton and Monahan (2005) propose a method to control for future cash flow and discount rate shocks in realized returns – COE regressions.[35]

In this subsection, we conduct the Easton and Monahan tests for our implied COE measures. The tests consist of two parts. The first part involves regressing the log of one-year-ahead stock returns on the log of the COE measure (proxy for expected return) and the logs of contemporaneous cash flow and discount rate news proxies. The coefficient on the valid COE measure should not be statistically different from one. The second part involves calculating implied measurement errors for the COE estimates, using a modified Garber and Klepper (1980) approach.

Table 7 reports average by-year coefficients of Easton and Monahan regressions, where Panel A (Panel B) pertains to unadjusted (adjusted) COE measures. In Panel A, regression coefficients for all COE measures are significantly negative, suggesting that

[35] The Easton and Monahan (2005) test has proven to be a high bar for estimating construct validity of COE measures. Most conventional implied COE measures are negatively correlated with realized stock returns after controlling for cash flow and discount rate news, and have significant measurement errors.

all unadjusted measures are invalid. In contrast, Panel B reports that two COE measures adjusted for analyst forecast errors—our measure, r_{SE}, and r_{PEG}—have regression coefficients statistically indistinguishable from one. One caveat in interpreting these results is that COE proxies as well as cash flow and discount rate news proxies can be measured with error. In case these errors are correlated, the regression coefficients can no longer be interpreted at the face value.

The second part of the Easton and Monahan tests addresses the aforementioned issue of correlated measurement errors. Specifically, Easton and Monahan construct a statistic for the extent of the measurement error in the COE proxy that controls for correlation in measurement errors across the three variables in the regression. We report this statistic ("modified noise variable") in the last column of both Panels A and B in Table 7. The results show that our implied COE measure, r_{SE}, has the lowest measurement error across all unadjusted (adjusted) COE measures.

To summarize, Easton and Monahan tests of construct validity suggest the following. First, the tests unambiguously establish construct validity of our COE measure adjusted for analyst forecast errors, while our unadjusted COE measure exhibits a negative association with future expected returns (possibly due to correlated measurement errors in cash flow and discount rate news proxies). Second, among all COE measures adjusted (unadjusted) for analyst forecast errors, our measure exhibits the lowest degree of measurement error.

Future Realized Earnings Growth and Survivorship Bias

The growth rates used in validation of implied growth measures are estimated only for the firms that survive over the [t+1, t+8] period. Next, we explore the effects that sample attrition may have on our implied growth validation tests.

Panel A of Figure 3 plots percentage of firms for which realized growth in either *EBEI* or *OI* is unavailable. Clearly, the percentage of firms leaving the sample ("non-survivors") is higher within higher quintiles of implied growth. For example, growth in *OI* cannot be estimated for 51% (31%) of firms within the highest (lowest) quintile of unadjusted implied growth.[36] To the extent that "non-survivors" would have had lower realized growth rates, the growth estimates are systematically biased upwards, and the degree of bias is higher for the higher quintiles of implied growth.

To investigate the potential extent of the bias, we first classify "non-survivors" by reasons for leaving the sample. For that purpose, we use CRSP classification of stock delistings from exchanges. The main categories of delistings are: mergers or stock exchanges, bad performance (such as bankruptcy or liquidation), and other miscellaneous reasons (such as switching to a different exchange or going private). The bad performance-related category is classified following Shumway (1997). Panel B of Figure 3 reports percentage of firms delisted within eight years following the implied growth estimation by quintiles of implied growth measures.[37] The evidence from the figure suggests that the main reason behind sample attrition is related to mergers. Mergers are

[36] The sample attrition for growth in *EBEI* is higher than for *OI* due to more frequent negative growth base (growth in EBEI cannot be calculated when four-year cum-dividend earnings for [t+1, t+4] are negative).

[37] Note, that the percentages of delisted firms do not add up to the total percentage of "non-survivors" from Panel A of Figure 3. The difference is due to the cases where earnings are available, but growth cannot be computed due to negative four-year cum-dividend earnings for [t+1, t+4].

also the biggest source of the higher sample attrition for firms in the higher implied growth quintiles. For example, the difference in delisting percentage between the top and the bottom quintiles of unadjusted (adjusted) implied growth is 7.6% (8.8%) for merger-related delistings versus 0.7% (3%) for bad performance-caused delistings.

Using the above classification results, we perform a robustness check by substituting missing realized earnings growth for non-surviving firms with plausible ad-hoc growth estimates. Arguably, a firm that goes bankrupt has a relatively lower realized earnings growth compared to a firm that undergoes a merger. Accordingly, as our first robustness check we substitute the missing [t+4, t+8] earnings for firms with bad performance-related delistings with a negative book value of equity at t+4. Such substitution assumes that equity becomes entirely worthless after performance delisting, which is a conservative assumption. We re-run the analyses in Table 4, Panels B and C using substituted growth rates. The results are presented in Table 8, Panel A. Both the unadjusted and adjusted implied growth is positively and significantly associated with future realized growth in *OI*, while the unadjusted implied growth is positively associated with future realized growth in *EBEI*.

Next, we make an additional assumption of a zero growth rate for firms delisting due to mergers. Note, that this is a conservative assumption. Zero represents the 26th (34th) percentile of *OI* (*EBEI*) growth distribution. Regression results after performing this additional substitution are presented in Panel B of Table 8. Despite the conservative growth assumptions, unadjusted (adjusted) implied growth rate quintiles are positively and significantly associated with the realized growth in *EBEI* (*OI*).

Overall, the survivorship bias is a serious concern for the implied growth validity tests. However, robustness tests suggest that our results are unlikely entirely explained by such bias.

Implied COE Based on Aggregate Earnings

Our implied COE measure is different from benchmark measures (r_{GLS}, r_{CT}, and r_{PEG}) on a number of dimensions, including the underlying valuation model, forecast horizon, and earnings aggregation. To confirm that endogenously estimated terminal growth is the main source of our measure's superior return predictive ability, we construct an implied COE measure that is similar to our measure on all dimensions, except assumed terminal growth. Namely, we calculate r_{ZERO} as an internal rate of return from equation (2), assuming zero growth in four-year cum-dividend residual earnings (i.e. $G_i = 1$). We then replicate the validation tests summarized in Figure 1 and Table 3 using r_{ZERO}. The portfolio results (untabulated) suggest that r_{ZERO} on average performs better than the benchmark COE measures, but somewhat worse than our measure in predicting future returns. Using earnings forecasts adjusted for predictable errors, the average difference in one-year-ahead returns between the stocks in the top and the bottom quintiles of r_{ZERO} is 8.43%, compared to 9.45% for our measure. However, at the firm level, our measure dominates r_{ZERO}. In the firm-level regressions of one-year-ahead returns on COE measures, the slope on r_{ZERO} is 0.45 (significant at the 10% level), compared to 1.45 (significant at 1% level) for our measure. When both measures are included in the regression, r_{ZERO} is no longer statistically significant, while our measure is significant at the 1% level.

To further confirm that the superior predictive ability of our measure comes from a more accurately estimated terminal growth, we perform analyses similar to those reported in Table 6 for r_{GLS}. Namely, we partition the sample based on the absolute value of our implied growth (to capture deviation from the zero growth assumed for r_{ZERO}). In untabulated results, we find that r_{ZERO} does not predict future returns in the top quintile with the highest absolute implied growth (the average slope estimate is 0.17 with a *t*-statistic of 0.98), whereas our measure remains significantly associated with future returns (the average slope estimate is 1.47 with a *t*-statistic of 3.41).

6. Conclusion

The implied COE has recently gained significant popularity in accounting (and increasingly in finance) research. Despite its theoretical and practical appeal, the implied COE, as any other valuation model output, is only as good as the model inputs.[38] In particular, the implied COE is sensitive to the assumption about the expected earnings growth rate. In this study, we propose a method of estimating COE that avoids relying on ad-hoc assumptions about the long-term growth by estimating growth rates *implied by the data*.

Our estimation method follows Easton, Taylor, Shroff, and Sougiannis (2002), who simultaneously estimate sample averages for COE and expected growth in earnings.

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[38] The two other commonly used approaches to estimating COE (multiplying historical estimates of factor risk premia on historical factor loadings, and using ex-post realized returns) have their own merits and demerits. The first, approach is problematic given the ongoing debate about the appropriate asset pricing model and substantial measurement errors in the estimates of factor risk premia and risk loadings (Fama and French 1997). The second approach requires a very large sample spanning dozens of years (which is often not available to the researcher), since more risky stocks can underperform less risky stocks for multiple consecutive years (Elton 1999). Also, ex-post returns approach does not allow estimating the (ex-ante) COE in real time necessary for capital budgeting and other decisions.

The two assumptions that allow us to estimate firm-specific COE and expected growth are that each company has a unique risk-growth profile that can be proxied by observable characteristics, and that parsimonious measures of risk and growth should allow minimal deviations from such risk-growth profiles.

Our paper is related to earlier work by Huang et al. (2005), who use ETSS' method to estimate firms' COE and growth based on the *time series* of monthly stock prices and earnings forecasts. Our method differs from that proposed by Huang et al. along several dimensions. First, their method assumes that a firm's risk exposure and expected earnings growth do not change over the estimation period (36 months), which limits the practical appeal of the resulting measures (i.e., they cannot be used to examine changes in risk over short horizons). In contrast, we provide point-in-time COE estimates. Second, their estimation pairs monthly stock prices with annual book values of equity, which implicitly assumes that the book value of equity does not change within a given fiscal year. Our method relies on annual stock prices corresponding to annual book values of equity. Finally, by using monthly analyst forecasts and stock prices, their method assumes that forecasts and prices are simultaneously updated to reflect new information on a timely basis, which is inconsistent with prior research documenting significant sluggishness in analyst forecasts (Guay et al. 2005).

We validate our COE and growth estimates by examining their association with future stock returns and realized earnings growth, respectively. We find that our COE measure has a significant out-of-sample predictive ability with respect to future returns, which subsumes the predictive ability of other commonly used COE measures. At the same time, our expected growth measure is significantly associated with the future long-term earnings growth. Therefore, both the COE and the long-term growth measures appear to have construct validity.

Appendix A

Simultaneous Estimation of COE and Long-Term Growth

In this appendix, we derive expressions for implied COE and growth. Combining equation (3b) with assumption (4) from Section 2 yields the following system of equations:

$$\begin{cases} \underset{\varepsilon_R^i, \varepsilon_G^i, \varepsilon^i, \gamma_0, \gamma_1, \lambda_R, \lambda_G}{Min} \sum_i w_1^i (\varepsilon_R^i)^2 + w_2^i (\varepsilon_G^i)^2 \\ s.t.\ X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \varepsilon^i \\ \varepsilon^i = (G^i - \overline{G})(1 - MB^i) + (R^i - \overline{R}) MB^i \\ \gamma_0 = \overline{G} - 1 \\ \gamma_1 = \overline{R} - \overline{G} \\ R^i = \overline{R} + \lambda_R x_R^i + \varepsilon_R^i \\ G^i = \overline{G} + \lambda_G x_G^i + \varepsilon_G^i \end{cases} \tag{A1}$$

Next, we simplify the problem in (A1) so that it can be solved using standard regression analysis. Substituting the expressions for ε^i, R^i, and G^i into the second equation in (A1) and defining $\nu^i = \varepsilon_G^i + (\varepsilon_R^i - \varepsilon_G^i) MB^i$, we express the above system of equations as follows:

$$\begin{cases} \underset{\varepsilon_R^i, \varepsilon_G^i, \nu^i, \gamma_0, \gamma_1, \lambda_R, \lambda_G}{Min} \sum_i w_1^i (\varepsilon_R^i)^2 + w_2^i (\varepsilon_G^i)^2 \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1 - MB^i) x_G^i + \nu^i \\ \nu^i = \varepsilon_G^i + (\varepsilon_R^i - \varepsilon_G^i) MB^i \end{cases} \tag{A2}$$

Substituting $\varepsilon_G^i = (\varepsilon_R^i MB^i - \nu^i)/(MB^i - 1)$ from the last equation, we obtain

$$\begin{cases} \underset{\varepsilon_R^i, \nu^i, \gamma_0, \gamma_1, \lambda_R, \lambda_G}{Min} \sum_i w_1^i (\varepsilon_R^i)^2 + w_2^i ((\varepsilon_R^i MB^i - \nu^i)/(MB^i - 1))^2 \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1 - MB^i) x_G^i + \nu^i \end{cases} \tag{A3}$$

Finally, substituting the expression for ε_R^i that satisfies the first order conditions, $\varepsilon_R^i = w_2^i MB^i \nu^i / (w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2)$, we obtain the following weighted least square regression:

$$\begin{cases} \underset{\nu^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i \frac{w_1^i w_2^i (\nu^i)^2}{w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2} \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + \nu^i \end{cases} \tag{A4}$$

Combining equations (A4) with the above expressions for $\overline{R}$, $\overline{G}$, ε_R^i, ε_G^i, R^i, and G^i, we have the following WLS regression and equations that uniquely determine firm COE and expected growth rate:

$$\begin{cases} \underset{\nu^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i \frac{w_1^i w_2^i (\nu^i)^2}{w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2} \\ s.t. \; X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + \nu^i \\ \overline{G} = \gamma_0 + 1 \\ \overline{R} = \gamma_1 + \gamma_0 + 1 \\ \varepsilon_R^i = \nu^i \frac{w_2^i MB^i}{w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2} \\ \varepsilon_G^i = \nu^i \frac{w_1^i (1-MB^i)}{w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2} \\ R^i = \overline{R} + \lambda_R x_R^i + \varepsilon_R^i \\ G^i = \overline{G} + \lambda_G x_G^i + \varepsilon_G^i \end{cases} \tag{A5}$$

The first equation specifies the weights $w^i = w_1^i w_2^i / (w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2)$ that should be used in the WLS regression $X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + \nu^i$. Having found the intercept, slopes, and residuals from the regression, the third and the fourth equations can be used to obtain the sample mean *R* and *G*, the fifth and the sixth equations can be used to calculate the components of R^i and G^i due to unobservable risk and growth factors, and finally the last two equations can be used to calculate the firm COE and growth rate.

Comparison of between Our Model and ETSS

Recall that our minimization problem outlined in Section 2 is specified as:

$$\begin{cases} \underset{\bar{R},\bar{G},\lambda_R,\lambda_G,\varepsilon_R^i,\varepsilon_G^i}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 \\ R^i = \bar{R} + \boldsymbol{\lambda}_{\mathbf{R}}\,'\mathbf{x}_{\mathbf{R}}^{\mathbf{i}} + \varepsilon_R^i \\ G^i = \bar{G} + \boldsymbol{\lambda}_{\mathbf{G}}\,'\mathbf{x}_{\mathbf{G}}^{\mathbf{i}} + \varepsilon_G^i \end{cases} \tag{4}$$

Estimating regression (3b) in ETSS implies a different minimization problem. Because OLS minimizes the sum of squared residuals, the deviations of R^i and G^i from the sample means are jointly minimized in the following way:

$$\underset{\bar{R},\bar{G},\varepsilon^i}{Min} \sum_i (\varepsilon_G^i(1-MB^i) + \varepsilon_R^i MB^i)^2$$

$$\begin{cases} R^i = \bar{R} + \varepsilon_R^i \\ G^i = \bar{G} + \varepsilon_G^i \end{cases} \tag{A6}$$

The key difference between ETSS' and our minimization problems is that ETSS' minimization function (A6) does not increase even as ε_R^i and ε_G^i go to infinity as long as their linear combination, $\varepsilon_G^i(1-MB^i) + \varepsilon_R^i MB^i$, remains the same. In contrast, our loss function (4) always increases in the magnitude of ε_R^i and ε_G^i. Mathematically, our minimization function is positive definite while that in ETSS is positive semi-definite.[39] The assumption of a positive definite function is a standard assumption in the definition of a loss function. We find that the minimization of any positive definite quadratic function of ε_R^i and ε_G^i is sufficient to uniquely identify firm-specific *R* and *G* (the proof is available from the authors upon request).

[39] A quadratic function $w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 + w_3^i\varepsilon_R^i\varepsilon_G^i$ is positive (semi-)definite if it is positive (non-negative) for any non-zero argument, $\varepsilon_R^i\varepsilon_G^i \neq 0$, which holds if and only if $w_1^i > 0\,(\geq 0)$ and $4w_1^i w_2^i - (w_3^i)^2 > 0\,(\geq 0)$.

Appendix B

Benchmark COE Measures

Implied COE from Claus and Thomas (2001), r_{CT}, is an internal rate of return from the following valuation equation:

$$P_0 = B_0 + \sum_{\tau=1}^{4} \frac{E_\tau - r_{CT} B_{\tau-1}}{(1+r_{CT})^t} + \frac{E_5 - r_{CT} B_4}{(r_{CT} - g_{CT})(1+r_{CT})^4} \qquad (r_{CT})$$

where P_0 is the stock price as of June of year t+1 from *I/B/E/S*; B_0 is the book value of equity at the end of year t from *Compustat* divided by the number of shares outstanding from *I/B/E/S;* E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year t+1; E_3, E_4 and E_5 are three-, four- and five-year-ahead earnings per share forecasts computed using the long-term growth from *I/B/E/S* as: $E_3 = E_2(1+Ltg)$, $E_4 = E_3(1+Ltg)$, and $E_5 = E_4(1+Ltg)$; B_τ is the expected per-share book value of equity for year τ estimated using the clean surplus relation ($B_{t+1} = B_t + E_{t+1} - d_{t+1}$); g_{CT} is the terminal growth calculated as the ten-year Treasury bond yield minus three percent.[40]

Implied COE from Gebhardt et al. (2001), r_{GLS}, is an internal rate of return from the following valuation equation:

$$P_0 = B_0 + \sum_{\tau=1}^{11} \frac{(ROE_\tau - r_{GLS})B_{\tau-1}}{(1+r_{GLS})^t} + \frac{(IndROE - r_{GLS})B_{11}}{r_{GLS}(1+r_{GLS})^{11}} \qquad (r_{GLS})$$

where ROE_τ is expected future return on equity calculated as earnings per share forecast (E_τ) divided by per share book value of equity at the end of the previous year ($B_{\tau\text{-}1}$); ROE_1 and ROE_2 are calculated using one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year t+1; ROE_3 is computed by applying the long-term growth rate from *I/B/E/S* to the two-year-ahead consensus earnings per share forecast; beyond year t+3, ROE is assumed to linearly converge to industry median ROE (*IndROE*) by year t+12.

Implied COE from Gode and Mohanram (2003), $r_{PEG,}$, is calculated as:

$$r_{PEG} = \sqrt{\frac{E_1}{P_0}}(r_{PEG}), \qquad g_2 = \frac{(E_2 / E_1 - 1) + Ltg}{2} \qquad (r_{PEG})$$

where P_0 is the stock price as of June of year t+1 from *I/B/E/S*; E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year t+1; *Ltg* is the long-term earnings growth forecast from *I/B/E/S* reported in June of year t+1. This measure is a modified version of the Easton (2004) PEG measure, which assumes $g_2 = E_2/E_1$.

[40] To avoid using very high terminal growth in years with high risk-free rate we winsorize g_{CT} at the 3% level. When we do not winsorize g_{CT}, r_{CT} performs worse and none of the inferences regarding our COE measure change.

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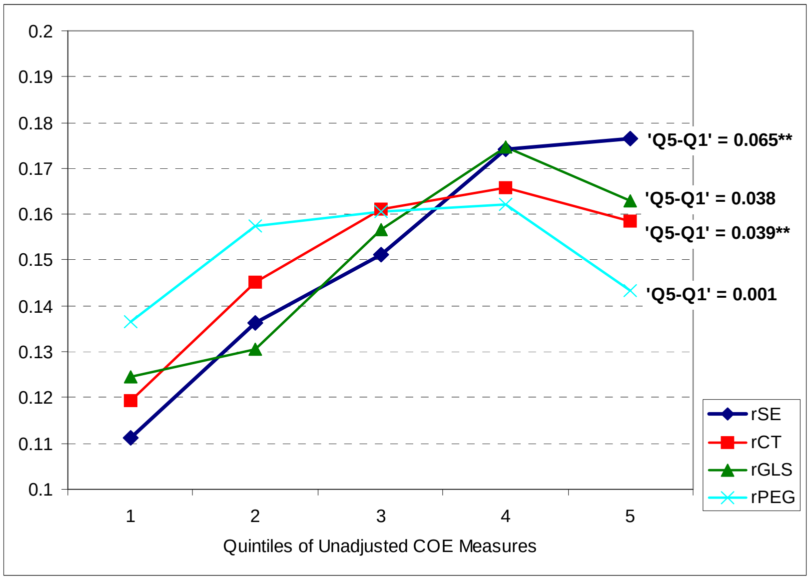
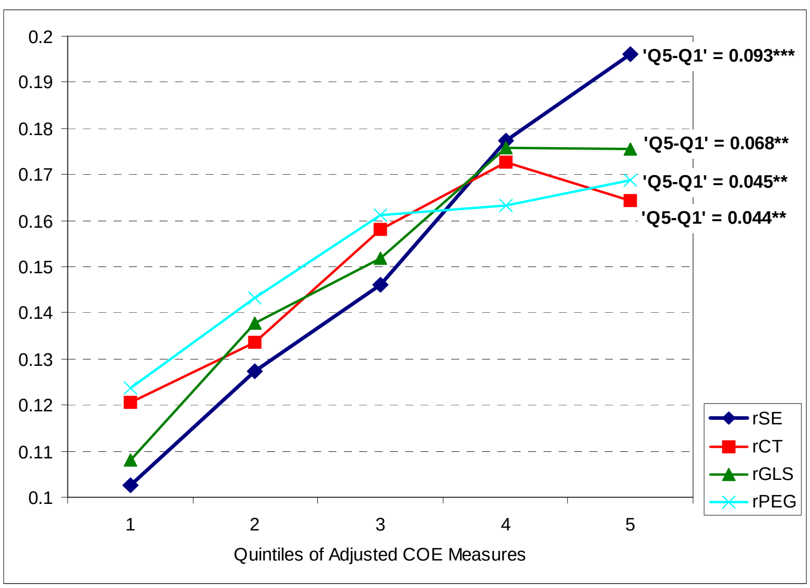
Figure 1. Future Realized Returns for COE Portfolios

Panel A. Average Returns by Quintiles of Unadjusted COE Measures



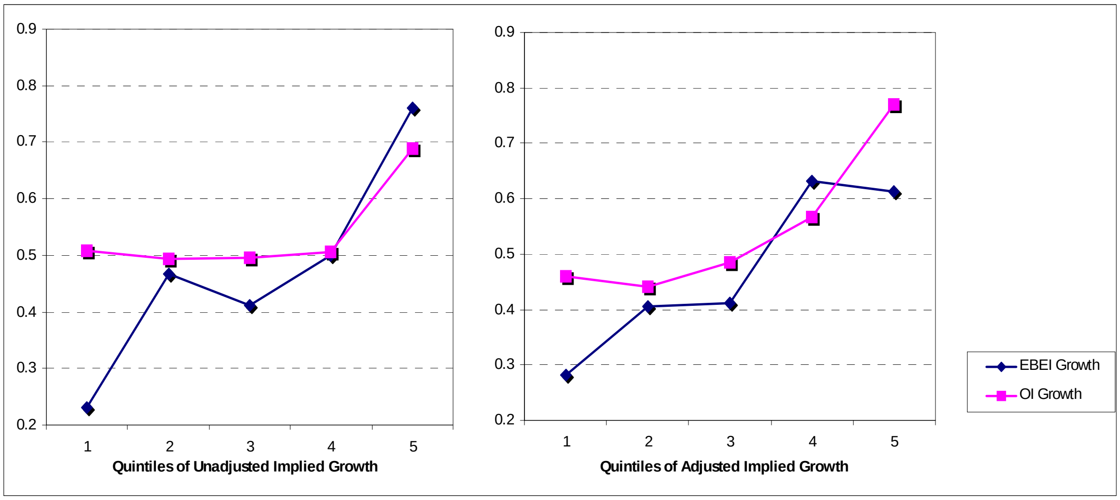
Panel B. Average Returns by Quintiles of Adjusted COE Measures



***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The figure plots average one-year-ahead buy-and-hold returns for equal-weighted quintile portfolios based on COE measures for a sample of 50,636 firm-year observations from 1980 to 2007. r_{SE} is the COE measure based on our model, r_{CT} is the COE measure based on the Claus and Thomas (2001) model, r_{GLS} is the COE measure based on the Gebhardt et al. (2001) model, r_{PEG} is the COE measure based on the PEG model (Gode and Mohanram 2003). Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors). 'Q5-Q1' refers to hedge returns on portfolios long (short) in quintile five (one) stocks. Statistical significance of hedge returns is based on Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation.

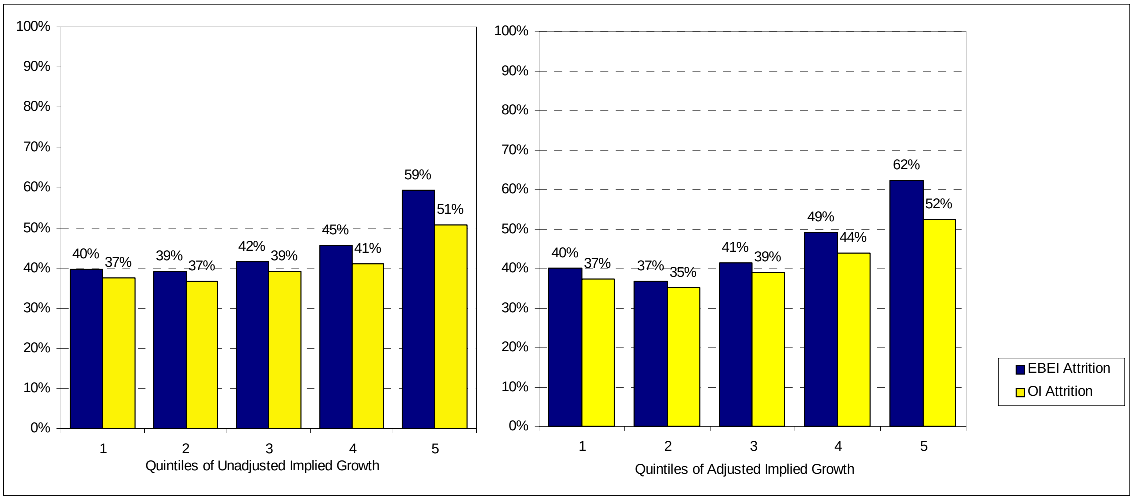
Figure 2. Realized Growth Rates by Quintiles of Implied Growth



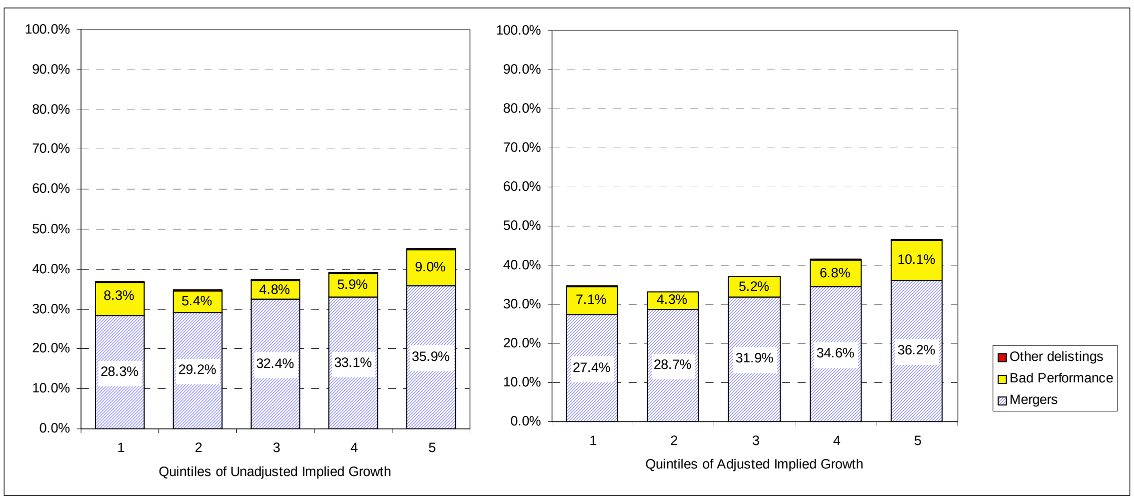
The figure plots average growth in four-year cum-dividend earnings before extraordinary items (*EBEI*) or operating income before depreciation (*OI*) by quintiles of unadjusted (adjusted) implied growth. Unadjusted (adjusted) implied growth is based on raw analyst earnings forecasts (forecasts adjusted for predictable forecast errors (Gode and Mohanram 2009)). Growth rates are calculated as $GR_{t+4,\ t+8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1$, where $X_T^{cumd} = \Sigma_{[t=T-3,T]}(E_t) + \Sigma_{[t=T-3,T-1]}((1+r)^{4-t}-1)d_t$, and E_t is realized earnings for year t, d_t is dividends declared in year t, and r is the risk-free rate at period t.

Figure 3. Sample Attrition

Panel A. Sample Attrition Rates during [*t*, *t*+8] by Quintiles of Implied Growth



Panel B. Reasons for Delisting during [*t*, *t*+8] by Quintiles of Implied Growth



The figure documents the rates and causes of sample attrition within eight years following implied earnings growth estimation. Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors). Percentages are calculated using firms with available implied earnings growth estimates at time *t*.

Panel A reports average percentage of firms with unavailable four-year cum-dividend earnings growth by quintiles of implied growth. *EBEI* (*OI*) refers to growth in earnings before extraordinary items (operating income before depreciation).

Panel B reports average percentage of firms delisted from the exchanges. “Bad performance” category includes delistings due to various adverse events, including bankruptcies, liquidations, and failure to satisfy listing requirements. “Mergers” category includes delistings following merger and acquisition activity, or stock exchanges. “Other delistings” include all delistings not included in the two previous categories (for example, moving to a different exchange). Delisting classification is performed based on CRSP delisting codes; bad performance-related delistings are coded following Shumway (1997).

Table 1. Descriptive Statistics

Variable	Mean	10%	25%	Median	75%	90%
Firm Characteristics						
Size	3163	64	161	517	1840	6456
B/M	0.615	0.185	0.317	0.517	0.779	1.144
Beta	1.067	0.292	0.580	0.969	1.410	1.997
Ret_{-12}	0.179	-0.324	-0.107	0.117	0.376	0.722
Ltg	0.171	0.065	0.100	0.140	0.200	0.325
dIndROE	-0.029	-0.134	-0.064	-0.013	0.026	0.065
RDSales	0.030	0.000	0.000	0.000	0.016	0.097

The table reports descriptive statistics for a sample of 50,636 firm-year observations from 1980 to 2007. *Size* is the market capitalization, *B/M* is the book-to-market ratio, *Beta* is the CAPM beta, *Leverage* is the ratio of the book value of debt to the market value of equity, Ret_{-12} is the past one-year buy-and-hold return, *Ltg* is the long-term growth consensus forecast from *I/B/E/S*; *dIndROE* is the industry ROE minus the firm's average forecasted ROE over years t+1 to t+4; *RDSales* is the ratio of R&D expenses to sales.

Table 2. Cost of Equity Estimates

Panel A. Simultaneous COE and Growth Estimation

Variables	Unadjusted Forecasts			Adjusted Forecasts		
	Regression Coefficients (λ)	Driver's Standard Deviation (Std)	λ*Std	Regression Coefficients (λ)	Driver's Standard Deviation (Std)	λ*Std
Intercept	0.035 [1.01]			0.014 [0.61]		
MB	0.399 [13.73]***			0.321 [10.52]***		
MB * ***LogSize***	-0.023 [2.89]***	0.72	-0.017	-0.004 [0.61]	0.72	-0.003
MB * ***MB***	-0.056 [7.01]***	2.32	-0.129	-0.042 [7.58]***	2.32	-0.098
MB * $\boldsymbol{LogRet_{-12}}$	-0.015 [2.20]**	0.42	-0.006	0.083 [5.06]***	0.42	0.034
MB * ***Beta***	0.005 [0.55]	0.62	0.003	-0.014 [2.48]**	0.62	-0.009
(1-MB) * ***dIndROE***	1.149 [4.48]***	0.09	0.100	0.972 [5.09]***	0.09	0.085
(1-MB) * ***Ltg***	0.008 [0.19]	0.11	0.001	0.302 [7.13]***	0.11	0.033
(1-MB) * ***RDSales***	0.355 [2.56]**	0.07	0.023	0.203 [1.88]*	0.07	0.013
R^2	48.9%			54.3%		

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel B: Descriptive Statistics COE and Growth Estimates

Variable	Mean	10%	25%	Median	75%	90%
Unadjusted COE and Growth						
r_{SE}	0.082	0.040	0.057	0.077	0.102	0.134
r_{CT}	0.111	0.067	0.083	0.100	0.124	0.157
r_{GLS}	0.103	0.068	0.082	0.099	0.120	0.143
r_{PEG}	0.111	0.072	0.087	0.105	0.129	0.158
g_{SE}	0.006	-0.030	-0.022	0.004	0.026	0.046
Adjusted COE and Growth						
r_{SE}	0.069	0.032	0.047	0.063	0.085	0.117
r_{CT}	0.095	0.053	0.068	0.084	0.102	0.127
r_{GLS}	0.094	0.060	0.075	0.091	0.111	0.133
r_{PEG}	0.102	0.066	0.081	0.097	0.118	0.144
g_{SE}	0.004	-0.030	-0.017	0.002	0.021	0.038

Table 2 (continued)

Panel C: Correlations Among COE Measures

	Unadjusted COE Measures					Adjusted COE Measures			
	r_{SE}	r_{CT}	r_{GLS}	r_{PEG}		r_{SE}	r_{CT}	r_{GLS}	r_{PEG}
r_{SE}	—	0.489 (26/0)	0.709 (28/0)	0.529 (28/0)	r_{SE}	—	0.314 (18/3)	0.605 (27/0)	0.429 (28/0)
r_{CT}		—	0.522 (28/0)	0.634 (28/0)	r_{CT}		—	0.384 (28/0)	0.309 (27/0)
r_{GLS}			—	0.559 (28/0)	r_{GLS}			—	0.406 (28/0)
r_{PEG}				—	r_{PEG}				—

The table reports results of COE estimation using simultaneous COE and growth estimation approach. The sample consists of 50,636 firm-year observations from 1980 to 2007.

Panel A reports average of yearly coefficients from cross-sectional regression (6) estimated using WLS:

$$X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + (\lambda_{Beta}Beta^i + \lambda_{Size}LogSize^i + \lambda_{MB}MB^i + \lambda_{ret}ret_{-12}^i)MB^i x_R^i$$
$$+ (\lambda_{Ltg}Ltg^i + \lambda_{dROE}dIndROE^i + \lambda_{RdSales}RdSales^i)(1 - MB^i)x_G^i + v^i ,$$

where X_{cT}/B_0 is four-year cum-dividend earnings forecast, divided by per-share book value of equity; *MB* is market-to-book ratio, calculated as stock price from *I/B/E/S* as of June of year *t*+1, divided per-share book value of equity; *Beta* is CAPM beta estimated over sixty months preceding June of year *t*+1; *LogSize* is the log of the market value of equity as of June of year *t*+1; ret_{-12} is the twelve-month buy-and-hold stock return preceding June of year *t*+1; *Ltg* is the long-term growth consensus forecast from *I/B/E/S* as of June of year *t*+1; *dIndROE* is the industry ROE minus the firm's average forecasted ROE over years *t*+1 to *t*+4; *RDSales* the ratio of R&D expenses to sales. Regressions are estimated by year, with an iterative procedure described in detail in Section 2.
The first (last) three columns of Panel A use raw analyst earnings forecasts (forecasts adjusted for predictable errors). The panel reports time-series averages of estimated regression coefficients (λ), time-series averages of yearly standard deviations of risk and growth drivers (Std), and the product of the above averages (λ*Std). Absolute values of Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation are reported in brackets.

Panel B reports descriptive statistics for COE and growth estimated using regressions from Panel A, as well as descriptive statistics for benchmark COE models. r_{SE} is the COE measure based on our model, g_{SE} is our implied terminal growth in residual earnings, , r_{CT} is the COE measure based on Claus and Thomas (2001) model, r_{GLS} is the COE measure based on the GLS (Gebhardt et al. 2001) model, r_{PEG} is the COE measure based on the PEG model (Gode and Mohanram 2003). Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors).

Panel C reports average by-year correlations between COE measures. Numbers in parentheses indicate the number of years with significantly positive/negative correlations.

Table 3. Predicting Future Returns using COE Measures

Panel A: Univariate Cross-Sectional Regressions of Future Returns on COE Measures

	Unadjusted COE Measures				**Adjusted COE Measures**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Intercept	0.072	0.136	0.094	0.155	0.018	0.125	0.060	0.106
	[2.56]**	[6.86]***	[2.74]***	[4.98]***	[0.44]	[6.89]***	[1.83]*	[3.94]***
$\boldsymbol{r_{SE}}$	**0.714**				**1.453**			
0	**[2.28]****				**[3.34]*****			
1	**[0.91]**				**[1.04]**			
r_{CT}		0.119				0.280		
0		[0.81]				[1.79]*		
1		[6.00]***				[4.60]***		
r_{GLS}			0.507				0.888	
0			[1.47]				[2.52]**	
1			[1.43]				[0.32]	
r_{PEG}				-0.040				0.439
0				[0.16]				[1.60]
1				[4.08]***				[2.04]*
R^2	0.02	0.00	0.01	0.01	0.02	0.00	0.02	0.01

Panel B: Cross-Sectional Regressions of Future Returns on Pairs of COE Measures

	Unadjusted COE Measures			**Adjusted COE Measures**		
	1	**2**	**3**	**1**	**2**	**3**
Intercept	0.078	0.072	0.096	0.027	0.009	0.019
	[2.58]**	[2.02]**	[3.48]***	[0.76]	[0.20]	[0.54]
$\boldsymbol{r_{SE}}$	**1.067**	**0.668**	**0.962**	**1.649**	**1.284**	**1.411**
	[2.36]**	**[2.15]****	**[2.32]****	**[2.98]*****	**[3.59]*****	**[2.9]*****
r_{CT}	-0.363			-0.263		
	[1.39]			[1.01]		
r_{GLS}		0.055			0.245	
		[0.15]			[0.73]	
r_{PEG}			-0.405			0.040
			[1.49]			[0.16]
R^2	0.03	0.03	0.04	0.03	0.03	0.03

Table 3 (continued)

Panel C: Cross-Sectional Regressions of Future Returns on COE Measures and Risk Drivers

	Unadjusted COE Measures				Adjusted COE Measures			
	1	2	3	4	1	2	3	4
Intercept	0.118 [1.95]**	0.168 [2.49]**	0.139 [2.06]*	0.187 [2.66]**	0.088 [1.64]*	0.167 [2.49]**	0.125 [1.75]*	0.163 [2.29]**
$\boldsymbol{r_{SE}}$	**0.534** **[2.71]*** **				**1.047** **[3.79]*** **			
r_{CT}		0.088 [0.98]				0.126 [1.04]		
r_{GLS}			0.435 [1.54]				0.731 [2.00]**	
r_{PEG}				-0.023 [0.12]				0.190 [0.77]
Beta	-0.008 [0.59]	-0.011 [0.76]	-0.011 [0.75]	-0.011 [0.88]	-0.005 [0.36]	-0.011 [0.74]	-0.011 [0.79]	-0.014 [1.06]
LogSize	-0.014 [0.71]	-0.015 [0.77]	-0.014 [0.73]	-0.018 [0.94]	-0.015 [0.77]	-0.015 [0.78]	-0.014 [0.75]	-0.016 [0.82]
B/M	0.014 [1.05]	0.020 [1.38]	0.003 [0.18]	0.022 [1.36]	0.007 [0.51]	0.022 [1.41]	-0.011 [0.48]	0.021 [1.30]
Ret_{-12}	0.068 [3.99]***	0.065 [3.78]***	0.066 [3.93]***	0.067 [3.88]***	0.058 [3.65]***	0.065 [3.79]***	0.060 [3.81]***	0.068 [3.76]***
R^2	0.074	0.068	0.072	0.070	0.076	0.068	0.073	0.070

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The table reports results of cross-sectional regressions of one-year-ahead returns on COE measures and risk proxies. The sample consists of 50,636 firm-year observations from 1980 to 2007.

Reported values are the means of by-year regression coefficients. Absolute values of Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation are reported in brackets. Slopes on the COE measures have two corresponding *t*-statistics, where =0 (=1) denotes a null of zero (one).

r_{SE} is the COE measure based on our model, g_{SE} is our implied terminal growth in residual earnings, r_{CT} is the COE measure based on Claus and Thomas (2001) model, r_{GLS} is the COE measure based on the GLS (Gebhardt et al. 2001) model, r_{PEG} is the COE measure based on the PEG model (Gode and Mohanram 2003). *Beta* is the CAPM beta, *LogSize* is the log of the market capitalization, *B/M* is the book-to-market ratio, Ret_{-12} is the past one-year buy-and-hold return. Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors).

Table 4. Predicting Earnings Growth using Implied Growth Estimates

Panel A. Descriptive Statistics for Realized Growth Rates

Variable	Number of Observations	Mean	10%	25%	Median	75%	90%
Growth in EBEI	18,801	0.48	-1.17	-0.25	0.30	0.93	2.06
Growth in OI	20,267	0.52	-0.39	-0.01	0.32	0.79	1.52

Panel B. Regressions of Realized Growth Rates on Quintile Ranks of Unadjusted Implied Growth

	Dependent Variable = Future Growth in *EBEI*		Dependent Variable = Future Growth in *OI*	
	1	2	3	4
$R(g_{SE})$	**0.122**	**0.04**	**0.026**	**-0.002**
	[4.35]***	**[1.35]**	**[1.64]**	**[0.15]**
Ltg		0.711		1.666
		[1.00]		[8.19]***
dIndROE		2.226		1.007
		[3.40]***		[3.75]***
RDSales		-3.086		-0.378
		[2.05]**		[0.52]
Intercept	-0.099	0.07	0.350	0.189
	[1.75]*	[0.65]	[10.90]***	[4.38]***
Observations	18,801	18,801	20,267	20,267
R^2	0.03	0.03	0.02	0.04

Panel C. Regressions of Realized Growth Rates on Quintile Ranks of Adjusted Implied Growth

	Dependent Variable = Future Growth in *EBEI*		Dependent Variable = Future Growth in *OI*	
	1	2	3	4
$R(g_{SE})$	**0.098**	**0.011**	**0.060**	**0.006**
	[2.77]***	**[0.38]**	**[4.24]*****	**[0.49]**
Ltg		0.683		1.637
		[0.95]		[7.30]***
dIndROE		2.574		0.923
		[4.40]***		[3.16]***
RDSales		-3.038		-0.387
		[2.04]**		[0.53]
Intercept	-0.053	0.145	0.280	0.174
	[0.76]	[1.46]	[9.67]***	[5.91]***
Observations	18,801	18,801	20,267	20,267
R^2	0.03	0.03	0.02	0.04

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The table documents association between implied earnings growth and future realized earnings growth. The analyses are based on observations with available realized growth rates in four-year cum-dividend earnings before extraordinary items (operating income before depreciation) for a period from 1980 to 2001.

Panel A contains descriptive statistics for the realized earnings growth. Realized growth rates are calculated as $GR_{t+4,\ t+8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1$, where $X_T^{cumd} = \Sigma_{[t=T\text{-}3,T]}(E_t) + \Sigma_{[t=T\text{-}3,T\text{-}1]}((1+r)^{4\text{-}t} - 1)d_t$, and E_t is realized earnings for year *t,* d_t is dividends declared in year *t,* and *r* is the risk-free rate at *t*. Growth in *EBEI* (*OI*) refers to growth in earnings before extraordinary items (operating income before depreciation).

Panels B and C report coefficients from regressing growth in *EBEI* (*OI*) on the quintile ranks of unadjusted (adjusted) implied earnings growth, $R(g_{SE})$, and control variables: *Ltg* - analysts' long-term growth forecast, *dIndROE* - the difference between the industry ROE and the firm's average forecasted ROE over years *t+1* to *t+4*, and *RDSales* - R&D expenses scaled by sales. Industry ROE is calculated as a ten-year moving median ROE excluding loss firms (Gebhardt et al. 2001). Unadjusted (adjusted) implied growth is based on raw analyst earnings forecasts (forecasts adjusted for predictable errors (Gode and Mohanram 2009)).

All regressions are based on a pooled sample, with year fixed effects and standard errors clustered by firm and year as in Petersen (2009). Absolute values of *t*-statistics are reported in brackets.

Table 5. Predicting Returns and Earnings Growth Using Statistical Models

Panel A. Predicting Realized Returns

Independent Variables	**Dependent Variable = Future Realized Return**		
	1	**2**	**3**
Unadjusted R(r_{SE})	0.017 [2.44] **		
Adjusted R(r_{SE})		0.024 [3.19] ***	
R(*Stat_pRET*)			0.005 [0.81]
Intercept	0.116 [5.28] ***	0.103 [4.89] ***	0.133 [4.95] ***
Observations	50,636	50,636	49,875
R^2	0.02	0.02	0.02

Panel B. Predicting Earnings Growth: Unadjusted Implied Growth

Independent Variables	**Dependent Variable = Future Growth in *EBEI***				**Dependent Variable = Future Growth in *OI***			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
***R*(g_{SE})**	**0.148** **[5.01]*** **			**0.133** **[5.22]*** **	**0.050** **[2.76]*** **			**0.034** **[1.83]* **
R(*Stat_pGrEBEI*)		0.093 [2.03]**		0.047 [1.00]		0.028 [0.94]		
R(*Stat_pGrOI*)			0.077 [1.51]				0.105*** [5.62]	0.099 [5.54]***
Intercept	0.449 [11.05]***	0.533 [6.10]***	0.571 [6.63]***	0.386 [3.98]***	0.348 [11.08]***	0.384 [6.68]***	0.241 [7.21]***	0.189 [4.08]***
Observations	15,416	15,416	15,416	15,416	16,766	16,766	16,766	16,766
R^2	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.03

Panel C. Predicting Earnings Growth: Adjusted Implied Growth

Independent Variables	**Dependent Variable = Future Growth in *EBEI***				**Dependent Variable = Future Growth in *OI***			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
***R*(g_{SE})**	**0.149** **[4.73]*** **			**0.133** **[4.50]*** **	**0.085** **[5.14]*** **			**0.051** **[2.71]*** **
R(*Stat_pGrEBEI*)		0.093 [2.03]**		0.048 [0.96]		0.028 [0.94]		
R(*Stat_pGrOI*)			0.077 [1.51]				0.105 [5.62]***	0.084 [4.20]***
Intercept	0.435 [9.70]***	0.533 [6.10]***	0.571 [6.63]***	0.374 [3.94]***	0.274 [9.07]***	0.384 [6.68]***	0.241 [7.21]***	0.183 [4.57]***
Observations	15,416	15,416	15,416	15,416	16,766	16,766	16,766	16,766
R^2	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.03

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The table documents predictive ability of statistically predicted returns (earnings growth). The analyses in Panel A (Panels B and C) are based on the 1981 to 2007 (1987 to 2001) period.

Panel A reports coefficients from regressing realized one-year-ahead returns on quintile ranks of our implied COE, $R(r_{SE})$, and statistically predicted return, *R*(*Stat_pRET*). Statistically predicted returns are based on (1) estimating the slope coefficients in the hold-out cross-sectional regressions of past realized one-year returns on the risk drivers lagged by one year, and (2) applying slope coefficients to current risk drivers (market-to-book ratio, logarithm of market value of equity, CAPM beta, and prior twelve-month return). Reported values are the means of by-year regression coefficients. Absolute values of Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation are reported in brackets.

Panels B and C report coefficients from regressing realized growth in *EBEI* (*OI*) on the quintile rank of unadjusted (adjusted) implied earnings growth, $R(g_{SE})$, and the quintile rank of statistically predicted growth in earnings, *R*(*Stat_pGrEBEI*) or *R*(*Stat_pGrOI*). Realized growth rates are calculated as $GR_{t+4,\, t+8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1$, where $X_T^{cumd} = \Sigma_{[t=T\text{-}3,T]}(E_t) + \Sigma_{[t=T\text{-}3,T\text{-}1]}((1+r)^{4\text{-}t} - 1)d_t$, and E_t is realized earnings for year t, d_t is dividends declared in year t, and r is the risk-free rate at period t. Growth in *EBEI* (*OI*) refers to growth in earnings before extraordinary items (operating income before depreciation). Statistically predicted growth in earnings is based on (1) estimating the slope coefficients in the hold-out cross-sectional regressions of past realized growth in *EBEI* (*OI*) on the growth drivers lagged by eight years, and (2) applying slope coefficients to current growth drivers (analysts' long-term growth forecasts, deviations of firm's forecasted ROE from the industry ROE, and R&D expenses scaled by sales). All regressions use a pooled sample, with year fixed effects and standard errors clustered by firm and year as in Petersen (2009). Absolute values of *t*-statistics are reported in brackets.

Table 6. Cross-Sectional Determinants of COE's Return Predictive Ability

Panel A. Return Predictability by Quintiles of Absolute Difference between r_{SE} and r_{GLS}

	Quintiles of $\lvert r_{SE} - r_{GLS} \rvert$				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Adjusted r_{GLS}					
r_{GLS}	**1.889** **[3.99]*** **	**1.515** **[2.39]** **	**1.414** **[3.03]*** **	**0.801** **[1.62]**	**0.315** **[0.80]**
Intercept	-0.020 [0.55]	0.005 [0.10]	0.01 [0.22]	0.053 [1.13]	0.106 [2.17]**
R^2	0.03	0.04	0.03	0.03	0.01
Adjusted r_{SE}					
r_{SE}	**1.968** **[4.04]*** **	**1.657** **[2.49]** **	**1.640** **[3.16]*** **	**0.940** **[1.90]* **	**1.211** **[2.99]*** **
Intercept	-0.019 [0.48]	-0.004 [0.08]	0.003 [0.06]	0.043 [1.05]	0.062 [1.75]*
R^2	0.03	0.04	0.03	0.02	0.02
Slope(r_{SE}) − Slope(r_{GLS})	**0.079**	**0.142**	**0.226**	**0.139**	**0.896**

Panel B. Average Firm Characteristics by Quintiles of Absolute Difference between r_{SE} and r_{GLS}

	Quintiles of $\lvert r_{SE} - r_{GLS} \rvert$						
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q5-Q1**	**T-Statistics**
$\lvert g_{SE} \rvert$	0.022	0.020	0.020	0.023	0.027	**0.005**	**[3.24]*** **
|*ROE – iROE*|	0.081	0.074	0.081	0.101	0.137	**0.056**	**[5.24]*** **
|*RDSales – iRDSales*|	0.039	0.061	0.100	0.172	0.163	**0.124**	**[2.23]** **
|*Ltg – iLtg*|	0.064	0.058	0.058	0.066	0.085	**0.020**	**[5.78]*** **
|*SalesGr – iSalesGr*|	0.095	0.092	0.096	0.113	0.129	**0.034**	**[4.53]*** **
|*Beta – mBeta*|	0.470	0.468	0.469	0.502	0.548	**0.077**	**[4.25]*** **
|*LogSize – mLogSize*|	0.584	0.585	0.573	0.568	0.618	**0.034**	**[3.07]*** **
|*B/M – mB/M*|	0.227	0.220	0.239	0.285	0.568	**0.341**	**[12.78]*** **
$\lvert Ret_{-12} - mRet_{-12} \rvert$	0.295	0.251	0.262	0.316	0.402	**0.107**	**[6.04]*** **

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

This table examines the divergence in the return predictability between our and GLS measures and its cross-sectional determinants.

The quintile portfolios in both panels are formed each year based on the absolute difference between r_{SE} and r_{GLS}. r_{SE} is the COE measure based on our model, r_{GLS} is the COE measure based on the GLS model (Gebhardt et al. 2001)

Panel A reports results of cross-sectional regressions of one-year-ahead returns on the COE measures within the quintile portfolios. Reported values are the means of by-year regression coefficients. The absolute values of Fama-MacBeth *t*-statistics with the Newey-West autocorrelation adjustment are reported in brackets.

Panel B reports time-series means of by-year variable means by quintiles of $|r_{SE} - r_{GLS}|$. $|g_{SE}|$ is the absolute value of our implied growth measure; $|ROE - iROE|$ is the absolute difference between firm and industry mean ROE; $|RDSales - iRDSales|$ is the absolute difference between firm and industry mean R&D expense scaled by sales; $|Ltg - iLtg|$ is the absolute difference between firm and industry mean long-term growth forecast form I/B/E/S; $|SalesGr - iSalesGr|$ is the absolute difference between firm and industry mean sales growth over previous five years; $|Beta - mBeta|$ is the absolute difference between firm and sample mean CAPM bets; $|LogSize - LogSize|$ is the absolute difference between firm and sample mean log of market capitalization; $|B/M - mB/M|$ is the absolute difference between firm and sample mean book-to-market ratio; $|Ret_{-12} - mRet_{-12}|$ is the absolute difference between firm and sample mean past twelve-month stock return. The last two columns report average differences between the top and the bottom quintiles and the corresponding Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation.

Table 7. Easton and Monahan (2005) Analysis

Panel A: Regressing Realized Returns on Unadjusted COE Measures, Cash Flow News, and Discount Rate News

COE Measure	*Intercept*	***LOG_ER***	*LOG_CN*	*LOG_RN*	Adjusted R^2	**Modified Noise Variable**
r_{SE}	0.119	**-0.127**	0.802	0.082	0.25	0.0002
=0	[2.77]**	**[0.26]**	[10.67]***	[10.23]***		
=1	[20.6]***	**[2.29]****	[2.63]**	[113.84]***		
r_{CT}	0.128	**-0.098**	0.805	0.044	0.19	0.0009
=0	[5.58]***	**[0.51]**	[10.08]***	[7.34]***		
=1	[38.04]***	**[5.70]*****	[2.44]**	[159.89]***		
r_{GLS}	0.199	**-0.900**	0.799	0.201	0.37	0.0002
=0	[6.69]***	**[3.07]*****	[11.22]***	[22.17]***		
=1	[26.87]***	**[6.47]*****	[2.83]***	[88.21]***		
r_{PEG}	0.187	**-0.633**	0.842	0.074	0.23	0.0095
=0	[7.44]***	**[2.40]****	[9.90]***	[11.79]***		
=1	[32.26]***	**[6.20]*****	[1.86]*	[146.69]***		

Panel B: Regressing Realized Returns on Adjusted COE Measures, Cash Flow News, and Discount Rate News

COE Measure	*Intercept*	***LOG_ER***	*LOG_CN*	*LOG_RN*	Adjusted R^2	**Modified Noise Variable**
r_{SE}	0.033	**1.169**	0.750	0.004	0.18	-0.0003
=0	[0.82]	**[1.98]***	[10.59]***	[0.36]		
=1	[23.75]***	**[0.29]**	[3.53]***	[95.61]***		
r_{CT}	0.079	**0.489**	0.757	0.015	0.16	0.0015
=0	[2.63]**	**[1.94]***	[10.25]***	[2.34]**		
=1	[30.65]***	**[2.03]***	[3.29]***	[149.40]***		
r_{GLS}	0.138	**-0.250**	0.746	0.178	0.32	-0.0001
=0	[4.97]***	**[0.80]**	[10.95]***	[13.87]***		
=1	[30.96]***	**[4.00]*****	[3.73]***	[64.13]***		
r_{PEG}	0.049	**0.784**	0.828	-0.004	0.16	0.0004
=0	[2.35]**	**[2.34]****	[9.46]***	[0.54]		
=1	[45.27]***	**[0.64]**	[1.97]*	[129.24]***		

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The table evaluates the reliability of the COE estimates using the Easton and Monahan (2005) method.

The second to sixth columns contain mean regression coefficients and adjusted R^2 for the annual cross-sectional regressions of (log) realized returns on a COE measure, cash flow news, and expected return news: $LOG\_RET_{i,t+1}$ = $Intercept$ + α_1*$LOG\_ER_{i,t}$ + α_2*$LOG\_CN_{i,t+1}$ + α_3*$LOG\_RN_{i,t+1}$ + $\varepsilon_{i,}$ where $LOG\_RET_{i,t+1}$ is the realized return over the one year after the COE estimation, LOG_ER_i is the expected return, i.e. one of the COE estimates, $LOG\_CN_{i,t+1}$ is the cash flow news measured over the one year after the COE estimation, and $LOG\_RN_{i,t+1}$ is the discount rate news over the one year after the COE estimation. All return measures are continuously compounded. The last column reports the modified noise coefficient for each COE measure.

Cash flow news is measured as a sum of the forecast error realized over year t+1, the revision in one-year-ahead forecasted ROE, and the capitalized revision in the two-year-ahead forecasted ROE: $LOG\_CN_{i,t+1}$=$LOG\_FERR_{i,t+}\Delta LOG\_FROE_{i,t+1}$+ρ/(1-ρω)*$\Delta LOG\_FROE_{i,t+2}$, where LOG_FERR_{it} is the realized forecast error on the EPS_t forecast made at the end of fiscal year t,[41] and revisions refer to changes in forecasts from June of year t to June of year t+1. Forecasted ROE is defined as EPS forecast divided by book value of equity divided by number of shares used to calculate EPS. We use ρ estimates reported in Easton and Monahan (2005). Persistence coefficients ω_t are estimated through a pooled time-series cross-sectional regression for each of the 48 Fama-French industries: $LOG\_ROE_{i,t-\tau} = \omega_{0t} + \omega_t \times LOG\_ROE_{i,t-(\tau-1)},$ where τ is a number between zero and nine, and ROE is return on equity.

Discount rate news is measured as $LOG\_RN_{i,t+1}$= ρ/(1-ρ)*($LOG\_ER_{1,t+1}$-$LOG\_ER_{i,t}$), where $LOG\_ER_{i,t}$ is the continuously compounded COE estimate measured as of June of year t, and $LOG\_ER_{i,t+1}$ is the continuously compounded COE estimate measured as of June of year t+1.

The details of estimating the modified noise coefficient are described in Easton and Monahan (2005) pp. 506-507.

Reported values are the means of by-year regression coefficients. Absolute values of Fama-MacBeth t-statistics with the Newey-West adjustment for autocorrelation are reported in brackets. Slopes on the COE measures have two corresponding t-statistics, where =0 (=1) denotes a null of zero (one).

All estimations are performed after deleting observations that fall in the top and bottom 0.5% for $LOG\_RET_{i,t+1}$, $LOG\_ER_{i,}$, LOG_CN_i, or $LOG\_RN_{i,}$ distributions.

[41] $FERR_{it}$ captures a revision in expectations that occurs in year t+1 due to announcement of actual year t earnings.

Table 8. Survivorship Bias in Earnings Growth Prediction

Panel A. Regressions of Realized Growth Rates on Quintile Ranks of Implied Growth. Substituted Missing Realized Growth for Bad Performance Delistings

	Dependent Variable = Future Growth in *EBEI* 1	Dependent Variable = Future Growth in *OI* 2
	Unadjusted Implied Growth	
***R*(g_{SE})**	**0.088**	**0.025**
	[3.32]* **	**[1.95]***
Intercept	-0.032	0.348
	[0.59]	[13.25]***
Observations	21,357	23,508
R^2	0.023	0.016
	Adjusted Implied Growth	
***R*(g_{SE})**	**0.050**	**0.050**
	[1.57]	**[3.87]*****
Intercept	0.042	0.298
	[0.66]	[11.34]***
Observations	21,357	23,508
R^2	0.022	0.018

Panel B. Regressions of Realized Growth Rates on Quintile Ranks of Implied Growth. Substituted Missing Realized Growth for Bad Performance and Merger Delistings

	Dependent Variable = Future Growth in *EBEI* 1	Dependent Variable = Future Growth in *OI* 2
	Unadjusted Implied Growth	
***R*(g_{SE})**	**0.061**	**0.014**
	[3.33]***	**[1.54]**
Intercept	0.006	0.302
	[0.17]	[15.68]***
Observations	25,589	28,290
R^2	0.020	0.012
	Adjusted Implied Growth	
***R*(g_{SE})**	**0.032**	**0.031**
	[1.47]	**[3.31]*****
Intercept	0.063	0.268
	[1.43]	[13.90]***
Observations	25,589	28,290
R^2	0.020	0.013

The table examines sensitivity of growth prediction results in Table 4 to the survivorship bias. Both panels report coefficients from regressing growth in *EBEI* (*OI*) on the quintile rank of unadjusted (adjusted) implied earnings growth rate, $R(g_{SE})$. The missing realized growth rates are substituted with assumed rates depending on the reason of firms' exit from the sample.

In Panel A, missing realized growth rates of firms delisted due to bad performance are calculated as $GR_{t+4,\,t+8} = -BV_{t+4} / X_{t+4}^{cumd} - 1$, where BV_{t+4} is the book value of equity at the end of t+4, $X_T^{cumd} = \Sigma_{[t=T\text{-}3,T]}(E_t) + \Sigma_{[t=T\text{-}3,T\text{-}1]}((1+r)^{4\text{-}t} - 1)d_t$, and E_t is realized earnings for year t, d_t is dividends declared in year t, and r is the risk-free rate at period t. Growth in *EBEI* (*OI*) refers to growth in earnings before extraordinary items (operating income before depreciation).

In Panel B, in addition to substitution from Panel A, missing realized growth rates of firms delisted due to mergers are set equal to zero.

All regressions use a pooled sample, with year fixed effects and standard errors clustered by firm and year as in Petersen (2009). The absolute values of t-statistics are reported in brackets.

May 08, 2013

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Are Stocks Cheap? A Review of the Evidence

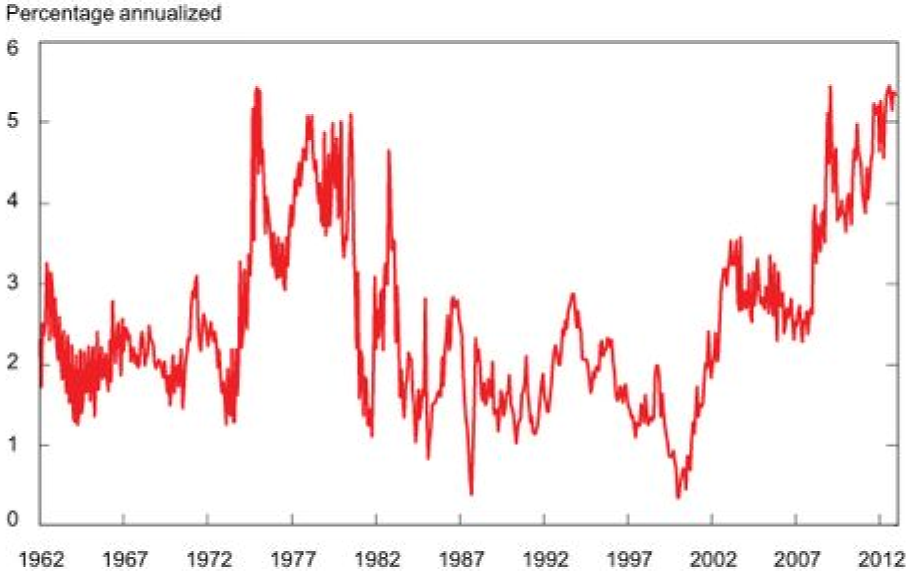
Fernando Duarte and Carlo Rosa

We surveyed banks, we combed the academic literature, we asked economists at central banks. It turns out that most of their models predict that we will enjoy historically high excess returns for the S&P 500 for the next five years. But how do they reach this conclusion? Why is it that the equity premium is so high? And more importantly: Can we trust their models?

The equity risk premium is the *expected* future return of stocks minus the risk-free rate over some investment horizon. Because we don't directly observe market expectations of future returns, we need a way to figure them out indirectly. That's where the models come in. In this post, we analyze twenty-nine of the most popular and widely used models to compute the equity risk premium over the last fifty years. They include surveys, dividend-discount models, cross-sectional regressions, and time-series regressions, which together use more than thirty different variables as predictors, ranging from price-dividend ratios to inflation. Our calculations rely on real-time information to avoid any look-ahead bias. So, to compute the equity risk premium in, say, January 1970, we only use data that was available in December 1969.

Let's now take a look at the facts. The chart below shows the weighted average of the twenty-nine models for the one-month-ahead equity risk premium, with the weights selected so that this single measure explains as much of the variability across models as possible (for the geeks: it is the first principal component). The value of 5.4 percent for December 2012 is about as high as it's ever been. The previous two peaks correspond to November 1974 and January 2009. Those were dicey times. By the end of 1974, we had just experienced the collapse of the Bretton Woods system and had a terrible case of stagflation. January 2009 is fresher in our memory. Following the collapse of Lehman Brothers and the upheaval in financial markets, the economy had just shed almost 600,000 jobs in one month and was in its deepest recession since the 1930s. It is difficult to argue that we're living in rosy times, but we are surely in better shape now than then.

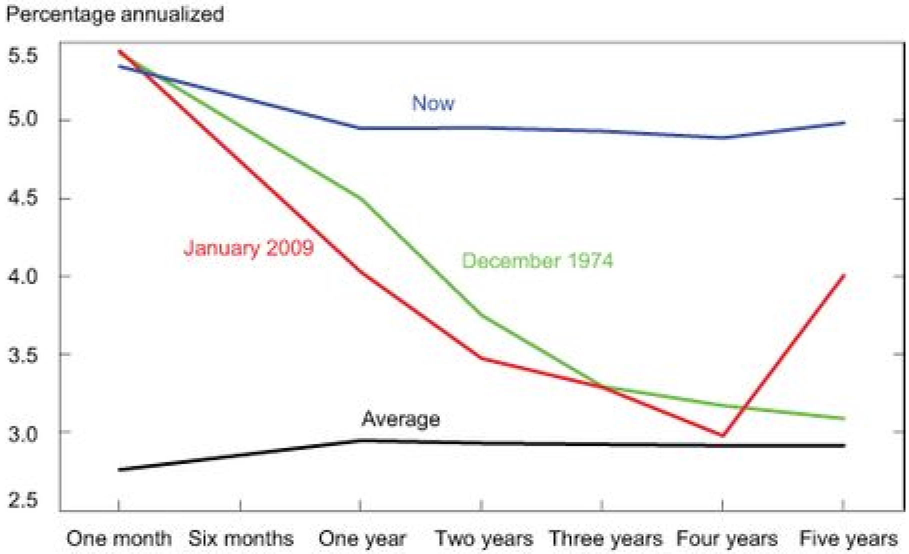
Today's equity premium has reached a historic high



Sources: Authors' calculations; Barclays; Deutsche Bank; Duke/CFO Business Outlook survey; Federal Reserve Board; Federal Reserve Bank of New York; Goldman Sachs; J.P. Morgan; Nomura; the Center for Research in Security Prices; Federal Reserve Economic Data; Thomson Reuters; the websites of NYU's Aswath Damodaran; Dartmouth's Kenneth French, University of Lausanne's Amit Goyal, University of California at Berkeley's Martin Lettau, Yale's Robert Shiller.

The next chart shows a comparison between those two episodes and today. For 1974 and 2009, the green and red lines show that the equity risk premium was high at the one-month horizon, but was decreasing at longer and longer horizons. Market expectations were that at a four-year horizon the equity risk premium would return to its usual level (the black line displays the average levels over the last fifty years). In contrast, the blue line shows that the equity risk premium today is high irrespective of investment horizon.

The equity premium is elevated at all horizons



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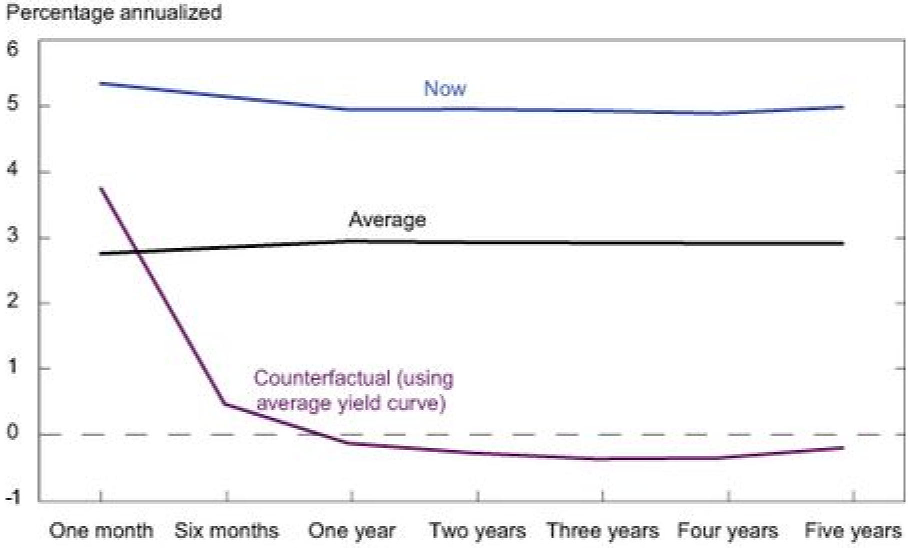
Why is the equity premium so high right now? And why is it high at all horizons? There are two possible reasons: low discount rates (that is, low Treasury yields) and/or high current or future expected dividends. We can figure out which factor is more important by comparing the twenty-nine models with one another. This strategy works because some models emphasize changes in dividends, while others emphasize changes in risk-free rates. We find that the equity risk premium is high mainly due to exceptionally low Treasury yields at all foreseeable horizons. In contrast, the current level of dividends is roughly at its historical average and future dividends are expected to grow only modestly above average in the coming years.

In the next chart we show, in an admittedly crude way, the impact that low Treasury yields have on the equity risk premium. The blue and black lines reproduce the lines from the previous chart: the blue is today's equity risk premium at different horizons and the black is the average over the last fifty years. The new purple line is a counterfactual: it shows what the equity premium would be today if nominal Treasury yields were at their average historical levels instead of their current low levels. The figure makes clear that exceptionally low yields are more than enough to justify a risk premium that is highly elevated by historical standards.

The equity premium is high because Treasury yields are low



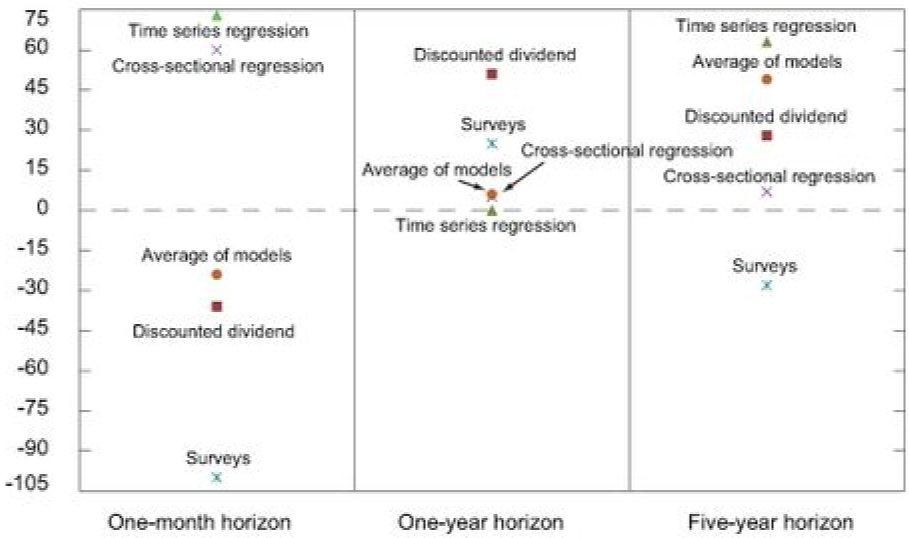
Sources: Authors' calculations; Barclays; Deutsche Bank; Duke/CFO Business Outlook survey; Federal Reserve Board; Federal Reserve Bank of New York; Goldman Sachs; J.P. Morgan; Nomura; the Center for Research in Security Prices; Federal Reserve Economic Data; Thomson Reuters; the websites of NYU's Aswath Damodaran; Dartmouth's Kenneth French, University of Lausanne's Amit Goyal, University of California at Berkeley's Martin Lettau, Yale's Robert Shiller.

But none of this analysis matters if excess returns are unpredictable because the equity risk premium is all about expected returns. So…*are* returns predictable? The jury is still out on this one, and the debate among academics and practitioners is alive and well. The simplest predictive method is to assume that future returns will be equal to the average of all past returns. It turns out that it is remarkably tricky to improve upon this simple method. However, with so many models at hand, we couldn't help but ask if any of them can, in fact, do better.

The table below gives the extra returns that investors could have earned by using the models instead of the historical mean to predict future returns. For investment horizons of one month, one year, and five years, we pick the best model in each of the four classes we consider together with the weighted average of all twenty-nine models. We compute these numbers by assuming that investors can allocate their wealth in stocks or bonds, and that they are not too risk-averse (for the geeks again, we solved a Merton portfolio problem in real time assuming that the coefficient of relative risk aversion is equal to one). The table shows positive extra returns for most of the models, especially at long horizons.

Model performance is varied, but better at longer horizons

Basis points per year



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Notes: We tested twenty-nine models in four classes (surveys, dividend-discount models, cross-sectional regressions, and time series regressions) over three investment horizons. In this chart, we plot the single best-performing model in each category. We also show how the optimal weighted average (the first principal component) of all models performs.

At face value, this result means that the models are actually helpful in forecasting returns. However, we should keep in mind some of the limitations of our analysis. First, we have not shown confidence intervals or error bars. In practice, those are quite large, so even if we could have earned extra returns by using the models, it may have been solely due to luck. Second, we have selected models that have performed well in the past, so there is some selection bias. And of course, past performance is no guarantee of future performance.

Disclaimer

SURVEY OF PROFESSIONAL FORECASTERS

Release Date: February 13, 2015

FIRST QUARTER 2015

Unchanged Outlook for Growth, but Brighter Outlook for Labor Markets

The outlook for growth in the U.S. economy over the next three years has changed little from the survey of three months ago, according to 39 forecasters surveyed by the Federal Reserve Bank of Philadelphia. The forecasters predict real GDP will grow at an annual rate of 2.7 percent this quarter and 3.0 percent next quarter. On an annual-average over annual-average basis, real GDP will grow 3.2 percent in 2015, up 0.2 percentage point from the previous estimate. The forecasters predict real GDP will grow 2.9 percent in 2016, 2.7 percent in 2017, and 2.7 percent in 2018.

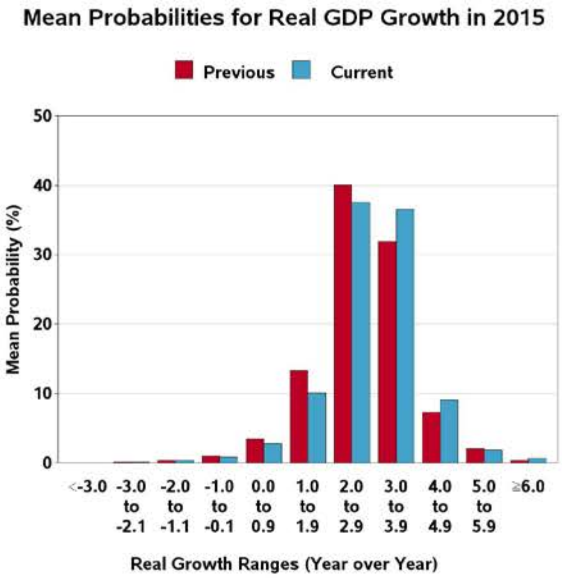
A brighter outlook for the labor market accompanies the nearly stable outlook for growth. The forecasters predict that the unemployment rate will be an annual average of 5.4 percent in 2015, before falling to 5.1 percent in 2016, 5.0 percent in 2017, and 4.9 percent in 2018. The projections for 2015, 2016, and 2017 are below those of the last survey.

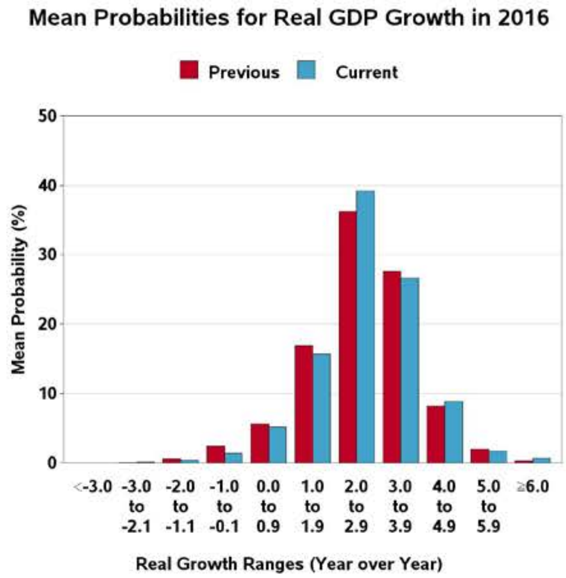
The panelists also predict an improved outlook on the employment front. They have revised upward their estimates for job gains in the next four quarters. The forecasters see nonfarm payroll employment growing at a rate of 269,300 jobs per month this quarter, 233,800 jobs per month next quarter, 222,000 jobs per month in the third quarter of 2015, and 229,400 jobs per month in the fourth quarter of 2015. The forecasters' projections for the annual-average level of nonfarm payroll employment suggest job gains at a monthly rate of 252,500 in 2015 and 213,600 in 2016, as the table below shows. (These annual-average estimates are computed as the year-to-year change in the annual-average level of nonfarm payroll employment, converted to a monthly rate.)

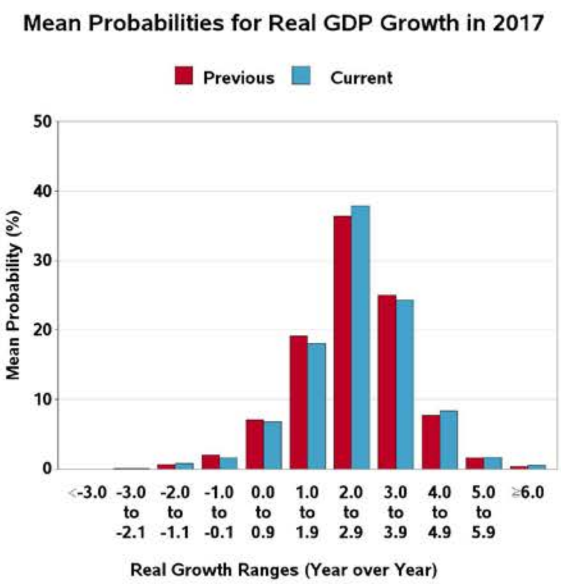
Median Forecasts for Selected Variables in the Current and Previous Surveys

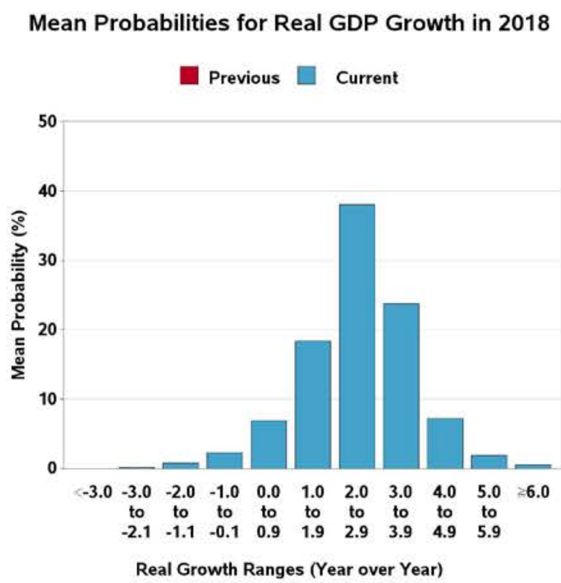
	Real GDP (%)		Unemployment Rate (%)		Payrolls (000s/month)	
	Previous	New	Previous	New	Previous	New
Quarterly data:						
2015:Q1	2.8	2.7	5.8	5.6	211.2	269.3
2015:Q2	3.1	3.0	5.7	5.5	195.4	233.8
2015:Q3	2.8	2.8	5.6	5.4	208.0	222.0
2015:Q4	3.0	2.8	5.5	5.2	201.3	229.4
2016:Q1	N.A.	2.9	N.A.	5.2	N.A.	213.8
Annual data (projections are based on annual-average levels):						
2015	3.0	3.2	5.6	5.4	212.3	252.5
2016	2.9	2.9	5.4	5.1	N.A.	213.6
2017	2.7	2.7	5.2	5.0	N.A.	N.A.
2018	N.A.	2.7	N.A.	4.9	N.A.	N.A.

The charts below provide some insight into the degree of uncertainty the forecasters have about their projections for the rate of growth in the annual-average level of real GDP. Each chart (except the one for 2018) presents the forecasters' previous and current estimates of the probability that growth will fall into each of 11 ranges. The probability estimates for growth in 2015, 2016, and 2017 are about the same now as they were in the previous survey.

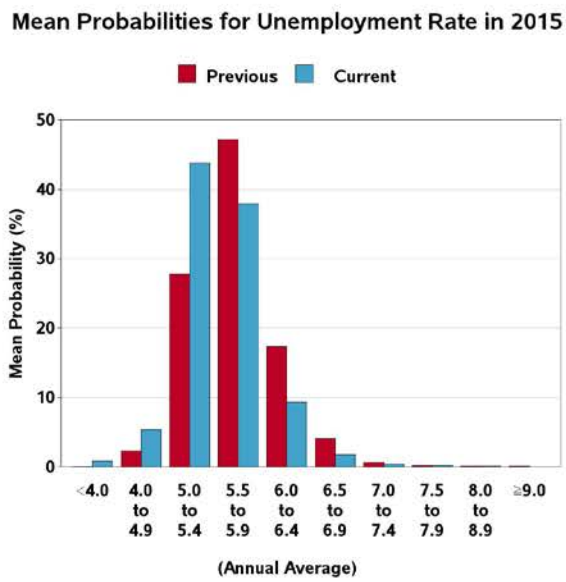


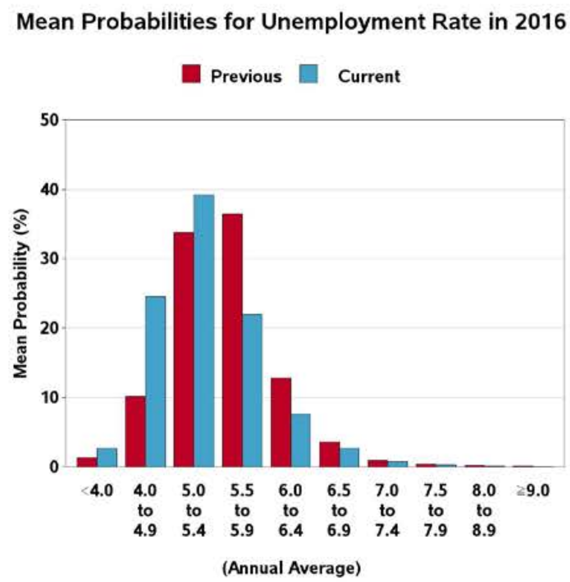


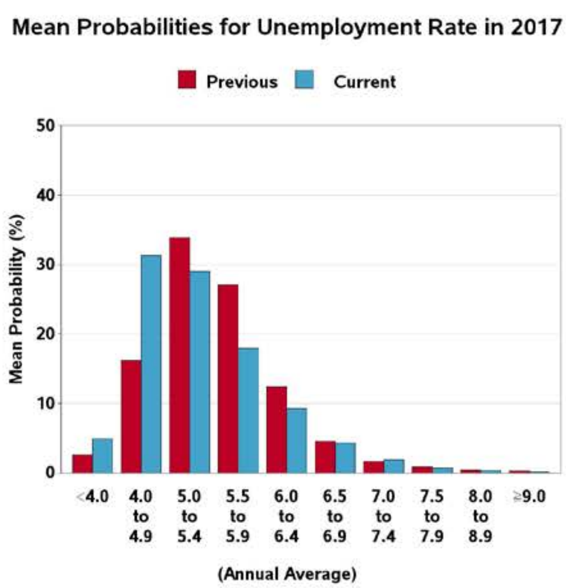


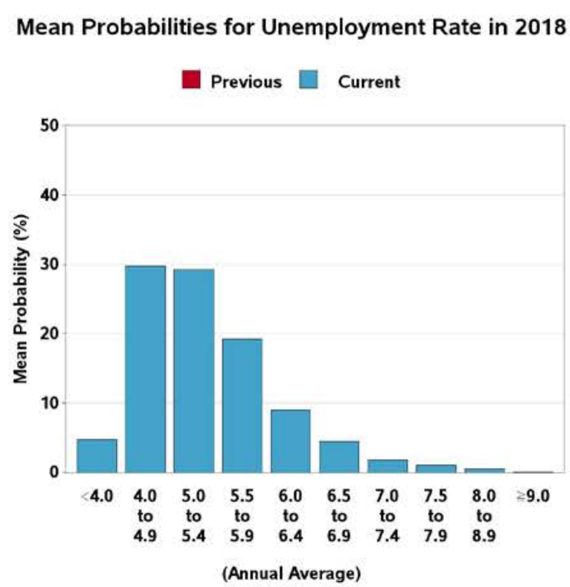


The forecasters' density projections for unemployment, shown below, shed light on uncertainty about the labor market over the next four years. Each chart for unemployment presents the forecasters' current estimates of the probability that unemployment will fall into each of 10 ranges. The charts show the forecasters are raising their density estimates over the next three years at the lower levels of unemployment outcomes, suggesting they are more confident about lower unemployment than they were in the last survey.









Forecasters Predict Lower Inflation in 2015

The forecasters expect current-quarter headline CPI inflation to average -1.4 percent, lower than the last survey's estimate of 1.8 percent. The forecasters predict current-quarter headline PCE inflation of -0.6 percent, lower than the prediction of 1.7 percent from the survey of three months ago.

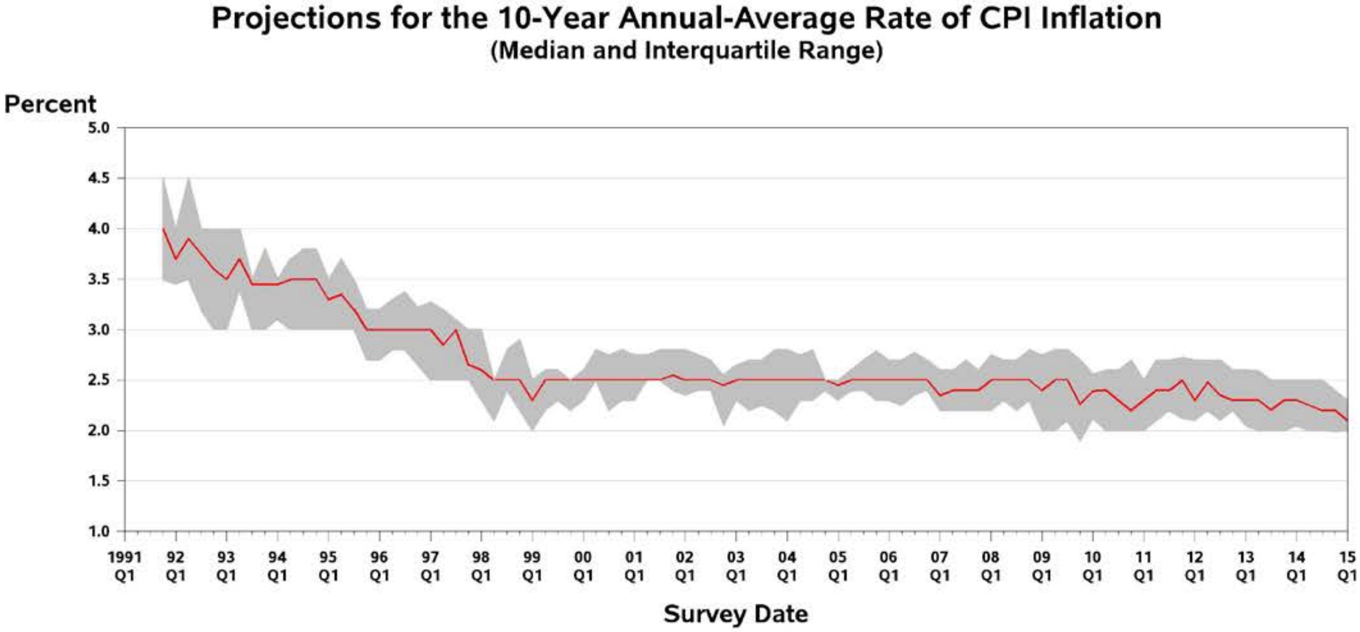
The forecasters also see lower headline and core measures of CPI and PCE inflation in 2015. Measured on a fourth-quarter over fourth-quarter basis, headline CPI inflation is expected to average 1.1 percent in 2015, down from 1.9 percent in the last survey. Forecasters expect fourth-quarter over fourth-quarter headline PCE inflation to also average 1.1 percent in 2015, down from 1.8 percent in the last survey.

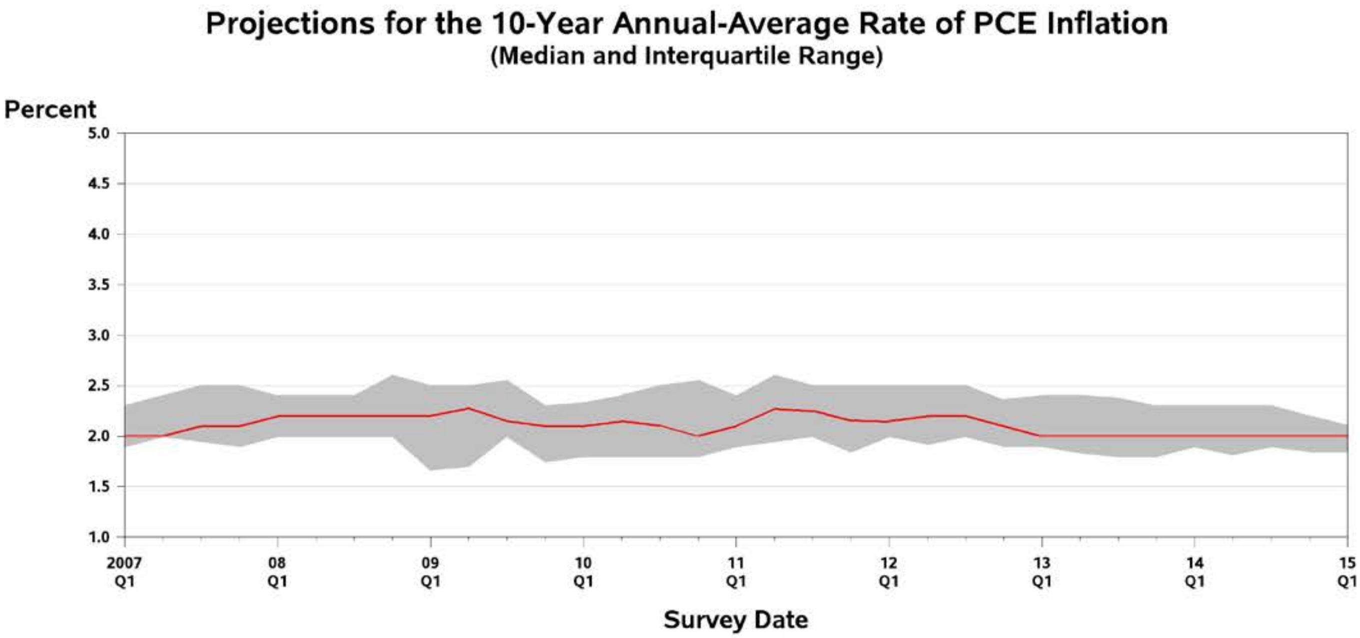
Over the next 10 years, 2015 to 2024, the forecasters expect headline CPI inflation to average 2.1 percent at an annual rate. The corresponding estimate for 10-year annual-average PCE inflation is 2.0 percent.

Median Short-Run and Long-Run Projections for Inflation (Annualized Percentage Points)

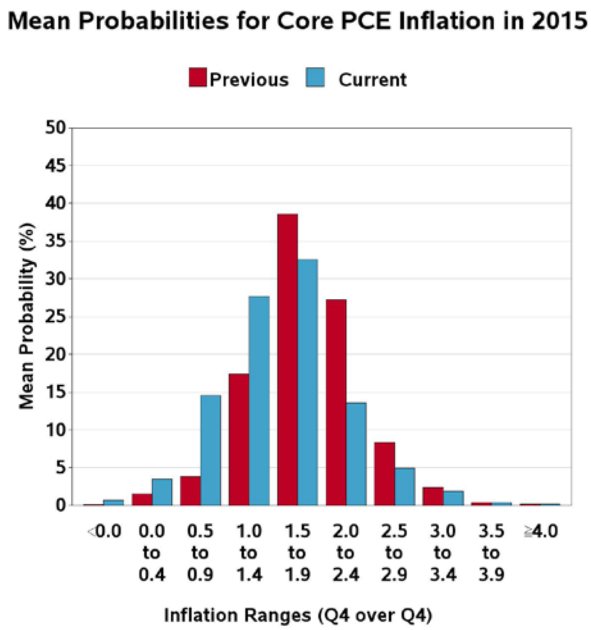
	Headline CPI		Core CPI		Headline PCE		Core PCE	
	Previous	Current	Previous	Current	Previous	Current	Previous	Current
Quarterly								
2015:Q1	1.8	-1.4	1.9	1.3	1.7	-0.6	1.7	1.2
2015:Q2	1.9	1.6	1.9	1.7	1.8	1.4	1.7	1.4
2015:Q3	2.0	1.9	1.9	1.8	1.8	1.9	1.8	1.5
2015:Q4	2.0	2.0	2.0	1.8	1.9	1.8	1.8	1.7
2016:Q1	N.A.	2.1	N.A.	1.9	N.A.	1.8	N.A.	1.6
Q4/Q4 Annual Averages								
2015	1.9	1.1	2.0	1.7	1.8	1.1	1.8	1.4
2016	2.1	2.1	2.0	1.9	1.9	1.9	1.8	1.7
2017	N.A.	2.3	N.A.	2.1	N.A.	2.1	N.A.	1.9
Long-Term Annual Averages								
2014-2018	2.09	N.A.	N.A.	N.A.	1.90	N.A.	N.A.	N.A.
2015-2019	N.A.	2.00	N.A.	N.A.	N.A.	1.80	N.A.	N.A.
2014-2023	2.20	N.A.	N.A.	N.A.	2.00	N.A.	N.A.	N.A.
2015-2024	N.A.	2.10	N.A.	N.A.	N.A.	2.00	N.A.	N.A.

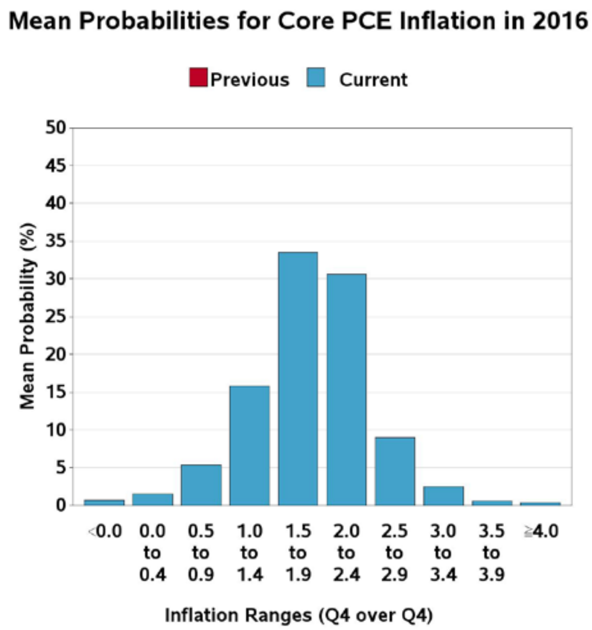
The charts below show the median projections (the red line) and the associated interquartile ranges (the gray area around the red line) for 10-year annual-average CPI and PCE inflation. The top panel shows a slightly lower level of the long-term projection for CPI inflation, at 2.1 percent. The bottom panel highlights the unchanged 10-year forecast for PCE inflation, at 2.0 percent.





The figures below show the probabilities that the forecasters are assigning to the possibility that fourth-quarter over fourth-quarter core PCE inflation in 2015 and 2016 will fall into each of 10 ranges. For 2015, the forecasters assign a higher chance than previously predicted that core PCE inflation will be below 1.5 percent (and a lower probability that inflation will be above 1.5 percent).





Lower Risk of a Negative Quarter

For the current quarter, the forecasters predict a 7.9 percent chance of negative growth. As the table below shows, the forecasters have also reduced their risk estimates for a downturn in the following quarters, compared with their previous estimates.

Risk of a Negative Quarter (%)
Survey Means

Quarterly data:	Previous	New
2015:Q1	10.3	7.9
2015:Q2	11.4	9.3
2015:Q3	12.6	11.1
2015:Q4	13.5	11.9
2016:Q1	N.A.	13.2

Forecasters State Their Views on House Prices

In this survey, a special question asked panelists to provide their forecasts for fourth-quarter over fourth-quarter growth in house prices, as measured by a number of alternative indices. The panelists were allowed to choose their measure from a list of indices or to write in their own index. For each index of their choosing, the panelists provided forecasts for growth in 2015 and 2016.

Twenty-two panelists answered the special question. Some panelists provided projections for more than one index. The table below provides a summary of the forecasters' responses. The number of responses (N) is low for each index. The median estimates for the seven house-price indices listed in the table below range from 3.7 percent to 5.9 percent in 2015 and from 3.0 percent to 5.0 percent in 2016.

Projections for Growth in Various Indices of House Prices
Q4/Q4, Percentage Points

	2015 (Q4/Q4 Percent Change)			2016 (Q4/Q4 Percent Change)		
Index	N	Mean	Median	N	Mean	Median
S&P/Case-Shiller: U.S. National	7	4.4	4.5	7	5.0	4.0
S&P/Case-Shiller: Composite 10	2	4.0	4.0	2	3.5	3.5
S&P/Case-Shiller: Composite 20	5	3.7	4.0	5	2.9	3.5
FHFA: U.S. Total	5	4.9	5.6	5	4.8	5.0
FHFA: Purchase Only	8	3.5	3.7	8	3.0	3.0
CoreLogic: National HPI, incl. Distressed Sales (Single Family Combined)	4	5.1	5.3	4	4.4	4.5
NAR Median: Total Existing	2	5.9	5.9	2	3.7	3.7

Forecasters See Slightly Lower Long-Run Growth in Output and Productivity and in Returns to Financial Assets

In the first-quarter surveys, the forecasters provide their long-run projections for an expanded set of variables, including growth in output and productivity, as well as returns on financial assets.

As the table below shows, the forecasters have reduced their estimates for the annual-average rate of growth in real GDP over the next 10 years. Currently, the forecasters expect real GDP to grow at an annual-average rate of 2.50 percent over the next 10 years, down from 2.60 percent in the first-quarter survey of 2014.

Similarly, productivity growth is now expected to average 1.70 percent, down from 1.80 percent. Downward revisions to the return on two of the financial assets accompany the current outlook. The forecasters see the S&P 500 returning an annual-average 5.45 percent per year over the next 10 years, down from 6.00 percent. The forecasters expect the rate on 10-year Treasuries to average 3.98 percent over the next 10 years, down from 4.35 percent in last year's first-quarter survey. Three-month Treasury bills will return 2.67 percent, up from 2.50 percent.

Median Long-Term (10-Year) Forecasts (%)

	First Quarter 2014	*Current Survey*
Real GDP Growth	2.60	2.50
Productivity Growth	1.80	1.70
Stock Returns (S&P 500)	6.00	5.45
Rate on 10-Year Treasury Bonds	4.35	3.98
Bill Returns (3-Month)	2.50	2.67

The Federal Reserve Bank of Philadelphia thanks the following forecasters for their participation in recent surveys:

Lewis Alexander, Nomura Securities; **Scott Anderson**, Bank of the West (BNP Paribas Group); **Robert J. Barbera**, Johns Hopkins University Center for Financial Economics; **Peter Bernstein**, RCF Economic and Financial Consulting, Inc.; **Christine Chmura, Ph.D.** and **Xiaobing Shuai, Ph.D.**, Chmura Economics & Analytics; **Gary Ciminero, CFA**, GLC Financial Economics; **David Crowe**, National Association of Home Builders; **Nathaniel Curtis**, Navigant Consulting; **Gregory Daco**, Oxford Economics USA, Inc.; **Rajeev Dhawan**, Georgia State University; **Michael R. Englund**, Action Economics, LLC; **Michael Gapen**, Barclays Capital; **James Glassman**, JPMorgan Chase & Co.; **Matthew Hall** and **Daniil Manaenkov**, RSQE, University of Michigan; **Jan Hatzius**, Goldman Sachs; **Keith Hembre**, Nuveen Asset Management; **Peter Hooper**, Deutsche Bank Securities, Inc.; **IHS Global Insight**; **Fred Joutz**, Benchmark Forecasts and Research Program on Forecasting, George Washington University; **Sam Kahan**, Kahan Consulting Ltd. (ACT Research LLC); **N. Karp**, BBVA Compass; **Jack Kleinhenz**, Kleinhenz & Associates, Inc.; **Thomas Lam**, OSK-DMG/RHB; **L. Douglas Lee**, Economics from Washington; **John Lonski**, Moody's Capital Markets Group; **Macroeconomic Advisers, LLC**; **R. Anthony Metz**, Pareto Optimal Economics; **Michael Moran**, Daiwa Capital Markets America; **Joel L. Naroff**, Naroff Economic Advisors; **Luca Noto**, Anima Sgr; **Brendon Ogmundson**, BC Real Estate Association; **Tom Porcelli**, RBC Capital Markets; **Arun Raha**, Eaton Corporation; **Martin A. Regalia**, U.S. Chamber of Commerce; **Vincent Reinhart**, Morgan Stanley; **Philip Rothman**, East Carolina University; **Chris Rupkey**, Bank of Tokyo-Mitsubishi UFJ; **John Silvia**, Wells Fargo; **Allen Sinai**, Decision Economics, Inc.; **Sean M. Snaith, Ph.D.**, University of Central Florida; **Neal Soss**, Credit Suisse; **Stephen Stanley**, Amherst Pierpont Securities; **Charles Steindel**, Ramapo College of New Jersey; **Susan M. Sterne**, Economic Analysis Associates, Inc.; **Thomas Kevin Swift,** American Chemistry Council; **Richard Yamarone**, Bloomberg, LP; **Mark Zandi**, Moody's Analytics.

This is a partial list of participants. We also thank those who wish to remain anonymous.

SUMMARY TABLE
SURVEY OF PROFESSIONAL FORECASTERS
MAJOR MACROECONOMIC INDICATORS

	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2015	2016	2017	2018
						(YEAR-OVER-YEAR)			
PERCENT GROWTH AT ANNUAL RATES									
1. REAL GDP (BILLIONS, CHAIN WEIGHTED)	2.7	3.0	2.8	2.8	2.9	3.2	2.9	2.7	2.7
2. GDP PRICE INDEX (PERCENT CHANGE)	0.6	1.6	1.9	1.6	2.0	1.1	1.8	N.A.	N.A.
3. NOMINAL GDP ($ BILLIONS)	3.5	4.2	4.5	4.5	4.5	4.2	4.8	N.A.	N.A.
4. NONFARM PAYROLL EMPLOYMENT									
(PERCENT CHANGE)	2.3	2.0	1.9	1.9	1.8	2.2	1.8	N.A.	N.A.
(AVG MONTHLY CHANGE)	269.3	233.8	222.0	229.4	213.8	252.5	213.6	N.A.	N.A.
VARIABLES IN LEVELS									
5. UNEMPLOYMENT RATE (PERCENT)	5.6	5.5	5.4	5.2	5.2	5.4	5.1	5.0	4.9
6. 3-MONTH TREASURY BILL (PERCENT)	0.0	0.1	0.3	0.6	0.8	0.3	1.2	2.7	3.0
7. 10-YEAR TREASURY BOND (PERCENT)	2.0	2.2	2.4	2.5	2.7	2.3	3.1	3.9	4.1

	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2015	2016	2017
						(Q4-OVER-Q4)		
INFLATION INDICATORS								
8. CPI (ANNUAL RATE)	-1.4	1.6	1.9	2.0	2.1	1.1	2.1	2.3
9. CORE CPI (ANNUAL RATE)	1.3	1.7	1.8	1.8	1.9	1.7	1.9	2.1
10. PCE (ANNUAL RATE)	-0.6	1.4	1.9	1.8	1.8	1.1	1.9	2.1
11. CORE PCE (ANNUAL RATE)	1.2	1.4	1.5	1.7	1.6	1.4	1.7	1.9

THE FIGURES ON EACH LINE ARE MEDIANS OF 39 INDIVIDUAL FORECASTERS.

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA.
SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

SURVEY OF PROFESSIONAL FORECASTERS

First Quarter 2015

Tables

Note: Data in these tables listed as "actual" are the data that were available to the forecasters when they were sent the survey questionnaire on January 30; the tables do not reflect subsequent revisions to the data. All forecasts were received on or before February 10, 2015.

TABLE ONE
MAJOR MACROECONOMIC INDICATORS
MEDIANS OF FORECASTER PREDICTIONS

	NUMBER OF FORECASTERS	ACTUAL 2014 Q4	FORECAST 2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	ACTUAL 2014 ANNUAL	FORECAST 2015 ANNUAL	2016 ANNUAL	2017 ANNUAL	2018 ANNUAL
1. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	38	17711	17864	18048	18249	18449	18652	17421	18156	19022	N.A.	N.A.
2. GDP PRICE INDEX (2009=100)	38	108.64	108.81	109.25	109.76	110.19	110.74	108.31	109.53	111.47	N.A.	N.A.
3. CORPORATE PROFITS AFTER TAXES ($ BILLIONS)	17	N.A.	1629.2	1659.1	1682.9	1705.2	1717.2	N.A.	1652.6	1752.9	N.A.	N.A.
4. UNEMPLOYMENT RATE (PERCENT)	39	5.7	5.6	5.5	5.4	5.2	5.2	6.1	5.4	5.1	5.0	4.9
5. NONFARM PAYROLL EMPLOYMENT (THOUSANDS)	31	140061	140869	141570	142236	142925	143566	138890	141920	144484	N.A.	N.A.
6. INDUSTRIAL PRODUCTION (2007=100)	33	106.1	107.1	108.0	108.8	109.7	110.4	104.2	108.4	111.5	N.A.	N.A.
7. NEW PRIVATE HOUSING STARTS (ANNUAL RATE, MILLIONS)	36	1.07	1.09	1.13	1.18	1.22	1.25	1.00	1.15	1.30	N.A.	N.A.
8. 3-MONTH TREASURY BILL RATE (PERCENT)	36	0.02	0.05	0.10	0.30	0.56	0.84	0.03	0.26	1.21	2.66	3.00
9. AAA CORPORATE BOND YIELD (PERCENT)	27	3.88	3.65	3.80	4.00	4.13	4.30	4.16	3.87	4.50	N.A.	N.A.
10. BAA CORPORATE BOND YIELD (PERCENT)	26	4.74	4.53	4.70	4.83	4.96	5.09	4.85	4.78	5.28	N.A.	N.A.
11. 10-YEAR TREASURY BOND YIELD (PERCENT)	38	2.28	1.97	2.22	2.43	2.52	2.75	2.54	2.30	3.11	3.86	4.09
12. REAL GDP (BILLIONS, CHAIN WEIGHTED)	37	16312	16419	16542	16657	16771	16893	16090	16598	17074	17536	18003
13. TOTAL CONSUMPTION EXPENDITURE (BILLIONS, CHAIN WEIGHTED)	35	11114.9	11206.2	11293.2	11377.0	11467.0	11540.8	10967.8	11329.7	11662.5	N.A.	N.A.
14. NONRESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	34	2154.8	2178.9	2206.5	2239.0	2266.9	2290.2	2112.7	2223.2	2331.3	N.A.	N.A.
15. RESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	33	504.6	513.3	524.4	537.6	551.2	564.5	496.3	532.1	581.1	N.A.	N.A.
16. FEDERAL GOVERNMENT C & I (BILLIONS, CHAIN WEIGHTED)	34	1119.7	1122.0	1123.9	1127.1	1128.6	1130.2	1123.4	1125.3	1132.0	N.A.	N.A.
17. STATE AND LOCAL GOVT C & I (BILLIONS, CHAIN WEIGHTED)	33	1775.2	1780.8	1787.1	1794.2	1801.0	1806.0	1764.9	1791.0	1812.3	N.A.	N.A.
18. CHANGE IN PRIVATE INVENTORIES (BILLIONS, CHAIN WEIGHTED)	33	113.1	84.0	75.0	73.0	68.0	62.4	78.8	75.2	61.4	N.A.	N.A.
19. NET EXPORTS (BILLIONS, CHAIN WEIGHTED)	34	-471.5	-477.9	-489.7	-500.9	-509.8	-520.5	-452.6	-493.5	-532.6	N.A.	N.A.

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA. SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE TWO
MAJOR MACROECONOMIC INDICATORS
PERCENTAGE CHANGES AT ANNUAL RATES

	NUMBER OF FORECASTERS	Q4 2014 TO Q1 2015	Q1 2015 TO Q2 2015	Q2 2015 TO Q3 2015	Q3 2015 TO Q4 2015	Q4 2015 TO Q1 2016	2014 TO 2015	2015 TO 2016	2016 TO 2017	2017 TO 2018
1. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	38	3.5	4.2	4.5	4.5	4.5	4.2	4.8	N.A.	N.A.
2. GDP PRICE INDEX (2009=100)	38	0.6	1.6	1.9	1.6	2.0	1.1	1.8	N.A.	N.A.
3. CORPORATE PROFITS AFTER TAXES ($ BILLIONS)	17	7.5	7.5	5.9	5.4	2.8	9.3	6.1	N.A.	N.A.
4. UNEMPLOYMENT RATE (PERCENT)	39	-0.1	-0.1	-0.1	-0.2	-0.0	-0.7	-0.3	-0.1	-0.0
5. NONFARM PAYROLL EMPLOYMENT										
(PERCENT CHANGE)	31	2.3	2.0	1.9	1.9	1.8	2.2	1.8	N.A.	N.A.
(AVG MONTHLY CHANGE)	31	269.3	233.8	222.0	229.4	213.8	252.5	213.6	N.A.	N.A.
6. INDUSTRIAL PRODUCTION (2007=100)	33	3.8	3.4	3.1	3.2	2.7	4.0	2.8	N.A.	N.A.
7. NEW PRIVATE HOUSING STARTS (ANNUAL RATE, MILLIONS)	36	6.6	14.1	19.4	12.8	9.8	14.7	12.8	N.A.	N.A.
8. 3-MONTH TREASURY BILL RATE (PERCENT)	36	0.03	0.05	0.20	0.26	0.28	0.23	0.94	1.46	0.34
9. AAA CORPORATE BOND YIELD (PERCENT)	27	-0.23	0.15	0.20	0.13	0.17	-0.29	0.63	N.A.	N.A.
10. BAA CORPORATE BOND YIELD (PERCENT)	26	-0.21	0.17	0.13	0.13	0.13	-0.07	0.50	N.A.	N.A.
11. 10-YEAR TREASURY BOND YIELD (PERCENT)	38	-0.31	0.25	0.21	0.08	0.23	-0.24	0.81	0.75	0.22
12. REAL GDP (BILLIONS, CHAIN WEIGHTED)	37	2.7	3.0	2.8	2.8	2.9	3.2	2.9	2.7	2.7
13. TOTAL CONSUMPTION EXPENDITURE (BILLIONS, CHAIN WEIGHTED)	35	3.3	3.1	3.0	3.2	2.6	3.3	2.9	N.A.	N.A.
14. NONRESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	34	4.6	5.1	6.0	5.1	4.2	5.2	4.9	N.A.	N.A.
15. RESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	33	7.1	8.9	10.5	10.5	10.0	7.2	9.2	N.A.	N.A.
16. FEDERAL GOVERNMENT C & I (BILLIONS, CHAIN WEIGHTED)	34	0.8	0.7	1.1	0.5	0.6	0.2	0.6	N.A.	N.A.
17. STATE AND LOCAL GOVT C & I (BILLIONS, CHAIN WEIGHTED)	33	1.3	1.4	1.6	1.5	1.1	1.5	1.2	N.A.	N.A.
18. CHANGE IN PRIVATE INVENTORIES (BILLIONS, CHAIN WEIGHTED)	33	-29.1	-9.0	-2.0	-5.0	-5.6	-3.6	-13.8	N.A.	N.A.
19. NET EXPORTS (BILLIONS, CHAIN WEIGHTED)	34	-6.4	-11.8	-11.2	-8.8	-10.8	-40.9	-39.1	N.A.	N.A.

NOTE: FIGURES FOR UNEMPLOYMENT RATE, TREASURY BILL RATE, AAA CORPORATE BOND YIELD, BAA CORPORATE BOND YIELD, AND 10-YEAR TREASURY BOND YIELD ARE CHANGES IN THESE RATES, IN PERCENTAGE POINTS. FIGURES FOR CHANGE IN PRIVATE INVENTORIES AND NET EXPORTS ARE CHANGES IN BILLIONS OF CHAIN-WEIGHTED DOLLARS. ALL OTHERS ARE PERCENTAGE CHANGES AT ANNUAL RATES.

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA. SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE THREE
MAJOR PRICE INDICATORS
MEDIANS OF FORECASTER PREDICTIONS

	NUMBER OF FORECASTERS	ACTUAL 2014 Q4	FORECAST(Q/Q) 2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	ACTUAL 2014 ANNUAL	FORECAST(Q4/Q4) 2015 ANNUAL	2016 ANNUAL	2017 ANNUAL
1. CONSUMER PRICE INDEX (ANNUAL RATE)	37	-1.2	-1.4	1.6	1.9	2.0	2.1	1.2	1.1	2.1	2.3
2. CORE CONSUMER PRICE INDEX (ANNUAL RATE)	35	1.4	1.3	1.7	1.8	1.8	1.9	1.7	1.7	1.9	2.1
3. PCE PRICE INDEX (ANNUAL RATE)	32	-0.5	-0.6	1.4	1.9	1.8	1.8	1.1	1.1	1.9	2.1
4. CORE PCE PRICE INDEX (ANNUAL RATE)	34	1.1	1.2	1.4	1.5	1.7	1.6	1.4	1.4	1.7	1.9

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA. SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE FOUR
ESTIMATED PROBABILITY OF DECLINE IN REAL GDP

ESTIMATED PROBABILITY (CHANCES IN 100)	Q4 2014 TO Q1 2015	Q1 2015 TO Q2 2015	Q2 2015 TO Q3 2015	Q3 2015 TO Q4 2015	Q4 2015 TO Q1 2016
	NUMBER OF FORECASTERS				
10 OR LESS	27	27	18	17	16
11 TO 20	6	5	14	15	15
21 TO 30	0	1	1	1	1
31 TO 40	0	0	0	0	1
41 TO 50	0	0	0	0	0
51 TO 60	0	0	0	0	0
61 TO 70	0	0	0	0	0
71 TO 80	0	0	0	0	0
81 TO 90	0	0	0	0	0
91 AND OVER	0	0	0	0	0
NOT REPORTING	6	6	6	6	6
MEAN AND MEDIAN					
MEDIAN PROBABILITY	6.00	10.00	10.00	10.00	12.00
MEAN PROBABILITY	7.90	9.30	11.14	11.85	13.20

NOTE: TOTAL NUMBER OF FORECASTERS REPORTING IS 33.
SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA.
SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE FIVE
MEAN PROBABILITIES

MEAN PROBABILITY ATTACHED TO POSSIBLE
CIVILIAN UNEMPLOYMENT RATES:
(ANNUAL AVERAGE)

	2015	2016	2017	2018
9.0 PERCENT OR MORE	0.00	0.09	0.14	0.07
8.0 TO 8.9 PERCENT	0.12	0.14	0.37	0.52
7.5 TO 7.9 PERCENT	0.18	0.27	0.69	1.09
7.0 TO 7.4 PERCENT	0.45	0.80	1.88	1.81
6.5 TO 6.9 PERCENT	1.83	2.68	4.32	4.49
6.0 TO 6.4 PERCENT	9.36	7.63	9.27	8.98
5.5 TO 5.9 PERCENT	38.01	22.00	17.96	19.24
5.0 TO 5.4 PERCENT	43.82	39.18	29.07	29.29
4.0 TO 4.9 PERCENT	5.38	24.57	31.38	29.74
LESS THAN 4.0 PERCENT	0.85	2.64	4.90	4.77

MEAN PROBABILITY ATTACHED TO POSSIBLE
PERCENT CHANGES IN REAL GDP:
(ANNUAL-AVERAGE OVER ANNUAL-AVERAGE)

	2014-2015	2015-2016	2016-2017	2017-2018
6.0 OR MORE	0.64	0.72	0.53	0.50
5.0 TO 5.9	1.84	1.70	1.69	1.86
4.0 TO 4.9	9.05	8.84	8.33	7.18
3.0 TO 3.9	36.63	26.63	24.38	23.80
2.0 TO 2.9	37.53	39.22	37.90	38.07
1.0 TO 1.9	10.09	15.69	18.02	18.39
0.0 TO 0.9	2.83	5.21	6.79	6.91
-1.0 TO -0.1	0.87	1.46	1.56	2.32
-2.0 TO -1.1	0.36	0.42	0.77	0.80
-3.0 TO -2.1	0.16	0.11	0.09	0.15
LESS THAN -3.0	0.00	0.00	0.02	0.02

MEAN PROBABILITY ATTACHED TO POSSIBLE
PERCENT CHANGES IN GDP PRICE INDEX:
(ANNUAL-AVERAGE OVER ANNUAL-AVERAGE)

	2014-2015	2015-2016
4.0 OR MORE	0.08	0.12
3.5 TO 3.9	0.08	0.68
3.0 TO 3.4	0.78	2.34
2.5 TO 2.9	4.63	9.62
2.0 TO 2.4	11.78	26.27
1.5 TO 1.9	22.48	32.78
1.0 TO 1.4	33.64	17.99
0.5 TO 0.9	20.21	7.00
0.0 TO 0.4	5.57	2.52
WILL DECLINE	0.75	0.69

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA.
SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE SIX
MEAN PROBABILITY OF CORE CPI AND CORE PCE INFLATION (Q4/Q4)

MEAN PROBABILITY ATTACHED TO CORE CPI INFLATION:

	14Q4 TO 15Q4	15Q4 TO 16Q4
4 PERCENT OR MORE	0.40	0.83
3.5 TO 3.9 PERCENT	0.65	0.90
3.0 TO 3.4 PERCENT	1.94	3.37
2.5 TO 2.9 PERCENT	6.56	11.60
2.0 TO 2.4 PERCENT	17.42	29.91
1.5 TO 1.9 PERCENT	36.34	33.83
1.0 TO 1.4 PERCENT	25.48	13.31
0.5 TO 0.9 PERCENT	8.18	3.86
0.0 TO 0.4 PERCENT	2.45	1.74
WILL DECLINE	0.76	0.66

MEAN PROBABILITY ATTACHED TO CORE PCE INFLATION:

	14Q4 TO 15Q4	15Q4 TO 16Q4
4 PERCENT OR MORE	0.16	0.40
3.5 TO 3.9 PERCENT	0.37	0.58
3.0 TO 3.4 PERCENT	1.88	2.49
2.5 TO 2.9 PERCENT	4.94	9.01
2.0 TO 2.4 PERCENT	13.60	30.64
1.5 TO 1.9 PERCENT	32.56	33.53
1.0 TO 1.4 PERCENT	27.72	15.82
0.5 TO 0.9 PERCENT	14.59	5.36
0.0 TO 0.4 PERCENT	3.47	1.49
WILL DECLINE	0.73	0.68

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA.
SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

TABLE SEVEN
LONG-TERM (5-YEAR AND 10-YEAR) FORECASTS

ANNUAL AVERAGE OVER THE NEXT 5 YEARS: 2015-2019

CPI INFLATION RATE		PCE INFLATION RATE	
MINIMUM	1.10	MINIMUM	0.90
LOWER QUARTILE	1.90	LOWER QUARTILE	1.70
MEDIAN	2.00	MEDIAN	1.80
UPPER QUARTILE	2.20	UPPER QUARTILE	2.00
MAXIMUM	2.60	MAXIMUM	2.40
MEAN	2.03	MEAN	1.83
STD. DEVIATION	0.33	STD. DEVIATION	0.30
N	35	N	33
MISSING	4	MISSING	6

ANNUAL AVERAGE OVER THE NEXT 10 YEARS: 2015-2024

CPI INFLATION RATE		PCE INFLATION RATE	
MINIMUM	1.40	MINIMUM	1.30
LOWER QUARTILE	2.00	LOWER QUARTILE	1.85
MEDIAN	2.10	MEDIAN	2.00
UPPER QUARTILE	2.30	UPPER QUARTILE	2.11
MAXIMUM	3.10	MAXIMUM	2.50
MEAN	2.14	MEAN	1.94
STD. DEVIATION	0.31	STD. DEVIATION	0.26
N	33	N	31
MISSING	6	MISSING	8

REAL GDP GROWTH RATE		PRODUCTIVITY GROWTH RATE	
MINIMUM	1.80	MINIMUM	0.10
LOWER QUARTILE	2.30	LOWER QUARTILE	1.50
MEDIAN	2.50	MEDIAN	1.70
UPPER QUARTILE	2.68	UPPER QUARTILE	2.00
MAXIMUM	3.07	MAXIMUM	2.40
MEAN	2.51	MEAN	1.63
STD. DEVIATION	0.28	STD. DEVIATION	0.55
N	28	N	21
MISSING	11	MISSING	18

STOCK RETURNS (S&P 500)		BOND RETURNS (10-YEAR)		BILL RETURNS (3-MONTH)	
MINIMUM	1.70	MINIMUM	2.44	MINIMUM	0.30
LOWER QUARTILE	5.00	LOWER QUARTILE	3.75	LOWER QUARTILE	2.21
MEDIAN	5.45	MEDIAN	3.98	MEDIAN	2.67
UPPER QUARTILE	7.00	UPPER QUARTILE	4.50	UPPER QUARTILE	3.00
MAXIMUM	8.10	MAXIMUM	5.00	MAXIMUM	3.90
MEAN	5.79	MEAN	3.91	MEAN	2.55
STD. DEVIATION	1.38	STD. DEVIATION	0.70	STD. DEVIATION	0.74
N	20	N	25	N	24
MISSING	19	MISSING	14	MISSING	15

SOURCE: RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA.
SURVEY OF PROFESSIONAL FORECASTERS, FIRST QUARTER 2015.

Available online at www.sciencedirect.com
ScienceDirect
International Journal of Forecasting 24 (2008) 34–75
www.elsevier.com/locate/ijforecast

The financial analyst forecasting literature: A taxonomy with suggestions for further research

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Abstract

This paper develops a taxonomy of research examining the role of financial analysts in capital markets. The paper builds on the perspectives provided by Schipper [Schipper, K. (1991). Analysts' forecasts. *Accounting Horizons*, 5, 105–131] and Brown [Brown, L. (1993). Earnings forecasting research: Its implications for capital markets research. *International Journal of Forecasting*, 9, 295–320]. We categorize papers published since 1992, describe the research questions addressed, and suggest avenues for further research in seven broad areas: (1) analysts' decision processes; (2) the nature of analyst expertise and the distributions of earnings forecasts; (3) the information content of analyst research; (4) analyst and market efficiency; (5) analysts' incentives and behavioral biases; (6) the effects of the institutional and regulatory environment (including cross-country comparisons); and (7) research design issues.

Keywords: Earnings forecasting; Financial analysts; Financial markets; Stock price forecasts; Analyst stock recommendations; Analyst research reports; Analyst decision processes; Analysts' incentives; Analyst expertise; Analyst inefficiency; Forecast bias; Financial analyst literature review

1. Introduction

This paper provides a taxonomy of research examining the roles financial analysts play in the allocation of economic resources. Two important papers published in the early 1990s provide perspectives on the literature: one appears in *Accounting Horizons* (Schipper, 1991) and the other appears in the *International Journal of Forecasting* (Brown, 1993). Our paper begins by summarizing the perspectives and directions for future research suggested by Schipper (1991) and Brown (1993).[3] We then develop a taxonomy of the research that has appeared since 1992.

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[3] Also see Givoly and Lakonishok (1984) for a review of analyst forecasting research prior to 1984.

0169-2070/$ - see front matter
doi:10.1016/j.ijforecast.2007.12.006

Our goal is to provide an organized look at the literature, paying particular attention to the questions remaining for further research.[4]

Since 1992, approximately 250 papers related to financial analysts have appeared in the eleven major research journals that we use to develop our taxonomy.[5] In our review of papers published since 1992, we have found much progress in some of the areas identified by Schipper (1991) and Brown (1993), and less progress in others. In particular, the research has evolved from descriptions of the statistical properties of analysts' forecasts to investigations of the incentives and decision processes that give rise to these properties. However, in spite of this broader focus, much of the analysts' decision processes and the market's mechanism of drawing a useful consensus from the combination of individual analysts' decisions remains hidden in a black box. Furthermore, we still have much to learn about relevant valuation metrics and mechanisms by which analysts and investors translate forecasts into equity values. For example, with the renewed popularity of the earnings-based valuation model in the early 1990s, the research turned toward investigating the model's role in the market's conversion of analysts' earnings forecasts into stock prices. Given the unexpected result that this model does a relatively poor job of explaining the variation in market prices and analysts' price forecasts and recommendations, researchers have turned their attention to examining heuristics that might better explain analyst and market decisions about firm value. We still have much to learn about the heuristics relied upon by analysts and the market.

The rest of this paper draws attention to these issues, as well as other issues that have arisen since 1992. The next section provides a summary of the questions identified in Schipper (1991) and Brown (1993) and the directions for future research suggested by those authors, as well as those suggested by the authors of the four papers commenting on Brown (1993). Section 3 describes our taxonomy, categorizes the papers published since Brown (1993), and identifies new research questions that emerge from our reading of the literature. Section 4 provides concluding comments, highlighting the areas that we consider most promising for future research.

2. Perspectives from Schipper (1991) and Brown (1993)

Katherine Schipper's (1991) commentary makes two major points. First, she suggests that the research regarding analysts' earnings forecasts focuses too narrowly on the statistical properties of the forecasts, without considering the full decision context and economic incentives affecting these properties. She takes the point of view that the analyst's job is to provide buy-sell-hold recommendations, and generate research reports to support those recommendations. Schipper describes analysts' earnings forecasts as one component of their research reports, and a means to an end rather than ends in themselves. She suggests that a more complete description of analysts' economic incentives and the role of earnings forecasts in the full decision context of analysts should lead to richer hypotheses regarding the statistical properties of the earnings forecasts. The second major point is that the research on the statistical properties of analysts' earnings forecasts focuses on outputs from, rather than inputs to, analysts' decision processes. The commentary calls for more research into how analysts actually use accounting information and their own earnings forecasts in making decisions.

From Larry Brown's (1993) review paper, we glean four key points. First, he notes that the models that produce the most accurate forecasts of an earnings variable should also produce the best proxies for the market's expectations, assuming market efficiency and

[4] We focus on the research related to analysts' decision processes and the usefulness of their forecasts and stock recommendations. For broader reviews of archival capital markets research and experimental financial accounting research (including issues related to analysts' forecasts and recommendations), see Kothari (2001) and Libby, Bloomfield, and Nelson (2002), respectively.

[5] Our taxonomy generally excludes papers published before 1993 and after June 2006, and we also generally exclude working papers. However, we believe that our classification scheme is both flexible and broad enough to enable the interested reader to continue categorizing new papers. For an expanded list of papers, we refer the interested reader to the Thomson Financial Research Bibliography (Brown 2007). Our taxonomy focuses only on the papers in that bibliography that were published in the 11 journals we review exhaustively; however, many of the papers in the *I/B/E/S Research Bibliography* were published in other journals, and many remain in working paper form. We also refer the interested reader to the *Financial Analysts' Journal* and the *Journal of Investing* for articles suggesting practical applications of the ideas in the academic articles included in our taxonomy.

assuming that the research design correctly models the valuation implications of the earnings variable. Under these assumptions, "predictive ability and association are two sides of the same coin (p. 296)." Brown notes mixed results on this issue and calls for future research to sort out whether the apparently conflicting results stem from research design problems or market inefficiency. Second, Brown encourages researchers to carefully consider the appropriateness of summary files of I/B/E/S consensus forecasts. Although the date of the I/B/E/S report and the coding of the forecast horizon indicates a timely consensus, the consensus may contain stale forecasts which have not been updated since the information event on which the study intends to condition the forecasts. Brown suggests that using the I/B/E/S Detail files can avoid this problem.[6] Third, Brown calls for research to better understand the role of analysts' forecasts in post-earnings announcement drift. In particular, he calls for research into the reasons for variation in the degree and speed of forecast convergence following earnings announcements (i.e., convergence towards a consensus that fully reflects the information in the prior earnings announcement), and the effect, if any, of forecast convergence on post-earnings announcement drift. Finally, like Schipper (1991), Brown calls for research to better understand the decision processes of analysts and the roles of analysts' earnings forecasts, macroeconomic and industry factors, and other information in formulating stock price forecasts and recommendations.

Both Brown (1993) and Schipper (1991) call for experimental research to play a more prominent role in understanding the uses of accounting and other information in making stock recommendations, within the full context of the analyst's decision environment and economic incentives. In Brown's words, "joint efforts by capital markets researchers and behavioralists to examine these issues more thoroughly would considerably enhance our understanding of the role of analysts in the price formation process (p. 315)."

Four authors commented on Brown (1993), and each provides interesting insights and suggestions for future research. O'Hanlon (1993) calls for investigations of the degree to which financial analysts' earnings forecasts distinguish permanent from temporary earnings changes. Thomas (1993) suggests that the importance of research into how analysts make earnings predictions depends on the answers to several questions, including (1) whether analysts' forecasts influence the marginal investor; (2) whether analysts seek to predict a 'core' earnings number that will persist in the future; and (3) whether their incentives are consistent with producing the most accurate forecasts possible. P. Brown (1993) calls for research into whether some analysts are better forecasters than others, whether the market's earnings expectations reflect these differences, and the degree to which consensus forecasts drawn from analyst tracking services such as I/B/E/S reflect investor expectations. Zmijewski (1993) focuses on the need for investigations of cross-country variation in the properties of earnings forecasts and their roles in price formation in capital markets.

Based on our reading of Schipper (1991), Brown (1993) and the related comment papers, along with an initial look at the research published since 1992, we organize the research into seven broad topic areas: (1) What is the nature of analysts' decision processes, and how do analysts rationalize the forecasts and recommendations contained in their research reports? (2) What is the nature of analyst expertise and what are the distributional characteristics of individual analyst earnings forecasts? (3) How informative are the outputs from analyst research (including earnings forecasts, target price forecasts, stock recommendations, and qualitative contextual analysis)? (4) Do analysts' forecasts and recommendations impound information about future earnings efficiently? Do stock prices impound the information in analysts' forecasts and recommendations efficiently? (5) How do management and analyst incentives, along with behavioral biases, affect the statistical properties of analysts' forecasts? (6) How does variation in the regulatory environment (over time and across countries) affect the behavior of analysts' forecasts and the role of analysts in capital markets? (7) What are some research design and database issues that threaten the validity of inferences from studies of the behavior of analysts and their forecasts and recommendations?

The next section is divided into seven subsections that categorize the research papers addressing these

[6] Most of the studies reviewed by Brown (1993) relied on either the I/B/E/S consensus or the Value Line data. Some studies also used Merrill Lynch's Opinion Alert, Standard and Poors' Earnings Forecaster, and Zacks' Investment Research. Others used Detail files from I/B/E/S and Zacks, which only became readily available at the end of the period.

questions, with a selective focus on papers published since Brown (1993) that stimulate our suggestions of avenues for further research in each category of our taxonomy.

3. A taxonomy of research related to the role of financial analysts in capital markets

The questions at the end of Section 2 naturally arise from the analyst reporting environment shown in Fig. 1, and provide the foundation for our taxonomy. The seven subsections below (3.1 through 3.7) and the triangles in Fig. 1 correspond to the seven questions above. As described in Fig. 1, analysts develop expertise (Section 3.2) in obtaining and analyzing information from various sources, including (1) earnings and other information from SEC filings, such as proxy statements and periodic financial reports; (2) industry and macroeconomic conditions; and (3) conference calls and other management communications. From this information, analysts produce earnings forecasts, target price forecasts, and stock recommendations, along with qualitative reports describing firms' prospects (Section 3.1). Investors use these outputs from analyst research to make trading decisions that affect market prices (Section 3.3). If the analyst forecasting process and capital markets are efficient, then market prices and analysts' forecasts immediately reflect all of the information described in Fig. 1. Inefficiencies

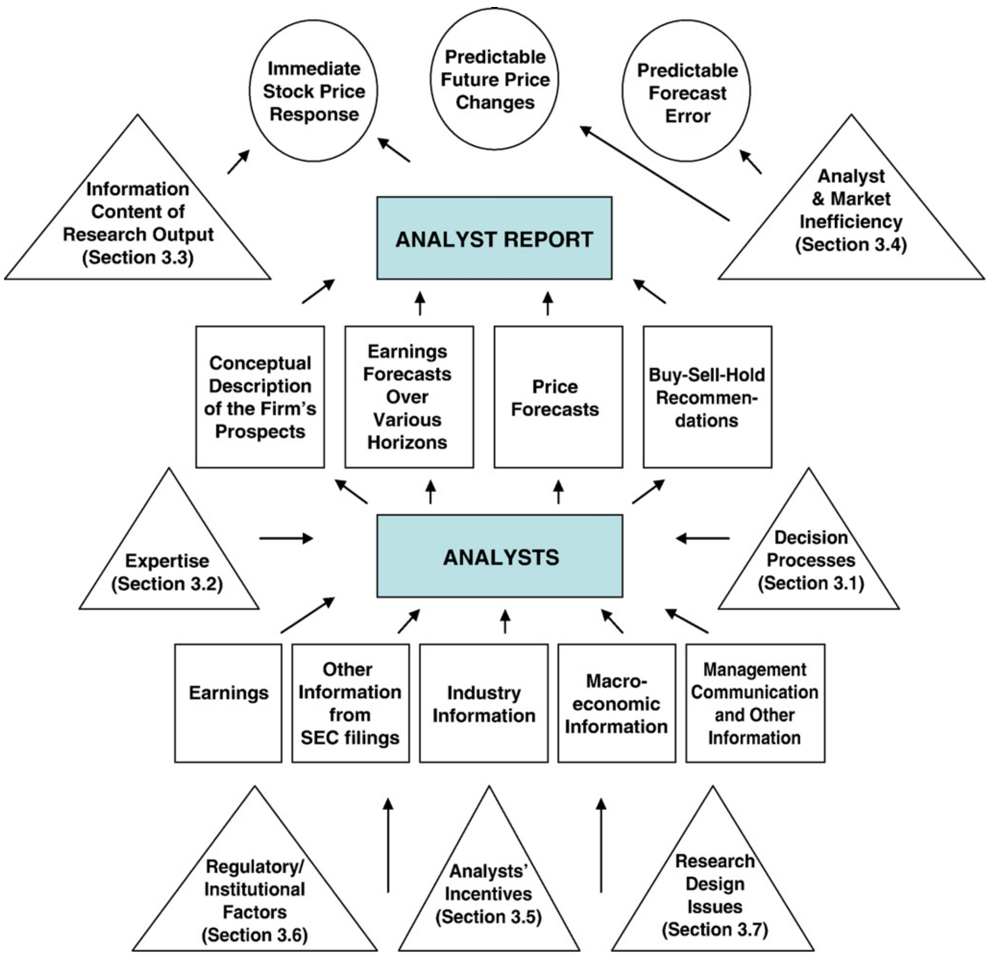

Fig. 1. Analysts' Reporting Environment.

create predictable analyst forecast errors and stock price changes (Section 3.4). The decision processes and analyst research output pictured in Fig. 1 also depend on regulatory and institutional factors that vary over time and across countries (Section 3.6), as well as on analysts' economic incentives and behavioral biases (Section 3.5). Finally, the limitations associated with archival databases, econometric tools, and mathematical models create research design issues that constrain the researcher's ability to observe the forces that ultimately drive market prices (Section 3.7).

We launch our taxonomy by listing and categorizing *all* papers related to analysts and published since 1992 in the following eleven major research journals spanning accounting, finance and forecasting: *The Accounting Review*, *Contemporary Accounting Research*, *International Journal of Forecasting*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, *Journal of Business, Journal of Finance*, *Journal of Financial Economics*, *Journal of Financial and Quantitative Analysis, Review of Accounting Studies*, and *Review of Financial Studies*.[7] Our Tables 3.1 through 3.7 exhaustively categorize and briefly describe each paper related to analysts and appearing in any one of the above journals between January 1993 and June 2006. From that starting point, four areas of subjectivity necessarily enter our paper. First, we infer important sub-questions within each area of our taxonomy. Second, we subjectively select papers to discuss in the text that facilitate our assessment of directions for further research in each area of the seven categories of our taxonomy. Third, we list a paper more than once if it relates to more than one of our sub-questions. Finally, we refer to working papers and papers published in journals other than the eleven listed above when they come to our attention and directly relate to our ideas for further research. Our goal is not to provide exhaustive reviews of (or even references to) all of the papers published since 1992 or currently in process, but rather to selectively identify the aspects of papers that we think capture the pulse of the research and suggest new questions that might be addressed in the foreseeable future.[8]

3.1. Analysts' decision processes

3.1.1. Questions addressed since 1992

As shown in Table 1, researchers have investigated a number of questions related to analysts' decision processes since 1992, including:

1. What information affects the development of analysts' earnings forecasts and recommendations? (Panel A);
2. What information affects analyst following and portfolio decisions? (Panel B);
3. What environmental, classification and reporting quality factors affect analysts' forecasts and recommendations? (Panel C);
4. How do analysts transform information into target prices and stock recommendations? (Panel D); and
5. What is the role of earnings components in analysts' decision processes? (Panel E).

Researchers have used surveys to simply ask analysts how they process information (e.g., Block, 1999), content analyses of analysts' research reports to infer the information analysts rely upon in making forecasts and recommendations (e.g., Rogers & Grant, 1997; Bradshaw, 2002), and laboratory experiments to study how analysts use information (e.g., Hopkins, Houston, & Peters, 2000). Archival studies offer more generalizable results, but are limited in their ability to penetrate the black box of analysts' actual decision processes. The challenge is that analysts have a context-specific task that is very difficult to model, and, consistent with suggestions in Brown (1993) and Schipper (1991), in recent years we have seen relatively more studies using experimental and contextual approaches to questions about analysts' decision processes and incentives.

3.1.2. Suggestions for further research related to analysts' decision processes

In addition to the obvious use of earnings-related information, the research summarized in Table 1, Panel

[7] We exclude papers that use analysts' forecasts merely as a control variable or to proxy for an underlying construct. That is, we focus on papers studying the roles of analysts in capital market resource allocation. We also generally exclude discussion comments on published papers.

[8] See Ramnath, Rock, and Shane (2006) for a more detailed review of the research categorized in our taxonomy.

Table 1
Selected Papers Addressing Questions Related to Analysts' Decision Processes (Section 3.1)

Reference	Method	Key result
Panel A. Research Question 3.1.1: What information affects the development of analysts' earnings forecasts and recommendations?		
Lev and Thiagarajan (1993)	Archival, various analyst commentaries, 1973-1990.	Twelve fundamentals-based earnings persistence indicators, derived from practitioner-oriented analyst literature, collectively enhance the explanatory power of an earnings-returns regression.
Denis, Denis, and Sarin (1994)	Archival, I/B/E/S, 1962-1988.	Analyst forecast revisions following dividend changes are consistent with dividend changes providing information about future cash flows rather than about investment opportunities.
Previts, Bricker, Robinson, and Young (1994)	Content analysis of Investext reports, 1987-1988, 1990-1992.	Analysts place heavy weights on earnings-related information, disaggregate the information beyond the GAAP-based disaggregation found in annual reports, extract non-recurring items, and rely heavily on management for information beyond annual reports.
Bouwman, Frishkoff, and Frishkoff (1995)	Protocol analysis of 12 buy-side analysts.	The nature of the information used by analysts depends on the phase of the decision process. Overall, buy-side analysts want more segment information, longer time series of historical summary information, management-supplied forward-looking information, and sell-side analyst reports.
Kasznik and Lev (1995)	Archival, I/B/E/S, 1979-1986.	Analysts' forecast revisions in response to disappointing earnings accompanied by warnings are significantly more negative than the responses to disappointing earnings unaccompanied by warnings, suggesting that warnings occurring before negative earnings surprises have more permanent implications for future earnings.
Ely and Mande (1996)	Archival, Value Line, 1977-1986.	Analysts' earnings forecast revisions reflect corroborative information in dividend and earnings announcements, particularly when the earnings information is noisy.
Lang and Lundholm (1996)	Archival, Report of the Financial Analysts' Federation (FAF) Corporate Information Committee, 1985-1989.	The dispersion in analysts' forecasts declines with higher quality annual report disclosures and better investor relations, but not with the quality of other corporate communications (e.g., quarterly reports, press releases, etc.). Analysts' forecast accuracy improves with the quality of other corporate communications and investor relations, but not with the quality of annual report disclosures.
Williams (1996)	Archival, I/B/E/S, 1979-1986.	Analyst reliance on management earnings forecasts increases with the prior "usefulness" of the forecasts (i.e., the incremental contribution of the prior forecasts to prior forecast accuracy).
Maines, McDaniel, and Harris (1997)	Experiments with 56 professional analysts and 60 MBA students.	Analyst confidence in segment reporting quality depends on the consistency with the definitions of segments used by the company for internal decision-making.
Rogers and Grant (1997)	Content analysis of One Source reports, 1993-1994.	Analysts use substantial amounts of non-financial information both within and outside of GAAP-based annual reports.
Ederington and Goh (1998)	Archival, I/B/E/S, 1984-1990.	Analysts' earnings forecast revisions both lead and lag bond rating downgrades; part of the post-downgrade revision seems to be related to the downgrade itself, as opposed to a change in actual earnings. Bond rating upgrades are followed by upward analyst forecast revisions, although actual earnings are unrelated to upgrades.
Barron, Kile, and O'Keefe (1999)	Archival, I/B/E/S, 1987-1989.	Analyst forecast accuracy improves and dispersion in analysts' forecasts declines with increases in the SEC ratings of the quality of firms' communication through MD&A disclosures. The results are driven by forward-looking disclosures about operations and both forward-looking and historical analyses of capital expenditures.
Healy et al. (1999)	Archival, AIMR Reports, 1980-1990.	The key factors valued by analysts are segmental reporting quality; quality and candidness in the management discussion and analysis (MD&A) section of annual and quarterly reports; the publication of supplemental disclosures outside of the required periodic reports; and the availability of management to analysts.
Bowen, Davis, and Matsumoto (2002)	Archival, Zacks and First Call, 1995-1998.	Prior to Reg FD, the information in conference calls led to improved analyst forecast accuracy and reduced the dispersion in analysts' earnings forecasts, suggesting a form of selective disclosure, since conference calls were generally closed to the general public prior to Reg FD.
Conrad, Cornell, Landsman, and Rountree (2006)	Archival, I/B/E/S, 1993-1999.	Analysts are equally likely to upgrade or downgrade recommendations following large stock price increases, but are more likely to downgrade following large stock price declines. The results are consistent with "sticky" downside recommendation revisions.

(continued on next page)

Table 1 (*continued*)

Reference	Method	Key result
Panel B. Research Question 3.1.2: What information affects analyst following and portfolio decisions?		
Previts et al. (1994)	Content analysis of Investext reports, 1987-1988, 1990-1992.	Analysts prefer to follow firms that smooth earnings.
Chung and Jo (1996)	Archival, I/B/E/S, 1984-1987.	Analyst following has a positive impact on firm value, and analysts tend to follow stocks of high quality firms.
Lang and Lundholm (1996)	Archival, Report of the Financial Analysts' Federation (FAF) Corporate Information Committee, 1985-1989.	Analysts prefer to follow firms with more forthcoming disclosures, particularly in the context of direct investor relations communications, as opposed to public disclosures in annual and quarterly reports to shareholders.
Botosan and Harris (2000)	Archival, Nelson's Directory, I/B/E/S, 1987-1994.	Analyst following increases with firms' decisions to include information on segment activity as part of their quarterly (as opposed to only annual) reports.
Barth, Kasznik and McNichols (2001)	Archival, I/B/E/S, 1983-1994.	Relative to industry peers, analyst following increases with R&D and advertising expenditures.
Panel C. Research Question 3.1.3: What environmental, classification and reporting quality factors affect analysts' forecasts and recommendations?		
Haw et al. (1994)	Archival, I/B/E/S, 1977-1984.	Forecast complexity increases and analyst forecast accuracy deteriorates following mergers, but after four years accuracy levels return to pre-merger levels.
Hopkins (1996)	Experiment with 83 buy-side financial analysts.	The classification of hybrid instruments as either a liability or an equity causes analysts to overemphasize the debt (equity) attributes of the instruments in making stock recommendations.
Hirst and Hopkins (1998)	Experiment with 96 buy-side analysts.	The clarity of income effects in comprehensive income disclosures affects analysts' ability to detect earnings management and make effective valuation judgments.
Hopkins et al. (2000)	Experiment with 113 buy-side equity analysts.	The method of accounting for a business combination affects analysts' stock price judgments unless the income effect of the method is clearly delineated.
Duru and Reeb (2002)	Archival, I/B/E/S, 1995-1998.	Forecasting complexity increases and accuracy decreases with corporate international diversification.
Plumlee (2003)	Archival, Value Line, 1984-1988.	The effective tax rate effects of the more complex aspects of the 1986 tax act were more difficult for analysts to forecast.
Hirst, Hopkins, and Wahlen (2004)	Experiment with 56 buy-side analysts.	Analysts use information about interest rate risk more effectively when gains and losses are measured and reported in financial statements than when they are merely disclosed in financial statements.
Panel D. Research Question 3.1.4: How do analysts transform information into target prices and stock recommendations?		
Bandyopadhyay, Brown, and Richardson (1995)	Archival study, Research Evaluation Service (RES), Value Line, 1983-1988.	RES next year earnings forecast revisions explain about 30% of the variation in RES 12-month-ahead price forecast revisions; and revisions in Value Line's 3-5 year ahead earnings forecasts explain about 60% of the variation in revisions in Value Line's 3-5 year ahead price forecasts.
Block (1999)	Questionnaire survey of members of AIMR.	46% of respondents said that present value analysis is not part of their normal procedures. Analysts considered earnings and cash flow to be far more important than dividends and book value in security valuation. However, analysts rely more heavily on earnings multiples versus DCF in valuation, and growth potential and earnings quality are the crucial factors in evaluating P/E ratios.
Bradshaw (2002)	Content analysis Investext reports, First Call Real-Time Database, 1998-1999.	Analysts tend to justify favorable stock recommendations and target prices with reference to low P/E ratios relative to growth projections, and analysts appear to derive target prices using a PEG-based multiples approach that adjusts P/E ratios for growth prospects.
Bradshaw (2004)	Archival, Investext reports, First Call Real-Time Database, 1998-1999.	A simple heuristic based on analysts' consensus long-term growth rate forecasts explains 23% of the variation in analysts' consensus stock recommendations, and this heuristic is negatively correlated with value-to-price ratios based on earnings-based valuation models.

Table 1 (*continued*)

Reference	Method	Key result
Panel D. Research Question 3.1.4: How do analysts transform information into target prices and stock recommendations?		
Demirakos, Strong, and Walker (2004)	Content analysis of Investext reports, 1997-2001.	Analysts overwhelmingly refer to simple P/E multiples (as opposed to DCF or earnings-based valuation models) to support their stock recommendations.
Loh and Mian (2006)	Archival, I/B/E/S, 1994-2000.	Analysts who issue more accurate forecasts also issue more profitable recommendations, implying that analysts use their earnings forecasts to generate recommendations.
Panel E. Research Question 3.1.5: What is the role of earnings components in analysts' decision processes?		
Chandra, Procassini, and Waymire (1999)	Archival, Value Line, 1986-1993.	Analysts' firm-specific sales forecast revisions reflect information in industry trade association industry-wide orders-to-sales ratio reports. This information is useful in assessing the persistence of unexpected firm-specific quarterly sales announcements.
Mest and Plummer (1999)	Archival, Value Line, 1982-1988.	The proportion of transitory earnings components reflected in earnings forecasts decreases as forecast horizons increase, suggesting that short-term forecasts are directed at GAAP earnings, whereas long-term forecasts reflect expectations about persistent earnings.
Brown and Sivakumar (2003)	Archival, I/B/E/S, 1989-1997.	Earnings changes based on actual quarterly earnings reported on the I/B/E/S database exhibit more persistence than earnings changes computed using EPS from operations per Compustat. I/B/E/S-reported actual earnings are also more closely associated with market measures than Compustat's EPS from operations.
Gu and Chen (2004)	Archival, First Call, 1990-2003.	Non-recurring items that analysts forecast and include in their actual earnings reports have greater persistence and higher valuation multiples than those excluded.

A, shows that analysts' earnings forecasts rely heavily on disaggregated and qualitative information. The two most commonly used sources of information, other than reported earnings, are management communications (Previts et al., 1994; Lang & Lundholm, 1996; Bowen et al., 2002) and segment reports (Bouwman et al., 1995; Healy et al., 1999). For example, in an experimental setting, Maines, McDaniel, and Harris (1997) find that analyst confidence in segment reporting quality depends on consistency with the definitions of segments used by the company for internal decision-making. The nature of the disaggregated information that is most important to analysts, and their preferred methods of disaggregation are questions that remain open to further research.

Analysts consistently point to the quality of firm reporting as an important factor in determining the usefulness of financial information (Williams, 1996; Healy et al., 1999). Interestingly, Lang and Lundholm (1996) report that the source of information that increases forecast accuracy often does not reduce analyst disagreement. Future research might help us to better understand the relationship between forecast accuracy and consensus as outcomes of the information used by analysts.

Some research, which is summarized in Table 1, Panel B, examines the firm characteristics that influence analyst decisions to follow firms. Assuming that a greater analyst following leads to more efficient information transmission and lower cost of capital, firms benefit by attracting more analysts. Studies find that the firm disclosure quality is the most important factor that drives the analyst following (Lang & Lundholm, 1996; Botosan & Harris, 2000). Interestingly, Previts et al. (1994) observe that analysts prefer to follow firms with effective earnings management tools "which provide analysts with a low-risk earnings platform for making stock price forecasts and buy/sell/hold recommendations... (p. 63)." Future research might evaluate whether analysts tend to follow firms that manage earnings towards expectations, and if so, whether investors have more or less information about firms that do not or cannot manage earnings.

A number of archival studies, beginning with Brown, Richardson, and Schwager (1987), have suggested that complexity affects analyst forecast accuracy. More recent research, which is summarized in Table 1, Panel C, addresses the question of the effects of complexity on analyst forecasting quality. If providing unambiguous information is the objective of financial reporting, then it is important to understand the potential for the misinterpretation of information by users. Some experimental studies find that analysts' judgments are affected by the accounting method choice, the classification of financial statement items, and whether items are recognized in financial statements or disclosed in footnotes (Hopkins et al., 2000; Hopkins, 1996; Hirst et al., 2004). A number of archival studies also suggest that complexity affects analyst forecast accuracy (Haw et al., 1994; Duru & Reeb, 2002). Plumlee (2003) provides perhaps the most direct test of this proposition, finding that the magnitude of errors in forecasting effective tax rates increases with the complexity of tax law changes. She interprets her results as indicating that greater information complexity reduces analyst use of the information, due to either processing limitations or time constraints. Since the research design did not predict the direction of the forecast errors, an alternative explanation is that analysts obtained and efficiently processed all possible information regarding the effects of the more complex tax law changes, but because those effects were highly uncertain, the forecast errors were large in absolute value for the firms most affected. Further research is needed to distinguish between these explanations.

Questions regarding the algorithms or models analysts use to convert their earnings forecasts into stock recommendations offer fertile ground for further research. A number of studies, which are summarized in Table 1, Panel D, find correlations between accounting variables and analysts' price forecasts and recommendations (e.g., Bandyopadhyay, Brown, & Richardson, 1995). However, the evidence in Bradshaw (2002, 2004) suggests that simple algorithms based on P/E ratios and long-term growth forecasts explain analysts' recommendations better than more sophisticated valuation models.[9] Bradshaw's sample period corresponds to a time when the market was overheating, perhaps due to analysts pushing long-term growth forecasts of growth-oriented firms. It will be interesting to examine whether the heuristics used by analysts to generate recommendations, as well as the stock price effects of these recommendations, change over time. The models analysts use to translate earnings forecasts into valuation and recommendation judgments remains an elusive topic for further research.

Table 1, Panel E, lists some recent research on the role of earnings components in analysts' forecasting decisions. The analyst's challenge is to separate the transitory from the more permanent components of earnings surprise, and evaluate the persistence over short- and longer-term forecast horizons (e.g., Mest & Plummer, 1999). We expect to see more research that assesses analysts' ability to detect and adjust for transitory earnings components. Following Gu and Chen (2004), we also expect to see more research evaluating the degree to which differences between actual earnings, as reported in forecast databases (e.g., I/B/E/S), and the GAAP-based earnings reported in financial statements reflect truly non-recurring items. Finally, we expect researchers to develop approaches to evaluating analyst forecast accuracy with respect to components of earnings not specifically disclosed on I/B/E/S or other analyst databases.

3.2. The nature of analyst expertise and the distributional characteristics of analysts' earnings forecasts

3.2.1. Questions addressed since 1992

The studies described in Table 2 focus on the following research questions:

1. What is the nature of analyst expertise? (Panel A);
2. What characteristics make forecasts useful? (Panel B);
3. Do analysts herd? (Panel C); and
4. What attributes of analyst and investor information are associated with dispersion in analysts' earnings forecasts? (Panel D).

If accuracy and value relevance are related, then identifying expert forecasters may be a profitable strategy for investors. The research since 1992 suggests that forecast accuracy leads to media recognition, and accuracy increases with employer size (proxying for research resources), the number of forecasts made in a forecasting interval (proxying for effort), and both firm-specific and general experience. Forecast accuracy appears to be negatively related to the number of industries and firms that a given analyst follows (proxying for specialization). Some evidence indicates that superior analysts in the forecasting dimension also exert a greater influence on prices, supporting Brown's (1993)

[9] Also see Demirakos et al., (2004), who use content analysis of Investext reports and find that analysts overwhelmingly refer to simple P/E multiples (as opposed to DCF or earnings-based valuation models) to support their stock recommendations.

Table 2
Selected Papers Addressing Questions Related to the Nature of Analyst Expertise and the Distributional Characteristics of Analysts' Earnings Forecasts (Section 3.2)

Reference	Method	Key results
Panel A. Research Question 3.2.1: What is the nature of analyst expertise?		
Maines et al. (1997)	Experiments with 56 professional analysts and 60 MBA students.	Experienced analysts use segment reports more effectively than MBA students.
Mikhail et al. (1997)	Archival, Zacks, 1980-1995.	Forecast accuracy increases with firm-specific experience, and market reactions are more closely related to the forecast errors of analysts with firm-specific experience. However, firm-specific experience is not related to abnormal returns following analyst stock recommendation revisions.
Clement (1999)	Archival, I/B/E/S, 1983-1994.	Forecast accuracy is positively related to experience and employer size and negatively associated with the number of industries and firms followed, providing evidence about the characteristics of successful analysts.
Jacob et al. (1999)	Archival, Zacks, 1981-1992.	Forecast accuracy improves with analyst aptitude (analyst-target alignments), brokerage size, and industry specialization, but not with general experience. Forecast accuracy also improves as a function of the number of forecasts made in a forecasting interval, providing evidence about the characteristics of superior analysts.
Dechow et al. (2000)	Archival, I/B/E/S, 1981-1990.	Analyst evaluations are more often based on stock recommendations and the accuracy of annual earnings forecasts than on the accuracy of long-term growth forecasts.
Brown (2001b)	Archival, I/B/E/S, 1986-1998.	A simple model using past accuracy to predict current and future accuracy performs as well as a model using current analyst characteristics to identify superior analysts.
Hirst et al. (2004)	Experiment with 56 buy-side analysts.	Analysts following less than the sample median number of firms make better decisions than analysts following more than the median number of firms.
Clarke, Ferris, Jayaraman, and Lee (2006)	Archival, I/B/E/S, 1993-2001.	Stock recommendations reflect more pessimism for firms that subsequently file for bankruptcy. All-Star analysts downgrade earlier and more strongly than other analysts. Significant differences exist in recommendations between affiliated and unaffiliated analysts.
Panel B. Research Question 3.2.2: What characteristics make forecasts useful?		
Sinha, Brown, and Das (1997)	Archival, I/B/E/S, 1984-1993.	Controlling for forecast timing, superior analysts maintain forecast accuracy superiority in holdout periods, but inferior analysts do not continue to be inferior in holdout periods.
Cooper, Day, and Lewis (2001)	Archival, I/B/E/S, 1993-1995.	Market responses to forecast revisions are higher for forecast timeliness leaders. Performance rankings based on timeliness are more informative than those based on trading volume and accuracy, suggesting that timely forecasts are valued by the market.
Gleason and Lee (2003)	Archival, I/B/E/S, 1993-1998.	Pricing of forecast revisions is greater for forecasts that diverge from the consensus. Price adjustment is faster and more complete for celebrity analysts.
Mozes (2003)	Archival, First Call, 1990-1994.	Forecast immediacy (proximity to the beginning of a forecast cluster) is negatively related to forecast accuracy, and positively related to forecast dispersion and improved accuracy relative to outstanding forecasts, suggesting that forecast timeliness is important in price discovery.
Clement and Tse (2005)	Archival, I/B/E/S, 1989-1998.	Bold forecasts have larger pricing implications because they offer greater improvements in forecast accuracy as compared to herding forecasts, implying that bold forecasts reflect more useful private information.
Cheng, Liu, and Qian (2006)	Archival, Thomson Financial/Nelson Information's *Directory of Fund Managers*, 2000-2002.	Fund managers weigh buy-side research more when sell-side reports are biased or when the uncertainty about the bias in sell-side reports is increasing.
Panel C. Research Question 3.2.3: Do analysts herd?		
Trueman (1994)	Mathematical Model	To enhance investor assessment of their forecasting ability, analysts tend to release forecasts closer to prior expectations than is warranted given their private information, and analysts with less ability are more likely to herd.
Graham (1999)	Mathematical Model and Archival, Newsletters, 1981-1992.	Analysts with high reputations or of low ability tend to herd; herding also occurs if strong public information is inconsistent with an analyst's private information, suggesting that analysts are conservative in forecasting.

(continued on next page)

Table 2 (*continued*)

Reference	Method	Key results
Panel C. Research Question 3.2.3: Do analysts herd?		
Hong, Kubik, and Solomon (2000a)	Archival, I/B/E/S, 1983-1996.	Inexperienced analysts are more likely to experience negative employment outcomes due to poor forecasting, and, controlling for accuracy, less experienced analysts are more likely to be fired for bold forecasts, providing motivation for inexperienced analysts to herd.
Welch (2000)	Archival and Mathematical Model, Zacks, 1989-1994.	While current recommendations influence immediate subsequent recommendations, analysts do not herd to the consensus recommendation when the consensus is a good predictor of subsequent stock returns. This is consistent with analysts herding when there is little information.
Bernhardt, Campello, and Kutsoati (2006)	Archival, I/B/E/S, 1989-2001.	The authors find evidence that is consistent with an economically large contrarian bias in analysts' forecasts, but not with systematic analyst herding.
Clarke and Subramanian (2006)	Mathematical Model and Archival, I/B/E/S, 1988-2000.	Analysts who are very good or very poor forecasters tend to issue bold forecasts. Forecast boldness is positively related to experience, possibly because experienced analysts are very good or can take risks without fear of employment loss.
Panel D. Research Question 3.2.4: What attributes of analyst and investor information are associated with dispersion in analysts' earnings forecasts?		
Abarbanell, Lanen, and Verrecchia (1995)	Mathematical Model	Forecast dispersion is not sufficient to proxy for investor uncertainty, because other forecast attributes are related to precision. A model that includes other forecast attributes is useful in interpreting empirical results and designing empirical tests of reactions to announcements.
Barron (1995)	Archival, I/B/E/S, 1984-1990.	Belief jumbling across analysts drives trading in securities beyond prior forecast dispersion and changes in dispersion, implying that trading may result when analysts change their relative beliefs, even if the dispersion does not change.
Bamber, Barron, and Stober (1997)	Archival, I/B/E/S, 1984-1994.	The factors noted in Barron (1995) (dispersion in prior forecasts, changes in forecast dispersion, and belief jumbling) each explain the trading volume around earnings announcements beyond contemporaneous price changes.
Barron, Kim, Lim, and Stevens (1998)	Mathematical Model	Analysts' total uncertainty and consensus can be estimated using the mean forecast error, forecast dispersion, and number of forecasts. Forecast dispersion measures analysts' idiosyncratic uncertainty but does not capture total earnings uncertainty; thus, decreases in dispersion do not necessarily signal a decrease in overall uncertainty.
Bamber, Barron, and Stober (1999)	Archival, I/B/E/S, 1984-1994.	Even with minimal price changes, trading volume increases with differential analyst interpretations of the information in quarterly earnings announcements. The differential interpretation of news leads to more informed trading when the abnormal trading volume is high around earnings announcements, consistent with informed traders camouflaging their trades amongst liquidity trades.
Barron, Byard, Kile, and Riedl (2002a)	Archival, I/B/E/S, 1986-1998.	Consensus, measured as the correlation between individual analyst forecast errors, is negatively related to firms' levels of intangible assets, suggesting that analysts rely more on gathering their own private information when the disclosure quality is relatively low.
Barron, Byard, and Kim (2002b)	Archival, I/B/E/S, 1986-1997.	Consensus among analysts decreases following earnings announcements, implying that analysts embed more private information in forecast revisions and their forecasts become more useful following earnings announcements. Idiosyncratic information in earnings forecast revisions increases with the number of analysts providing forecasts.
Diether, Malloy, and Scherbina (2002)	Archival, I/B/E/S, 1983-2000.	Securities with high (low) forecast dispersions subsequently earn negative (positive) returns, implying that dispersion does not proxy for ex ante risk. These results are consistent with stock prices reflecting the most optimistic valuations, possibly due to short-selling constraints.
Byard and Shaw (2003)	Archival, I/B/E/S and AIMR, 1986-1996.	Analyst forecast distributions for firms with a reputation for providing higher quality disclosures reflect greater precision in both analysts' common and idiosyncratic (private) information.
Gu (2004)	Mathematical Model and Archival, First Call, 1998-2002.	This paper relaxes the Barron et al. (1998) assumption of constant precision of private information across analysts, and provides generalized measures of analysts' common and private information (based on observable forecasts).

Table 2 (*continued*)

Reference	Method	Key results
Panel D. Research Question 3.2.4: What attributes of analyst and investor information are associated with dispersion in analysts' earnings forecasts?		
Johnson (2004)	Mathematical Model and Archival, I/B/E/S, 1983-2001.	The negative relationship between forecast dispersion and future returns relates to firms with risky debts, suggesting that for levered firms, adding uncertainty increases the option value of equity.
Barron, Harris, and Stanford (2005)	Archival, I/B/E/S, 1984-1996.	Earnings announcements that increase analysts' private information are related to increased trading volume, consistent with investors' acquisition of private information. Announcements that decrease the consensus also relate to increased trading volume.
Park (2005)	Archival, I/B/E/S, 1982-2001.	Dispersion in S&P 500 earnings forecasts predicts future returns, similar to Diether et al. (2002), but at the aggregate market level. The results are likewise attributed to stock prices reflecting the most optimistic valuations (in this case due to reluctance to engage in short-selling).
Doukas, Kim, and Pantzalis (2006)	Archival, IBES, 1983-2002.	The results in Diether et al. (2002) do not hold when the Barron et al. (1998) measure of investor disagreement is used. This result is inconsistent with Miller's (1977) prediction that divergence of opinion results in overvaluation, but is consistent with the divergence of opinion proxying for risk.
Garfinkel and Sokobin (2006)	Archival, I/B/E/S, 1985-1998.	The results in Diether et al. (2002) suffer from a selection bias problem related to analyst following. If a trading volume measure of opinion divergence is used, instead of analysts' forecasts, the divergence of beliefs is positively related to future returns.

conjecture that forecast accuracy and the association with stock prices should be two sides of the same coin.

3.2.2. *Suggestions for further research related to analyst expertise and the distributional properties of analysts' earnings forecasts*

Clement (1999) and Jacob, Lys, and Neale (1999) develop models of characteristics that explain analyst expertise (e.g., frequency of forecasting, firm-specific experience, resources of larger brokerage houses, and focus on fewer firms and industries). These papers, along with others listed in Table 2, Panel A, provide an important starting point in understanding the characteristics associated with analyst expertise. However, much still remains to be explained, as is evidenced by Brown (2001b), who finds that a simple model using analyst past accuracy as a predictor of future accuracy does as well as the more sophisticated models presented by Clement (1999) and Jacob et al. (1999).

This research can be extended to examine whether analysts who are more accurate for some companies but less accurate for others are retained, but reassigned from companies for which they are relatively inaccurate.[10] Another open question is why certain employers assign their analysts to cover more companies and industries, when decreased breadth is related to improved forecast accuracy. While a convenient explanation is that such employers are most likely smaller brokerage houses employing fewer analysts, what is the role of these overworked/inferior analysts when other, presumably superior, analysts cover the same company for larger brokerage houses? Mikhail, Walther, and Willis (1997) find an association between firm-specific experience and both forecast accuracy and the degree to which earnings forecasts proxy for market expectations; however, they find no such relationship between experience and abnormal returns following analyst recommendations. The reason why firm-specific experience leads to more accurate forecasts but not better recommendations remains an important issue for further research.[11]

Future research might also investigate the analyst and firm characteristics associated with the accuracy of analysts' long-term earnings growth forecasts. Accurate long-term forecasts are important for firm valuation, because most terminal value estimates depend

[10] Hong and Kubik (2003) (described in Table 5, Panel B) provide some preliminary evidence on this issue.

[11] Assessing quality in the context of recommendations is tenuous, because there is no corresponding, mutually-agreed-upon "actual" similar to what is available in the context of earnings forecasts. The general approach to assessing recommendation accuracy examines the association between the recommendation and stock returns contemporaneous with, or subsequent to, the recommendation date.

on assumptions about long-term growth. Dechow, Hutton, and Sloan (2000, p. 6) note that "analysts are frequently evaluated on the accuracy of their buy-sell recommendations and annual earnings forecasts, but not on their long-term growth forecasts." Thus, both the market and the researchers largely ignore the factors that affect the accuracy of analysts' long-term forecasts. Identifying analysts who consistently provide more accurate long-term growth forecasts should also be appealing to investors, given the research evidence suggesting significant mispricing due to overly optimistic long-term growth forecasts. Future research can examine whether some of the characteristics associated with superior short-term forecasts also apply to long-term forecasts.

Another avenue for further research related to Table 2, Panel A, is to better understand the differences in the decision-making processes of buy-side versus sell-side analysts, and between more experienced and less experienced analysts. For example, Maines et al. (1997) find that, relative to experienced analysts, MBA students are less efficient processors of the segmental disclosures in footnotes to firms' financial statements. The way in which analysts develop this type of decision-making expertise remains a question for future research. Similarly, Bouwman et al. (1995) (described in our Table 1, Panel A) find that buy-side analysts seek to combine their own independent analyses with information from sell-side analyst reports as inputs to portfolio formation decisions. This suggests that buy-side analysts value the research reports of sell-side analysts. Cheng et al. (2006) examine self-reported weights placed by fund managers on buy-side versus sell-side analyst research. Consistent with model predictions, they find that fund managers weight buy-side research more highly when sell-side reports are biased or when the uncertainty about the bias in sell-side reports is increasing. Future research could investigate other contexts in which buy-side analysts rely more or less heavily on sell-side analyst reports. Future research could also examine whether sell-side analysts are indeed more efficient processors of corporate financial information, and whether this superiority relates to analyst characteristics which may differ across the two groups, such as the number of firms and industries followed.

Several recent papers (Table 2, Panel B) consider attributes that make forecasts more useful. In addition to accuracy, research suggests that forecast timing plays an important role in forecast usefulness, as reflected in market responsiveness. Forecasts issued shortly before the target earnings announcement date are generally more accurate, but they are not necessarily more informative than less accurate forecasts issued earlier in the period. Analysts issuing forecasts later in the period may simply herd towards the consensus. Cooper et al. (2001) and Gleason and Lee (2003) find a larger price response to the forecast revisions of lead analysts, defined as analysts who provide timely forecasts, than the price response to follower analysts. Mozes (2003) finds that forecasts with greater "immediacy" (i.e., "the speed with which analysts respond to a significant change in the publicly available information set" (p. 417)) are also more useful, in the sense that they offer a greater improvement in forecast accuracy relative to the prevailing consensus. Thus, studies should jointly consider accuracy and timeliness when evaluating the usefulness of analysts' forecasts, as well as accuracy relative to the prevailing consensus. Sinha et al. (1997), for example, recognize the effect of forecast age on accuracy, and find that forecast accuracy differs across analysts after controlling for the relative ages of the forecasts. In further tests, they find that analysts identified as being superior *ex ante*, at either firm-specific or industry levels, continue to provide more accurate forecasts in subsequent holdout periods; however, curiously, they do not find that inferior analysts continue to provide poorer earnings estimates. Future research could explore whether inferior analysts who do not improve leave the profession, and are therefore absent from the later sample periods.

Given the preliminary evidence suggesting that analyst expertise is associated with more useful forecasts, identifying expert analysts is a potentially profitable strategy for investors. Identifying the characteristics associated with analyst expertise should also interest brokerage houses, which are trying to enhance the quality of their output. Finally, if the quality of analysts' forecasts and recommendations differ systematically based on analyst characteristics, then researchers could also use these characteristics to derive more accurate consensus earnings and target price forecasts.

Related to forecast timing/usefulness, recent research suggests that "bold" forecasts differentially drive prices, and reflect more private information than herding forecasts (e.g., Clement & Tse, 2005). However, if analysts have superior information and bold forecasts are valued more by investors, why do some analysts choose to herd (and not fully convey their private information)?[12] Some of the work listed in Table 2, Panel C, suggests that the answer lies in analysts' self-confidence. Confident analysts are more likely to issue bold forecasts, while analysts who are less confident in their information are more likely to herd. Analysts with less experience are also more likely to herd, suggesting that career concerns may inhibit boldness (Hong et al., 2000a). Further, research suggests that analysts with either relatively good or relatively poor prior performance are most likely to issue bold forecasts (Clarke & Subramanian, 2006). Graham (1999) suggests that analysts herd to reduce the risk of damaging their reputation when, for example, their private information is inconsistent with contemporaneously available public signals. More uncertainty regarding a firm's future performance may also lead to herding among analysts. An interesting question for further research is whether forecasting difficulty is associated with herding behavior. For example, is herding behavior more prevalent for firms with greater earnings volatility? Higher dispersion in analysts' forecasts is inversely related to measures of herding behavior and positively related to the variance of actual earnings. Thus, uncertainty with respect to firms' earnings could be the underlying cause of herding behavior, or it could represent an important correlated omitted variable.

Table 2, Panel D, refers to studies examining the attributes of analyst and investor information associated with forecast dispersion, measured as the standard deviation of analysts' forecasts. Forecast dispersion proxies for investor uncertainty if disagreement among analysts reflects general disagreement among investors. Based on the notion that investor disagreement is one factor that triggers trade, forecast dispersion is used to study trading volume around information events such as earnings announcements. Advances in research since 1992 include a more careful consideration of dispersion and of what drives changes in dispersion. Specifically, Barron (1995) suggests that trading may result even with no change in the level of dispersion, because analysts change their relative positions from one forecast period to the next, referred to as "belief jumbling." Proxies for this notion of changing beliefs are related to the monthly trading volume and to increases in trading volume around information events such as earnings announcements.

The findings from forecast dispersion studies suggest avenues for future research. In their model of analyst uncertainty, Barron et al. (1998) assume constant precision of private information across all analysts. Future work might derive implications for analyst uncertainty and market trading when this restrictive assumption is relaxed.[13] Future research might also extend Barron et al. (2002a) to connect the Barron et al. (1998) uncertainty measures to firms' disclosure practices. For example, Byard and Shaw (2003) find that analyst forecast distributions for firms with a reputation for providing higher quality disclosures reflect a greater precision of both analysts' common and idiosyncratic (private) information. Finally, an interesting research puzzle arising from recent research is why securities with high (low) earnings forecast dispersions earn negative (positive) returns if forecast dispersion is a risk proxy. Conflicting evidence in Diether et al. (2002), Johnson (2004), and Doukas et al. (2006) provides some preliminary insight into this issue, but further research is needed.

3.3. The information content of analyst research

3.3.1. Questions addressed since 1992

As shown in Table 3, researchers have investigated a number of questions since 1992 related to the information content of analysts' research output, including:

1. How informative are analysts' short-term earnings forecasts? (Panel A);
2. How informative are analysts' annual earnings growth forecasts? (Panel B);
3. Do forecasts of earnings components provide incremental to forecasts of earnings? (Panel C); and
4. How informative are the various components of analyst research reports? (Panel D).

[12] Analysts may issue similar forecasts (i.e., appear to herd) because they possess the same information. However, in a study of stock recommendations, Welch (2000) finds evidence that herding towards the consensus is not information driven.

[13] Gu (2004) relaxes this assumption and provides generalized measures of analysts' common and private information based on observable forecasts.

Table 3
Selected Papers Addressing Questions Related to the Information Content of Analyst Research (Section 3.3)

Reference	Method	Key result
Panel A. Research Question 3.3.1: How informative are analysts' short-term earnings forecasts?		
Datta and Dhillon (1993)	Archival, I/B/E/S, 1984-1990.	Like the stock market, bond market reactions are positively related to the unexpected component in quarterly earnings. Bondholders react like stockholders to new information regarding future cash flows.
Wiedman (1996)	Archival, I/B/E/S, 1988-1991.	The factors associated with superior accuracy of analysts' earnings forecasts relative to forecasts from seasonal random walk time-series models are similarly associated with the superiority of analysts' forecasts as proxies for the market's earnings expectations.
Walther (1997)	Archival, Zacks, 1980-1995.	This study finds no relationship (a strong relationship) between *ex post* forecast accuracy (investor sophistication) and the degree to which the consensus analyst earnings forecast outperforms forecasts from seasonal random walk time-series models as proxies for the market's earnings expectations.
Conroy et al. (1998)	Archival, Toyo Keizai, 1985-1993.	Analyst forecast errors are value relevant for Japanese securities, but less so than management forecast revisions from prior consensus forecasts. The value relevance of management forecasts was greater after the Tokyo Exchange bubble of the late 1980s.
Park and Stice (2000)	Archival, I/B/E/S, 1988-1994.	During the 30 days prior to a firm's quarterly earnings announcement, the market responds more strongly to forecast revisions by analysts with relatively high firm-specific forecast accuracy track records over the most recent two years.
Bonner et al. (2003)	Archival, Zacks, 1991-1999 (Brunswick Lens Model Matching Index).	For firm quarters with more sophisticated investors (i.e., relatively high analyst following, institutional investor interest and trading volume), the market's response to individual analyst forecast revisions better reflects factors affecting individual analyst forecast accuracy.
Clement and Tse (2003)	Archival, I/B/E/S, 1994-1998.	The market's response to analysts' earnings forecast revisions depends on factors *inversely* related to forecast accuracy; in particular, days elapsed since the last forecast and forecast timeliness.
Battalio and Mendenhall (2005)	Archival, I/B/E/S, 1993-1996.	Large volume traders respond to analyst forecast errors, while small volume traders do not. The results suggest that small volume (less sophisticated) traders drive post earnings announcement drift.
Chen et al. (2005)	Archival, Zacks, 1990-2000.	The market's response to analysts' forecast revisions is consistent with investors learning about analysts' forecasting ability in a Bayesian fashion as more observations of past forecast accuracy become available.
Cheng et al. (2006)	Archival, Thomson Financial/Nelson's Information *Directory of Fund Managers*, 2000-2002.	Self-reported weights placed by fund managers on buy-side versus sell-side analysts' research increase with sell-side analysts' average earnings forecast errors, where forecast errors are computed with reference to the earliest consensus forecast of current year earnings.
Gu and Xue (2006)	Archival, First Call, 1989-2002.	Independent analysts provide forecasts that are relatively better proxies for the market's earnings expectations, particularly in cases of bad news; and independent analysts apparently play a disciplining role, as non-independent analysts produce forecasts that are more consistent with market expectations when independent analysts follow the same firm.
Frankel, Nanda, and Wang (2006)	Archival, I/B/E/S, 1995-2002.	Forecast revisions are most informative when potential brokerage profits are higher, and less informative when processing costs are high, consistent with the supply and demand for information impacting the informativeness of analyst reports.
Panel B. Research Question 3.3.2: How informative are analysts' annual earnings growth rate forecasts?		
Frankel and Lee (1998)	Archival, I/B/E/S, 1975-1993.	Analysts' forecasts of the current year *EPS*, next year's *EPS* and the following three years' *EPS* growth rates contribute significantly to models explaining the cross-section of current year price-to-book ratios.
Liu and Thomas (2000)	Archival, I/B/E/S, 1981-1994.	Returns-earnings regression R^2 can be improved dramatically by including revisions in analysts' forecasts of next year or two-year-ahead earnings. More modest incremental improvements result from including revisions in analysts' long-term growth forecasts.

Table 3 (*continued*)

Reference	Method	Key result
Panel B. Research Question 3.3.2: How informative are analysts' annual earnings growth rate forecasts?		
Claus and Thomas (2001)	Archival, I/B/E/S, 1985-1998.	The authors estimate a 3% market risk premium implied by current prices, current book values, current dividend payout ratios, and forecasted 5-year earnings growth. This estimate is much lower and more realistic than estimates based on historical returns on equity securities.
Gebhardt, Lee, and Swaminathan (2001)	Archival, I/B/E/S, 1979-1995.	This study combines forecasts of earnings over 5 years s with dividend payout and terminal value assumptions to derive a firm-specific implied cost of equity capital that can be explained and predicted by risk proxies, including industry membership, B/M ratio (+), forecasted long-term growth rate (+), and analyst earnings forecast dispersion (-).
Begley and Feltham (2002)	Analytical and archival -empirical, I/B/E/S, 1988-1997.	Analysts' implied one- and especially two-year-ahead abnormal earnings forecast revisions effectively proxy for persistence of revenues from prior investments and investment opportunities, respectively, in an earnings-based valuation model.
Liu, Nissim, and Thomas (2002)	Archival, I/B/E/S, 1982-1999.	Forward earnings forecasts provide the best explanations among considered value drivers, implying that future expectations, relative to historical performance, drive prices.
Baginski and Wahlen (2003)	Archival, I/B/E/S 1990-1998.	Historical earnings volatility is a powerful variable in explaining implied firm-specific risk premia.
Gode and Mohanram (2003)	Archival, I/B/E/S, 1984-1998.	The firm-specific implied cost of equity capital can be explained and predicted by risk proxies, including β, unsystematic risk, earnings variability, leverage and size.
Easton (2004)	Archival, I/B/E/S 1981-1999.	Analysts' short-term earnings growth rate forecasts effectively proxy for *ex ante* risk estimates.
Botosan and Plumlee (2005)	Archival, Value Line, 1983-1993.	The information in generally accepted risk factors is captured by two simple cost of capital estimates: (1) expected return implied by analysts' dividend and price forecasts over a five-year forecast horizon; and (2) the price-deflated square root of a fraction equal to analysts' forecasts of *EPS* growth between years four and five of the five-year forecast horizon.
Cheng (2005)	Archival, I/B/E/S, 1991-2000.	Analysts' consensus forecasts of firms' next year earnings and long-term (3-5 year) earnings growth rates contribute significantly (and incrementally) to a model explaining the cross-sectional variation in firms' market-to-book ratios.
Easton and Monahan (2005)	Archival, I/B/E/S, 1981-1998.	Approaches combining earnings and long-term growth rate forecasts with current stock prices to infer expected returns are generally unreliable due to low-quality analysts' earnings forecasts, particularly when long-term growth rate forecasts are high (and *ex post* forecast accuracy is low).
Panel C. Research Question 3.3.3: Do forecasts of earnings components provide information incremental to forecasts of earnings?		
DeFond and Hung (2003)	Archival, I/B/E/S, 1993-1999.	Analysts provide cash flow forecasts to fill an information gap when earnings have low quality or decision-relevance. The long window returns-earnings association is lower among firms with cash flow forecasts, and returns around the earnings announcement date are positively associated (not associated) with cash flow forecast errors (earnings forecast errors).
Ertimur, Livnat, and Martikainen (2003)	Archival, I/B/E/S, 1996-2001.	Relative to time-series models, analysts' forecasts provide better proxies for market expectations of both revenues and expenses. Relative to value firms, growth firms have larger revenue and expense response coefficients; the response to earnings surprise is more sensitive to conflicting or confirming signs of revenue surprise; and the market response to barely meeting analysts' expectations is more sensitive to whether revenues met expectations.
Melendrez, Schwartz, and Trombley (2005)	Archival, I/B/E/S, 1993-2001.	The authors derive unexpected accruals from analysts' earnings and cash flow forecasts and actuals, and find that the market overprices accruals, particularly for loss firms.
McInnis and Collins (2006)	Archival, I/B/E/S, 1993-2004.	Firms making both cash flow and earnings forecasts also implicitly forecast accruals. Accruals are of higher quality when accompanied by both cash flow and earnings forecasts.
Panel D. Research Question 3.3.4: How informative are the various components of analysts' research reports?		
Broughton and Chance (1993)	Archival, Value Line Options, 1983-1985.	The combined call option and stock rankings have information content, but Value Line's prescribed strategy of investing in call options does not yield abnormal returns.
Hirst et al. (1995)	Experiment with 291 graduate business student subjects.	Investors' judgments about a stock are influenced by the strength of the arguments in the analyst report when accompanied by unfavorable recommendations.

(continued on next page)

Table 3 (*continued*)

Reference	Method	Key result
Panel D. Research Question 3.3.4: How informative are the various components of analysts' research reports?		
Francis and Soffer (1997)	Archival, Investext, 1988-1991.	Stock recommendation *revisions* contain information incremental to the information in earnings forecast revisions, and investors place a significantly larger weight on earnings forecast revisions accompanied by buy versus both sell and hold recommendations.
Kim, Lin, and Slovin (1997)	Archival, DJ News Wire, ISSM, 1991.	The market responds very quickly (within 15 minutes) to private information in initial coverage buy recommendations issued by analysts.
Brav and Lehavy (2003)	Archival, First Call, 1990-2002.	The market reacts incrementally to target price revisions, controlling for its reaction to stock recommendations and earnings forecast revisions.
Ivkovic and Jegadeesh (2004)	Archival, I/B/E/S, 1990-2002.	Analysts' upward (but not downward) stock recommendations and quarterly earnings forecast revisions shortly before earnings announcements contain more new information than forecast revisions shortly after earnings announcements.
Asquith, Mikhail, and Au (2005)	Archival, Investext, 1997-1999.	Earnings forecast revisions, stock recommendations, target price revisions and a coding of the strength of the analysts' (positive or negative) arguments in support of the stock recommendations combine to explain 25% of the variation in returns around the release of analysts' research reports. The target price and strength of arguments variables appear to have the strongest price impacts.
Boni and Womack (2006)	Archival, I/B/E/S, 1996-2002.	Analyst recommendation changes lead to more profitable trading strategies within industries than across industries, suggesting that analysts are able to distinguish performance within industry, but are not good predictors of sector/industry performance.
Green (2006)	Archival, First Call, 1999-2002.	Early access to analyst recommendation changes enables profitable trades for brokerage firm clients. For NASDAQ stocks, early access to recommendation changes from the top 16 brokerage firms suggests that brokerage clients profit from analyst recommendation advice if they act prior to its public dissemination.

These questions are addressed almost exclusively using archival empirical methods and drawing data from I/B/E/S or First Call.[14] One study (Conroy, Harris, & Park, 1998) relies on Toyo Kezai data (for forecasts related to Japanese firms), and one study (Cheng et al., 2006) relies on Nelson's Directory of Fund Managers to assess the relative weights placed on buy-side versus sell-side analyst research. We found one experimental study (Hirst, Koonce, & Simko, 1995) addressing the information contained in narrative sections of analyst reports; and we found one study (Begley & Feltham, 2002) that develops an analytical model distinguishing between the information contained in analysts' short- and long-term forecasts.

3.3.2. Suggestions for further research related to the information content of analyst research

In an efficient market, stock prices should reflect the best (most accurate) information available at any point in time. The most recent research focusing on the information content of analysts' short-term earnings forecasts (Table 3, Panel A) relates to a question emerging from O'Brien (1988): why are accuracy and association not two sides of the same coin? Wiedman (1996) and Walther (1997) come to different conclusions. Wiedman (1996) finds that common factors drive both analyst forecast accuracy and the association between analysts' forecasts and stock prices. Walther (1997), on the other hand, finds that investor sophistication, not forecast accuracy, explains the degree to which analyst expectations (relative to time series model forecasts) effectively proxy for market expectations. However, this begs the question: if not for greater accuracy, why would more sophisticated investors rely on sell-side analysts' earnings forecasts? Clement and Tse (2003) find that the market weights the forecast horizon and the number of days elapsed since the last forecast variables positively when responding to individual analysts' forecast revisions, whereas an accuracy prediction model weights them negatively. Analysts issuing forecasts earlier in a sequence (either the first after a public announcement or the first after a long information gap) are likely to have incentives to trade off accuracy for timeliness in order to have more

[14] A few studies rely on Zacks data (Walther, 1997; Bonner, Walther, & Young, 2003; Chen, Francis, & Jiang, 2005), but these studies could be replicated using I/B/E/S data.

impact on the market's earnings expectations. Future research should consider uncertainty resolution as a key ingredient in explaining the variation in the market's response to earnings forecast revisions.[15] More generally, whether, and to what degree, other factors, in addition to (or instead of) forecast accuracy, affect the marginal investor's reliance on one model or another in forming earnings expectations remains an interesting avenue for further research.

In addition, some recent evidence suggests that independent analysts provide forecasts that are relatively better proxies for the market's earnings expectations, particularly in cases of bad news; and also that independent analysts apparently play a disciplinary role, as non-independent analysts produce forecasts that are more consistent with market expectations when independent analysts follow the same firm (Gu & Xue, 2006). These results suggest the need for further research into the respective roles of independent and non-independent analysts in financial markets.

The studies listed in Table 3, Panel B, that combine analysts' long-term earnings forecasts with earnings-based valuation models to infer firms' costs of equity capital depend critically on the assumption that analysts' earnings and/or price forecasts mirror the market's expectations (Botosan & Plumlee, 2005). An important corollary to this assumption is that the current stock price mirrors the analyst's assessment of the firm's intrinsic equity value. Since analysts are in the business of identifying mispriced stocks, this corollary is unlikely to hold.[16] Research regarding divergence between analyst and market expectations can help future studies to evaluate various approaches to estimating the cost of equity capital, make appropriate adjustments to analysts' forecasts, or choose sub-samples where the critical assumption of similar analyst and market expectations is most likely to hold.

As described in Table 3, Panel C, relatively little research has investigated the information contained in analysts' forecasts of earnings components. Ertimur et al. (2003) provide evidence that analysts' revenue forecasts reflect market expectations, and revenue surprise informs the market's response to earnings surprise. Similarly, DeFond and Hung (2003) find that analysts' cash flow forecasts provide useful information when earnings lack quality or relevance. Future research might consider that the difference between analysts' earnings and cash flow forecasts provides a forecast of accruals.[17] For example, researchers might derive unexpected accruals by comparing these accruals forecasts to the actual accrual component of the reported earnings, and use these unexpected accrual estimates to study the degree to which the market uses the information in accruals to assess earnings persistence.[18]

As shown in Table 3, Panel D, researchers have begun examining various components of analyst research reports, and, as described below, many important questions remain unanswered. Francis and Soffer (1997) find that the market responds more strongly to earnings forecast revisions accompanied by buy (versus hold or sell) recommendations. The authors argue that because analysts bias recommendations upward, investors turn to earnings forecast revisions for more information when analysts issue buy or strong buy recommendations. However, Hirst et al. (1995) make the opposite argument. They hypothesize that skepticism about a recommendation extends to other information in the research report and, in an experimental setting, they find that subjects expend effort in analyzing other information in analyst research reports only when analysts' stock recommendations are unfavorable or are revised downward. Asquith et al. (2005) report archival evidence consistent with the Hirst et al. (1995) prediction. They find a higher correlation between the strength of analysts' remarks and returns around the release of analyst reports containing recommendation downgrades, as opposed to reiterations or recommendation upgrades.

To reconcile these three studies, we offer a slightly different perspective on investor perceptions of information credibility. Each study considers investor response to information incremental to the recommen-

[15] Chen et al. (2005) evaluate the market response to individual analyst forecast revisions, and include empirical proxies of the market's prior assessment of the analyst's forecasting ability, but do not include variables to proxy for the precision of the market's prior earnings expectations.

[16] We are grateful to Jake Thomas for discussions leading us to this insight.

[17] McInnis and Collins (2006) observe that firms making both cash flow and earnings forecasts also implicitly forecast accruals, and the paper's evidence suggests that accruals are of higher quality when accompanied by both cash flow and earnings forecasts.

[18] We are grateful to one of the referees, who pointed out that a working paper by Melendrsez et al. (2005) derives unexpected accruals in the manner suggested above, and finds that the market overprices accruals, particularly for loss firms.

dation. However, the incremental information variable in Francis & Soffer (1997) is an earnings forecast revision, whereas the other two studies consider strength of arguments variables. Analysts' reputations often depend on their earnings forecast accuracy, and records of forecast accuracy are carefully maintained by interested observers, whereas the strength of arguments variable is harder to measure and verify. For these reasons, investors may view earnings forecast revisions as being more credible than the strength of analysts' remarks in support of buy recommendations. On the other hand, given analysts' incentives to bias recommendations upward, investors may attach more credibility to analysts' *arguments* in support of hold and sell recommendations. Further empirical research (both experimental and archival) could enhance our understanding of the interaction between the type of recommendation and investors' usage of other information in analyst research reports.[19]

Brav & Lehavy (2003) find that only two-thirds of all analyst reports include target prices, and reports containing buy or strong buy recommendations are more likely to contain target price forecasts. The authors speculate that analysts may provide target prices to stimulate the purchase of equity securities in conjunction with buy recommendations, and that lowering price targets to stimulate sell orders could jeopardize already strained relationships with the managers of the firms followed.[20] These conjectures warrant examination in further research.

The two most prominent summary statistics associated with equity securities are earnings per share and stock price. Studies like Brav & Lehavy (2003), which examine the informativeness of target price forecast revisions, conditional on the informativeness of earnings forecast revisions, potentially provide insight into analyst expertise in modeling the relationship between earnings and equity value. Opening the black box containing the process by which analysts convert earnings forecasts into price forecasts could provide interesting insights into the valuation models that are most relevant to investors and into the allocation of scarce resources in capital markets. However, the persistent explanatory power of the earnings variable with the target price variable in the regression suggests that the market's translation of earnings forecasts into current equity value differs from analysts', or the combination of analysts' price and earnings forecasts proxies for an unknown risk factor. An interesting question for future research is why earnings forecast revisions are significantly related to returns, conditional on both recommendations and target prices.

Asquith et al. (2005, p. 259) note that the earnings forecast revision and strength of arguments variables are highly correlated, and that "this relation suggests that positive (negative) earnings forecast revisions are generally supported by more optimistic (pessimistic) analyst statements." This begs the question as to the interactive effect of the strength of arguments variable on the market's reaction to earnings forecast revisions. Finally, it is not clear what analysts attempt to communicate through their stock recommendations. In particular, what does a reiteration of a strong buy or a downgrade from a strong buy to a buy really mean? In the Asquith et al. sample, when analysts reiterated a strong buy, the target price forecast increased by only 1%, on average. Why would analysts reiterate a strong buy when they only increase their target price forecast by 1%? One explanation might be that the market price has not yet increased from the last strong buy recommendation, and therefore analysts still view the firm as undervalued. However, Francis & Soffer (1997) find that the change in the recommendation has a significant contemporaneous association with returns after controlling for the level of the recommendation. Future research will perhaps shed more light on the

[19] Similarly, Brav and Lehavy (2003) find that when analysts revise a recommendation in a direction opposite to (same as) the direction of the target price revision, the association between returns and the recommendation revision declines (increases) dramatically. In addition, the evidence indicates a significantly larger market response to target price forecast revisions accompanied by corroborating downward (versus upward) earnings forecast revisions. Understanding the interactive effects between all combinations of the three variables warrants further research.

[20] Research also suggests that analysts generate more trading commissions with buy than sell recommendations (e.g., Irvine, 2004; Hayes, 1998) (described in our Table 5). One explanation is that the population of investors who already hold a particular stock is smaller than the population that could potentially buy the stock. While short selling alleviates this problem, short selling constraints (e.g., higher transaction costs) create incentives for analysts to issue more buy than sell recommendations in order to maximize trading commissions. Assuming costly consequences of inaccurate target prices, analysts are more likely to use target prices to justify buy recommendations.

nature of the information in recommendation *changes* that is not subsumed by the information in recommendation *levels*.[21]

3.4. Market and analyst efficiency

3.4.1. Questions addressed since 1992

A number of studies have examined analysts' forecasts as a means to understanding the broader issue of whether investors respond to new information efficiently.[22] Analysts have long been viewed as sophisticated processors of financial information who are less likely (than naïve investors) to misunderstand the implications of financial information. Thus, evidence of inefficient information processing by analysts is seen as strong evidence of overall inefficiency by market participants. A second reason for examining analysts' forecasts for possible biases is that evidence of market inefficiency based on "abnormal" stock returns is always open to the criticism that the expected return benchmark used in measuring abnormal returns may be misspecified (Fama, 1998). Analysts' forecasts do not suffer from benchmark issues, and thus provide an avenue for mitigating the criticism that evidence of information processing inefficiencies is due to an omitted risk factor.

As shown in Table 4, we have classified the research since 1992 related to market and analyst inefficiency into four sub-questions:

1. Do analysts' forecasts and recommendations efficiently reflect the information in earnings? (Panel A);
2. Do analysts' forecasts and recommendations efficiently reflect information from sources other than earnings? (Panel B);
3. Do stock prices efficiently reflect the information in analysts' forecasts and recommendations, and other information in analyst research reports? (Panel C); and
4. Do analysts' earnings forecasts explain inefficiencies in stock prices with respect to publicly available information? (Panel D).

3.4.2. Suggestions for further research related to market and analyst efficiency

Regarding the first two questions (Panels A and B), most of the research to date has concluded that analysts underreact to information. The general approach to demonstrating analyst inefficiency is to show that analyst forecast revisions are positively related to the errors in their revised forecasts. In other words, errors in analyst forecasts, on average, are in the same direction as their prior revisions, suggesting that the revisions are incomplete. The research since 1992 has documented analyst underreaction to a wide range of accounting and other economic information. However, not all studies conclude that analysts underreact to information. Easterwood and Nutt (1999) report that inefficiency in analysts' forecasts is not characterized by a uniform overreaction or underreaction to information, but is more appropriately described as general optimism. Specifically, analysts seem to overreact (underreact) to good (bad) news in prior year earnings, which is consistent with incentive-based explanations of analyst optimism. While this finding is consistent with incentive-driven analyst behavior, the sensitivity of the results to truncation rules warrants future research.[23] The systematic errors in analysts' earnings forecasts documented thus far could be attributed to the inefficient processing of information, or could be due to analysts' incentives. We defer a discussion of the research in support of incentives arguments until Section 3.5.

A potentially fruitful area of future research is to investigate analyst ability to anticipate and adjust

[21] Asquith et al. (2005) report that in their sample (1997-99), analysts' reports rarely include prior forecasts and recommendations. Francis and Soffer (1997) report that about half of the reports in their sample (1989-1991) include the analysts' prior earnings forecast and recommendation. This raises the question as to the factors, apart from sample period, that explain analysts' decisions to include comparison forecasts and recommendations from prior reports.

[22] If analysts revise forecasts efficiently in response to new information, then the error in their revised forecasts should be unrelated to that information. A positive (negative) relationship between the information item and the revised forecast error (actual minus forecast) will imply under-reaction (over-reaction) by analysts with respect to the new information.

[23] Some papers note that the findings of Easterwood and Nutt (1999) do not appear to be robust and are sensitive to the treatment of outliers (Mikhail, Walther, & Willis, 2003). Abarbanell and Lehavy (2003) caution that tests of over/underreaction by analysts are affected by the distributional properties of analyst forecast errors. In a recent working paper, Gu and Xue (2005) report that the overreaction to good news documented by Easterwood and Nutt disappears when they control for earnings uncertainty.

Table 4
Selected Papers Addressing Questions Related to Market and Analyst Efficiency (Section 3.4)

Reference	Method	Key results
Panel A. Research Question 3.4.1: Do analysts' forecasts and recommendations efficiently reflect the information in earnings?		
Chan, Jegadeesh, and Lakonishok (1996)	Archival, I/B/E/S, 1977-1993.	Analysts' forecasts, like returns, respond in a delayed fashion to news in earnings announcements, particularly for firms that have performed poorly in the past.
Easterwood and Nutt (1999)	Archival, I/B/E/S, 1982-1995.	Analysts underreact to negative information but overreact to positive information. The authors interpret this to mean that analysts are systematically optimistic in response to new information.
Darrough and Russell (2002)	Archival, I/B/E/S, 1987-1999.	Bottom-up analysts, who forecast earnings for individual firms, are more optimistic than top-down analysts, who forecast earnings for market indices, possibly due to incentives or cognitive biases.
Mikhail et al. (2003)	Archival, Zacks, 1980-1995.	Analysts underreact less to past earnings information when they have greater experience, implying that inefficiency decreases with experience. Contrary to Easterwood and Nutt (1999), the authors are unable to document analyst overreaction.
Gu and Xue (2005)	Archival, First Call, 1989-2002.	When uncertainty is high, analyst overreaction to extreme good news is a rational response and is not necessarily due to cognitive bias. Analyst overreaction to good news is not evident after controlling for earnings uncertainty.
Zhang (2006)	Archival, I/B/E/S, 1983-2001.	Positive (negative) forecast errors and forecast revisions follow good (bad) news when greater uncertainty is present, proxied by dispersion. The results support an underreaction hypothesis.
Panel B. Research Question 3.4.2: Do analysts' forecasts and recommendations efficiently reflect information from sources other than earnings?		
Stickel (1993)	Archival, Zacks, 1981-1985.	Updated forecasts based on information in forecast revisions are less biased and more accurate than other frequently cited measures.
Bartov and Bodnar (1994)	Archival, I/B/E/S, 1983-1988.	Similar to market failure to incorporate the valuation implications of changes in the exchange rate for U.S. multinationals, analyst forecast errors are correlated with changes in currency exchange rates.
Elliott, Philbrick, and Weidman (1995)	Archival, I/B/E/S, 1982–1991.	Analysts systematically underweight new information, particularly when revising forecasts downward.
Ettredge, Shane, and Smith (1995)	Archival, Value Line and I/B/E/S, 1980-1989.	Analysts' forecast revisions around earnings announcements containing undisclosed overstatements adjust for part of the overstatement amounts, implying that analysts use alternative information to "see through" earnings manipulations.
Abarbanell and Bushee (1997)	Archival, I/B/E/S, 1983-1990.	Analyst forecast revisions fail to consider all of the information in fundamental signals related to future earnings, implying that analysts ignore available non-earnings information.
Frankel and Lee (1998)	Archival, I/B/E/S, 1975-1993.	Errors in three-year-ahead forecasts are predictable based on past sales growth and market-to-book ratios.
Chaney, Hogan, and Jeter (1999)	Archival, I/B/E/S, 1987-1992.	Analysts' forecasts are optimistic in the year subsequent to a restructuring charge, despite downward revisions on average following the charge for that forecast horizon. This finding suggests that analysts do not interpret the future implications of past restructuring charges appropriately.
Bradshaw, Richardson, and Sloan (2001)	Archival, I/B/E/S, 1988-1998.	Analysts do not fully adjust forecasts for transitory working capital accruals. There is a negative relationship between those accruals and subsequent earnings forecast errors, suggesting that analysts are not aware that high accruals in one period lead to predictable declines in earnings in subsequent periods.
Burgstahler and Eames (2003)	Archival, Zacks, 1986-1996.	The distributions of both earnings forecasts and realizations contain a disproportionate number of observations at or barely above zero, suggesting that firms manage earnings to avoid losses, and analysts anticipate that behavior. However, analysts appear to be unable to identify which firms will manage earnings to avoid losses.
Louis (2004)	Archival, I/B/E/S, 1992-2000.	Post-merger forecasts initially do not fully anticipate the earnings reversals resulting from abnormal accruals, but the reversals appear to be reflected in subsequent forecasts made prior to earnings announcements, suggesting that analysts are initially fooled, but are eventually guided to beatable forecasts.
Shane and Stock (2006)	Archival, I/B/E/S, 1984-1990.	Analysts' forecasts do not fully reflect firms' incentives to manage their earnings to mitigate taxes.
Panel C. Research Question 3.4.3: Do stock prices efficiently reflect the information in analysts' forecasts and recommendations, or the other information in research reports?		
Barber and Loffler (1993)	Archival, WSJ 'Dartboard' column picks, 1988-1990.	Expert analyst picks experience high trading volume and positive returns in the days surrounding the publication of the 'Dartboard' column picks. Partial price reversals suggest that "price pressure" creates some overreaction, but the evidence of information-driven price reactions remains.

Table 4 (*continued*)

Reference	Method	Key results
Panel C. Research Question 3.4.3: Do stock prices efficiently reflect the information in analysts' forecasts and recommendations, or the other information in research reports?		
Womack (1996)	Archival, First Call, 1989-1991.	Post-event drifts following both “buy” and “sell” recommendations exist, but they are larger and more sustained for sells, suggesting that the market does not fully incorporate the information in “sell” recommendations.
Frankel and Lee (1998)	Archival, I/B/E/S, 1975-1993.	Valuation estimates based on consensus forecasts are good predictors of future stock returns, especially over longer horizons, implying that current market prices do not fully reflect the information in analysts’ forecasts.
Guerard, Blin, and Bender (1998)	Archival, I/B/E/S, 1988-1997.	A technique that creates a “market-neutral portfolio” and relies on a proprietary quadratic form of I/B/E/S earnings forecasts improves predictions of subsequent returns in Japanese and U.S. portfolios relative to those relying on only a value component.
Choi (2000)	Archival, Value Line, 1965-1996.	Value Line recommendations result in unexpected returns relative to benchmarks, controlling for post-earnings-announcement drift. However, trading profits are unlikely after transaction costs.
Barber, Lehavy, McNichols, and Trueman (2001)	Archival, Zacks, 1985-1996.	A trading strategy based on buying (selling short) stocks with the most (least) favorable stock recommendations yields annual abnormal returns of over 9%. However, net returns are insignificant once transaction costs are taken into account.
Ramnath (2002)	Archival, I/B/E/S, 1986-1995.	Analysts’ forecast revisions for later-announcers partially incorporate information from the first earnings announcement in the industry. Stock prices of later-announcers do not fully reflect the information from the first earnings announcement.
Ali, Hwang, and Trombley (2003)	Archival, I/B/E/S, 1975-1993.	After controlling for risk factors, this paper confirms the Frankel and Lee (1998) evidence that stock prices do not fully reflect the information in analysts’ forecasts.
Gleason and Lee (2003)	Archival, I/B/E/S, 1993-1998.	Investors underreact to analysts’ earnings forecast revisions, particularly in cases of high innovation (i.e., movement away from the consensus), low analyst profile, and low analyst coverage.
Barth and Hutton (2004)	Archival, I/B/E/S, 1981-1996.	A trading strategy that simultaneously exploits the accrual anomaly and the forecast revision anomaly yields annual returns of over 28%. The returns from the combined strategy are greater than the returns from either strategy individually.
Mendenhall (2004)	Archival, I/B/E/S, 1991-2000.	Post-earnings-announcement drift is an underreaction to information in earnings that persists because arbitrage risk and, to a lesser extent, transaction costs preclude arbitrageurs from bidding it away.
Mikhail, Walther, and Willis (2004)	Archival, Zacks, 1985-1999.	Analysts making more profitable recommendation changes in the past also do so in the future. The market recognizes superior recommendation ability, as the market response is stronger to both superior analyst upgrades *and* downgrades, but the response by the market is incomplete.
Li (2005)	Archival, I/B/E/S, 1993-2000.	Individual analysts are persistent in making superior recommendations (more so for buy than sell). The market does not fully incorporate the information in superior analysts’ recommendations.
Livnat and Mendenhall (2006)	Archival, I/B/E/S, 1987-2003.	The magnitudes of post-earnings announcement drift are greater when earning surprise is defined using I/B/E/S data versus Compustat earnings and seasonal random walk expectations. The return pattern at subsequent earnings announcement dates related to forecast errors differs depending on the definition of earnings surprise.
Loh and Mian (2006)	Archival, I/B/E/S, 1994-2000.	Monthly abnormal returns on hedge portfolios based on recommendations of analysts in the top (bottom) quintile of earnings forecast accuracy are, on average, approximately 0.74% (−0.53%).
Sorescu and Subrahmanyam (2006)	Archival, I/B/E/S, 1993-2002.	Short-term price reactions to recommendation revisions are larger for more reputed and more experienced analysts. In the long run, smaller (larger) recommendation revisions by analysts with high (low) reputations and more (less) experience are followed by stock price drift (reversals).
Panel D. Research Question 3.4.4: Do analysts' earnings forecasts explain inefficiencies in stock prices with respect to publicly available information?		
La Porta (1996)	Archival, I/B/E/S, 1982-1990.	Returns to “value” stocks appear high because investors (proxied by analysts) underestimate future performance, not because these stocks are inherently more risky. The results are consistent with an errors-in-expectations explanation, and imply that a reversal of analyst forecast errors impacts security prices.
Dechow and Sloan (1997)	Archival, I/B/E/S, 1981-1993.	Over half of the returns to contrarian strategies are due to investors’ naïve incorporation of analysts’ optimistic long-term growth forecasts.

(continued on next page)

Table 4 (*continued*)

Reference	Method	Key results
Panel D. Research Question 3.4.4: Do analysts' earnings forecasts explain inefficiencies in stock prices with respect to publicly available information?		
Rajan and Servaes (1997)	Archival, I/B/E/S, 1975-1987.	Analysts' forecasts of earnings and growth are more optimistic for IPO firms than for matched firms. Future stock performance is negatively related to optimism in growth forecasts.
Dechow, Hutton, and Sloan (1999)	Archival, I/B/E/S, 1976-1995.	Analysts' year-ahead earnings forecasts fail to fully account for mean-reversion in the abnormal earnings component of current year earnings, and this error is reflected in stock prices, suggesting that investors do not adjust for predictable errors in analyst forecasts.
Billings and Morton (2001)	Archival, I/B/E/S, 1981-1995.	Both bias and lag components of book-to-market ratios explain future returns, but the lag component dominates and explains most of the book-to-market anomaly. The results imply that forecast revisions explain most of the returns anomaly.
Shane and Brous (2001)	Archival, Value Line, 1977-1986.	Underreaction in analysts' earnings forecasts with respect to the information in earnings announcements explains about 50% of the post-earnings-announcement drift. The market and analysts also appear to underreact similarly to non-earnings surprise information leading to predictable returns and analysts' earnings forecast revisions.
Bradshaw and Sloan (2002)	Archival, I/B/E/S, 1985-1997.	The incidence and magnitude of differences between "GAAP" and "street" earnings increase dramatically and market prices increasingly reflect "street numbers" over the sample period.
Doukas, Kim, and Pantzalis (2002)	Archival, I/B/E/S, 1976-1997.	Inconsistent with La Porta (1996), the evidence from analyst forecast errors and forecast revisions fails to support the hypothesis that analysts are unduly pessimistic (optimistic) about "value" ("glamour") stocks.
Ikenberry and Ramnath (2002)	Archival, I/B/E/S, 1988-1997.	Analysts' forecasts do not appear to incorporate the positive signal of future performance conveyed by stock-split announcements, implying that analyst underreaction contributes to the market underreaction to stock split information.
Teoh and Wong (2002)	Archival, I/B/E/S, 1975-1990.	Analysts do not fully adjust earnings forecasts for past abnormal accruals. Accruals-related predictable errors in analyst forecasts explain post-issue underperformance of equity issuers.
Elgers, Lo, and Pfeiffer (2003)	Archival, I/B/E/S, 1989-1998.	Analysts' earnings forecasts explain at most about 40% of the market's underestimation of the transitory component in working capital accruals.
Kadiyala and Rau (2004)	Archival, I/B/E/S, 1984-1994.	Using earnings surprises as a measure of pre-event information, long-run market returns following corporate events (e.g., SEOs, acquisitions, and repurchases) are most consistent with investor *underreaction* to pre-event information and information in the corporate event announcement.
Purnanandam and Swaminathan (2004)	Archival, I/B/E/S, 1980-1997.	IPOs that are overvalued (based on the offer price) tend to have more optimistic long-term growth forecasts (after the IPO date) and more negative long-run returns, relative to undervalued IPOs.
Jackson and Johnson (2006)	Archival, I/B/E/S, 1983-1999.	Momentum in returns and post-event drift is manifest only if they are coincident with changes in earnings and earnings growth forecasts. After purging both sets of forecasts of their predictable components, no relationship between adjusted forecasts and abnormal returns remains, implying that subsequent returns follow fundamental (earnings) news which explains momentum.

forecasts for the effects of firms' incentives to manage earnings. Ettredge et al. (1995) provide evidence that analysts use alternative information to effectively adjust their forecasts for approximately 20% of the current earnings surprise effects of earnings misstatements (which later result in prior period adjustments). Burgstahler and Eames (2003) find that analysts' forecasts reflect a general awareness of firms' incentives to manage earnings in order to barely avoid reporting losses, but the study finds no evidence that analysts can anticipate *which* firms will engage in this behavior. In the context of the Tax Reform Act of 1986, Shane and Stock (2006) find little evidence that analysts anticipate or adjust for the earnings effects of firms' incentives to shift their income from higher to lower tax rate years. Future research might continue these investigations into the ability of analysts to anticipate and adjust for the earnings effects of firms' earnings management incentives in various contexts.

Future research might also develop and test hypotheses explaining the cross-sectional variation in analyst underreaction to information about future earnings, market underreaction to the information embedded in analysts' earnings forecast revisions, and the degree to which inefficiencies in analysts' earnings forecasts explain market inefficiencies. Obviously the context matters, and thus far we have little evidence about the contexts in which we are most likely to find particular forms of information processing inefficiencies.

Regarding the third question in Table 4 (Panel C), some studies demonstrate that investors underreact to analysts' forecast revisions (e.g., Gleason & Lee, 2003), as well as their stock recommendations (e.g., Womack, 1996). Thus, investors seem to be slow in responding, not only to information releases from companies, but also to direct signals from financial analysts. Some studies contend that, while markets may be inefficient with respect to specific pieces of information, like analysts' stock recommendations, exploiting such market inefficiency is unprofitable because of transaction costs (Barber et al., 2001). Nonetheless, it is intriguing that investors continue to systematically underreact to a direct signal, like analysts' recommendations and revisions, despite numerous research studies consistently documenting this phenomenon over a number of years.[24] Explaining such (continued) anomalous behavior on the part of investors is a challenging task for future research.

Inefficiency in analysts' forecasts (Table 4, Panels A and B) is an indication, but not conclusive evidence, of market inefficiency. As described in Table 4, Panel D, a number of studies have considered the relative inefficiency of analysts and investors with respect to specific pieces of information. Most studies find that the stock market is generally more sluggish in incorporating information than financial analysts are. For example, Elgers et al. (2003) find that analysts' forecasts can explain at most 40% of the market's apparent underestimation of the transitory component of current accruals. Thus, analysts at least partially (and more effectively than investors) recognize the difference in the persistence of accrual and cash flow components of earnings. Evidence that investors are less efficient than financial analysts in responding to information is puzzling for a number of reasons. First, incentive-based explanations of analyst bias, such as better access to management, should not explain investor reactions. Second, investors (especially sophisticated investors like financial institutions) have the opportunity to independently (and efficiently) use the same publicly available information that underlies financial analysts' (inefficient) forecasts. Third, investors have the option of adjusting analysts' forecasts for known and widely documented systematic errors. The reason why market prices are relatively less efficient than analysts in various information contexts remains an interesting question for further research.

3.5. Analysts' incentives and behavioral biases

3.5.1. Questions addressed since 1992

Analyst forecasting research has evolved considerably since the early work documenting what appeared to be a bias toward optimism in forecasts and recommendations. As shown in Table 5, more recent work has addressed such questions as:

1. How do incentives impact analysts' effort and decisions to follow firms? (Panel A);
2. Do incentives create systematic optimism/pessimism in analysts' forecasts and recommendations? (Panel B);
3. How do management incentives impact communications with analysts, analysts' forecasts, and analysts' recommendations? (Panel C);
4. How does the market consider analysts' incentives in setting prices? (Panel D); and
5. Do economic incentives or behavioral (psychological) biases create an underreaction in analysts' forecasts? (Panel E).

An important distinction between biased forecasts driven by judgment errors as distinct from economic incentives is that the former is non-motive driven, while the latter is motive driven.[25] The principal lines of inquiry since 1992 have considered incentives related to the career concerns of analysts, the underwriting and trading incentives of their employers, and how the incentives of, and communication with, company management influence analyst behavior. As shown in Table 5, in addition to standard archival empirical approaches, researchers have used mathematical modeling, questionnaire surveys, and experimental methods to evaluate these questions.

[24] Givoly and Lakonishok (1979) performed an early study documenting predictable stock returns following analysts' earnings forecast revisions.

[25] We are grateful to a referee for suggesting this distinction.

Table 5
Selected Papers Addressing Questions Related to Analysts' Incentives and Behavioral Biases (Section 3.5)

Reference	Method	Key results
Panel A. Research Question 3.5.1: How do incentives impact analysts' effort and decisions to follow firms?		
McNichols and O'Brien (1997)	Archival, Research Holdings, 1990-1994.	Analysts cover firms about which they have optimistic views, implying a selection bias in coverage decisions.
Hayes (1998)	Mathematical model	Incentives for gathering information are strongest for stocks that are expected to perform well, so forecasts are likely to be more accurate for such stocks.
Mikhail, Walther, and Willis (1999)	Archival, Zacks, 1985-1995.	Analyst turnover and earnings forecast accuracy are inversely related, but turnover is not related to stock recommendations, implying that analysts are motivated to issue accurate forecasts.
Hong et al. (2000a)	Archival, I/B/E/S, 1983-1996.	Forecast accuracy is directly related to the likelihood of promotion, especially for less experienced analysts.
Das, Guo, and Zhang (2006)	Archival, I/B/E/S, 1986-2000.	IPOs with unexpectedly high analyst coverage have better operating and return performance than those with unexpectedly low analyst coverage, suggesting that analysts selectively provide coverage on firms about which expectations are favorable.
Panel B. Research Question 3.5.2: Do incentives create systematic optimism/pessimism in analysts' forecasts and recommendations?		
Francis and Philbrick (1993)	Archival, Value Line, 1987-1989.	Earnings forecasts are more optimistic for "sell" and "hold" stocks than for "buy" stocks, suggesting that analysts try to maintain relationships with managers when recommendations are negative.
Kang, O'Brien, and Sivaramakrishnan (1994)	Archival, Value Line, 1980-1985.	Ex-post optimism bias increases with the forecast horizon, suggesting that forecasting behavior is due to incentives or cognitive biases rather than adaptive adjustment to new information.
Dugar and Nathan (1995)	Archival, CIRR and Investext, 1983-1988.	Earnings forecasts and recommendations are relatively optimistic when issued by underwriter analysts.
Hunton and McEwen (1997)	Experiment with 60 professional analysts.	Underwriter treatment analysts issue relatively more optimistic forecasts than brokerage treatment analysts, and control group analysts issue the least optimistic forecasts.
Das, Levine, and Sivaramakrishnan (1998)	Archival, Value Line, 1989-1993.	Analysts make relatively optimistic forecasts when earnings are least predictable, suggesting that analysts believe that by issuing optimistic forecasts, they obtain better information from managers.
Lin and McNichols (1998)	Archival, I/B/E/S, 1989-1994.	Long-term growth forecasts and recommendations made by affiliated underwriter analysts are optimistic relative to non-affiliated analysts.
Michaely and Womack (1999)	Archival, First Call, 1990-1991.	Lead underwriter analysts issue more buy recommendations for IPO firms than do unaffiliated analysts.
Dechow et al. (2000)	Archival, I/B/E/S, 1981-1990.	All analysts' long-term growth forecasts are optimistic around equity offerings, but affiliated analysts are the most optimistic.
Claus and Thomas (2001)	Archival, I/B/E/S, 1985-1998.	Price-deflated forecast errors based on actual earnings minus April forecasts of current year (5-year-ahead) earnings were about 0.78% (3.54%) in 1985 and about 0.15% (0.74%) in 1993.
Lim (2001)	Mathematical Model and Archival, I/B/E/S, 1984-1996.	Forecast bias varies predictably as a function of firm size, analyst coverage, company-specific uncertainty and brokerage size, suggesting that analysts may rationally bias forecasts to improve management access and accuracy.
Duru and Reeb (2002)	Archival, I/B/E/S, 1995-1998.	Earnings uncertainty, forecasting complexity, the need for management guidance, and forecast optimism increase with corporate international diversification.
Eames, Glover, and Kennedy (2002)	Archival, Zacks, 1988-1996.	Contrary to Francis and Philbrick's (1993) results, after controlling for the level of earnings, levels of optimism/pessimism in earnings forecasts are consistent with levels of optimism/pessimism in recommendations.
Chan, Karceski, and Lakonishok (2003)	Archival, I/B/E/S, 1982-1998.	I/B/E/S long-term earnings growth forecasts are overly optimistic, and dividend yields are as useful in predicting future earnings as are analyst forecasts.
Eames and Glover (2003)	Archival, Value Line, 1987-1999.	After controlling for the level of earnings, there is no relationship between forecast optimism and past predictability (which is not consistent with Das et al., 1998).
Hong and Kubik (2003)	Archival, I/B/E/S, 1983-2000.	For underwriter analysts, promotion/demotion depends relatively more on optimism than accuracy, suggesting that analysts have some incentive to issue optimistic forecasts.
Irvine (2004)	Archival, I/B/E/S, 1993-1994.	Forecasts departing from the consensus drive trade, but biased forecasts do not. Analysts generate greater trading commissions by issuing optimistic stock recommendations than they do by biasing earnings forecasts, suggesting that analysts have more incentive to bias recommendations.

Table 5 (*continued*)

Reference	Method	Key results
Panel B. Research Question 3.5.2: Do incentives create systematic optimism/pessimism in analysts' forecasts and recommendations?		
Jackson (2005)	Survey, Mathematical model, and Archival, I/B/E/S, 1992-2002.	High reputation and analyst optimism generate more trades for employers. Accurate analysts generate higher reputations. Forecast optimism can exist in equilibrium.
Malloy (2005)	Archival, I/B/E/S, 1994-2001.	Relative optimism is concentrated in geographically distant, not local, affiliated analyst stock recommendations, and distant analysts are more likely to work at high-status firms with pressure to garner investment banking business.
O'Brien, McNichols, and Lin (2005)	Archival, First Call, 1994-2001.	Relative to unaffiliated analysts, affiliated analysts are slower to downgrade recommendations and faster to upgrade recommendations.
Cowen, Groysberg, and Healy (2006)	Archival, I/B/E/S and First Call, 1996-2002.	Analysts employed by firms that fund research through underwriting and trading activities issue relatively pessimistic forecasts and recommendations, but brokerage activities are related to forecast optimism, suggesting that optimism is driven by trading versus underwriting incentives.
Houston, James, and Karceski (2006)	Archival, Investext, 1996-2000.	During the "bubble period," issue prices of IPO firms were lower than peer firm valuations using "comparable" multiples. In the pre-bubble period, IPO issue prices were higher than comparable firm valuations, but within a month post-IPO target prices were at a premium versus comparables (consistent with investment bankers "low-balling" offer prices during the bubble period).
Ljungqvist, Marston, and Wilhelm (2006)	Archival, I/B/E/S, 1993-2002.	Optimistic recommendations do not appear to increase underwriting business.
Jacob, Rock, and Weber (in press)	Archival, I/B/E/S, 1995-2003.	Controlling for other factors, affiliated investment bank analysts issue more accurate forecasts than unaffiliated investment bank analysts or non-investment bank analysts. Affiliated analysts' forecasts are no more optimistic than those of other analysts.
Panel C. Research Question 3.5.3: How do management incentives impact communications with analysts, analysts' forecasts, and analysts' recommendations?		
Francis, Hanna, and Philbrick (1997)	Archival, Corporate presentations to the NYSSA, 1986-1992.	Companies' experience increases in analyst following and positive returns at presentation dates, but analysts' post-presentation forecasts are no more accurate, no less dispersed, and no less biased, suggesting that managers/firms benefit from presentations but analysts do not.
Degeorge, Patel, and Zeckhauser (1999)	Archival, Q-Prime, 1974-1984; I/B/E/S, 1984-1996.	The authors provide indirect evidence of earnings/expectations management in the aggregate, noting that the distribution of forecast errors exhibits a discontinuity at zero cents. They report a threshold hierarchy, where reporting positive earnings and earnings greater than the seasonal random walk expectations appears to be more important than meeting analyst forecasts.
Libby and Tan (1999)	Experiment with 28 financial analysts.	Consistent with psychological biases, when provided with negative earnings information and warnings simultaneously, analysts made higher future earnings forecasts than analysts provided with warnings and negative earnings information sequentially.
Fischer and Stocken (2001)	Mathematical model	The quantity of the information provided by analysts is maximized when analysts receive imperfect information. In other cases, firms communicate directly with investors.
Brown (2001a)	Archival, I/B/E/S, 1984-1999.	Over time, median forecast errors have changed, on average, from slightly negative to slightly positive, which is consistent with managers' increased incentives to meet or beat analysts' earnings forecasts. The tendency to just beat forecasts is more prominent for growth firms.
Matsunaga and Park (2001)	Archival, First Call, 1993-1997.	CEO annual bonuses are reduced if earnings thresholds are not met for two quarters or more, providing evidence of the incentives managers face to meet earnings forecasts.
Bartov, Givoly, and Hayn (2002)	Archival, I/B/E/S, 1983-1997.	A residual market premium for meeting or beating expectations exists, controlling for the total information in a quarter.
Kasznik and McNichols (2002)	Archival, I/B/E/S, 1986-1993.	Firms meeting expectations have higher forecasts and realized future earnings, providing a rational explanation for rewards for meeting expectations.
Matsumoto (2002)	Archival, Zacks, 1993-1997.	Firms with greater transient institutional ownership, greater reliance on implicit claims, and greater value-relevance of earnings are more likely to meet or beat expectations, providing support for the idea that managers' incentives influence forecasting.
Skinner and Sloan (2002)	Archival, I/B/E/S, 1984-1996.	Growth stocks are punished more severely, relative to value stocks, for the same amount of negative earnings surprise, providing incentives for growth firm managers to avoid negative earnings surprises.

(continued on next page)

Table 5 (*continued*)

Reference	Method	Key results
Panel C. Research Question 3.5.3: How do management incentives impact communications with analysts, analysts' forecasts, and analysts' recommendations?		
Tan, Libby, and Hunton (2002)	Experiment with 149 financial analysts.	Consistent with psychological biases, firms with negative (positive) total news receive the most optimistic earnings forecasts when the pre-announcement overstates (understates) the extent of the news.
Brown (2003)	Archival, I/B/E/S, 1984-1999.	Over time, the incidence of slightly missing earnings forecasts has decreased as the negative valuation consequences have amplified, principally for "growth" firms.
Richardson, Teoh, and Wysocki (2004)	Archival, I/B/E/S, 1984-2001.	Walk-down to beatable targets is associated with managerial incentives to sell stock (the company's or the managers') after earnings announcements. In these cases analysts tend to issue optimistic forecasts early and slightly pessimistic forecasts late in the forecasting period.
Brown and Caylor (2005)	Archival, I/B/E/S, 1985-2002.	Managers' foci shifted from other thresholds towards meeting analysts' earnings expectations in the mid-1990s, as the rewards for doing so became more pronounced.
Graham, Harvey, and Rajgopal (2005)	Questionnaire survey of 400+ CFOs.	Managers focus on meeting or beating analysts' forecasts because of stock price implications and concerns about their reputation. Respondents think that an inability to generate a few cents of earnings to beat an earnings benchmark or a downward-guided benchmark are particularly negative signals.
Libby, Tan, and Hunton (2006)	Experiment with 95 sell-side analysts.	Analysts' reactions to errors in management guidance are influenced by the guidance form; i.e., wide (narrow) ranges of guidance decrease (increase) the impact of guidance error on forecast revisions.
Panel D. Research Question 3.5.4: How does the market consider analysts' incentives in setting prices?		
Hirst et al. (1995)	Experiment with 291 graduate business student subjects.	When making prospective stock performance judgments, investors react more negatively to unfavorable recommendations of analysts having investment banking conflicts relative to their reaction to unfavorable recommendations of unaffiliated research analysts.
Branson, Guffey, and Pagach (1998)	Archival, Lexis-Nexis, Coverage initiation announcements since 1992.	The market reaction to analyst coverage initiation announcements with buy recommendations depends on prior analyst following, the reputation of the new analyst, brokerage house size, and the richness of the firm's information environment, proxied by firm size and exchange listing.
Lin and McNichols (1998)	Archival, I/B/E/S, 1989-1994.	The market reacts negatively to "hold" recommendations and does not react to affiliated analysts' "strong buy" and "buy" recommendations, implying that investors consider analysts' incentives.
Michaely and Womack (1999)	Archival, First Call, 1990-1991.	Returns to "buy" recommendations from security underwriters' analysts are lower than returns to buy recommendations from unaffiliated analysts before, at, and after recommendation dates, suggesting that the market considers analysts' incentives.
Hayes and Levine (2000)	Archival, Zacks, 1978-1995.	Adjusting for bias makes forecasts more accurate and less biased, but no more correlated with contemporaneous returns, suggesting that either the market does not adjust for bias or the adjustment captured by the researchers is not the same as the market's adjustment.
Malloy (2005)	Archival, I/B/E/S, 1994-2001.	Extends the analysis of Lin and McNichols (1998) by showing that the negative market reaction to affiliated analyst hold recommendations relates to geographically distant analysts (as opposed to local affiliated analysts).
Barber, Lehavy, and Trueman (2007)	Archival, First Call, 1996-2003.	The market reaction to independent analysts' buy recommendations exceeds the reaction to investment bank analysts' buy recommendations, while the market reaction to investment bank analysts' hold and sell recommendations exceeds the reaction to independent analysts' recommendations of the same type. The findings suggest that the market can unravel optimism in investment bank analysts' recommendations.
Panel E. Research question 3.5.5: Do economic incentives or behavioral (psychological) biases create underreactions in analysts' forecasts?		
Incentives-oriented papers:		
Mozes (2003)	Archival, First Call, 1990-1994.	Forecast immediacy (proximity to the beginning of a forecast cluster) is positively related to underreaction, suggesting that uncertainty about future earnings drives underreaction, and that some analysts are willing to trade-off some underreaction and accuracy for greater forecast immediacy and usefulness.

Table 5 (*continued*)

Reference	Method	Key results
Panel E. Research question 3.5.5: Do economic incentives or behavioral (psychological) biases create underreactions in analysts' forecasts?		
Chen and Jiang (2006)	Archival, Zacks, 1985-2001.	On average, analysts overweight private information, but weighting is asymmetric. Analysts overweight (underweight) private information when issuing forecasts that are more (less) favorable than the consensus. The deviation from efficient weighting corresponds to related cost/benefit considerations, suggesting that incentives, rather than cognitive biases, play a prominent role.
Markov and Tan (2006)	Archival, Mathematical Model, I/B/E/S, 1985-2004.	The distributions of analyst forecast errors are consistent with analysts having asymmetric loss functions.
Raedy, Shane, and Yang (2006)	Archival, Mathematical Model, I/B/E/S, 1984-1999.	Horizon-dependent underreaction to news about future earnings is consistent with an asymmetric loss function, which provides incentives for analysts to underreact to information. Underreaction reduces the likelihood of subsequent news contradicting the direction of the prior earnings forecast revision.
Behavioral bias oriented papers:		
Maines (1996)	Experiments with 228 MBA student subjects.	Consistent with the perception that analysts' forecasts are optimistic, investors' expectations are conservatively biased when combining the forecasts of individual analysts. The evidence suggests that individual investors might not combine forecasts from multiple analysts efficiently.
Maines and Hand (1996)	Experiment with 60 MBA students.	Individuals underweight the moving average component of earnings series and misweight the seasonal change component, suggesting that psychological biases may be responsible for market and analyst inefficiency with respect to earnings news.
Calegari and Fargher (1997)	Experiments with 87 student subjects.	Individuals underweight innovations in quarterly earnings, suggesting that psychological biases may be responsible for market and analyst underreaction to earnings news.
Loffler (1998)	Archival, I/B/E/S, 1988-1993.	Psychological biases related to underreaction and overconfidence explain the empirical evidence of inefficiency better than rational, game-theoretic models. However, inefficiencies do not seem to have important economic consequences.
Sedor (2002)	Experimental survey with 86 sell-side analysts.	Consistent with psychological biases, analysts make more optimistic forecasts when provided with management information in scenarios, as opposed to lists.
Friesen and Weller (2006)	Archival, Mathematical Model, I/B/E/S, 1993-1999.	The authors develop a model of behaviorally-biased analyst forecasts due to the overconfidence and cognitive dissonance of individual analysts.
Kadous, Krische, and Sedor (2006)	Survey with 59 financial analysts.	Building on Sedor (2002), the paper finds that making subjects generate a few, but not many, counter-explanations reduces scenario-induced optimism, suggesting a boundary condition for using counter-explanations.

3.5.2. *Suggestions for further research related to analysts' incentives and behavioral biases*

As described in Table 5, Panel A, the research since 1992 has established that the likelihood of analyst promotion/reward increases with their relative forecast accuracy. Thus, analysts have incentives to expend effort towards forecast accuracy. Hong et al. (2000a) find that forecast accuracy is directly related to the likelihood of promotion, especially for less experienced analysts. However, when controlling for forecast accuracy, they find that less experienced analysts are more likely to be fired for being bold (i.e., deviating from the consensus). Hence, less experienced analysts have incentives to trade off some accuracy and timeliness for the safety of proximity to the consensus. An alternative interpretation of these results is that analysts gain experience by watching the consensus, while at the same time testing their own models privately. Once they become confident in their own models, they become bolder and attempt to lead rather than follow. Future research might investigate the descriptive validity of this interpretation. Future research might also explore the importance of market price impact or other proxies for forecast usefulness relative to forecast accuracy at various stages of analysts' careers.

Another promising research area is to further evaluate the selection bias suggested by Hayes (1998) and documented empirically by McNichols and O'Brien (1997). Hayes suggests that analysts' incentives to follow firms for which they have favorable views increase with the extent to which investors already own shares of the stock, which in turn should increase with the size of the firm followed and the extent/influence of analysts' recent buy recommendations. Hayes also predicts that the asymmetry should increase with short selling restrictions on the stock and the dispersion of ownership among investors. These predictions can be tested empirically.

Selection bias may also provide an explanation for the market inefficiency described in the behavioral finance literature. For example, in tests of Hong and Stein's (1999) "gradual information diffusion" theory of market inefficiency, Hong, Lim, and Stein (2000b) hypothesize and find that return momentum increases with a low analyst following. The study also documents "an interesting regularity" (p. 267): the effect of low analyst coverage is most pronounced in stocks that are past losers. This result is consistent with Hayes' (1998) theory and McNichols and O'Brien's (1997) empirical results suggesting that analysts expend less effort in their coverage of underperforming stocks; as well as Hayes and Levine's (2000) evidence that the market does not appear to adjust its expectations for the selection bias documented by McNichols and O'Brien. Thus, the incentives described by Hayes, when combined with the results in Hong et al. (2000b), McNichols and O'Brien (1997), and Hayes and Levine (2000), might contribute to the theory of return momentum developed in Hong and Stein (1999). More generally, the interplay between management and analyst incentives, biases in forecasts and recommendations, naïve investor psychological biases, and the degree to which the market unravels biased forecasts and recommendations, should continue to provide fertile ground for the application of analytical, archival, experimental, and other research methods for many years to come.

A number of recent studies listed in Panel B consider how employers' incentives to gain/maintain underwriting business or generate trading commissions impact analysts' forecasts and recommendations. The results regarding underwriting are generally consistent, in that it appears that affiliated analysts (those whose employers have existing underwriting relationships) make relatively optimistic recommendations (e.g., Dugar & Nathan, 1995; Lin & McNichols, 1998), but the evidence does not suggest that investment banking activities *per se* (without affiliation) cause optimism in forecasts and recommendations (Cowen et al., 2006). Recent research evidence questions the impact of investment banking activities and optimism on analysts' forecasts (e.g., Jacob et al., in press). Further research is needed to sort out the effects of affiliation and investment banking on analyst optimism/pessimism in pre- and post-Enron periods. Future research might also build on Irvine (2004), Jackson (2005), and Cowen et al. (2006), focusing more on trade generation as an incentive for analyst optimism, as opposed to underwriting business.

Interesting questions also remain regarding whether management incentives drive persistent optimism in long-term forecasts, and whether the temporal decreases in both short and long-term forecast optimism, documented by Brown (2001a) and Claus and Thomas (2001), respectively, reflect intertemporal changes in incentives. The nature of these incentives and the reasons why they change over time warrant further research. While Hong and Kubik (2003) report that optimism plays a role in career advancement, future research could focus on whether analyst amenability to a walk-down to beatable forecasts also influences future career prospects. Another fruitful line of inquiry might consider whether beatable short-term forecasts, combined with optimism in recommendations and long-term earnings forecasts, impact analyst employment outcomes. Further, analysts' incentives may depend on where the target firm is in its lifecycle; e.g., a firm with a recent IPO versus a mature firm, or "value" versus "glamour" stocks.

The existence and persistence of biases in analysts' forecasts and recommendations remain open questions. The biases are likely to include optimism at longer horizons, pessimism at shorter horizons, and underreaction to new information. As shown in Table 5, Panel C, Richardson et al. (2004) find that the walk-down to beatable earnings expectations is most pronounced for firms with stock issuances or with insiders selling their own shares in post-earnings announcement periods; and various other studies provide other reasons why managers prefer forecasts that are attainable or beatable (e.g., Matsunaga & Park, 2001; Bartov et al., 2002). However, it is not clear why analysts do not unravel the effects of these incentives on managers' earnings guidance. The evidence is mixed on whether the market adjusts analysts' forecasts for potential biases. For example, as described in Table 5, Panel D, Lin and McNichols (1998) find evidence that is consistent with the market unraveling analysts' incentives to issue optimistic recommendations due to investment banking relations; whereas Hayes and Levine (2000) suggest that the market does not unravel the effects of analysts' incentives to drop the coverage of firms for which they have pessimistic views. The degree to which, and the context in which, the market "sees through" incentives that create biased analysts' forecasts remain areas open for future research. Further, when reported earnings meet analysts' expectations, the forecasts are, by definition, unbiased. In these cases, have firms managed earnings and expectations downward to just meet forecasts and create reserves for future earnings increases? What are the causes and consequences of just meeting versus barely beating analysts' forecasts? These questions also warrant further research.

The research is mixed on whether psychological biases or economic incentives affect analysts' forecasts (Panel E). Analyst incentives may result in analysts underreacting to publicly-available information. Trueman (1990) models underreaction as a function of analysts' incentives to disguise their inability to develop private information about firms' prospects. On the other hand, Raedy et al. (2006) model an underreaction arising from asymmetric loss functions that create incentives for analysts to revise their future forecasts in a direction consistenwith the interpretation of firms' prospects included in the analysts' current research reports.[26] The question of whether the assumptions underlying these models hold true in financial markets awaits further empirical examination. Similarly, future research might attempt to more directly tie specific incentives like career concerns or employer objectives to underreaction bias. Mozes (2003) suggests that forecasts with greater immediacy (i.e., released quickly after a preceding news event) are associated with greater uncertainty and greater underreaction. Future research might investigate the incentives and behavioral factors that lead some analysts to provide forecasts more quickly (i.e., immediately) after an information event, and whether these analysts underreact in ways that protect against inaccuracy, while at the same time creating more useful forecasts for investors. Loffler (1998) offers a promising approach for separating behavioral explanations from rational economics-based explanations for underreaction in analysts' earnings forecasts, and concludes that, while behavioral biases dominate, they are economically immaterial. Loffler finds that analysts issue forecasts that adjust for investor perceptions of the forecasts. Analysts who believe that investors overestimate (underestimate) the precision of the analysts' forecasts will tend to underreact (overreact) to new information. As noted by Loffler (1998, p. 274), these results "raise the question of why analysts do not simply report the precision of their forecasts." Further research is needed to better understand the constraints analysts face, the techniques they use, and their incentives for communicating the precision of their forecasts to investors.

In experimental tests of biases that might cause underreactions to earnings news, Maines and Hand (1996) find that student subjects generally understand the time-series implications of the first-order autoregressive component of seasonal earnings changes but do not understand the implications of the fourth-order moving average component, while Calegari and Fargher's (1997) results suggest the opposite. More generally, if psychological biases affect students' abilities to detect time-series patterns in earnings series, more research is needed to understand whether, and if so, how professional analysts learn to overcome these biases. Further, some behavioral finance theories of market inefficiency assume that psychological biases affect market prices (e.g., Barberis, Shleifer, & Vishny, 1998; Daniel, Hirshleifer, & Subramanyam, 1998). Therefore, an important research question is whether analysts' forecasts reflect psychological biases, and whether these biases, in turn, affect market prices.[27]

3.6. Questions related to the regulatory environment

3.6.1. Questions addressed since 1992

The papers summarized in Table 6 examine the impact of the regulatory environment on analyst activities. The questions addressed include:

1. How do new regulations affect the information environment and the characteristics of analysts' forecasts? (Panel A); and

[26] See Markov and Tan (2006) for recent evidence that the distributions of analyst forecast errors are consistent with analysts having asymmetric loss functions.

[27] Friesen and Weller (2006) develop a model of behaviorally-biased analyst forecasts due to overconfidence and cognitive dissonance of individual analysts.

Table 6
Selected Papers Addressing Questions Related to the Regulatory Environment (Section 3.6)

Reference	Method	Key Results
Panel A. Research Question 3.6.1: How do new regulations affect the information environment and the characteristics of analysts' forecasts?		
Bailey et al. (2003)	Archival, First Call, 1999-2001.	Analyst forecast dispersion and quarterly earnings disclosures increased following Reg FD, implying that Reg FD increased the quantity of information available to the public, but also increased the demands on investment professionals.
Berger and Hann (2003)	Archival, I/B/E/S, 1996-1998.	Forecast accuracy improves for multi-segment firms relative to single segment firms following SFAS 131, implying that regulatory changes in reporting can improve forecast quality.
Heflin et al. (2003)	Archival, First Call, 1999-2001.	Neither forecast dispersion nor accuracy appear to change following Reg FD, suggesting that Reg FD did not impair the information available to investors prior to earnings announcements.
Bushee, Matsumoto, and Miller (2004)	Archival, First Call and BestCalls, 1999-2001.	Managers are more likely to discontinue conference calls after Reg FD, but the amount of information disclosed during conference calls does not decrease. Reg FD increased price volatility for firms that previously restricted access, resulting in more trade. Overall, Reg FD impacted trading during the conference call period for firms most likely to be affected by Reg FD.
Eleswarapu, Thompson, and Venkataraman (2004)	Archival, I/B/E/S, 2000-2001.	Information asymmetry (proxied by bid-ask spreads and order flow imbalance) declined after Reg FD, particularly for firms with a low analyst following.
Gintschel and Markov (2004)	Archival, First Call, 1999-2001.	The absolute price impact of information disseminated by analysts following Reg FD is reduced by 28%, implying that Reg FD was effective in reducing selective disclosure.
Ivkovic and Jegadeesh (2004)	Archival, I/B/E/S, 1990-2002.	Evidence of a stronger market reaction to upward forecast revisions and recommendations just prior to earnings announcements both before and after Reg FD supports the inference that analysts have access to positive (but not negative) insider information, and that Reg FD was unsuccessful in changing this characteristic of the information environment.
Barber, Lehavy, McNichols, and Trueman (2006)	Archival, First Call, 1996-2003.	After NASD Rule 2711, the distribution of stock recommendations became more pessimistic. The largest returns are earned based on going long (short) on buy (sell) recommendations from brokers who had issued few buy (sell) recommendations in the past.
Francis, Nanda, and Wang (2006)	Archival, Zacks, 1999-2002.	Analyst report informativeness declined for U.S. firm stocks relative to ADRs in the post-Reg FD environment.
Monhanram and Sunder (2006)	Archival, I/B/E/S, 1999-2001.	The precision of idiosyncratic information increased after Reg FD, and analysts correspondingly decreased firm coverage, mostly for firms with a large pre-existing coverage.
Panel B. Research Question 3.6.2: How do differences in regulations across countries affect the information environment and the characteristics of analysts' forecasts?		
Hope (2003a)	Archival, I/B/E/S, 1993, 1995.	Across countries, a strong enforcement of accounting standards is associated with improved forecast accuracy, particularly for thinly-followed firms, implying that enforcement reduces uncertainty about earnings.
Hope (2003b)	Archival, I/B/E/S, 1993, 1995.	Across countries, the level of disclosure about accounting policies is inversely related to forecast errors and dispersion, suggesting that increased disclosure reduces uncertainty about earnings.
Lang, Lins, and Miller (2003)	Archival, I/B/E/S, 1996.	Foreign firms that cross-list on U.S. stock exchanges obtain the following benefits: greater analyst following, higher valuations, and more accurate analyst earnings forecasts.
Lang, Lins, and Miller (2004)	Archival, I/B/E/S, 1996.	Analyst following and forecast accuracy improve from cross listing in the US, and the increase is associated with higher valuations. The results support the notion that cross-listed firms have better information environments, which are valued by the market.
Barniv, Myring, and Thomas (2005)	Archival, I/B/E/S, 1984-2001.	Consistent with legal and financial reporting environments influencing analyst activities, superior analysts maintain superiority in common-law countries, but not in civil-law countries.

2. How do differences in regulations across countries affect the information environment and the characteristics of analysts' forecasts? (Panel B).

A number of studies address whether Regulation Fair Disclosure (Reg FD) served the SEC's intended purpose of proscribing the selective disclosure of important information to particular (preferred) analysts. In effect, the regulation was intended to level the information playing field. Prior to it being passed, there was broad speculation upon Reg FD's likely impact with respect to levels of information asymmetry across analysts, forecast accuracy, forecast dispersion, forecast informativeness, managers' propensity to communicate with analysts, the form of management communication, and volatility in stock prices.

3.6.2. Suggestions for further research related to the regulatory environment

Regarding forecast dispersion, directional hypotheses hinge on whether analysts' forecasts rely more heavily on public or private information in the post-Reg FD period. If public information becomes more important after Reg FD, then the forecast dispersion should decrease. Alternatively, if analysts seek to gain an advantage via their own analysis because public information is common, then private information development activities and dispersion could increase after Reg FD. The results related to the effects of Reg FD on forecast dispersion are mixed (e.g., Bailey, Li, Mao, & Zhong, 2003; Heflin, Subramanyam, & Zhang, 2003). Further research is needed to understand how managers and analysts reacted to Reg FD's selective disclosure restrictions. With respect to pricing effects, research generally suggests that price impacts have decreased after Reg FD, and that the decreases are related to the level of selective disclosure pre-Reg FD, as proxied by brokerage and firm characteristics (e.g., Gintschel & Markov, 2004).

Ivkovic and Jegadeesh (2004, p. 433) find "a sharp increase in the information content of upward forecast revisions and recommendation upgrades in the week before earnings announcements, but … do not find a similar increase for downward revisions or for recommendation downgrades." The authors interpret this result as being consistent with analysts accessing managers' inside information in the case of good news preceding an earnings announcement, but not in cases of bad news, and the results are similar in the pre- and post-Reg FD periods. However, the paper notes the small post-Reg FD sample period and the correspondingly imprecise parameter estimation. Thus, the effectiveness of Reg FD in limiting analyst access to inside information remains an open question for further research. The results with respect to return volatility are likewise mixed, though some evidence suggests that the trading volume related to differing opinions increased following the regulation (Bushee et al., 2004).

A challenge for many conclusions regarding the impact of Reg FD is that the regulation impacted all U.S. firms at the same time, and as such, control groups are difficult to find. Francis et al. (2006) attempt to control for omitted macroeconomic variables by comparing the effects of Reg FD on the information environment and analyst forecast characteristics of ADR versus U.S. firms. Their results indicate no differential changes in the information environment of ADR versus U.S. domiciled company stocks, but the informativeness of analyst reports on U.S. domiciled stocks declined relative to the informativeness of analyst reports on ADR stocks. However, as noted by the authors, ADR stocks might not be an ideal control group, because, although they are exempt from the requirements of Reg FD, they have close ties to the U.S. economy, need to compete in U.S. capital markets, and might have either been indirectly affected by Reg FD or voluntarily chosen to comply, thus reducing the power of their tests. In general, researchers need to exercise care in dismissing macroeconomic (e.g., market downturn) and firm-specific effects that occurred concurrently with the implementation of Reg FD. Further research is needed to develop more powerful and better controlled hypothesis tests.

In a pre-Reg FD period, Park & Stice (2000) (described in our Table 3, Panel A) find evidence consistent with a positive relationship between the market's response to analysts' forecast revisions and analysts' prior firm-specific forecast accuracy, but they do not find a spillover effect of forecasting superiority from one firm to other firms followed by the same analyst. The authors interpret these results to suggest that analyst forecasting superiority stems more from access to managers' inside information than from a superior ability to analyze commonly available information. An interesting extension would be to see whether changes in the information environment after Reg FD affect the source of superior analysts' forecasting advantages. As noted in Section 3.1, Previts et al. (1994) observed that analysts prefer to follow firms with effective strategies for presenting smooth earnings streams. It would be interesting to know whether analysts have the same preferences post-Reg FD. Future archival research might consider the relationship between analyst following decisions and the ability of mangers to consistently meet earnings expectations before and after Reg FD.

With the expanded access to international forecasts provided by I/B/E/S and other data providers, researchers have an increased ability to study new research questions about whether differences in accounting standards, regulations, and legal structures and practices across countries impact analyst activities. To date, few studies (Table 6, Panel B) have addressed issues related to the impact of disclosure practices, enforcement standards, and accounting policy disclosures on analysts' forecasting activities. The results generally suggest that rules aimed at improving disclosure and adherence to accounting rules create an information environment conducive to improved forecast accuracy (see, e.g., Hope, 2003a,b; Lang et al., 2004). Future research might consider the effects of institutional/cultural differences across countries on analysts' decision processes, expertise, incentives, forecasts, and recommendations. The increased flow of capital, coupled with the convergence of international accounting standards, makes this line of research important, and we expect it to expand considerably in the future.

3.7. Research design issues

3.7.1. Questions addressed since 1992

The widely documented evidence of apparent analyst forecast bias and inefficiency with respect to public information has spawned other research that critically examines the validity of these inferences. The papers summarized in Table 7 generally point to the inappropriateness of the assumptions implicit in the research designs adopted by studies documenting bias and inefficiency in analysts' responses to information. The research questions posed in Table 7 are:

1. How might statistical validity issues threaten inferences about the behavior of analysts' forecasts and recommendations? (Panel A); and
2. How might construct or internal validity issues threaten inferences about the behavior of analysts' forecasts and recommendations? (Panel B).

3.7.2. Suggestions for further research related to research design issues

One criticism leveled against research that documents bias in analysts' forecasts is that evidence of bias depends on whether the tests focus on the mean or the median of analyst forecast errors. Abarbanell and Lehavy (2003) report that, due to possible management of the target earnings variable, the distribution of price-scaled analyst forecast errors contains more large negative forecast errors than large positive forecast errors. For similar reasons, small positive forecast errors outnumber small negative forecast errors. Abarbanell and Lehavy (2003) caution that these asymmetries in the distribution of analyst forecast errors violate assumptions of a normal distribution, and therefore the choice between the mean and median of the distribution affects conclusions about analyst bias.[28]

Other studies question the conclusion of analyst inefficiency in prior research. Gu and Wu (2003) argue that analysts' forecasts may seem inefficient under the assumption that analysts have a quadratic loss function; i.e., that analysts attempt to minimize their mean *squared* forecast error. If analysts' objectives are consistent with minimizing their mean *absolute* forecast error, the evidence is no longer consistent with inefficiency. Future research might identify analysts' loss functions based on the nature of their incentives in the various situations and decision contexts they face. Future research might also identify the determinants of particular forms of loss functions that affect analysts' forecasting decisions, and might assess whether utility functions differ across analyst types (e.g., based on affiliation or experience).

Future research could also examine whether analyst inefficiency depends on the sign and magnitude of the forecast error. Analyst forecast errors are determined by *reported* (rather than unmanaged) earnings, and, as Abarbanell and Lehavy (2003) note, earnings management is more likely in certain regions of the forecast error distribution. Inferences about analyst behavior based on analyst forecast errors are problematic in situations where reported earnings are more likely to (systematically) deviate from unmanaged earnings. Future research should consider the possibility that analysts' forecasts and reported earnings are jointly determined.[29] If firms provide guidance to analysts

[28] Keane and Runkle (1998) conclude that inefficiencies and bias in prior studies are due to research design issues that ignore cross-correlation in analyst forecast errors. Their tests using GMM estimation provide no evidence of bias or inefficiency in analyst forecasts.

[29] Sankaraguruswamy and Sweeney (2006) take a step in this direction by using a simultaneous equations model to study analysts' forecasts and reported earnings.

Table 7
Selected Papers Addressing Research Design Issues (Section 3.7)

Reference	Method	Key result
Panel A: Research Question 3.7.1: How might statistical validity issues threaten inferences about the behavior of analysts' forecasts and recommendations?		
Keane and Runkle (1998)	Archival, I/B/E/S, 1983-1991.	Inefficiencies and bias in prior studies are due to research design issues that ignore cross-correlation in analyst forecast errors. Tests using GMM estimation provide no evidence of bias or inefficiency in analysts' forecasts.
Rock, Sedo, and Willenborg (2000)	Archival, Nelson's Directory, 1985.	Count data econometric models are superior in estimating analyst following, as compared to ordinary least squares regressions.
Kim, Lim, and Shaw (2001)	Mathematical Model	Using mean (or median) forecasts to evaluate analyst accuracy and bias overweights the common information in analyst forecasts and underweights private information. Bias increases with the number of forecasts in the consensus. Adding a positive fraction of the *change* in mean forecasts to the prior mean forecast increases the forecast accuracy.
Abarbanell and Lehavy (2003)	Archival, Zacks, 1985-1998.	Inferences about analyst bias and inefficiency may be tainted by asymmetries in the distribution of forecast errors, where the distribution contains larger errors in the left tail (tail asymmetry) and more small positive forecast errors in the middle (middle asymmetry). Econometric fixes, such as truncation or winsorization, could reduce the effect of the tail asymmetry, but will magnify the effect of the middle asymmetry.
Cohen and Lys (2003)	Archival, Zacks, 1987-1999.	The authors challenge Abarbanell & Lehavy's (2003) conclusion that forecast error asymmetries create serially-correlated forecast errors. The distributions of both forecasts and actuals manifest the asymmetries noted by Abarbanell & Lehavy (2003).
Sankaraguruswamy and Sweeney (2006)	Archival, Mathematical Model, I/B/E/S, 1990-2002.	A simultaneous equations model is used to study analysts' forecasts and reported earnings.
Panel B: Research Question 3.7.2: How might construct or internal validity issues threaten inferences about the behavior of analysts?		
Gu and Wu (2003)	Archival, I/B/E/S, 1983-1998.	Forecast bias is positively related to skewness in the earnings distribution, consistent with analysts forecasting the median value of the earnings distribution rather than the mean. Forecasting the median minimizes the mean absolute forecast error. Analysts' forecasts are rational if their objective is to minimize mean absolute forecast errors.
Payne and Thomas (2003)	Archival, I/B/E/S, 1984-1999.	Conclusions based on using split-adjusted data provided by I/B/E/S may be affected by the rounding conventions I/B/E/S uses to adjust forecasts and actuals for stock splits. The split adjustment effect is more severe for studies of earnings forecast errors that are around zero, and for studies using the I/B/E/S Summary File.
Basu and Markov (2004)	Archival, I/B/E/S, 1985-2001.	The linear regressions used in analyst efficiency tests assume that analysts' loss functions dictate the minimization of mean squared forecast errors. The results show that analysts' forecasts are efficient when econometric tests are designed under the assumption that analysts seek to minimize mean absolute forecast errors.
Ramnath, Rock, and Shane (2005)	Archival, Value Line and I/B/E/S, 1993-1996.	I/B/E/S forecasts are more accurate than Value Line forecasts and proxy better for market expectations. Much of the superiority in I/B/E/S forecasts is attributable to timeliness (recency) and the aggregation of multiple forecasts. Both Value Line and I/B/E/S earnings forecasts, however, exhibit inefficiency with respect to past forecast errors.
Frankel, Kothari, and Weber (2006)	Archival, I/B/E/S, 1995-2002.	Discussions with I/B/E/S personnel suggest that there are construct validity issues associated with pre-1995 forecast dates on the I/B/E/S Detail Files.

and also manage reported earnings, the implicit assumption that analysts' forecasts and reported earnings are independently determined does not hold.

A few studies also focus on database issues and their possible implications for conclusions in prior research. Ramnath et al. (2005) examine whether there are inherent differences between two commonly used analyst forecast databases in accounting and finance research, Value Line and I/B/E/S, and find, for example, that forecasts derived from I/B/E/S dominate Value Line analysts' forecasts as proxies for the market's earnings expectations. Payne and Thomas (2003) note that the manner in which I/B/E/S pre-adjusts data for stock splits could affect inferences in prior research, and Frankel et al. (2006) note that their discussions with I/B/E/S personnel suggest that there may be construct validity issues associated with pre-1995 forecast dates in the I/B/E/S Detail files. The overall message is that the choice of analyst forecast database is not innocuous, and further research is needed to evaluate the degree to which the variables developed from these databases faithfully represent the underlying constructs of interest.

Another avenue for future research-design oriented studies is to address the construct validity of the news variable in studies of the information content of analysts' forecast revisions. Measurement error in the news proxy potentially creates ambiguities in cross-sectional comparisons of the information content of forecast revisions. The literature includes a curious regularity, indicating that the analyst's own most recent (i.e., current outstanding) forecast of the target earnings variable is a better proxy for the market's expectations than a more recent consensus forecast (e.g., Stickel, 1991; Gleason & Lee, 2003 (described in our Table 2, Panel B)). Future research might help us understand how the market forms its expectations regarding the timing and magnitude of an individual analyst's next earnings forecast.

4. Summary and conclusion

Discovering the information and valuation models that determine equity security prices in capital markets is a daunting task. Analysts may collectively hold the key, but no single analyst can tell you what it is. Instead, the key lies in the way the market derives a consensus from the distribution of extant individual analysts' forecasts of a company's future earnings, the characteristics of the information impounded in that consensus, and the additional information the market incorporates into its model for valuing a company's equity securities. Important insights can be gained from the research regarding analysts' decision processes, determinants of analyst expertise and distributions of individual analysts' forecasts, the informativeness of analysts' research outputs, market and analyst efficiency with respect to value-relevant information, the effects of analysts' economic incentives and behavioral biases on their research outputs, the effects of the institutional and regulatory environment, and the limitations of databases and various research paradigms. In this paper, we have provided some perspective on the research in each of these important areas.

The areas for future research that seem the most promising to us include the following. First, Schipper's (1991) and Brown's (1993) calls for research providing more insight into analysts' decision processes are as relevant today as they were in 1992. We look forward to research clarifying the distinction between analysts' roles as interpreters of public information and as developers of private information that is useful in determining prices of equity securities. The decision processes of analysts in distinguishing permanent from more temporary components of earnings reports (including temporary components due to earnings management) remain a critical area for future research. We also expect research to clarify the role of heuristics in the price-setting process and the degree to which these heuristics function as effective substitutes for rigorous multi-period valuation models. More research is needed to understand the interaction between analysts' economic incentives and the frictions that limit investors' abilities to arbitrage away any inefficiencies or biases in forecasts and prices resulting from those incentives, and we expect this research to have implications for emerging behavioral finance theories of market inefficiency.

We expect researchers to continue exploring the factors that make some analysts better forecasters than others. We also expect ongoing research attempting to uncover the market's mechanism for developing earnings expectations from individual analysts' forecasts. Further research is required to describe the behavior of the forecasts that have higher price impacts, such as long-term growth forecasts and target prices. Given the evidence of the informativeness of earnings in the presence of analysts' target price forecasts, recommendations, and other information in analysts' research reports, it is not clear that earnings forecasts are simply a means to an end (Schipper, 1991). Further research is needed to explore the importance of analysts' earnings forecasts and actual earnings reports in the allocation of resources in capital markets. Finally, we expect to see more international research describing the institutional and regulatory factors that create cross-country differences in the role of analysts and the properties of their forecasts.

Acknowledgements

We greatly appreciate the research assistance of Kevin Hee and comments and suggestions from three anonymous referees, the associate editor, Mark Bradshaw, Donal Byard, Geoff Friesen, Steve Glover, Zhaoyang Gu, Rick Johnston, Dave Smith, Barry Spicer, and Jilnaught Wong.

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The stock price effects from downward earnings guidance versus beating analysts' forecasts: Which effect dominates?

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September 2010

Abstract: This paper provides evidence on the net stock price effects associated with managers following a disclosure strategy of guiding earnings down to a level where they can report a positive earnings surprise. Prior literature documents a stock price premium when firms meet or beat analysts' forecasts. However, studies also show a substantial negative price response to downward earnings guidance that can potentially negate any benefit from reporting a positive earnings surprise. We find that the negative stock price effect for firms that release downward earnings guidance is substantially larger than the stock price premium from meeting analysts' forecasts. Further, this downward guidance stock price penalty persists after explicitly controlling for other news that might be disclosed by managers that voluntarily provide guidance. These findings challenge conclusions made in some prior research that the optimal disclosure strategy is to ensure a positive earnings surprise at the earnings announcement date.

Acknowledgements: The helpful comments by Marcus Caylor, Ted Christiansen, Michael Drake, Thomas Lopez, and Jenny Tucker are gratefully acknowledged.

The stock price effects from downward earnings guidance versus beating analysts' forecasts: Which effect dominates?

1. Introduction

This study examines the net stock price effects from following various disclosure strategies that separate total earnings news into management voluntary disclosures and the subsequent official earnings release. We are particularly interested in the net benefits from following a strategy where managers explicitly guide expectations down during a period in order to subsequently report a positive earnings surprise. In addition, we examine whether or not stock price effects associated with this disclosure strategy are permanent and can be justified on the basis of future earnings performance.

Our research question is motivated by several findings from the extant literature. In particular, prior research provides evidence suggesting that the overall reaction by investors to earnings news varies according to the manner in which the news is disclosed to the market.[1] This evidence implies the existence of an optimal disclosure strategy from the perspective of maximizing stock price, and several studies have drawn inferences as to what is the optimal strategy. For example, Soffer, Thiagarajan, and Walther (2000) and Tan, Libby, and Hunton (2002) argue that the optimal disclosure strategy is one where firms report a positive earnings surprise at the official earnings release date no matter whether the total earnings news is positive, neutral, or negative. Consistent with this conclusion, the popular press and academic literature cite stock price implications as an explanation for why firms tend to walk down earnings expectations to a beatable level (Brown, 2002; Richardson et al., 2004).[2] While not explicitly tested, the evidence in these studies suggests that the absolute stock price response to downward guidance is less than the stock price response to a positive earnings surprise.

[1] See, for example, Kasznik and Lev (1995), Libby and Tan (1999); Soffer, Thiagarajan, and Walther (2000); Tan, Libby, and Hunton (2002); and Miller (2005; 2006).

[2] There are many factors involved in a firm's decision to issue guidance beyond the stock price. These include litigation costs (Francis et al., 1994; Skinner, 1994) and stock option compensation (Aboody and Kasznik, 2000; Noe, 1999). However, our research question is focused on the stock price effects of various earnings disclosure strategies.

However, evidence in other studies yields different implications. Specifically, research shows a more pronounced stock price response to management downward earnings guidance relative to upward guidance.[3] This finding suggests that for firms with negative earnings news, issuing downward guidance is unlikely to yield a more positive response to earnings news relative to remaining silent. Consistent with this view, Kasznik and Lev (1995) find that for a small sample of firms with large negative earnings news that employ a wide variety of voluntary disclosures,[4] the total stock price response for firms that warn is significantly more negative compared to a control sample of non-warning firms.[5] However, Tucker (2007) argues that this finding is driven by firms self-selecting into guidance and non-guidance samples depending on the amount of other bad news they face. Using a Heckman selection model, she finds that after controlling for this self-selection bias, firms with negative earnings news who warn are no longer penalized by the stock market relative to those who keep silent.

Thus, the extant literature showing a stock price penalty for firms that warn is difficult to reconcile with studies that conclude the optimal disclosure strategy is to guide earnings down to a beatable level. Accordingly, the net benefit from guiding expectations down in order to report a positive surprise is ambiguous. We contribute to this literature by explicitly modelling and comparing the stock price effects of issuing downward earnings guidance and meeting analysts' forecasts.

Our study is most closely related to Kasznik and Lev (1995) and Tucker (2007), both of which examine the overall stock price effect from warning about bad news. Besides explicitly comparing the stock price penalty from guiding forecasts down with the stock price premium from meeting analysts' forecasts, our study can be further differentiated from Kasznik and Lev (1995) in that we consider only

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[3] See Hutton et al. (2003), Skinner (1994), and Kothari et al. (2009). Anecdotally, incidents of a large stock price response to downward earnings guidance are easy to find. On October 24, 2002, after the close of trading, CIGNA announced the company would not meet analysts' expectations due to weakness in one of its major segments. The price of the company's shares fell as much as 45 percent the following day. On January 3, 2006, prior to the market open, Pilgrim's Pride guided first-quarter earnings lower citing lower sales prices and worse than expected performance in its Mexico operations. Share prices fell that day by more than 20 percent.

[4] In addition to earnings guidance, a sampling of the types of management disclosures that are included in Kasznik and Lev (1995) are sales forecasts, asset write-offs, gains on asset sales, order backlog, stock repurchases, dividends, earnings components, appointments of officers and board members, and capital expenditures.

[5] Similar results are documented in Atiase et al. (2006).

earnings guidance for a substantially larger sample and over a different time period. We restrict the analysis to management earnings guidance because we are interested in whether the benefits to walking expectations down to a beatable target are worth the costs of issuing downward guidance. We also do not restrict the analysis only to firms with large earnings news, which increases the generalizability of our results. Expanding on the findings of Tucker (2007), we further examine whether any differential valuation can be justified based on either the simultaneous disclosure of unfavourable non-earnings news or future earnings performance. Thus, the evidence here can more directly assess the overall stock price effects of following an earnings disclosure strategy that guides expectations down in order to report a positive earnings surprise.

The sample is comprised of 8,635 firm/quarter observations where managers provide explicit earnings guidance for quarter *t* subsequent to the earnings announcement for quarter *t*-1. Each sample observation is paired with a control firm matched on firm size, industry, time period, and the level of total earnings news disclosed during the quarter. As shown in Figure 1, we define total earnings news as the difference between actual quarterly earnings and the first available mean consensus analyst forecast occurring after the earnings announcement for quarter *t*-1.

[Insert Figure 1 Here]

Consistent with prior research (e.g., Brown, 2001; Cotter et al., 2006; Richardson et al., 2004), we find that analysts' forecasts at the beginning of the quarter are generally optimistic, but tend to move downward over time to an attainable level. The propensity of firms to meet analysts' expectations is much stronger for guidance firms than for non-guidance firms. Specifically, guidance firms meet or beat expectations 79 percent of the time, whereas, the rate for non-guidance firms is only 55 percent. This evidence is consistent with managers using quarterly earnings guidance as a tool to keep expectations in check (Hsieh et al., 2006; Matsumoto, 2002).

We find a significantly negative stock price penalty for firms that provide downward earnings guidance during the quarter, after controlling for the magnitude of total earnings news. Moreover, this downward earnings guidance penalty is larger in absolute value than the equity premium realized by firms that meet analysts' forecasts, as documented in prior research (Bartov et al., 2002; Lopez and Rees, 2002). Thus, this evidence challenges the notion purported by some empirical and experimental studies that firms can maximize stock price by following a strategy of disclosing bad news during the quarter in order to report a positive surprise at the earnings announcement date. In fact, our evidence suggests that when total earnings news is negative, on average, firms are better off from a stock price perspective to not provide guidance during the quarter.

We examine whether the stock price penalty for downward earnings guidance in the current quarter can be explained by poor future earnings performance. As pointed out by Tan et al. (2002), different market reactions to various disclosure paths followed by managers could be due to certain signalling properties. If downward earnings guidance has signalling ramifications for periods beyond the current quarter, then the observed stock price penalty for these firms would be justified. In addition, it is possible that firms providing downward guidance for the current quarter also tend to simultaneously disclose or signal negative information about future performance (Tucker 2007).

To investigate these possibilities, we first estimate a regression model where abnormal returns are measured over multiple periods beginning in the quarter when the guidance is issued. These returns are regressed on contemporaneous aggregated earnings and indicator variables for downward guidance and positive surprises at earnings announcement dates (along with other controls). If the stock price penalty is a consequence of the downward guidance signalling unfavourable information about future earnings, its significance should be attenuated when future earnings are explicitly included in the model. We do not document this result but rather, the stock price penalty for downward earnings guidance in the current quarter persists into the future even when we explicitly control for future earnings. In contrast, we observe a significant reduction in the equity premium to meeting analysts' forecasts, which is consistent with the view that meeting analysts' forecasts is a signal about superior future performance that is impounded into the current stock price (Kasznik and McNichols, 2002). As a sensitivity analysis, we also perform a two-stage Heckman selection model to control for self-selection bias, consistent with Tucker (2007). The use of the two-stage model does not qualitatively affect our results in that we continue to find a significant stock price penalty for firms that provide downward earnings guidance, even when the guidance allows firms to meet analysts' forecasts.

This study contributes to the literature by showing that earnings disclosure strategies that result in a positive earnings surprise are not always preferred from a valuation perspective, because the negative stock price effects from providing downward guidance can dominate the positive equity premium from meeting analysts' forecasts. Further, we show that the stock price penalty to downward earnings guidance persists for several future quarters even after controlling for future earnings performance. These results challenge the conventional wisdom that companies can benefit from warning investors about impending bad news. However, they are consistent with other studies such as Hutton et al. (2003) and Kasznik and Lev (1995) that show a disproportionate negative reaction to downward guidance.

Our study provides a potential explanation for why firms might discontinue the practice of issuing earnings guidance. A 2007 survey by the National Investor Relations Institute indicates that 51 percent of its members in that year provided earnings guidance, which is a substantial decline from 77 percent in 2003. Recent studies that examine firm characteristics associated with the decision to stop providing earnings guidance consistently find that guidance stoppers tend to have poor current operating performance (e.g., Chen et al., 2007; Cheng et al., 2007; Houston et al., 2008). Evidence in this study suggests that firms might decide to discontinue guidance during periods of poor performance because of the significantly negative valuation effect, which is greater than the option of remaining silent and reporting a negative earnings surprise. A recent working paper finds that when total earnings news for a period is negative, a greater proportion of it is released through the earnings announcement relative to positive total earnings news (Roychowdhury and Sletten, 2010). This evidence suggests that many managers might be aware of the penalty for downward guidance and take actions to avoid it.

The paper proceeds as follows. In the next section, we review the literature related to this study and develop our hypothesis. Section 3 describes the sample. Sections 4 and 5 provide empirical results. In section 6, we reconcile results from this study with prior empirical work that has examined earnings preannouncement strategies. The final section offers some conclusions and discussion.

2. Literature Review and Hypothesis Development

It is well established that stock returns are positively associated with a firm's earnings news, where total earnings news for a quarter is defined as the difference between the market's earnings expectations at the beginning of the period and actual realized earnings (see Figure 1). Managers can choose when and how to communicate earnings information to the market, and many firms provide voluntary earnings guidance about current and future earnings. Many studies have documented a significant stock price reaction to news contained in earnings guidance, which indicates that these disclosures are credible (Atiase et al., 2005; McNichols, 1989; Pownall et al., 1993; Pownall and Waymire, 1989).

Managers give several reasons for why they provide earnings guidance, including, mitigating stock price volatility, building a wider shareholder base, and satisfying a market demand for information (Hsieh et al., 2006). Achieving higher valuations is another frequently cited reason that is supported by academic research. That is, several studies find a stock price premium (penalty) to meeting (missing) analysts' forecasts (Lopez and Rees, 2002; Skinner and Sloan, 2002). In addition, research evidence is consistent with managers manipulating accruals (Dhaliwal et al., 2004; Moehrle, 2002) or even real decisions (Graham et al., 2005) in order to achieve earnings targets. Managing expectations through earnings guidance is another tool available to managers (Baik and Jiang, 2006; Cotter et al., 2006; Matsumoto, 2002).

From a valuation perspective, guiding earnings down to a beatable level explicitly assumes that the market reaction to a positive earnings surprise at the earnings announcement date more than compensates for the negative response to earnings guidance. Some support for this view is provided by Bartov et al. (2002). Although they do not directly examine explicit earnings guidance disclosed by managers, they find that investors assign a smaller weight to analysts' forecast revisions during a quarter compared to earnings surprises at the earnings announcement date. Other archival and experimental studies provide additional support for the idea that stock price is maximized by ensuring a positive surprise at the earnings announcement date, even when it involves issuing downward guidance during the period. Soffer, Thiagarajan, and Walther (2000) find that most firms use earnings preannouncements to avoid a negative surprise at the official earnings release date, and that firms realize a more negative stock price reaction when they report a negative earnings surprise (holding the level of total earnings news constant). In an experimental setting, Tan, Libby, and Hutton (2002) show that analysts' forecasts of future earnings are higher when firms understate positive news and overstate negative news prior to an earnings announcement. Miller (2005) presents evidence indicating that reactions by investors and analysts to total earnings news are more pronounced when the earnings guidance and the official earnings announcement surprise are of the same sign. In all these studies, the results imply that the optimal strategy from a stock price perspective is to disclose total earnings news to ensure a positive earnings surprise at the earnings announcement date, which would include guiding earnings down during periods when total earnings news is negative.

However, a primary motivation for the current study is extant research that appears to contradict the notion that firms are better off from a stock price perspective to warn investors when they have negative earnings news. Caylor, Lopez, and Rees (2007) do not explicitly examine earnings guidance but examine analyst forecast revisions and abnormal returns for various earnings paths that firms can take during a quarter. They find that across all earnings paths, investors do not always assign a greater weight to the earnings surprise compared to the forecast revision during the period and that, although differential pricing exists across earnings paths, stock returns are not always maximized by reporting a positive earnings surprise at the official earnings release date. The authors reconcile their seemingly contrasting results with prior findings by showing that separate analyses of different earnings paths that were combined in previous research can lead to different conclusions. In addition, Hutton, Miller, and Skinner (2003) find that the stock price response is substantially more pronounced when management provides downward guidance compared to upward guidance. Specifically, they find a mean stock price reaction of -9.96 percent to downward guidance but only 1.93 percent for upward guidance. Other studies find a similar asymmetric response to downward and upward management guidance (Skinner 1994; Kothari et al., 2009). Thus, when a firm has negative total earnings news, it is not obvious that the optimal preannouncement strategy would be to guide expectations down in order to report a positive earnings surprise.

Finally, Kasznik and Lev (1995) examine all corporate voluntary disclosures 60 days prior to a large earnings surprise announcement[6] and find that the stock price reaction to earnings news for firms that warn is more negative compared to a control group of no-warning firms. These results suggest that firms realize a stock price penalty for issuing downward guidance, and contrast with popular opinion in the business press that investors have little tolerance for earnings disappointments and will punish those firms that do not warn. However, Tucker (2007) provides evidence suggesting that the results in Kasznik and Lev (1995) are driven by a failure to control for a systematic bias that occurs when downward guidance firms tend to have other bad news that is not explicitly contained in the current period guidance.

The contrasting implications from the above studies prevent us from extrapolating their results to the net valuation consequences of issuing downward earnings guidance in order to report a positive earnings surprise. Given that recent research finds that firms tend to discontinue the practice of issuing guidance during periods of poor performance, we examine the following hypothesis:

Hypothesis: Firms realize a stock price penalty from issuing negative quarterly guidance that is greater in absolute value than the stock price premium from meeting analysts' forecasts.

3. Description of Sample

The sample employed in this study is comprised of 8,635 earnings guidance observations issued by 2,751 unique firms over the period 1993-2006 as obtained from the First Call *Company Issued Guidance* (CIG) database.[7] While we are particularly interested in the net effects of downward guidance and a positive earnings surprise, we retain all guidance observations in the sample in order to assess differences in our results across different types of guidance. Table 1 provides a breakdown of the sample

[6] Their sample is restricted to earnings surprises that exceed one percent of stock price.
[7] By comparison, previous archival studies on earnings preannouncements typically employ only a few hundred observations or less.

selection process. We begin by extracting from the CIG database all available management disclosures that relate to earnings. The initial screen eliminates almost 15,000 observations where the management guidance is open-ended or qualitative such that the nature and/or magnitude of the news cannot be unambiguously determined. The focus in this study is on quarterly earnings guidance and accordingly, approximately 48 percent of the remaining observations are deleted because they are disclosures about annual earnings. We include only the last guidance observation for firms that provide guidance more than once during the quarter.

[Insert Table 1 Here]

We obtain data on analysts' forecasts, actual earnings, and earnings announcement dates from I/B/E/S. To conduct the analyses, we require that firms must have a consensus forecast for quarters t and t+1 prior to the management guidance date for quarter t but after the earnings announcement date for quarter t-1, and a consensus forecast for quarter t+1 that occurs after the earnings announcement date for quarter t. Firms are eliminated when these forecasts are unavailable along with actual earnings and an earnings announcement date from I/B/E/S. An additional 97 observations are deleted where the earnings announcement date is more than 75 days after the fiscal quarter end. Thus, for our sample, earnings is disclosed on a timely basis for the period, which mitigates confounding factors that can affect returns but not show up in earnings for quarter t. Two additional screens eliminate observations that have missing stock returns data from CRSP (355 observations) and where the matching procedures do not yield a matched firm with sufficient data from I/B/E/S and/or CRSP (2,740 observations).

To control for various factors that could affect the earnings/return relation, we obtain a matched control sample of firms that did not provide earnings guidance during the quarter. The matching procedure is as follows. First, for each firm/quarter guidance observation, we obtain all firms listed on I/B/E/S that are in the same industry[8] and did not provide guidance during the quarter (both qualitative and quantitative guidance firms are excluded). We also require that the sign of total earnings news is the same for the guidance and matched firms, and the absolute difference in total earnings news between the

[8] Industry is represented as the first two digits of the Global Industry Classification Standard code.

guidance and matched firms is less than or equal to five cents. Total earnings news is defined as the difference between actual earnings and the first available mean consensus analyst forecast for quarter *t* that occurs after the earnings announcement for quarter *t*-1 (see Figure 1). Finally, we require that firm size, as measured by the quarter end market value of equity, for the matched firm is between 75 percent and 125 percent of firm size for the guidance firm. From this set of potential matches, we choose the firm that is closest to the guidance firm's total earnings news. If there are more than one possible match firms that minimize the difference in total earnings news, we choose the firm that minimizes the difference in market value of equity. Thus, the non-guidance matched firms control for the sign and magnitude of total earnings news, industry, firm size, and time period.[9]

Table 2 provides descriptive statistics for the guidance and no-guidance control samples. Sample size varies across the different firm characteristics listed in Table 2 because of the availability of financial statement data from COMPUSTAT, which was not a criterion in the sample selection process. The mean undeflated earnings per share (EPS) for the guidance and matched firms are about \$0.26 and \$0.22, respectively. Most firms have negative total earnings news for the period as indicated by TNews%, defined as total earnings news deflated by price as of the first consensus analyst forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1. This result is consistent with general optimism in analysts' forecasts at the beginning of the quarter. Firm characteristics related to size (analyst following, total sales, and total assets) suggest that the matching procedure on size was successful. Although we use market value of equity as the matching variable, we do not find substantial median differences in analyst following, sales, and total assets across the guidance and no-guidance samples. Dispersion in analysts' forecasts is slightly greater for the no-guidance sample, which might be expected given that the control sample is probably less likely to have provided guidance at any time prior to the first consensus forecast for the period. The median market-to-book ratio (MB) and leverage (Lev) are

[9] We find successful matches for an additional 1,410 firm/quarter guidance observations when we eliminate the industry criterion, and an additional 391 observations when we further eliminate the firm size criterion. All inferences in the paper remain unchanged when we use this expanded sample.

fairly close across the two samples, although the variability in both appears to be somewhat greater for the control firms.

[Insert Table 2 Here]

In Table 3, the guidance observations are partitioned into groups based on the direction of the earnings guidance and the nature of the earnings surprise at the subsequent official earnings release. The direction of earnings guidance is determined by comparing the guidance to the mean consensus analyst forecast that exists prior to the guidance. Similarly, the nature of the earnings surprise at the official earnings release is considered positive (neutral) [negative] when actual earnings are greater than (equal to) [less than] the management forecast. In the final row of Table 3, we present the direction of earnings news at the earnings announcement date for the matched sample of no-guidance firms. For the matched sample, the nature of the earnings surprise is determined by comparing actual earnings with the most recent available mean consensus analyst forecast prior to the earnings announcement date.

[Insert Table 3 Here]

The cell frequencies in Table 3 reveal that most earnings guidance is negative (63%). Also, only 21 percent of guidance firms experience a negative surprise at the earnings announcement date, which is substantially smaller than 45 percent of no-guidance firms that report a negative earnings surprise. Most of the negative earnings surprises for guidance firms occur when downward guidance is disclosed during the quarter but the guidance failed to disclose all of the bad news (76%). However, among all firms with downward guidance, 22 percent disclose all of the bad news at the guidance date, and 53 percent reveal something greater than the bad news (resulting in a positive earnings surprise).

4. Contemporaneous Valuation Effects of Downward Earnings Guidance

In this section, we examine the net stock price effects from issuing downward earnings guidance and meeting analysts' forecasts during a quarter. In Table 4, we present statistics on the market reaction to earnings news after partitioning the guidance and matched samples based on the level of total earnings news. Panels A and B report median returns for firms with positive and negative total earnings news, respectively. The variable CAR^{EG} represents the 3-day size-adjusted return from one day before to one day after the guidance date. CAR^{EA} is the 3-day size-adjusted return surrounding the earnings announcement date. The last abnormal return metric (lwCAR) is a long-window size-adjusted return that extends from one day before the first mean consensus analyst forecast for the quarter until one day following the earnings announcement date. This quarterly return metric captures the entire valuation effects of total earnings news disclosed during the period.

[Insert Table 4 Here]

Focusing on the group of firms with small (1 to 5 cents) positive total earnings news in Panel A, the investor response surrounding the guidance is slightly positive, as indicated by the 1.4 percent abnormal return.[10] The median abnormal return surrounding the subsequent earnings announcement is also positive, albeit small in magnitude (only 0.9 percent). This evidence is consistent with managers disclosing only a portion of good news at the guidance date (Soffer et al., 2000). The abnormal return for the no-guidance matched sample is 1.6 percent at the earnings announcement date and is significantly greater than the return for the guidance sample, which is to be expected given that some of the good news for the guidance sample was disclosed previously when the guidance was issued. The overall abnormal return for the quarter (lwCAR) is close to four percent for both groups and is not significantly different across the two samples.

Turning now to the medium (+6 to +15 cents) and large (>+15 cents) total earnings news partitions, we continue to find significantly positive abnormal returns around the guidance date and the earnings announcement date for the guidance sample, indicating that the guidance provides positive news to the market, but that managers saved some positive news for the earnings announcement. One important difference for the medium and large total earnings news subsamples, however, is that we observe a more pronounced quarterly return for the guidance sample relative to the quarterly return for the no-guidance matched sample. The difference is statistically significant at the $\alpha = .01$ level for both

[10] We do not indicate in the table statistical significance for the median levels; however, unless otherwise indicated, all medians are statistically significant at conventional levels.

medium and large positive total earnings news. Thus, for medium and large total earnings news, univariate differences in medians suggest that firms can realize more positive abnormal returns when they provide guidance during the period. Assuming that the guidance does not disclose more than 100 percent of the good news, this result is consistent with the cue consistency theory forwarded in Miller (2005).

Results for firms with negative total earnings news are reported in Panel B of Table 4, and it is here where substantial differences arise between the guidance and no-guidance samples. When the negative total earnings news is small (-1 to -5 cents), the 3-day abnormal return surrounding the guidance is large in absolute value, -3.5 percent. The absolute magnitude is substantially greater than the 1.4 percent abnormal return for small upward guidance in Panel A, however, this could be due to managers disclosing a greater portion of bad news relative to the portion of good news they disclose at the guidance date. The median abnormal return at the earnings announcement date is not significantly different from zero for the guidance sample,[11] and is -1.3 percent for the no-guidance sample. This difference is statistically significant at the $\alpha = .01$ level, as would be expected since the guidance sample likely disclosed their bad news at the guidance date. However, the finding in the last column that the quarterly abnormal return is significantly more negative for the guidance sample suggests that firms might be penalized from a stock price perspective for providing the guidance relative to those firms with no guidance. The difference of 4.1 percent is substantial given the relatively low level of total earnings news.

For the medium (-6 to -15 cents) and large (< -15 cents) negative total earnings news groups, we find qualitatively similar results but larger magnitudes for the median levels and differences in medians. Most importantly, quarterly abnormal returns to negative total earnings news are much more pronounced when firms provide guidance during the period. The differences in lwCAR for the medium and large total earnings news groups are -7.9 and -8.6 percent, respectively. These magnitudes are substantially greater in absolute magnitude than the corresponding differences for positive total earnings news in Panel A, and

[11] The median abnormal return surrounding the earnings announcement date for the medium total earnings news group is also not significantly different from zero. All other median levels in the panel are significant at conventional levels.

provide preliminary evidence consistent with there being a stock price penalty for negative quarterly earnings guidance.

To more fully control for the effects of the magnitude of total earnings news on returns, we estimate the following regression (firm and time subscripts omitted):

$$lwCAR = \beta_0 + \beta_1 TNews\% + \beta_2 GUIDE + \beta_3 DOWN^{Guide} + \beta_4 PS^{EA} + \beta_5 PTNews + \gamma_i \sum_{i=1}^{53} QTR + \varepsilon \qquad (1)$$

The variables lwCAR (long window return) and TNews% (total earnings news) have been defined previously. GUIDE is an indicator variable equal to one when the firm provides guidance during the quarter, and zero if the observation is a matched control firm. $DOWN^{Guide}$ is an indicator variable equal to one when the quarterly earnings guidance direction is negative, and zero otherwise. Thus, the sum of β_2 and β_3 yields the average effect on returns from issuing downward earnings guidance after controlling for total earnings news. A negative sum would be consistent with the preliminary findings in Table 4 suggesting a market penalty to issuing an earnings warning. The coefficient on GUIDE (β_2) provides evidence as to how stock prices are affected by the issuance of upward and confirming guidance.

The variable PS^{EA} is an indicator variable equal to one when the firm reports a positive surprise at the earnings announcement date, and zero otherwise. The coefficient on this variable is expected to be positive if the firm receives a market reward from reporting actual earnings that beat expectations, as documented in prior research (Bartov et al. 2002). Thus, the sum of $\beta_2 + \beta_3 + \beta_4$ compares the positive stock price effects that arise from the firm reporting a positive earnings surprise with the negative effects from issuing an earnings warning (after controlling for the magnitude of total earnings news), and represents a formal test of our hypothesis.

PTNews is an indicator variable equal to one when the firm's total earnings news is positive, and zero otherwise. Caylor et al. (2007) provide evidence that the market reward to meeting analysts' forecasts is more a function of the first analyst forecast as opposed to the most recent forecast. Thus, if this finding holds for our sample and period, we expect the coefficient on this variable to be positive.

To test the significance of the coefficient magnitudes in equation 1 (and all other regression equations), we control for dependency in the error terms by reporting standard errors clustered by firm and include quarterly dummy variables in the regression (Petersen, 2009; Rogers, 1993). To control for outliers and observations with undue influence on the regression parameters, we delete observations where the value of total earnings news is greater in absolute value than 25 percent of stock price or abnormal returns is greater than 100 percent in absolute value.[12]

The results from estimating equation 1 are reported in Table 5 (quarterly dummies not reported). In addition to the full model, we report results from estimating a reduced model that merely examines the well-known relation between earnings and contemporaneous returns and forecast revisions. Comparing the full and reduced models provides some insight as to the effect of the indicator variables on the model's fit and their significance in explaining how investors and analysts respond to total earnings news. As expected, TNews% is highly significant. The magnitude of the slope coefficient suggests that for each dollar of total earnings news, stock price increases by approximately $3.41. Measurement error in the explanatory variable and non-linearities in the regression both suggest that this slope coefficient is likely understated (Kothari and Zimmerman, 1995).

[Insert Table 5 Here]

Upon estimating the full model, we find a significant increase in the adjusted-R^2 and TNews% remains highly significant. We document a significantly positive coefficient on GUIDE, which indicates that firms realize a small stock price bump from providing upward guidance during the period independent of total earnings news, which is consistent with evidence presented in Table 4. Also consistent with Table 4 results, we find a significantly negative stock price effect on quarterly earnings of about -9.3 percent (-10.8 + 1.5) when firms issue downward earnings guidance. As expected and consistent with prior research, there is an equity premium to meeting the most recent analyst forecast after controlling for the magnitude of total earnings news (Lopez and Rees, 2002). However, this equity

[12] Admittedly, these parameter cut-offs are arbitrary, but they result in fewer deleted observations compared to the no less arbitrary method of deleting observations in the extreme 1 or 5 percentile tails of the distribution, which is a common practice in the literature.

premium does not compensate for the downward earnings guidance, as the absolute magnitude of $\beta_2 + \beta_3$ is significantly greater than that of β_4 (p-value = .001).[13]

The results in Tables 4 and 5 provide new insight as to the net effects from a valuation perspective of guiding earnings down in order to report a positive earnings surprise. When firms have negative total earnings news, they would appear to benefit from going silent, which helps explain why firms choose this route during periods of poor operating performance (e.g., Chen et al., 2007; Cheng et al., 2007; Houston et al., 2008). The results are in stark contrast with research on preannouncement strategies (e.g., Soffer et al., 2000; Tan et al., 2002) suggesting that the optimal strategy is one that ensures a positive earnings surprise at the earnings announcement date. It appears that the pronounced investor reaction to downward earnings guidance is not offset by the equity reward from reporting a positive surprise, which is a new finding that this study contributes to the literature.

5. Rationality of the Stock Price Penalty for Downward Earnings Guidance

The previous section documents a net stock price penalty to issuing downward quarterly guidance, even after considering the stock price bump from beating analysts' forecasts. In particular, the evidence in Tables 4 and 5 consistently shows that downward guidance results in lower quarterly abnormal returns. This response by investors could be rational if firms, by choosing to issue downward earnings guidance in the current period, are signalling (either implicitly or explicitly) poor future performance. Alternatively, given that earnings guidance merely communicates differently the same earnings information for the current period after holding constant the level of total earnings news, it's possible the results are due to a market overreaction to downward earnings guidance. In an experimental setting, Libby and Tan (1999) find that although analysts believe earnings declines are less permanent for those firms that warn investors, the process of sequentially processing two signals (an earnings preannouncement warning and the subsequent actual earnings release) results in lower forecasts of future

[13] We also document an incremental and more pronounced equity premium when firms beat the first mean consensus analyst forecast for the period, which is consistent with Caylor et al. (2007), however, this stock price effect does not depend on whether or not the firm provides guidance during the period.

earnings for firms that warn of bad news. This disconnect between what individuals believe and how they behave is a common finding in the judgment and decision making psychology literatures (Libby, 1981).

To provide evidence on whether the stock price penalty to downward earnings guidance is rational, we first estimate regressions that aggregate earnings news and equity returns over multiple periods. The association of downward guidance with contemporaneous forecast revisions and abnormal returns could be a function of guidance firms disclosing more bad news about future earnings realizations (Tucker, 2007). If this is the case, by including future earnings performance in a regression model where equity returns are cumulated over the corresponding periods that earnings are aggregated, we should observe an attenuation of the coefficient on $\mathrm{DOWN}^{\mathrm{Guide}}$ since any future earnings signal contained within the downward guidance is explicitly included in the model. Likewise, prior research generally attributes the stock price premium to meeting analysts' forecasts as a signal for superior future performance (Bartov et al., 2002). If this is the case, a similar attenuation for the coefficients on $\mathrm{PS}^{\mathrm{EA}}$ and PTNnews should be observed as future earnings realizations are included in the model.

Accordingly, we estimate the following three regressions, where earnings and returns are aggregated over two, three, and four quarters, respectively.

<u>Two Period Model</u>

$$\mathrm{CAR}^2 = \gamma_0 + \gamma_1\mathrm{TNews\%}^2 + \gamma_2\mathrm{GUIDE} + \gamma_3\mathrm{DOWN}^{\mathrm{Guide}} + \gamma_4\mathrm{PS}^{\mathrm{EA}} + \gamma_5\mathrm{PTNews} + \gamma_6\mathrm{PS}^{\mathrm{EAt+1}} + \gamma_7\mathrm{PTNews}^{\mathrm{t+1}} + \beta_\mathrm{i}\sum_{i=1}^{53} QTR + \varepsilon \tag{2}$$

<u>Three Period Model</u>

$$\mathrm{CAR}^3 = \gamma_0 + \gamma_1\mathrm{TNews\%}^3 + \gamma_2\mathrm{GUIDE} + \gamma_3\mathrm{DOWN}^{\mathrm{Guide}} + \gamma_4\mathrm{PS}^{\mathrm{EA}} + \gamma_5\mathrm{PTNews} + \gamma_6\mathrm{PS}^{\mathrm{Eat+1}} + \gamma_7\mathrm{PTNews}^{\mathrm{t+1}} + \gamma_8\mathrm{PS}^{\mathrm{Eat+2}} + \gamma_9\mathrm{PTNews}^{\mathrm{t+2}} + \beta_\mathrm{i}\sum_{i=1}^{53} QTR + \varepsilon \tag{3}$$

<u>Four Period Model</u>

$$\mathrm{CAR}^4 = \gamma_0 + \gamma_1\mathrm{TNews\%}^4 + \gamma_2\mathrm{GUIDE} + \gamma_3\mathrm{DOWN}^{\mathrm{Guide}} + \gamma_4\mathrm{PS}^{\mathrm{EA}} + \gamma_5\mathrm{PTNews} + \gamma_6\mathrm{PS}^{\mathrm{EAt+1}} + \gamma_7\mathrm{PTNews}^{\mathrm{t+1}} + \gamma_8\mathrm{PS}^{\mathrm{EAt+2}} + \gamma_9\mathrm{PTNews}^{\mathrm{t+2}} + \gamma_{10}\mathrm{PS}^{\mathrm{EAt+3}} + \gamma_{11}\mathrm{PTNews}^{\mathrm{t+3}} + \beta_\mathrm{i}\sum_{i=1}^{53} QTR + \varepsilon \tag{4}$$

The dependent variables in the respective models (CAR^2, CAR^3, and CAR^4) are size-adjusted returns extending from one day prior to the first mean consensus forecast in quarter *t* through one day following the earnings announcement in quarters t+1, t+2, and t+3, respectively. Therefore, these returns reflect earnings information disclosed within the earnings guidance in quarter t and the entire subsequent quarter(s). $TNews\%^2$, $TNews\%^3$, and $TNews\%^4$ are the total earnings news aggregated over the quarters that correspond with the dependent variable, deflated by stock price as of the first consensus analyst forecast for quarter t occurring after the earnings announcement for quarter t-1. Specifically, total earnings news in quarter t is defined as before (actual earnings in quarter t less the first mean consensus analyst forecast after the earnings announcement for quarter t-1). In subsequent quarters t+1 through t+3, total earnings news is defined as actual earnings for those quarters less market expectations existing in quarter t. When available, existing analysts' forecasts for the corresponding quarters that exist prior to the earnings guidance in quarter t are used as proxies for market expectations. However, most firms do not have analysts' forecasts beyond quarter t+1. Therefore, when analysts' forecasts for future quarters are not available, we use actual earnings realized by the firm in the same fiscal quarter one year earlier.[14]

PS^{EA} and PTNews, as defined before, are indicator variables equal to one when the firm reports actual earnings greater than the earnings guidance (or the last available mean consensus analyst forecast for the no-guidance sample) and the first available mean consensus forecast for the quarter t, respectively. The remaining variables in the model are similar indicator variables for the quarter indicated. For example, PS^{EAt+1}, PS^{EAt+2}, and PS^{EAt+3} are equal to one when the firm reports actual earnings in quarters t+1, t+2, and t+3, respectively, that exceed the most recent mean consensus analyst forecast prior to the earnings announcement for that quarter. Similarly, $PTNews^{t+1}$, $PTNews^{t+2}$, and $PTNews^{t+3}$ are equal to one when actual earnings in the respective quarters exceed market expectations as of the guidance date in quarter t.

[14] As an alternative approach to obtain market expectations when analysts' forecasts are unavailable, actual earnings in previous periods are adjusted by the difference between consensus analysts' forecasts for quarter t that existed immediately prior to the guidance, and the last consensus analyst forecast for quarter t-4 prior to the earnings announcement for quarter t-4. This approach assumes that any forecasted improvement or decline in earnings for the current period relative to a year ago is permanent and the trend will continue for all subsequent quarters. Results from this alternative approach are qualitatively identical to what is reported in Table 6.

Results from estimating the multi-period regression equations 2 through 4 are presented in Table 6. The coefficient magnitudes and significance levels for $DOWN^{Guide}$, PS^{EA}, and PTNews can be compared with the one period model reported in Table 5. As expected, the association between returns and earnings news is strongly positive in every regression, and the magnitude of γ_1 increases as the number of aggregated periods increase, consistent with prior research (Warfield and Wild, 1992). Of particular interest in these regressions are the magnitudes of γ_2 through γ_5. The coefficients on GUIDE and $DOWN^{Guide}$ are significant in every period, and their magnitudes are similar across regressions. Thus, the returns association with a firm's providing guidance and, in particular, the disproportionate decrease in market value from providing downward guidance persists up through quarter *t*+3 and there is virtually no attenuation in this association (change in coefficients across models is not significantly different). This stock price penalty cannot be explained by a decrease in future earnings performance given that future earnings are explicitly included in these models. The association between market value and downward guidance appears to be incremental to any information contained within the guidance about current or future earnings.

[Insert Table 6 Here]

In contrast to the persistent magnitude of the coefficients for GUIDE and $DOWN^{Guide}$, we find a general decline in coefficient magnitudes for PS^{EA} and PTNews and their future counterparts as we increase the number of periods in the model (from the one period model in Table 5 to the four period model in Table 6). For example, the coefficient for PS^{EA} in regression equation (1) reported in Table 5 is 0.024, suggesting a 2.4 percent equity premium for meeting analysts' expectations at the earnings announcement, after controlling for total earnings news. This premium tends to decline as future earnings are included in the regression. The only exception is γ_4 in the four period model relative to the three period model. A general declining trend for PTNews is also observed and for these variables' future counterparts (coefficients $\gamma_6 - \gamma_9$ in Table 6). These results are consistent with the notion that the premium to beating analysts' forecasts (whether it be the first or last forecast for the period) is a rational market response to signals about future earnings performance, and the premium declines as earnings performance is explicitly included in the model.

To provide further evidence on the rationality of the differential market response to downward guidance, we also re-estimate regression equation (1) using a two-stage Heckman selection model to control for a potential self-selection bias wherein firms who choose to issue guidance may have larger amounts of unfavourable news than other firms. Although researchers have expressed concerns in recent years regarding these types of selection models (e.g., Francis and Lennox, 2008; Kennedy, 2008; Puhani, 2000), the use of such a model increases the comparability of our findings with those of prior research, notably Tucker (2007).

In the first stage, we follow Tucker (2007) in modelling managers' litigation, reputation, and earnings-torpedo-related motives for issuing guidance. The following six instrumental variables from Tucker (2007) are utilized: the log of market value of equity, the log of the absolute value of the earnings surprise, the number of quarterly earnings guidelines issued in the previous year, the average number of analysts following the firm, the market-to-book ratio, and earnings volatility. We also include three additional instruments. Litigation risk is captured by including an indicator variable equal to one if the firm belongs to a high litigation-risk industry as defined by Matsumoto (2002). To capture earnings-torpedo-related effects that might motivate managers to warn (Skinner and Sloan, 2002), we include stock return volatility during the previous 12 months and the consensus analyst long-term earnings growth forecast.

Similar to Tucker (2007), we interact the inverse Mills ratios from this analysis with GUIDE in our second stage. In untabulated analysis, we find that while this control for self-selection does slightly reduce the magnitude of the results in Table 5, inferences remain unchanged.[15] Thus, our results do not appear to be driven by a self-selection bias that is related to other earning news simultaneously disclosed by guidance firms.

[15] Specifically, the negative stock price effect of issuing downward guidance is reduced from -9.4 percent to -6.9 percent, while the equity premium from meeting analysts' expectations decreases from 2.7 percent to 2.0 percent. More importantly, the absolute magnitude of $\beta_2 + \beta_3$ remains significantly greater than that of β_4 (p-value = .001).

6. Reconciling Results with Prior Research

The evidence in this study indicates that firms realize a stock price penalty from issuing negative quarterly earnings guidance that exceeds the stock price premium from meeting analysts' forecasts, after holding total earnings news constant. Our results do not explain the rationale for the penalty, but they can assist in explaining why firms tend to discontinue providing guidance during times of poor operating performance (e.g., Chen et al., 2007; Cheng et al., 2007; Houston et al., 2008). In addition, our results are consistent with some prior research on the differential market response to downward guidance (Hutton et al., 2003) and the market response to pre-earnings announcement warnings of large negative surprises (Kasznik and Lev, 1995). However, our results contrast with research suggesting that the optimal disclosure strategy from a stock price perspective is to ensure a positive surprise at the earnings announcement, even when that means talking analysts' forecasts down. In this section, we attempt to reconcile our results with prior contrasting research by initially estimating the same regression specifications that were implemented in other studies, and then expanding the regressions to examine the incremental significance of $DOWN^{Guide}$.

Two archival studies that draw different conclusions from this study are Soffer et al. (2000) and Miller (2005). Soffer et al. (2000) conclude that the market reacts more strongly to the earnings announcement compared to an earnings preannouncement, which is opposite from what we find for downward guidance observations. Also, Soffer et al. conclude that the optimal preannouncement strategy to maximize stock price is to always report a positive earnings surprise. In their study, the sign of the preannouncement surprise is unimportant so long as it does not preclude a firm from reporting a positive surprise at the earnings announcement date.

Miller (2005) concludes that the market reaction to total earnings news is most pronounced when the guidance news and earnings announcement news are of the same sign. This cue consistency theory is not completely consistent with the implications in this study that suggest the key to an optimal disclosure strategy is not the consistency of the earnings surprises but rather, the sign of the earnings guidance.

We use the same terminology employed in Soffer et al. (2000) to express their regression specification as follows:

$$CAR^{PA-1,EA+1} = \alpha_0 + \alpha_1 TOTNEWS + \alpha_2 NEG^{EA} + \alpha_3(TOTNEWS * NEG^{EA}) + \varepsilon \quad (5)$$

The measurement of the variables in equation (5) is equivalent or very similar to what has already been used in regression equations (1) through (4) in this study, and we continue to employ the same measurement procedures as before. Any differences in variable measurement between this study and Soffer et al. (2000) are specifically delineated. $CAR^{PA-1,EA+1}$ is defined in Soffer et al. (2000) as the size-adjusted return extending from one day before the earnings guidance to one day following the official earnings release date. We extend the window for this variable to one day before the first consensus analyst forecast to ensure that all the earnings news is captured by returns. TOTNEWS or total earnings news is measured the same way as TNews% in equation (1).[16] NEG^{EA} is an indicator variable equal to one when the firm reports a negative surprise at the earnings announcement date and zero otherwise.[17]

Upon initially estimating equation (5) and comparing our results with the results reported in Soffer et al. (2000), we estimate an expanded equation that includes $DOWN^{Guide}$ as an additional explanatory variable, which indicates whether or not the earnings guidance during the period is downward (as defined before).

$$CAR^{PA-1,EA+1} = \alpha_0 + \alpha_1 TOTNEWS + \alpha_2 NEG^{EA} + \alpha_3(TOTNEWS * NEG^{EA}) + \alpha_4 DOWN^{Guide} + \varepsilon \quad (6)$$

Similar to Soffer et al. (2000) we estimate regression equation (6) only for the guidance sample.

A similar process is employed to reconcile our results to those reported in Miller (2005). The regression specification employed in Miller (2005) is as follows:

$$CAR = \beta_0 + \beta_1 TOTSURP + \beta_2 NEGEPSSURP + \beta_3 TOTSURPSIGN + \beta_4(TOTSURPSIGN * TOTSURP)$$
$$+ \beta_5 NEGEARN + \beta_6(NEGEARN * TOTSURP) + \beta_7 PATHTYPE + \beta_8(PATHTYPE * TOTSURP) + \varepsilon \quad (7)$$

[16] Soffer et al. (2000) deflate total earnings news by beginning of quarter stock price instead of stock price as of the first consensus analyst forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1.
[17] Soffer et al. (2000) define NEG^{EA} as equal to one when the earnings preannouncement released more than 105% of its positive news or less than 95% of its negative news.

CAR and TOTSURP are defined equivalently as lwCAR and TNews in equation (1).[18] NEGEPSSURP is defined the same way as NEG^{EA} in equation (6); specifically, it is an indicator variable equal to one when the firm reports a negative surprise at the earnings announcement date. TOTSURPSIGN is defined equivalently to PTNews, which is an indicator variable equal to one when the firm reports actual earnings in excess of the mean consensus analyst forecast prior to the guidance. NEGEARN is an indicator variable equal to one when the actual earnings are negative and zero otherwise. Finally, PATHTYPE tests the primary hypothesis in Miller (2005) that the market reaction will be more pronounced when the guidance and official earnings news are of the same sign. This indicator variable is equal to one when the signs of the surprises on the two dates are consistent, and zero otherwise.

After estimating the regression in Miller (2005), we expand the equation to include $DOWN^{Guide}$ as follows to assess whether or not reporting downward guidance has an incremental effect on stock prices.

$$\begin{aligned} CAR = {} & \beta_0 + \beta_1 TOTSURP + \beta_2 NEGEPSSURP + \beta_3 TOTSURPSIGN + \beta_4 (TOTSURPSIGN * TOTSURP) \\ & + \beta_5 NEGEARN + \beta_6 (NEGEARN * TOTSURP) + \beta_7 PATHTYPE + \beta_8 (PATHTYPE * TOTSURP) + \\ & \beta_9 DOWN^{Guide} + \varepsilon \end{aligned} \tag{8}$$

The results from this exercise are reported in Table 7. Panel A is related to Soffer et al. (2000) and Panel B relates to Miller (2005). The first row of regression results presents what is reported in the original papers. The second row presents the results from estimating the same regression specifications on our sample. As can be seen in Panel A of Table 7, we are able to produce results that are qualitatively similar to what is reported in Soffer et al. (2000). The only meaningful difference is that we find a significantly negative coefficient for the slope interaction $TOTNEWS*NEG^{EA}$; probably because the size of our sample allows for more powerful tests that can detect smaller effects.

[Insert Table 7 Here]

In the last column, we examine how the interpretation of the results is affected by the inclusion of $DOWN^{Guide}$ in the regression. Consistent with our prior results, we continue to find a negative coefficient for $DOWN^{Guide}$ that is strongly significant. We also continue to find a significant coefficient for NEG^{EA};

[18] Miller (2005) deflates TOTSURP by stock price as of ten days prior to the guidance date.

thus, our results confirm the notion that firms realize more positive returns when they are able to avoid reporting a negative earnings surprise. This result is consistent with what is reported in Tables 5 and 6. However, the significance and magnitude of the $DOWN^{Guide}$ coefficient gives rise to a different interpretation of the relative importance of talking down analysts' forecasts in order to report a positive earnings surprise, as the coefficient on $DOWN^{Guide}$ is significantly more negative than that of NEG^{EA} (p-value = .001), suggesting that the stock price effects of reporting a positive earnings surprise are not as large in absolute value and do not completely offset the negative effects of reporting downward earnings guidance.

The first row of regression results in Panel B presents what was reported in Miller (2005). We are unable to produce an exact replication of Miller (2005). Most importantly, the coefficient on the PATHTYPE*TOTSURP interaction term is not significant for our sample, suggesting that this result is not robust across firms and/or over time. Otherwise, most of the results for our sample are close to what is presented in Miller (2005). Further, the coefficient on $DOWN^{Guide}$ remains strongly significant within this model, providing more evidence of the robustness of our primary findings across regression specifications, and provides a different interpretation from what is presented in Miller (2005) as to the optimal disclosure strategy to maximize stock price.

7. Conclusions and Discussion

Prior studies have examined the important issue of the overall market reaction to the combined news disclosed in earnings preannouncements and subsequent official earnings releases. The evidence from this line of literature is not completely consistent. Some studies suggest that warning investors of impending bad news will result in a more negative overall market response even though the total earnings news is the same if there had been no warning (Kasznik and Lev, 1995; Libby and Tan, 1999). In contrast, more recent research indicates that an optimal disclosure strategy is to guide earnings expectations to ensure a positive surprise at the official earnings release date (Soffer et al., 2000; Tan et al., 2002; Miller, 2005). These latter results suggest that investors and analysts tend to react more strongly to earnings announcements compared to preannouncements, but this notion cannot be neatly reconciled with the literature that consistently shows a substantial market reaction to management earnings guidance, especially when the guidance is negative (Hutton et al., 2003). Further, although Caylor et al., (2007) do not examine earnings guidance explicitly issued by managers, they find evidence indicating that the optimal disclosure strategy is not always to ensure a positive earnings surprise.

With the development of First Call's *Company Issued Guidance* database, researchers have access to better data to examine the importance of voluntary management disclosures relative to official earnings announcements. Based upon a large sample extracted from this database, we show that controlling for the magnitude of total earnings news, quarterly stock returns are more negative when the firm provides downward earnings guidance during the period relative to a no-guidance control sample. This study is the first to provide large-sample evidence on the net benefits to explicitly guiding earnings expectations down to a beatable level.

We examine whether this net stock price penalty for downward guidance can be explained by future earnings realizations. The inclusion of future earnings in a multiple-period regression framework reveals that the stock price penalty to downward guidance persists over at least three subsequent quarters relative to the guidance quarter, while the premium to meeting analysts' forecasts is attenuated over the same period. This result indicates that the market response to the guidance cannot be explained by differential operating performance over the next three quarters. Using a Heckman two-stage selection model, we also show that this market response to downward guidance is not driven by a self-selection bias. These results go against the conventional wisdom that companies can benefit from warning investors about impending bad news, and that stock price is maximized when managers report a positive earnings surprise even when downward guidance is required to do so.

Consistent with prior research, we observe that most guidance is negative, which begs the question: if downward guidance is overall harmful to firm value after controlling for total earnings news, why do managers provide downward guidance? A potential response is the general trend among companies of discontinuing the practice of providing short-term guidance. A 2007 survey by the National

Investor Relations Institute indicates that 51 percent of its members in that year provided earnings guidance, which is a substantial decline from 77 percent in 2003. Research has found that company decisions to go silent are associated with negative operating performance (Chen et al., 2007; Houston et al., 2008). Further, a recent working paper finds that when total earnings news for a period is negative, a greater proportion of it is released through the earnings announcement relative to positive total earnings news (Roychowdhury and Sletten, 2010). This evidence suggests that many managers might be aware of the penalty for downward guidance and take actions to avoid it.

Although we are unaware of managers explicitly citing stock price effects of downward guidance as a motive for discontinuing the practice of issuing guidance, it stands to reason that if a stock price penalty exists for downward guidance, then it would serve as an incentive to managers to stop issuing guidance altogether and not only during periods of poor performance. Selectively issuing guidance only when managers have good news would not seem to be a prudent policy, as that would expose the firm to greater liability. When firms do not meet analysts' forecasts and stock price falls precipitously, stockholders are eager to assign blame to managers. Having demonstrated a willingness to provide guidance in the past when analysts' forecasts were too low, managers could be held liable if they stay silent when analysts' forecasts are too high. In contrast, when a firm adopts a "no guidance" policy, managers are unlikely to be held responsible for what third parties (i.e., analysts) say about the firm. In fact, avoiding litigation is a reason cited by managers as to why they discontinue providing guidance (Morgan, 2003). Another potential response as to why most earnings guidance is negative is the possibility that managers believe the conventional wisdom that firms are penalized for not being forthcoming about bad news.

Our results suggest that the market response to negative guidance is not rational. An explanation for the response is beyond the scope of this study, but prior behavioural research provides a possible explanation. Libby and Tan (1999) design an experiment that examines analyst forecast revisions of future earnings under different conditions. One set of analysts are asked to provide a new forecast after an earnings warning and then again after the official earnings release (a sequential condition). Another group of analysts are given the same information from the warning and official earnings release simultaneously (a simultaneous condition) and asked to provide a new forecast. Finally, a third group of analysts provide a new forecast after being informed only about the actual earnings with no warning (a no warning condition). The authors find that analysts seem to prefer a warning about negative earnings because the revisions for the simultaneous condition were less negative compared to the no warning condition. However, the sequential condition resulted in the most negative revisions, which suggests that any perceived benefit from warning investors about negative earnings is more than offset by the cognitive process of sequentially receiving an earnings warning followed by an earnings announcement. These results provide a possible explanation for the apparent disconnect between the conventional wisdom that downward guidance might ultimately benefit companies' stock price and actual market behaviour.

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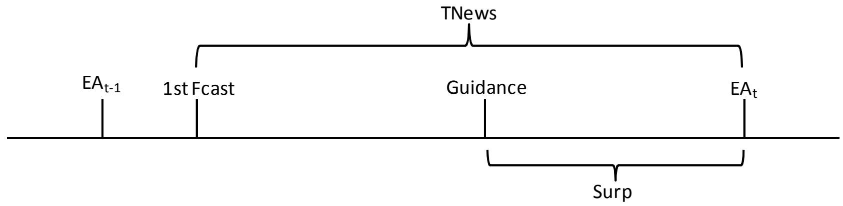
Figure 1: Earnings News Timeline



EA = Earnings Announcement
1st Fcast = First Consensus Analyst Forecast for quarters t and t+1
Guidance = Earnings Guidance
TNews = Total Earnings News determination period
Surp = Earnings Surprise determination period

Table 1
Sample Selection Process

	No. of Firms	No. of Observations
Data on First Call's Company Issued Guidance Database from 1993-2006	6,698	86,413
Sample Screens:		
Delete open-ended or qualitative management guidance	5,703	71,606
Delete annual guidance	4,953	37,462
Retain only the last guidance for the quarter	4,902	29,222
Delete observations with insufficient analysts' forecast data[a]	3,257	11,823
Delete observations where earnings announcement occurs more than 75 days after quarter end	3,230	11,730
Delete observations with insufficient CRSP data	3,122	11,375
Delete observations with insufficient data for matched firm[b]	2,751	8,635
Total Sample of Quarterly Earnings Guidance Observations	2,751	8,635

[a]The following analysts' forecasts from I/B/E/S are required for an observation to be retained in the sample: 1) mean consensus forecast for quarter *t* that occurs after the earnings announcement from quarter *t*-1 and before the earnings guidance for quarter *t*, 2) mean consensus forecast for quarter *t*+1 that occurs after the earnings announcement from quarter *t*-1 and before the earnings guidance for quarter *t*, and 3) mean consensus forecast for quarter *t*+1 that occurs after the earnings announcement in quarter *t*.

[b]We require the matched firm to have returns data available on CRSP and actual earnings and analyst forecast data on I/B/E/S.

Table 2
Descriptive Statistics

Variable	Sample	N	Mean	Median	Inter-quar Range
EPS	Earnings Guidance Sample	8,635	$ 0.26	$ 0.21	$0.35
	Matched Sample	8,635	0.22	0.18	0.40
TNews%	Earnings Guidance Sample	8,635	-0.36%	-0.11%	0.64%
	Matched Sample	8,635	-0.44	-0.11	0.64
AnaF	Earnings Guidance Sample	8,635	7.6	6	7
	Matched Sample	8,635	6.4	5	7
Disp	Earnings Guidance Sample	7,934	1.9%	1%	1%
	Matched Sample	7,287	3.0	2	2
MB	Earnings Guidance Sample	8,613	2.9	2.2	2.0
	Matched Sample	8,601	3.7	2.1	2.4
Lev	Earnings Guidance Sample	8,612	1.3	0.8	1.2
	Matched Sample	8,599	1.7	0.9	1.4
Assets	Earnings Guidance Sample	8,635	$2,705	$533	$1,559
	Matched Sample	8,635	2,895	563	1,746
Sales	Earnings Guidance Sample	8,627	$569	$141	$383
	Matched Sample	8,628	480	121	335

The earnings guidance sample is comprised of observations from First Call's *Company Issued Guidance* database during the period 1993-2006 where the firm disclosed quarterly earnings guidance after the earnings announcement for quarter *t*-1 and before the official earnings announcement for quarter *t* (see Table 1 for the sample selection criteria). Each firm/quarter guidance observation is matched with a no-guidance firm where the matching criteria are calendar quarter , industry, size, and the sign and magnitude of total earnings news. Total earnings news is defined as the unscaled difference between actual earnings per share for quarter *t* less the first mean consensus forecast for the same period that is issued after the earnings announcement for quarter *t*-1.

Variable definitions: EPS = reported actual earnings per share for quarter t; TNews% = EPS minus the first mean consensus analyst forecast for the period occurring after the earnings announcement for quarter *t*-1, deflated by stock price as of the first consensus analyst forecast for the period; AnaF = the number of unique analyst forecasts that comprise the last consensus forecast for quarter *t*; Disp = dispersion in analysts' forecasts that comprise the last consensus forecast for quarter *t*; MB = market value of common stock divided by the book value of common shareholders' equity as of the end of fiscal quarter *t*; Lev = total liabilities divided by total shareholders' equity as of the end of fiscal quarter *t*; Assets = total assets as of the end of fiscal quarter *t*; Sales = total revenues for quarter *t*.

Table 3
Frequency Matrix of News Released at the Earnings Guidance and Official Earnings Announcement Dates

Direction of Earnings Guidance	Nature of Earnings Surprise: Positive	Neutral	Negative	Totals
Up				
N	1,576	439	367	2,382
% of row total	66%	19%	15%	100%
% of column total	32%	23%	20%	27%
Confirming				
N	459	312	69	840
% of row total	55%	37%	8%	100%
% of column total	9%	16%	4%	10%
Down				
N	2,857	1,197	1,359	5,413
% of row total	53%	22%	25%	100%
% of column total	59%	61%	76%	63%
Totals				
N	4,892	1,948	1,795	8,635
% of row total	57%	22%	21%	100%
% of column total	100%	100%	100%	100%
No Earnings	3,681	1,021	3,933	8,635
Guidance	43%	12%	45%	100%

The guidance sample consists of 8,635 observations during the period 1993-2006 as obtained from First Call's *Company Issued Guidance* database where managers provided quarterly earnings guidance for quarter *t* after the earnings announcement for quarter *t*-1 (see Table 1 for sample screening criteria). The direction of earnings guidance is determined by comparing the guidance with the mean consensus analyst forecast that exists immediately prior to the guidance. The nature of the news at the official earnings announcement date is considered positive (neutral) [negative] when actual earnings are greater than (equal to) [less than] the earnings guidance for the guidance sample. For the matched sample, the nature of news at the official earnings announcement date is considered positive (neutral) [negative] when actual earnings are greater than (equal to) [less than] the most recent mean consensus forecast for the period.

Table 4
Median Analyst Forecast Revisions of Future Earnings Forecasts and Stock Returns Across Different Guidance Paths

Panel A: Positive Total Earnings News

	N	CAR^{EG}	CAR^{EA}	lwCAR
TNews from +1 to +5				
Guidance Sample	1,953	1.4%	0.9%	3.9%
Matched Sample	1,953	NA	1.6	3.8
Median Difference		NA	-0.6***	0.3
TNews from +6 to +15				
Guidance Sample	845	4.3%	1.4%	10.9%
Matched Sample	845	NA	2.5	7.2
Median Difference		NA	-1.4***	2.9***
TNews greater than +15				
Guidance Sample	175	5.2%	1.6%	12.6%
Matched Sample	175	NA	2.8	8.7
Median Difference		NA	-1.1	4.3***

Panel B: Negative Total Earnings News

	N	CAR^{EG}	CAR^{EA}	lwCAR
TNews from -1 to -5				
Guidance Sample	1,859	-3.5%	-0.0%	-6.7%
Matched Sample	1,859	NA	-1.3	-2.5
Median Difference		NA	1.2***	-4.1***
TNews from -6 to -15				
Guidance Sample	2,203	-8.5%	0.1%	-12.4%
Matched Sample	2,203	NA	-1.3	-5.1
Median Difference		NA	1.5***	-7.9***
TNews less than -15				
Guidance Sample	975	-11.4%	-0.4%	-18.0%
Matched Sample	975	NA	-1.6	-7.2
Median Difference		NA	1.2***	-8.6***

The guidance sample consists of 8,635 observations during the period 1993-2006 as obtained from First Call's *Company Issued Guidance* database where managers provided quarterly earnings guidance for quarter *t* after the earnings announcement for quarter *t*-1 (see Table 1 for sample screening criteria). TNews is defined as the unscaled difference between actual earnings per share for fiscal quarter *t* and the first mean consensus analyst forecast for the same period issued after the earnings announcement for quarter *t*-1. CAR^{EG} is a 3-day size-adjusted return from one day before to one day after the earnings guidance. CAR^{EA} is a 3-day size-adjusted return from one day before to one day after the official earnings announcement. lwCAR is a size-adjusted return extending from one day before the first mean consensus analyst forecast for quarter *t* to one day after the official earnings announcement date for quarter *t*.

*, **, and *** indicate the median difference is statistically significant at the α = .10, .05, and .01 levels, respectively, using a two-tailed sign test.

Table 5
Results from Regression Analysis of Market Reaction to Total Earnings News

Regression Equation:

$$lwCAR = \beta_0 + \beta_1 TNews\% + \beta_2 GUIDE + \beta_3 DOWN^{Guide} + \beta_4 PS^{EA} + \beta_5 PTNews + \gamma_i \sum_{i=1}^{53} QTR + \varepsilon$$

	β_0	β_1	β_2	β_3	β_4	β_5	Adj-R^2	N
Coef.	-0.003	**3.406**					6.7%	17,192
(t-stat.)	(-0.36)	**(12.4)**						
Coef.	**-0.033**	**1.525**	**0.015**	**-0.108**	**0.024**	**0.085**	15.6%	17,192
(t-stat.)	**(-3.66)**	**(6.79)**	**(3.45)**	**(-18.82)**	**(5.37)**	**(15.7)**		
				$\boldsymbol{\beta_2 + \beta_3 + \beta_4 = -0.069}$				

Definition of regression variables:
lwCAR is the size-adjusted return extending from one day before the first mean consensus forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1 to one day after the earnings announcement for quarter *t*. TNews% is defined as the difference between actual earnings per share for fiscal quarter *t* and the first mean consensus analyst forecast for quarter *t* made after the earnings announcement for quarter *t*-1, deflated by stock price as of the first consensus analyst forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1. GUIDE is an indicator variable equal to one if the company issued earnings guidance during the quarter (and zero otherwise). PS^{EA} is an indicator variable equal to one when actual earnings exceeds the earnings guidance for the guidance sample, or the last mean consensus analyst forecast for the matched sample (and zero otherwise). PTNews is an indicator variable equal to one when TNews% is positive (and zero otherwise). $DOWN^{Guide}$ is an indicator variable equal to one when the earnings guidance is less than the most recent mean consensus analyst forecast that exists prior to the guidance (and zero otherwise).
Coefficients are presented in bold when they are statistically significant at the α = .05 level using a two-tailed test. Standard errors clustered by firm with time period dummy variables (coefficients not reported) are used to control for correlation in the error terms.

Table 6
Results from Regression of Multiple Period Returns on Aggregated Earnings

Two Period Model

$$CAR^2 = \gamma_0 + \gamma_1 TNews\%^2 + \gamma_2 GUIDE + \gamma_3 DOWN^{Guide} + \gamma_4 PS^{EA} + \gamma_5 PTNews + \gamma_6 PS^{EAt+1} + \gamma_7 PTNews^{t+1} + \beta_i \sum_{i=1}^{53} QTR + \varepsilon$$

Three Period Model

$$CAR^3 = \gamma_0 + \gamma_1 TNews\%^3 + \gamma_2 GUIDE + \gamma_3 DOWN^{Guide} + \gamma_4 PS^{EA} + \gamma_5 PTNews + \gamma_6 PS^{EAt+1} + \gamma_7 PTNews^{t+1} + \gamma_8 PS^{EAt+2} + \gamma_9 PTNews^{t+2} + \beta_i \sum_{i=1}^{53} QTR + \varepsilon$$

Four Period Model

$$CAR^4 = \gamma_0 + \gamma_1 TNews\%^4 + \gamma_2 GUIDE + \gamma_3 DOWN^{Guide} + \gamma_4 PS^{EA} + \gamma_5 PTNews + \gamma_6 PS^{EAt+1} + \gamma_7 PTNews^{t+1} + \gamma_8 PS^{EAt+2} + \gamma_9 PTNews^{t+2} +$$

$$\gamma_{10} PS^{EAt+3} + \gamma_{11} PTNews^{t+3} + \beta_i \sum_{i=1}^{53} QTR + \varepsilon$$

	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	γ_8	γ_9	γ_{10}	γ_{11}
Coef.	**-0.064**	**1.029**	**0.031**	**-0.099**	**0.018**	**0.077**	**0.094**	-0.003				
(t-stat.)	**(-4.71)**	**(7.02)**	**(4.40)**	**(-12.37)**	**(2.94)**	**(10.46)**	**(13.33)**	(-0.42)				
	Adj. R^2 = 14.5%			N = 13,917								
Coef.	**-0.113**	**1.837**	**0.028**	**-0.083**	0.007	**0.058**	**0.051**	**-0.019**	**0.080**	**0.091**		
(t-stat.)	**(-7.46)**	**(9.91)**	**(3.14)**	**(-8.50)**	(0.92)	**(6.30)**	**(5.82)**	**(-2.02)**	**(10.91)**	**(11.31)**		
	Adj. R^2 = 16.7%			N = 13,436								
Coef.	**-0.191**	**1.974**	**0.034**	**-0.088**	**0.019**	**0.040**	0.020	-0.005	**0.039**	**0.054**	**0.062**	**0.127**
(t-stat.)	**(-10.46)**	**(8.43)**	**(3.14)**	**(-7.50)**	**(2.10)**	**(3.75)**	(1.91)	(-0.49)	**(4.49)**	**(6.11)**	**(6.69)**	**(13.13)**

Adj. R^2 = 18.0% N = 12,903

Regression variable definitions:
CAR^2, CAR^3, and CAR^4 are two-, three-, and four-period CARs defined as size-adjusted returns extending from one day after the first consensus analyst forecast available in quarter *t* after the earnings announcement for quarter *t*-1 to one day following the earnings announcement in quarters , *t*+1, *t*+2, and *t*+3, respectively. $TNews\%^2$ ($TNews\%^3$) [$TNews\%^4$] is the sum of total earnings news from quarter *t*+1 (*t*+2) [*t*+3] and the previous quarter(s), deflated by stock price as of the first consensus analyst forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1. Total earnings news in quarter *t* is defined as before. Total earnings news in periods *t*+1, *t*+2, and *t*+3 are defined as the difference between actual earnings for that quarter less the market expectations of earnings for the same quarter that exists prior to the earnings guidance for quarter *t*. When available in quarter *t*, mean consensus analyst forecasts are used to proxy for market expectations for all future quarters. When analyst forecasts for future periods are not available, market expectations are defined as actual earnings per share in the same quarter one year prior to the relevant period. GUIDE is an indicator variable equal to one if the company issued earnings guidance during the quarter (and zero otherwise). $DOWN^{Guide}$ is an indicator variable equal to one when the earnings guidance is less than the most recent mean consensus analyst forecast that exists prior to the guidance, and zero otherwise. PS^{EA} is an indicator variable equal to one when actual earnings for quarter *t* exceeds the earnings guidance for the guidance sample, or the last available consensus analyst forecast for the matched sample, and zero otherwise. PS^{EAt+1}, PS^{EAt+2}, and PS^{EAt+3} are indicator variables equal to one when actual earnings for the corresponding period exceeds the most recent mean consensus analyst forecast that exists immediately prior to the earnings announcement for the corresponding period. $PTNews^{t+1}$ ($PTNews^{t+2}$) [$PTNews^{t+3}$] is an indicator variable equal to one when $TNews\%^2$ ($TNews\%^3$) [$TNew\%^4$] is positive, and zero otherwise.
Coefficient magnitudes are presented in bold when they are statistically significant at the α=.05 level using a two-tailed test. Standard errors clustered by firm with time period dummy variables (coefficients not reported) are used to control for correlation in the error terms.

Table 7
Results from Employing Regression Specifications from Prior Studies

Panel A

Regression Equation from Soffer et al. (2000)

$$CAR^{PA-1,EA+1} = \alpha_0 + \alpha_1 TOTNEWS + \alpha_2 NEG^{EA} + \alpha_3(TOTNEWS * NEG^{EA}) + \varepsilon$$

Expanded Equation to Include Type of News in Earnings Preannouncement

$$CAR^{PA-1,EA+1} = \alpha_0 + \alpha_1 TOTNEWS + \alpha_2 NEG^{EA} + \alpha_3(TOTNEWS * NEG^{EA}) + \alpha_4 DOWN^{Guide} + \varepsilon$$

	Coefficient Estimates (t-statistics in parentheses)						
	α_0	α_1	α_2	α_3	α_4	Adj-R^2	N
Reduced Model as reported in Soffer et al. (2000)	-0.016 (-1.95)	**3.250** **(6.57)**	**-0.070** **(-3.19)**	1.248 (0.95)		21.0%	325
Reduced Model current sample	0.015 (1.66)	**5.463** **(11.34)**	**-0.070** **(-11.40)**	**-3.635** **(-5.42)**		11.25%	8,621
Expanded Model	**0.065** **(6.95)**	**3.540** **(8.55)**	**-0.059** **(-10.15)**	**-2.597** **(-4.61)**	**-0.092** **(-19.35)**	15.5%	8,621

Panel B

Regression Equation from Miller (2005)

$$CAR = \beta_0 + \beta_1 TOTSURP + \beta_2 NEGEPSSURP + \beta_3 TOTSURPSIGN + \beta_4(TOTSURPSIGN * TOTSURP) + \beta_5 NEGEARN + \beta_6(NEGEARN * TOTSURP) + \beta_7 PATHTYPE + \beta_8(PATHTYPE * TOTSURP) + \varepsilon$$

Expanded Equation to Include Type of News in Earnings Preannouncement

$$CAR = \beta_0 + \beta_1 TOTSURP + \beta_2 NEGEPSSURP + \beta_3 TOTSURPSIGN + \beta_4(TOTSURPSIGN * TOTSURP) + \beta_5 NEGEARN + \beta_6(NEGEARN * TOTSURP) + \beta_7 PATHTYPE + \beta_8(PATHTYPE * TOTSURP) + \beta_9 DOWN^{Guide} + \varepsilon$$

	Coefficient estimates (p-values in parentheses)											
	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	Adj-R^2	N
Reduced Model												
As reported in	**-0.075**	**6.015**	0.013	**0.115**	**-3.287**	**-0.029**	**-7.288**	-0.008	**1.287**		33.1%	840
Miller (2005)	**(.001)**	**(.001)**	(.117)	**(.015)**	**(.001)**	**(.012)**	**(.001)**	(.174)	**(.006)**			
Current sample	**-0.047**	**4.744**	**-0.018**	**0.100**	**2.549**	**-0.029**	**-4.014**	0.005	0.137		19.0%	7,928
	(.001)	**(.001)**	**(.009)**	**(.001)**	**(.030)**	**(.001)**	**(.001)**	(.314)	(.787)			
Expanded Model	-0.014	**4.730**	**-0.023**	**0.077**	**2.699**	**-0.028**	**-3.868**	0.000	-0.262	**-0.031**	19.2%	7,928
	(.270)	**(.001)**	**(.001)**	**(.001)**	**(.020)**	**(.001)**	**(.001)**	(.947)	(.602)	**(.001)**		

Regression variable definitions from panel A:
CAR$^{PA-1,EA+1}$ is the size-adjusted return from one day before the first mean consensus analyst forecast for quarter *t* to one day following the official earnings announcement for quarter *t*. TOTNEWS is actual earnings per share for quarter *t* less the first mean consensus analyst forecast for quarter *t*, deflated by stock price as of the first consensus analyst forecast for quarter *t* occurring after the earnings announcement for quarter *t*-1. NEG^{EA} is an indicator variable equal to one when actual earnings per share are less than the earnings guidance (and zero otherwise). DOWN^{Guide} is an indicator variable equal to one when the earnings guidance is less than the first mean consensus forecast for quarter *t*.
Regression variable definitions from panel B:
CAR is defined the same as CAR$^{PA-1,EA+1}$. TOTSURP is defined the same as TOTNEWS. NEGEPSSURP is defined the same as NEG^{EA}. TOTSURPSIGN is an indicator variable equal to one when TOTNEWS is positive (and zero otherwise). NEGEARN is an indicator variable equal to one when earnings for quarter *t* are less than zero (and zero otherwise). PATHTYPE is an indicator variable equal to one when the signs of DOWN^{Guide} and NEGEPSSURP are consistent (and zero otherwise).
Coefficient magnitudes are presented in bold when they are statistically significant at the α=.05 level using a two-tailed test. Standard errors clustered by firm with time period dummy variables (coefficients not reported) are used to control for correlation in the error terms.

The Biggest Mistakes We Teach

Forthcoming, *Journal of Financial Research* (Summer 2002)

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December 3, 2001

Presented at the Southern Finance Association Annual Meetings, November 30, 2001. The comments of Joel Houston, Michael Ryngaert, Richard Warr, and especially Jeremy Siegel are appreciated.

I. Introduction

When I started to teach at the University of Pennsylvania's Wharton School over twenty years ago, I used the very first edition of the Brealey and Myers' textbook. The book had some mistakes in it, as almost all books do. For example, the first two editions had an incorrect formula for the valuation of warrants. I taught the incorrect formula for several years before a perceptive student asked a question that exposed the mistake. But I don't want to dwell on technical errors. Instead, I want to focus on some of the conceptual mistakes that dominate the received body of wisdom in the academic finance profession.

II. The Relative Risk of Stocks and Bonds

Almost all finance textbooks prominently feature the historical returns provided by Ibbotson Associates. These numbers show that since 1926, stocks have produced higher average annual returns than bonds, and that stocks are riskier than bonds. This is consistent with equilibrium risk-return models. There are three problems with this evidence that stocks are riskier than bonds, however.

First, the use of annual holding periods. There is no theoretical reason why one year is the appropriate holding period. People are used to thinking of interest rates as a rate per year, so reporting annualized numbers makes it easy for people to focus on the numbers. But I can think of no reason other than convenience for the use of annual returns. If returns follow a random walk, then whether a one year holding period is used, or a shorter or longer period is used, makes no difference. But if there is mean reversion or mean aversion in the data, then the risk of one class of securities relative to another depends on the holding period.

Second, the use of arithmetic, rather than geometric returns. The relation between the arithmetic (simple) average and the geometric (compounded) average is given by the formula

$$r_{arith} = r_{geo} + 1/2\sigma^2$$

The higher is the variance rate, the larger will be the difference between the arithmetic and geometric returns. For stocks, the difference between the arithmetic and geometric averages is about 2% per year. For bonds, the difference is much smaller. As a result, the performance of stocks relative to bonds looks better when arithmetic averages are compared than when geometric averages are compared. Now, if stock and bond returns follow a random walk, the use of annual arithmetic returns is appropriate. But if there is mean reversion or mean aversion, then the use of arithmetic returns over longer time periods is not appropriate. With mean reversion, the multi-period arithmetic return will be closer to the geometric return.

Third, the use of nominal, rather than real returns. People are concerned about the consumption bundle that they can consume. The only reason that nominal returns, rather than real returns, should be reported in textbooks is simplicity. But this simplicity comes at a cost. If stocks are good short-term hedges against inflation, they could have a higher variance of nominal returns and yet offer a lower variance of real returns. In fact, stocks are bad short-term hedges against inflation. On theoretical grounds, it is the standard deviation of real returns that is relevant.

Figure 1 provides an updated version of Figure 2-4 in Jeremy Siegel's *Stocks for the Long Run*, showing the standard deviation of real returns for different holding periods, using data starting in 1802. For a one-year holding period, stocks are twice as risky as bonds. For holding periods of twenty or more years, however, stocks are less risky than bonds.

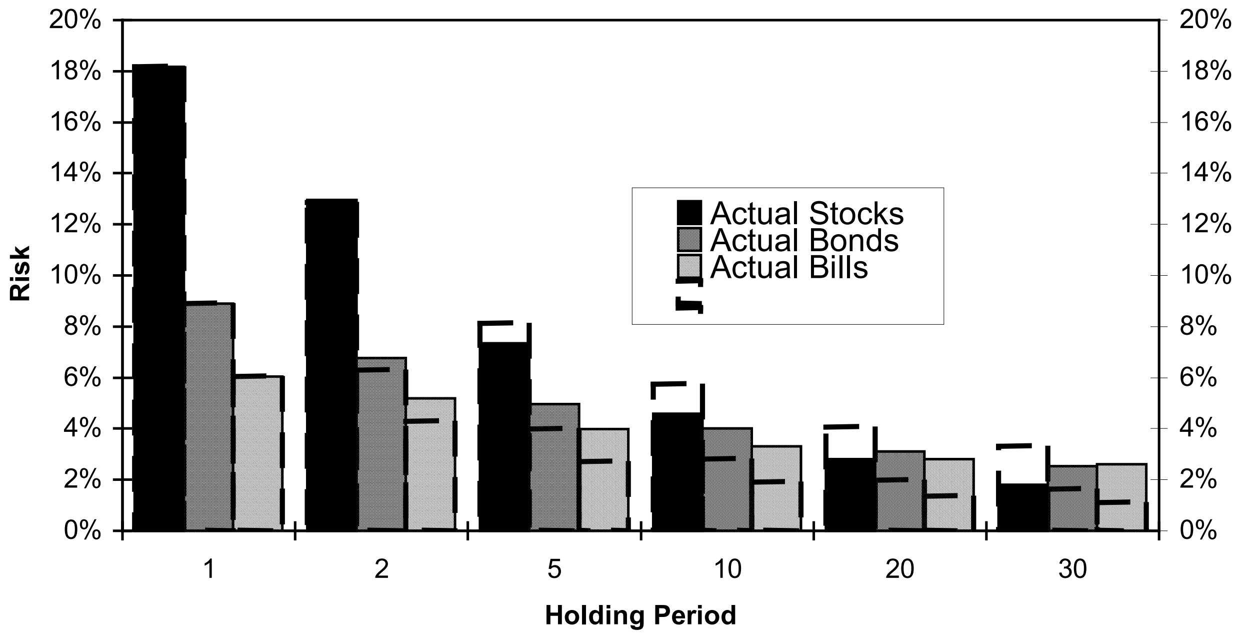

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Figure 1: The annualized standard deviation of compounded real holding-period returns from Janaury 1802 to September 2001. For example, a two-year buy-and-hold real return of 21% would have an annualized compounded real return of 10%. For the sample period, there are 199 overlapping two-year returns, from which 199 annualized numbers are calculated. The bars represent these actual standard deviations. The dashed bars represent what the standard deviations would be if the one-year standard deviations are divided by the square root of the holding period, which is the random walk assumption. This is an updated version of Figure 2-4 from Siegel (1998), supplied by Jeremy Siegel.

Why is this so? Well, although stocks are a bad hedge against inflation in the short-run, they are a good hedge against inflation over a longer period of time, such as five years. This pattern is a major contributor to the negative autocorrelation of real stock returns that exists over a five-year horizon. In other words, real stock returns show a tendency towards mean-reversion. This makes stocks less risky over a T-year holding period than would be suggested by multiplying the annual variance by T. If there is no mean reversion, the T-period variance of returns, σ^2_T, is equal to T times the variance of single-period returns, σ^2. If one uses monthly returns data, however, researchers generally find that $\sigma^2_T < T\sigma^2$ when using a market index when T is greater than 24 months.

I can think of another reason why real stock returns are negatively autocorrelated at three-to-five year horizons. If individuals put too much weight on recent evidence, then they will put more money into stocks after stocks have done well, pushing up the prices even further. Similarly, after stocks have done poorly, they will pull money out of stocks, depressing prices further. This is an example of the representativeness heuristic. People put too much weight on recent evidence. This is also known as the fallacy of small numbers.

In contrast to stocks, the real returns on nominal bonds show no tendency towards mean reversion. In fact, there is a slight tendency towards mean-aversion, making them more risky the longer the holding period. But the big risk with nominal bonds comes from a hyper-inflation. Fortunately, the U.S. has never had a hyper-inflation, but other countries have. In a hyper-inflation, stocks typically have negative real returns, but then recover, at least partially. Bonds get wiped out in real terms, and once this occurs, you can never recover.

Stocks are riskier than bonds for short holding periods. But it is not at all obvious that this is true for long holding periods, either historically or in the future.

III. Estimating the Future Equity Risk Premium

The equity risk premium is the difference in returns between stocks and safe assets, such as Treasury bills. There are three approaches to estimating the equity risk premium on a point-forward basis. The first approach is to extrapolate historical returns. The second approach is to use a theoretical model of what the equity premium should be, given plausible assumptions about risk aversion. The third approach is to use forward-looking information such as the current dividend yield and interest rates.

Many textbooks encourage students to use the historical arithmetic equity risk premium of 9% for computing the cost of equity capital. Ivo Welch's recent survey of financial economists indicates that most finance professors extrapolate the historical average, too, although many shade it down to about 7%, perhaps due to concerns about survivorship bias. The numbers that I am about to compute using forward-looking information suggest that 1% is a more defensible number.

Before doing so, let me point out how extrapolating historical numbers can result in numbers that are nonsensical. If one were estimating the equity risk premium for Japan at the end of 1989, using the historical data starting when the Japanese stock market reopened after World War II, one would produce an equity risk premium of more than 10%. But at the end of 1989, the Japanese economy was booming, corporate profits were high, and the market's price-earnings ratio was over 60. At the time, it was the conventional wisdom that the cost of equity capital for Japanese corporations was low. It *cannot* be the case that the cost of equity capital is low *and* the equity risk premium is high. But it *can* be the case that the historical equity premium is high, and the expected equity risk premium for the future is low.

If a theoretical model is used for what the equity risk premium should be, one comes up with a number in the vicinity of 2% if geometric returns are used, or 4% if arithmetic returns are used. This is the approach used by Mehra and Prescott (1985) in their famous paper.

The first forward-looking approach to estimate the future real return on equities is to look at the market's earnings yield. The earnings yield is just the reciprocal of the P/E ratio. Now, one must normalize earnings because earnings may be temporarily high or low due to business cycle effects. Historically, the earnings yield has averaged 7%. Not coincidentally, the average compounded real return on equities has averaged 7%. This historical average of 7% is composed of a dividend yield of 4.5% and a real capital gain of 2.5%.

Today, the earnings yield is in the vicinity of 4%, once one smoothes out business cycle effects. This generates a real return on equities, on a point-forward basis, of about 4%, which is below the historical average. The lower forecast today is because the P/E ratio is higher than the historical average of about 14. The higher P/E ratio today also results in a lower dividend yield. Today, the dividend yield is about 1.5%. The dividend yield is low both because the P/E ratio is high, and the payout ratio of dividends to earnings is relatively low. The dividend payout ratio is low partly because of the increase in share repurchases. Because of share repurchases, expected real capital gains have increased. But employee stock options have also become more popular, and this dilution partly offsets the effect of share repurchases. A 2.5% real capital gain per share plus a 1.5% dividend yield produces a 4% per year real return on equities.

The second forward-looking approach is to use the Gordon dividend growth model. Using this model, which is a rearrangement of the growing perpetuity formula $P_0 = Div_1/(r - g)$, one gets that

$$r = \text{the dividend yield} + g$$

where g is the growth rate of dividends per share. If the dividend yield stays constant over time, then the growth rate of dividends per share will be the same as the growth rate of the stock price.

What is a plausible estimate of g? If aggregate dividends grow at 2.5%, and the aggregate dividend/labor income ratio for the economy stays constant, this would imply that real labor income grows at 2.5%. If the population grows at 1%, this would imply that per capita income grows at 1.5% per year. This is equal to the historical average long-term growth rate of about 1.5% in developed countries, according to Prichett (1997). A 1.5% per year growth rate means that real per capita income will double every 47 years. If the net effect of share repurchases and option dilution adds 1% to per share growth, then a growth rate of real dividends per share of 2.5% can be justified. Adding a 1.5% dividend yield to this gives a 4% real return on equities in the future.

Since 1997, the U.S. Treasury has issued inflation-indexed bonds, commonly known as TIPS, for Treasury Inflation-Protected Securities. These bonds do offer protection against inflation risk. Many textbooks do not even acknowledge the existence of this important asset class.

The Ibbotson numbers show that the historical real return on bonds has been about 1%. But today, TIPs are yielding real returns of about 3.3%. If the expected real return on equities is 4% and the real return on inflation-indexed bonds is 3.3%, the equity risk premium is only 0.7%. In round numbers, 1%. The equity premium has gotten squeezed from the top (low future real returns on stocks) and the bottom (a higher real return on bonds).

I think that textbooks should present historical returns, but should focus on the Gordon dividend growth model for estimating the future equity risk premium. For predicting future dividend growth rates, all one has to do is assume an economy-wide growth rate and then assume that the ratio of labor income to capital income is a constant. Fama and French (2002) and Jagannathan, McGratton, and Scherbina (2000), among others, also adopt the Gordon dividend growth model framework and conclude that the equity risk premium is now in the vicinity of 1%, far below the historical average.

IV. The Fed Model

The so-called Fed Model states that the stock market is fairly valued when the earnings yield on stocks is equal to the interest rate on bonds. This model for valuing stocks is based on the empirical regularity that is illustrated in Figure 2.

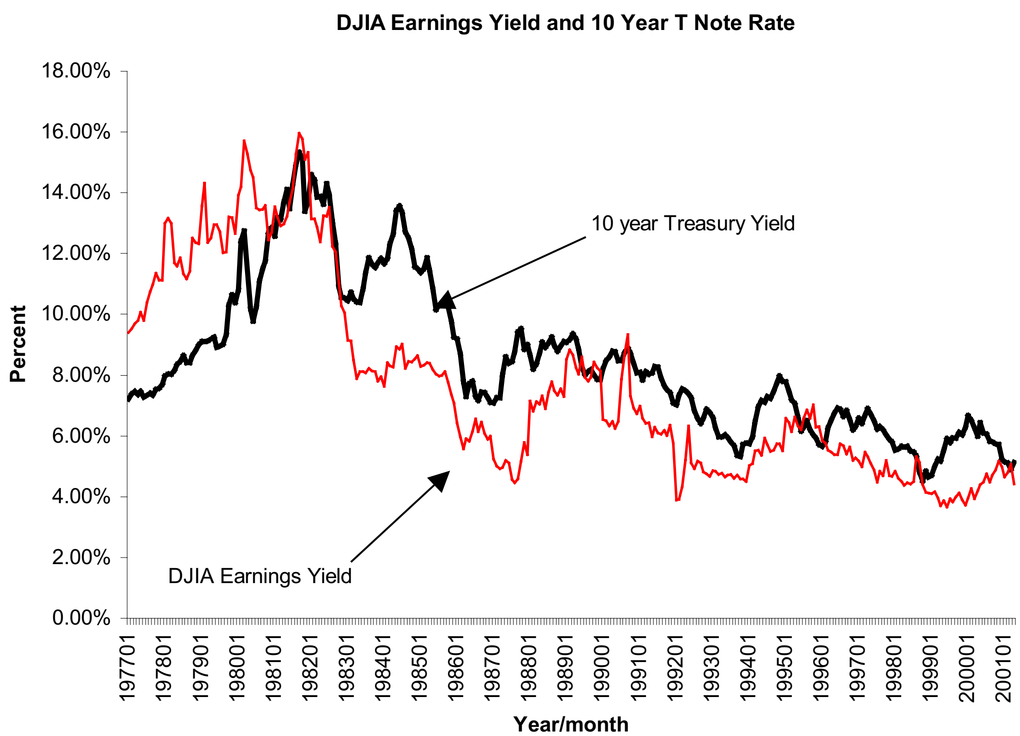

Figure 2: Monthly values of the earnings yield (last fiscal year's earnings) on the Dow Jones Industrial Average and the nominal yield on 10-year Treasury securities.

Empirically, this is a model that works very well. But on theoretical grounds, if most of the variation in nominal interest rates comes from changes in expected inflation rather than changes in real rates, the model should not work well. In fact, the strong positive correlation should theoretically be negative, in an efficient market. The logic was first pointed out by Modigliani and Cohn in their 1979 *FAJ* article, and is reiterated in my paper with Richard Warr in the March 2002 *JFQA*. The logic is that, for firms with debt in their capital structure, earnings are depressed by high nominal interest payments. The part of the nominal interest payment that goes to compensate bondholders for inflation reflects the decline in the real value of the liabilities of the firm. Accountants measure the cost to equityholders from the interest payments, but they don't measure the benefit to equityholders from the decline in the value of the firm's real liabilities. Thus, in an inflationary environment, accounting earnings underestimate the true economic earnings of a firm. Since accounting earnings are used to calculate the price-earning (P/E) ratio, the more economic earnings are understated, the higher should be the P/E ratio.

Now, inflation distorts accounting earnings in other ways, and the tax system is not inflation-neutral. But when Richard Warr and I adjust for these other effects, we conclude that the net impact is that P/E ratios should be higher, not lower, in periods of high inflation. This is exactly the opposite of the empirical evidence.

I think that there is a complacency in the profession. If we have an empirical pattern that is difficult to reconcile with theory, we shy away from saying that the market gets it wrong. Instead, we search for other explanations or just ignore the inconvenient facts.

The Fed model is typically not discussed in textbooks. But it is frequently discussed in the financial press, and there is never any discussion of why the empirical relation is inconsistent with rational valuation. Adjusted for business cycle effects, the earnings yield on stocks is an estimate of the expected real return on stocks.[1] The earnings yield is *not* an estimate of the expected *nominal* return on stocks. For the earnings yield to move one-for-one with the nominal bond yield, as the Fed model would have it, one has to assume that the nominal yield on bonds equals the real return on stocks. This is why the empirical success of the Fed model is inconsistent with rational valuation.

V. The Limits to Arbitrage and Market Efficiency

Securities markets in the United States are very good at getting the little things right. It is incredibly difficult to find high-frequency arbitrage opportunities that persist. But in my opinion, the profession has made a serious error in jumping to the conclusion that if the market gets the little things right, it must get the big things right. Low-frequency events are not amenable to formal statistical tests. By definition, they don't repeat themselves frequently. What makes it difficult to separate out overreactions that slowly correct themselves from rational time-variation in equilibrium expected returns is that the market gets overvalued when there are legitimate grounds for optimism, and undervalued when there are legitimate grounds for pessimism.

[1] Note that every textbook points out that the earnings yield on a stock is not the cost of equity capital for the firm, because earnings growth rates for firms vary all over the map. But the economy's growth rate of earnings does not vary much over time, once one accounts for business cycle effects. So the "normalized" earnings yield on the market is a good estimate of the cost of equity capital, in real terms, for the market as a whole.

By low-frequency events, I am referring to things like the October 1987 stock market crash, the Japanese bubble of the 1980s, and the TMT (technology, media, and telecom) bubble of the late 1990s.

Market efficiency does not just mean the lack of arbitrage profits. Just because it is difficult to design and implement strategies that will reliably make positive risk-adjusted profits does not mean that large misvaluations are not common. As Shleifer and Vishny (1997) have pointed out, taking positions in misvalued securities is extremely risky. For instance, if one shorted overvalued Japanese stocks at the beginning of 1988, one would have lost substantial money over the next two years. An investor who did this might not have had any capital left when the bubble finally burst starting in January of 1990.

Similarly, money managers that bet against overvalued internet stocks in early 1999 suffered huge losses before the TMT bubble burst starting in March 2000. Few of these investors had any capital left in March 2000. As with the Japanese bubble, unless one had the foresight to avoid taking a position when the misvaluations were large, and wait until the misvaluations became very large, you would have been wiped out. Being right in the long run is no consolation if you have lost everything in the short run.

But I am hard-pressed to find a discussion along these lines in most textbooks. Instead, the evidence on high-frequency efficiency is typically fallaciously applied to assert that low-frequency inefficiencies won't exist.

VI. Dividend Policy

The chapter on dividend policy should be called payout policy. There are two distinct issues-- the form of payout, and the level of payout. In the days of M&M, these were pretty much one and the same. But since 1984, they have been very different. The typical textbook covers the Modigliani and Miller theorem, taxes, and signaling, and then at the end of the chapter adds a few paragraphs on share repurchases. Instead, I would suggest that the first half of the chapter should be devoted to what determines the level of cash payouts, and the second half should be devoted to the choice between share repurchases and dividends. The empirical evidence is that taxes are at best a second-order consideration in determining the form of payout. In particular, any tax-based model would predict that there should have been much more share repurchases prior to the 1986 tax reform act, because capital gains had been given preferential tax status. Shefrin and Statman's 1984 *Journal of Financial Economics* article giving behavioral reasons for cash dividends is barely mentioned, if it is mentioned at all, in most textbooks.

I suspect that if most of us were writing a textbook from scratch today, the chapter on payout policy would look very different than the one that appears in textbooks. There is a strong path-dependency involved. Even if a textbook author wants to make a major change, most professors don't want to have to revise their lecture notes.

VII. Lease Finance

Most textbooks cover leasing before they cover options. Many leases give the lessee the right to buy the item that they have leased at the end of the lease, at a fixed exercise price. This option is valuable. But most textbooks ignore it, because they haven't covered option pricing theory yet.

Similarly, most textbooks cover issuing equity before options are covered. Many of these textbooks cover rights offerings in their chapter on issuing equity or raising capital. But because they haven't covered options yet, they don't note that a right is just a warrant. So they don't give the correct formula for valuing a right that is not deep in the money.

The deferral of the options chapter until late in the book has other costs. In one prominent textbook (I won't mention names, to protect the guilty), convertible bonds are covered before option pricing is covered. The gyrations that the textbook has to go through are funny, except that students don't get the humor.

VIII. Conclusions

I've taken issue with the way we as a profession teach certain things, and the way that textbooks present them. These are some of my pet peeves. I'm sure that each of us could make up a list. But I have to concede that I find it a lot easier to criticize others than to do it right myself. I have no intention of writing a textbook. And even if I did, and got a lot of things right that other textbooks get wrong, I'm sure that I would introduce different mistakes.

About seven years ago I attended an NBER meeting where Michael Jensen was one of the speakers. Jensen received his Ph.D. from Chicago in 1968. I received my Ph.D. from Chicago in 1981, and by that time a number of Jensen's articles were on the reading lists. At the NBER meeting, Jensen said that he had come to realize that most of what he learned in graduate school was wrong. Well, I feel that way, too. Twenty years from now, I expect that my former doctoral students will be saying that a lot of what they learned in graduate school was wrong. I just wish that I knew now which things that I'm teaching are wrong, rather than having to wait twenty years to find out.

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ON COMPUTING MEAN RETURNS AND THE SMALL FIRM PREMIUM

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Received January 1983, final version received June 1983

The mean return computational method has a substantial effect on the estimated small firm premium. The buy-and-hold method, which best mimics actual investment experience, produces an estimated small-firm premium only one-half as large as the arithmetic and re-balanced methods which are often used in empirical studies. Similar biases can be expected in mean returns when securities are classified by any variable related to trading volume.

1. Introduction

There is a potentially serious problem in estimating expected return differences between small and large firms. Even with exactly the same sample observations, the method used to compute sample mean returns can have a substantial effect on the estimates.

With an arithmetic computational method, daily returns on individual stocks are averaged across both firms and days to obtain the mean daily return on an equally-weighted portfolio; then the portfolio's mean daily return is compounded to obtain an estimate of the expected return over a longer interval. With a buy-and-hold method, individual stock returns are first obtained for the longer interval by linking together the daily individual returns; then an equally-weighted portfolio's mean return is computed by averaging the longer-term (individual) returns.

Defining a 'longer interval' as one year, the arithmetic method produces an average annual return difference of 14.9 percent between AMEX and NYSE stocks[1] over the 19 complete calendar years, 1963–1981 inclusive. The buy-and-hold method gives an annual return difference of only 7.45 percent. Assuming that annual returns are statistically independent, the arithmetic

*Comments and suggestions by Gordon Alexander, Kenneth French, Stephen Ross and the referee, Allan Kleidon, are gratefully acknowledged.

[1]The effect of smallness can be measured by the difference in returns of stock listed on the American Exchange (AMEX) and the New York Exchange (NYSE) because AMEX issues are, on average, much smaller than NYSE issues. Most of the results presented here are based on the AMEX–NYSE differential because it is convenient and easy to use. Some confirmatory results based directly on measured size will also be presented.

method's return differential had an associated t-statistic of 3.07 while the buy-and-hold method yielded a t-statistic of 1.53.

Speculation on possible causes of the small firm premium has occupied the attention of many finance theorists over the past few years; but perhaps this attention has been premature. If the estimated small firm premium can be cut in half simply by compounding individual returns before averaging them, some consideration should be given to whether the magnitude of the true premium is really all that large. The various explanations for the premium offered so far would become more plausible if the premium is actually smaller than has been previously reported.

This paper investigates why the mean return computational method can be such a significant choice in some empirical research. The reason seems to be that individual asset returns are not as well-behaved as we might like. Individual assets do not trade continuously and there are significant trading costs. In some empirical studies, the effect of these factors might be safely ignored; but when the object of investigation is related to trading volume (and thus to trading frequency and trading costs), there can be measurement problems. Firm size is related to trading volume and it is used as an example throughout the paper. Other variables related to size and to trading, such as dividend yield, price/earnings ratio, and beta, could also present similar empirical difficulties. Section 2 gives a brief theoretical discussion of mean return computational methods and section 3 presents details of the empirical results for small firm premia.

2. Compounding and the bias in mean return calculation

2.1. Formulae for computing mean returns

To elucidate the differences in mean return computation and explain why they might produce different results, consider a sample of N securities, each having returns observed for T periods. Let R_{it} be the value relative (1 + return), of security i in period t. Suppose also that investment results are reviewed every τ periods. For example, if data were available daily but returns were to be reviewed every month, we would have $\tau \cong 21$ since there are usually about 21 trading days per month.

Two alternative methods of computing the mean equally-weighted return over the review period can be written algebraically as

$$\bar{R}_{\mathrm{AR}} = \left[\frac{1}{N \cdot \tau} \sum_i \sum_t R_{it}\right]^{\tau}, \tag{1}$$

$$\bar{R}_{\mathrm{BH}} = \frac{1}{N} \sum_i \left[\prod_t R_{it}\right], \tag{2}$$

where the subscripts 'AR' and 'BH' denote 'arithmetic' and 'buy-and-hold', respectively. These labels are intended to portray the sense of the computation method. The first method (1) is simply an arithmetic mean raised to the τth power while the second method gives the actual investment results an investor would achieve from buying equal dollar amounts of N securities and holding the shares for τ periods.

There is also a third possible definition of mean return,

$$\bar{R}_{\mathrm{RB}} = \prod_t \left[\frac{1}{N}\sum_i R_{it}\right], \tag{3}$$

where the subscript 'RB' stands for 'rebalanced'. This would be the actual investment return (ignoring transactions costs) on a portfolio which begins with equal investments in the N securities and *maintains* equal investments by rebalancing at the end of each period, $t = 1, \ldots, \tau$.

To compare results over different review periods, we must choose some typical and familiar calendar interval, say a year, and express the results as percentage returns over that common calendar interval. In the tables below, annualization is accomplished and reported for 'linked' returns; the review period returns within each calendar year are simply multiplied together (or linked) in order to obtain an annual return.[2] Linked annualization includes *every* daily observation in some review period during the year. This assures that in any comparison of the results across review periods, the observed differences are due to review period alone and cannot be ascribed to slightly different sample observations.

The next two subsections investigate some properties of these sample mean returns. Subsection 2.2 derives their expected values under the assumption of temporally independent individual asset returns. Subsection 2.3 then examines the effect of intertemporal dependence.

[2]The exact formulae for linked returns can be written as follows. Let $\bar{R}_m(y,\tau)$ denote the mean annualized linked return for year y ($y = 1, \ldots, Y$) using a review period whose length is τ trading days and using method ($m = \mathrm{BH}, \mathrm{AR}, \mathrm{RB}$), to compute the review period returns. Then,

$$\bar{R}_{\mathrm{BH}}(y,\tau) = \prod_{j=(y-1)k_\tau+1}^{y \cdot k_\tau} \left[\frac{1}{N}\sum_i \prod_{t=(j-1)\tau+1}^{j \cdot \tau} (R_{it})\right],$$

$$\bar{R}_{\mathrm{AR}}(y,\tau) = \prod_{j=(y-1)k_\tau+1}^{y \cdot k_\tau} \left[\frac{1}{N \cdot \tau}\sum_i \sum_{t=(j-1)\tau+1}^{j \cdot \tau} R_{it}\right]^\tau,$$

$$\bar{R}_{\mathrm{RB}}(y,\tau) = \prod_{j=(y-1)k_\tau+1}^{y \cdot k_\tau} \left\{\prod_{t=(j-1)\tau+1}^{j \cdot \tau} \left[\frac{1}{N}\sum_i R_{it}\right]\right\},$$

where $k_\tau = T/(Y \cdot \tau)$ is the number of review periods per year and T is the total number of trading days in the entire sample. When returns are reviewed in natural calendar intervals such as months, the review period cannot be a fixed number of trading days and thus τ in the formulae above varies slightly with the actual number of trading days.

2.2. Sample mean return biases with temporal independence

Following Blume (1974), assume that each individual asset return is drawn from a stationary distribution with temporally independent disturbances; that is,

$$\tilde{R}_{it} = \mu_i + \tilde{\varepsilon}_{it}, \quad \forall i, \tag{4}$$

with $E(\tilde{R}_{it}) = \mu_i$, a constant for all t, and where the unexpected return, $\tilde{\varepsilon}_{it}$, satisfies $\operatorname{cov}(\tilde{\varepsilon}_{i,t}, \tilde{\varepsilon}_{i,t-j}) = 0$ for $j \neq 0$.

The expected value of the arithmetic mean (1) can be expressed as

$$E(\bar{R}_{AR}) = E\left[\left(\frac{1}{N}\sum_i \mu_i + \tilde{h}\right)^{\tau}\right], \tag{5}$$

where

$$\tilde{h} \equiv \frac{1}{N \cdot \tau} \sum_i \sum_t \tilde{\varepsilon}_{it}$$

is the average disturbance on the equally-weighted portfolio over the sample review period τ.

The expected value of the buy-and-hold mean (2) is

$$E(\bar{R}_{BH}) = \frac{1}{N}\sum_i \left[E \prod_t (\mu_i + \tilde{\varepsilon}_{it})\right] = \frac{1}{N}\sum_i (\mu_i^{\tau}). \tag{6}$$

This follows since the expectation can be taken inside the product with independent returns and since $E(\tilde{\varepsilon}) = 0$, by definition.

The rebalancing method (3) produces a mean return whose expectation is

$$E(\bar{R}_{RB}) = \prod_t \left[\frac{1}{N}\sum_i \mu_i\right] = \left(\frac{1}{N}\sum_i \mu_i\right)^{\tau}, \tag{7}$$

where, again, the expectation can be taken inside the product because of time independence.

Expressions (5), (6) and (7) imply that the three different mean return definitions do not produce the same results. By Jensen's inequality,

$$E(\bar{R}_{AR}) \geqq E(\bar{R}_{RB}),^3$$

[3] Jensen's inequality for a random variable $\tilde{x}$ and a convex function $f(x)$ is $E[f(\tilde{x})] \geqq f[E(x)]$. Let $\tilde{x} \equiv (1/N)\sum_i \mu_i + \tilde{h}$; then $f(\tilde{x}) = \tilde{x}^{\tau}$ is convex since $\tau > 1$. $E(\bar{R}_{AR}) > E(\bar{R}_{RB})$ follows immediately from (5) and (7) since $E(\tilde{h}) = 0$.

with strict inequality if $\mathrm{var}(\tilde{h}) > 0$, and

$$\mathrm{E}(\bar{R}_{\mathrm{BH}}) \geqq \mathrm{E}(\bar{R}_{\mathrm{RB}}),^{4}$$

with strict inequality if $N > 1$ and at least two assets have different returns. Since we generally have some randomness [$\mathrm{var}(\tilde{h}) > 0$], and many securities, ($N > 1$), the rebalanced method generally should produce lower mean returns than either the arithmetic or the buy-and-hold method, provided that returns are temporally independent.

The relation between the buy-and-hold and arithmetic means is more complex; and, indeed, neither is invariably smaller than the other. The larger the cross-sectional dispersion of individual expected returns, the larger $\mathrm{E}(\bar{R}_{\mathrm{BH}})$ relative to $\mathrm{E}(\bar{R}_{\mathrm{AR}})$. But there is an offsetting influence: the larger the intertemporal dispersion of unexpected returns ($\tilde{h}$), the larger $\mathrm{E}(\bar{R}_{\mathrm{AR}})$ relative to $\mathrm{E}(\bar{R}_{\mathrm{BH}})$.[5] Their relation in a given sample depends, therefore, on the characteristics of the underlying individual returns.

2.3. *Time series dependence and its effect on estimated expected returns*

The effect of serial dependence is seen most easily by examining expected mean returns when the review period is doubled, say from daily to bi-daily or from bi-weekly to monthly. Assume first that returns are collected for the shorter review period and then let $\tau = 2$ (a doubling of the period). Over the doubled review period, the three mean returns are

$$\bar{R}_{\mathrm{AR}} = \left[\frac{1}{N}\sum_i\left(\mu_i + \frac{\varepsilon_{i1} + \varepsilon_{i2}}{2}\right)\right]^2, \tag{8}$$

[4]Define $f(\mu_i) = \mu_i^{\tau}$, a convex function for $\tau > 1$. With $1/N$ used as a (pseudo) probability, $\mathrm{E}(\bar{R}_{\mathrm{BH}}) \geqq \mathrm{E}(\bar{R}_{\mathrm{RB}})$ follows immediately from (6) and (7). (Cf. footnote 3.) Strict inequality holds if at least two μ_i's are different. [This result was noted by Cheng and Deets in (1971).]

The inequality above grows with the cross-sectional dispersion in μ_i, ceteris paribus. To prove this, expand μ_i^{τ} in a Taylor series about $\bar{\mu} \equiv (1/N)\sum_i \mu_i$; the second-order term is a positive function of the cross-sectional variance in μ_i. If μ_i were cross-sectionally normally distributed, the variance *alone* would determine the size of the inequality.

[5]This can be confirmed by using a Taylor series expansion of $\mathrm{E}(\bar{R}_{\mathrm{AR}})$. Define $\bar{\mu} = (1/N)\sum_i \mu_i$; then

$$\mathrm{E}(\bar{R}_{\mathrm{AR}}) = \bar{\mu}^{\tau}\,\mathrm{E}\left[1 + \frac{\tilde{h}^2}{2}(\tau)(\tau-1)\bar{\mu}^{-2} + \frac{\tilde{h}^3}{3!}(\tau)(\tau-1)(\tau-2)\bar{\mu}^{-3} + \ldots + \tilde{h}^{\tau}\bar{\mu}^{-\tau}\right].$$

Jensen's inequality (see footnote 4 above), implies that $\mathrm{E}(\bar{R}_{\mathrm{BH}}) > \bar{\mu}^{\tau}$ with the inequality being larger the larger the cross-sectional variance in μ_i. But the term in brackets just above shows that $\mathrm{E}(\bar{R}_{\mathrm{AR}})$ increases with the higher moments of $\tilde{h}$ (since $\bar{\mu}$ is strictly positive). For example, the second term in brackets involves the variance of $\tilde{h}$. Conceivably, this term could more than offset the cross-sectional variance in μ_i. If the unexpected arithmetic portfolio return h happens to be normally-distributed, the expression above simplifies to $\mathrm{E}(\bar{R}_{\mathrm{AR}}) = \bar{\mu}^{\tau}[1 + k \cdot \mathrm{var}(\tilde{h})]$ with the constant $k > 0$. In this case, there is a simple and direct tradeoff between the cross-sectional variance in expected return, μ_i, and the variance of the unexpected portfolio return, $\tilde{h}$.

$$\bar{R}_{\mathrm{BH}}=\frac{1}{N}\sum_{i}[(\mu_i+\varepsilon_{i1})(\mu_i+\varepsilon_{i2})], \tag{9}$$

$$\bar{R}_{\mathrm{RB}}=\left[\frac{1}{N}\sum_{i}(\mu_i+\varepsilon_{i1})\right]\left[\frac{1}{N}\sum_{i}(\mu_i+\varepsilon_{i2})\right], \tag{10}$$

where $R_{it}=\mu_i+\varepsilon_{it}$ is the observed return on individual stock i ($i=1,\dots,N$) in period t, and μ_i is i's single-period (i.e., shorter review period) expected return.

For notational convenience, define the cross-sectional averages

$$\bar{\mu}=\frac{1}{N}\sum_{i}\mu_i \quad \text{and} \quad \bar{\varepsilon}_t=\frac{1}{N}\sum_{i}\varepsilon_{it}.$$

Then the three mean returns have expected values,

$$\mathrm{E}(\bar{R}_{\mathrm{AR}})=\bar{\mu}^2+\tfrac{1}{2}(\sigma_{\bar{\varepsilon}}^2+\sigma_{\bar{\varepsilon}_1,\bar{\varepsilon}_2}), \tag{11}$$

$$\mathrm{E}(\bar{R}_{\mathrm{BH}})=\frac{1}{N}\sum_{i}\mu_i^2+\frac{1}{N}\sum_{i}\sigma_{\varepsilon_{i1},\varepsilon_{i2}}, \tag{12}$$

$$\mathrm{E}(\bar{R}_{\mathrm{RB}})=\bar{\mu}^2+\sigma_{\bar{\varepsilon}_1,\bar{\varepsilon}_2}, \tag{13}$$

where σ_x^2 is the variance of x and $\sigma_{x,y}$ is the covariance of x and y.

Even with serial dependence, the expected arithmetic mean still exceeds the expected rebalanced mean in all circumstances since,

$$\mathrm{E}(\bar{R}_{\mathrm{AR}}-\bar{R}_{\mathrm{RB}})=\tfrac{1}{2}(\sigma_{\bar{\varepsilon}}^2-\sigma_{\bar{\varepsilon}_1,\bar{\varepsilon}_2})>0. \tag{14}$$

Comparing the buy-and-hold means and the rebalanced means, we have

$$\mathrm{E}(\bar{R}_{\mathrm{BH}}-\bar{R}_{\mathrm{RB}})=\sigma_{\mu_i}^2+\left(\frac{1}{N}\sum_{i}\sigma_{\varepsilon_{i1},\varepsilon_{i2}}-\sigma_{\bar{\varepsilon}_1,\bar{\varepsilon}_2}\right).$$

With no serial dependence in the ε's, the term in parentheses is zero and the BH mean would exceed the RB mean by the cross-sectional variance in expected individual returns.

However, with negative serial dependence in unexpected individual returns (ε_{i1} and ε_{i2}) or positive dependence in portfolio returns ($\bar{\varepsilon}_1$ and $\bar{\varepsilon}_2$), the rebalanced mean would become larger; enough such dependence could conceivably render it larger that the buy-and-hold mean. Since the expected arithmetic mean exceeds the expected rebalanced mean, it too could be larger than the BH mean with enough serial dependence of the right type.

There is some reason to anticipate just this type of serial dependence because of the intertemporal characteristics of individual returns. Scholes and Williams (1977, pp. 313–314) explain that because of non-synchronous trading individual assets display first-order *negative* serial dependence while diversified portfolios display *positive* dependence. A difference in the sign of serial dependence between individual assets and portfolios is relevant here because buy-and-hold (BH) means are mainly affected by individual asset serial dependence [see (12)], while the arithmetic (AR) and rebalanced (RB) means are affected by portfolio serial dependence [see (11) and (13)]. The Scholes/Williams explanation implies that BH means would tend to fall as review period lengthens while the AR and RB means would tend to rise.

There is also negative serial dependence induced in very short-term returns because of the institutional arrangement of trading. Neiderhoffer and Osborne (1966) pointed out that negative serial dependence should be anticipated when a market maker is involved in most transactions (because successive transactions are conducted at either the bid or the asked price).[6]

First-order negative serial dependence in individual returns has the effect of widening the disparity between the buy-and-hold mean and the arithmetic and rebalanced means as the review period lengthens. This follows from the fact that a doubling of the review period introduces serial covariance terms in *addition* to those already present. However, the marginal effect of lengthening the review period should probably diminish as the review period becomes longer; the effect on measured mean return should be greater when changing from, say, a daily to a weekly review period than from a monthly to an annual period. The exact impact of serial dependence can, of course, only be determined empirically and we now turn to an examination of the data.

3. The empirical small firm premium

3.1. Results

In the previous section, we found that the computational formula for sample mean returns can affect the estimated expected return. The buy-and-hold (BH) mean (2) gives an unbiased estimate of the holding period return on a realistic portfolio. The rebalanced (RB) mean (3), gives an unbiased estimate of return for its strategy but it is not realistic if the period is short since rebalancing is so costly. Except under a fortuitous combination of circumstances, the arithmetic (AR) mean (3) gives a biased estimate of *both* the rebalanced and the buy-and-hold investment returns.

[6]A paper by Blume and Stambaugh (1983), which came to my attention after the first version of this paper was written, investigates this explanation for serial dependence in detail. They find empirical results very similar to those reported here. See also Cohen et al. (1979).

Although the arithmetic and rebalanced methods of calculating the mean return probably do not portray realistic investment experience, the small-firm premium is calculated as the *difference* between the two mean returns and one might hope that the improper portrayal in these methods would cancel. Unfortunately, this is not likely for several reasons. The intertemporal variance in the portfolio disturbance, $\tilde{h}$, and the cross-sectional variance in individual security expected returns, μ_i, will not be the same in samples of large and small firms. The disturbance, $\tilde{h}$, will almost certainly have a larger variance for portfolios of small firms while the cross-sectional variances of μ_i within large- and small-firm portfolios could conceivably differ in either direction. Furthermore, serial dependence has an effect which is stronger for stocks with lower trading volumes and thus with less synchronous trading and with larger bid/ask spreads.

Empirical evidence is reported in table 1. Small Firm Premia (AMEX–NYSE) are given for the 19 complete calendar years, 1963–1981, according to the method of computation and the 'review' period. As explained earlier, the 'review' period refers to the rebalancing interval for buy-and-hold returns. For example, with a monthly review period, an equal allocation is made to stocks listed on the first day of the month and the original positions are held until the end of the month. This is repeated for each calendar month of the sample. The daily rebalancing method uses the same available returns, but it re-initializes equal positions every day during the month. The arithmetic method simply averages the same available returns during the month.

In order to compare results across the different review periods, returns are annualized by linking together the review period returns obtained during the calendar year.[7] Thus, there are 19 annual observations (one for each calendar year, 1963–81), regardless of the review period.[8] Means and t-statistics are calculated from the 19 annual returns differences between exchanges; t-

[7]See footnote 2 for exact computational formulae.

[8]Daily and bi-daily returns are over trading day intervals, while weekly and longer returns use actual calendar intervals. In the weekly case, the first week of the year ends on the same day of the week as the last trading day of the previous year, say Thursday for a given year. Then weekly returns are computed from Thursday to Thursday during that year. If the year does not terminate on a Thursday trading day, the last 'weekly' return of the year is over the remaining fraction of a calendar week. This method of year-end padding was used to ensure that every daily return during a year was included, regardless of the review period. Only the bi-daily, weekly, and bi-weekly returns are subject to such padding because the other intervals are evenly divisible into years.

Weekly returns are not always for five trading day intervals. During 1968, the exchanges were closed on Wednesdays for part of the year so that a week was composed of only four trading days. Holidays are also a problem for weekly returns; if the calendar week ended on a holiday, the return was computed through the next trading day. Then the subsequent week's return covered four trading days. Bi-weekly returns were treated identically to weekly returns with respect to year-end padding, holidays, and exchange closings.

Table 1

The small firm premium as measured by the difference in returns between American Exchange and New York Exchange listed stocks, 1963–1981 (basic data are daily, January 2, 1963 — December 31, 1981).

Review period[a] (number of review periods in sample)	Return computation method[b]		
	Buy-and-hold (BH)	Arithmetic (AR)	Daily rebalancing (RB)
	AMEX–NYSE mean return differential (% per annum)[c]		
Daily (4767)	14.9 (3.16) [7.76]	14.9 (3.16) [7.76]	14.9 (3.16) [7.76]
Bi-daily (2389)	12.3 (2.64) [5.58]	14.9 (3.16) [7.06]	14.8 (3.15) [7.01]
Weekly (992)	9.81 (2.16) [3.35]	14.8 (3.15) [5.64]	14.7 (3.14) [5.62]
Bi-weekly (498)	8.27 (1.84) [2.46]	14.9 (3.14) [5.09]	14.7 (3.13) [5.07]
Monthly (228)	7.06 (1.58) [1.82]	14.9 (3.14) [4.40]	14.7 (3.11) [4.38]
Quarterly (76)	6.42 (1.43) [1.67]	15.0 (3.15) [3.88]	14.8 (3.12) [3.85]
Annual (19)	7.45 (1.53) [1.53]	15.1 (3.10) [3.10]	14.9 (3.07) [3.07]

[a]For the daily and bi-daily cases, one- and two-trading-day intervals were used respectively. For all other cases, actual calendar intervals were used. (In the weekly and bi-weekly cases, a residual interval was necessary to fill out each calendar year). All returns were compounded to an annual basis by linking successive observations within each year (see footnote 2 of the text).

[b]The computation method follows expressions (1), (2) and (3) of the text. For interested readers, the author will gladly supply a mimeographed sheet containing details on the treatment of delisting and listing securities. The main feature of the treatment of new listings and delistings was to assure that all three mean return methods employed exactly the same sample observations.

[c]t-statistics based on the 19 annual (linked) observations are in parentheses; t-statistics based on the review period returns as independent observations are given in brackets. To understand the difference in the two reported t-statistics, consider the example of the daily review period of which there are 4767 in the sample. The t-statistic in brackets is calculated from these 4767 (daily) observations (mean *daily* return divided by standard error of mean daily return). The t-statistic in brackets is calculated from 19 annual observations; each annual observation having been calculated by linking together approximately 250 (4767/19) daily observations observed during that year. In calculating the review-period-based t-statistics for the weekly and bi-weekly cases, ten days were omitted; these ten days were the reminders of partial weeks at year end. It turned out that in 10 years of the 19, the year was exactly 52 weeks plus one trading day long. An earlier version of the paper, available on request, details the effect of omitting these single-day partial weeks. N.B. This is an issue only for the bracketed t-statistics. The linked annual returns include *every* sample day.

statistics are also given based on review period returns taken as independent observations.[9]

The results most like actual investment experience are those in the first column, buy-and-hold returns. Most actual portfolios pursue a buy-and-hold strategy within a given review period with only minor modifications induced by new information about particular individual issues. The results are frequently expressed on an annual percentage basis by comparing wealth levels at the ends of successive years, i.e., after linking sub-year results.

The review period seems to have little effect on the AR and RB means. The annual average difference in returns between AMEX and NYSE issues is about fifteen percent. But for the BH means, the review period has a large impact. Monthly and longer review periods give an AMEX–NYSE return differential of only around seven percent (and the t-statistic does not indicate an overwhelming probability that the differential is even positive). The drop in the BH mean with lengthening review period is statistically significant and so is the difference between the BH and the other means.[10]

[9]Note that the t-statistics in these tables are based on the assumption that the annual returns (t-statistics in parentheses) and review period returns (t-statistics in brackets) are temporally independent. The results indicate that the AR and RB returns are, in fact, close to independent while there is negative serial dependence in the BH returns. This implies that the t-statistics for the BH means are actually *understated*.

[10]A statistical test of the significance of the review period can be conducted by considering each year's mean difference, AMEX–NYSE, as an independent observation. Let $D_{m,y,\tau}$ be the difference for year y, review period τ, and the method m (m = BH, AR, RB). Then the time series mean of $D_{m,y,\tau} - D_{m,y,\tau'}$ ($\tau \neq \tau'$) can be tested for significance under the presumption that the years constitute independent observations. t-statistics for the AR and RB means, for all combinations of τ and τ', never indicated significance. Of the 42 combinations (21 for each mean AR and RB) none exceeded 2.0, five exceeded 1.5, and 28 were less than 1.0. In contrast, the t-statistics for the BH mean comparisons across review periods are given below:

Review period τ'	Review period τ Daily	Bi-daily	Weekly	Bi-weekly	Monthly	Quarterly
Bi-daily	6.21					
Weekly	6.75	6.82				
Bi-weekly	7.67	8.37	10.8			
Monthly	8.11	8.89	11.3	9.82		
Quarterly	8.10	7.68	8.65	6.49	3.27	
Annual	5.08	4.42	2.81	1.04	−0.532	−1.67

All BH means are significantly different across-review periods except the annual mean versus the bi-weekly, monthly and quarterly means. Note that these table entries are not statistically independent of one another (they were all calculated from the same underlying data).

A similar procedure can be employed to test the statistical significance of mean computational method. The difference $D_{m,y,\tau} - D_{m',y,\tau}$ ($m \neq m'$) forms another time series across years. Based on 19 annual observations, t-statistics for the significance of this difference from zero are as follows:

Given that the BH results in table 1 are most likely to portray actual investment experience, we now turn to the interesting econometric question: What explains the observed pattern of means? To aid in answering this question, the mean returns for each exchange are presented separately in table 2. Notice that the pattern is not predicted by the expected values of the mean returns derived in section 2.2 under the assumption of temporally independent returns. With serial independence, the BH expected mean should be greater than the RB expected mean. The empirical results in table 2 show, however, that serial dependence must be present since $\bar{R}_{BH}$ falls below $\bar{R}_{RB}$ as the review period lengthens.

The arithmetic (AR) mean is larger than the rebalanced (RB) mean as was expected with or without serial dependence. However, these two means are very close and this suggests that serial dependence in *portfolio* returns is not much of an influence [Cf. eq. (14)]. Indeed, the strikingly different behavior of the BH means from the other two means indicates that negative serial dependence in individual securities is the dominant influence on the results.

In order to be certain that the AMEX–NYSE comparison measures the small firm effect properly, table 3 is presented. It contains results for the annual review period and for portfolios classified directly by size. Firm size was calculated as market capitalization (market price times number shares), at the end of each year, 1962–1980. Firms were assigned to fractiles based on market capitalization and their returns were calculated for the following year according to three mean return methods, BH, AR, and RB.

Not surprisingly, the results are consistent with the AMEX corresponding to lower size quintiles and the NYSE to higher quintiles. The overall implication is identical: viz., the estimated small firm premium is much smaller and less significant when mean returns are computed with the buy-

Review period τ	$m=\text{AR}$, $m'=\text{BH}$	$m=\text{RB}$, $m'=\text{BH}$	$m=\text{AR}$, $m'=\text{RB}$
	t-statistic for difference		
Bi-daily	6.82	6.30	1.47
Weekly	7.33	6.80	1.59
Bi-weekly	8.14	7.59	1.74
Monthly	8.44	7.90	2.17
Quarterly	8.21	7.69	2.72
Annual	5.85	5.48	3.16

No statistic was computed in the daily case because all three means are identical by construction in that case. Notice that the BH means are significantly smaller than the other two means for all review periods.

Although the difference between the AR and RB small firm premium is very small (cf. table 1), the AR mean premium is always larger and is significantly larger for monthly, quarterly and annual review periods. This is predicted by eq. (14); the AR mean grows with review period relative to the RB mean.

Table 2
Mean returns on NYSE and AMEX listed securities, 1963–1981.[a]

Review period	Buy-and-hold (BH) NYSE	Buy-and-hold (BH) AMEX	Arithmetic (AR) NYSE	Arithmetic (AR) AMEX	Daily rebalancing (RB) NYSE	Daily rebalancing (RB) AMEX
	Mean returns (% per Annum)					
Daily	17.24	32.09	17.24	32.09	17.24	32.09
	(2.94)	(3.29)	(2.94)	(3.29)	(2.94)	(3.29)
	[5.09]	[7.72]	[5.09]	[7.72]	[5.09]	[7.72]
Bi-daily	16.93	29.23	17.53	32.42	17.24	32.09
	(2.89)	(3.03)	(2.98)	(3.31)	(2.94)	(3.29)
	[4.59]	[6.25]	[4.76]	[6.96]	[4.68]	[6.88]
Weekly	16.38	26.19	17.79	32.61	17.26	31.99
	(2.80)	(2.78)	(3.02)	(3.34)	(2.94)	(3.28)
	[4.47]	[5.32]	[4.81]	[6.44]	[4.68]	[6.32]
Bi-weekly	15.86	24.14	17.95	32.83	17.29	32.08
	(2.72)	(2.58)	(3.05)	(3.36)	(2.95)	(3.28)
	[4.29]	[4.66]	[4.71]	[5.85]	[4.58]	[5.74]
Monthly	15.34	22.39	18.07	32.96	17.34	32.08
	(2.65)	(2.42)	(3.07)	(3.36)	(2.95)	(3.28)
	[3.11]	[3.08]	[3.67]	[4.54]	[3.51]	[4.41]
Quarterly	15.01	21.42	18.17	33.17	17.38	32.19
	(2.63)	(2.33)	(3.09)	(3.38)	(2.96)	(3.29)
	[2.73]	[2.62]	[3.22]	[3.84]	[3.09]	[3.73]
Annual	15.18	22.63	17.96	33.07	17.16	32.03
	(2.69)	(2.39)	(3.11)	(3.36)	(2.98)	(3.27)
	[2.69]	[2.39]	[3.11]	[3.36]	[2.98]	[3.27]

[a]See footnotes to table 1.

and-hold method than when means are computed with the AR and RB methods.

3.2. *Implications for previous research and for the 'risk-adjusted' small firm premium*

The implications of these findings for previously-published estimates of the small firm premium are: if the basic data were very short-term and arithmetic or rebalanced means were used, the estimated premium overstates the reward investors can expect from a buy-and-hold position in small firms. Papers by Reinganum (1981a, b, 1982) and Roll (1981) used daily data and arithmetic mean returns. Reinganum's (1982) paper gives monthly and quarterly returns but these were computed with the daily rebalancing method since the author states that '... these holding period returns are created by compounding the daily *portfolio* returns' (p. 34, emphasis added).

Table 3
Mean returns and small firm premia for portfolios classified by size[a] at year-end, 1963–1981, annual review period.

Size quintile	Return computation method[b] Buy-and-hold (BH)	Arithmetic (AR)	Daily rebalancing (RB)
	Mean return (% per annum)[c]		
Smallest	27.9 (2.42)	46.0 (3.68)	44.9 (3.61)
2	21.1 (2.51)	27.6 (3.15)	26.6 (3.04)
3	17.1 (2.41)	20.7 (2.86)	19.7 (2.73)
4	14.6 (2.53)	16.9 (2.89)	16.1 (2.75)
Largest	10.8 (2.50)	12.2 (2.85)	11.5 (2.68)
	Small firm premium, smallest–largest quintile (% per annum)		
	17.1 (1.88)	33.9 (3.47)	33.4 (3.46)
	Small firm premium, smallest–largest decile (% per annum)		
	22.8 (2.07)	49.1 (3.84)	48.3 (3.83)

[a]Firms are included in the kth size fractile if the closing price times the number of outstanding shares is ranked in that fractile among all listed AMEX and NYSE firms.

[b]The computation method follows expressions (1), (2) and (3) of the text. An unpublished appendix (available from the author) contains details on the treatment of listing and delisting.

[c]t-statistics based on 19 annual observations are in parentheses.

Papers with monthly returns are apparently much less subject to mean return estimation problems. Tables 1 and 2 show that there is little additional discrepancy between the BH and other means in going from monthly to annual data. The well-known paper by Banz (1981) used monthly data as did earlier papers on the closely-related stock price effect [Blume and Husic (1973), Bachrach and Galai (1979)]. Thus, it seems unlikely that the results presented in those papers will be much affected by the problem investigated here. In a more recent paper, Reinganum, (1983) used the buy-and-hold method and found results close to those reported above. Reinganum did not, however, contrast the buy-and-hold with other mean returns.

It is important to ascertain whether the *risk-adjusted* small firm premium is attributable solely to econometric problems. Is underestimation of risk for small firms [Roll (1981), Reinganum (1982)], combined with overestimation of expected returns, sufficient to induce the observed risk-adjusted premium; or is the premium really evidence of a misspecified capital asset pricing model (CAPM), perhaps because of omitted factors in the single index CAPM?

This is tantamount to asking whether the implicit CAPM market risk premium $\hat{p}$ ($\hat{p} \equiv \hat{\mathrm{E}}(R_{\text{small}} - R_{\text{large}})/(\hat{\beta}_{\text{small}} - \hat{\beta}_{\text{large}})$), is in a reasonable range. $\hat{p}$ was computed by Reinganum (1983) as 37.5 percent per annum using (a) buy-and-hold means on the smallest and largest deciles of NYSE and AMEX stocks, (b) Dimson's (1979) aggregated coefficient betas, (c) the value-weighted C.R.S.P. index and (d) daily data for 1963–1980. The return on the value-weighted index during this period was only about 9.5 percent, so $\hat{p}$ is grossly too large, thereby indicating a substantial risk-adjusted small firm premium.

The main problem with such a test was described some time ago [Roll (1977)]. Even if we make the dubious assumption that the value-weighted C.R.S.P. index is ex-ante mean/variance efficient, there is no necessity in the generalized Black (1972) C.A.P.M. that $\mathrm{E}(\hat{p}) = \mathrm{E}(R_M - R_F)$. Instead, the model requires that $\mathrm{E}(\hat{p}) = \mathrm{E}(R_M - R_Z)$ where Z is M's 'zero-beta' portfolio. Depending upon M's position on the efficient frontier, $\mathrm{E}(R_Z)$ can be negative and large.

To illustrate the difference in inferences that can be obtained with a different index, *I* recomputed $\hat{p}$ using (a) buy-and-hold annual means on the smallest and largest deciles of NYSE and AMEX stocks, (b) simple OLS beta coefficients estimated from annual returns,[11] (c) the *equally*-weighted C.R.S.P. index, and (d) annual data for 1963–1981.

The beta estimates (t-statistics) were $\beta_{\text{small}} = 1.78$ (5.59), $\beta_{\text{large}} = 0.598$ (8.60). Using the estimated premium $\mathrm{E}(R_{\text{small}} - R_{\text{large}}) = 22.8\%$ from table 3, we have $\hat{p} = 19.3$ percent. The actual ex post return on this market index was 15.3 percent, so $\hat{p}$ is still somewhat too high (thus indicating a risk-adjusted small-firm premium). Nevertheless, the discrepancy between a $\hat{p}$ of 19.3 and a market return of 15.3 is much less aberrant than the difference Reinganum (1983) reports between $\hat{p} = 37.5$ and $\bar{R}_M = 9.5$ percent.

It still seems that investigation of the observed small firm premium in the context of a more general asset pricing model would be a worthwhile endeavor; but estimation problems in expected returns and in simple risk parameters can explain much of the apparent anomaly.

[11]Instead of the Dimson aggregated coefficient betas, I used betas from annual data because of the now well-documented annual seasonal [Keim (1983), Roll (1983)], which has the potential to induce biases into any betas, including the Dimson type, when they are computed from non-yearly data.

5. Conclusion

Computing mean returns in order to estimate investment experience is not as easy as it sounds. Common stock data have serial dependence which, though seemingly slight, substantially affects the estimates obtained under alternate mean return computational methods. Investment experience is best portrayed by buy-and-hold portfolio returns but scholars often use arithmetic or rebalanced portfolio returns because they are easier to compute.

Perhaps this makes little difference for some studies; but if serial dependence differs systematically with the item being investigated, the computational method can be quite material.

For the small firm premium, as measured by the difference in mean returns of American Exchange and New York Exchange listed stocks, the buy-and-hold mean return difference is only about $7\frac{1}{2}$ percent per annum (for 1963–81) while the rebalanced and arithmetic methods produce annual return differences *with the same stocks and time periods* of over 14 percent. The annual difference in returns between the smallest and largest size quintiles (deciles) is about 34 (49.1) percent using the rebalanced and arithmetic methods and about 17 (22.8) percent using the buy-and-hold method.

The annual small-firm premium is only marginally significant at usual significance levels if mean returns are measured with the buy-and-hold method.

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Journal of Forecasting, Vol. 2, 425–435 (1983)

Predicting Long-term Earnings Growth: Comparisons of Expected Return Models, Submartingales and Value Line Analysts

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ABSTRACT

This paper derives four–five year predictions of growth rates of accounting earnings per share implicit in four expected return models commonly used in financial research. A comparison of such growth rates with those produced and reported by Value Line analysts and those generated by a submartingale model revealed the following: two expected return models—the Sharpe–Lintner–Mossin model and the Black model—were significantly more accurate than the submartingale model, though not significantly more accurate than the other return models. However, the growth rate forecasts provided by Value Line significantly outperformed all the other models tested—none of which relied on the direct input of a security analyst.

KEY WORDS Forecasting Earnings growth Comparisons Empirical study Analysts Value Line

An extensive body of literature evaluates the short-run (less than 15 months) earnings forecasts of security analysts and time-series models.[1] The importance of this subject to accounting and finance is that a variety of applications such as firm valuation, cost of capital, and event studies require the measurement of earnings expectations. However, except for a recent paper by Moyer *et al.* (1983), little work has been done to this point in studying long-run earnings forecasts. Moreover, a potential source of earnings forecasts—expected return models—has been overlooked.

This paper evaluates the accuracy of long-term forecasts of growth rates of annual earnings per share. Six sources of forecasts are used: a submartingale model, the *Value Line Investment Survey*, and four expected return models. Each expected return model is combined with the Gordon–Shapiro constant growth model. Further, certain expected return models use the beta coefficient and, as such, lend insight into the usefulness of beta in a forecasting context.

The paper comprises three sections. Section 1 describes the six forecasting sources and states the

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[1] See Cragg and Malkiel (1968), Elton and Gruber (1972), Barefield and Comiskey (1975), Brown and Rozeff (1978), Abdel-khalik and Thompson (1977–78), Crichfield *et al.* (1978), Givoly and Lakonishok (1979), Collins and Hopwood (1980), Jaggi (1980), Elton *et al.* (1981), Hopwood *et al.* (1981), Fried and Givoly (1982) and Imhoff and Pare (1982) for studies of analyst forecasts and time-series models. See Ball and Watts (1972), Brooks and Buckmaster (1976), Albrecht *et al.* (1977), Watts and Leftwich (1977), Foster (1977), Griffin (1977), Brown and Rozeff (1979), Lorek (1979), Hopwood and McKeown (1981), Hopwood *et al.* (1981) and Manegold (1981) for studies of the time-series properties of earnings.

0277-6693/83/040425-11$01.10

hypotheses. Tests of the hypotheses are presented in Section 2. Section 3 offers tentative conclusions.

1. FORECASTING SOURCES AND HYPOTHESES

This section (1) describes how six sets of growth rate forecasts of earnings per share are derived and (2) discusses the formal hypotheses to be tested.

Submartingale model

Evidence that measured annual accounting income is a submartingale or some similar process can be found in Ball and Watts (1972), Albrecht *et al.* (1977), and Watts and Leftwich (1977).[2] Although measured (reported) annual earnings per share may not be precisely a submartingale, a submartingale process is included because of its appearance in numerous studies as a benchmark forecasting technique. Another reason for including the submartingale model is to compare its forecasts to those reported in the *Value Line Investment Survey*. Such comparisons have been done for forecasts of three to fifteen months (Brown and Rozeff, 1978) but not forecasts of four to five years.

The submartingale model (SUB), as used here, estimates the expected annual growth rate of accounting earnings per share as the average compound annual rate of growth of earnings per share of the ten-year period preceding the test period. These historical growth data are obtained from various issues of the *Value Line Investment Survey*.

Value Line forecasts

The *Value Line Investment Survey* (VL) contains forecasts of earnings per share made by the Value Line security analysts for time periods four to five years into the future. After adjustment for capital changes, these forecasts, in conjunction with actual earnings per share in the base period, are converted to VL forecasts of a compound annual growth rate for each firm in the sample.

The importance of testing analyst forecasts is explained by Brown and Rozeff (1978). They argue that since analyst forecasts are purchased in a free market they are likely to be informed forecasts with a marginal value exceeding that of less costly forecast alternatives. According to this reasoning, the VL forecasts should be more accurate than the SUB forecasts and those derived from the expected return models (stated next).

Expected return model forecasts

A technique that has not previously been exploited to obtain earnings forecasts is to use expected stock rate of return models in conjunction with the Gordon–Shapiro (1956) constant growth model. This subsection shows how to extract earnings per share growth rate forecasts from these models. First, the four expected stock rate of return models are explained. Secondly, the paper proceeds to show how growth rate forecasts are obtained.

Four expected return models

The four models of how the market sets expected rates of return on securities are:

(1) the comparison returns (CMR) model (Masulis, 1980; Brown and Warner, 1980),
(2) the market adjusted returns (MAR) model (Latane and Jones, 1979; Brown and Warner, 1980),
(3) the Sharpe–Lintner–Mossin (SLM) model (Sharpe, 1964; Lintner, 1965; Mossin, 1966),
(4) the Black (BLK) model (Black, 1972).

[2] For example, Ball and Watts (1972, p. 680) conclude: 'Consequently, our conclusion ... is that income can be characterized on average as a submartingale or some similar process.'

The CMR model assumes that the expected return on stock i at time T ($E(R_{iT})$) is an expectation that is specific to each security. However, a risk parameter such as the beta coefficient is not explicitly included in the expected return calculation. Instead, the expected stock return at time T is measured as the arithmetic mean of the realized returns of the stock in a prior period. To the extent that individual means of stock return distributions differ as a reflection of risk differences, the CMR model allows for individual differences in risk. This model (see Masulis, 1980) has been tested by Brown and Warner (1980) who found that it compared favourably with alternative expected return models in detecting abnormal performance.

The MAR model states that the expected return on stock i at time T equals the expected return on the market (denoted $E(R_{MT})$), which is the same for all stocks. As for the CMR model, no beta coefficient is used in calculating expected returns. However, unlike the CMR model, the MAR model does not allow for individual risk differences among stocks, since all stocks are assumed to have the same expected return, namely, the expected market return. To estimate expected market returns, an arithmetic average of past returns on the equally-weighted (Center for Research in Securities Prices) CRSP index is used.

The SLM model is infrequently referred to as the capital asset pricing model or CAPM. It is used in its *ex ante* form:

$$E(R_{iT}) = R_{fT} + [E(R_{MT}) - R_{fT}]\beta_i \tag{1}$$

where

R_{fT} = interest rate on a U.S. Treasury security over the forecast horizon,
β_i = beta coefficient of stock i expected to prevail over the forecast horizon.

This study examines two annual growth rate forecasts over two non-overlapping horizons of five years and four years. The five year forecast period is 1968–1972 and its base year is 1967. The four year forecast period is 1973–1976 and its base year is 1972. In estimating expected returns using the SLM model, R_{fT} for the forecast period 1968–1972 is taken as the yield-to-maturity on a five year U.S. Government security as of December 1967. Similarly, for the forecast period 1973–1976, R_{fT} is the yield-to-maturity on a four year U.S. Government security as of December 1972.[3]

$E(R_{MT})$ is estimated precisely in the same manner as in the CMR model, namely, as an average over past realized market returns.

The beta coefficients of individual stocks were estimated in two ways. First, the expected beta was measured as the historical beta coefficient of the stock over the 84 months up to and including month T. This beta was simply the covariance of the stock's returns with the market divided by the variance of the market's returns over the sample period. Secondly, in an attempt to obtain a more accurate estimate of the future expected beta, the tendency of betas to regress towards the value 1.0 noted by Blume (1971) was taken into account. The method for doing this is Blume's method.[4]

The last expected return model is the BLK model. This can be stated in *ex ante* form (Black, 1972) as:

$$E(R_{iT}) = E(R_{ZT}) + [E(R_{MT}) - E(R_{ZT})]\beta_i \tag{2}$$

where $E(R_{ZT})$ is the expected return on the minimum variance portfolio whose return is

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[3] Schaefer (1977) points out the pitfalls of using yield-to-maturity as a surrogate for the interest rate on a no-coupon bond. Livingston and Jain (1982) estimate the biases involved. Since for bonds of maturity four to five years, the coupon bias is confortably small (of the order of ten basis points), the effect is neglected in this paper.

[4] For example, to adjust the betas computed over the 1961–1967 time period, the betas of all stocks on the CRSP file from the 1954–1960 period were regressed on the betas of the same stocks from the 1947–1953 period. The resulting regression coefficients were then used to adjust linearly the 1961–1967 betas.

uncorrelated with the return on the market portfolio. Unlike R_{fT} in the SLM model, $E(R_{ZT})$ is not observable at time T. Historical returns are frequently used to estimate this model (Black *et al.*, 1972). When this is done, the BLK model can be written

$$E(R_{iT}) = \bar{\gamma}_0 + \bar{\gamma}_1 \beta_i \tag{3}$$

$\bar{\gamma}_0$ and $\bar{\gamma}_1$ are arithmetic averages of monthly estimates of $E(R_{ZT})$ and $E(R_{MT}) - E(R_{ZT})$. The estimation method of Fama and Macbeth (1973) was used to obtain the gamma estimates.[5]

The forecasting model can now be formulated by obtaining $\bar{\gamma}_0$ and $\bar{\gamma}_1$ as of time T and using these as estimates of future gammas. The procedure is legitimate since Fama and Macbeth have shown that the gamma variables are stationary and have autocorrelations that are essentially nil.

Obtaining growth rate forecasts

Suppressing the time subscript T for simplicity, the expected return of security i according to model j is denoted $E(R_{ij})$. Given the expected rate of return of security i from model j, each model's expected growth rate of earnings per share will be extracted by assuming that each firm possesses investment opportunities which are expected to provide a constant rate of growth of earnings in perpetuity. In other words, the 'constant growth' model is assumed to hold for each stock (Gordon and Shapiro, 1956, Miller and Modigliani, 1961).

Let g_{ip} be firm i's rate of price increase, g_{id} be its rate of growth of dividends per share, and g_{ie} be its rate of growth of earnings per share. In the constant growth model, the expected rate of return of security i is given by:

$$E(R_i) = \frac{\tilde{P}_{i1} + \tilde{D}_{i1} - P_{i0}}{P_{i0}} = \frac{\tilde{D}_{i1}}{P_{i0}} + \frac{\tilde{P}_{i1} - P_{i0}}{P_{i0}} \tag{4}$$

where

$\tilde{P}_{i1}$ = random end-of-period price per share
$\tilde{D}_{i1}$ = random end-of-period dividend per share
P_{i0} = current price per share
D_{i0} = current dividend per share.

Hence:

$$\frac{\tilde{D}_{i1}}{P_{i0}} + \frac{\tilde{P}_{i1} - P_{i0}}{P_{i0}} = \frac{D_{i0}(1 + g_{id})}{P_{i0}} + g_{ip} \tag{5}$$

Assuming $g_{id} = g_{ip} = g_i$

$$E(R_i) = \frac{D_{i0}(1 + g_i)}{P_{i0}} + g_i \tag{6}$$

A key assumption to obtain the constant growth is that the firm's payout ratio of dividends from earnings is constant. This ensures the equality of the growth rates of dividends, earnings, and price per share. Violation of the constant payout ratio assumption occurs for a variety of reasons such as a change in the firm's investment opportunities or a change in its financing mix. To the extent that the constant growth model fails to describe the firm's expected rate of return, the derived estimates of g_i will contain measurement error which will bias the tests against the expected return models.

[5] I am grateful to Gary Schlarbaum for supplying these estimates.

Since each expected return model estimates $E(R_i)$ by $E(R_{ij})$, equation (6) can be solved to obtain model *j*'s implicit forecast of g_i, denoted g_{ij} or:

$$g_{ij} = \frac{E(R_{ij}) - D_{i0}/P_{i0}}{1 + D_{i0}/P_{i0}} \tag{7}$$

Hence, by estimating $E(R_{ij})$ and observing the current dividend yield, a forecast by model *j* of the firm *i*'s growth rate of earning per share, g_{ij}, is extracted.

Statement of hypotheses

The empirical results in this paper will be interpreted with reference to several hypotheses, which are presented and discussed below:

> *Hypothesis* 1. Expected return models that use *ex ante* information on stock beta coefficients contain implicit earnings per share growth rate forecasts that are not more accurate than the implicit earnings per share growth rate forecasts of expected return models that do not use information on beta coefficients.

The SLM and BLK models include beta information whereas the CMR and MAR models do not. Rejection of Hypothesis 1 means that the beta-based expected return models can be employed to obtain forecasts of earnings per share which are superior to those obtained from the non-beta stock return models. Assuming that earnings growth rates observed for a future period reflect the prices and the expected returns established at the start of the period, rejection of Hypothesis 1 provides an indication that the market, in setting expected returns, uses betas or their informational equivalent as opposed to neglecting betas as the CMR and MAR do.

The forecasts of the expected return models can also be compared with the SUB model forecasts. These comparisons provide a natural check on whether the expected return models combined with the constant growth model are producing forecasts that are reasonably competitive with the process which, at least approximately, generates annual earnings.

> *Hypothesis* 2. Expected return models contain implicit earnings per share growth rate forecasts that are not more accurate than the forecasts of the growth rate of earnings per share derived using the submartingale model of earnings.

A third test compares the forecasting ability of the VL model with the expected return models. If the procedure used in this paper to extract forecasts from the expected return models was efficient enough to extract forecasts that reflected all information available to the market, then the VL model forecasts would not be more accurate than the expected return model forecasts. Since the procedure used is clearly crude compared to the information processing of analysts, it is anticipated that Hypothesis 3 will be rejected in favour of VL.

> *Hypothesis* 3. The VL forecasts of the growth rate of earnings per share are no more accurate than the earnings forecasts of the expected return models.

Finally, since the lengthy literature comparing analyst forecasts with those of time series models is confined to short forecast horizons (see footnote 1), it is of interest to compare the VL forecasts with the SUB forecasts over the long forecast horizons used in this paper.

> *Hypothesis* 4. The VL forecasts of the growth rate of earnings per share are no more accurate than the forecasts of the SUB model.

Rejection of Hypothesis 4 in favour of VL superiority would provide further evidence of analyst forecast superiority relative to time-series models.

2. TESTS OF HYPOTHESES

Samples

Two replications of the experiment were conducted. In the first, time T was year-end 1967 and forecasted earnings were for 1972. The first 253 firms (in alphabetical order) were selected from the CRSP tape which met the criteria: (1) return data available during 1961–1967; (2) covered by the *Value Line Investment Survey* as of December 1967; (3) December fiscal year; and (4) positive earnings per share in 1967 and 1972. The second replication set T at December 1972. The sample size was 348. The criteria were similar with the corresponding changes in dates, namely, return data available during 1966–1972 and positive earnings per share in the base year 1972 and test year 1976.

The reasons for these criteria follow. The requirement that a sample firm have return data on the CRSP tape in the base period allowed computation of the firm's beta coefficient using this data source. The firm had to be covered by the *Value Line Investment Survey* to allow forecast comparisons to be made. Use of the December fiscal year-end ensured that all six model forecasts were based on comparable amounts of data relative to the fiscal year. Furthermore, the VL model forecasts had to be conditional only on annual earnings of the base year. The requirements of positive earnings per share in the base and test years allowed for positive growth rates. (The positive earnings criterion, as it turned out, was not binding in the first test period. In the second period, ten firms were eliminated because of this criterion.)

Although it is unlikely that the sample selection procedures materially affected the outcomes of the experiments, they did result in noticeably less risky sample firms than the market as a whole. The average beta for both samples was 0.85. As such, the test results may not generalize to the entire population of firms.

Test procedures

Because January 1935 was the starting date for calculating the BLK model estimates, that date was the starting point for most of the other return calculations. Thus, in estimating the CMR model, a stock's mean monthly stock return was found by averaging its returns over the history of the stock available since January 1935. In estimating mean market returns, the average of monthly returns was found over the time period beginning in January 1935. The market index was the equally-weighted return index of all stocks on the CRSP tape. Finally, in estimating the gammas for the BLK model, the monthly averages were also taken over the period starting in 1935.[6]

The SLM model requires risk-free returns and, for this purpose, yields-to-maturity on U.S. Government Bonds of the relevant maturity were employed. The data source was *Moody's Municipal and Government Manual.*

Let a_i = growth rate of actual earnings per share for firm i and g_{ij} = growth rate of forecasted earnings per share for firm i by method j. In each test period, a vector of errors $|a_i - g_{ij}| = e_{ij}$ may be calculated for each method j, where e_{ij} is the absolute value of the difference between the forecasted and realized growth rates. For hypothesis tests of two models, an appropriate design is a one-sample or matched-pairs case with self-pairing by firm. The members of each pair are errors, e_{ij}, from the two models, which are reduced to a single observation by taking the difference in the errors. The t-test is the usual parametric test of the mean difference and the Wilcoxon signed ranks test is an alternative non-parametric test of the median difference. Both tests were conducted. But since the results were similar, only the paired t-test results are reported.

[6] All tests were also conducted using mean returns calculated over the most recent 84 months. The results were essentially the same as those reported in the paper. If anything, the longer estimation period benefited the CMR model.

Results

Table 1 contains summary statistics of the error distributions generated by the models when regression-adjusted betas were employed.

The average of deviations, $a_i - g_{ij}$, was computed for all sample firms. Such deviations measure the average bias of the forecast models. It appears that, in period 1, all the models tended to overforecast earnings growth. In period 2, the average deviation of the return models was slight, whereas VL tended to overforecast on average. However, the fraction of firms overestimated by VL (58.0 per cent) was quite close to the fractions for the other models. This suggests that the sample average deviation for VL was heavily influenced by a few firms.

Table 1. Summary statistics of error distributions*†

	Error measure	SUB	MAR	CMR	SLM	BLK	VL
Period 1, 1967–1972	Average deviation	−0.001	−0.062	−0.051	−0.049	−0.051	−0.046
	MABE	0.115	0.112	0.117	0.105	0.106	0.088
	MSE	0.046	0.032	0.034	0.031	0.031	0.018
	RMSE	0.213	0.178	0.184	0.176	0.177	0.135
	% Forecasts overestimated	56.1	81.8	72.7	72.3	73.5	64.0
Period 2, 1972–1976	Average deviation	0.040	−0.002	0.012	0.011	0.008	−0.030
	MABE	0.146	0.140	0.147	0.137	0.137	0.118
	MSE	0.071	0.067	0.070	0.066	0.066	0.031
	RMSE	0.266	0.258	0.265	0.256	0.256	0.175
	% Forecasts overestimated	47.2	58.9	53.4	52.9	53.7	58.0

* MAR = Market adjusted return; SUB = Submartingale; CMR = Comparison return; SLM = Sharpe–Lintner–Mossin; BLK = Black; VL = Value Line.

† Based on adjusted betas for the SLM and BLK models.

The mean absolute error (MABE), defined as the sample average of $|a_i - g_{ij}|$, better reflects the overall forecasting performance of the models since it takes into account the average error size. In period 1, VL's MABE was lowest at 0.088, followed by SLM and BLK at 0.105 and 0.106, while the other three models had MABE's between 0.112 and 0.117. Two other summary error measures, which give greater weight to large deviations, are mean square error or MSE (the sample average of $(a_i - g_{ij})^2$) and root mean squared error or RSME (the square root of MSE). Using these measures of forecast accuracy, VL was most accurate followed by the four expected return models all of which were more accurate than SUB.

In time period 2, VL had the most accurate forecasts. Using MABE, it again appears that SLM and BLK had smaller errors than the CMR, MAR, and SUB models. Using MSE, all models other than VL appear to have approximately equal forecast accuracy.

Table 2 contains the t-statistics for all paired comparisons over both sample periods and using both the historical beta and the regression-adjusted beta. In reading this table, a positive t-statistic means that the model at the top has lower errors than the model at the side. Since the results are very similar for both beta estimation methods, the discussion concentrates on the regression-adjusted beta case.

In both sample periods, both the SLM and BLK models produced smaller errors at high levels of confidence than the two non-beta expected return models—MAR and CMR. Hypothesis 1 is thus rejected. If one were attempting to gauge the market's expectation of future earnings growth via

Table 2. Parametric *t*-statistics, comparisons of six model's earnings prediction errors for two time periods*†

		Historical beta							Regression-adjusted beta					
		SUB	MAR	CMR	SLM	BLK	VL		SUB	MAR	CMR	SLM	BLK	VL
Period 1, 1967–1972	SUB	—	0.59	−0.50	1.32	1.17	2.69‡	SUB	—	0.59	−0.50	1.76¶	1.58‡	2.69‡
	MAR	—	—	−1.70¶	1.74¶	1.37	3.72‡	MAR	—	—	−1.70¶	4.93‡	4.29‡	3.72‡
	CMR	—	—	—	3.32‡	3.00‡	4.50‡	CMR	—	—	—	4.35‡	3.96‡	4.50‡
	SLM	—	—	—	—	−7.12‡	3.06‡	SLM	—	—	—	—	−8.22‡	2.72‡
	BLK	—	—	—	—	—	3.21	BLK	—	—	—	—	—	2.88‡
Period 2, 1972–1976	SUB	—	1.58	−0.40	2.88‡	2.84‡	2.90‡	SUB	—	1.58	−0.40	2.78‡	2.68‡	2.90‡
	MAR	—	—	−2.25§	2.38§	2.48§	2.35§	MAR	—	—	−2.25§	3.06‡	3.13‡	2.35§
	CMR	—	—	—	3.77‡	3.76‡	2.92‡	CMR	—	—	—	3.83‡	3.72‡	2.92‡
	SLM	—	—	—	—	−0.59	1.86¶	SLM	—	—	—	—	−1.60	1.93¶
	BLK	—	—	—	—	—	1.88¶	BLK	—	—	—	—	—	1.96§

* MAR = Market adjusted return; SUB = Submartingale; CMR = Comparison return; SLM = Sharpe–Lintner–Mossin; BLK = Black; VL = Value Line.

† A positive test statistic indicates superiority (lower forecast error) of model on top as compared with model on side; a negative test statistic indicates superiority of model on side. Forecast error is mean absolute error (MABE).

‡ Significant at the 1 per cent level, two-tailed test.

§ Significant at the 5 per cent level, two-tailed test.

¶ Significant at the 10 per cent level, two-tailed test.

the market's expected rate of return and the revealed dividend yield, then one would be better off employing either of the two models that use beta. The consistency of the results over the two test periods strengthens the conclusion that use of the beta coefficient enhances the predictability of expected rate of return and hence earnings growth.

To check on the efficacy of the procedure by which the expected return model forecasts were extracted, those models were compared with the SUB model. For the non-beta models, the t-statistics were less than ordinary conventional levels in both of the test periods. A comparison of MAR against SUB produced t-statistics of -0.50 and -0.40. These results indicate that Hypothesis 2 cannot be rejected for the non-beta models, although the MAR model provided slight indication of outperforming the SUB model.

For the SLM and BLK models, the t-statistics were positive and significant in both time periods. A comparison of SLM against SUB yielded t-statistics of 1.76 and 2.78, whereas in similar comparisons, BLK yielded 1.58 and 2.68. This is reasonable evidence for rejecting Hypothesis 2 in favour of the alternative hypothesis that SLM and BLK produce smaller errors than SUB. From another point of view, this result is impressive: a relatively simple manipulation of the expected return models, involving extrapolation of the expected market return and the stock's beta coefficient and subtraction of the stock's dividend yield, produced earnings forecasts that were more accurate than a well known time-series model of annual earnings. This interpretation indicates that the SLM and BLK expected return models appear to capture an important aspect of the market's return generating mechanism, and that the forecast extraction procedure has reasonable power.

The next hypothesis tests involve the VL forecasts. It is clear that Hypothesis 3 can be rejected at high levels of significance. By wide margins, VL produced lower forecast errors than all the expected return models, including the more accurate SLM and BLK models.

The last comparison, Hypothesis 4, evaluates VL against the TS model. In both samples, the forecasts of earnings per share growth were statistically superior to those of the TS model. This provides additional evidence that security analysts produce more accurate forecasts than time-series models.

The results of the tests were quite uniform in the two time periods. The average analyst error in forecasting the future annual growth rate for the following four to five year period tended to be about 1.7 per cent below the errors of the SLM and BLK expected return models, whereas the errors of the latter two models were about 0.7–1.2 per cent below the errors of the remaining models, including the SUB model.

3. CONCLUSIONS

This paper has shown that expected return models commonly used in the finance literature contain implicit forecasts of the growth rate of accounting earnings per share. For the comparison returns model (CMR) and the market-adjusted returns model (MAR), the resulting forecasts were no less accurate than a submartingale model. On the other hand, for the Sharpe–Lintner–Mossin (SLM) and Black (BLK) models, the forecasts were significantly more accurate than those generated by the submartingale model.

Evidence that security analysts forecasts are more accurate than those of less costly alternatives is also provided. The forecasts of four to five year growth rates of earnings per share produced and reported in the *Value Line Investment Survey* were shown to be more accurate than *all* of the other models tested—none of which required the direct input of a security analyst.

ACKNOWLEDGEMENTS

Earlier versions of this paper were presented at the International Symposium on Forecasting, Quebec City, Canada in May, 1981, the Midlands Finance Conference, Lincoln, Nebraska in September, 1981, and the Finance Workshop of the University of California at Los Angeles in October, 1981. I am grateful to these audiences for useful comments and discussions. Two anonymous referees of this journal also provided stimulating comments for which I am thankful.

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U.S. Securities and Exchange Commission

Final Rule:
Disclosure of Mutual Fund After-Tax Returns

SECURITIES AND EXCHANGE COMMISSION

17 CFR Parts 230, 239, 270, and 274

[Release Nos. 33-7941; 34-43857; IC-24832; File No. S7-09-00]

RIN 3235-AH77

Disclosure of Mutual Fund After-Tax Returns

AGENCY: Securities and Exchange Commission

ACTION: Final rule

SUMMARY: The Securities and Exchange Commission is adopting rule and form amendments under the Securities Act of 1933 and the Investment Company Act of 1940 to improve disclosure to investors of the effect of taxes on the performance of open-end management investment companies ("mutual funds" or "funds"). These amendments require mutual funds to disclose in their prospectuses after-tax returns based on standardized formulas comparable to the formula currently used to calculate before-tax average annual total returns. The amendments also require certain funds to include standardized after-tax returns in advertisements and other sales materials. Disclosure of standardized mutual fund after-tax returns will help investors to understand the magnitude of tax costs and compare the impact of taxes on the performance of different funds.

EFFECTIVE DATE: April 16, 2001. Section II. J. of this release contains information on compliance dates.

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SUPPLEMENTARY INFORMATION: The Securities and Exchange Commission ("Commission") is adopting amendments to Form N-1A [17 CFR 239.15A and 274.11A], the registration form used by mutual funds to register under the Investment Company Act of 1940 [15 U.S.C. 80a-1 *et seq*.] ("Investment Company Act" or "Act") and to offer their shares under the Securities Act of 1933 [15 U.S.C. 77a *et seq*.] ("Securities Act"). The Commission also is adopting amendments to rule 482 under the Securities Act [17 CFR 230.482] and rule 34b-1 under the Investment Company Act [17 CFR 270.34b-1].

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I. Introduction

We are adopting rule and form amendments that require a mutual fund to disclose after-tax returns.[1] Taxes are one of the most significant costs of investing in mutual funds through taxable accounts. In 1999, mutual funds distributed approximately $238 billion in capital gains and $159 billion in taxable dividends.[2] Shareholders investing in stock and bond funds paid an estimated $39 billion in taxes in 1998 on distributions by their funds.[3] Recent estimates suggest that more than two and one-half percentage points of the average stock fund's total return is lost each year to taxes.[4] Moreover, it is estimated that, between 1994 and 1999, investors in diversified U.S. stock funds surrendered an average of 15 percent of their annual gains to taxes.[5]

Despite the tax dollars at stake, many investors lack a clear understanding of the impact of taxes on their mutual fund investments.[6] Generally, a mutual fund shareholder is taxed when he or she receives income or capital gains distributions from the fund and when the shareholder redeems fund shares at a gain.[7] The tax consequences of distributions are a particular source of surprise to many investors when they discover that they can owe substantial taxes on their mutual fund investments that appear to be unrelated to the performance of the fund. Even if the value of a fund has declined during the year, a shareholder can owe taxes on capital gains distributions if the portfolio manager sold some of the fund's underlying portfolio securities at a gain.[8]

The tax impact of mutual funds on investors can vary significantly from fund to fund. For example, the amount and character of a fund's taxable distributions are affected by its investment strategies, including the extent of a fund's investments in securities that generate dividend and other current income, the rate of portfolio turnover and the extent to which portfolio trading results in realized gains, and the degree to which portfolio losses are used to offset realized gains. One recent study reported that the annual impact of taxes on the performance of stock funds varied from zero, for the most tax-efficient funds, to 5.6 percentage points, for the least tax-efficient.[9] While the tax-efficiency of a mutual fund is of little consequence to investors in 401(k) plans or other tax-deferred vehicles, it can be very important to an investor in a taxable account, particularly a long-term investor whose tax position may be significantly enhanced by minimizing current distributions of income and capital gains.

Recently, there have been increasing calls for improvement in the disclosure of the tax consequences of mutual fund investments. Mutual funds, as well as third party providers that furnish information to mutual fund shareholders, are responding to this growing investor demand by providing after-tax returns, calculators that investors can use to compute after-tax returns, and other tax information.[10] In addition, several fund groups have created new funds promoting the use of more tax-efficient portfolio management strategies.[11] Moreover, in April 2000, a bill that would require the Commission to revise its regulations to require improved disclosure of mutual fund after-tax returns was passed by the U.S. House of Representatives and referred to the Senate.[12] Many press commenters also have highlighted the need for improvements in mutual fund tax disclosure.[13]

Currently, the Commission requires mutual funds to disclose significant information about taxes to investors.[14] While we believe that this disclosure is useful, we are persuaded that funds can more effectively communicate to investors the tax consequences of investing. As a result, last March we proposed for public comment amendments to our rules and to Form N-1A, the registration form for mutual funds, that would require disclosure of standardized mutual fund after-tax returns.[15]

Today we adopt rule and form amendments that require a fund to disclose its standardized after-tax returns for 1-, 5-, and 10-year periods. After-tax returns, which will accompany before-tax returns in fund prospectuses, will be presented in two ways: (i) after taxes on fund distributions only; and (ii) after taxes on fund distributions and a redemption of fund shares. Although after-tax returns will not generally be required in fund advertisements and sales literature, any fund that either includes after-tax returns in these materials or includes other performance information together with representations that the fund is managed to limit taxes will be required to include after-tax returns computed according to our standardized formulas.

While the Commission recognizes that a significant amount of mutual fund assets are held through tax-deferred arrangements, such as 401(k) plans or individual retirement accounts ("IRAs"), almost forty percent of non-money market fund assets held by individuals are held in taxable accounts.[16] We are concerned that the millions of mutual fund investors who are subject to current taxation may not fully appreciate the impact of taxes on their fund investments because mutual funds are required to report their performance on a before-tax basis only.[17] Although performance is only one of many factors that an investor should consider in deciding whether to invest in a particular fund, many investors consider performance one of the most significant factors when selecting or evaluating a fund.[18] As a result, we believe it would be beneficial for funds to provide their after-tax performance in order to allow investors to make better-informed decisions.

This is the latest Commission action in our continuing effort to improve fund disclosure of costs. Since 1988, we have required mutual funds to include a uniform fee table in the prospectus.[19] More recently, we have increased our efforts to educate investors about mutual fund costs and how those costs affect performance.[20] In 1999, we introduced a "Mutual Fund Cost Calculator" to assist investors in determining how fund fees and charges affect their mutual fund returns.[21] Moreover, we are currently considering recommendations made in separate reports by the United States General Accounting Office and the Commission's Division of Investment Management on ways to improve fund disclosure of fees and costs.[22]

The amendments we adopt today represent another significant step in these efforts. Taxes are one of the largest costs associated with a mutual fund investment, having a dramatic impact on the return an investor realizes from a fund. Disclosure of standardized mutual fund after-tax returns will help investors to understand the magnitude of tax costs and compare the impact of taxes on the performance of different funds.

II. Discussion

The Commission received 235 letters commenting on the Proposing Release.[23] One hundred ninety-five of the letters were from individual investors or investor advocacy groups. The individual investors and investor advocacy groups overwhelmingly supported the Commission's proposal to require disclosure of after-tax returns. The remaining 40 letters were from industry participants, who were divided in their views. Many generally supported the proposal, while expressing concerns regarding specific disclosure requirements. Others opposed the proposal. Many commenters offered recommendations for improving portions of the proposal.

The Commission is adopting the proposed rule and form amendments with the modifications described below that address commenters' concerns.

A. Required Disclosure of After-Tax Returns

The Commission is adopting, with modifications, the requirement that mutual funds disclose after-tax return, a measure of a fund's performance adjusted to reflect taxes that would be paid by an investor in the fund. As discussed more fully below, funds will be required to include after-tax return information in the risk/return summary of the prospectus.[24] Funds will not generally be required to include after-tax returns in advertisements or other sales materials. Funds will, however, be required to include after-tax returns computed according to a standardized formula in sales materials that either include after-tax returns or include any other performance information together with representations that the fund is managed to limit taxes.[25]

Individual commenters overwhelmingly supported the required disclosure of after-tax returns. Many of these individuals stated that after-tax returns would help them compare funds and make better-informed investment decisions. Industry comments, however, were mixed regarding whether funds should be required to disclose this information. Industry commenters supporting after-tax return disclosure noted that the disclosure would give investors a clearer understanding of fund performance and assist them in evaluating the impact of taxes on the performance of various funds. Industry commenters opposing after-tax return disclosure argued, among other things, that the disclosure would overwhelm investors, be irrelevant to investors in tax-deferred accounts such as 401(k) plans, be inaccurate because the returns are not tailored to individual investors' specific tax situation, place funds at a competitive disadvantage, and be unduly burdensome to compute. A few of these commenters suggested that, instead of requiring the disclosure of after-tax returns, the Commission should encourage the development of web-based personalized after-tax return calculators.

After careful consideration of these comments, we continue to believe that requiring funds to provide standardized after-tax returns will be beneficial to investors, allowing them to make better-informed investment decisions. We believe that after-tax return disclosure is useful to, and understandable by, investors, as evidenced by the overwhelming support of individual commenters. Moreover, in recognition of the fact that after-tax returns would not be relevant for investors who hold fund shares through tax-deferred arrangements, we are requiring that after-tax returns be accompanied by narrative disclosure to that effect, and we are exempting prospectuses used exclusively to offer fund shares as investment options for tax-deferred arrangements from the after-tax return disclosure requirement.[26]

We recognize that the computation of after-tax return depends on assumed tax rates, which vary from investor to investor. Standardized after-tax returns will, however, serve as useful guides to understanding the effect of taxes on a fund's performance and allow investors to compare funds' after-tax returns. The presentation of standardized after-tax returns, coupled with the presentation of before-tax returns, will provide investors with a more complete and accurate picture of a fund's performance than before-tax returns standing alone.

We strongly encourage funds to develop web-based calculators and other tools that investors may use to compute their individualized after-tax return for a fund. This information will be very useful to investors in assessing how a particular fund has performed for them. We believe, however, that after-tax returns should be made available to all investors, not only to those who have the ability to access and use these web-based programs. In addition, personalized after-tax calculators often do not facilitate ready comparisons of different funds' after-tax performance.

We do not believe that requiring funds to disclose after-tax returns will place them at a competitive disadvantage vis-à-vis other investments. Investors choose funds over other investment products because they offer advantages unavailable with most other investment products, *e.g.,* access to professional portfolio management and diversification with a relatively small investment. In addition, we are exempting money market funds from the after-tax return disclosure requirement, in part because of our concern that they would be disadvantaged vis-à-vis very similar, competing products.

Finally, we believe that the burden to funds of computing and disclosing after-tax returns is justified by the benefits to investors from receiving this information. While we acknowledge that funds will incur a one-time cost to modify their systems to compute after-tax returns, the computation thereafter should be straightforward to perform using readily available data.

B. Types of Return to Be Disclosed

As proposed, funds will be required to calculate after-tax returns using a standardized formula similar to the formula presently used to calculate before-tax average annual total return.[27] We proposed to require funds to disclose after-tax return for 1-, 5-, and 10-year periods on both a "pre-liquidation" and "post-liquidation" basis, and we are adopting that requirement. Pre-liquidation after-tax return assumes that the investor continued to hold fund shares at the end of the measurement period, and, as a result, reflects the effect of taxable distributions by a fund to its shareholders but not any taxable gain or loss that would have been realized by a shareholder upon the sale of fund shares.[28] Post-liquidation after-tax return assumes that the investor sold his or her fund shares at the end of the measurement period, and, as a result, reflects the effect of both taxable distributions by a fund to its shareholders and any taxable gain or loss realized by the shareholder upon the sale of fund shares.[29] Pre-liquidation after-tax return reflects the tax effects on shareholders of the portfolio manager's purchases and sales of portfolio securities, while post-liquidation after-tax return also reflects the tax effects of a shareholder's individual decision to sell fund shares.

Most commenters addressing the issue of whether we should require pre- and post-liquidation after-tax returns supported disclosure of both types of after-tax returns. A few commenters argued that pre-liquidation after-tax return should be eliminated because the addition of another performance figure could overwhelm and confuse investors and, if provided without post-liquidation after-tax return, would tend to suggest to shareholders that taxation could be deferred indefinitely. A few commenters recommended that only pre-liquidation after-tax returns be required because post-liquidation returns reflect the action of a specific shareholder (*i.e.,* the decision to sell fund shares), rather than the tax-efficiency of the fund's portfolio management.

The Commission is adopting, as proposed, the requirement that funds present both pre- and post-liquidation after-tax returns in order to provide investors with a more complete understanding of the impact of taxes on a fund's performance.[30] We believe that pre-liquidation after-tax return is important because it provides information about the tax-efficiency of portfolio management decisions. We also believe, however, that it is important for shareholders, many of whom hold shares for a relatively brief period, to understand the full impact that taxes have on a mutual fund investment that has been sold.[31]

In response to commenters' concerns about investor confusion, we are streamlining the returns required to be disclosed. Most commenters recommended that we revise the proposed pre-liquidation after-tax return figure to deduct fees and charges payable upon a redemption of fund shares, such as sales charges or redemption fees. This would make the pre-liquidation after-tax return figure comparable to currently required standardized before-tax returns, which also deduct fees and charges payable upon sale, and would result in comparable disclosure by funds that impose sales charges upon purchase and those that impose sales charges upon redemption.[32] Commenters also argued that this modification would eliminate the need for the proposed pre-liquidation before-tax return figure with no deduction of fees and charges payable upon sale, thereby simplifying the presentation of before- and after-tax returns.

We agree and have eliminated pre-liquidation before-tax returns. This will result in three, rather than four, types of return, all of which are net of all fees and charges: before-tax return; return after taxes on distributions (pre-liquidation); and return after taxes on distributions and redemption (post-liquidation).[33] To address concerns that investors could be confused by a pre-liquidation after-tax return measure that assumes no sale of fund shares for purposes of computing tax consequences but nonetheless reflects fees and charges payable upon a sale of fund shares, we have modified the captions in the performance table to focus investor attention on the taxes that are deducted, rather than whether or not the shareholder held or sold his shares.[34]

C. Location of Required Disclosure

We are requiring, as proposed, that funds disclose after-tax returns in the performance table contained in the risk/return summary of the prospectus.[35] The amendments also will have the effect of requiring that after-tax returns be included in any fund profile because a profile must include the prospectus risk/return summary.[36] We proposed, but are not adopting, a requirement that after-tax returns be included in Management's Discussion of Fund Performance ("MDFP"), which is typically contained in the annual report.[37] Funds will, however, be required to state in the MDFP that the performance table and graph do not reflect the deduction of taxes that a shareholder would pay on fund distributions or the redemption of fund shares.[38]

We are requiring that after-tax returns be included in the prospectus and profile because, for the overwhelming majority of prospective investors who base their investment decision, in part, on past performance, after-tax returns can be useful in understanding past performance.[39] Most commenters that addressed the issue of the appropriate location for after-tax return disclosure supported requiring disclosure of after-tax returns in fund prospectuses.

Several commenters recommended that after-tax returns not be included in fund profiles. Commenters were concerned that the length and complexity of the disclosure could overwhelm the remaining information in the profile, defeating the purpose of the summary disclosure document. We continue to believe, however, that after-tax returns should be included in the fund profile because of the importance of past performance in many investors' investment decisions. We have, however, addressed the concerns expressed by commenters by simplifying the presentation of required after-tax returns.[40]

Some commenters supported inclusion of after-tax returns in the risk/return summary, but others recommended that after-tax returns be disclosed in the section of the prospectus describing the tax consequences to investors of buying, holding, exchanging, and selling fund shares.[41] These commenters argued that the required disclosure is too lengthy and technical for inclusion in the risk/return summary. We believe that it is critical that after-tax returns be disclosed in the same location as before-tax returns, so that after-tax returns will be easy for investors to find and compare with before-tax returns. Therefore, we are adopting, as proposed, the requirement that after-tax returns be presented in the risk/return summary. In addition, in response to commenters' concerns that the proposed disclosure would be too lengthy or complex for inclusion in the risk/return summary, we have simplified the presentation of returns in the table, as well as the accompanying narrative.[42]

We have decided not to require funds to include after-tax returns in the MDFP, which is typically contained in the annual report. Many commenters who addressed the issue of the appropriate location for disclosing after-tax returns recommended that after-tax returns not be included in the MDFP. As commenters observed, existing shareholders already receive detailed information that allows them to determine the tax impact of their investment in the fund.[43] They also typically receive on an annual basis an updated prospectus that will contain after-tax performance information.[44] Moreover, commenters pointed out that, because after-tax returns in the MDFP would have been calculated on a fiscal year basis, they would not be comparable from fund to fund, and use of fiscal year results could enable funds to time distributions in order to artificially enhance after-tax returns. We have therefore decided not to require disclosure of after-tax returns in the MDFP.

We are concerned, however, that investors may be confused about whether the returns included in the performance table and graph in the MDFP have been calculated on a before- or after-tax basis. Therefore, funds will be required to include a statement in the MDFP that accompanies the performance table and graph to the effect that the returns shown do not reflect the deduction of taxes that a shareholder would pay on fund distributions or the redemption of fund shares.[45]

D. Format of Disclosure

We are requiring, as proposed, that before and after-tax returns be presented in a standardized tabular format. Consistent with the modifications to the types of returns required, funds must present before- and after-tax returns as follows:[46]

AVERAGE ANNUAL TOTAL RETURNS

(For the periods ended December 31, _____)

	1 year	5 years [or Life of Fund]	10 years [or Life of Fund]
Return Before Taxes	___%	___%	___%
Return After Taxes on Distributions	___%	___%	___%
Return After Taxes on Distributions and Sale of Fund Shares	___%	___%	___%
Index **(reflects no deduction for [fees, expenses, or taxes])**	___%	___%	___%

Before- and after-tax returns must be presented in the order specified, using the captions provided by Form N-1A. When more than one fund or series is offered in a prospectus, the before- and after-tax returns of each fund or series must be adjacent to one another. A prospectus may not, for example, present the before-tax returns for all funds, followed by the after-tax returns for all funds.[47] We believe that this presentation will help investors to compare funds and to understand the differences among the different measures of return for any particular fund.

We have modified the captions in the performance table to focus investor attention on the taxes that are deducted, rather than whether or not the shareholder held or sold his shares. We have also modified the captions to clarify that returns are shown for the life of the fund, if shorter than the 5- or 10-year measurement periods, and that the language following the caption for the index may be modified, as appropriate, to be consistent with the index selected by the fund.

We have also simplified the presentation for funds that offer multiple classes of a fund in a single prospectus. We were persuaded by several commenters who argued that requiring after-tax returns for all classes of a fund, as proposed, could result in overwhelming or confusing disclosure to investors, and that, with the exception of expense ratio differences, which affect the level of dividend distributions, the tax burden of the various share classes will be similar. We have modified the amendments to require that a fund offering multiple classes in a single prospectus present the after-tax returns of only one class.[48] The class selected must be offered to investors who hold their shares through taxable accounts and have returns for at least 10 years, or, if no such class has 10 years of return, be the class with the returns for the longest period.

A fund that offers multiple classes in a single prospectus must explain in the narrative that accompanies the performance table that the after-tax returns are for only one class offered by the prospectus and that the after-tax returns for other classes will vary.[49] In addition, in order to facilitate comparisons among the returns shown, after-tax returns for the one class presented must be adjacent to the before-tax returns for that class and not interspersed with the before-tax returns of the other classes, returns of other funds, or with the return of the broad-based securities market index.[50] The return of the broad-based securities index may either precede or follow the returns for the fund.[51]

E. Exemptions from the Disclosure Requirement

We are exempting money market funds from the requirement to disclose after-tax returns, as proposed.[52] We are also adopting, with modifications, our proposal to permit a fund to omit the after-tax return information in a prospectus used exclusively to offer fund shares as investment options for defined contribution plans and similar arrangements.[53]

Specifically, we are permitting a fund to omit the after-tax return information in a prospectus used exclusively to offer fund shares as investment options to one or more of the following:

- a defined contribution plan that meets the requirements for qualification under section 401(k) of the Internal Revenue Code ("Code");
- a tax-deferred arrangement under section 403(b) or 457 of the Code;
- a variable contract as defined in section 817(d) of the Code;
- a similar plan or arrangement pursuant to which an investor is not taxed on his or her investment in the fund until the investment is sold;[54] or
- entities that are not subject to the individual federal income tax.

The proposed after-tax return information would largely be irrelevant in these circumstances because the affected investors either are not subject to current taxation on fund distributions or are not subject to current taxation at the individual federal income tax rates, and their tax consequences on a sale of fund shares are different from those experienced by individual investors in taxable accounts.[55]

In response to the recommendations of several commenters, we have expanded the exemption to include prospectuses used to offer fund shares to entities that are not subject to individual taxation (*e.g.,* tax-exempt foundations, colleges, and corporations). We agree that the after-tax return information is not relevant to these investors. A fund may not, however, rely on this exemption if the prospectus is used indirectly to offer shares to persons that are subject to individual taxation, such as an offer to a partnership whose individual partners are taxed on a pass-through basis.[56]

The Commission carefully considered whether to exclude bond funds, generally, or tax-exempt funds, specifically, from the requirement to disclose after-tax returns. A number of commenters argued that bond funds should be exempt from disclosing after-tax returns because investors in bond funds are generally aware of the tax consequences of investing in these funds, the funds do not usually make unexpected distributions of capital gains, and the funds are bought for their yield and not their growth potential. Other commenters argued that bond funds should not be exempt because such funds may have significant capital gains or losses in volatile markets, certain types of bond funds commonly realize significant capital gains, and some managers of bond funds seek to avoid making capital gains distributions by using various tax management strategies.

Having considered the views expressed by commenters, we have decided not to exempt bond funds from disclosing after-tax returns. While investors may more readily understand the tax impact of owning a bond fund that makes few, if any, capital gains distributions, than the tax impact of owning other funds, bond funds may have significant capital gains or losses, and we believe that it is important for after-tax return information to be available to their shareholders.

Similarly, while most, if not all, income distributed by a tax-exempt mutual fund generally will be tax-exempt, a tax-exempt mutual fund may also make capital gains distributions that are taxable and an investor is taxed on gains from the sale of fund shares.[57] As a result, the performance of a tax-exempt fund may be affected by taxes, and taxes may have a greater or lesser impact on different tax-exempt funds. Therefore, we have decided not to exempt tax-exempt funds from the required disclosure.[58]

F. Advertisements and Other Sales Literature

We are adopting, with modifications, amendments that require certain fund advertisements and sales literature to include after-tax performance that is calculated according to the standardized formulas prescribed in Form N-1A for computation of after-tax returns in the risk/return summary. As proposed, all fund advertisements and sales literature that include after-tax performance information will be required to include after-tax returns computed according to the standardized formulas.[59] Any quotation of non-standardized after-tax return also will be subject to the same conditions currently applicable to quotations of non-standardized performance that are included in fund advertisements and sales literature.[60] Requiring advertisements and sales literature that include after-tax performance information to include standardized after-tax returns will help to prevent misleading advertisements and sales literature and permit shareholders to compare claims about after-tax performance.

Commenters generally supported the proposal to require fund advertisements and sales literature that include after-tax performance information to include standardized after-tax returns, but several commenters recommended that we extend the requirement to advertisements and sales literature that claim that a fund is "tax-managed" or "tax-efficient" and that include any performance information. As noted by one commenter, a fund advertising 20 percent before-tax return and claiming 100 percent tax-efficiency could have significant unrealized gains that would result in tax liabilities when a shareholder redeems his or her shares. We are persuaded that, to help prevent such tax-efficiency claims from being misleading, such advertisements should include standardized after-tax returns, which will help an investor to assess the tax-efficiency of the fund more accurately. Therefore, we have modified the proposal to require the inclusion of standardized after-tax returns in any advertisement or sales literature that includes a quotation of performance and that represents or implies that the fund is managed to limit or control the effect of taxes on performance.[61]

This requirement does not apply to advertisements or sales literature for a fund that is eligible to use a name suggesting that the fund's distributions are exempt from federal income tax or from both federal and state income tax under our recently-adopted fund names rule.[62] Because these funds meet the strict standards of the names rule, we have concluded that the additional requirement for including standardized after-tax returns in advertisements or sales literature should not apply to them unless they voluntarily choose to include after-tax performance information.

One commenter recommended that we prohibit funds from publishing after-tax returns for periods of less than one year. The commenter argued that this would prevent funds from reporting year-to-date after-tax returns just before a large taxable distribution, wrongly suggesting to shareholders that the fund had been tax-efficient. While we have decided not to prohibit funds from publishing after-tax returns for periods of less than one year in all cases, we remind funds that sales materials are subject to the antifraud provisions of the federal securities laws and that compliance with the terms of rule 482 under the Securities Act or rule 34b-1 under the Investment Company Act is not a safe harbor from liability for fraud.[63] Therefore, any fund that publishes after-tax returns for periods shorter than one year should be extremely careful to ensure that the returns are not materially misleading, *e.g.,* because the returns incorrectly suggest that a fund has been more tax-efficient than has, in fact, been the case.

G. Formulas for Computing After-Tax Return

We are adopting, with the modifications discussed below, the requirement that funds compute after-tax returns using standardized formulas that are based largely on the current standardized formula for computing before-tax average annual total return.[64] After-tax returns will be computed assuming a hypothetical $1,000 one-time initial investment and the deduction of the maximum sales load and other charges from the initial $1,000 payment.[65] Also, after-tax returns will be calculated for 1-, 5-, and 10-year periods.[66]

1. Tax Bracket

We are requiring, as proposed, that standardized after-tax returns be calculated assuming that distributions by the fund and gains on a sale of fund shares are taxed at the highest applicable individual federal income tax rate.[67] Comment was divided on this issue. Some commenters supported the highest tax rate as providing investors with the full range of historical after-tax returns, as well as being the simplest rate to use to compute after-tax returns. Other commenters, however, recommended that we require funds to calculate after-tax returns using an intermediate tax rate in addition to, or in lieu of, the highest tax rate. These commenters observed that the typical mutual fund investor is not in the highest tax bracket, and argued that after-tax returns calculated using tax rates to which the typical mutual fund investor is subject would be more useful.

After careful consideration of these comments, we continue to believe that it is most appropriate to use the highest tax rate, rather than an intermediate rate. Computing after-tax returns with maximum tax rates will provide investors with the "worst-case" federal income tax scenario. Coupled with before-tax return, which reflects the imposition of taxes at a 0 percent rate, this "worst-case" scenario will effectively provide investors with the full range of historical after-tax returns. We believe that providing the full range of federal income tax outcomes provides investors the most complete information.

In addition, we concluded that any benefits of using an intermediate tax rate would be outweighed by the complexity of determining the appropriate intermediate rate from one year to the next as tax rates and the income of a typical mutual fund investor change. Most of the commenters who recommended that after-tax returns be calculated using an intermediate rate suggested that we either use a specific rate (*e.g.,* 28 percent) or select a specific income level (*e.g.,* $55,000) that would be used to identify the appropriate tax rate. If we were to adopt either of these approaches, we would be required to make ongoing modifications to respond to changes in tax rates and income levels. One commenter suggested that we determine the intermediate rate by reference to the median United States household income reported by the U.S. Census Bureau. This approach would be predicated on assumptions about the "typical" mutual fund investor and the past, present, and future income of that investor.

In any case, a requirement that funds calculate after-tax returns using an intermediate rate would effectively require that we continually monitor the changing demographics of mutual fund investors, as well as changing tax laws, and update our rules accordingly. The use of an intermediate rate also would require that funds include complex narrative disclosure in the risk/return summary about how the intermediate rate had been selected or what intermediate rate had been used from year to year. [68]

While we are not adopting a requirement that funds calculate after-tax returns using an intermediate rate, we encourage funds to provide their investors with additional information that is tailored to a particular fund's typical investor, or to make available to investors after-tax returns calculated using multiple tax rate assumptions. Funds can supply this information in a variety of ways (*e.g.,* calculators on their websites or disclosure elsewhere in the prospectus of returns calculated based on different tax rate assumptions).

2. Capital Gains and Losses Upon a Sale of Fund Shares

We are adopting, substantially as proposed, amendments requiring that return, after taxes on distributions and redemption, be computed assuming a complete sale of fund shares at the end of the 1-, 5-, or 10-year measurement period, resulting in capital gains taxes or a tax benefit from any resulting capital losses.[69] As proposed, a fund will be required to track the actual holding periods of reinvested distributions and may not assume that they have the same holding period as the initial $1,000 investment.[70] We have made technical changes to clarify that applicable federal tax law should be used to determine whether and how gains and losses from the sale of shares with different holding periods should be netted, as well as the tax character (*e.g.,* short-term or long-term) of any resulting gains or losses.[71]

Several commenters suggested that we permit funds to calculate taxes on gains realized upon a sale of shares at the end of the one-year period (*i.e.,* short-term capital gains) as if the shares had been held for one year and one day (*i.e.,* long-term capital gains).[72] These commenters argued that a reasonable shareholder would hold the shares for the extra day in order to qualify for the more advantageous tax treatment, and that it is inappropriate to assume that shares would be sold at the end of the one-year period. We are not modifying the proposal to reflect this comment. A shareholder who redeems his or her shares at any time during the one-year period is subject to taxation of gains at short-term rates. We believe that it is important for the after-tax return calculation to accurately reflect the fact that redeeming shares within the one-year period may have significant adverse tax consequences. In addition, we are providing that the tax consequences of a sale of fund shares should be determined in accordance with applicable federal tax law on the redemption date. If we were, instead, to prescribe a special rule for one-year returns, we would have to reevaluate this special rule in light of subsequent changes in tax law, such as increases to the holding period required for long-term gain treatment.

A number of commenters suggested other modifications to the proposal regarding the tracking of holding periods, such as treating the holding period of all reinvested distributions as beginning on the date of the original investment, and treating all gains on redemption as qualifying for long-term capital gains treatment. We are not adopting these recommended modifications, each of which would have the effect of reclassifying short-term gains as long-term gains, as they would minimize the impact of short-term gains on fund returns, in a manner inconsistent with federal tax law. One of our purposes in requiring the disclosure of after-tax returns is to provide investors with information about the differential impact that taxes have on the before-tax returns of various funds, and we believe that ignoring the effect of short-term gains would tend to minimize these differences inappropriately.

3. Other Assumptions

Commenters generally supported the other assumptions that the Commission proposed to require in the computation of after-tax returns, and we are adopting those requirements as proposed. Specifically, after-tax returns:

- Will be calculated using historical tax rates;[73]
- Will be based on calendar-year periods, consistent with the before-tax return disclosure that currently appears in the risk/return summary;[74]
- Will exclude state and local tax liability;[75]
- Will not take into account the effect of either the alternative minimum tax or phaseouts of certain tax credits, exemptions, and deductions for taxpayers whose adjusted gross income is above a specified amount;[76]
- Will assume that any taxes due on a distribution are paid out of that distribution at the time the distribution is reinvested and reduce the amount reinvested;[77] and
- Will be calculated assuming that the taxable amount and tax character (*e.g.,* ordinary income, short-term capital gain, long-term capital gain) of each distribution are as specified by the fund on the dividend declaration date, adjusted to reflect subsequent recharacterizations.[78]

Tax Treatment of Distributions

As proposed, we are not specifying in detail the tax consequences of fund distributions. Funds generally should determine the tax consequences of distributions by applying the tax law in effect on the date the distribution is reinvested. However, because a number of commenters expressed concern about whether a fund that has elected to pass through foreign tax credits to its shareholders may reflect the foreign tax credit in after-tax returns, we are providing that the effect of applicable tax credits, such as the foreign tax credit, should be taken into account in accordance with federal tax law.[79]

H. Narrative Disclosure

We are adopting, with modifications, the requirement that funds include a short, explanatory narrative adjacent to the performance table in the risk/return summary.[80] This is intended to facilitate investor understanding of the table. We are not mandating specific language for the narrative, but it must be in plain English.[81]

Commenters generally agreed that the proposed narrative disclosure would help investors understand information in the performance table. Several commenters, however, recommended streamlining the narrative by combining some of the proposed items with the narrative currently required for before-tax returns and by eliminating technical items unnecessary for investor understanding of performance information. We agree and have modified the narrative disclosure to require the following information:[82]

- After-tax returns are calculated using the historical highest individual federal marginal income tax rates, and do not reflect the impact of state and local taxes; and

- Actual after-tax returns depend on the investor's tax situation and may differ from those shown, and the after-tax returns shown are not relevant to investors who hold their fund shares through tax-deferred arrangements such as 401(k) plans or individual retirement accounts.[83]

In addition, a fund will be required to provide a statement to the effect that the fund's past performance, before and after taxes, is not necessarily an indication of how the fund will perform in the future.[84]

I. Technical and Conforming Amendments

We proposed to amend rule 482(e)(3) under the Securities Act in order to clarify that the average annual total returns that are required to be shown in any performance advertisement are before-tax returns net of fees and charges payable upon a sale of fund shares. This technical change is no longer necessary due to modifications we have made to the types of returns required. We are adopting, as proposed, amendments to rule 34b-1(b)(3) under the Investment Company Act to exclude after-tax performance information contained in periodic reports to shareholders from the updating requirements of the rule.

We proposed to delete an instruction contained in Form N-1A that provides that total return information in a mutual fund prospectus need only be current to the end of the fund's most recent fiscal year because the items of Form N-1A that require funds to include total returns in the prospectus have explicit instructions about how current the total return information must be. We have decided not to delete this instruction because it applies to returns that are not required by specific items of Form N-1A.[85]

J. Effective Date; Compliance Dates

1. Effective Date

The rule and form amendments that the Commission is adopting today will be effective April 16, 2001.

2. Compliance Date for Prospectuses

February 15, 2002. All post-effective amendments that are annual updates to effective registration statements and profiles filed on or after February 15, 2002, must comply with the amendments to Form N-1A. Based on the comments, we believe that this will provide funds with sufficient time to make the necessary changes to existing software and internal systems in order to compile after-tax returns and incorporate the new disclosure in their prospectuses. We would not object if existing funds file their first annual update complying with the amendments pursuant to rule 485(b), provided that the post-effective amendment otherwise meets the conditions for immediate effectiveness under the rule.[86]

3. Compliance Date for Advertisements and Other Sales Materials

October 1, 2001. All fund advertisements and sales materials must comply with the amendments to rules 482 and 34b-1 no later than October 1, 2001. These amendments apply only to those funds voluntarily choosing to include after-tax returns in advertisements or sales literature, or claiming to be managed to limit or control the effect of taxes on performance and including performance information in these materials. As these funds have made the decision to market themselves in this manner, we believe that they should be required to do so in a standardized fashion as soon as practicable.

III. Cost/Benefit Analysis

In the Proposing Release, we analyzed the costs and benefits of our proposals and requested comments and data regarding the costs and benefits of the rule and form amendments. In response to our request for comments, a few commenters generally argued that the proposed amendments would increase costs for the funds and that such costs will be passed on to investors. None of the commenters, however, provided specific data quantifying additional costs.

The rule and form changes will require a fund to disclose its standardized after-tax returns for 1-, 5-, and 10-year periods. After-tax returns, which will accompany before-tax returns in fund prospectuses, will be presented in two ways: (i) after taxes on fund distributions only; and (ii) after taxes on fund distributions and a redemption of fund shares.[87] The before- and after-tax returns would be required to be presented in a standardized tabular format. Although after-tax returns will not generally be required in fund advertisements and sales literature, any fund that either includes after-tax returns in these materials or includes other performance information together with representations that the fund is managed to limit taxes will be required to include after-tax returns computed according to our standardized formulas.

A. Benefits

As discussed above, taxes are one of the most significant costs of investing in mutual funds through taxable accounts. In 1999, mutual funds distributed approximately $238 billion in capital gains and $159 billion in taxable dividends.[88] Shareholders investing in stock and bond funds paid an estimated $39 billion in taxes in 1998 on distributions by their funds.[89] Recent estimates suggest that more than two and one-half percentage points of the average stock fund's total return is lost each year to taxes.[90] Moreover, it is estimated that, between 1994 and 1999, investors in diversified U.S. stock funds surrendered an average of 15 percent of their annual gains to taxes.[91]

Despite the tax dollars at stake, many investors lack a clear understanding of the impact of taxes on their mutual fund investments.[92] The tax consequences of distributions are a particular source of surprise to many investors when they discover that they can owe substantial taxes on their mutual fund investments that appear to be unrelated to the performance of the fund. Even if the value of a fund has declined during the year, a shareholder can owe taxes on capital gains distributions if the portfolio manager sold some of the fund's underlying portfolio securities at a gain.

There have been increasing calls for improvement in the disclosure of the tax consequences of mutual fund investments. Mutual funds, as well as third party providers that furnish information to mutual fund shareholders, are responding to this growing investor demand by providing after-tax returns, calculators that investors can use to compute after-tax returns, and other tax information.[93] Indeed, all but a few of the comment letters we received from individual investors supported the Commission's proposal to require standardized after-tax returns.

Currently, the Commission requires mutual funds to disclose significant information about taxes to investors.[94] While this disclosure is useful, we believe funds can more effectively communicate to investors the tax consequences of investing. Therefore, the Commission is adopting amendments to Form N-1A and rules 482 and 34b-1 that will require disclosure of standardized mutual fund after-tax returns.

By requiring all funds to report after-tax performance pursuant to a standardized formula, the amendments will allow investors to compare after-tax performance among funds, which is likely to affect investor decisions relating to the purchase or sale of fund shares. This could have indirect benefits, such as the creation of new funds designed to maximize after-tax performance or causing existing funds to alter their investment strategies to invest in a more tax-efficient manner. The changes in fund investment strategies and investor behavior resulting from this disclosure may also result in higher average after-tax returns for investors.[95]

Requiring standardized after-tax performance in the prospectus, fund advertisements, and sales literature also should help prevent confusing and misleading after-tax performance claims by funds. Currently, fund advertisements and sales literature may contain tax-adjusted performance calculated according to non-standardized methods. In addition to making it difficult to compare after-tax performance measures among different funds, the lack of a standardized method for computing after-tax returns creates the possibility that after-tax performance information as currently reported could be misleading or confusing to investors.

The amendments will also increase the amount of after-tax performance information available to investors. With the exception of the few funds that publish after-tax performance information, investors currently must rely on third-party providers to obtain information regarding a fund's after-tax performance.

Moreover, information regarding a fund's after-tax performance helps investors understand the magnitude of tax costs and how they affect fund performance. Increased understanding should have the beneficial effect of enhancing investor confidence in the fund industry.

B. Costs

The changes in fund investment strategies and investor behavior resulting from the after-tax requirements may have distributional effects among funds depending on their relative after-tax returns. Funds that have lower after-tax returns relative to other funds may experience loss of market share. We expect, however, that any reduction of market share for funds with lower after-tax returns will be offset by a commensurate increase in market share for funds with higher after-tax returns.

Funds affected by the after-tax requirements will incur costs in complying with the new disclosure. Funds will have to compute the after-tax returns using a standardized method prescribed by Form N-1A. The costs associated with computing the new after-tax performance will include the costs of purchasing or developing software, implementing a new system for computing the returns, analyzing data for inclusion in the standardized formula, and training fund employees. In addition, funds will incur costs in incorporating the new disclosure in their prospectuses, advertisements, and sales literature. Funds could also incur costs in responding to questions from investors regarding the after-tax returns.

We expect that the costs of implementing new systems to compute the standardized after-tax performance will largely consist of initial, one-time expenses. In addition, the software development and implementation costs may be reduced if software vendors begin to offer "off-the-shelf" programs for computing the standardized after-tax performance data. [96] Also, the costs of analyzing data for inclusion in the standardized formula will be substantially greater in connection with a fund's first-time compliance with the amendments than it will be in subsequent disclosures. Likewise, the costs of revising fund prospectuses, advertisements, and sales literature to incorporate the new disclosure should decrease after the first disclosures complying with the amendments have been made. We note that in response to concerns expressed by certain commenters regarding the burdens imposed on funds by the new requirements, we have simplified the presentation of after-tax returns.[97] Although the costs of updating the disclosure in fund prospectuses, advertisements, and sales literature will be ongoing, the costs incurred in subsequent disclosures should be less than the costs associated with the initial computations and disclosures because neither the formula for calculating performance nor the format for the disclosure will change from year to year.

Because funds filing initial registration statements will not have any performance information to report, the new after-tax performance requirements will not impose any additional costs on the preparation and filing of an initial registration statement on Form N-1A. The disclosure required by the amendments will appear in the first post-effective amendment that is required to include the after-tax return disclosure. The costs associated with including the disclosure in this first post-effective amendment will consist of the costs required for developing a system for performing the standardized calculations and the costs of revising the prospectus to incorporate the new disclosure. The costs incurred by funds choosing to include after-tax returns in fund advertisements and sales literature will be limited to the cost of revising the advertisements and sales literature to incorporate the same standardized after-tax returns that will be required to appear in fund prospectuses.

Form N-1A

The primary cost of complying with the amendments to Form N-1A is the cost of preparing and filing post-effective amendments to registration statements. We estimate that 4,500 post-effective amendments to registration statements are filed annually on Form N-1A, for 7,875 portfolios.

These post-effective amendments will contain performance figures and thus be affected by the amendments. For purposes of the Paperwork Reduction Act ("PRA"), we have estimated that the amendments will increase the hour burden per portfolio per filing of a post-effective amendment by 18 hours.[98] Of the 7,875 funds referenced in post-effective amendments, 1,040 are money market funds, which will be exempted from the after-tax disclosure requirements. An additional 1,575 funds are used as investment vehicles for variable insurance contracts, which will be permitted to omit the after-tax information. Thus, approximately 5,260 of the 7,875 funds referenced in post-effective amendments will be affected by the amendments.[99] We estimate that the cost for all funds to comply with the amendments discussed above is $6,059,520.[100]

The amendments to Form N-1A will impose other related costs on funds. Our current estimated cost of preparing a post-effective amendment to a previously effective registration statement is $7,500. We estimate that the additional cost imposed by the amendments to Form N-1A is $1,860 per portfolio/fund or a total cost of $9,783,600.[101] This estimate represents the cost of developing and implementing a computerized system for compiling tax data and computing after-tax returns and the costs of hiring outside counsel to assist in revising the prospectus to incorporate the new after-tax return disclosure.[102] Again, a portion of this cost burden will be comprised largely of initial, one-time costs.

Rule 482

Rule 482 is a safe harbor that permits a fund to advertise information the "substance of which" is contained in its statutory prospectus, subject to the requirements of the rule. Rule 482 limits performance information to standardized quotations of yield and total return and other measures of performance that reflect all elements of return.

Because rule 482 does not require funds to perform any computations not required by the amendments for Form N-1A, the primary cost of complying with the amendments is the cost of the additional hour burden that is outlined in our PRA analysis. As described above, there are approximately 5,260 funds filing post-effective amendments that will be affected by the amendments. The Commission further estimates that three percent of these funds will elect to use advertisements or sales literature that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance and therefore be required to comply with the amendments to rule 482.[103] For purposes of the PRA, we have estimated that the additional hour burden required to comply with the amendments to rule 482 is .5 hours.[104] The amendments to rule 482 will thus impose additional estimated costs of $5,506.[105]

Rule 34b-1

Rule 34b-1 governs sales material that is accompanied or preceded by the delivery of a statutory prospectus and requires the inclusion of standardized performance data and certain legend disclosure in sales material that includes performance data. As with the amendments to rule 482, these amendments will not require funds to perform any computations not required by the amendments to Form N-1A. Hence, the cost of complying with these amendments is primarily the cost associated with the burden estimate in our PRA analysis.

We estimate that approximately 8,495 respondents file approximately 4.35 responses annually pursuant to rule 34b-1.[106] Of these respondents, we estimate that 1,040 are money market funds that will be exempt from the amendments and that an additional 620 funds and unit investment trusts ("UITs") registered on Forms N-3 and N-4 will not be affected by the amendments. We estimate that an additional 1,575 funds registered on Form N-1A and subject to rule 34b-1 are used as underlying portfolios for variable insurance contracts and will not use advertisements or sales literature that include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance. Thus, 5,260 respondents subject to rule 34b-1 will also be subject to the after-tax disclosure.[107] We further estimate that three percent of respondents subject to rule 34b-1 or 157.8 respondents will elect to use advertisements or sales literature that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance and therefore be subject to the amendments.[108] For purposes of the PRA, we have estimated that the additional hour burden attributable to the amendments to rule 34b-1 is .5 hours, for a total of 78.9 annual burden hours or $5,049.60.[109]

IV. Effects on Efficiency, Competition, and Capital Formation

Section 2(c) of the Investment Company Act, section 2(b) of the Securities Act, and section 3(f) of the Exchange Act require the Commission, when engaging in rulemaking that requires it to consider or determine whether an action is consistent with the public interest, to consider, in addition to the protection of investors, whether the action will promote efficiency, competition, and capital formation.[110] The Commission has considered these factors.

The Commission believes that the after-tax return requirements will help to increase investor understanding of a fund's after-tax performance. Increased understanding should enable investors to better evaluate various funds in determining which funds are most suitable for their investment needs. More educated investors should promote competition among funds as they seek to attract those investors interested in the impact of taxes on fund investments. On balance, the Commission believes that the after-tax return requirements will benefit investors, foster efficiency, and promote competition among mutual funds. While investors will be better equipped to make investment decisions, it is unclear whether these amendments will result in an increase in capital formation.

V. Summary of Final Regulatory Flexibility Analysis

A Final Regulatory Flexibility Analysis ("FRFA") has been prepared in accordance with 5 U.S.C. 604. The Commission proposed amendments to Form N-1A [17 CFR 239.15A and 274.11A], the registration form used by mutual funds to register under the Act and to offer their shares under the Securities Act, and amendments to rule 482 under the Securities Act and rule 34b-1 under the Act in the Proposing Release. The Commission prepared an Initial Regulatory Flexibility Analysis ("IRFA") in accordance with 5 U.S.C. 603 in conjunction with the Proposing Release, which was made available to the public. The Proposing Release summarized the IRFA and solicited comments on it. No comments specifically addressed the IRFA.

A. Need for the Rule and Form Amendments

As discussed above, taxes are one of the most significant costs of investing in mutual funds through taxable accounts. Despite the tax dollars at stake, many investors lack a clear understanding of the impact of taxes on their mutual fund investments.[111]

There have been increasing calls for improvement in the disclosure of the tax consequences of mutual fund investments. Mutual funds, as well as third party providers that furnish information to mutual fund shareholders, are responding to this growing investor demand by providing after-tax returns, calculators that investors can use to compute after-tax returns, and other tax information.[112] In addition, several fund groups have created new funds promoting the use of more tax-efficient portfolio management strategies.[113] Moreover, in April 2000, a bill that would require the Commission to revise its regulations to require improved disclosure of mutual fund after-tax returns was passed by the U.S. House of Representatives and was referred to the Senate.[114]

B. Significant Issues Raised by Public Comment

The Commission requested comment on the IRFA, but we received no comments specifically addressing the analysis. One commenter, however, argued that the proposed amendments would have a greater impact on smaller entities while another commenter suggested a longer phase-in period for smaller funds to comply with the new requirements. Neither of the commenters provided any specific or quantifiable data.

C. Small Entities Subject to the Rule

For purposes of the Regulatory Flexibility Act, a fund is a small entity if the fund, together with other funds in the same group of related funds, has net assets of $50 million or less as of the end of its most recent fiscal year.[115] As of December 1999, there were approximately 2,900 investment companies registered on Form N-1A that may be affected by the proposed amendments.[116] Of these 2,900, approximately 150 are investment companies that meet the Commission's definition of small entity for purposes of the Investment Company Act.[117] The amendments that require funds to provide after-tax returns in registration statements, advertisements, and sales literature will affect those small entities.

D. Projected Reporting, Recordkeeping, and Other Compliance Requirements

The amendments will require all funds subject to the amendments to provide after-tax return information in their prospectuses. Although after-tax returns will not generally be required in fund advertisements and sales literature, any fund that either includes after-tax returns in these materials or includes other performance information together with representations that the fund is managed to limit taxes will be required to include after-tax returns computed according to our standardized formulas.

After assessing the amendments in light of the current reporting requirements and consulting with representatives in the industry, the Commission has considered the potential effect that the amendments will have on the preparation of registration statements, advertisements, and sales literature. The Commission estimates that, as a result of the amendments, it will take approximately 18 additional hours per portfolio to prepare the first post-effective amendment to the registration statement on Form N-1A that is required to include the proposed after-tax return disclosure.[118] The Commission believes that this estimate represents an initial, one-time burden and that the hour burden will be reduced for subsequent post-effective amendments. For purposes of calculating the rule 482 hour burden relating to advertisements, the Commission estimates that the proposed amendments will impose approximately .5 additional hours per portfolio.[119] The Commission also estimates that the proposed amendments will impose approximately .5 additional hours per response for sales literature subject to rule 34b-1.[120]

E. Agency Action to Minimize Effects on Small Entities

The Commission believes that special compliance or reporting requirements for small entities would not be appropriate or consistent with investor protection. The disclosure amendments we are adopting will give prospective and existing shareholders greater access to information about the after-tax returns of mutual funds. Different disclosure requirements for small entities, such as reducing the level of disclosure that small entities would have to provide, would create the risk that investors would not receive adequate information about a fund's after-tax returns or would receive confusing, false, or misleading information. In addition, investors would not be able to easily compare each fund when making an investment decision if there were no uniform disclosure standards for after-tax performance information applicable to all funds. The Commission believes it is important for prospective and existing shareholders to receive this information about after-tax returns for all funds, not just for funds that are not considered small entities.

Investors in small funds should have information about the funds' after-tax returns and would benefit from this information as much as investors in larger funds. If we do not require certain information for small entities, this could create the risk that investors in small funds might not receive important information about a fund's after-tax returns. The Commission also notes that current disclosure requirements in registration statements do not distinguish between small entities and other funds. In addition, the Commission believes it would be inappropriate to impose a different timetable on small entities for complying with the requirements because investors would not have the ability to compare the after-tax returns of all funds when making an investment decision.

Further clarification, consolidation, or simplification of the proposals for funds that are small entities would be inconsistent with concerns for investor protection. Simplifying or otherwise reducing the regulatory requirements of the proposals for small entities could undercut the purpose of these proposals: to emphasize to investors the impact of taxes on a fund's return and to enable investors to make effective comparisons among various fund performance claims. For the same reasons, using performance standards to specify the requirements for small entities also would not be appropriate.

We note, however, that in response to concerns expressed by certain commenters regarding the burdens imposed on funds by the new requirements, we have simplified the presentation of after-tax returns.[121] We have also extended the date by which all post-effective amendments that are annual updates to effective registration statements and profiles must comply with the amendments to Form N-1A from the proposed six-month period to February 15, 2002, which will provide funds an additional four months to comply with the amendments. Overall, these amendments will not adversely affect small entities. We believe that the burden on funds of computing and disclosing after-tax returns is justified by the benefits to investors from receiving this information. While we acknowledge that funds will incur a one-time cost to modify their systems to compute after-tax returns, the computation thereafter should be straightforward to perform using readily available data.

The FRFA is available for public inspection in File No. S7-23-99, and a copy may be obtained by contacting Peter M. Hong, Special Counsel, at (202) 942-0721, Office of Disclosure Regulation, Division of Investment Management, Securities and Exchange Commission, 450 5th Street, N.W., Washington, D.C. 20549-0506.

VI. Paperwork Reduction Act

As explained in the Proposing Release, certain provisions of the amendments contain "collection of information" requirements within the meaning of the Paperwork Reduction Act of 1995 [44 U.S.C. 3501, *et seq.*], and the Commission has submitted the proposed collections of information to the Office of Management and Budget ("OMB") for review in accordance with 44 U.S.C. 3507(d) and 5 CFR 1320.11. The titles for the collections of information are: (i) "Form N-1A under the Investment Company Act of 1940 and Securities Act of 1933, Registration Statement of Open-End Management Investment Companies"; (ii) "Registration Statements - Regulation C";[122] and (iii) "Rule 34b-1 of the Investment Company Act of 1940, Sales Literature Deemed to Be Misleading." An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid control number.[123]

Form N-1A (OMB Control No. 3235-0307) was adopted pursuant to section 8(a) of the Investment Company Act [15 U.S.C. 80a-8] and section 5 of the Securities Act [15 U.S.C. 77e]. Rule 30d-1 (OMB Control No. 3235-0025) was adopted pursuant to Section 30(e) of the Investment Company Act [15 U.S.C. 80a-2]. Rule 482 of Regulation C (OMB Control No. 3235-0074) was adopted pursuant to section 10(b) of the Securities Act [15 U.S.C. 77j(b)]. Rule 34b-1 (OMB Control No. 3235-0346) was adopted pursuant to section 34(b) of the Investment Company Act [15 U.S.C. 80a-33(b)].

As discussed above, the amendments will require a fund to disclose its standardized after-tax returns for 1-, 5-, and 10-year periods. After-tax return information is to be included in the risk/return summary of the prospectus. Funds are required to include a short, explanatory narrative adjacent to the performance table in the risk/return summary. After-tax returns, which will accompany before-tax returns in fund prospectuses, will be presented in two ways: (i) after taxes on fund distributions only; and (ii) after taxes on fund distributions and a redemption of fund shares. The before- and after-tax returns will be required to be presented in a standardized tabular format. Although after-tax returns will not generally be required in fund advertisements and sales literature, any fund that either includes after-tax returns in these materials or includes other performance information together with representations that the fund is managed to limit taxes will be required to include after-tax returns computed according to our standardized formulas.

The information required by the amendments is primarily for the use and benefit of investors. The Commission is concerned that mutual fund investors who are subject to current taxation may not fully appreciate the impact of taxes on their fund investments because mutual funds are currently required to report their performance on a before-tax basis only. Many investors consider performance one of the most significant factors when selecting or evaluating a fund, and we believe that requiring funds to disclose their after-tax performance would allow investors to make better-informed decisions. The information required to be filed with the Commission pursuant to the information collections also permits the verification of compliance with securities law requirements and assures the public availability and dissemination of the information.

In the Proposing Release, the Commission estimated the burden hours that would be necessary for the collection of information requirements under the proposed amendments. Although no commenters specifically addressed the burden estimates for the collection of information requirements, a few commenters raised concerns regarding the costs involved in complying with the disclosure requirements of the amendments. These commenters, however, did not provide an estimate of the burden hours associated with the proposed rule changes. We continue to believe that the estimates of the burden hours contained in the Proposing Release are appropriate.[124]

Form N-1A

Form N-1A, including the amendments, contains collection of information requirements. The purpose of Form N-1A is to meet the registration and disclosure requirements of the Securities Act and the Investment Company Act and to enable funds to provide investors with information necessary to evaluate an investment in the fund. The likely respondents to this information collection are open-end funds registering with the Commission on Form N-1A.

We estimate that 170 initial registration statements are filed annually on Form N-1A, registering 298 portfolios, and that the current hour burden per portfolio per filing is 824 hours, for a total annual hour burden of 245,552 hours.[125] We estimate that 4,500 post-effective amendments to registration statements are filed annually on Form N-1A, for 7,875 portfolios, and that the current hour burden per portfolio per post-effective amendment filing is 104 hours, for an annual burden of 819,000 hours.[126] Thus, we estimate a current total annual hour burden of 1,064,552 hours for the preparation and filing of Form N-1A and post-effective amendments on Form N-1A.

The proposed amendments will not affect the hour burden of an initial filing of a registration statement on Form N-1A since an investment company filing such an initial form will have no performance history to disclose. Post-effective amendments to such registration statements, however, will contain performance figures and thus be affected by the amendments. We estimate that the amendments will increase the hour burden per portfolio per filing of a post-effective amendment by 18 hours.[127] Of the 7,875 funds referenced in post-effective amendments, 1,040 are money market funds, which will be exempted from the after-tax return disclosure requirements. An additional 1,575 funds are used as investment vehicles for variable insurance contracts, which will be permitted to omit the after-tax information. Thus, approximately 5,260 of the 7,875 funds referenced in post-effective amendments will be affected by the proposed amendments.[128] The Commission estimates the total annual hour burden for all funds for preparation and filing of initial registration statements and post-effective amendments on Form N-1A will be 1,159,311 hours.[129]

Compliance with the disclosure requirements of Form N-1A is mandatory. Responses to the disclosure requirements will not be kept confidential.

Rule 482

Rule 482, including the amendments, contains collection of information requirements. The rule permits a fund to advertise information the "substance of which" is contained in its statutory prospectus, subject to the requirements of the rule. Rule 482 limits performance information to standardized quotations of yield and total return and other measures of performance that reflect all elements of return.

The increased burden associated with the amendments to rule 482 is included in Form N-1A.[130] Thus, the amendments to rule 482 will affect the burden hours for Form N-1A, the registration form for open-end investment companies that currently may advertise pursuant to rule 482. As described above, there are approximately 5,260 funds filing post-effective amendments that will be affected by the proposed amendments. The Commission further estimates that three percent of these funds will elect to use advertisements or sales literature that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance and therefore be required to comply with the proposed amendments to rule 482.[131] We estimate that the additional hour burden required to comply with the proposed amendments to rule 482 is .5 hours.[132]

Compliance with rule 482 is mandatory for every registered fund that issues advertisements. Responses to the disclosure requirements will not be kept confidential.

Rule 34b-1

Rule 34b-1, including the amendments, contains collection of information requirements. The rule governs sales material that is accompanied or preceded by the delivery of a statutory prospectus and requires the inclusion of standardized performance data and certain legend disclosure in sales material that includes performance data.

We estimate that approximately 8,495 respondents file approximately 4.35 responses annually pursuant to rule 34b-1.[133] Of these respondents, we estimate that 1,040 are money market funds that will be exempt from the amendments and that an additional 620 funds and unit investment trusts ("UITs") registered on Forms N-3 and N-4 will not be affected by the amendments. We estimate that an additional 1,575 funds registered on Form N-1A and subject to rule 34b-1 are used as underlying portfolios for variable insurance contracts and will not advertise after-tax returns or use advertisements that either include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance due to their unique tax-deferred nature. Thus, 5,260 respondents subject to rule 34b-1 will also be subject to the after-tax return disclosure.[134] We further estimate that three percent of respondents subject to rule 34b-1 will elect to use advertisements or sales literature that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance and therefore be subject to the proposed amendments.[135] The burden for rule 34b-1 requires approximately 2.4 hours per response resulting from creating the information required by rule 34b-1. We estimate that rule 34b-1 imposes a current total annual reporting burden of 88,800 hours on the industry.[136] We estimate that the additional hour burden required to comply with the proposed amendments to rule 34b-1 is .5 hours, for a total burden per response of 2.9 hours and a total annual burden on the industry of 89,143 hours.[137]

Compliance with rule 34b-1 is mandatory for every registered investment company that issues sales literature. Responses to the disclosure requirements will not be kept confidential.

VII. Statutory Authority

The Commission is adopting amendments to Form N-1A pursuant to authority set forth in sections 5, 6, 7, 10, and 19(a) of the Securities Act [15 U.S.C. 77e, 77f, 77g, 77j, 77s(a)] and sections 8, 24(a), and 38 of the Investment Company Act [15 U.S.C. 80a-8, 80a-24(a), 80a-37]. The Commission is adopting amendments to rule 482 pursuant to authority set forth in sections 5, 10(b), and 19(a) of the Securities Act [15 U.S.C. 77e, 77j(b), and 77s(a)]. The Commission is adopting amendments to rule 34b-1 pursuant to authority set forth in sections 34(b) and 38(a) of the Investment Company Act [15 U.S.C. 80a-33(b) and 80a-37(a)].

List of Subjects

17 CFR Part 230

Advertising, Investment companies, Reporting and recordkeeping requirements, Securities.

17 CFR Part 239

Reporting and recordkeeping requirements, Securities.

17 CFR Parts 270 and 274

Investment companies, Reporting and recordkeeping requirements, Securities.

Text of Rules and Forms

For the reasons set out in the preamble, Title 17, Chapter II of the Code of Federal Regulations is amended as follows:

PART 230 -- GENERAL RULES AND REGULATIONS, SECURITIES ACT OF 1933

1. The general authority citation for part 230 is revised to read as follows:

Authority: 15 U.S.C. 77b, 77c, 77d, 77f, 77g, 77h, 77j, 77r, 77sss, 77z-3, 78c, 78d, 78*l*, 78m, 78n, 78o, 78t, 78w, 78*ll*(d), 78mm, 79t, 80a-8, 80a-24, 80a-28, 80a-29, 80a-30, and 80a-37, unless otherwise noted.

2. Section 230.482 is amended by:

a. removing "; and" at the end of paragraph (e)(3)(iv) and in its place adding a period;

b. redesignating paragraph (e)(4) as paragraph (e)(5) and paragraph (f) as paragraph (g);

c. adding new paragraphs (e)(4) and (f); and

d. revising newly redesignated paragraph (e)(5) to read as follows:

§ 230.482 Advertising by an investment company as satisfying requirements of section 10.

* * * * *

(e) * * *

(4) For an open-end management investment company, average annual total return (after taxes on distributions) and average annual total return (after taxes on distributions and redemption) for one, five, and ten year periods; *Provided*, That if the company's registration statement under the Securities Act of 1933 (15 U.S.C. 77a *et seq.*) has been in effect for less than one, five, or ten years, the time period during which the registration statement was in effect is substituted for the period(s) otherwise prescribed; and *Provided further*, That such quotations:

(i) Are based on the methods of computation prescribed in Form N-1A;

(ii) Are current to the most recent calendar quarter ended prior to the submission of the advertisement for publication;

(iii) Are accompanied by quotations of total return as provided for in paragraph (e)(3) of this section;

(iv) Include both average annual total return (after taxes on distributions) and average annual total return (after taxes on distributions and redemption);

(v) Are set out with equal prominence and are set out in no greater prominence than the required quotations of total return; and

(vi) Identify the length of and the last day of the one, five, and ten year periods; and

(5) Any other historical measure of company performance (not subject to any prescribed method of computation) if such measurement:

(i) Reflects all elements of return;

(ii) Is accompanied by quotations of total return as provided for in paragraph (e)(3) of this section;

(iii) In the case of any measure of performance adjusted to reflect the effect of taxes, is accompanied by quotations of total return as provided for in paragraph (e)(4) of this section;

(iv) Is set out in no greater prominence than the required quotations of total return; and

(v) Identifies the length of and the last day of the period for which performance is measured.

(f) An advertisement for an open-end management investment company (other than a company that is permitted under § 270.35d-1(a)(4) of this chapter to use a name suggesting that the company's distributions are exempt from federal income tax or from both federal and state income tax) that represents or implies that the company is managed to limit or control the effect of taxes on company performance shall accompany any quotation of the company's performance permitted by paragraph (e) of this section with quotations of total return as provided for in paragraph (e)(4) of this section.

* * * * *

PART 270 -- RULES AND REGULATIONS, INVESTMENT COMPANY ACT OF 1940

3. The authority citation for part 270 continues to read in part as follows:

Authority: 15 U.S.C. 80a-1 *et seq*., 80a-34(d), 80a-37, 80a-39, unless otherwise noted;

4. Section 270.34b-1 is amended by:

a. redesignating paragraphs (b)(1)(iii)(B) and (C) as paragraphs (b)(1)(iii)(D)

and (E);

b. adding new paragraphs (b)(1)(iii)(B) and (C); and

c. revising paragraph (b)(3) before the note to read as follows:

§ 270.34b-1 Sales literature deemed to be misleading.

* * * * *

(b)(1) * * *

(iii) * * *

(B) Accompany any quotation of performance adjusted to reflect the effect of taxes (not including a quotation of tax equivalent yield or other similar quotation purporting to demonstrate the tax equivalent yield earned or distributions made by the company) with the quotations of total return specified by paragraph (e)(4) of § 230.482 of this chapter;

(C) If the sales literature (other than sales literature for a company that is permitted under § 270.35d-1(a)(4) to use a name suggesting that the company's distributions are exempt from federal income tax or from both federal and state income tax) represents or implies that the company is managed to limit or control the effect of taxes on company performance, include the quotations of total return specified by paragraph (e)(4) of § 230.482 of this chapter;

* * * * *

(3) The requirements specified in paragraph (b)(1) of this section shall not apply to any quarterly, semi-annual, or annual report to shareholders under Section 30 of the Act (15 U.S.C. 80a-29) containing performance data for a period commencing no earlier than the first day of the period covered by the report; nor shall the requirements of paragraphs (e)(3)(ii), (e)(4)(ii), and (g) of § 230.482 of this chapter apply to any such periodic report containing any other performance data.

* * * * *

PART 239 -- FORMS PRESCRIBED UNDER THE SECURITIES ACT OF 1933

5. The authority citation for part 239 continues to read, in part, as follows:

Authority: 15 U.S.C. 77f, 77g, 77h, 77j, 77s, 77z-2, 77sss, 78c, 78*l*, 78m, 78n, 78o(d), 78u-5, 78w(a), 78*ll*(d), 79e, 79f, 79g, 79j, 79*l*, 79m, 79n, 79q, 79t, 80a-8, 80a-24, 80a-29, 80a-30 and 80a-37, unless otherwise noted.

PART 274 -- FORMS PRESCRIBED UNDER THE INVESTMENT COMPANY ACT OF 1940

6. The authority citation for part 274 continues to read as follows:

Authority: 15 U.S.C. 77f, 77g, 77h, 77j, 77s, 78c(b), 78*l*, 78m, 78n, 78o(d),

80a-8, 80a-24, and 80a-29, unless otherwise noted.

Note: The text of Form N-1A does not and these amendments will not appear in the *Code of Federal Regulations.*

7. General Instruction C to Form N-1A (referenced in §§ 239.15A and 274.11A) is amended by adding paragraphs 3.(d)(iii) and (iv) to read as follows:

Form N-1A

*** * * * ***

General Instructions

* * * * *

C. Preparation of the Registration Statement

* * * * *

3. Additional Matters:

* * * * *

(d) * * *

(iii) A Fund may omit the information required by Items 2(c)(2)(iii)(B) and (C) and 2(c)(2)(iv) if the Fund's prospectus will be used exclusively to offer Fund shares as investment options for one or more of the following:

(A) a defined contribution plan that meets the requirements for qualification under section 401(k) of the Internal Revenue Code (26 U.S.C. 401(k)), a tax-deferred arrangement under section 403(b) or 457 of the Internal Revenue Code (26 U.S.C. 403(b) or 457), a variable contract as defined in section 817(d) of the Internal Revenue Code (26 U.S.C. 817(d)), or a similar plan or arrangement pursuant to which an investor is not taxed on his or her investment in the Fund until the investment is sold; or

(B) persons that are not subject to the federal income tax imposed under section 1 of the Internal Revenue Code (26 U.S.C. 1), or any successor to that section.

(iv) A Fund that omits information under Instruction (d)(iii) may alter the legend required on the back cover page by Item 1(b)(1) to state, as applicable, that the prospectus is intended for use in connection with a defined contribution plan, tax-deferred arrangement, variable contract, or similar plan or arrangement, or persons described in Instruction (d)(iii)(B).

* * * * *

8. Item 2 of Form N-1A (referenced in §§ 239.15A and 274.11A) is amended by:

a. revising paragraphs (c)(2)(i) and (c)(2)(iii);

b. adding paragraph (c)(2)(iv);

c. revising paragraph (a) of Instruction 2;

d. adding paragraph (e) to Instruction 2; and

e. revising paragraph (c) of Instruction 3 to read as follows:

Form N-1A

* * * * *

Item 2. Risk/Return Summary: Investments, Risks, and Performance

* * * * *

(c) * * *

(2) * * *

(i) Include the bar chart and table required by paragraphs (c)(2)(ii) and (iii) of this section. Provide a brief explanation of how the information illustrates the variability of the Fund's returns (*e.g.,* by stating that the information provides some indication of the risks of investing in the Fund by showing changes in the Fund's performance from year to year and by showing how the Fund's average annual returns for 1, 5, and 10 years compare with those of a broad measure of market performance). Provide a statement to the effect that the Fund's past performance (before and after taxes) is not necessarily an indication of how the Fund will perform in the future.

* * * * *

(iii) If the Fund has annual returns for at least one calendar year, provide a table showing the Fund's (A) average annual total return; (B) average annual total return (after taxes on distributions); and (C) average annual total return (after taxes on distributions and redemption). A Money Market Fund should show only the returns described in clause (A) of the preceding sentence. All returns should be shown for 1-, 5-, and 10- calendar year periods ending on the date of the most recently completed calendar year (or for the life of the Fund, if shorter), but only for periods subsequent to the effective date of the Fund's registration statement. The table also should show the returns of an appropriate broad-based securities market index as defined in Instruction 5 to Item 5(b) for the same periods. A Fund that has been in existence for more than 10 years also may include returns for the life of the Fund. A Money Market Fund may provide the Fund's 7-day yield ending on the date of the most recent calendar year or disclose a toll-free (or collect) telephone number that investors can use to obtain the Fund's current 7-day yield. For a Fund (other than a Money Market Fund or a Fund described in General Instruction C.3.(d)(iii)), provide the information in the following table with the specified captions:

AVERAGE ANNUAL TOTAL RETURNS

(For the periods ended December 31, _____)

	1 year	5 years [or Life of Fund]	10 years [or Life of Fund]
Return Before Taxes	___%	___%	___%
Return After Taxes on Distributions	___%	___%	___%
Return After Taxes on Distributions and Sale of Fund Shares	___%	___%	___%
Index **(reflects no deduction for [fees, expenses, or taxes])**	___%	___%	___%

(iv) Adjacent to the table required by paragraph 2(c)(2)(iii), provide a brief explanation that:

(A) After-tax returns are calculated using the historical highest individual federal marginal income tax rates and do not reflect the impact of state and local taxes;

(B) Actual after-tax returns depend on an investor's tax situation and may differ from those shown, and after-tax returns shown are not relevant to investors who hold their Fund shares through tax-deferred arrangements, such as 401(k) plans or individual retirement accounts;

(C) If the Fund is a Multiple Class Fund that offers more than one Class in the prospectus, after-tax returns are shown for only one Class and after-tax returns for other Classes will vary; and

(D) If average annual total return (after taxes on distributions and redemption) is higher than average annual total return, the reason for this result may be explained.

Instructions.

* * * * *

2. Table.

(a) Calculate a Money Market Fund's 7-day yield under Item 21(a); the Fund's average annual total return under Item 21(b)(1); and the Fund's average annual total return (after taxes on distributions) and average annual total return (after taxes on distributions and redemption) under Items 21(b)(2) and (3), respectively.

* * *

(e) Returns required by paragraphs 2(c)(2)(iii)(A), (B), and (C) for a Fund or Series must be adjacent to one another and appear in that order. When more than one Fund or Series is offered in the prospectus, do not intersperse returns of one Fund or Series with returns of another Fund or Series. The returns for a broad-based securities market index, as required by paragraph 2(c)(2)(iii), must precede or follow all of the returns for a Fund or Series rather than be interspersed with the returns of the Fund or Series.

* * * * *

3. Multiple Class Funds.

* * * * *

(c) When a Multiple Class Fund offers more than one Class in the prospectus:

(i) Provide the returns required by paragraph 2(c)(2)(iii)(A) of this Item for each Class offered in the prospectus;

(ii) Provide the returns required by paragraphs 2(c)(2)(iii)(B) and (C) of this Item for only one of those Classes. The Fund may select the Class for which it provides the returns required by paragraphs 2(c)(2)(iii)(B) and (C) of this Item, provided that the Fund:

(A) Selects a Class that has been offered for use as an investment option for accounts other than those described in General Instruction C.3.(d)(iii)(A);

(B) Selects a Class described in paragraph (c)(ii)(A) of this instruction with 10 or more years of annual returns if other Classes described in paragraph (c)(ii)(A) of this instruction have fewer than 10 years of annual returns;

(C) Selects the Class described in paragraph (c)(ii)(A) of this instruction with the longest period of annual returns if the Classes described in paragraph (c)(ii)(A) of this instruction all have fewer than 10 years of returns; and

(D) If the Fund provides the returns required by paragraphs 2(c)(2)(iii)(B) and (C) of this Item for a Class that is different from the Class selected for the most immediately preceding period, explain in a footnote to the table the reasons for the selection of a different Class;

(iii) The returns required by paragraphs 2(c)(2)(iii)(A), (B), and (C) of this Item for the Class described in paragraph (c)(ii) of this instruction should be adjacent and should not be interspersed with the returns of other Classes; and

(iv) All returns shown should be identified by Class.

* * * * *

9. Item 5 of Form N-1A (referenced in §§ 239.15A and 274.11A) is amended by revising paragraph (b)(2) to read as follows:

Form N-1A

* * * * *

Item 5. Management's Discussion of Fund Performance

* * * * *

(b)(1) * * *

(2) In a table placed within or next to the graph, provide the Fund's average annual total returns for the 1-, 5-, and 10-year periods as of the end of the last day of the most recent fiscal year (or for the life of the Fund, if shorter), but only for periods

subsequent to the effective date of the Fund's registration statement. Average annual total returns should be computed in accordance with Item 21(b)(1). Include a statement accompanying the graph and table to the effect that past performance does not predict future performance and that the graph and table do not reflect the deduction of taxes that a shareholder would pay on fund distributions or the redemption of fund shares.

* * * * *

10. Item 21 of Form N-1A (referenced in §§ 239.15A and 274.11A) is amended by:

a. revising the phrase "(b)(1) - (4)" to read "(b)(1) - (6)" in the introductory text of paragraph (b);

b. redesignating paragraphs (b)(2), (3), (4), and (5) as paragraphs (b)(4), (5), (6), and (7), respectively;

c. adding new paragraphs (b)(2) and (b)(3); and

d. revising paragraph (b)(1) to read as follows:

Form N-1A

* * * * *

Item 21. Calculation of Performance Data

* * * * *

(b) * * *

(1) *Average Annual Total Return Quotation.* For the 1-, 5-, and 10-year periods ended on the date of the most recent balance sheet included in the registration statement (or for the periods the Fund has been in operation), calculate the Fund's average annual total return by finding the average annual compounded rates of return over the 1-, 5-, and 10-year periods (or for the periods of the Fund's operations) that would equate the initial amount invested to the ending redeemable value, according to the following formula:

$P(1+T)^n = ERV$

Where:

P = a hypothetical initial payment of $1,000.

T = average annual total return.

n = number of years.

ERV = ending redeemable value of a hypothetical $1,000 payment made at the beginning of the 1-, 5-, or 10-year periods at the end of the 1-, 5-, or 10-year periods (or fractional portion).

Instructions.

1. Assume the maximum sales load (or other charges deducted from payments) is

deducted from the initial $1,000 payment.

2. Assume all distributions by the Fund are reinvested at the price stated in the prospectus (including any sales load imposed upon reinvestment of dividends) on the reinvestment dates during the period.

3. Include all recurring fees that are charged to all shareholder accounts. For any account fees that vary with the size of the account, assume an account size equal to the Fund's mean (or median) account size. Reflect, as appropriate, any recurring fees charged to shareholder accounts that are paid other than by redemption of the Fund's shares.

4. Determine the ending redeemable value by assuming a complete redemption at the end of the 1-, 5-, or 10-year periods and the deduction of all nonrecurring charges deducted at the end of each period. If shareholders are assessed a deferred sales load, assume the maximum deferred sales load is deducted at the times, in the amounts, and under the terms disclosed in the prospectus.

5. State the average annual total return quotation to the nearest hundredth of one percent.

6. Total return information in the prospectus need only be current to the end of the Fund's most recent fiscal year.

(2) *Average Annual Total Return (After Taxes on Distributions) Quotation.*

For the 1-, 5-, and 10-year periods ended on the date of the most recent balance sheet included in the registration statement (or for the periods the Fund has been in operation), calculate the Fund's average annual total return (after taxes on distributions) by finding the average annual compounded rates of return over the 1-, 5-, and 10-year periods (or for the periods of the Fund's operations) that would equate the initial amount invested to the ending value, according to the following formula:

$P(1+T)^n = ATV_D$

Where:

P = a hypothetical initial payment of $1,000.

T = average annual total return (after taxes on distributions).

n = number of years.

ATV_D = ending value of a hypothetical $1,000 payment made at the beginning of the 1-, 5-, or 10-year periods at the end of the 1-, 5-, or 10-year periods (or fractional portion), after taxes on fund distributions but not after taxes on redemption.

Instructions.

1. Assume the maximum sales load (or other charges deducted from payments) is deducted from the initial $1,000 payment.

2. Assume all distributions by the Fund, less the taxes due on such distributions, are reinvested at the price stated in the prospectus (including any sales load imposed upon reinvestment of dividends) on the reinvestment dates during the period.

3. Calculate the taxes due on any distributions by the Fund by applying the tax rates specified in Instruction 4 to each component of the distributions on the reinvestment date (*e.g.,* ordinary income, short-term capital gain, long-term capital gain).

The taxable amount and tax character of each distribution should be as specified by the Fund on the dividend declaration date, but may be adjusted to reflect subsequent recharacterizations of distributions. Distributions should be adjusted to reflect the federal tax impact the distribution would have on an individual taxpayer on the reinvestment date. For example, assume no taxes are due on the portion of any distribution that would not result in federal income tax on an individual, *e.g.*, tax-exempt interest or non-taxable returns of capital. The effect of applicable tax credits, such as the foreign tax credit, should be taken into account in accordance with federal tax law.

4. Calculate the taxes due using the highest individual marginal federal income tax rates in effect on the reinvestment date. The rates used should correspond to the tax character of each component of the distributions (*e.g.*, ordinary income rate for ordinary income distributions, short-term capital gain rate for short-term capital gain distributions, long-term capital gain rate for long-term capital gain distributions). Note that the required tax rates may vary over the measurement period. Disregard any potential tax liabilities other than federal tax liabilities (*e.g.*, state and local taxes); the effect of phaseouts of certain exemptions, deductions, and credits at various income levels; and the impact of the federal alternative minimum tax.

5. Include all recurring fees that are charged to all shareholder accounts. For any account fees that vary with the size of the account, assume an account size equal to the Fund's mean (or median) account size. Assume that no additional taxes or tax credits result from any redemption of shares required to pay such fees. Reflect, as appropriate, any recurring fees charged to shareholder accounts that are paid other than by redemption of the Fund's shares.

6. Determine the ending value by assuming a complete redemption at the end of the 1-, 5-, or 10-year periods and the deduction of all nonrecurring charges deducted at the end of each period. If shareholders are assessed a deferred sales load, assume the maximum deferred sales load is deducted at the times, in the amounts, and under the terms disclosed in the prospectus. Assume that the redemption has no tax consequences.

7. State the average annual total return (after taxes on distributions) quotation to the nearest hundredth of one percent.

(3) *Average Annual Total Return (After Taxes on Distributions and Redemption) Quotation.* For the 1-, 5-, and 10-year periods ended on the date of the most recent balance sheet included in the registration statement (or for the periods the Fund has been in operation), calculate the Fund's average annual total return (after taxes on distributions and redemption) by finding the average annual compounded rates of return over the 1-, 5-, and 10-year periods (or for the periods of the Fund's operations) that would equate the initial amount invested to the ending value, according to the following formula:

$$P(1 + T)^n = ATV_{DR}$$

Where:

P = a hypothetical initial payment of $1,000.

T = average annual total return (after taxes on distributions and redemption).

n = number of years.

ATV_{DR} = ending value of a hypothetical $1,000 payment made at the beginning of the 1-, 5-, or 10-year periods at the end of the 1-, 5-, or 10-year periods (or fractional portion), after taxes on fund distributions and redemption.

Instructions.

1. Assume the maximum sales load (or other charges deducted from payments) is deducted from the initial $1,000 payment.

2. Assume all distributions by the Fund, less the taxes due on such distributions, are reinvested at the price stated in the prospectus (including any sales load imposed upon reinvestment of dividends) on the reinvestment dates during the period.

3. Calculate the taxes due on any distributions by the Fund by applying the tax rates specified in Instruction 4 to each component of the distributions on the reinvestment date (*e.g.,* ordinary income, short-term capital gain, long-term capital gain). The taxable amount and tax character of each distribution should be as specified by the Fund on the dividend declaration date, but may be adjusted to reflect subsequent recharacterizations of distributions. Distributions should be adjusted to reflect the federal tax impact the distribution would have on an individual taxpayer on the reinvestment date. For example, assume no taxes are due on the portion of any distribution that would not result in federal income tax on an individual, *e.g.,* tax-exempt interest or non-taxable returns of capital. The effect of applicable tax credits, such as the foreign tax credit, should be taken into account in accordance with federal tax law.

4. Calculate the taxes due using the highest individual marginal federal income tax rates in effect on the reinvestment date. The rates used should correspond to the tax character of each component of the distributions (*e.g.,* ordinary income rate for ordinary income distributions, short-term capital gain rate for short-term capital gain distributions, long-term capital gain rate for long-term capital gain distributions). Note that the required tax rates may vary over the measurement period. Disregard any potential tax liabilities other than federal tax liabilities (*e.g.,* state and local taxes); the effect of phaseouts of certain exemptions, deductions, and credits at various income levels; and the impact of the federal alternative minimum tax.

5. Include all recurring fees that are charged to all shareholder accounts. For any account fees that vary with the size of the account, assume an account size equal to the Fund's mean (or median) account size. Assume that no additional taxes or tax credits result from any redemption of shares required to pay such fees. Reflect, as appropriate, any recurring fees charged to shareholder accounts that are paid other than by redemption of the Fund's shares.

6. Determine the ending value by assuming a complete redemption at the end of the 1-, 5-, or 10-year periods and the deduction of all nonrecurring charges deducted at the end of each period. If shareholders are assessed a deferred sales load, assume the maximum deferred sales load is deducted at the times, in the amounts, and under the terms disclosed in the prospectus.

7. Determine the ending value by subtracting capital gains taxes resulting from the redemption and adding the tax benefit from capital losses resulting from the redemption.

(a) Calculate the capital gain or loss upon redemption by subtracting the tax basis from the redemption proceeds (after deducting any nonrecurring charges as specified by Instruction 6).

(b) The Fund should separately track the basis of shares acquired through the $1,000 initial investment and each subsequent purchase through reinvested distributions. In determining the basis for a reinvested distribution, include the distribution net of taxes assumed paid from the distribution, but not net of any sales loads imposed upon reinvestment. Tax basis should be adjusted for any distributions representing returns of capital and any other tax basis adjustments that would apply to an individual taxpayer, as permitted by applicable federal tax law.

(c) The amount and character (*e.g.*, short-term or long-term) of capital gain or loss upon redemption should be separately determined for shares acquired through the $1,000 initial investment and each subsequent purchase through reinvested distributions. The Fund should not assume that shares acquired through reinvestment of distributions have the same holding period as the initial $1,000 investment. The tax character should be determined by the length of the measurement period in the case of the initial $1,000 investment and the length of the period between reinvestment and the end of the measurement period in the case of reinvested distributions.

(d) Calculate the capital gains taxes (or the benefit resulting from tax losses) using the highest federal individual capital gains tax rate for gains of the appropriate character in effect on the redemption date and in accordance with federal tax law applicable on the redemption date. For example, applicable federal tax law should be used to determine whether and how gains and losses from the sale of shares with different holding periods should be netted, as well as the tax character (*e.g.*, short-term or long-term) of any resulting gains or losses. Assume that a shareholder has sufficient capital gains of the same character from other investments to offset any capital losses from the redemption so that the taxpayer may deduct the capital losses in full.

8. State the average annual total return (after taxes on distributions and redemption) quotation to the nearest hundredth of one percent.

* * * * *

By the Commission.

Jonathan G. Katz
Secretary

January 18, 2001

Footnotes

1 *See* Disclosure of Mutual Fund After-Tax Returns, Investment Company Act Release No. 24339 (Mar. 15, 2000) [65 FR 15500 (Mar. 22, 2000)] ("Proposing Release").

2 Investment Company Institute ("ICI"), Mutual Fund Fact Book 56 (2000) ("2000 Mutual Fund Fact Book") (distributions of taxable dividends included $95.6 billion on equity, hybrid, and bond funds and $63.1 billion on money market funds).

3 Liberty Funds Distributor News Release, *Liberty Announces Annual Mutual Fund Tax Pain Index* (Apr. 12, 2000) http://www.libertyfunds.com (estimate of the tax burden based on net capital gains realized on mutual funds other than money market funds, and net investment income on equity, bond, and

income funds).

4 KPMG Peat Marwick LLP, An Educational Analysis of Tax-Managed Mutual Funds and the Taxable Investor ("KPMG Study"), at 14.

5 Jonathan Clements, *Fund Distributions are a Taxing Problem; How the Tax Man Dines on Your Funds,* The Wall Street Journal, Aug. 31, 1999, at C1.

6 In a recent telephone survey, 1,000 mutual fund investors were asked about their tax knowledge. Eighty-five percent of respondents claimed taxes play an important role in investment decisions, but only thirty-three percent felt that they were very knowledgeable about the tax implications of investing. Eighty-two percent were unable to identify the maximum rate for long-term capital gains. The Dreyfus Corporation, *Dreyfus' 1999 Tax Informed Investing Study* (visited Jan. 2, 2001) <http://www.dreyfus.com/>.

7 I.R.C. 61(a)(3) and (7) (providing that an individual's gross income includes dividends and gains derived from dealings in property); I.R.C. 852(b)(3)(8) (capital gain dividend from a mutual fund treated as gain from sale or exchange of capital asset held for more than one year); I.R.C. 1001 (gain from sale or other disposition of property is excess of amount realized over adjusted basis, and loss is excess of the adjusted basis over amount realized). *See* IRS Publication 564, *Mutual Fund Distributions* (2000), at 2-4 (explaining tax treatment of distributions of income and capital gains by mutual funds to their shareholders).

8 This is attributable, in part, to the fact that a mutual fund generally must distribute substantially all of its net investment income and realized capital gains to its shareholders in order to qualify for favorable tax treatment as a "regulated investment company" ("RIC"). I.R.C. 852 and 4982(b). As a RIC, a mutual fund is generally entitled to deduct dividends paid to shareholders, resulting in its shareholders being subject to only one level of taxation on the income and gains distributed to them. I.R.C. 851 (circumstances under which an investment company may be treated as a RIC) and 852(b)(2) (calculation of taxable income of a RIC).

S*ee, e.g., Year-End Tax Tips, Bob Edwards* (National Public Radio, Morning Edition radio broadcast, Dec. 28, 1999) (describing tax consequences of mutual fund distributions as a "shock" to investors).

9 KPMG study, *supra* note 3, at 14 (reporting the impact of taxes on performance of 496 stock funds for the ten-year period ending December 31, 1997).

10 For example, Eaton Vance Management reports after-tax returns and tax-efficiency ratios for certain of its tax-managed funds on its website. Eaton Vance, *Eaton Vance Mutual Funds* (visited December 19, 2000) http://www.eatonvance.com/mutual_ funds/ mutualfunds_A.asp. Online tax calculators are also available. The Vanguard Group, *After-Tax Returns Calculator* (visited December 19, 2000) http:// majestic5. vanguard.com/FP/DA/0.1.vgi_FundAfterTaxSim/ 079190348019134650? AFTER_TAX_CALC= SIMPLE (calculator that can be used to calculate after-tax returns for Vanguard funds); *Andrew Tobias' Mutual Fund Cost Calculator* (visited Dec. 22, 2000) http://www.personalfund.com/cgi-bin/cost.cgi? ticker=TWLBX (cost calculator includes a feature that calculates after-tax returns). Fidelity Investments and Charles Schwab & Co. offer Internet tools that feature after-tax returns of funds offered in their fund supermarkets. *E.g.,* Fidelity Investments, *Fidelity Funds* (visited December 19, 2000) http://personal100. fidelity.com/gen/mflfid/0/316145200.html; About Schwab, *Schwab Introduces New On-line Mutual Fund Selection and Screener Tools,* Dec. 22, 1999 (visited Dec. 19, 2000) http://www.prnewswire.com/ cgi-bin/micro_stories.pl? ACCT= 154881&TICK=SCH&STORY=/www/story/12-22- 1999/0001102424&E

DATE=Dec+22,+1999. Further, Morningstar, Inc., and *Forbes* report mutual fund after-tax returns. Morningstar, Mutual Fund 500 (2000 ed.); *Fund Survey,* Forbes, Feb. 7, 2000, at 166.

11 The fund groups offering funds labeled as "tax-managed," "tax-efficient," "tax-sensitive," or "tax-aware" include 59 Wall Street, American Century, Bernstein, Delaware Investments, DFA Investment Dimensions, Dresdner RCM Global Investors, Dreyfus, Eaton Vance, Evergreen, Fidelity, GMO, Golden Oak, ING, J.P. Morgan, Liberty Financial Funds, PaineWebber, PIMCO, Prudential, Putnam, Russell, Standish Ayer & Wood, STI Classic, SunAmerica, T. Rowe Price, USAA, and Vanguard. Morningstar, Inc., currently tracks 59 tax-managed funds, as compared to 12 such funds only four years ago. Morningstar, Principia Pro Plus (Dec. 2000) (reporting as of Nov. 30, 2000).

12 The Mutual Fund Tax Awareness Act of 2000, H. R. 1089, 106th Cong., 2nd Sess. (2000) (introduced by Congressman Paul Gillmor, passed by the House, as amended, on Apr. 3, 2000, by a vote of 358 to 2, and referred to the Senate on Apr. 4, 2000.). *See also* H.R. 1089: The Mutual Fund Tax-awareness Act of 1999: Hearings Before the Subcomm. on Finance and Hazardous Materials of the House Comm. on Commerce, 106th Cong., 1st Sess. (Oct. 29, 1999) (Statement of the U.S. Securities and Exchange Commission Concerning Disclosure of the Tax Consequences of Mutual Fund Investments and Charitable Contributions).

13 *See, e.g.,* Fred Barbash, *Facts Might Confuse Us? Excuse Me?,* The Washington Post, Nov. 19, 2000, at H1; Karen Damato, *Funds' Tally of IRS Bite Can Be Tricky,* The Wall Street Journal, Nov. 3, 1999, at C1; Paul J. Lim, *Your Money; Funds and 401(k)s; As Stock Market Returns Shrink, After-Tax Results Gain Importance,* Los Angeles Times, Oct. 17, 1999, at C3; Charles A. Jaffe, *Mutual Fund Gains Create Interesting Tax Issues Later*, The Kansas City Star, Mar. 23, 1999, at D19.

14 In its prospectus, a mutual fund is required to disclose (i) the tax consequences of buying, holding, exchanging, and selling fund shares, including the tax consequences of fund distributions; and (ii) whether the fund may engage in active and frequent portfolio trading to achieve its principal investment strategies, and, if so, the tax consequences of increased portfolio turnover and how this may affect fund performance. Item 7(e) of Form N-1A; Instruction 7 to Item 4 of Form N-1A. A fund also must disclose in its prospectus and annual report the portfolio turnover rate and dividends and capital gains distributions per share for each of the last five fiscal years. Items 9(a) and 22(b)(2) of Form N-1A. These items also require funds to show net realized and unrealized gain or loss on investments on a per share basis for each of the fund's last five fiscal years.

15 Proposing Release, *supra* note 1.

16 As of year end 1999, eighty-one percent of mutual fund assets ($5.5 trillion) were held by individuals. 2000 Mutual Fund Fact Book, *supra* note 2, at 41. At the end of 1999, mutual fund assets held in retirement accounts stood at $2.5 trillion. 2000 Mutual Fund Fact Book, at 49. Mutual fund assets held by individuals in money market funds stood at $885 billion. 2000 Mutual Fund Fact Book, at 103. Thus, almost 40 percent of non-money market fund assets held by individuals ($2.1 trillion) were held in taxable accounts.

An investor is not taxed on his or her investments in IRAs, 401(k) plans, and other qualified retirement plans until the investor receives a distribution from the plan.

I.R.C. 401 *et seq. See* IRS Publication 564, *Mutual Fund Distributions* (1999), at 2 (explaining tax treatment of mutual funds held in retirement vehicles).

See Items 2, 5, 9, and 22(b)(2) of Form N-1A.

17

18 Last year, we posted a bulletin for mutual fund investors on our website, in which we cautioned investors to look beyond performance when evaluating mutual funds and to consider the costs relating to a mutual fund investment, including fees, expenses, and the impact of taxes on their investment. Securities and Exchange Commission, *Mutual Fund Investing: Look at More Than a Fund's Past Performance* (last modified Jan. 24, 2000) http://www.sec.gov/consumer/mperf.htm.

See ICI, *Understanding Shareholders' Use of Information and Advisers* (Spring 1997), at 21 and 24 (Total return information was frequently considered by investors before a purchase, second only to the level of risk of the fund. Eighty-eight percent of fund investors surveyed said that they considered total return before their most recent purchase of a mutual fund. Eighty percent of fund owners surveyed reported that they followed a fund's rate of return at least four times per year.).

19 Item 3 of Form N-1A; Consolidated Disclosure of Mutual Fund Expenses, Investment Company Act Release No. 16244 (Feb. 1, 1988) [53 FR 3192 (Feb. 4, 1988)].

20 *See, e.g.,* Securities and Exchange Commission, *Mutual Fund Investing: Look at More Than a Fund's Past Performance* (last updated Jan. 24, 2000) http://www.sec.gov/ consumer/mperf.htm; Securities and Exchange Commission, *Invest Wisely: An Introduction To Mutual Funds* (last modified Oct. 21, 1996) http://www.sec.gov /consumer/inwsmf.htm; "Common Sense Investing in the 21st Century Marketplace," Remarks by Arthur Levitt, Chairman, SEC, Investors Town Meeting, Albuquerque, NM (Nov. 20, 1999); "Financial Self-Defense: Tips From an SEC Insider," Remarks by Arthur Levitt, Boston Globe "Moneymatters" Personal Finance Conference, Boston, MA (Oct. 16, 1999); Transparency in the United States Debt Market and Mutual Fund Fees and Expenses: Hearings Before the Subcomm. on Finance and Hazardous Materials of the House Comm. on Commerce, 105th Cong., 2nd Sess. (Sept. 29, 1998) (Statement of Arthur Levitt, Chairman, U.S. Securities and Exchange Commission).

21 Securities and Exchange Commission, *The SEC Mutual Fund Cost Calculator* (last modified Jul. 24, 2000) http://www.sec.gov/mfcc/get-started.html.

22 United States General Accounting Office, Mutual Fund Fees: Additional Disclosure Could Encourage Price Competition (June 2000) (recommending that the Commission require fund quarterly account statements to include the dollar amount of each investor's share of fund operating expenses); Division of Investment Management, Securities and Exchange Commission, Report on Mutual Fund Fees and Expenses (Dec. 2000) (recommending that the Commission consider requiring fund shareholder reports to include a table showing the cost in dollars incurred by a shareholder who invested a standardized amount in the fund, paid the fund's actual expenses, and earned the fund's actual return for the period).

23 The comment letters and a summary of the comments prepared by the Commission staff are available for public inspection and copying in the Commission's Public Reference Room, 450 Fifth Street, N.W., Washington, D.C. (File No. S7-09-00).

24 Items 2(c)(2)(i) and (iii) of Form N-1A.

25 Rule 482(e)(4) and (5)(iii); rule 482(f); rule 34b-1(b)(1)(iii)(B) and (C).

26 General Instruction C.3(d)(iii) and Item 2(c)(2)(iv)(B) of Form N-1A.

27 *See* Item 21(b)(1) of Form N-1A.

28 Proposed Item 21(b)(3) of Form N-1A.

29 Proposed Item 21(b)(4) of Form N-1A.

30 Items 21(b)(2) and (3) of Form N-1A.

31 A recent report estimates that over the past decade the average holding period of mutual funds has decreased from over 10 years to about 3 years. Steve Galbraith, Mary Medley, Sean Yu, The Apotheosis of Stuart--Lighting the Candle in U.S. Equities, Bernstein Research Call, Sanford C. Bernstein & Co., Jan. 10, 2000.

32 Instruction 4 to Item 21(b)(1) of Form N-1A.

33 Items 2(c)(2)(i) and (iii) and 21(b)(1)-(3) of Form N-1A.

34 *See* Section D, *infra*, regarding modifications to the format of disclosure.

35 Item 2(c)(2)(iii) of Form N-1A.

36 Rule 498(c)(2)(iii) under the Securities Act [17 CFR 230.498(c)(2)(iii)]. In addition, after-tax returns would be required in registration statements filed on Form N-14 [17 CFR 239.23], the registration form used by mutual funds to register securities to be issued in mergers and other business combinations under the Securities Act. *See* Item 5(a) of Form N-14 (cross-referencing Item 2 of Form N-1A).

37 *See* Proposing Release, *supra* note 1, at nn. 36-41, and accompanying text.

38 Item 5(b)(2) of Form N-1A.

39 An estimated 88 percent of mutual fund shareholders considered the total return of the fund before their most recent fund purchase. Seventy-five percent of mutual fund shareholders considered the fund's performance relative to similar funds. ICI, *Understanding Shareholders' Use of Information and Advisers, supra* note 18, at 21.

40 *See* Section II.A., *supra,* regarding modifications to the types of returns required; Section II.D., *infra,* regarding modifications to the format of disclosure, including simplification of presentation for funds offering more than one class of shares in the prospectus; Section II.H., *infra,* regarding the narrative accompanying the performance table.

41 Item 7(e) of Form N-1A.

42 *See* discussion in note 40, *supra.*

43 Annually, funds are required to send Form 1099-DIV or a similar statement to any shareholder receiving $10 or more in taxable income. I.R.C. 6042. Form 1099-DIV reports the amount and character of fund distributions (*e.g.,* ordinary dividends, capital gain distributions, and non-taxable distributions) received by shareholders during the year. Funds also are required to send Form 1099-B or a similar statement to any shareholder who sells, exchanges, or redeems fund shares during the year. I.R.C. 6045. Form 1099-B reports the proceeds from the sale of fund shares.

44 The Securities Act requires mutual funds to send updated prospectuses only to those existing shareholders who make additional purchases. In practice, many mutual funds send an updated prospectus annually to all of their shareholders.

45 Item 5(b)(2) of Form N-1A.

46 Item 2(c)(2)(iii) of Form N-1A.

47 Item 2(c)(2)(iii) of Form N-1A; Instruction 2(e) to Item 2 of Form N-1A.

48 Instruction 3(c)(ii) to Item 2 of Form N-1A.

49 Item 2(c)(2)(iv)(C) of Form N-1A.

50 Instructions 2(e) and 3(c)(iii) to Item 2 of Form N-1A.

51 Instruction 2(e) to Item 2 of Form N-1A.

52 Item 2(c)(2)(iii) of Form N-1A.

53 General Instruction C.3(d)(iii) of Form N-1A.

54 These similar plans or arrangements may include those existing under current tax law or new types of plans or arrangements permitted by future changes in the tax law.

55 *See* IRS Publication 575, *Pension and Annuity Income* (2000), at 4 (explaining tax treatment of earnings under a variable annuity contract) and 7-19 (explaining tax treatment of distributions from retirement plans); IRS Publication 525, *Taxable and Non-Taxable Income* (2000), at 6 (explaining tax treatment of contributions to a retirement plan) and 15 (explaining tax treatment of proceeds of a life insurance contract); IRS Publication 575, *Pension and Annuity Income* (2000), at 5 (tax treatment of Section 457 Deferred Compensation Plan); IRS Publication 571, *Tax Sheltered Annuity Programs for Employees of Public Schools and Certain Tax-Exempt Organizations* (1999), at 2 (explaining tax treatment of Section 403(b) tax sheltered annuities).

56 I.R.C. 702 (regarding taxation of partners).

57 Interest on any state or local bond is excluded from gross income. However, there is no exclusion for capital gains resulting from the sale of such bonds. *See* I.R.C. 103(a); IRS Publication 564, *Mutual Fund Distributions* (2000), at 2 (describing tax treatment of tax-exempt mutual funds).

58 A tax-exempt fund, like any other fund, may assume, when calculating after-tax returns, that no taxes are due on the portions of any distribution that would not result in federal income tax on an individual. Instruction 3(a) to Item 21(b)(2) and Instruction 3(a) to Item 21(b)(3) of Form N-1A.

59 Rule 482(e)(4) permits the standardized after-tax returns for 1-, 5-, and 10-year periods to be contained in an advertisement, provided that the standardized after-tax returns (i) are current to the most recent calendar quarter ended prior to the submission of the advertisement for publication; (ii) are accompanied by quotations of standardized before-tax return; (iii) include both measures of standardized after-tax return; (iv) are set out with equal prominence to one another and in no greater prominence than the required quotations of standardized before-tax return; and (v) identify the length of and the last day of the 1-, 5-, and 10-year periods.

Any other measure of after-tax return could be included in advertisements if accompanied by the standardized measures of after-tax return. Rule 482(e)(5)(iii). Similarly, measures of after-tax return may be included in other sales materials if accompanied by the standardized measures of after-tax return. Rule 34b-1(b)(1)(iii)(B).

A quotation of standardized tax equivalent yield in an advertisement or other sales literature need not be accompanied by standardized after-tax returns. Rules 482(e)(2) and 34b-1(b)(iii)(B).

60 Specifically, any measure of after-tax return in a rule 482 advertisement will

be required to reflect all elements of return and be set out in no greater prominence than the required quotations of standardized before-tax and after-tax returns. The advertisement will be required to identify the length of and the last day of the period for which performance is measured. Rule 482 (e)(5)(i), (iv), and (v).

Likewise, any sales literature that contains a quotation of performance that has been adjusted to reflect the effect of taxes remains subject to the other requirements of rule 34b-1.

61 We believe that any fund that uses terms such as tax-managed, tax-efficient, tax-sensitive, or tax-aware in its name is representing or implying that the fund is managed to limit or control the effect of taxes on performance. Therefore, a fund using these terms in its name will be required to include standardized after-tax returns in any advertisement or sales literature that includes a quotation of performance.

62 Rules 482(e)(6) and 34b-1(b)(1)(iii)(C). The fund names rule, rule 35d-1(a)(4), requires a fund that uses a name suggesting that a fund's distributions are exempt from federal income tax or from both federal and state income tax to adopt a fundamental policy under section 8(b)(3) of the Investment Company Act: (i) to invest at least 80 percent of its assets in investments the income from which is exempt, as applicable, from federal income tax or from both federal and state income tax; or (ii) to invest its assets so at least 80 percent of the income that it distributes will be exempt, as applicable, from federal income tax or from both federal and state income tax. *See* Investment Company Names, Investment Company Act Release No. 24828 (Jan. 17, 2001).

63 *See, e.g.,* Advertising by Investment Companies, Investment Company Act Release No. 16245 (Feb. 2, 1988) [53 FR 3868 (Feb. 10, 1988)], at n.51. *See also* section 17(a) of the Securities Act [15 U.S.C. 77q]; section 10(b) of the Exchange Act [15 U.S.C. 78j(b); section 34(b) of the Investment Company Act [15 U.S.C. 80a-33]; section 206 of the Investment Advisers Act of 1940 [15 U.S.C. 80b-6].

64 Items 21(b)(2) and (3) of Form N-1A.

65 Items 21(b)(2) and (3) of Form N-1A; Instruction 1 to Item 21(b)(2) and Instruction 1 to Item 21(b)(3) of Form N-1A.

66 Items 21(b)(2) and (3) of Form N-1A.

67 Instruction 4 to Item 21(b)(2) of Form N-1A; Instruction 4 to Item 21(b)(3) of Form N-1A.

Currently, the highest individual marginal income tax rate imposed on ordinary income is 39.6%, and the highest rate imposed on long-term capital gains is 20%. I.R.C. 1(a)-(d), (h).

68 The concerns expressed by the commenters are, in any event, mitigated by the fact that after-tax returns will not reflect state and local taxes, which are often quite significant. State income tax rates can be as high as 12%; and a rate of 6%-7%, or higher, is common on taxable income of $55,000, the income level suggested by commenters as representative of a typical mutual fund investor. *See* The World Almanac and Book of Facts 161 (2000) (state income tax rates).

69 Instructions 6 and 7 to Item 21(b)(3) of Form N-1A. In order to simplify the computation of returns after taxes on distributions and sale of fund shares, funds may assume that a taxpayer has sufficient capital gains of the same character to offset any capital losses on a sale of fund shares and therefore that the taxpayer may deduct the entire capital loss. Instruction 7(d) to Item

21(b)(3) of Form N-1A.

70 Instruction 7(c) to Item 21(b)(3) of Form N-1A.

A fund would also be required to separately track the basis of shares acquired though the $1,000 initial investment and each subsequent purchase through reinvested distributions. We wish to clarify that a distribution representing a return of capital will reduce the basis of an existing lot of shares and be included in the basis of the shares acquired upon reinvestment, which may have the effect of shifting the amount of basis allocated to shares with various holding periods.

71 Instruction 7(d) to Item 21(b)(3) of Form N-1A.

72 I.R.C. 1222(1) provides that the term "short-term capital gain" means "gain from the sale or exchange of a capital asset held for not more than 1 year, if and to the extent such gain is taken into account in computing gross income."

73 Instruction 4 to Item 21(b)(2) of Form N-1A; Instruction 4 to Item 21(b)(3) of Form N-1A. The Proposing Release sets forth the maximum federal income tax rates for the years 1990-2000. Proposing Release, *supra* note 1, at n.66, and accompanying text.

74 Item 2(c)(iii) of Form N-1A.

75 Instruction 4 to Item 21(b)(2) of Form N-1A; Instruction 4 to Item 21(b)(3) of Form N-1A.

76 *Id.*

77 Instruction 3 to Item 21(b)(2) of Form N-1A; Instruction 3 to Item 21(b)(3) of Form N-1A.

78 *Id.*

79 Instruction 3 to Item 21(b)(2) of Form N-1A; Instruction 3 to Item 21(b)(3) of Form N-1A. A fund may elect to pass through to shareholders foreign tax credits if more than 50 percent of the value of the fund's total assets at the close of the taxable year consists of stock or securities in foreign corporations and the fund otherwise qualifies for favorable tax treatment as a regulated investment company for the taxable year. I.R.C. 853. In computing after-tax returns, a fund that elects to pass foreign tax credits through to shareholders may assume that the shareholders use those credits. We would not object if a fund adjusts after-tax returns to reflect the impact of distributions of up to $600 of foreign tax credits, the amount of credit that may be taken by a married couple filing jointly without regard to limits on the foreign tax credit. I.R.C. 904(a) and (j)(2). If a fund makes distributions of foreign tax credits in excess of $600, the fund must take into account the limits in the federal tax law on the ability of shareholders to use foreign tax credits.

80 Item 2(c)(2)(iv) of Form N-1A.

81 *See* rule 421(b) and (d) under the Securities Act [17 CFR 230.421(b) and (d)] (requiring that all information in the prospectus be presented in clear, concise, and understandable fashion and that registrants use plain English principles in the organization, language, and design of the summary and risk factors sections of their prospectuses); General Instruction C.1 to Form N-1A (fund prospectus should be easy to understand and promote effective communication); Item 2 of Form N-1A (requiring that the response to Item 2 be stated in plain English).

82 We eliminated the proposed requirement that funds explain the differences between the types of returns presented, which is unnecessary in light of our reduction of the returns from four to three and our revision of the table

captions. We also eliminated the proposed requirement that funds disclose that before-tax returns assume all distributions are reinvested. As commenters noted, funds are not currently required to include this technical information with before-tax returns. We also eliminated the similar proposed requirement that funds disclose that after-tax returns assume that taxes are paid out of fund distributions and that distributions, less taxes, are reinvested. Finally, we eliminated the proposed requirement that funds, whose after-tax returns exceed before-tax returns, explain the reason for this result. Funds, however, will have the option of including this explanatory material. Item 2(c)(2)(iv)(D) of Form N-1A.

83 As discussed above, we have simplified the proposal to require a fund offering more than one class of shares in its prospectus to show after-tax returns for one class only. *See* Section II.C., *supra* notes 48-50 and accompanying text. Consistent with this modification, such funds will be required to include disclosure that after-tax returns are shown for only one class and that after-tax returns for other classes will vary. Item 2(c)(2)(iv)(C) of Form N-1A.

84 Item 2(c)(2)(i) of Form N-1A.

85 Instruction 6 to Item 21(b)(1) of Form N-1A.

86 17 CFR 230.485(b).

87 As discussed above, we have modified the proposal by eliminating the proposed requirement to include after-tax returns in the MDFP, which is typically contained in the annual report. Accordingly, the hour burden for preparing and filing annual reports in compliance with rule 30d-1 will be reduced by 7.5 hours. *See* Proposing Release, *supra* note 1, at nn. 107-110, and accompanying text (discussing the estimated hour burden for proposal requiring after-tax return disclosure in annual reports). Funds will be required to include a statement in the MDFP that accompanies the performance table and graph to the effect that the returns shown do not reflect the deduction of taxes that a shareholder would pay on fund distributions or the redemption of fund shares. Item 5(b)(2) of Form N-1A. We believe that the hour burden for the required statement in the MDFP will be negligible and will not result in a change to the current hour burden for preparing and filing annual reports.

88 2000 Mutual Fund Fact Book, *supra* note 2, at 56.

89 Liberty Funds Release, *supra* note 3.

90 KPMG study, *supra* note 4, at 14.

91 Clements, *supra* note 5, at C1.

92 Dreyfus Corporation, *supra* note 6.

93 *See supra* note 10 and accompanying text.

94 In its prospectus, a mutual fund is required to disclose (i) the tax consequences of buying, holding, exchanging, and selling fund shares, including the tax consequences of fund distributions; and (ii) whether the fund may engage in active and frequent portfolio trading to achieve its principal investment strategies, and, if so, the tax consequences of increased portfolio turnover and how this may affect fund performance. *See* Item 7(e) of Form N-1A; Instruction 7 to Item 4 of Form N-1A. A fund also must disclose in its prospectus turnover rate and dividends and capital gains distributions per share for each of the last five fiscal years. *See* Items 9(a) and 22(b)(2) of Form N-1A. These items also require funds to show net realized and unrealized gain or loss on investments on a per share basis for each of the fund's last five fiscal years.

Given the $2.1 trillion of assets held in individual non-money market fund

95 taxable accounts, even a small change in relative after-tax returns affecting only a small portion of those assets can lead to significant benefits to investors.

96 A service provider that compiles and disseminates fund pricing and performance information recently announced that it will offer to calculate and publish after-tax returns for its fund clients. *See* Daly, *Program Lets Fund Companies Offer After-Tax Returns (Dec. 29, 1999)* (visited Feb. 9, 2000) http://www.ignites.com/.

97 As discussed above, we have modified the proposal by: eliminating the proposed requirement to disclose pre-liquidation before-tax returns; eliminating after-tax returns in annual reports; streamlining the required narrative disclosure; and simplifying the presentation for funds that offer multiple classes in a single prospectus.

98 This estimate is based on the staff's consultations with industry representatives.

99 The number of funds referenced in post-effective amendments that will be affected by the amendments is computed by subtracting those funds that are exempt from or permitted to omit the after-tax disclosure from the number of funds referenced in post-effective amendments (7,875 - 1,040 - 1,575, or 5,260). For purposes of our analysis, we have not excluded certain funds that also would be permitted to omit the after-tax return disclosure, such as funds that distribute prospectuses for use by investors in 401(k) plans or other similar tax-deferred arrangements. While these funds will be permitted to omit the after-tax return disclosure in prospectuses distributed to investors in these tax-deferred arrangements, they will still incur a burden from including the disclosure in prospectuses distributed to other investors.

100 This cost estimate is calculated by multiplying the estimated number of hours to comply with the requirements (94,680 hours) by the weighted average hourly wage ($64). The Commission's estimate concerning the burden hours is based on the staff's consultation with industry representatives. The Commission's estimate concerning the wage rate is based on salary information for the securities industry compiled by the Securities Industry Association. *See* Securities Industry Association, *Report on Management & Professional Earnings in the Securities Industry 1999* (Sept. 1999).

101 The estimate is based on the staff's consultation with industry representatives.

102 Software-related costs may decrease as vendors offering services for computing the new standardized after-tax returns enter the market. *See* Daly, *Program Lets Fund Companies Offer After-Tax Returns (Dec. 29, 1999)* (visited Feb. 9, 2000) http://www.ignites.com/.

103 This estimate is based on the assumption that tax-managed funds and index funds would be most likely to use advertisements that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance.

104 This estimate is based on the staff's consultations with industry representatives.

105 The total cost of the annual hour burden is calculated by multiplying the annual hour burden (79) by the weighted average hourly wage ($64). *See supra* note 100.

106 These estimates are based on filings received in calendar year 1999.

107 This number is computed by subtracting from the number of respondents filing rule 34b-1 sales material the number of money market funds, the

number of funds and UITs registered on Forms N-3 and N-4, and the number of funds used as underlying portfolios for variable insurance contracts (8,495 - 1,040 - 620 - 1,575, or 5,260).

108 This estimate is based on the assumption that tax-managed funds and index funds would be most likely to advertise after-tax performance.

109 The total annual burden for the amendments is computed by multiplying the estimated number of respondents (157.8) subject to rule 34b-1 by the additional burden imposed by the amendments (.5). The total cost of the annul burden attributable to the amendments is calculated by multiplying the total burden hours (78.9) by the weighted average hourly rate of $64.

110 15 U.S.C. 77(b), 78c(f), and 80a-2(c).

111 *See supra* notes 1-5 and accompanying text.

112 *See supra* note 10 and accompanying text.

113 *See supra* note 11 and accompanying text.

114 *See supra* note 12 and accompanying text.

115 17 C.F.R. 270.0-10.

116 This estimate is based on statistics compiled by the Commission's Division of Investment Management staff from January 1, 1999, through December 31, 1999.

117 This estimate is based on statistics compiled by the Commission's Division of Investment Management staff from January 1, 1999, through December 31, 1999.

118 This estimate is based on the staff's consultation with industry representatives. Since an investment company filing an initial registration statement on Form N-1A has no performance history to disclose, the proposed amendments would not affect such initial filings.

119 This estimate is based on the staff's consultation with industry representatives.

120 This estimate is based on the staff's consultation with industry representatives.

121 As discussed above, we have modified the proposal by: eliminating the proposed requirement to disclose pre-liquidation before-tax returns; eliminating after-tax returns in annual reports; streamlining the required narrative disclosure; and simplifying the presentation for funds that offer multiple classes in a single prospectus.

122 The amendments modify rule 482, which is part of Regulation C under the Securities Act of 1933. Regulation C describes the disclosure that must appear in registration statements under the Securities Act and Investment Company Act. The PRA burden associated with rule 482, however, is included in the investment company registration statement form, not in Regulation C. In this case, the amendments to rule 482 will affect the burden hours for Form N-1A, the registration form for open-end investment companies that currently advertise pursuant to rule 482. We estimate that the burden associated with Regulation C will not change with the amendments to rule 482.

123 As discussed above, we have modified the proposal by eliminating the proposed requirement to include after-tax returns in the MDFP, which is typically contained in the annual report. Accordingly, the hour burden for preparing and filing annual reports in compliance with rule 30d-1 will be

reduced by 7.5 hours. *See* Proposing Release, *supra* note 1, at nn. 107-110, and accompanying text (discussing the estimated hour burden for proposal requiring after-tax return disclosure in shareholder reports). Funds will be required to include a statement in the MDFP that accompanies the performance table and graph to the effect that the returns shown do not reflect the deduction of taxes that a shareholder would pay on fund distributions or the redemption of fund shares. Item 5(b)(2) of Form N-1A. We believe that the hour burden for the required statement in the MDFP will be negligible and will not result in a change to the current hour burden for preparing and filing annual reports.

124 As discussed above, we have modified the proposal by: eliminating the proposed requirement to disclose pre-liquidation before-tax returns; eliminating after-tax returns in annual reports; streamlining the required narrative disclosure; and simplifying the presentation for funds that offer multiple classes in a single prospectus. The elimination of after-tax returns in annual reports will reduce the hour burden for preparing and filing annual reports in compliance with rule 30d-1 by 7.5 hours. *See* Proposing Release, *supra* note 1, at nn. 107-110, and accompanying text (discussing the estimated hour burden for proposal requiring after-tax return disclosure in annual reports). We do not believe, however, that the other three modifications will affect the estimated burden hours overall.

125 These estimates are based on filings received in calendar year 1999. The current approved hour burden per portfolio for an initial Form N-1A is 824 hours.

126 These estimates are based on filings received in calendar year 1999. The current approved hour burden per portfolio for post-effective amendments to Form N-1A is 104 hours.

127 This estimate is based on the staff's consultations with industry representatives.

128 The number of funds referenced in post-effective amendments that will be affected by the amendments is computed by subtracting those funds that are exempt from or permitted to omit the after-tax return disclosure from the number of funds referenced in post-effective amendments (7,875 - 1,040 - 1,575, or 5,260). For purposes of our analysis, we have not excluded certain funds that also would be permitted to omit the after-tax return disclosure, such as funds that distribute prospectuses for use by investors in 401(k) plans or other similar tax-deferred arrangements. While these funds will be permitted to omit the after-tax return disclosure in prospectuses distributed to investors in these tax-deferred arrangements, they would still incur a burden from including the disclosure in prospectuses distributed to all other investors.

129 This total annual hour burden is calculated by adding the total annual hour burden for initial registration statements and the total annual hour burden for post-effective amendments, including the additional burden imposed by the amendments. As explained, the hour burden per portfolio for an initial filing would remain at 824 hours, for a total burden of 245,552 hours. The hour burden per portfolio for a post-effective amendment will be 122 hours (104 + 18), with a burden of 104 hours imposed on all 7,875 portfolios (104 × 7,875, or 819,000) and the additional 18 hours affecting 5,260 portfolios (18 × 5,260, or 94,680). Moreover, since the burden associated with rule 482 is included in Form N-1A (as discussed in note 122, *supra*), the Form N-1A burden will include the estimated rule 482 burden of .5 hours (the rule 482 burden is discussed below) that will be imposed on the three percent of funds that we estimate would use advertisements or sales literature that either include after-tax returns or include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance [.5 × (5,260 × 3%), or 79]. Thus, the total annual

hour burden for all funds for the preparation and filing of initial registration statements and post-effective amendments on Form N-1A will be 1,159,311 hours (245,552 + 819,000 + 94,680 + 79).

130 *See supra* note 122.

131 This estimate is based on the assumption that tax-managed funds and index funds would be most likely to advertise after-tax performance or use advertisements that include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance.

132 This estimate is based on the staff's consultations with industry representatives.

133 These estimates are based on filings received in calendar year 1999. The current approved hour burden per response for rule 34b-1 is 2.4 hours.

134 This number is computed by subtracting from the number of respondents filing rule 34b-1 sales material the number of money market funds, the number of funds and UITs registered on Forms N-3 and N-4, and the number of funds used as underlying portfolios for variable insurance contracts (8,495 - 1,040 - 620 - 1,575, or 5,260).

135 This estimate is based on the assumption that tax-managed funds and index funds would be most likely to advertise after-tax performance or use advertisements that include other performance information together with representations that the fund is managed to limit or control the effect of taxes on performance.

136 The current total annual hour burden is computed by multiplying the number of responses filed annually under rule 34b-1 by the current hour burden (37,000 × 2.4). The total annual hour burden for the industry has increased significantly from previous estimates because we have reevaluated the number of respondents subject to rule 34b-1.

137 The total annual burden is computed by adding the current burden (2.4 × 37,000, or 88,800) to the additional burden imposed by the proposed amendments [.5 × (8,495 - 1,040 - 620 - 1,575) × 4.35 × 3%, or 343].

http://www.sec.gov/rules/final/33-7941.htm

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Has The Realized Equity Premium Been Shrinking?

Jun. 4, 2014 7:20 AM ET | 23 comments | by: Larry Swedroe

Disclosure: I have no positions in any stocks mentioned, and no plans to initiate any positions within the next 72 hours. **(More...)**

Summary

- Claude Erb has done a series of papers in which he examines the various premiums — size, value, momentum, and beta.
- His most recent one focused specifically on the equity risk premium.
- While it’s certainly possible that the equity risk premium could revert to its historical mean, mean reversion of valuations is far from a certainty.

Tying up our two-part series on premiums, today we'll explore the equity premium.

Claude Erb has done a series of papers in which he examines the various premiums - size, value, momentum, and beta - and found that there's a demonstrable trend in each case of the premiums shrinking in terms of realized returns. His April 2014 paper, "The Incredible Shrinking Realized Equity Risk Premium," focused specifically on the equity risk premium.

To create a trend line Erb used a three-step process:

Step 1: He linked the monthly excess returns into a "growth of $1" cumulative. The "market" excess return is the monthly total return minus the monthly Treasury-bill return from Ken French's website.

Step 2: On a monthly basis, he calculated the 10-year annualized rate of return. The first calculation covered the 10 years from June 1926 to June 1936, the second from July 1926 to July 1936, etc. Part of the reason for using the 10-year time horizon was that it is the same time horizon that Campbell and Shiller used in their early CAPE ratio research.

Step 3: He created a trend line using an Excel/PowerPoint function that regressed the rolling 10-year return on time (the x axis). He found that a 4.3 percent equity risk premium (the stock market total return in excess of the return of the t-bill) was the best fit of the relationship between 10-year excess return and time as of April 2014. Or given the way that 10-year equity excess returns have evolved over time, the relationship that best captures the downtrend in this measure suggests that the trend equity risk premium is currently 4.3 percent.

It's worth noting that Erb's 4.3 percent estimate is very similar to the current *real* expected return using Shiller's adjusted CAPE 10. The CAPE 10 is now at about 25.9. That produces an earnings yield of about 3.9 percent. However, we need to make an adjustment to arrive at the forecasted real return to stocks because the earnings figure from the CAPE 10 is on average a lag of 5 years. With real earnings growing about 1.5 percent a year, we need to multiply the 3.9 percent earnings yield by 1.075 percent (1.5 percent x 5 years). That produces a real expected return to stocks of about 4.2 percent.

Having estimated the equity risk premium at 4.3 percent, Erb noted that "the realized 'equity risk premium' has been in a downward trend since 1925. He explained that while a constant equity risk premium, and mean reversion, leads to the view that the probability rises over time that stocks will outperform high quality bonds, a declining equity risk premium, and mean reversion, leads to the view that the probability increases over time that safe assets will outperform stocks. He suggests that the declining equity risk premium has created a conundrum for many investors: Is it stocks for the long run, or bonds for the long run?

Erb also noted that a simple extrapolation of the declining trend in the equity risk premium results in a 0 premium by 2050. Logically (not that markets are always rational - see March 2000 when the earnings yield was below the yield on TIPS), that world shouldn't exist since no one would buy riskier stocks if there was no expectation of earning a risk premium. In other words, Stein's Law applies: If something cannot go on forever, it will stop (usually ending badly when it comes to stocks). However, it's certainly possible that instead of reverting to its historical mean (as many, such as Jeremy Grantham, are predicting) the equity risk premium could remain where it is, or even decline somewhat further. There are several possible/likely explanations for why the equity risk premium has been falling:

- When risk capital is scarce, it earns high "economic rents." As national wealth increases, the equity risk premium tends to fall as more capital is available to invest in risky assets. All else equal our rising national wealth should be expected to lead to a fall in the equity risk premium.
- Over time, the SEC's regulatory powers have increased, and accounting rules and regulations have been strengthened. The result is that investors have should have more confidence to invest in risky assets. Again, all else equal, this should lead to a smaller required equity risk premium.
- Implementation costs of equity strategies have fallen. Both commissions and bid/offer spreads have come way down over time. In addition, mutual fund expense ratios and loads are also much lower. And, the Internet has made trading much easier/more convenient. All else equal, lower implementation costs should lead to a lower equity risk premium. Lower trading costs can also help explain the falling small cap premium that Erb had found.
- Longer life expectancies can lead investors to have a stronger preference for equities as they provide the higher expected returns that may be needed to allow portfolios to last for longer horizons.

The bottom line is that while it's certainly possible that the equity risk premium could revert to its historical mean, mean reversion of valuations is far from a certainty. Thus, investors shouldn't draw the conclusion that the market is overvalued, nor that it's ripe for a fall.

How Does the Market Interpret Analysts' Long-term Growth Forecasts?

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April, 2004

Forthcoming in the *Journal of Accounting, Auditing and Finance*. The views expressed herein are those of the author and do not necessarily reflect the views of the Board nor the staff of the Federal Reserve System. I am grateful for comments and suggestions from Jason Cummins, Steve Oliner, and an anonymous referee, and members of the Capital Markets Section at the Board. Excellent research assistance was provided by Eric Richards and Dimitri Paliouras.

How Does the Market Interpret Analysts' Long-term Growth Forecasts?

Abstract

The long-term growth forecasts of equity analysts do not have well-defined horizons, an ambiguity of substantial import for many applications. I propose an empirical valuation model, derived from the Campbell-Shiller dividend-price ratio model, in which the forecast horizon used by the "market" can be deduced from linear regressions. Specifically, in this model, the horizon can be inferred from the elasticity of the price-earnings ratio with respect to the long-term growth forecast. The model is estimated on industry- and sector-level portfolios of S&P 500 firms over 1983-2001. The estimated coefficients on consensus long-term growth forecasts suggest that the market applies these forecasts to an average horizon somewhere in the range of five to ten years.

1. Introduction

Long-term earnings growth forecasts by equity analysts have garnered increasing attention over the last several years, both in academic and practitioner circles. For instance, one of the more popular valuation yardsticks employed by investment professionals of late is the ratio of a company's PE to its expected growth rate, where the latter is conventionally measured using analysts' long-term earnings growth forecasts. An expanding body of academic research uses equity analysts' earnings forecasts as well.

One of the more common and important applications is the measurement of the equity risk premium; and, as Chan, Karceski and Lakonishok (2003) argue, analysts' long-term forecasts are a "vital component" of such exercises. However, inferences from such studies can be quite sensitive to how those long-term growth forecasts are applied. Unfortunately, as evidenced by the range of assumptions employed in these applications, how these forecasts should be interpreted – that is, the horizon to which they ought to be applied – is quite ambiguous. For instance, Claus and Thomas (2001), in gauging the level of the equity risk premium, apply these growth forecasts to years 3 through 5; and beyond year 5 they apply a fixed growth rate assumption. At the other extreme, Harris and Marston (1992, 2001) and Khorana, Moyer and Patel (1999), apply these growth forecasts to an infinite horizon. In other studies, the assumed horizon usually falls somewhere in the middle.[1]

The implications are not purely academic, as these growth forecasts, or the perceptions they reflect, appear to have been a key factor driving equity market valuations skyward during the latter half of the 1990s. Indeed, as shown in figure 1, the PE ratio for S&P500, the ratio of the index price to 12-month-ahead operating earnings, rose more than 50 percent between January 1994 and January 2000. Over roughly that same time period, the "bottom-up" (weighted average) long-term earnings growth forecast for the S&P500 climbed almost 4 percentage points to nearly 15 percent, well above previous peaks. Findings in Sharpe (2001) suggest this was no

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[1]To estimate the intrinsic value of the companies in the Dow Jones Industrials Index, Lee, Myers and Swaminathan (1999) use the long-term earnings growth rate as a proxy for expected growth only through year 3. They implicitly pin down earnings growth beyond that point by assuming that the rate of return on equity reverts toward the industry median over time. Gebhardt, Lee and Swaminathan (2001) also use this formulation.

coincidence, that Wall Street's long-term growth forecasts have been a significant factor in valuations; however, because of their relatively short history and high autocorrelation, the size of that influence is difficult to gauge in aggregate analysis.

(Insert Figure 1)

In this study, I attempt to gauge the appropriate horizon over which to apply these growth forecasts by appealing to the market's judgement, that is, by inferring the horizon from market prices. In particular, I propose a straightforward empirical valuation model in which linear regression can be used to deduce the forecast horizon that the "market" uses to value stocks. This model is a descendent of the Campbell and Shiller (1988, 1989) dividend-price ratio model, which is an approximation to the standard dividend-discount formula. As in Sharpe (2001), their model is modified in order to emphasize the expected dynamics of earnings rather than dividends. In the resulting framework, the horizon over which the market applies analysts' long-term growth forecasts can be inferred from the elasticity of the PE ratio with respect to the growth forecast.

I estimate the model using industry- and sector-level portfolios of S&P 500 firms, constructed from quarterly data on stock prices and consensus firm-level earnings forecasts over 1983-2001. The estimated coefficients on consensus long-term growth forecasts suggest that the market applies these forecasts to an average horizon somewhere in the range of 5 to 10 years. Thus, these growth forecasts are more important for valuation than assumed in the many applications that treat them as 3-to-5 year forecasts, though far less influential than forecasts of growth into perpetuity. Among other implications, the results suggest that the increase in S&P500 constituent growth forecasts during the second half of the 1990s can explain up to half of the concomitant rise in their PE ratios.

2. The Relation Between PE Ratios, Expected EPS Growth, and Payout Rates

2.1 The Basic Idea

The principal modeling goal is to develop a simple estimable model of the relationship between the price-earnings ratio and expected earnings growth. As discussed in the subsequent section, by expanding out terms in the model of Campbell and Shiller (1988), we can produce the following relation for any equity or portfolio of equities:

$$\log \frac{P_t}{EPS_{t+1}} \approx \sum_{j=2}^{\infty} \rho^{j-1} g_{t+j} + Z_t \qquad \textbf{(1)}$$

where P_t is the current stock price, EPS_{t+1} is expected earnings per share in the year ahead, g_{t+j} is expected growth in earnings per share in year t+j. ρ is a constant slightly less than 1, similar to a discount factor, and Z_t is a function of the expected dividend payout rates and the required return.

For the analysis that follows, divide the discounted sum of expected EPS growth rates into two pieces:

$$\sum_{j=2}^{\infty} \rho^{j-1} g_{t+j} = \sum_{j=2}^{T} \rho^{j-1} g_t^L + \sum_{j=T+1}^{\infty} \rho^{j-1} g^{\infty} \qquad \textbf{(2)}$$

where g_t^L represents the expected average EPS growth rate over the next T years, measured by analysts' long-term growth forecasts, and g^{∞} is the average growth rate expected thereafter. This amounts to assuming there is a finite horizon, T, over which investors formulate their forecasts of earnings growth; beyond that horizon, expected average growth (g^{∞}) is assumed constant or, at a minimum, uncorrelated with g^L .

We thus rewrite (1) as follows:

$$\log \frac{P_t}{EPS_{t+1}} = \frac{\rho(1-\rho^{T-1})}{1-\rho} g_t^L + Z_{0t}(T) \qquad \textbf{(3)}$$

where $\frac{\rho(1-\rho^{T-1})}{1-\rho} = [\rho + \rho^2 + \rho^3 + \ldots + \rho^{T-1}]$ and ***Z(T)*** now subsumes an additional (independent) term containing the growth rate expected after T. Clearly, the longer the horizon over which investors' formulate "long-term" growth forecasts, the larger will be the "effect" on stock prices of any change in that expected (average) growth rate. For instance, suppose ρ=0.96; if investors apply the forecast on a horizon running between year 1 through year 5 (growth in year 2, 3, 4, and 5) the multiplier on g^L is 3.6. If, instead, this horizon ran from year 1 through year 10, the multiplier would be 7.4. The main contribution of this paper is to infer this horizon by estimating this multiplier--the elasticity of the PE ratio with respect to the expected growth rate--in the context of the valuation model described more thoroughly below.

2.2 Derivation of the Empirical Model

Campbell and Shiller (1988) show that the log of the dividend-price ratio of a stock can be expressed as a linear function of forecasted one-period rates of return and forecasted one-period dividend growth rates; that is,

$$\log \frac{D_t}{P_t} = E_t \left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j} - \sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j} \right] + k \tag{4}$$

where D_t is dividends per share in the period ending at time t and P_t is the price of the stock at t. On the right hand side, E_t denotes investor expectations taken at time t, r_{t+j} is the return during period $t+j$, and Δd_{t+j} is dividend growth in $t+j$, calculated as the change in the log of dividends. The ρ is a constant less than unity, and can be thought of as a pseudo-discount factor.

Campbell-Shiller show that ρ is best approximated by the average value over the sample period of the ratio of the share price to the sum of the share price and the per share dividend, or $P_t /(P_t + D_t)$. k is a constant that ensures the approximation holds exactly in the steady-state growth case. In that special case, where the expected rate of return and the dividend growth rate are constant, equation (4) collapses to the Gordon growth model: $D_t /P_t = R - G$.

The Campbell-Shiller dynamic growth model is convenient because it faciliates the use of linear regression for testing hypotheses. As pointed out by Nelson (1999), the Campbell Shiller dividend-price ratio model can be reformulated by breaking the log dividends per share term into the sum of two terms--the log of the earnings per share and the log of the dividend payout rate. When this is done and terms are rearranged, then the Campbell-Shiller formulation can be rewritten as:

$$\log \frac{EPS_t}{P_t} = E_t \left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j} - \sum_{j=1}^{\infty} \rho^{j-1} g_{t+j} - (1-\rho) \sum_{j=1}^{\infty} \rho^{j-1} \phi_{t+j} \right] + k \tag{5}$$

where EPS_t represents earnings per share in the period ending at t, $g_{t+j} = \Delta \log EPS_{t+j}$, or earnings per share growth in $t+j$, and $\phi_{t+j} = \log(D_{t+j}/EPS_{t+j})$, the log of the dividend payout rate in $t+j$.

This reformulation is particularly convenient as it facilitates a focus on earnings growth.

To simplify and further focus data requirements on earnings forecasts (as opposed to dividend forecasts), I assume that the expected path of the payout ratio can be characterized by a simple dynamic process. In particular, reflecting the historical tendency of payout ratios to revert back toward their target levels subsequent to significant departures, I assume that investors forecast the (log) dividend payout ratio as a stationary first-order autoregressive process:

$$E_t\phi_{t+j} = \lambda\phi^* + (1-\lambda)\phi_{t+j-1} \qquad \textbf{(6)}$$

In words, the payout rate is expected to adjust toward some norm, ϕ^*, at some speed $\lambda < 1$.

It is straightforward to show that, given (6), the discounted sum of expected log payout ratios in (5) can be written as a linear function of the current payout rate:

$$E_t \sum_{j=1}^{\infty} \rho^{j-1}\phi_{t+j} = \frac{1-\lambda}{1-\rho(1-\lambda)}\phi_t + \frac{\lambda/(1-\rho)}{1-\rho(1-\lambda)}\phi^* \qquad \textbf{(7)}$$

The final equation is arrived at by substituting into (5) the assumed structure of expected payout rates (7), and the assumed structure of earnings growth forecasts (2). Rearranging terms, and defining R_t as the discounted sum of expected returns:

$$\log \frac{P_t}{EPS_{t+1}} = \frac{\rho(1-\rho^{T-1})}{1-\rho} g_t^L + \alpha\phi_t + [\frac{\rho^{T+1}}{1-\rho} g^{\infty} + (1-\alpha)\phi^*] - R_t + k \qquad \textbf{(8)}$$

where $\alpha \equiv \dfrac{(1-\rho)(1-\lambda)}{1-\rho(1-\lambda)}$ is between 0 and 1.

2.3 Empirical Implementation

To translate equation (8) into a regression equation with the log PE ratio as dependent variable, note that the first pair of right-hand side variables--the long-term growth forecast *(g^L)* and the current log dividend payout rate (ϕ)--are observable, at least by proxy. The pair of terms in brackets are the expected "long-run" log payout ratio and expected earnings growth in the "out years," both of which are unobservable and assumed constant; thus, they are absorbed into the regression constant. Even if constant over time, they are likely to vary cross-sectionally, which suggests the need for additional controls or industry dummies. Finally, expected future returns, R_t, are also unobservable. To control for time variation in expected returns, macroeconomic factors are added to the list of regressors. As discussed below, cross-sectional variation in expected returns is dealt with by including fixed effects.

Letting *i* represent a firm or portfolio of firms, and letting Z represent proxies for, or factors in, expected returns, (8) is translated into the following regression equation:

$$\log \frac{P_{it}}{EPS_{i,t+1}} = \beta g_{it}^{L} + \alpha\phi_{it} + \beta_{0i} - \gamma Z_{it} + u_{it} \quad \textbf{(9)}$$

with u_{it} a mean-zero error term, assumed to be uncorrelated with the explanatory variables.

Given an assumed value for ρ, the horizon over which investors apply analysts' long-term growth forecasts can be inferred from the magnitude of β, which should be positive. For these calculations I assume ρ=0.96; in that case, if long-term growth horizon applied to the five years of growth beginning at the end of the current year (T=6), we would expect the coefficient on long-term growth to be 4.4 . The resultant mapping from horizon T to implied coefficient is provided in the following table:

T	2	3	4	5	6	8	10	20	∞
β	0.96	1.9	2.8	3.6	4.4	6.0	7.4	12.9	24

To understand why the best approximation for ρ is $\frac{P}{P+D}$, consider the case where *g* is the expected growth into perpetuity (T=∞). In this case, the coefficient on *g*, according to (8), would boil down to simply ρ/(1−ρ) = *P/D*. But this is precisely the implied effect of growth on price in the Gordon (constant) growth model; in that model, $\frac{\partial \log P}{\partial g} = \frac{1}{r-g} = \frac{P}{D}$. Moreover, as long as the horizon is not extremely distant -- the coefficient on g^L is not too large -- then the inferred horizon is not very sensitive to the precise choice of ρ.[2]

According to the model (8), the coefficient on the dividend payout rate should lie between 0 and 1. It would equal 1 if the current payout rate was expected to be maintained

[2]For instance, if T=6, then the coefficient (β) is predicted to be 4.3 for ρ=0.95 versus 4.6 for ρ=0.97.

forever (λ=0); in most cases it should be much closer to zero than 1, even if the dividend payout rate is expected to revert quite slowly back to the long-run payout rate. For instance, if λ=0.1 (the payout rate is adjusted annually by 10 percent of the gap between the desired and current level), then the theoretical coefficient on the payout rate (given ρ=.96) would be 0.27.

Clearly, the assumed dynamics of the payout rate are a simplification. It is quite plausible, for instance, that the long-run target for any given industry evolves over time. If that were the case, then we would expect the current payout rate to carry more information about the average future payout; thus, its coefficient would be larger than that what is implied by short-run autocorrelations, and we would interpret it somewhat differently. However, this would not alter our interpretation of the coefficient on the growth forecast. Indeed, excluding the payout rate from the regression or adding another lag does not substantially alter inferences drawn with regard to the growth horizon.

As in much of the research on expected returns, estimation is conducted on portfolios of firms. One potential benefit of this aggregation is a reduction in potential measurement error that comes from using analysts' forecasts as proxies for long-term growth forecasts. But using portfolios is also necessary because model (8) cannot be applied literally to firms that do not have positive dividends and earnings because the log payout ratio would be undefined. The model is too stylized for application to very immature firms. To some extent, this observation guides the choice of portfolio groupings. In particular, firms are grouped into portfolios by industry, rather than by characteristics that would be correlated with firm size or maturity.

3. Data and Sample Description

3.1 The data

The sample is constructed using monthly survey data on equity analyst earnings forecasts and historical annual operating earnings, both obtained from I/B/E/S International. A dataset of quarterly stock prices and earnings forecasts is constructed using the observations from the middle month of each quarter (February, May, August, and November), beginning in 1983, when long-term growth forecasts first become widely available in the I/B/E/S database. The sample in each quarter is built using firms belonging to the S&P500 at the time. Sample firms must also have consensus forecasts for earnings per share in the current fiscal year (EPS1) and the following fiscal year (EPS2), as well as a consensus long-term growth forecast. Data on dividends per share are mostly drawn from the historical I/B/E/S tape, though missing values in the early part of the sample are filled in using Compustat.

The data of greatest interest in this study are the equity analysts' long-term growth forecasts, which I measure using the median analyst forecast from I/B/E/S, where the typical forecast represents the "expected annual increase in operating earnings over the company's next full business cycle." In general, these forecasts refer to a period of between three to five years (I/B/E/S International, 1999). Clearly, this description is fairly ambiguous about the horizon of these forecasts, though three to five years is probably the most widely cited horizon.

The measure of expected earnings used for the denominator of the PE ratio is constructed using forecasts for both current-year and next-year earnings. For any given observation, a firm's "12-month-ahead" earnings per share $EPS_t = w_m*EPS1 + (1-w_m)*EPS2$, where the weight ($w_m$) on current year EPS is proportional to the fraction of the current year that remains. For instance, w_m is 1 if the firm just reported its previous fiscal-year earnings within the past month, and it equals 11/12 if the firm reported its previous year's earnings one month ago. The PE ratio is then calculated as the ratio of current price to 12-month-ahead earnings.

To construct the lagged dividend payout ratio, I create an analogous measure of 12-month *lagging* earnings. Specifically; 12-month lagging earnings, or $EPS_{t-1} = w_m*EPS0 + (1-w_m)*EPS1$, where $EPS0$ is earnings per share reported for the previous fiscal year. The dividend payout rate is then calculated as the ratio of the firm's most recent (annualized) dividend per share to its 12-month lagging operating earnings per share. Prior to 1985, the dividend variable is not provided in the I/B/E/S data. For these observations, the dividend per share value is taken from Compustat.

3.2 Construction of Sector and Industry Portfolios

For each quarterly observation, firms are grouped into portfolios using two alternative levels of aggregation. In the more aggregated case, firms are grouped into 11 sectors, which are broad economic groupings as defined by I/B/E/S (Consumer Services, Technology, ...etc.). The second portfolio grouping is comprised of industry-level portfolios, constructed using I/B/E/S industry codes that are similar in detail to the old 2-digit Standard Industrial Classification (SIC) industry groupings. For instance, the technology sector is broken down into (i) computer manufacturers, (ii) semiconductors and components, (iii) software and EDP services, and (iv) office and communication equipment.

Each quarterly observation for each variable is constructed by aggregating over all portfolio members in that quarter--S&P500 firms in the given sector (or industry). Constructing a portfolio aggregate long-term growth forecast is somewhat tricky because these variables are growth rates and because there is no clearly optimal set of weights for aggregating these growth rates. The most intuitive choice would be the level of a firm's previous-year earnings; but this would be nonsensical in the case where some firms had negative earnings. To get around this, I use a measure of expected earnings; in particular, each firm's weight is calculated as current shares times the maximum of [EPS1, EPS2, 0]. Because *EPS2* is almost always positive for S&P500 firms, this approach avoids the problem of potentially negative weights and minimizes the number of companies that get zero weight.

The dependent variable, the price-earnings ratio, is constructed by summing up the market values of all (S&P500) sector or industry members, and then dividing by the sum of their expected 12-month ahead earnings. Similarly, dividend payout rates at the portfolio level are constructed by summing the dividends (dividends per share times shares outstanding) of portfolio members and dividing by the sum of their 12-month lagging earnings.

The payout rate and the PE ratio are undefined when their denominators are negative; thus, these variables are occasionally undefined when we use the finer industry-level portfolio partition. Moreover, there is a higher frequency of negative observations on 12-month lagging earnings than on 12-month ahead earnings (presumably owing to analysts' optimistic bias); that is, actual earnings are negative more often than expected earnings. To reduce the loss of industry-level observations as a result of negative earnings, in constructing industry payout ratios, I substituted an industry's 12-month ahead earnings for its 12-month lagging earnings in cases where the latter is negative and the former is not, with little effect on the results.

3.3 Controls for expected returns

Because empirical inferences are partly drawn from the time series dimension of the data, I include a couple proxies for the expected long-run return on the market portfolio, specifically the long-term (10-year) government bond yield and the risk spread on corporate bonds, equal to the difference between the yields on the Moody's Aaa and Baa corporate bond indexes. In light of the findings by Fama and French (1989) and others, that *excess* expected equity returns are positively related to the risk spreads on bonds, we expect the PE ratio to be negatively related to both the corporate risk spread and the bond yield.

A third macro factor I consider is the expected inflation rate, as proxied by the four-quarter expected inflation rate from the Philadelphia Federal Reserve survey of professional forecasters. As suggested in Sharpe (2001), expected inflation also appears to be a positive factor in required equity returns (before taxes), perhaps because inflation raises the effective tax rate on real equity returns.

I do not construct a measure of the industry or sector portfolio betas, or any other cross-sectional determinants of expected returns. First, the bulk of empirical research weighs in on the side of finding very little role for beta. Perhaps most salient study in this regard is Gebhardt, Lee, and Swaminathan (2001), which also analyzes expected returns with an earnings-based ex ante measure. They find beta to be of little value in explaining cross-sectional differences in expected return. On the other hand, their findings suggest that industry membership is a factor in expected returns; I control for potential industry factors in expected returns by including fixed industry effects.[3]

3.4 Sample Statistics

After dropping the first observation per sector or industry in order to create one lag on the PE ratio, the sample runs from 1983:Q2 to 2001:Q2. This leaves a potential of 73 quarterly

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[3]Indeed, Gebhardt, et. al find the long-term growth forecast to be a positive factor in firm-level expected returns. But that finding might be the result of assumptions they use to construct their ex ante measure of expected return. If their measure builds in too long a horizon on the growth forecast, then the growth forecast will appear to have a positive effect on expected return (or a negative effect on valuations). In their "terminal value" calculation, the slow decay rate of ROE, and the use of median industry ROE as the expected ROE for perpetuity, may implicitly build in too long a horizon on current expected earnings growth or, more precisely, on the value of ROE in year t+4. Indeed, it is somewhat curious that long-term growth is a significant factor in expected return only when the regression also includes the book-to-market ratio–another key component in the construction of the dependent variable.

observations for each of 11 sectors, or 803 sector-time observations. In addition to excluding observations for which earnings are negative or dividends are zero, those with extreme values are also filtered out. In particular, observations are excluded if either the portfolio PE ratio exceeds 300 or its dividend payout rate exceeds 5.0.

In the case of sector portfolios, these filters remove only 2 observations; and no observations are lost as a result of negative earnings or zero dividends. Distributions of the key variables for the sector portfolios are depicted by the top number among each pair of numbers in table 1. The average sector price-earnings ratio over the sample period is about 14, and it ranges from 3.5 to 54.1. The average dividend payout rate is 0.45 (or 45 percent of earnings), with a range of 0.08 to 2.16. The average expected long-term growth rate is 11 percent, with a range of 5 to 20 percent.

Correlations among variables are shown in the bottom half of the table. The PE ratio is strongly correlated with the earnings growth forecast, as theory would suggest, but it is uncorrelated with the dividend payout rate. The earnings growth forecast is negatively correlated with the dividend payout rate, consistent with the prediction that firms with lower growth prospects pay out a higher proportion of their dividends.

In the case of industry portfolios, roughly 120 observations are excluded where industry dividends are zero or, in a handful of cases, where expected year-ahead earnings are negative, leaving 4071 observations on 66 industries.[4] Another 14 observations are excluded because the PE ratio exceeds 300 or the dividend payout rate exceeds 5, leaving 4057 industry-quarter observations, an average of about 62 quarters per industry. Distributions and correlations for the industry portfolio variables are depicted by the bottom figures among the pairs in table 1.

4. Empirical Results

4.1 Sector Regressions

Table 2 shows the results of sector portfolio regressions with the log of the PE ratio as dependent variable. Heteroskedasticity and autocorrelation-consistent (Newey-West) standard

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[4] I have also excluded 5 very small industries for which the average total industry market value (over the sample period) is less than $1 billion. Also note that not all industries exist over the entire sample.

errors are reported below the coefficient estimates. Column (1) shows the simplest specification; it includes the earnings growth forecast, the sector payout rate, the yield on the 10-year Treasury bond, and the risk spread on corporate bonds. The coefficient estimate on the growth forecast is 8.05, with a standard error of 0.5, indicating relatively high precision. The magnitude of the coefficient suggests that growth forecasts reflect expectations over a fairly long horizon. In particular, given that $\frac{\rho(1-\rho^{T-1})}{1-\rho}$ equals 7.75 for T=10 and 8.5 for T=11, the inference would be that the long-term growth forecast represents the expected growth rate for a 9 or 10 year period, starting from the coming year's expected level of earnings.

The coefficient on the payout rate, 0.34, falls within the [0,1] range dictated by theory; but, interpreted literally, the magnitude of the coefficient implies that payout rates adjust very slowly toward their long-run desired levels. Interpreted more loosely, one could infer that the current payout rate conveys some information about a sector's long-run desired payout rate, which is not likely to be constant over the very long run as assumed by the model.

The coefficients on the bond yield and the risk spread are both negative, as theory and previous empirical results would predict. The coefficient on the Treasury bond yield implies that a one percentage point increase in long-term yields drives down the PE ratio by about 12 percent -- or, holding E constant, drives down the stock price 12 percent. The regression R-squared is quite high, suggesting these four variables explain about 70 percent of the overall cross-sectional and time series variation in price-earnings ratios. The root mean squared error is 0.2.

One problem with this specification, however, is the presence of strong autocorrelation in the errors, reflected in a Durbin-Watson statistic of 0.32. In specification (2), this is rectified by modeling the dynamics with the addition of a lagged dependent variable, the lagged PE ratio, which receives a coefficient of 0.75. Not surprisingly, adding this regressor boosts the R-squared substantially, to 0.910, and cuts the root mean squared error in half. The Durbin-h test now strongly rejects the presence of autocorrelation.

Interpreting the coefficient on the growth forecast is a bit more complicated here because that coefficient, equal to 2.00, now represents only the "impact effect". The total long-run effect of a change in the growth forecast is equal to the impact coefficient divided by one minus the coefficient on the lagged PE, or $2/(1-0.75) = 8$. Thus, the conclusion from the original regression holds up: the growth forecast still appears to represent a horizon of about 9 years.

The long-run effect of the payout rate is 0.28, only a bit smaller than the static estimate. One notable difference from the static model is that the sign on the risk spread flips to positive, although that variable is no longer statistically significant. Thus, once we account for growth expectations and the underlying dynamics, the risk spread no longer has marginal explanatory power for stock valuations.

The third and fourth specifications address the potential omitted variable problem. Gebhardt, et. al (2001) find sector-level factors in expected returns. If sector-level (but non-growth-related) factors are correlated with sector long-term growth expectations, then the coefficient on growth forecasts will be biased. Sector-level expected-return factors can be removed using a fixed effects estimator. In column (3), results are shown for the static version of the model estimated on sector-mean-adjusted variables; and, in (4), results are shown when fixed effects are similarly incorporated into the dynamic model. In both cases, the results continue to yield conclusions similar to the first specification.[5]

Finally, I consider the possibility that omitted macroeconomic factors in expected returns are correlated with changes in the average sector growth forecast over time. Column (5) shows the results from adding expected inflation, specifically, expected inflation over the next four quarters as measured by the Philadelphia Fed survey of professional forecasters. As shown by Sharpe (2001), expected inflation seems to be related to both expected earnings growth and expected returns. In addition, controlling for expected inflation allows us to interpret the estimated effect of changes in expected long-term growth as reflecting changes in real growth expectations. In any case, adding expected inflation to the dynamic specification reduces somewhat the estimated effect of expected growth. Here, the long-run effect of 6.63 is consistent with a horizon between 7 and 8 years.

The final specification takes a more agnostic approach to macro factors and adds year dummies (in addition to the fixed sector effects). This eliminates any effect of the growth forecast that might be purely time-driven, and thus provides the most conservative estimate of the effect of these earnings expectations. Indeed, the long-run coefficient on the growth forecast falls to 5.45 in this regression, which suggests a horizon of about 6 years. Considering the

[5]Given the sample size, the small sample bias that arises when a lagged dependent variable is used in conjunction with fixed effects should not be an issue.

totality of the findings in table 2, one would conclude that the horizon of the earnings growth forecast falls somewhere in the range of 6 to 10 years.

4.2 Industry Regressions

An analogous set of results based on narrower industry-level portfolios is shown in table 3. The industry-level results generally follow the pattern of the sector-portfolio results, with one important difference. In these regressions, the long-run coefficient on the growth forecast tends to be about two-thirds the magnitude found in the analogous sector-level regressions. In particular, the coefficient estimate on the growth forecast runs from 5.4 in the specifications without fixed effects down to 3.9 in the specification with both fixed industry and time effects. These results would suggest that investors apply the growth forecast to a somewhat shorter horizon – between 5 and 7 years, compared to the 6 to 10-year range suggested by the sector-level analysis.

One potential explanation of the difference between the sector- and industry-level coefficient estimates revolves around the idea that the analyst growth forecasts measure investor expectations with error. Assuming minimal measurement error on other regressors, then measurement error in the growth forecast would produce a downward bias in the coefficient on expected growth. Furthermore, if measurement errors were not highly correlated across firms or industries within a given sector, then using a higher level of aggregation would tend to reduce this measurement error. A similar but more structural explanation for the difference in results could be that investor expectations of a firm's or industry's growth beyond the very near term is partly reflected in growth expectations for other firms or industries within the same sector. Under either interpretation, we would expect sector growth forecasts to help explain variation in industry PE ratios, even after controlling for the industry growth forecast.

This hypothesis can be examined by reestimating the industry regressions but with the *sector growth* forecast as an additional explanatory variable. With both the industry and sector growth forecasts in the regression, the sum of their two coefficients can be interpreted as measuring the total effect of an increase in forecasted industry growth that is matched by an equal-sized increase in the forecast for sector-level growth.

The key results from re-estimating specification (1) are provided in the first column of

Table 4. As shown, the coefficients on the industry and sector growth forecasts are 4.35 and 1.87, respectively. These two coefficients sum up to 6.22, which is larger than the original industry growth effect from the analogous industry-level regression (table 3) though still smaller than the coefficient in the sector-level regression (table 2). Results from rerunning specification (4) are shown in the second column. The estimated (long-run) coefficients on industry and sector growth forecasts are 3.62 and 3.41, respectively. Thus, it again appears that sector growth expectations help explain industry valuations. Here, the coefficients sum to a total effect of 7.03, which is closer to the long-run coefficient on growth in the sector regression (7.92) than to that in the industry regression (4.53).[6]

4.3 Robustness over time

As a final robustness test of the model and its application to the analyst forecast data, I split the data into early (1983-1991) and late (1992-2001) subsamples and reestimate some of the key industry- and sector-level regressions. This experiment provides evidence on the extent to which our inferences depend upon the time period under consideration. Table 5 compares the coefficients estimates on the long-term growth forecast for the two time periods, under four alternative specifications (regressions (1) and (4) for both the sector and industry portfolios). Although not shown in the table, the coefficient on the dividend payout rate is always positive and less than 0.5, while the coefficient on the Treasury bond yield is always negative.

In short, the results do indicate that there is a substantial difference between the early and late sample valuation effects of long-term growth forecasts. Although statistically positive in all cases, the coefficient on the growth forecast is about double in the later subsample compared to the analogous early-sample estimate. For instance, in the simple sector regression (1), the early-sample coefficient on growth is 6.1, whereas the late sample coefficient in 10.0. This suggests that the horizon in the early sample is about 7 years, whereas it is closer to 12 years in the more recent period. At the other end of the spectrum, the dynamic fixed-effect regression (4) on

[6] An alternative tack, which amounts to the same test, would be to put the industry growth forecast and, second, the differential between the sector and industry growth forecasts in the regression. In this case, the coefficient on the industry growth forecast would be 7.02, and the coefficient on the differential would be 3.4.

industry portfolios produces a long-run coefficient of 2.3 in the early period, suggesting a 2 to 3 year horizon, versus 4.5 in the late period, consistent with a 5-year horizon.[7] We are thus led to the inference that long-term growth forecasts carried more weight, or were applied to a longer horizon, during the past decade. This could owe either to the fact that analyst forecasts have become more widely applied in valuation analysis or to an increased emphasis placed on these long-term growth forecasts by analysts and their customers.

4.4 Caveats

Before concluding, some cautionary remarks are in order. It should be emphasized that the interpretation0 of the results is conditioned upon the maintained hypothesis that the assumptions behind the model are a reasonably approximation of reality. While this is true of any econometric application, it is important here because the conclusions revolve around the magnitude of the key coefficients, rather than just their sign and statistical significance. Clearly, there are a number of rationales one could invoke for why that model might be prone to either overestimate or underestimate the forecast horizons imputed to investors.

On one hand, the analysis ignores the potential influence of momentum, or positive-feedback, trading, which would cause stock prices to overreact to fundamentals. In other words, if stock prices in an industry rise due to an increase in the growth outlook over the next few years, momentum trading could amplify the ultimate stock price effect. In that case, the model would overstate the duration that investors actually attribute to growth forecasts.

On the other and, it is possible that the *required* return on a firm or industry's stock is positively related to its expected growth rate, since high growth firms or industries may be riskier. This would imply the presence of a second (negative) channel through which growth expectations might influence PE ratios, making identification problematic. If we fail to control for a any such negative effect on stock prices coming through a required-return channel, the model would underestimate the imputed horizon of these forecasts, by underestimating their positive influence owing to their role as proxies of expected growth.

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[7]While the "discount" or weighting factor [$\rho = P/(P+D)$] used in the model approximation should be somewhat smaller in the early period, due to the higher average dividend yield in the 1980s, the difference would not be nearly enough to justify the difference in coefficient estimates.

5. Summary and Implications

The empirical analysis strongly confirms the value-relevance of analysts' long-term earnings growth forecasts. In particular, most regression coefficient estimates suggest that a 1 percentage point increase in expected earnings growth can explain a 4 to 8 percent boost in an industry's PE ratio. According to the model, these regression coefficients imply that the market treats these forecasts as having an applicable horizon of at least 5 years, and perhaps as many as 10 years. Results from splitting the sample indicates that long-term growth forecasts had larger valuation effects during the past decade than they did in the previous decade, which suggests that the upper-end estimates (the 10-year horizon) may be more relevant for the more recent period. In light of the 4 percentage point increase in the "bottom-up" growth forecast for the S&P500 during the latter half of the 1990s (documented in figure 1), these findings suggest that the increrase in long-term growth expectations might account for as much as a 32 % (8 x 4%) rise in the market PE ratio over those years, about half of the total increase.

The empirical relation between equity valuations and long-term growth forecasts suggests that investors view such forecasts as strong indicators of growth prospects for several years. It would thus appear that the market places a great deal of faith in the ability of analysts to divine differences in firm or industry long- term prospects; but, this begs the question: How good are such longer-term growth predictions? A detailed analysis of this issue is beyond the scope of my study; however, some recent research suggests that investors could well be misguided in putting so much weight on these forecasts.

One finding is that long-term forecasts are not only upward biased, like forecasts on more specific, shorter-term horizons, but they also appear to be "extreme"; that is to say, the higher a growth forecast is, the more upward biased it tends to be [Dechow and Sloan (1997), Rajan and Servaes (1997)]. In addition, there is mixed support for the view that analysts over-extrapolate from recent observations [De Bondt (1992), La Porta (1996)].

If the weight placed on these forecasts overreaches the ability of analysts (and perhaps anyone else) to predict long-run performance, the forecasts should be contrary indicators of future stock performance. Indeed, these studies find that stock returns for firms with high long-term growth forecasts tend to be substandard. In an analysis of long-term growth forecasts issued from 1982-1984, De Bondt (1992) finds a significant inverse relation between expected growth and excess returns over the subsequent 12-18 months. La Porta's (1996) analysis of forecasts issued from 1982-1991 finds subsequent stock returns to be negatively related to beginning-of-period long-term growth forecasts; and both Rajan and Servaes (1997) and Dechow, Hutton and Sloan (1999) find that post-offering performance of IPO stocks is worse for firms with higher long-term growth forecasts.

Finally, Chan, Karceski and Lakonishok (2003) offer some very interesting evidence on the efficacy of long-term growth forecasts. In particular, they compare realized growth to forecasted growth for firms sorted annually into quintile portfolios based on their I/B/E/S long-term growth forecasts. On average over their sixteen year sample, the median growth rate forecast in the top quintile is 22.4 percent, compared to a median of 6 percent in the bottom quintile, a spread of 16-1/2 percentage points. They compare this spread with the spread between the median growth rates actually experienced in subsequent years. Their calculations imply that, from year 2 through 5, the median realized growth rates in the top and bottom quintiles differed by 5-1/2 percentage points, only a third of the average forecasted differential.[8]

On average, my coefficient estimates suggest that industry portfolios are valued as if the market believes that the differential in long-term growth forecasts should be applied to a six- to seven-year horizon. Of course, there are alternative interpretations of my regression estimates. One possibility is that investors (correctly) expect only a third of the differential between growth forecasts to be realized, but that they apply that smaller differential over a much longer horizon. To rationalize this interpretation, though, investors would need to expect the reduced differential to persist for over 20 years. Such beliefs would appear to fly in the face of another finding by Chan, et al. (2001), that there is remarkably little long-term persistence in firm-level income growth. All this would seem to indicate that, even if using the long horizons suggested by my estimates produces more accurate measures of investors' expected returns, using such horizons would seem to be an ill-advised strategy for making portfolio investment decisions.

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[8]They find that, in the first year after the forecast, median realized growth in operating income for those quintiles was 16 percent and 3-1/2 percent, a spread of 12-1/2 percentage points, about three-fourths of the expected spread. But the spread in median realized growth narrows to 7 points when the performance period is extended to 5 years. Backing out the strong contribution from the first year yields an implied average growth differential in the subsequent four years (years 2-5) of about 5-1/2 percent.

Like the evidence on stock returns and growth forecasts discussed earlier, the analysis by Chan, et al. (2001) is largely focused on the cross-sectional informativeness of growth forecasts. To complete the picture, an important direction for future research would involve focusing on the efficacy of the time-series information in long-term growth forecasts, measured by *changes* in such forecasts for a given firm or industry.

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Table 1

Sample Statistics for Sector Portfolios (top) and Industry Portfolios (bottom)

	Mean	Std. Dev	Min	Max
P/E	14.2	5.8	3.5	54.1
	14.9	7.5	3.0	127.3
Payout	0.45	0.20	0.08	2.2
	0.41	0.28	0.01	4.1
Growth	11.2	0.03	0.05	0.20
	14.9	0.03	0.03	0.27

Pearson Correlation Coefficients

	P/E	Payout
Payout	0.02	1.00
	0.15	1.00
Growth	0.45	-0.44
	0.30	-0.33

The samples runs quarterly from 1983:Q2 to 2001:Q2. In the more aggregated portfolios, there are 801 observations on 11 sectors; the second sample has 4071 observations on 66 industries.

Table 2
Sector Portfolio Regressions: Dependent variable is the sector-level log PE ratio*

	(1)	(2)	(3)	(4)	(5)	(6)
Growth (β)	8.05	2.00	9.69	2.66	2.30	1.69
	(0.50)	(0.55)	(1.05)	(0.77)	(0.70)	(0.70)
β/(1-λ)		*8.00*		*7.92*	*6.63*	*5.45*
Payout Rate	0.34	0.07	0.31	0.07	0.09	0.09
	(0.05)	(0.03)	(0.08)	(0.04)	(0.04)	(0.04)
10-Year Treasury Yield	-11.99	-3.99	-11.84	-4.73	-2.86	
	(0.63)	(0.78)	(0.52)	(0.67)	(0.57)	
Risk Spread	-9.90	3.41	-8.82	2.84		
	(4.02)	(1.92)	(3.27)	(1.78)		
Expected. Inflation					-5.18	
					(1.04)	
Lagged PE (λ)		0.75		0.67	0.65	0.69
		(0.06)		(0.05)	(0.05)	(0.06)
Adj. R-Squared	.706	.910	.714	.889	.893	.764
Root MSE	.204	.113	.172	.107	.106	.085

*801 sector-time observations on 11 sectors over 1983:Q2 to 2001:Q2. Specifications (1) and (2) are estimated with OLS; fixed industry effects are added in (3)-(6) by using OLS on industry mean-adjusted values; year dummies are added in (6). Newey-West robust standard errors are shown in parentheses. Below the standard error for the coefficient on *Growth* (long-term growth) in (2), (4)-(6) is the implied "long-run" effect of *Growth* – equal to the coefficient on growth divided by (1-λ), where λ is the coefficient on the lagged PE.

Table 3
Industry Portfolio Regressions: Dependent variable is the industry-level log PE ratio*

	(1)	(2)	(3)	(4)	(5)	(6)
Growth (β)	5.39	0.91	5.06	1.36	1.20	1.00
	(0.37)	(0.16)	(0.36)	(0.21)	(0.20)	(0.22)
β/(1-λ)		*5.45*		*4.53*	*3.96*	*3.88*
Payout Rate	0.15	0.04	0.20	0.07	0.08	0.07
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
10-Year Treasury Yield	-10.59	-2.87	-10.33	-3.98	-2.38	
	(0.54)	(0.27)	(0.38)	(0.28)	(0.30)	
Risk Spread	-5.93	4.36	-6.83	2.26		
	(3.33)	(1.30)	(2.13)	(1.31)		
Expected Inflation					-3.96	
					(0.67)	
Lagged PE (λ)		0.83		0.71	0.70	0.74
		(0.02)		(0.02)	(0.02)	(0.03)
Adj. R-Squared	.421	.857	.510	.792	.794	.699
Root MSE	.311	.155	.226	.147	.146	.12

*4057 industry-time observations on 66 industries over 1983:Q2-2001:Q2 Specifications (1) and (2) are estimated with OLS; fixed industry effects are added to (3)-(6), by using OLS on industry mean-adjusted values; year dummies are added in (6). Newey-West robust standard errors are shown in parentheses. Below the standard error for the coefficient on *Growth* (long-term growth) in (2), (4)-(6) is the implied "long-run" effect of *Growth* – equal to the coefficient on growth divided by (1-λ), where λ is the coefficient on the lagged PE.

Table 4
Sector Growth Effects in Industry Portfolio Regressions

Coefficient on:	(1)	(4)
Industry Growth	4.35	3.62
Sector Growth	1.87	3.40
Total	6.22	7.02

Coefficients on growth forecast's are all significant at the 1 percent level. Figures under specifications (4) refer to implied long-run effects of growth, analogous to those in column (4) of tables 2 and 3.

Table 5
Coefficients on Growth in Early & Late Samples

	Sectors		Industries	
	(1)	(4)	(1)	(4)
1983-1991	6.1	2.9	4.0	2.3
1992-2001	10.0	10.6	6.5	4.5

Coefficients on growth forecast's are all significant at the 1 percent level. Figures under specifications (4) refer to implied long-run effects of growth, analogous to those in column (4) of tables 2 and 3.

The Journal of FINANCE

VOL. XIX | SEPTEMBER 1964 | NO. 3

CAPITAL ASSET PRICES: A THEORY OF MARKET EQUILIBRIUM UNDER CONDITIONS OF RISK*

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I. INTRODUCTION

ONE OF THE PROBLEMS which has plagued those attempting to predict the behavior of capital markets is the absence of a body of positive microeconomic theory dealing with conditions of risk. Although many useful insights can be obtained from the traditional models of investment under conditions of certainty, the pervasive influence of risk in financial transactions has forced those working in this area to adopt models of price behavior which are little more than assertions. A typical classroom explanation of the determination of capital asset prices, for example, usually begins with a careful and relatively rigorous description of the process through which individual preferences and physical relationships interact to determine an equilibrium pure interest rate. This is generally followed by the assertion that somehow a market risk-premium is also determined, with the prices of assets adjusting accordingly to account for differences in their risk.

A useful representation of the view of the capital market implied in such discussions is illustrated in Figure 1. In equilibrium, capital asset prices have adjusted so that the investor, if he follows rational procedures (primarily diversification), is able to attain any desired point along a *capital market line*.[1] He may obtain a higher expected rate of return on his holdings only by incurring additional risk. In effect, the market presents him with two prices: the *price of time*, or the pure interest rate (shown by the intersection of the line with the horizontal axis) and the *price of risk*, the additional expected return per unit of risk borne (the reciprocal of the slope of the line).

* A great many people provided comments on early versions of this paper which led to major improvements in the exposition. In addition to the referees, who were most helpful, the author wishes to express his appreciation to Dr. Harry Markowitz of the RAND Corporation, Professor Jack Hirshleifer of the University of California at Los Angeles, and to Professors Yoram Barzel, George Brabb, Bruce Johnson, Walter Oi and R. Haney Scott of the University of Washington.

† Associate Professor of Operations Research, University of Washington.

1. Although some discussions are also consistent with a non-linear (but monotonic) curve.

At present there is no theory describing the manner in which the price of risk results from the basic influences of investor preferences, the physical attributes of capital assets, etc. Moreover, lacking such a theory, it is difficult to give any real meaning to the relationship between the price of a single asset and its risk. Through diversification, some of the risk inherent in an asset can be avoided so that its total risk is obviously not the relevant influence on its price; unfortunately little has been said concerning the particular risk component which is relevant.

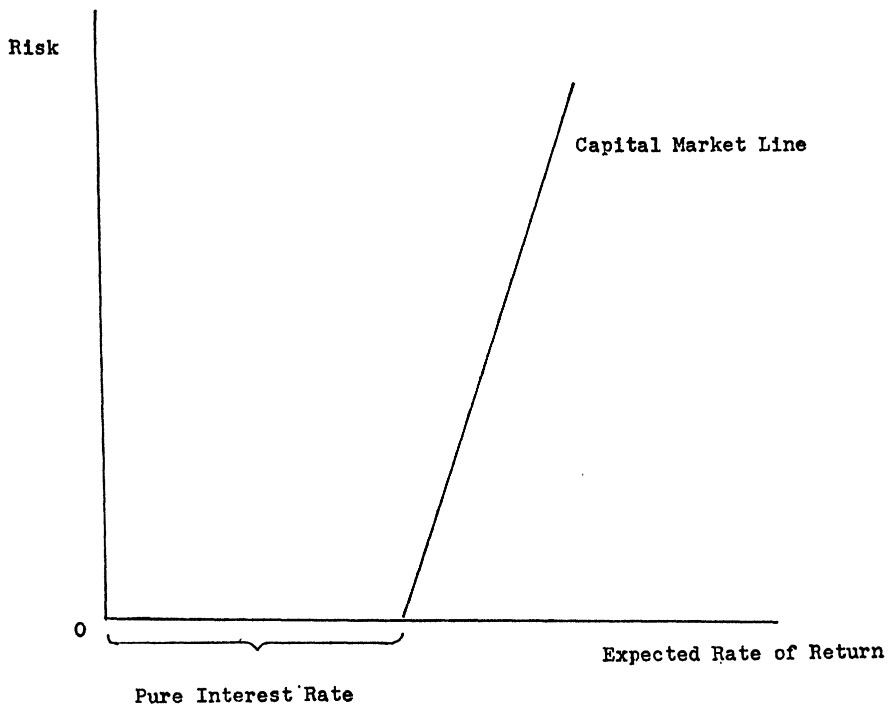

FIGURE 1

In the last ten years a number of economists have developed *normative* models dealing with asset choice under conditions of risk. Markowitz,[2] following Von Neumann and Morgenstern, developed an analysis based on the expected utility maxim and proposed a general solution for the portfolio selection problem. Tobin[3] showed that under certain conditions Markowitz's model implies that the process of investment choice can be broken down into two phases: first, the choice of a unique optimum combination of risky assets; and second, a separate choice concerning the allocation of funds between such a combination and a single riskless

2. Harry M. Markowitz, *Portfolio Selection, Efficient Diversification of Investments* (New York: John Wiley and Sons, Inc., 1959). The major elements of the theory first appeared in his article "Portfolio Selection," *The Journal of Finance*, XII (March 1952), 77-91.

3. James Tobin, "Liquidity Preference as Behavior Towards Risk," *The Review of Economic Studies*, XXV (February, 1958), 65-86.

asset. Recently, Hicks[4] has used a model similar to that proposed by Tobin to derive corresponding conclusions about individual investor behavior, dealing somewhat more explicitly with the nature of the conditions under which the process of investment choice can be dichotomized. An even more detailed discussion of this process, including a rigorous proof in the context of a choice among lotteries has been presented by Gordon and Gangolli.[5]

Although all the authors cited use virtually the same model of investor behavior,[6] none has yet attempted to extend it to construct a *market* equilibrium theory of asset prices under conditions of risk.[7] We will show that such an extension provides a theory with implications consistent with the assertions of traditional financial theory described above. Moreover, it sheds considerable light on the relationship between the price of an asset and the various components of its overall risk. For these reasons it warrants consideration as a model of the determination of capital asset prices.

Part II provides the model of individual investor behavior under conditions of risk. In Part III the equilibrium conditions for the capital market are considered and the capital market line derived. The implications for the relationship between the prices of individual capital assets and the various components of risk are described in Part IV.

II. Optimal Investment Policy for the Individual

The Investor's Preference Function

Assume that an individual views the outcome of any investment in probabilistic terms; that is, he thinks of the possible results in terms of some probability distribution. In assessing the desirability of a particular investment, however, he is willing to act on the basis of only two para-

4. John R. Hicks, "Liquidity," *The Economic Journal*, LXXII (December, 1962), 787-802.

5. M. J. Gordon and Ramesh Gangolli, "Choice Among and Scale of Play on Lottery Type Alternatives," College of Business Administration, University of Rochester, 1962. For another discussion of this relationship see W. F. Sharpe, "A Simplified Model for Portfolio Analysis," *Management Science*, Vol. 9, No. 2 (January 1963), 277-293. A related discussion can be found in F. Modigliani and M. H. Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment," *The American Economic Review*, XLVIII (June 1958), 261-297.

6. Recently Hirshleifer has suggested that the mean-variance approach used in the articles cited is best regarded as a special case of a more general formulation due to Arrow. See Hirshleifer's "Investment Decision Under Uncertainty," *Papers and Proceedings of the Seventy-Sixth Annual Meeting of the American Economic Association*, Dec. 1963, or Arrow's "Le Role des Valeurs Boursieres pour la Repartition la Meilleure des Risques," *International Colloquium on Econometrics*, 1952.

7. After preparing this paper the author learned that Mr. Jack L. Treynor, of Arthur D. Little, Inc., had independently developed a model similar in many respects to the one described here. Unfortunately Mr. Treynor's excellent work on this subject is, at present, unpublished.

meters of this distribution—its expected value and standard deviation.[8] This can be represented by a total utility function of the form:

$$U = f(E_w, \sigma_w)$$

where E_w indicates expected future wealth and σ_w the predicted standard deviation of the possible divergence of actual future wealth from E_w.

Investors are assumed to prefer a higher expected future wealth to a lower value, ceteris paribus ($dU/dE_w > 0$). Moreover, they exhibit risk-aversion, choosing an investment offering a lower value of σ_w to one with a greater level, given the level of E_w ($dU/d\sigma_w < 0$). These assumptions imply that indifference curves relating E_w and σ_w will be upward-sloping.[9]

To simplify the analysis, we assume that an investor has decided to commit a given amount (W_i) of his present wealth to investment. Letting W_t be his terminal wealth and R the rate of return on his investment:

$$R \equiv \frac{W_t - W_i}{W_i},$$

we have

$$W_t = R\,W_i + W_i.$$

This relationship makes it possible to express the investor's utility in terms of R, since terminal wealth is directly related to the rate of return:

$$U = g(E_R, \sigma_R).$$

Figure 2 summarizes the model of investor preferences in a family of indifference curves; successive curves indicate higher levels of utility as one moves down and/or to the right.[10]

8. Under certain conditions the mean-variance approach can be shown to lead to unsatisfactory predictions of behavior. Markowitz suggests that a model based on the semi-variance (the average of the squared deviations below the mean) would be preferable; in light of the formidable computational problems, however, he bases his analysis on the variance and standard deviation.

9. While only these characteristics are required for the analysis, it is generally assumed that the curves have the property of diminishing marginal rates of substitution between E_w and σ_w, as do those in our diagrams.

10. Such indifference curves can also be derived by assuming that the investor wishes to maximize expected utility and that his total utility can be represented by a quadratic function of R with decreasing marginal utility. Both Markowitz and Tobin present such a derivation. A similar approach is used by Donald E. Farrar in *The Investment Decision Under Uncertainty* (Prentice-Hall, 1962). Unfortunately Farrar makes an error in his derivation; he appeals to the Von-Neumann-Morgenstern cardinal utility axioms to transform a function of the form:

$$E(U) = a + bE_R - cE_R^2 - c\sigma_R^2$$

into one of the form:

$$E(U) = k_1 E_R - k_2 \sigma_R^2.$$

That such a transformation is not consistent with the axioms can readily be seen in this form, since the first equation implies non-linear indifference curves in the E_R, σ_R^2 plane while the second implies a linear relationship. Obviously no three (different) points can lie on both a line and a non-linear curve (with a monotonic derivative). Thus the two functions must imply different orderings among alternative choices in at least some instance.

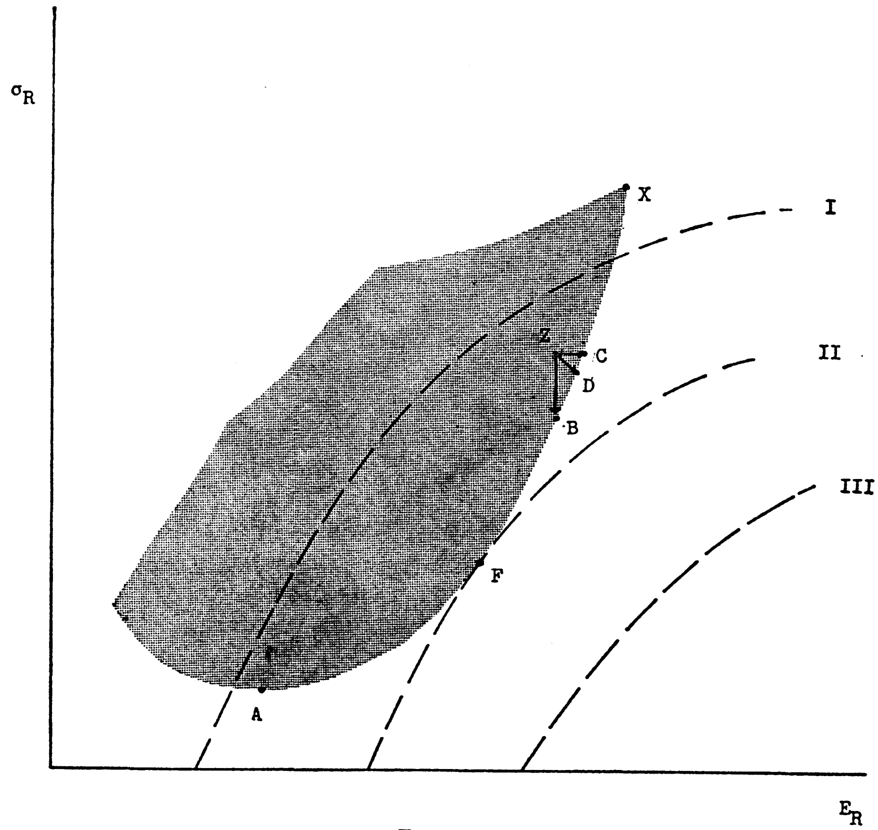

FIGURE 2

The Investment Opportunity Curve

The model of investor behavior considers the investor as choosing from a set of investment opportunities that one which maximizes his utility. Every investment plan available to him may be represented by a point in the E_R, σ_R plane. If all such plans involve some risk, the area composed of such points will have an appearance similar to that shown in Figure 2. The investor will choose from among all possible plans the one placing him on the indifference curve representing the highest level of utility (point F). The decision can be made in two stages: first, find the set of efficient investment plans and, second choose one from among this set. A plan is said to be efficient if (and only if) there is no alternative with either (1) the same E_R and a lower σ_R, (2) the same σ_R and a higher E_R or (3) a higher E_R and a lower σ_R. Thus investment Z is inefficient since investments B, C, and D (among others) dominate it. The only plans which would be chosen must lie along the lower right-hand boundary (AFBDCX)—the *investment opportunity curve.*

To understand the nature of this curve, consider two investment plans —A and B, each including one or more assets. Their predicted expected values and standard deviations of rate of return are shown in Figure 3.

If the proportion α of the individual's wealth is placed in plan A and the remainder $(1\text{-}\alpha)$ in B, the expected rate of return of the combination will lie between the expected returns of the two plans:

$$E_{Rc} = \alpha E_{Ra} + (1 - \alpha)\, E_{Rb}$$

The predicted standard deviation of return of the combination is:

$$\sigma_{Rc} = \sqrt{\alpha^2 \sigma_{Ra}{}^2 + (1 - \alpha)^2\, \sigma_{Rb}{}^2 + 2 r_{ab}\, \alpha(1 - \alpha)\, \sigma_{Ra}\sigma_{Rb}}$$

Note that this relationship includes r_{ab}, the correlation coefficient between the predicted rates of return of the two investment plans. A value of $+1$ would indicate an investor's belief that there is a precise positive relationship between the outcomes of the two investments. A zero value would indicate a belief that the outcomes of the two investments are completely independent and -1 that the investor feels that there is a precise inverse relationship between them. In the usual case r_{ab} will have a value between 0 and $+1$.

Figure 3 shows the possible values of E_{Rc} and σ_{Rc} obtainable with different combinations of A and B under two different assumptions about

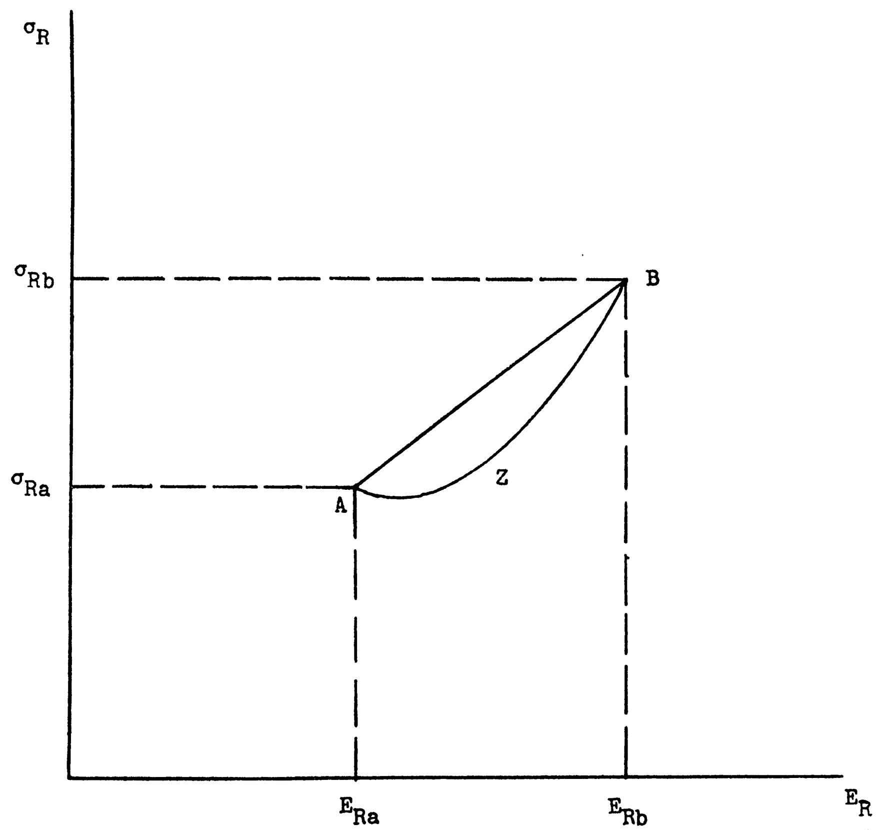

FIGURE 3

the value of r_{ab}. If the two investments are perfectly correlated, the combinations will lie along a straight line between the two points, since in this case both E_{Rc} and σ_{Rc} will be linearly related to the proportions invested in the two plans.[11] If they are less than perfectly positively correlated, the standard deviation of any combination must be less than that obtained with perfect correlation (since r_{ab} will be less); thus the combinations must lie along a curve below the line AB.[12] AZB shows such a curve for the case of complete independence ($r_{ab} = 0$); with negative correlation the locus is even more U-shaped.[13]

The manner in which the investment opportunity curve is formed is relatively simple conceptually, although exact solutions are usually quite difficult.[14] One first traces curves indicating E_R, σ_R values available with simple combinations of individual assets, then considers combinations of combinations of assets. The lower right-hand boundary must be either linear or increasing at an increasing rate ($d^2\, \sigma_R/dE^2_R > 0$). As suggested earlier, the complexity of the relationship between the characteristics of individual assets and the location of the investment opportunity curve makes it difficult to provide a simple rule for assessing the desirability of individual assets, since the effect of an asset on an investor's over-all investment opportunity curve depends not only on its expected rate of return (E_{Ri}) and risk (σ_{Ri}), but also on its correlations with the other available opportunities ($r_{i1}, r_{i2}, \ldots, r_{in}$). However, such a rule is implied by the equilibrium conditions for the model, as we will show in part IV.

The Pure Rate of Interest

We have not yet dealt with riskless assets. Let P be such an asset; its risk is zero ($\sigma_{Rp} = 0$) and its expected rate of return, E_{Rp}, is equal (by definition) to the pure interest rate. If an investor places α of his wealth

11.
$$E_{Rc} = \alpha E_{Ra} + (1 - \alpha)\, E_{R_b} = E_{Rb} + (E_{R_a} - E_{R_b})\, \alpha$$
$$\sigma_{R_c} = \sqrt{\alpha^2 \sigma_{R_a}{}^2 + (1 - \alpha)^2\, \sigma_{Rb}{}^2 + 2r_{ab}\, \alpha(1 - \alpha)\, \sigma_{Ra}\, \sigma_{Rb}}$$
but $r_{ab} = 1$, therefore the expression under the square root sign can be factored:
$$\begin{aligned} \sigma_{Rc} &= \sqrt{[\alpha\sigma_{Ra} + (1 - \alpha)\ \sigma_{R_b}]^2} \\ &= \alpha\, \sigma_{Ra} + (1 - \alpha)\, \sigma_{Rb} \\ &= \sigma_{Rb} + (\sigma_{Ra} - \sigma_{Rb})\, \alpha \end{aligned}$$

12. This curvature is, in essence, the rationale for diversification.

13. When $r_{ab} = 0$, the slope of the curve at point A is $-\dfrac{\sigma_{Ra}}{E_{Rb} - E_{Ra}}$, at point B it is $\dfrac{\sigma_{Rb}}{E_{Rb} - E_{Ra}}$. When $r_{ab} = -1$, the curve degenerates to two straight lines to a point on the horizontal axis.

14. Markowitz has shown that this is a problem in parametric quadratic programming. An efficient solution technique is described in his article, "The Optimization of a Quadratic Function Subject to Linear Constraints," *Naval Research Logistics Quarterly*, Vol. 3 (March and June, 1956), 111-133. A solution method for a special case is given in the author's "A Simplified Model for Portfolio Analysis," *op. cit.*

in P and the remainder in some risky asset A, he would obtain an expected rate of return:

$$E_{Rc} = \alpha E_{Rp} + (1 - \alpha)\, E_{Ra}$$

The standard deviation of such a combination would be:

$$\sigma_{Rc} = \sqrt{\alpha^2 \sigma^2_{Rp} + (1 - \alpha)^2 \sigma_{Ra}{}^2 + 2 r_{pa}\, \alpha (1 - \alpha)\, \sigma_{Rp} \sigma_{Ra}}$$

but since $\sigma_{Rp} = 0$, this reduces to:

$$\sigma_{Rc} = (1 - \alpha)\, \sigma_{Ra}.$$

This implies that all combinations involving any risky asset or combination of assets plus the riskless asset must have values of E_{Rc} and σ_{Rc} which lie along a straight line between the points representing the two components. Thus in Figure 4 all combinations of E_R and σ_R lying along

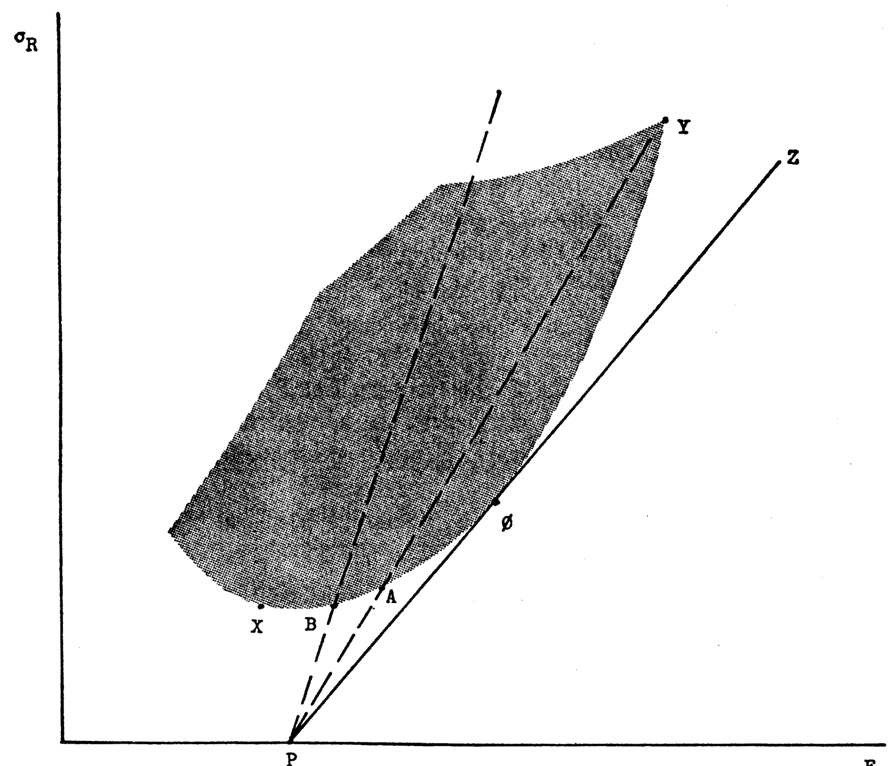

FIGURE 4

the line PA are attainable if some money is loaned at the pure rate and some placed in A. Similarly, by lending at the pure rate and investing in B, combinations along PB can be attained. Of all such possibilities, however, one will dominate: that investment plan lying at the point of the original investment opportunity curve where a ray from point P is tangent to the curve. In Figure 4 all investments lying along the original curve from X to ϕ are dominated by some combination of investment in ϕ and lending at the pure interest rate.

Consider next the possibility of borrowing. If the investor can borrow at the pure rate of interest, this is equivalent to disinvesting in P. The effect of borrowing to purchase more of any given investment than is possible with the given amount of wealth can be found simply by letting α take on negative values in the equations derived for the case of lending. This will obviously give points lying along the extension of line PA if borrowing is used to purchase more of A; points lying along the extension of PB if the funds are used to purchase B, etc.

As in the case of lending, however, one investment plan will dominate all others when borrowing is possible. When the rate at which funds can be borrowed equals the lending rate, this plan will be the same one which is dominant if lending is to take place. Under these conditions, the investment opportunity curve becomes a line (PϕZ in Figure 4). Moreover, if the original investment opportunity curve is not linear at point ϕ, the process of investment choice can be dichotomized as follows: first select the (unique) optimum combination of risky assets (point ϕ), and second borrow or lend to obtain the particular point on PZ at which an indifference curve is tangent to the line.[15]

Before proceeding with the analysis, it may be useful to consider alternative assumptions under which only a combination of assets lying at the point of tangency between the original investment opportunity curve and a ray from P can be efficient. Even if borrowing is impossible, the investor will choose ϕ (and lending) if his risk-aversion leads him to a point below ϕ on the line Pϕ. Since a large number of investors choose to place some of their funds in relatively risk-free investments, this is not an unlikely possibility. Alternatively, if borrowing is possible but only up to some limit, the choice of ϕ would be made by all but those investors willing to undertake considerable risk. These alternative paths lead to the main conclusion, thus making the assumption of borrowing or lending at the pure interest rate less onerous than it might initially appear to be.

III. Equilibrium in the Capital Market

In order to derive conditions for equilibrium in the capital market we invoke two assumptions. First, we assume a common pure rate of interest, with all investors able to borrow or lend funds on equal terms. Second, we assume homogeneity of investor expectations:[16] investors are assumed

15. This proof was first presented by Tobin for the case in which the pure rate of interest is zero (cash). Hicks considers the lending situation under comparable conditions but does not allow borrowing. Both authors present their analysis using maximization subject to constraints expressed as equalities. Hicks' analysis assumes independence and thus insures that the solution will include no negative holdings of risky assets; Tobin's covers the general case, thus his solution would generally include negative holdings of some assets. The discussion in this paper is based on Markowitz' formulation, which includes non-negativity constraints on the holdings of all assets.

16. A term suggested by one of the referees.

to agree on the prospects of various investments—the expected values, standard deviations and correlation coefficients described in Part II. Needless to say, these are highly restrictive and undoubtedly unrealistic assumptions. However, since the proper test of a theory is not the realism of its assumptions but the acceptability of its implications, and since these assumptions imply equilibrium conditions which form a major part of classical financial doctrine, it is far from clear that this formulation should be rejected—especially in view of the dearth of alternative models leading to similar results.

Under these assumptions, given some set of capital asset prices, each investor will view his alternatives in the same manner. For one set of prices the alternatives might appear as shown in Figure 5. In this situa-

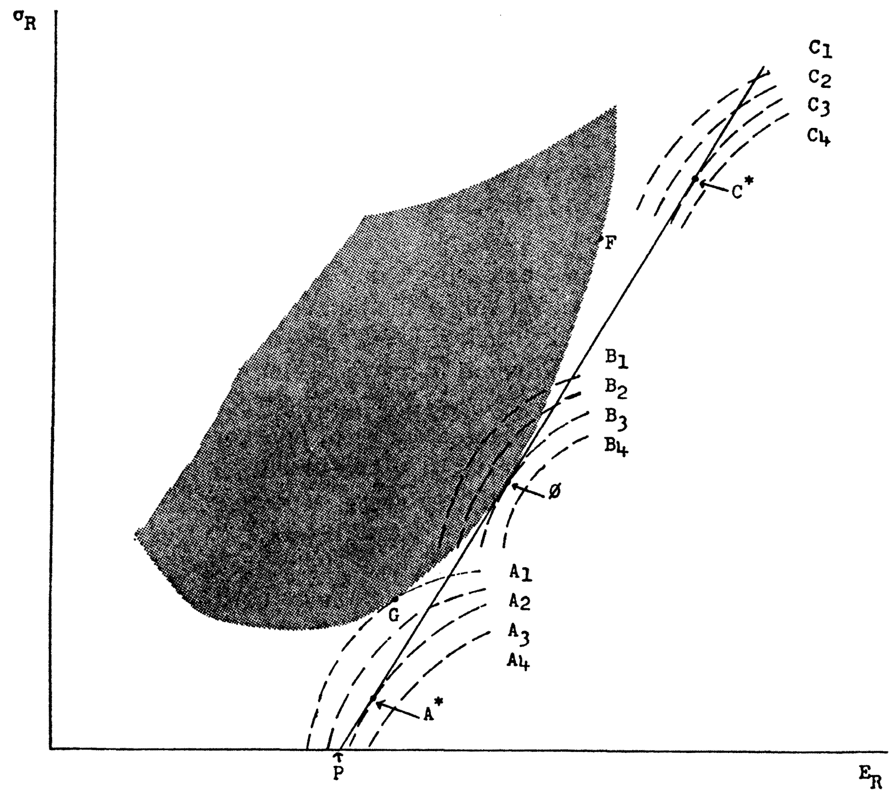

FIGURE 5

tion, an investor with the preferences indicated by indifference curves A_1 through A_4 would seek to lend some of his funds at the pure interest rate and to invest the remainder in the combination of assets shown by point ϕ, since this would give him the preferred over-all position A^*. An investor with the preferences indicated by curves B_1 through B_4 would seek to invest all his funds in combination ϕ, while an investor with indifference curves C_1 through C_4 would invest all his funds plus additional (borrowed) funds in combination ϕ in order to reach his preferred position (C*). In any event, all would attempt to purchase only those risky assets which enter combination ϕ.

The attempts by investors to purchase the assets in combination ϕ and their lack of interest in holding assets not in combination ϕ would, of course, lead to a revision of prices. The prices of assets in ϕ will rise and, since an asset's expected return relates future income to present price, their expected returns will fall. This will reduce the attractiveness of combinations which include such assets; thus point ϕ (among others) will move to the left of its initial position.[17] On the other hand, the prices of assets not in ϕ will fall, causing an increase in their expected returns and a rightward movement of points representing combinations which include them. Such price changes will lead to a revision of investors' actions; some new combination or combinations will become attractive, leading to different demands and thus to further revisions in prices. As the process continues, the investment opportunity curve will tend to become more linear, with points such as ϕ moving to the left and formerly inefficient points (such as F and G) moving to the right.

Capital asset prices must, of course, continue to change until a set of prices is attained for which every asset enters at least one combination lying on the capital market line. Figure 6 illustrates such an equilibrium condition.[18] All possibilities in the shaded area can be attained with combinations of risky assets, while points lying along the line PZ can be attained by borrowing or lending at the pure rate plus an investment in some combination of risky assets. Certain possibilities (those lying along PZ from point A to point B) can be obtained in either manner. For example, the E_R, σ_R values shown by point A can be obtained solely by some combination of risky assets; alternatively, the point can be reached by a combination of lending and investing in combination C of risky assets.

It is important to recognize that in the situation shown in Figure 6 many alternative combinations of risky assets are efficient (i.e., lie along line PZ), and thus the theory does not imply that all investors will hold the same combination.[19] On the other hand, all such combinations must be perfectly (positively) correlated, since they lie along a linear border of

17. If investors consider the variability of future dollar returns unrelated to present price, both E_R and σ_R will fall; under these conditions the point representing an asset would move along a ray through the origin as its price changes.

18. The area in Figure 6 representing E_R, σ_R values attained with only risky assets has been drawn at some distance from the horizontal axis for emphasis. It is likely that a more accurate representation would place it very close to the axis.

19. This statement contradicts Tobin's conclusion that there will be a unique optimal combination of risky assets. Tobin's proof of a unique optimum can be shown to be incorrect for the case of perfect correlation of efficient risky investment plans if the line connecting their E_R, σ_R points would pass through point P. In the graph on page 83 of this article (*op. cit.*) the constant-risk locus would, in this case, degenerate from a family of ellipses into one of straight lines parallel to the constant-return loci, thus giving multiple optima.

the E_R, σ_R region.[20] This provides a key to the relationship between the prices of capital assets and different types of risk.

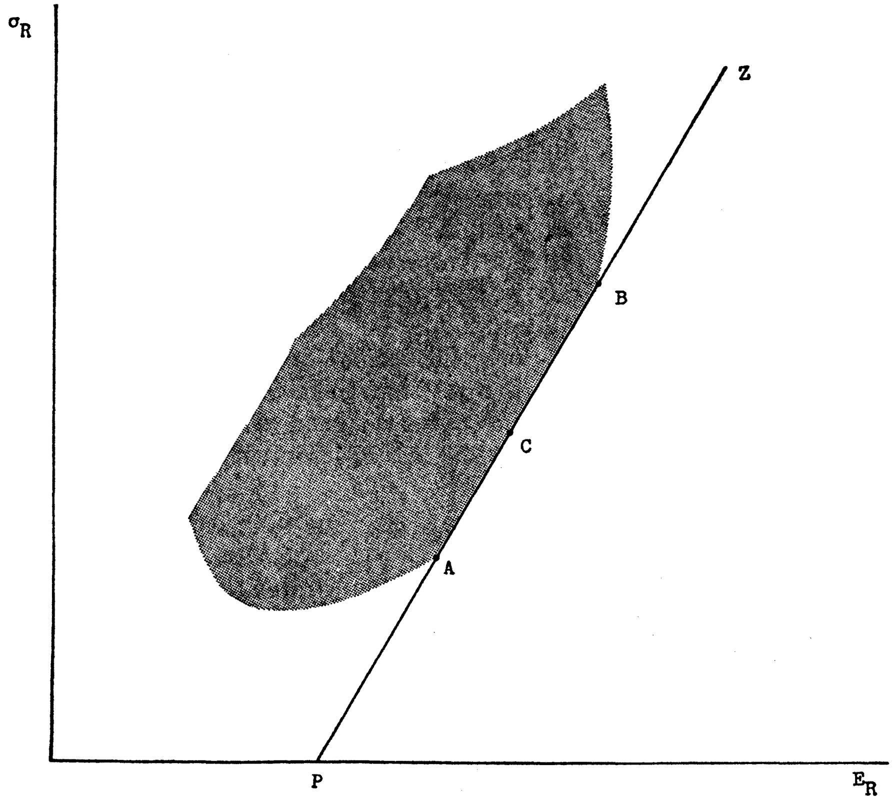

FIGURE 6

IV. THE PRICES OF CAPITAL ASSETS

We have argued that in equilibrium there will be a simple linear relationship between the expected return and standard deviation of return for efficient combinations of risky assets. Thus far nothing has been said about such a relationship for individual assets. Typically the E_R, σ_R values associated with single assets will lie above the capital market line, reflecting the inefficiency of undiversified holdings. Moreover, such points may be scattered throughout the feasible region, with no consistent relationship between their expected return and total risk (σ_R). However, there will be a consistent relationship between their expected returns and what might best be called *systematic risk*, as we will now show.

Figure 7 illustrates the typical relationship between a single capital

20. E_R, σ_R values given by combinations of any two combinations must lie within the region and cannot plot above a straight line joining the points. In this case they cannot plot below such a straight line. But since only in the case of perfect correlation will they plot along a straight line, the two combinations must be perfectly correlated. As shown in Part IV, this does not necessarily imply that the individual securities they contain are perfectly correlated.

asset (point i) and an efficient combination of assets (point g) of which it is a part. The curve igg′ indicates all E_R, σ_R values which can be obtained with feasible combinations of asset i and combination g. As before, we denote such a combination in terms of a proportion α of asset i and $(1 - \alpha)$ of combination g. A value of $\alpha = 1$ would indicate pure invest-

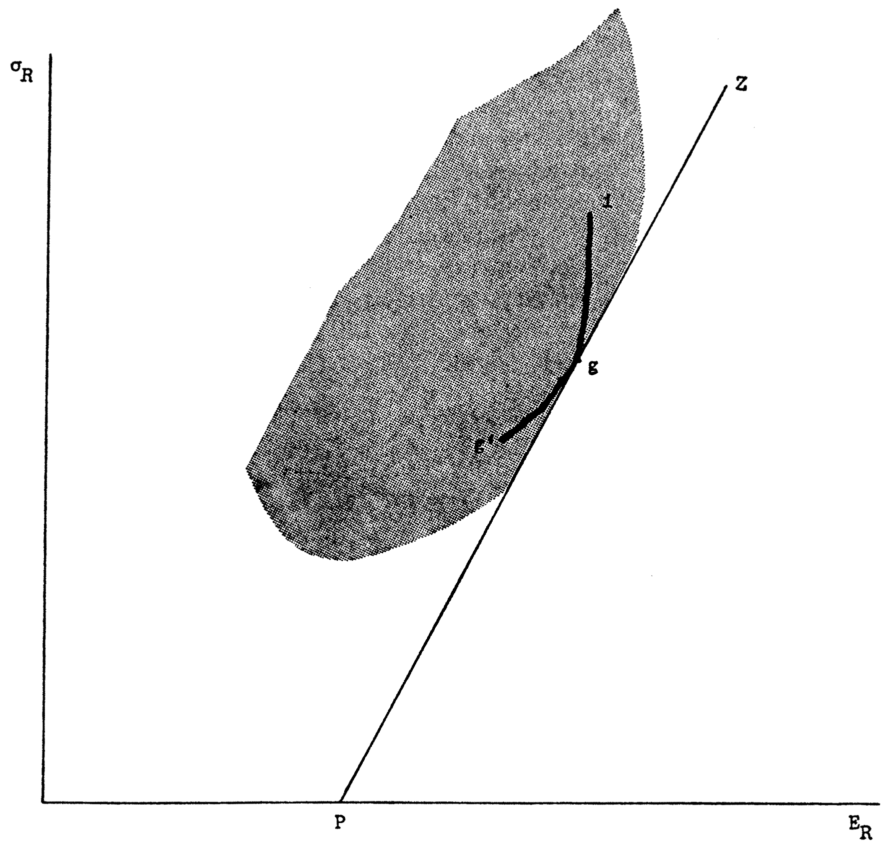

FIGURE 7

ment in asset i while $\alpha = 0$ would imply investment in combination g. Note, however, that $\alpha = .5$ implies a total investment of more than half the funds in asset i, since half would be invested in i itself and the other half used to purchase combination g, which also includes some of asset i. This means that a combination in which asset i does not appear at all must be represented by some negative value of α. Point g′ indicates such a combination.

In Figure 7 the curve igg′ has been drawn tangent to the capital market line (PZ) at point g. This is no accident. All such curves must be tangent to the capital market line in equilibrium, since (1) they must touch it at the point representing the efficient combination and (2) they are continuous at that point.[21] Under these conditions a lack of tangency would

21. Only if $r_{ig} = -1$ will the curve be discontinuous over the range in question.

imply that the curve intersects PZ. But then some feasible combination of assets would lie to the right of the capital market line, an obvious impossibility since the capital market line represents the efficient boundary of feasible values of E_R and σ_R.

The requirement that curves such as igg′ be tangent to the capital market line can be shown to lead to a relatively simple formula which relates the expected rate of return to various elements of risk for all assets which are included in combination g.[22] Its economic meaning can best be seen if the relationship between the return of asset i and that of combination g is viewed in a manner similar to that used in regression analysis.[23] Imagine that we were given a number of (ex post) observations of the return of the two investments. The points might plot as shown in Fig. 8. The scatter of the R_i observations around their mean (which will approximate E_{Ri}) is, of course, evidence of the total risk of the asset — σ_{Ri}. But part of the scatter is due to an underlying relationship with the return on combination g, shown by B_{ig}, the slope of the regression line. The response of R_i to changes in R_g (and variations in R_g itself) account for

22. The standard deviation of a combination of g and i will be:

$$\sigma = \sqrt{\alpha^2\sigma_{Ri}{}^2 + (1-\alpha)^2\,\sigma_{Rg}{}^2 + 2r_{ig}\,\alpha(1-\alpha)\;\sigma_{Ri}\sigma_{Rg}}$$

at $\alpha = 0$:

$$\frac{d\sigma}{d\alpha} = -\frac{1}{\sigma}\,[\sigma_{Rg}{}^2 - r_{ig}\sigma_{Ri}\sigma_{Rg}]$$

but $\sigma = \sigma_{Rg}$ at $\alpha = 0$. Thus:

$$\frac{d\sigma}{d\alpha} = -\;[\sigma_{Rg} - r_{ig}\sigma_{Ri}]$$

The expected return of a combination will be:

$$E = \alpha E_{Ri} + (1-\alpha)\;E_{Rg}$$

Thus, at all values of α:

$$\frac{dE}{d\alpha} = -\;[E_{Rg} - E_{Ri}]$$

and, at $\alpha = 0$:

$$\frac{d\sigma}{dE} = \frac{\sigma_{Rg} - r_{ig}\sigma_{Ri}}{E_{Rg} - E_{Ri}}.$$

Let the equation of the capital market line be:

$$\sigma_R = s(E_R - P)$$

where P is the pure interest rate. Since igg' is tangent to the line when $\alpha = 0$, and since (E_{Rg}, σ_{Rg}) lies on the line:

$$\frac{\sigma_{Rg} - r_{ig}\sigma_{Ri}}{E_{Rg} - E_{Ri}} = \frac{\sigma_{Rg}}{E_{Rg} - P}$$

or:

$$\frac{r_{ig}\sigma_{Ri}}{\sigma_{Rg}} = -\left[\frac{P}{E_{Rg} - P}\right] + \left[\frac{1}{E_{Rg} - P}\right] E_{Ri}.$$

23. This model has been called the diagonal model since its portfolio analysis solution can be facilitated by re-arranging the data so that the variance-covariance matrix becomes diagonal. The method is described in the author's article, cited earlier.

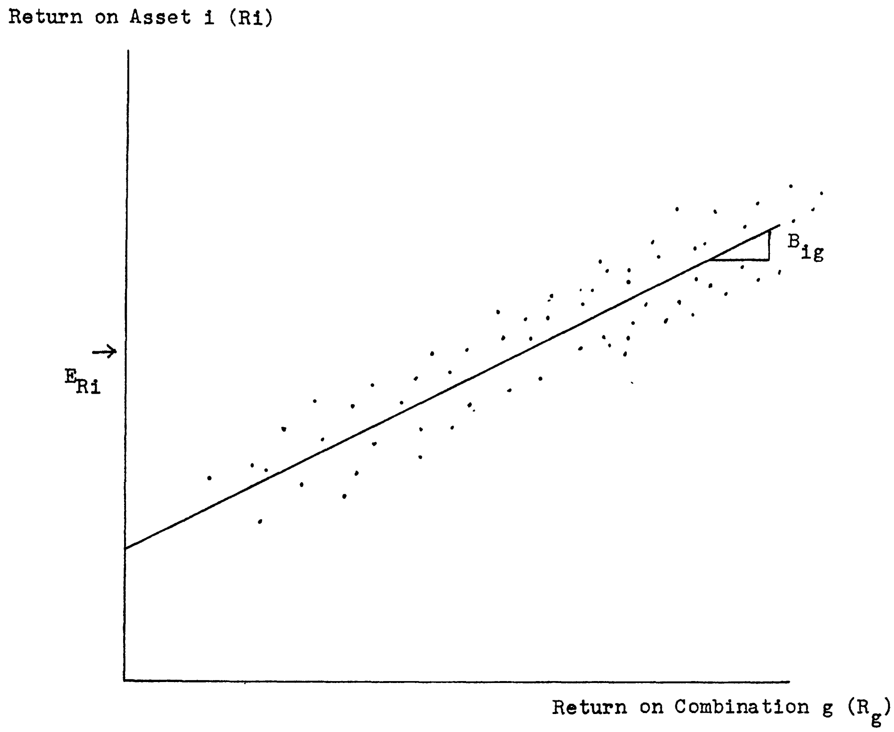

FIGURE 8

much of the variation in R_i. It is this component of the asset's total risk which we term the *systematic* risk. The remainder,[24] being uncorrelated with R_g, is the unsystematic component. This formulation of the relationship between R_i and R_g can be employed *ex ante* as a predictive model. B_{ig} becomes the *predicted* response of R_i to changes in R_g. Then, given σ_{Rg} (the predicted risk of R_g), the systematic portion of the predicted risk of each asset can be determined.

This interpretation allows us to state the relationship derived from the tangency of curves such as igg′ with the capital market line in the form shown in Figure 9. All assets entering efficient combination g must have (predicted) B_{ig} and E_{Ri} values lying on the line PQ.[25] Prices will

24. ex post, the standard error.

25.

$$r_{ig} = \sqrt{\frac{B_{ig}^2 \sigma_{Rg}^2}{\sigma_{Ri}^2}} = \frac{B_{ig}\sigma_{Rg}}{\sigma_{Ri}}$$

and:

$$B_{ig} = \frac{r_{ig}\sigma_{Ri}}{\sigma_{Rg}}.$$

The expression on the right is the expression on the left-hand side of the last equation in footnote 22. Thus:

$$B_{ig} = -\left[\frac{P}{E_{Rg} - P}\right] + \left[\frac{1}{E_{Rg} - P}\right] E_{Ri}.$$

adjust so that assets which are more responsive to changes in R_g will have higher expected returns than those which are less responsive. This accords with common sense. Obviously the part of an asset's risk which is due to its correlation with the return on a combination cannot be diversified away when the asset is added to the combination. Since B_{ig} indicates the magnitude of this type of risk it should be directly related to expected return.

The relationship illustrated in Figure 9 provides a partial answer to the question posed earlier concerning the relationship between an asset's risk

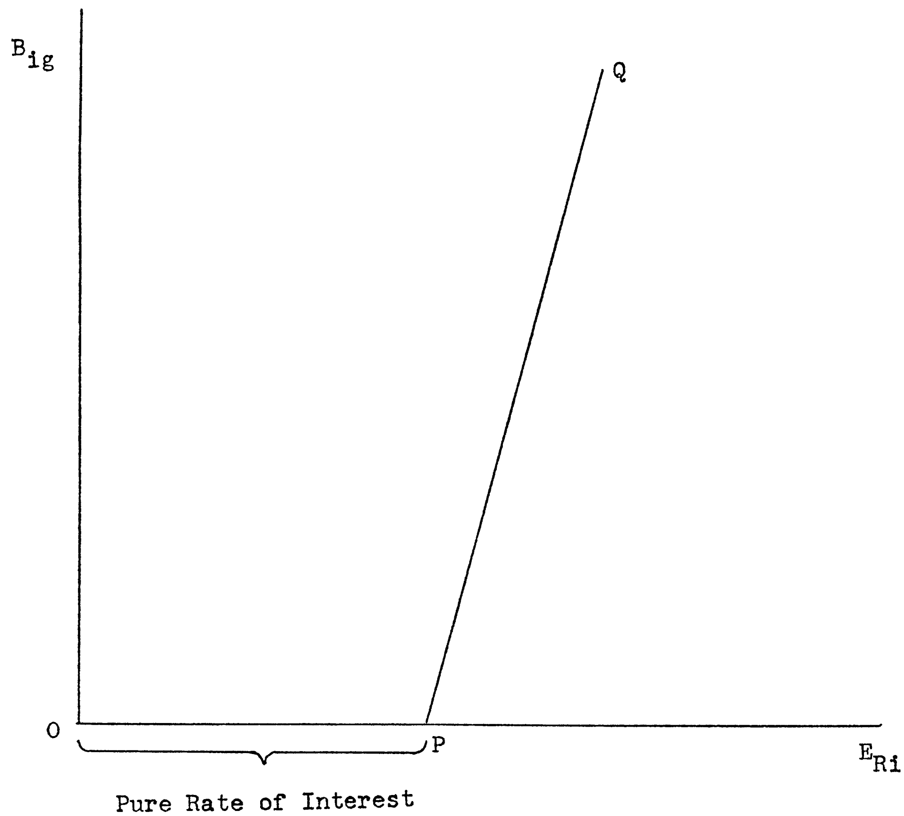

FIGURE 9

and its expected return. But thus far we have argued only that the relationship holds for the assets which enter some particular efficient combination (g). Had another combination been selected, a different linear relationship would have been derived. Fortunately this limitation is easily overcome. As shown in the footnote,[26] we may arbitrarily select *any* one

26. Consider the two assets i and i*, the former included in efficient combination g and the latter in combination g*. As shown above:

$$B_{ig} = -\left[\frac{P}{E_{Rg} - P}\right] + \left[\frac{1}{E_{Rg} - P}\right] E_{Ri}$$

and:

of the efficient combinations, then measure the predicted responsiveness of *every* asset's rate of return to that of the combination selected; and these coefficients will be related to the expected rates of return of the assets in exactly the manner pictured in Figure 9.

The fact that rates of return from all efficient combinations will be perfectly correlated provides the justification for arbitrarily selecting any one of them. Alternatively we may choose instead any variable perfectly correlated with the rate of return of such combinations. The vertical axis in Figure 9 would then indicate alternative levels of a coefficient measuring the sensitivity of the rate of return of a capital asset to changes in the variable chosen.

This possibility suggests both a plausible explanation for the implication that all efficient combinations will be perfectly correlated and a useful interpretation of the relationship between an individual asset's expected return and its risk. Although the theory itself implies only that rates of return from efficient combinations will be perfectly correlated, we might expect that this would be due to their common dependence on the over-all level of economic activity. If so, diversification enables the investor to escape all but the risk resulting from swings in economic activity—this type of risk remains even in efficient combinations. And, since all other types can be avoided by diversification, only the responsiveness of an asset's rate of return to the level of economic activity is relevant in

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$$B_{i*g*} = -\left[\frac{P}{E_{Rg*} - P}\right] + \left[\frac{1}{E_{Rg*} - P}\right] E_{Ri*}\,.$$

Since R_g and R_{g*} are perfectly correlated:

$$r_{i*g*} = r_{i*g}$$

Thus:

$$\frac{B_{i*g*}\sigma_{Rg*}}{\sigma_{Ri*}} = \frac{B_{i*g}\sigma_{Rg}}{\sigma_{Ri*}}$$

and:

$$B_{i*g*} = B_{i*g}\left[\frac{\sigma_{Rg}}{\sigma_{Rg*}}\right].$$

Since both g and g* lie on a line which intercepts the E-axis at P:

$$\frac{\sigma_{Rg}}{\sigma_{Rg*}} = \frac{E_{Rg} - P}{E_{Rg*} - P}$$

and:

$$B_{i*g*} = B_{i*g}\left[\frac{E_{Rg} - P}{E_{Rg*} - P}\right]$$

Thus:

$$-\left[\frac{P}{E_{Rg*} - P}\right] + \left[\frac{1}{E_{Rg*} - P}\right] E_{Ri*} = B_{i*g}\left[\frac{E_{Rg} - P}{E_{Rg*} - P}\right]$$

from which we have the desired relationship between R_{i*} and g:

$$B_{i*g} = -\left[\frac{P}{E_{Rg} - P}\right] + \left[\frac{1}{E_{Rg} - P}\right] E_{Ri*}$$

B_{i*g} must therefore plot on the same line as does B_{ig}.

assessing its risk. Prices will adjust until there is a linear relationship between the magnitude of such responsiveness and expected return. Assets which are unaffected by changes in economic activity will return the pure interest rate; those which move with economic activity will promise appropriately higher expected rates of return.

This discussion provides an answer to the second of the two questions posed in this paper. In Part III it was shown that with respect to equilibrium conditions in the capital market as a whole, the theory leads to results consistent with classical doctrine (i.e., the capital market line). We have now shown that with regard to capital assets considered individually, it also yields implications consistent with traditional concepts: it is common practice for investment counselors to accept a lower expected return from defensive securities (those which respond little to changes in the economy) than they require from aggressive securities (which exhibit significant response). As suggested earlier, the familiarity of the implications need not be considered a drawback. The provision of a logical framework for producing some of the major elements of traditional financial theory should be a useful contribution in its own right.

FINANCIAL ANALYSTS JOURNAL®
Reflections

Perspectives on the Equity Risk Premium

Jeremy J. Siegel

The equity risk premium, or the difference between the expected returns on stocks and on risk-free assets, has commanded the attention of both professional economists and investment practitioners for many decades. In the past 20 years, more than 320 articles, enough to fill some 40 economics and finance journals, have been published with the words "equity premium" in the title.

The intense interest in the magnitude of the premium is not surprising. The difference between the return on stocks and the return on bonds is critical not only for asset allocation but also for wealth projections for individual investors, foundations, and endowments. One of the most asked questions by investors is: How much more can I expect to earn from shifting from bonds to stocks?

Academic interest in the equity premium surged after Mehra and Prescott published a seminal article in 1985 titled "The Equity Premium: A Puzzle." By examining the behavior of the stock market and aggregate consumption, they showed that the equity risk premium, under the usual assumptions about investor behavior toward risk, should be much lower than had been calculated from the historical data. Indeed, Mehra and Prescott stated that the equity premium in the U.S. markets should be, at most, 0.35 percent instead of the approximately 6 percent premium computed from data going back to 1872.

The Mehra–Prescott research raised the following question: Have investors been demanding—and receiving—"too high" a return for holding stocks based on the fundamental uncertainty in the economy, or are the models that economists use to describe investor behavior fundamentally flawed? If the returns have been too high, then analysts can justify increased asset allocation to equities and reduced allocation to bonds; if the models are flawed, economists need to develop new models to describe investor behavior.

My discussion of the equity risk premium will be divided into three parts: (1) a summary of the data used to calculate the equity premium and discussion of potential biases in the historical data, (2) analysis of the economic models, and (3) discussion of the implications of the findings for investors and for forecasts of the future equity premium.[1]

> The equity risk premium determines asset allocations, projections of wealth, and the cost of capital, but we do not have a simple model that explains the premium.

Historical Returns on Stocks and Bonds

In this section, I present historical asset returns since 1802, define the equity premium, and discuss biases in the historical data that affect future estimates of the equity premium.

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Equity Returns. The historical returns on stocks, bonds, and bills and the equity risk premium for the U.S. markets from 1802 through 31 December 2004 are in **Table 1**.[2] Both the arithmetic mean of the annual data, which is the "expected return" used in the capital asset pricing model (CAPM), and the compound (or geometric) return, which is the return most often used by individual and professional investors, are given in Table 1.[3] The last columns display the equity risk premium in relation to both long-term U.S. government bonds and T-bills. Returns and premiums are broken down into two subperiods in Panel A, into three major subperiods in Panel B, and into the major bull and bear markets since World War II in Panel C.

The stability of the real (inflation-adjusted) return on stocks over all long periods is impressive.[4] The compound annual real return on equity has averaged 6.82 percent over the past 203 years and, as Panels B and C show, settled between 6.5 percent and 7.0 percent for each of the three major subperiods and for the post–World War II data. This return is about twice the growth of the economy and includes the risk premium above risk-free assets that investors have demanded to hold stocks.

When the period for which stock returns are analyzed shrinks to one or two decades, the real return on stocks can deviate substantially from the long-run average. Since World War II, returns in major market cycles have fluctuated from a 10.02 percent annual real equity return in the bull market of 1946–1965 to a –0.36 percent annual real equity return in the bear market of 1966–1981; in the great bull market of 1982–1999, the return doubled the 203-year average.

Fixed-Income Returns. The middle columns in Table 1 show that real bond returns, in contrast to stocks, have experienced a declining trend in the past two centuries. From 1802 through 2004, the average annual compound real return on long-term bonds was about half the equity return, but in the 19th century, real bond returns were nearly 5 percent. Since the end of World War II, the bond return has averaged less than 1.50 percent. The 3.31 percent average real return over the last two centuries is approximately equal to the real growth of the economy, but in the post–World War II period, real returns on bonds have fallen far below economic growth.[5]

The real return on short-dated T-bills has fallen even more sharply than the return on bonds over the past two centuries. For the entire period, real T-bill returns averaged 2.84 percent, 67 bps below the return on long-term bonds. Average short-term

Table 1. Historical Real Stock and Bond Returns and the Equity Premium

	Real Return						Stock Return minus Return on:			
	Stocks		Bonds		Bills		Bonds		Bills	
Period	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.
A. Long periods to present										
1802–2004	6.82%	8.38%	3.51%	3.88%	2.84%	3.02%	3.31%	4.50%	3.98%	5.36%
1871–2004	6.71	8.43	2.85	3.24	1.68	1.79	3.86	5.18	5.03	6.64
B. Major subperiods										
1802–1870	7.02%	8.28%	4.78%	5.11%	5.12%	5.40%	2.24%	3.17%	1.90%	2.87%
1871–1925	6.62	7.92	3.73	3.93	3.16	3.27	2.89	3.99	3.46	4.65
1926–2004	6.78	8.78	2.25	2.77	0.69	0.75	4.53	6.01	6.09	8.02
C. Post–World War II full sample, bull markets, and bear markets										
1946–2004	6.83%	8.38%	1.44%	2.04%	0.56%	0.62%	5.39%	6.35%	6.27%	7.77%
1946–1965	10.02	11.39	–1.19	–0.95	–0.84	–0.75	11.21	12.34	10.86	12.14
1966–1981	–0.36	1.38	–4.17	–3.86	–0.15	–0.13	3.81	5.24	–0.21	1.51
1982–1999	13.62	14.30	8.40	9.28	2.91	2.92	5.22	5.03	10.71	11.38
1982–2004	9.47	10.64	8.01	8.74	2.31	2.33	1.46	1.90	7.16	8.32

Note: "Comp." stands for "compound"; "Arith." stands for "arithmetic."

rates were 34 bps above long-term rates for 1802–1870, but they were 57 bps below long rates from 1871 through 1925 and have been 156 bps below long rates since 1926.

The increase in the spread between long rates and short rates was caused partly by the increased liquidity of the T-bill market, which lowered short rates, and partly by the increase in the inflation premium investors have required on long-term bonds over much of the post–World War II period.

The Equity Premium. The decline in the real return on bonds, combined with the relative stability of the real return on equity, has increased the equity premium over time, as the last columns in Table 1 show. Over the 1802–2004 period, the equity risk premium as measured from compound annual returns and in relation to bonds rose (see Panel B) from 2.24 percent to 2.89 percent to 4.53 percent. Measured in relation to T-bills, the equity risk premium has increased even more.

The Risk-Free Rate: Long or Short? Should the equity risk premium be measured against the rate of short-term or long-term government bonds? In the simple representations of the CAPM, the risk-free rate is calculated against the rate on short-term risk-free assets, such as T-bills. When an intertemporal CAPM is used, however, a short rate may not be appropriate.[6] Investors should hedge against changes in investment opportunities, as represented by changes in the real risk-free rate. And in an intertemporal context, a risk-free asset can be considered an annuity that provides a constant real return over a long period of time.[7] The return on this annuity is best approximated by the returns on long-term inflation-indexed government bonds. In the United States, inflation-indexed government bonds were not introduced until 1997, so real returns on bonds before that date must be calculated *ex post* by subtracting inflation from nominal bond yields.

Calculation of the Equity Premium. The equity risk premium can be defined by the reference asset class, time period chosen, or method of calculating mean returns so as to take on a wide range of values. Its maximum value is calculated by using the *arithmetic* mean return of historical stock returns and subtracting the mean return on the highest-quality short-dated securities, such as T-bills. Measured in this way, the equity premium in the United States since 1802 has been 5.36 percent and since 1926, has been 8.02 percent. When *geometric* mean returns are used, the equity premium shrinks to 3.98 percent since 1802 and 6.09 percent since 1926. If we calculate the equity premium against long-dated (instead of short-term) bonds, the compound premium falls farther—to 3.31 percent over the past 202 years and 4.53 percent since 1926.

So, over the period from 1926 to the present, the premium can differ by 3.5 percentage points depending on whether long- or short-dated securities are used or arithmetic or geometric returns are calculated. Notwithstanding, the premium calculated by any of these methods far exceeds the magnitude derived in the Mehra–Prescott model.

Biases in Historical Equity Returns. In calculations of the equity risk premium, certain biases must be recognized: the international survivorship bias; failure to take transaction costs and diversification benefits into account; investor ignorance of risks, returns, and mean reversion; taxes and individuals' pension assets; and biases in the historical record of bond returns.

- *International survivorship bias*. Some economists claim that the historical real return on U.S. equities quite probably overstates the true expected return on stocks (Brown, Goetzmann, and Ross 1995). They maintain that the United States simply turned out to be the most successful capitalist country in history, a development that was by no means certain when investors were buying stock in the 19th and early 20th centuries.

Because the economic outcome in the United States was better than expected, U.S. returns may overstate the *expected* return on stocks. The cause is a phenomenon called "survivorship bias." This bias will exist whenever stock returns are recorded in successful equity markets, such as those in the United States, but omitted where stocks have faltered or disappeared outright, such as they did in Russia.

To address survivorship bias and to compile definitive series of long-term international stock returns, three U.K. economists—Dimson and Marsh from the London School of Business and Staunton from the U.K. statistical center—examined stock and bond returns over the past century in 16 countries. Their research, published in *Triumph of the Optimists: 101 Years of Global Investment Returns,* found that the superior returns on stocks over bonds is not characteristic of the U.S. market alone but exists in virtually all countries (see Dimson, Marsh, and Staunton 2002, 2004). **Figure 1** shows the average annual real stock, bond, and bill returns of the 16 countries they analyzed from 1900 through 2003.

Real equity returns ranged from a low of 1.9 percent in Belgium to a high of 7.5 percent in Sweden and Australia. Stock returns in the United States, although quite good, were not exceptional. U.S. stock returns were exceeded by the returns in Sweden, Australia, and South Africa.

If an equal investment had been placed in each of these markets in 1900, the average annual real return on stocks from 1900 through 2003 would have been 6.0 percent a year, not far below the U.S. return of 6.5 percent.[8] Furthermore, in the countries where real equity returns were low, such as Belgium, Italy, and Germany, real bond returns were also low, so the equity premium in Italy and Germany as measured against bonds was actually higher than the premium in the United States. In fact, the compound annual return of an equal amount invested in stocks in each country surpassed an identical amount in bonds in each country by 4 percent a year, only slightly less than the 4.6 percent equity risk premium found for the United States over the same time period.

When all the information was analyzed, the authors concluded:

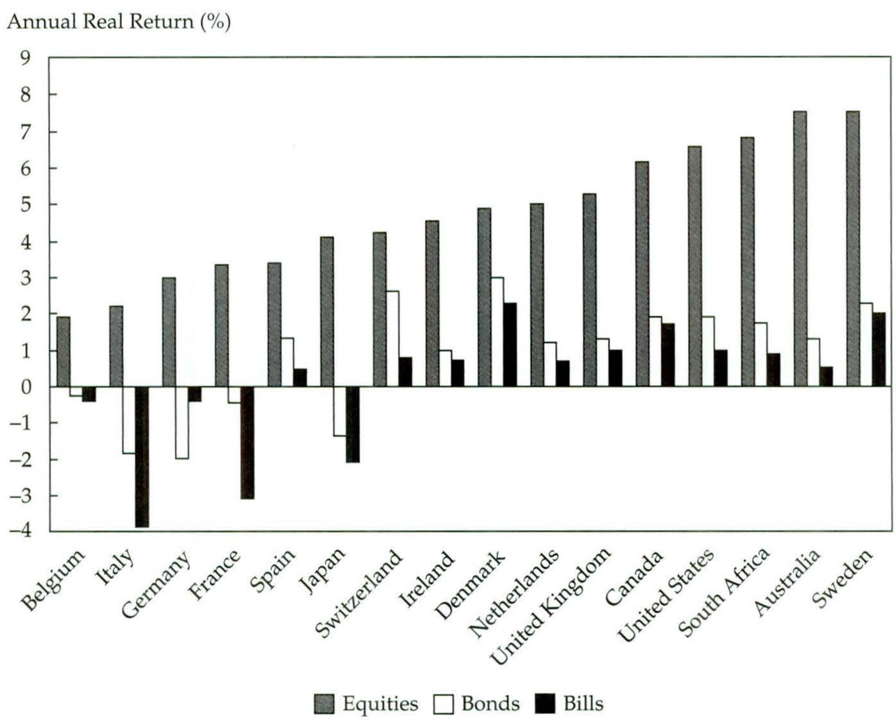
> While the U.S. and the U.K. have indeed performed well . . . there is no indication that they are hugely out of line with other countries. . . . Concerns about success and survivorship bias, while legitimate, may therefore have been somewhat overstated [and] investors may have not been materially misled by a focus on the U.S. (Dimson, Marsh, and Staunton 2002, p. 175)

The high historical equity premium is a worldwide, not just a U.S., phenomenon.[9]

Transaction costs and diversification. The returns used to calculate the equity premium are derived from published stock indices, but investors may not have realized these returns in their portfolios. Transaction costs in the equity markets were far higher over most of the period than they are today.

Low-cost indexed mutual and exchange-traded funds were not available to investors of the 19th century or most of the 20th century. Before 1975, brokerage commissions on buying and selling individual stocks were fixed by the NYSE at high levels. Moreover, it is not unreasonable to

Figure 1. Real Returns on International Assets, 1900–2003



assume that until recently, transaction costs involved with replicating a market portfolio with reinvested dividends subtracted 1–2 percentage points a year from stockholder returns.[10] So, the *realized* equity returns were probably much lower than those calculated from published data.

- *Investor ignorance of risks, returns, and mean reversion.* Because data on long-term stock returns were not available until the second half of the 20th century, investors in the past were probably ignorant of the true risks and returns from holding stocks and may have underestimated the return and/or overestimated the risk of equities. When Fisher and Lorie (1964) first documented long-term returns in the 1960s, many economists were surprised that even when the Great Depression was included, stocks yielded such a high rate of return.

Another advantage of stocks that until recently was not recognized is the evidence of *mean reversion* of long-term equity returns.[11] In the early development of capital asset pricing theory, financial returns were modeled as random walks whose risk increased as the square root of the time period. But examination of long-term data strongly suggests a predictable component of stock returns that makes the returns less variable over long periods than they would be if mean reversion did not exist. Mean reversion increases the desirability of stocks as assets for long-term investors.

Ignorance of the historical risks and returns of various asset classes may have led to a general underpricing of equities as an asset class. This result, in turn, may have raised realized returns higher than would be justified if stocks were priced by investors with full knowledge of the distribution of stock returns.[12]

- *Pension assets and taxes.* The evolution of U.S. federal tax policy also may have influenced stock returns. The tremendous increase in tax-sheltered plans over the past several decades has greatly increased the demand for equities. For example, in 1974, ERISA established minimum standards for pension plans in private industry and allowed equities to play a greatly expanded role in asset accumulation.

McGrattan and Prescott (2003) argued that the increase in tax-sheltered savings has led to a significant drop in the average tax rate on equities. This drop may have boosted stock returns and, to the extent that stocks substituted for bonds, lowered the real return on fixed-income assets.

- *Biases in historical bond returns.* Real government bond returns may have been biased downward in the period since 1926, especially since World War II. Bondholders clearly did not anticipate the double-digit inflation of the 1970s and 1980s.

Table 1 shows the extraordinarily poor bond returns in the 35 years following World War II. Of course, when inflation was brought down in the 1980s and 1990s, interest rates returned to the levels of the immediate postwar period. But the resulting bull market in bonds did not offset the losses of the inflationary 1960s and 1970s because, although the inflation rate returned to its earlier level, the *price level* did not. So, over the entire inflation cycle, bondholders suffered a permanent loss of return. This phenomenon is one reason real bond returns since World War II have averaged only 1.4 percent, less than half their historical level.[13]

Models of the Equity Premium

The biases just discussed have probably raised the historical return on equities and, therefore, the historical value of the equity risk premium. Nevertheless, accounting for these biases is unlikely to reduce the premium to the level that Mehra and Prescott maintain is consistent with reasonable levels of risk aversion. So, we are compelled to analyze whether the assumptions of the models used to describe investor behavior are, in fact, reasonable representations of investor and financial market behavior.

The equity premium puzzle is centered on the "reasonable" level of risk aversion for investors. Recall that risk premiums exist because individuals are assumed to have declining marginal utility of consumption. How fast this utility declines measures the investor's degree of risk aversion. In early risk models, the investor's utility function, U, was assumed to be a function of wealth, W, such that

$$U(W) = \left[\frac{1}{(1-A)}\right] W^{(1-A)}. \tag{1}$$

The parameter A is the coefficient of relative risk aversion, or the percentage change (elasticity) of the marginal utility of wealth caused by a 1 percent change in the level of wealth. In other words, A is directly related to the pain felt by investors when their wealth falls.

With this utility function, and under the assumption that returns are lognormally distributed, the arithmetic equity premium, EP, can be approximated by

$$EP \approx A(\sigma^2), \tag{2}$$

where σ is the standard deviation of returns on an investor's portfolio. If we use 0.18 as the standard deviation of annual stock market returns and an (arithmetic) equity risk premium of 8 percent as measured from annual data since 1926, we obtain a level of risk aversion, *A*, of 2 or 3.[14]

These levels of risk aversion produced by the early models seemed reasonable. With a risk aversion of 2, an individual would be willing to pay 4 percent of his wealth to insure against an equal probability of a 20 percent rise or 20 percent fall in wealth. If *A* equals 3, this insurance payment would be 5.6 percent of wealth.

But Equation 1 is not correctly specified. Economists knew that wealth is a proxy for consumption, which is the correct variable to put into the utility function. Putting consumption into the utility function led to the development of the "consumption CAPM" (CCAPM) popularized by Breeden (1979).

There is an important empirical difference between the consumption-based CAPM and the wealth-based CAPM. Per capita consumption, as measured by national income account statistics, fluctuates far less than the value of wealth. The standard deviation of the growth of consumption is only about 4 percent, so the variance of changes in the stock market is almost 20 times greater than the variance of the changes in consumption.

If we plug the variance of consumption of 0.16 percent and an equity premium of 8 percent into Equation 2, we find a risk aversion of 50. If investors were really this risk averse, they would pay an insurance premium of 17 percent to avoid an equal probability of a 20 percent rise or fall in their wealth. For investors to act this risk averse is implausible. In other words, if individuals actually have a risk aversion coefficient of 2 or 3, the equity risk premium implied in the CCAPM is much smaller, on the order of 0.3–0.4 percent. The intuition here is that historical changes in consumption are not large enough to significantly alter utility, so investors are willing to take nearly a "fair bet" with stocks.[15]

Another way of looking at this issue is that the standard CAPM assumes that changes in wealth cause equal changes in consumption, but in reality, movements in the stock market are not associated with dramatic changes in consumption. Any risk that is not strongly correlated with consumption should not require a large risk premium, and empirically, the returns on equities fall into that category.[16]

The equity premium puzzle was not the only anomaly implied by the consumption CAPM. Weil (1989) showed that not only did the CCAPM imply that the historical equity premium was too large, but it also implied that the historical real rate of return on bonds, given economic growth and reasonable risk-aversion parameters, was far too small. This anomaly was called the "risk-free rate puzzle." These two puzzles were related to the "excess volatility puzzle," which had been explored earlier by Shiller (1981), who showed that stock prices have been too volatile to be explained by changes in subsequent dividends.

These puzzles are caused by the fact that the stock market has fluctuated far more than the underlying economic variables, such as aggregate consumption or GDP.

Finding the Model That Fits the Data

Before attempting to change the basic model summarized by Equation 1 with consumption substituting for wealth, I should note that some economists believe that the high levels of risk aversion implied by the model are not necessarily unreasonable. Kandel and Stambaugh (1991) pointed out that, although high levels of risk aversion may lead to unreasonable behavior with respect to large changes in consumption, the behavior may not be implausible for small changes in wealth. For example, to avoid a 50/50 chance of your consumption rising or falling by 1 percent if your coefficient of risk aversion is 10, you would pay 5 percent of the gamble. Even if risk-aversion coefficient *A* is as high as 29, which best fits the data in the Kandel–Stambaugh model, an investor would pay only 14.3 percent of the gamble to avoid the risk of a 1 percent rise or fall in wealth. Neither of these actions appears unreasonable.

Fama, agreeing that a large risk-aversion coefficient is not necessarily a puzzle, stated that

> a large equity premium says that consumers are extremely averse to small negative consumption shocks. This is in line with the perception that consumers live in morbid fear of recessions (and economists devote enormous energy to studying them) even though, at least in the post war period, recessions are associated with small changes in per capita consumption. (1991, p. 1596)

In evaluating these arguments, however, remember that in the domain of retirement savings, the stakes are large relative to wealth or yearly consumption. A typical faculty member at age 55 saving, say, 10 percent of her salary a year might well have half or more of her wealth (including future earnings) in her retirement account. Similarly, university endowments are a substantial portion of the wealth of private universities. And even with mean reversion of equity returns, the 10-year to 20-year standard deviation of equity returns is substantial. So, we seem to be back in the high-stakes category, where high values of risk aversion lead to absurd behavior.

Changes in the Utility Function. In an attempt to solve the puzzle, most economists have been driven to modify the consumption-based utility function represented by Equation 1 to justify a higher equity premium without requiring an implausibly high level of risk aversion. A popular generalization of Equation 1, pioneered by Epstein and Zin (1989), breaks the rigid link between risk aversion (investor reaction to changes in consumption over a *given period of time*) and the reaction to changes in consumption over time, called the *intertemporal rate of substitution*, which affects the real rate of interest. This class of utility functions has been fruitful in explaining low real rates but does not go far in explaining the equity premium.

Another line of research makes utility a function not only of current consumption but also of some "benchmark" level of consumption. If the benchmark is taken to be prior levels of consumption, then individuals are taken to be sensitive not only to their level of consumption today but also to how it has changed from yesterday. Thus, individuals are assumed to take time to adjust to new levels of consumption, a behavior that can be described as "habit formation."

Constantinides (1990) showed that habit formation makes an investor more risk averse to a short-run change in consumption, leading to higher "short-run" risk aversion than "long-run" risk aversion. Evidently, once one has tasted the good life, it is difficult to adjust one's consumption downward. A similar approach was taken by Campbell and Cochrane (1999), who claimed that utility is a function of consumption over and above some habit that is slow to change. Therefore, in a recession, risk aversion increases markedly even though in absolute terms, recessions exhibit relatively small declines in consumption. The equity premium, as well as all other risk premiums, does indeed increase in recessionary periods.

Abel (1990) examined asset pricing when an individual's utility is derived not only from the individual's own consumption but also *relative* to the consumption of others around them—what he termed "catching up with the Joneses." This utility function is less risk averse if everyone's income moves up and down together, but when individuals compare their living standards with others', the comparison makes individuals act very risk averse. This utility function helps solve the real rate puzzle but is not much help in explaining the equity premium.[17]

An alternative approach, elaborated by Benartzi and Thaler (1995), is built on the "cumulative prospect theory" proposed by Tversky and Kahneman (1992). Prospect theory shares the claim that utility is based on benchmarks, so today's level of consumption is important, but prospect theory, which is a pioneering model in behavioral finance, asserts that asset *returns*, rather than consumption or wealth, are arguments of the utility function. In these models, investors dislike losses much more intensely than they like gains. When the utility function is based on *changes* in wealth rather than *levels* of wealth, investors are referred to as "loss averse" rather than "risk averse."[18]

When investors have these loss-averse preferences, their attitudes toward risky assets depend crucially on the time horizon over which returns are evaluated. For example, loss-averse investors who compute the values of their portfolios every day would find investing in stocks unattractive because stock prices fall almost as often as they rise. Investors who check returns less frequently have a higher probability of seeing positive returns. The concept of loss-averse preferences explains why individuals are so risk averse in the short run, what Benartzi and Thaler called "myopic loss aversion."

Uncertain Labor Income. The previous models assumed that the only important source of uncertainty is the return on equity. A more realistic way to model uncertainty would be to recognize that labor income is also uncertain. This fact can markedly change investors' behavior toward the risks in financial markets.

Uncertain labor income may explain why risk aversion increases in a recession; it is well known that unemployment and the number of layoffs affect workers' decisions. During recessions, stocks frequently sell at large discounts relative to their long-term values, a factor that increases long-run equity returns.

The inability to borrow large sums against labor income also means that many workers, especially young workers, are not able to hold as much equity as they would like, even though their "human capital," measured as the value of their future labor income, is high. Constantinides, Donaldson, and Mehra (2002) reported that this phenomenon can have important consequences for asset pricing. Older workers do hold equity, but this age cohort displays greater risk aversion than younger workers because older workers have much more limited ability to offset portfolio losses by changing their work effort. As a result, the economy in general displays the greater risk aversion of the older generation, for whom future consumption is more geared to the level of financial assets than to income. Indeed, Mankiw and Zeldes (1991) found that large stockholders' consumption reflects a larger sensitivity to market fluctuations than does the consumption of smaller stockholders.

Modeling the Risks to Consumption and Equities. Another path to justifying the equity risk premium, rather than changing the form of the utility function, is to reexamine the statistical properties of consumption and stock returns. The standard approach is to assume that both the growth of consumption and the return on stocks are stochastic processes marked by lognormal distributions with constant expected returns. Although this specification is analytically tractable and reasonably replicates the behavior of the historical data, it may not be correct.

Weitzman (2004) argues in a working paper that we do not know the exact distributions of output in the economy, so treating the historically estimated means and standard deviations as known parameters is incorrect. Uncertainty about the true means and variances of the distribution signifies that the probability distributions of consumption and stock returns have fatter tails than assumed in the lognormal distribution.

We know that stock returns do, in fact, have far fatter tails than implied by lognormality. If lognormality prevailed, the probability of the 19 percent decline in the S&P 500 Index that occurred on 19 October 1987 would be less than 1 in 10^{71}, so even if we had had billions of exchanges operating daily for the last 12 billion years (the estimated age of the universe), there would be virtually no chance of observing this event. Yet, the decline did occur, and it may have dramatically increased investors' perceptions of equity risk.

Weitzman shows that, in the absence of risk-free assets, these fatter-tailed distributions alter the analytics of the equity premium dramatically. Instead of yielding an extremely low equity premium, these distributions yield an arbitrarily high equity premium for any level of risk aversion. Furthermore, this model has the ability to explain a low risk-free rate *and* the "excess volatility" of the stock market.

This research is not unrelated to the earlier studies of Rietz (1988), who speculated shortly after Mehra and Prescott's research that investors fear a lurking "disaster state" of extreme negative consumption that has not yet been realized. Such fear would lead to a higher equity premium.[19] Recently, Barro (2005) found strong support for this theory in the data for international markets.

In a similar vein, Bansal and Yaron (2004) rewrote the stochastic properties of the consumption and dividend growth models. Instead of modeling consumption growth as uncorrelated through time, they assumed it has a small long-run predictable component that is affected by past growth. So, a shock to consumption influences its expected growth as well as the expected growth of dividends many years into the future, which can have a dramatic impact on the valuation of equities.[20] When this consumption process is combined with time-varying variance, the Bansal–Yaron model, like Weitzman's approach, has the capability of explaining all the asset pricing puzzles.[21]

Practical Applications

The practitioner might ask: How does the equity premium puzzle matter to investors? This question should be analyzed in the following way.

If the equity premium should be only a fraction of 1 percent, as the basic economic model suggests, then either stocks should be priced much higher or bonds should be priced much lower than they have been on a historical basis.[22] If stock prices rose and bond prices fell, the result would lower the forward-looking returns on equities and raise returns on fixed-income assets, thereby lowering the equity premium. Clearly, if investors believe this narrower premium will prevail at some time in the future, they should be fully invested in stocks now.

But this scenario is highly unlikely to occur. Although the future equity premium is likely to be somewhat lower than in the past, few believe investors will hold stocks if their expected return is only a fraction of a percent above the return of risk-free assets.

Yet, we should not dismiss the equity premium puzzle. The search for the right model has yielded insights that can give practitioners guidance in structuring their clients' portfolios. One promising area is the work on habit formation, which implies that there may be a significant difference in an investor's short-term and long-term attitudes toward risk. This research suggests that an advisor may find it worthwhile to explore the investor's reaction to lowering consumption in a short time frame versus lowering it in a longer time frame, when other adjustments can be made to ease the impact of a reduced standard of living.

A related issue is the importance of examining labor income as a component of portfolio choice. Individuals whose labor income is uncertain and whose borrowing capabilities are low should hold a lower allocation of equities. Those with highly marketable skills should hold a higher fraction in equities. Those who are near retirement and have no flexibility to change their labor income will be more risk averse than investors with marketable labor skills.

A high equity premium can arise from assuming that investors demand a minimum level of consumption that must be attained in any investment plan, no matter what the time period to adjust. The effect is equivalent to assuming that risk aversion becomes extremely high at low levels of consumption. This approach has given rise to the growth of "liability investing," in which investors, especially those approaching retirement, fund what they deem absolute minimum expenditures with risk-free assets, such as Treasury Inflation-Indexed Securities (informally called TIPS), with the remainder being subject to the usual risk and return trade-offs (see Waring 2004).

Investors who suffer from myopic loss aversion, the condition in which the downs in the market deliver much more pain than the ups deliver pleasure, should be advised to set their best allocations and then assess the value of their portfolios infrequently. Blind trusts controlled by outside advisors might be the best strategy for the investors who are particularly sensitive to losses.

Financial planners must also evaluate their clients' fears of remote but catastrophic events and evaluate the likelihood of such events. In some economic states, such as a terrorist strike or a nuclear attack, equities could suffer extreme losses. Practitioners should note that these events will also affect the value of government bonds, so what are considered risk-free assets may even no longer exist.[23] War and other conflicts that destroy wealth also cannot be ruled out. Furthermore, over a very long horizon, there is the possibility that capitalism as a form of economic organization may cease to exist and that the wealth of the propertied classes will be expropriated. For investors with fears of these remote, yet not inconceivable, events, a financial advisor must determine whether the equity premium is sufficient to overcome the outcomes.

Future of the Equity Risk Premium

Despite the fact that the models that economists taught in their classes predicted a small equity premium, most academic economists, even at the peak of the bull market in 2000, maintained a personal estimate of the equity premium (which, presumably, they taught to students) close to the historical mean realized premium since 1926—that is, about 6 percent (compound) or 8 percent (arithmetic) over T-bills.

For his 2000 paper, Welch surveyed a large number of academic economists, who estimated the arithmetic premium of stocks over short-term bonds at 7 percent, about 100 bps below the 1926–2004 average.[24] If we subtract 2 percentage points to convert to the geometric average and then subtract a further 150 bps to convert from short-run to long-run bonds, we obtain a geometric equity premium of stocks over bonds of about 3.5 percent.

Professional money managers apparently have a lower estimate of the equity risk premium than do academics. At a CFA Institute conference I spoke to in early 2004, Peter Bernstein—noted author, money manager, and an organizer of the conference—asked the large crowd of professional investors whether they would be inclined to hold in their portfolios a preponderance of equity over fixed income if they knew that the equity premium was 3 percent. A majority raised their hands. When he asked the same question with a 2 percent premium, most of the audience did not.[25]

I noted in the opening of this article that persuasive reasons support a lower forward-looking real return on equity than the return found in the historical data. The sharp drop in the cost of acquiring and maintaining a diversified portfolio of common stocks, not only in the United States but now worldwide, should increase the price of equities and lower their future return. If we assume these annual costs have been brought down by 100 bps, then the future real return on equities should be 5.5–6.0 percent, about 1 percentage point lower than the historical range of 6.5–7.0 percent. Although these returns are below the historical average calculated from indices, investors today will receive the same realized return from stocks as they obtained earlier when trading costs were higher.

For bonds, the question is whether real future returns should be higher than the 2.25 percent average recorded since 1926. Until recently, I believed that the answer was unambiguously yes. The historical real return on bonds was biased downward by the inflation of the 1970s. Indeed, when TIPS were issued in 1997, their real yield was 3.5 percent, and it climbed to more than 4 percent in 2000. If we assume future real bond returns will be 3.5 percent and real stock returns will be between 5.5 percent and 6 percent, the equity premium will be between 2 percent and 3 percent, a level that would leave most money managers satisfied with their equity allocations.

But in the last few years, the real return on protected government bonds has dropped sharply. TIPS yields, which had been as high as 3 percent in the summer of 2002, fell to 1.5 percent in 2005. The causes of the drop are not well understood but may be related to such factors as fear of a decline in growth because of the decline in the number of workers, the increased risk aversion of an aging population, the excess of saving over investment, manifesting itself through the demand for U.S. government bonds from developing Asian countries, or the increased demand for fixed-income assets by pension funds seeking to offset their pension liabilities. Another possibility is that bondholders believe central banks will keep inflation low, so they view government bonds as true hedges against disaster scenarios ranging from armed conflict to terrorist attacks—and even natural disasters.

If the equity premium is 2–3 percent and real bond yields remain at 1.5 percent, the projected real return on stocks is only about 4 percent. Some noted analysts believe that real stock returns will indeed be this low because this return comports with a 2 percent dividend yield plus the 2 percent long-term real growth of per share dividends found in long-run stock data (Bernstein and Arnott 2003).

I believe, however, that this forecast of real stock returns is too low. First, future dividend growth should be higher than the historical average because the dividend payout ratio has fallen dramatically, which enables companies to use retained earnings to finance growth.[26] Second, future real stock returns can be predicted by taking the earnings yield, which is the inverse of the well-known P/E. This approach works extremely well with long-run data because the average historical P/E of 15 has corresponded to a 6.7 percent real return on stocks. The P/E taken from data in August 2005 points to a 5.5–6.0 percent real stock return. As mentioned earlier, the higher level of stock prices relative to earnings is justified by the steep decline in the costs of holding a fully diversified equity portfolio.

Finally, I believe that the pessimism about future economic growth is unwarranted. In my opinion, the negative impact of the aging of the developed world's population will be more than offset by accelerating growth in the developing world, which will lead to rapid worldwide growth over the next several decades.[27] Forward-looking equity returns of an internationally diversified portfolio should therefore be in the range of 5.5–6.0 percent. If the real return on bonds remains in the 1.5–2.0 percent range, because of increased risk aversion or other factors unrelated to economic growth, then the equity risk premium has probably risen to a level that comports with the post-1926 data.

Conclusion

The equity premium is a critical number in financial economics. It determines asset allocations, projections of retirement and endowment wealth, and the cost of capital to companies. Economists are still searching for a simple model that can justify the premium in the face of the much lower volatility of aggregate economic data. Although there are good reasons why the future equity risk premium should be lower than it has been historically, projected compound equity returns of 2–3 percent over bonds will still give ample reward for investors willing to tolerate the short-term risks of stocks.

Notes

1. Many excellent academic reviews of the equity premium puzzle are available. Cochrane (2005) of the University of Chicago has provided a complete updated review.
2. The stock series is from a combination of sources. Data for 1802–1871 are from Schwert (1990); data for 1871–1925 are from Cowles (1938); data for 1926–2004 are from the CRSP capitalization-weighted indexes of all NYSE, Amex, and NASDAQ stocks. More extensive descriptions of the data can be found in Siegel (2002).
3. As an approximation, the geometric return is equal to the arithmetic return minus one-half the variance of the return. For a fuller description, see the subsection "Calculation of the Equity Premium."
4. Smithers and Wright (2000) called this stable long-term return "Siegel's Constant."
5. Theoretically, real interest rates do not necessarily equal growth. The real rate is also a function of the time rate of discount and the level of risk aversion.
6. See Merton (1973) for a description of the intertemporal CAPM.
7. Campbell and Viceira (2002) indicated that the yield on the 10-year U.S. inflation-linked bond would be the closest in duration to the indexed annuity, especially for someone approaching retirement.
8. Mathematically, the average return of an equally weighted world portfolio is higher than the average equity return in each country.
9. In fact, *Triumph of the Optimists* may have actually *understated* long-term international stock returns. The U.S. stock markets and other world markets for which we have data did very well in the 30 years prior to 1900, which is when their study began. U.S. returns measured from 1871 outperformed returns taken from 1900 by 32 bps. Data from the United Kingdom show a similar pattern.
10. Before commissions were deregulated in May 1975, a typical trade—say, 100 shares at $30—paid a commission of $58.21, almost 2 percent of market value. Small odd-lot trades resulting from reinvesting dividends could cost, considering odd-lot premiums, as much as 4 percent.
11. See Poterba and Summers (1988) for early research on mean reversion and Cochrane (1999) for evidence of stock return predictability.
12. Abel (2002) explored the implications for the equity risk premium when investors had incorrect information on the distributions of returns.
13. Recently, real bond returns have fallen sharply, which is discussed later.
14. See Friend and Blume (1975) for an earlier derivation of the risk-aversion parameter.
15. Arrow (1965) showed that for small risks, investors should be risk neutral, requiring little or no premium.
16. When consumption and stock returns are not perfectly correlated, $EP = \sigma_c \sigma_W \rho_{c,W}$, where σ_c is the standard deviation of consumption, σ_W is the standard deviation of stocks, and $\rho_{c,W}$ is the correlation coefficient between the two. Because empirically ρ is about 0.2, this equation leads to approximately the same estimate of risk aversion as does the CCAPM (see Cochrane 2005).
17. Once Abel (1999) added leverage, the equity premium was better estimated.
18. In the standard model, loss aversion is equivalent to a "kink" in the utility function at the current level of consumption. The loss in utility when consumption drops below the kink is greater than the gain when consumption is above, even for tiny changes in consumption.
19. Mehra and Prescott (1988), criticizing Rietz's research, noted that a disaster state was very likely to be realized in the more than 100 years of data that Mehra and Prescott analyzed.
20. The intuition here comes from the Gordon model of stock price determination, in which small changes in the growth rate of dividends have a large impact on stock prices.
21. Note that in reconciling the volatility of stocks with underlying macroeconomic variables, the compilation of national income accounts requires a large amount of estimation and smoothing of past data, and averaged data on any index lower its volatility. As for estimation, it is well known that the "appraised" value of real estate is far more stable than the value of securities that *represent* similar assets, such as REITs.
22. Indeed, a best-selling book by James Glassman and Kevin Hassett (1999) on the stock market, *Dow 36,000*, marketed at the peak of the last bull market, maintained this thesis and predicted that stocks would have to increase fourfold to bring their real yields down to those of bonds.
23. Perhaps this fear explains why gold continues to be popular despite the fact that in portfolio models, precious metals are often dominated by stocks and inflation-protected bonds.
24. These academics predicted that other academics' estimates were higher—in the 7.5–8.0 percent range.
25. The conference was "Points of Inflection: Investment Management Tomorrow"; a webcast of the Bernstein presentation is available at www.cfawebcasts.org. Rob Arnott has been doing such surveys for a number of years and has communicated to me that most of the institutional money managers would be satisfied with an equity premium measured against bond returns of 2–3 percent (see Arnott and Bernstein 2002).
26. If retained earnings can be invested at the same rate of return as required by equity investors, a drop in the dividend yield will produce an equal rise in the future growth of dividends (see Siegel 2002). Arnott and Asness (2003), believing that company managers squander retained earnings on low-return projects, rejected my contention that real dividends will grow faster in the future.
27. See Siegel (2005) for support for these statements.

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The Shrinking Equity Premium

Historical facts and future forecasts.

Jeremy J. Siegel

Few conundrums have caught the imagination of economists and practitioners as much as the "Equity Premium Puzzle," the title chosen by Rajneesh Mehra and Edward Prescott for their seminal 1985 article in the *Journal of Monetary Economics*. Mehra and Prescott show that the historical return on stocks has been too high in relation to the return on risk-free assets to be explained by the standard economic models of risk and return without invoking unreasonably high levels of risk aversion.[1] They calculate the margin by which stocks outperformed safe assets — the *equity premium* — to be in excess of 6 percentage points per year, and claim that the profession is at a loss to explain its magnitude.

There have been many attempts since to explain the size of the equity premium by variations of the standard finance model. I shall not enumerate them here, but refer readers to reviews by Abel [1991], Kocherlakota [1996], Cochrane [1997], and Siegel and Thaler [1997].

I review here the estimates of the equity premium derived from historical data, and offer some reasons why I believe that most of the historical data underestimate the real return on fixed-income assets and overestimate the expected return on equities. I shall also offer some reasons why, given the current high level of the stock market relative to corporate earnings, the forward-looking equity premium may be considerably lower than the historical average.

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REAL RETURNS ON "RISK-FREE" ASSETS

From 1889 through 1978, Mehra and Prescott estimate the real return on short-dated fixed-income assets (commercial paper until 1920 and Treasury bills thereafter) to have been 0.8%. In 1976 and again in 1982, Roger Ibbotson and Rex Sinquefield formally estimated the real risk-free rate to be even lower — at zero, based on historical data analyzed from 1926. This extremely low level of the short-term real rate is by itself puzzling, and has been termed the "real rate puzzle" by Weil [1989]. The essence of this puzzle is that, given the historical growth of per capita income, it is surprising that the demand to borrow against tomorrow's higher consumption has not resulted in higher borrowing rates.

The low measured level of the risk-free rate may in fact be in part an artifact of the time period examined. There is abundant evidence that the real rate both during the nineteenth century and after 1982 has been substantially higher. Exhibit 1, based on Siegel [1998], indicates that over the entire period from 1802 through 1998, the real compound annual return on Treasury bills (or equivalent safe assets) has been 2.9%, while the realized return on long-term government bonds has been 3.5%. Exhibit 2 presents the historical equity premium for selected time periods for both bonds and bills based on the same data.[2]

EXHIBIT 1
COMPOUND ANNUAL REAL RETURNS (%)
U.S. DATA, 1802-1998

	Stocks	Bonds	Bills	Gold	Inflation
1802-1998	7.0	3.5	2.9	−0.1	1.3
1802-1870	7.0	4.8	5.1	0.2	0.1
1871-1925	6.6	3.7	3.2	−0.8	0.6
1926-1998	7.4	2.2	0.7	0.2	3.1
1946-1998	7.8	1.3	0.6	−0.7	4.2

Source: Siegel [1998] updated.

The danger of using historical averages — even over long periods — to make forecasts is readily illustrated by noting Ibbotson and Sinquefield's long-term predictions made in 1976 and again in 1982 on the basis of their own analysis of the historical data. In 1976, they made predictions for the twenty-five-year period from

EXHIBIT 2
EQUITY PREMIUMS (%) — U.S. DATA, 1802-1998

	Equity Premium with Bonds		Equity Premium with Bills	
	Geometric	Arithmetic	Geometric	Arithmetic
1802-1998	3.5	4.7	5.1	5.5
1802-1870	2.2	3.2	1.9	2.9
1871-1925	2.9	4.0	3.4	4.6
1926-1998	5.2	6.7	6.7	8.6
1946-1998	6.5	7.3	7.2	8.6

Source: Siegel [1998] updated.

1976 through 2000, and in 1982 they made predictions for the twenty-year period from 1982 through 2001. Their forecasts are shown in Exhibit 3. Since we now have data for most of these forecast periods, it is of interest to assess their estimates.

The last two decades have been extremely good for financial assets, so it is not surprising that Ibbotson and Sinquefield underestimate all their real returns. But their most serious underestimation is for fixed-income assets, where they forecast the real bill rate to average essentially zero and the real return on bonds to be less than 2%. Given the standard deviation of estimates, realized annual real bond and bill returns have been 9.9% and 2.9%, respectively, significantly above their estimates. Since negative real returns on fixed-income assets persisted between the two surveys, Ibbotson and Sinquefield more seriously underestimate long-term real bill rates in their 1982 forecasts than they did in 1976.[3]

My purpose here is not to highlight errors in Ibbotson's and Sinquefield's past forecasts. Their analysis was state-of-the-art, and their data have rightly

EXHIBIT 3
LONG-TERM FORECASTS OF REAL RETURNS — COMPOUND ANNUAL RATES OF RETURN

Forecast Period		Stocks	Bonds	Bills	Inflation
1976-2000	Forecast	6.3 (23.5)	1.5 (8.0)	0.4 (4.6)	6.4 (4.8)
	Actual*	11.0	5.3	2.1	4.8
1982-2001	Forecast	7.6 (21.9)	1.8 (8.3)	0.0 (4.4)	12.8 (5.1)
	Actual*	14.6	9.9	2.9	3.3

*Data through 1998.
Standard deviations of annual returns in parentheses.
Source: Ibbotson and Sinquefield [1976, 1982].

formed the benchmark for the risk and return estimates used by both professional and academic economists. I bring these forecasts to light to show that even the fifty-year history of financial returns available to economists at that time was insufficient to estimate future real fixed-income returns.

It is not well understood why the real rate of returns on fixed-income assets was so low during the 1926-1980 period. The bursts of unanticipated inflation following the end of World War II and during the 1970s certainly had a negative effect on the realized real returns from long-term bonds. Perhaps the shift from a gold standard to a paper monetary standard had a negative effect on these real returns until investors fully adjusted to the inflationary bias inherent in the new monetary standard.[4]

Whatever the reasons, the current yields on the Treasury inflation-protected securities, or TIPS, first issued in 1997 support the assertion that the future real returns on risk-free assets will be substantially above the level estimated over the Ibbotson-Sinquefield period. This is so even when the estimating period includes the higher real rates of the past two decades. In August 1999, the ten- and thirty-year TIPS bond yielded 4.0%, nearly twice the realized rate of return on long-dated government bonds over the past seventy-five years.[5]

The market projects real returns on risk-free assets to be substantially higher in the future than they have been over most of this century. It is also likely that the expected returns in the past are substantially greater than they have turned out ex post, especially for longer-dated securities. If one uses a 3.5% real return on fixed-income assets, the geometric equity premium for a 7.0% real stock return falls to 3.5%.

HISTORICAL EQUITY RETURNS AND SURVIVORSHIP BIAS

The real return on stocks, as I have emphasized [1998], has displayed a remarkable long-term stability. Over the entire 196-year period that I examine, the long-term after-inflation geometric annual rate of return on equity averages 7.0%. In the 1926-1998 period, the real return has been 7.4%, and since 1946 (when virtually all the thirteenfold increase in the consumer price index over the past two hundred years has taken place) the real return on equity has been 7.8%. The relative stability of long-term real equity returns is in marked contrast to the unstable real returns on fixed-income assets.

Some economists believe the 7% historical real return on equities very likely overstates the true expected return on stocks. They claim that using the ex post equity returns in the United States to represent returns expected by shareholders is misleading. This is because no investor in the nineteenth or early twentieth century could know for certain that the United States would be the most successful capitalist country in history and experience the highest equity returns.

This "survivorship bias" hypothesis, as it has been called, is examined by Jorion and Goetzmann [1999] in "Global Stock Markets in the Twentieth Century." They conclude that of thirty-nine equity markets that existed in 1921, none of them show as high a real capital appreciation as the United States, and most of them have had substantial disruptions in their operations or have disappeared altogether. They report that the median real capital appreciation of non-U.S. markets has been only 0.8% per year as opposed to 4.3% in the U.S.[6]

But this evidence may be misleading. Total returns of a portfolio, especially over long periods of time, are a very non-linear function of the returns of the individual components. Mathematically it can be shown that if individual stock returns are lognormal, the performance of the *median* stock is almost always worse than the market portfolio performance.[7]

So, it is not surprising that the median performance of individual countries will not match the "world portfolio" or the returns in the dominant market. Jorion and Goetzmann recognize this near the end of their study when they show that compound annual real return on a GDP-weighted portfolio of equities in all countries falls only 28 basis points short of the U.S. return. In fact, because of the real depreciation of the dollar over this time, the compound annual *dollar* return on a GDP-weighted world is actually 30 basis points *higher* than the return on U.S. equities.[8]

But examining international stock returns alone does not give us a better measure of the equity premium. The equity premium measures the *difference* between the returns on stocks and safe bonds. Although stock returns may be lower in foreign countries than the U.S., the real returns on foreign bonds are substantially lower. Almost all disrupted markets experienced severe inflation, in some instances wiping out the value of fixed-income assets. (One could say that the equity premium in Germany covering any period including the 1922-1923 hyperinflation is over 100%, since the real value of fixed-income assets fell to zero while equities did not.)

Even investors who purchased bonds that promised precious metals or foreign currency experienced significant defaults. It is my belief that if one uses a world portfolio of stocks and bonds, the equity *premium* will turn out higher, not lower, than found in the U.S.[9]

TRANSACTION COSTS AND DIVERSIFICATION

I believe that 7.0% per year does approximate the long-term real return on equity indexes. But the return on equity *indexes* does not necessarily represent the *realized* return to the equityholder. There are two reasons for this: transaction costs and the lack of diversification.[10]

Mutual funds and, more recently, low-cost "index funds" were not available to investors of the nineteenth or early twentieth century. Prior to 1975, brokerage commissions on buying and selling individual stocks were fixed by the New York Stock Exchange, and were substantially higher than today. This made the accumulation and maintenance of a fully diversified portfolio of stocks quite costly.

The advent of mutual funds has substantially lowered the cost of maintaining a diversified portfolio. And the cost of investing in mutual funds has declined over the last several decades. Rea and Reid [1998] report a decline of 76 basis points (from 225 to 149) in the average annual fee for equity mutual funds from 1980 to 1997 (see also Bogle [1999, p. 69]). Index funds with a cost of less than 20 basis points per year are now available to small investors.

Furthermore, the risk experienced by investors unable to fully diversify their portfolios made the risk-return trade-off less desirable than that calculated from stock indexes. On a risk-adjusted basis, a less-than-fully diversified portfolio has a lower expected return than the total market.

Given transaction costs and inadequate diversification, I assume that equity investors experienced real returns more in the neighborhood of 5% to 6% over most of the nineteenth and twentieth century rather than the 7% calculated from indexes. Assuming a 3.5% real return on bonds, the historical equity premium may be more like 1.5 to 2.5 percentage points, rather than the 6.0 percentage points recorded by Mehra and Prescott.

PROJECTING FUTURE EQUITY RETURNS

Future stock returns should not be viewed independently of current fundamentals, since the price of stocks is the present discounted value of all expected future cash flows. Earnings are the source of these cash flows, and the average price-to-earnings (P-E) ratio in the U.S. from 1871 through 1998 is 14 (see Shiller [1989] for an excellent source for this series).

Using data from August 13, 1999, the S&P 500 stock index is 1327, and the mean 1999 estimate for operating earnings of the S&P 500 stock index of fifteen analysts polled by Bloomberg News is $48.47.[11] This yields a current P-E ratio on the market of 27.4. But due to the increased number of write-offs and other special charges taken by management over the last several years, operating earnings have exceeded total earnings by 10% to 15%.[12] On the basis of reported earnings, which is what most historical series report (including Shiller's), the P-E ratio of the market is currently about 32.[13]

There are two long-term consequences of the high level of stock prices relative to fundamentals. Either 1) future stock returns are going to be lower than historical averages, or 2) earnings (and hence other fundamentals such as dividends or book value) are going to rise at a more rapid rate in the future. A third possibility, that P-E ratios will rise continually without bound, is ruled out since this would cause an unstable bubble in stock prices that must burst.

If future dividends grow no faster than they have in the past, forward-looking real stock returns will be lower than the 7% historical average. As is well known from the dividend discount model, the rate of return on stocks can be calculated by adding the current dividend yield to the expected rate of growth of future dividends. The current dividend yield on the S&P 500 index is 1.2%. Since 1871, the growth of real per share dividends on the index has been 1.3%, but since 1946, due in part to a higher reinvestment rate, growth has risen to 2.1%. If we assume future growth of real per share dividends to be close to the most recent average of 2.1%, we obtain a 3.3% real return on equities, less than one-half the historical average.

A second method of calculating future real returns yields a similar figure. If the rate of return on capital equals the return investors require on stocks, the *earnings yield*, or the reciprocal of the price-earnings ratio, equals the forward-looking real long-term return on equity (see Phillips [1999] for a more formal development of this proposition). Long-term data support this contention; a 14 price-to-earnings ratio corresponds to a 7.1% earnings yield, which approximates the long-term real return on equities. The current P-E ratio on the S&P 500 stock index is between 27 to 32, depending on whether total or operating earnings are considered. This indicates a current earnings yield, and hence a future long-term and real return, of between 3.1% to 3.7% on equities.

One way to explain these projected lower future equity returns is that investors are bidding up the price of stocks to higher levels as the favorable historical data about the risks and returns in the equity market become incorporated into investor decisions.[14] Lower transaction costs further enable investors to assemble diversified portfolios of stocks to take advantage of these returns. The desirability of stocks may be further reinforced by the perception that the business cycle has become less severe over time and has reduced the inherent risk in equities.[15]

If these factors are the cause of the current bull market, then the revaluation of equity prices is a one-time adjustment. This means that future expected equity returns should be lower, not higher, than in the past. During this period of upward price adjustment, however, equity returns will be higher than average, increasing the historical measured returns in the equity market.

This divergence between increased historical returns and lower future returns could set the stage for some significant investor disappointment, as survey evidence suggests that many investors expect future returns to be higher, not lower, than in the past (see "PaineWebber Index of Investor Optimism" [1999]).

SOURCES OF FASTER EARNINGS GROWTH

Although the increased recognition of the risks and returns to equity may be part of the explanation for the bull market in stocks, there must be other reasons. This is because the forward-looking rates of return we derive for equities fall below the current 4.0% yield on inflation-protected government bonds. Although one could debate whether in the long run stocks or *nominal* bonds are riskier in real terms, there should be no doubt that the inflation-protected bonds are safer than equities and should have a lower expected return.

Hence, some part of the current bull market in stocks must be due to the expectations that future earnings (and dividend) growth will be significantly above the historical average. Optimists frequently cite higher growth of real output and enhanced productivity, enabled by the technological and communications revolution, as the source of this higher growth. Yet the long-run relation between the growth of real output and *per share* earnings growth is quite weak on both theoretical and empirical grounds. Per share earnings growth has been primarily determined by the reinvestment rate of the firm, or the earnings yield minus the dividend yield, not the rate of output growth.[16]

The reason why output growth does not factor into per share earnings growth is that new shares must be issued (or debt floated) to cover the expansion of productive technology needed to increase output. Over the long run, the returns to technological progress have gone to workers in the form of higher real wages, while the return per unit of capital has remained essentially unchanged. Real output growth could spur growth in per share earnings only if it were "capital-enhancing," in the growth terminology, which is contrary to the labor-augmenting and wage-enhancing technological change that has marked the historical data (see Diamond [1999] for a discussion of growth and real return).

But there are factors that may contribute to higher future earnings growth of U.S. corporations, at least temporarily. The United States has emerged as the leader in the fastest-growing segments of the world economy: technology, communications, pharmaceuticals, and, most recently, the Internet and Internet technology. Furthermore, the penetration of U.S. brand names such as Coca-Cola, Procter & Gamble, Disney, Nike, and others into the global economy can lead to temporarily higher profit growth for U.S. firms.

Nonetheless, the level of corporate earnings would have to double to bring the P-E ratio down to the long-term average, or to increase by 50% to bring the P-E ratio down to 20. A 20 price-to-earnings yield corresponds to a 5% earnings yield or a 5% real return, a return that I believe approximates realized historical equity returns after transaction costs are subtracted. For per share earnings to temporarily grow to a level 50% above the long-term trend is clearly possible in a world economy where the U.S. plays a dominant role, but it is by no means certain.

CONCLUSION

The degree of the equity premium calculated from data estimated from 1926 is unlikely to persist in the future. The real return on fixed-income assets is likely to be significantly higher than that estimated on earlier data. This is confirmed by the yields available on Treasury inflation-linked securities, which currently exceed 4%. Furthermore, despite the acceleration in earnings growth, the return on equities is likely to fall from its historical level due to the very high level of equity prices relative to fundamentals.[17]

All of this makes it very surprising that Ivo Welch [1999] in a survey of over 200 academic economists finds that most estimate the equity premium at 5 to 6 percentage points over the next thirty years. Such a premium would require a 9% to 10% real return on stocks, given the current real yield on Treasury inflation-indexed securities. This means that real per share dividends would have to grow by nearly 8.0% to 9.0% per year, given the current 1.2% dividend yield, to prevent the P-E ratio from rising farther from its current record levels. This growth rate is more than six times the growth rate of real dividends since 1871 and more than triple their growth rate since the end of World War II.

Unless there is a substantial increase in the productivity of capital, dividend growth of this magnitude would mean an ever-increasing share of national income going to profits. This by itself might cause political ramifications that could be negative for shareholders.

ENDNOTES

This article is adapted from a paper delivered at the UCLA Conference, "The Equity Premium and Stock Market Valuations," and a Princeton Center for Economic Policy Studies Conference, "What's Up with the Stock Market?" both held in May 1999. The author thanks participants in these seminars and particularly Jay Ritter, Robert Shiller, and Peter L. Bernstein for their comments.

[1]A few economists believe these high levels of risk aversion are not unreasonable; see, e.g., Kandel and Stambaugh [1991].

[2]In the capital asset pricing model, equity risk premiums are derived from the *arithmetic* and not geometric returns. Compound annual geometric returns are almost universally used in characterizing long-term returns.

[3]Their wildly high 12.8% long-term inflation estimate in 1982 is derived by subtracting their low historical real yield from the high nominal bond rate. This overprediction has no effect on their estimated *real* returns.

[4]But real rates on *short-dated* bonds, for which unanticipated inflation should have been less important, were also extremely low between 1926 and 1980.

[5]I am very persuaded by the research of Campbell and Viceira [1998], who argue that in a multiperiod world the proper risk-free asset is an inflation-indexed annuity rather than the short-dated Treasury bill. This conclusion comes from intertemporal models where agents desire to hedge against unanticipated changes in the real rate of interest. The duration of such an indexed annuity is closely approximated by the ten-year inflation-indexed bonds.

[6]They are unable to construct dividend series for most foreign countries, but they make a not-unreasonable assumption that dividend yields in the U.S. were at least as high as abroad.

[7]Intuitively, the return of the winners more than compensates for the lower returns of the more numerous losers.

[8]Furthermore, the dollar return on the foreign portfolio is much better measured than the real return. These data are taken from Jorion and Goetzmann [1991], Tables VI and VII.

[9]To avoid the problems with default, gold is considered the "risk-free" alternative in many countries. But gold's long-term real returns are negative in the U.S. even before one considers storage and insurance costs. And precious metals are far from risk-free in real terms. The real return on gold since 1982 has been a negative 7% per year.

[10]I abstract from taxes, which reduce the return on both bonds and stocks.

[11]These data were taken from the Bloomberg terminal on August 16, 1999.

[12]From 1970 through 1989, operating earnings exceeded reported earnings by an average of 2.29%. Since 1990, the average has been 12.93%.

[13]There are other factors that distort reported earnings, some upward (underreporting option costs: see Murray, Smithers, and Emerson [1998]) and some downward (overexpensing R&D; see Nakamura [1999]). No clear bias is evident.

[14]This is particularly true on a long-term, after-inflation basis. See Siegel [1998, Chapter 2].

[15]Bernstein [1998] has emphasized the role of economic stability in stock valuation. Also see Zarnowitz [1999] and Romer [1999]. Other reasons given for the high price of equities rely on demographic factors, specifically the accumulations of "baby boomers." This should, however, reduce both stock and bond returns, yet we see real bond returns as high if not higher than historically.

[16]From 1871 to 1998, the growth of real per share earnings is only 1.7% per year, slightly less than obtained by subtracting the median dividend yield of 4.8% from the median earnings yield of 7.2%.

[17]This should not be construed as predicting that equity prices need fall significantly, or that the expected returns on equities are not higher, even at current levels, than those on fixed-income investments.

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The Equity Risk Premium: An Annotated Bibliography

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The equity risk premium is broadly defined as the difference between the expected total return on an equity index and the return on a riskless asset. The magnitude of the equity risk premium, arguably the most important variable in financial economics, affects the asset allocation decisions of individual and institutional investors, and the premium is a critical factor in estimating companies' costs of capital. This literature review explores research by academics and practitioners on this topic during the past three decades.

The equity risk premium (or, simply, equity premium) is broadly defined as the difference between the expected total return on an equity index and the return on a riskless asset. (Which index and which riskless asset need to be defined precisely before numerically estimating this premium.) The equity premium is considered the most important variable in financial economics. The magnitude of the equity premium strongly affects the asset allocation decisions of individual investors and institutional investors, including pensions, endowment funds, foundations, and insurance companies, and is a critical factor in estimating companies' costs of capital.

History of Research on the Equity Risk Premium

The topic of the equity risk premium (ERP) has attracted attention from academics and practitioners. There are three major themes in the intellectual history of the equity premium. The first theme builds on Gordon and Shapiro's suggestion that a dividend discount model (DDM) be used to estimate the required return on capital for a corporate project, and, by extension, the expected return on an equity (if the equity is fairly priced).[1] Specifically, the DDM says that expected total equity return equals the dividend yield plus the expected dividend growth rate; the equity premium is this sum minus the riskless rate. The DDM was widely used by practitioners to estimate the equity premium until Ibbotson and Sinquefield (1976) introduced a different approach based on historical returns. An early work by Diermeier, Ibbotson, and Siegel (1984) attempted to bolster the use of the DDM for long-range forecasting, but it was not widely used; the recent, and quite remarkable, revival of the DDM as an estimator of the equity premium dates back only to the late 1990s.

The second theme arose from Ibbotson and Sinquefield's 1976 article, which decomposed historical returns on an equity index into a part attributable to the riskless rate and a part attributable to the equity premium. The arithmetic mean of the equity premium part is assumed to be stationary—that is, the same in the future as in the past. Thus, if equities had beaten riskless Treasury bills by an arithmetic mean margin of 7 percent a year over the historical measurement period, which was usually 1926 through the then-current time, then equities were forecast to beat bills by the same amount in the future. This approach dominated practitioners' estimates of the equity premium starting in the late 1970s, but its influence has faded recently, under attack from both the DDM and the "puzzle" literature that began with Mehra and Prescott (1985).

Mehra and Prescott's 1985 article, "The Equity Premium: A Puzzle," began a third theme. The puzzle they described is that the historical equity risk premium during the period of 1889–1978 (or any other similarly long period, such as 1926 to the present) was too high, by at least an order of magnitude, to be explained by standard

[1]Myron J. Gordon and Eli Shapiro, "Capital Equipment Analysis: The Required Rate of Profit," *Management Science*, vol. 3, no. 1 (October 1956):102–110.

"general equilibrium" or "macroeconomic" asset-pricing models. Using these models, such a high premium can only be explained by a very high coefficient of risk aversion, one in the range of 30 to 40. Risk aversion parameters observed in other aspects of financial behavior are around 1. So, Mehra and Prescott argued, either the model used to describe investors' behavior is flawed or equity investors have received a higher return than they expected.

We call the asset-pricing models referenced by Mehra and Prescott (1985) "macroeconomic" because they originated in that specialty, but more importantly to distinguish them from asset-pricing models commonly used in investment finance—such as the capital asset pricing model, the three-factor Fama–French model, and arbitrage pricing theory—that are silent on the absolute size of the risk premium (in fact, requiring it as an input) and that distinguish instead among the expected *relative* returns on specific securities or portfolios.

The rest of this introductory essay focuses on attempts to resolve the equity premium "puzzle" identified by Mehra and Prescott (1985). Their "puzzle" has stimulated a remarkable response in the academic literature. Most practitioners today, however, use estimates of the equity premium that emerge from the DDM—the earliest method. Moreover, practitioner debates tend to focus on which DDM estimate to use and the extent to which the estimate should be influenced by historical returns, not the question of whether either the DDM or the historical approach can be reconciled with that of Mehra and Prescott. Reflecting practitioners' concerns, this annotated bibliography covers all three major themes in the literature.

Reconciling the "Puzzle"

Research on the question of why the realized equity premium was so large can be grouped into two broad categories: (1) studies alleging bias in the historical data and (2) studies suggesting improvements in the macroeconomic model. A third category, studies that set forth methods for estimating for the equity risk premium *independent* of the macroeconomic model, is also addressed in this review.

Biases in Historical Data. Potential biases in the historical data vary from survivorship bias and variations in transaction and tax costs to the choice of short-term bills versus long-term bonds as the riskless asset.

- *Survivorship bias*. Brown, Goetzmann, and Ross (1995) argued that the historical equity premium calculated using U.S. data is likely to overstate the true (expected) premium because the U.S. stock market turned out to be the most successful in world history. However, Dimson, Marsh, and Staunton (2006) examined stock and bond returns using data from 1900 to 2005 for 17 countries and concluded that the high historical equity premium obtained for the United States is comparable with that of other countries.
- *Transaction costs, regulations, and taxes*. McGrattan and Prescott (2001) suggested that the higher historical equity premium is mainly because of a large run-up in the equity price caused by the sharp decline in the tax rate on dividends. In their 2003 article, they claimed that the equity premium is less than 1 percent after accounting for taxes, regulations, and costs.
- *Short-term bills vs. long-term bonds as the riskless asset*. McGrattan and Prescott (2003) argued that short-term bills provide considerable liquidity services and are a negligible part of individuals' long-term debt holdings. As a result, long-term bonds should be used as the riskless asset in equity premium calculations. Siegel (2005) argued that the riskless asset that is relevant to most investors (that is, to long-term investors) is "an annuity that provides a constant real return over a long period of time" (p. 63). And the return on long-term inflation-indexed government bonds is the closest widely available proxy for such an annuity.
- *Unanticipated repricing of equities*. Bernstein (1997) suggested that because equities started the sample period (which begins in 1926) at a price-to-earnings ratio (P/E) of about 10, and ended the period at a P/E of about 20, the actual return on equities was higher than investors expected or required. Thus, the historical return overstates the future expected return. This finding was bolstered by Fama and French (2002), who used the DDM to show that investors expected an equity risk premium of about 3 percent, on average, from 1926 to the present.
- *Unanticipated poor historical bond returns*. Historical bond returns may have been biased downward because of unexpected double-digit inflation in the 1970s and 1980s (Arnott and Bernstein 2002; Siegel 2005). However, subsequent disinflation and declines in bond yields have caused the bond yield to end the historical study period only a little above where it started, thus mostly negating the validity of this objection.

Improvements in the Theoretical Model. The second broad category of research on the equity risk premium is a large body of literature exploring a variety of improvements in the original Mehra and Prescott (1985) model.

- *Rare events*. Rietz (1988) suggested that the ERP puzzle can be solved by incorporating a very small probability of a very large drop in consumption. If such a probability exists, the predicted equity premium is large (to compensate investors for the small risk of a very bad outcome). In the same year, Mehra and Prescott countered that Rietz's model requires a 1 in 100 chance of a 25 percent decline in consumption to reconcile the equity premium with a risk aversion parameter of 10, which is the approximate degree of risk aversion that would be required to predict an equity premium equal to that which was realized.[2] However, they argued, the largest aggregate consumption decline in the last 100 years was only 8.8 percent. Campbell, Lo, and MacKinlay pointed out in 1997 that "the difficulty with Rietz's argument is that it requires not only an economic catastrophe, but one which affects stock market investors more seriously than investors in short-term debt instruments" (p. 311).[3] Recently, Barro (2006) extended Rietz's model and argued that it does provide a plausible resolution of the equity premium "puzzle."
- *Recursive utility function*. One critique of the power utility function used by Mehra and Prescott (1985) is the tight link between risk aversion and intertemporal substitution. Hall argued that this link is inappropriate because the intertemporal substitution concerns the willingness of an investor to move consumption between different time periods whereas the risk aversion parameter concerns the willingness of an investor to move consumption between states of the world.[4] However, Weil (1989) showed that the ERP puzzle cannot be solved by simply separating risk aversion from intertemporal substitution. More recently, Bansal and Yaron (2004) argued that risks related to varying growth prospects and fluctuating economic uncertainty, combined with separation between the intertemporal substitution and risk aversion, can help to resolve the ERP puzzle.
- *Habit formation*. Constantinides (1990) introduced habit persistence in an effort to explain the ERP puzzle. His model assumes that an investor's utility is affected by both current and past consumption and that a small fall in consumption can generate a large drop in consumption net of the subsistence level. This preference makes investors extremely averse to consumption risk even when risk aversion is small. Constantinides showed that the historical equity premium can be explained if past consumption generates a subsistence level of consumption that is about 80 percent of the normal consumption rate.

Abel defined a similar preference, called "catching up with the Joneses," where one's utility depends not on one's absolute level of consumption, but on how one is doing relative to others.[5]

- *Borrowing constraints and life-cycle issues*. Constantinides, Donaldson, and Mehra (2002) introduced life-cycle and borrowing constraints. They argued that as the correlation of equities with personal income changes over the life of the investor, so too does the attractiveness of equities to that investor. The young, who should borrow to smooth consumption and to invest in equities, cannot do so. Therefore, equities are priced almost exclusively by middle-aged investors, who find equities to be unattractive. Thus, equities are underpriced and bonds are overpriced, producing a higher equity risk premium than predicted by Mehra and Prescott (1985).
- *Limited market participation*. Mankiw and Zeldes (1991) examined whether the consumption of stockholders differs from that of nonstockholders and whether this difference helps explain the historical equity risk premium. They showed that aggregate consumption of stockholders is more highly correlated with the stock market and is more volatile than the consumption of nonstockholders. A risk aversion parameter of 6 can explain the size of the equity premium based on consumption of stockholders alone. Although this value is still too large to be plausible, it is much less than the magnitude of 30 to 40 derived by Mehra and Prescott (1985) using the aggregate consumption data of both stockholders and nonstockholders.

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[2] Rajnish Mehra and Edward C. Prescott, "The Equity Premium: A Solution?" *Journal of Monetary Economics*, vol. 22, no. 1 (July 1988):133–136.
[3] John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *The Econometrics of Financial Markets* (Princeton, NJ: Princeton University Press, 1997).
[4] Robert E. Hall, "Intertemporal Substitution in Consumption," *Journal of Political Economy*, vol. 96, no. 2 (December 1988):212–273.
[5] Andrew B. Abel, "Asset Prices under Habit Formation and Catching Up with the Joneses," *American Economic Review Papers and Proceedings*, vol. 80, no. 2 (May 1990):38–42.

■ *Incomplete markets*. Heaton and Lucas introduced uninsurable, idiosyncratic income risk into standard and dynamic general equilibrium models and showed that it can increase the risk premium.[6] Brav, Constantinides, and Geczy (2002) showed that the equity premium can be "explained with a stochastic discount factor calculated as the weighted average of the individual households' marginal rate of substitution with low and economically plausible values of the rate of risk aversion coefficient." This explanation relies on incomplete markets in that all risks would be insurable if markets were "complete."

■ *Behavioral approach*. Starting with prospect theory as proposed by Kahneman and Tversky,[7] a large swath of behavioral finance literature argues that the combination of "myopic" loss aversion and narrow framing can help to resolve the ERP puzzle, including works by Benartzi and Thaler (1995), Barberis, Huang, and Santos (2001), and Barberis and Huang (2006).

Summary

The various (and quite different, almost unrelated) approaches to estimating the equity risk premium is best summarized by Ibbotson and Chen, who categorized the estimation methods into four groups:[8]

1. *Historical method*. The historical equity risk premium, or difference in realized returns between stocks and bonds (or stocks and cash), is projected forward into the future. See Ibbotson and Sinquefield (1976), which is updated annually by Ibbotson Associates (now Morningstar), and Dimson, Marsh, and Staunton (2002).
2. *Supply-side models*. This approach uses fundamental information, such as earnings, dividends, or overall economic productivity, to estimate the equity risk premium. See Diermeier, Ibbotson, and Siegel (1984); Siegel (1999); Shiller (2000); Fama and French (1999); Arnott and Ryan (2001); Campbell, Diamond, and Shoven (2001); Arnott and Bernstein (2002); and Grinold and Kroner (2002).
3. *Demand-side models*. This approach uses a general equilibrium or macroeconomic model to calculate the expected equity return by considering the payoff demanded by investors for bearing the risk of equity investments. Mehra and Prescott (1985) is the best known example of this approach, and the "puzzle debate" is an attempt to reconcile the results of this approach with the much higher ERP estimates given by the other approaches.
4. *Surveys*. An estimate of the equity risk premium is obtained by surveying financial professionals or academics (e.g., Welch 2000). Such results presumably incorporate information from the other three methods.

In closing, the equity risk premium has been the topic of intense and often contentious research over at least the last three decades. As Siegel (2005) said, although there are good reasons why the future equity risk premium should be lower than it has been historically, a projected equity premium of 2 percent to 3 percent (over long-term bonds) will still give ample reward for investors willing to bear the risk of equities.

[6]John Heaton and Deborah Lucas, "Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Pricing," *Journal of Political Economy*, vol. 104, no. 3 (June 1996):443–487.

[7]Daniel Kahneman and Amos Tversky, "Prospect Theory: An Analysis of Decisions under Risk," *Econometrica*, vol. 47, no. 2 (March 1979):263–292.

[8]Roger Ibbotson and Peng Chen, "The Supply of Stock Market Returns," Ibbotson Associates, 2001.

Bibliography

Aït-Sahalia, Yacine, Jonathan A. Parker, and Yogo Motohiro. 2004. "Luxury Goods and the Equity Premium." *Journal of Finance*, vol. 59, no. 6 (December):2959–3004.

This article proposes a partial solution to the ERP puzzle by distinguishing between the consumption of basic goods and that of luxury goods. The authors argue that the aggregate consumption does not measure the marginal risk of investing in the stock market. Using several novel datasets on luxury goods consumption, such as sales of imported luxury automobiles, this study shows that the covariance of luxury goods and excess returns implies a risk aversion parameter of 7, significantly lower than that implied by aggregate consumption data.

Ang, Andrew, and Angela Maddaloni. 2005. "Do Demographic Changes Affect Risk Premiums? Evidence from International Data." *Journal of Business*, vol. 78, no. 1 (January):341–379.

This article examines empirically the relation between the equity risk premium and demographics using a long-term data sample (1900–2001) from the United States, Japan, the United Kingdom, Germany, and France as well as a shorter-term data sample (1970–2000) for 15 countries. By pooling international data, the authors show that a negative relation exists between the expected equity risk premium and the percentage of adults over 65 years old. The international results from this study support Abel's prediction that the equity risk premium is likely to decrease as the Baby Boom generation enters retirement.[9]

Arnott, Robert D., and Clifford S. Asness. 2003. "Surprise! Higher Dividends = Higher Earnings Growth." *Financial Analysts Journal*, vol. 59, no. 1 (January/February):70–87.

Contrary to the predictions of Ibbotson and Chen (2003) and others who apply Modigliani and Miller (M&M) dividend invariance intertemporally, earnings growth has been fastest when dividend payout is highest, not lowest, because of diminishing marginal productivity of capital. Thus, investors should not look to today's low payout ratios as a sign of stronger-than-historical earnings growth in the future.

Arnott, Robert D., and Peter L. Bernstein. 2002. "What Risk Premium Is 'Normal'?" *Financial Analysts Journal*, vol. 58, no. 2 (March/April):64–85.

The expected equity return equals the dividend yield, plus dividend growth, plus the expected change in valuation, if any. As of year-end 1925, investors expected about 5.1 percent (about 1.4 percent more than the bond yield). The subsequent positive surprise was because of four historical accidents: (1) bonds had unanticipated losses; (2) valuations quadrupled, as measured by the price-to-dividend ratio (P/D); (3) the market survived; and (4) accelerated growth in real dividends and earnings occurred because of regulatory reform. These observations are used to construct a framework for estimating the equity risk premium at each point in time, including the present. The "normal" equity risk premium, or historical average of what investors were actually expecting, is 2.4 percent, and the current equity risk premium is around zero.

[9]Andrew B. Abel, "Will Bequests Attenuate the Predicted Meltdown in Stock Prices when Baby Boomers Retire?" *Review of Economics and Statistics*, vol. 83, no. 2 (November 2001):589–595; "The Effects of a Baby Boom on Stock Prices and Capital Accumulation in the Presence of Social Security," *Econometrica*, vol. 71, no. 2 (March 2003):551–578.

Arnott, Robert, and Ronald Ryan. 2001. "The Death of the Risk Premium: Consequences of the 1990s." *Journal of Portfolio Management*, vol. 27, no. 3 (Spring):61–74.

Applying the dividend discount model to then-current (January 2000) valuations produces an equity risk premium of –0.9 percent, consisting of a real equity expected return of 3.2 percent minus a real Treasury Inflation-Protected Securities (TIPS) yield of 4.1 percent. A similar analysis of the equity risk premium at the end of 1925 shows that it was 2.7 percent. Pension funds, especially (because of their liability characteristics), should invest more in bonds given these estimates.

Avramov, Doron, and Tarun Chordia. 2006. "Predicting Stock Returns." *Journal of Financial Economics*, vol. 82, no. 2 (November):387–415. [added April 2008; abstract by Luis Garcia-Feijoo, CFA]

The authors construct optimal portfolios that allow for company-level equity expected returns, variances, and covariances to vary conditional on a set of macroeconomic variables. Predictability-based investments outperform static and dynamic investments in the market, the Fama–French plus momentum factors, and strategies that invest in stocks with similar size, book-to-market, and prior return characteristics. Returns on individual stocks are predictable out-of-sample because of alpha variation, not because of equity premium predictability.

Bansal, Ravi, and Amir Yaron. 2004. "Risk for the Long Run: A Potential Resolution of Asset Pricing Puzzles." *Journal of Finance*, vol. 59, no. 4 (August):1481–1509.

This article presents a model that can explain the equity risk premium. Dividend and, thus, consumption growth are assumed to consist of two components: a small persistent expected growth rate component and a time-varying economic uncertainty component. The authors show that the historical equity risk premium can be quantitatively justified by the model using a risk aversion parameter of 7.5 to 10.

Barberis, Nicholas, and Ming Huang. 2006. "The Loss Aversion/Narrow Framing Approach to the Equity Premium Puzzle." In *Handbook of Investments: Equity Risk Premium*. Edited by Rajnish Mehra. Amsterdam: North Holland.

The authors review the behavioral approach to understanding the ERP puzzle. The key elements of this approach are loss aversion and narrow framing, two well-known features of decision making under risk in experimental settings. By incorporating these features into traditional utility functions, Barberis and Huang show that a large equity premium and a low and stable risk-free rate can be generated simultaneously, even when consumption growth is smooth and only weakly correlated with the stock market.

Barberis, Nicholas, Ming Huang, and Tano Santos. 2001. "Prospect Theory and Asset Prices." *Quarterly Journal of Economics*, vol. 116, no. 1 (February):1–53.

This paper proposes a new approach for pricing assets by incorporating two psychological ideas into the traditional consumption-based model. Investors are assumed to be more sensitive to losses than to gains, and their risk aversion changes over time depending on their prior investment outcomes. The authors show that this framework can help explain the high historical equity risk premium.

Barro, Robert. 2006. "Rare Disasters and Asset Markets in the Twentieth Century." *Quarterly Journal of Economics*, vol. 121, no. 3 (August):823–866.

This paper extends the analysis of Rietz (1988) and argues that it does provide a plausible resolution of the ERP puzzle. The author suggests that the rare-disasters framework (i.e., the allowance for low-probability disasters proposed by Rietz) can explain the ERP puzzle while "maintaining the tractable framework of a representative agent, time-additive and iso-elastic preferences, and complete markets" (p. 823). These technical terms refer to assumptions that are embedded in Mehra and Prescott (1985) and that are considered standard in general equilibrium or macroeconomic models.

Benartzi, Shlomo, and Richard H. Thaler. 1995. "Myopic Loss Aversion and the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 110, no. 1 (February):73–92.

This article proposes an explanation for the equity premium based on two concepts from the psychology of decision making. The first concept is called "loss aversion," meaning that investors are more sensitive to losses than to gains. The second concept is called "mental accounting," which points out that investors mentally separate their portfolios into subportfolios for which they have quite different utility functions or risk aversion parameters. For example, investors may have one set of portfolios that they never evaluate and another set that they evaluate every day. Benartzi and Thaler show that the size of the historical equity premium can be explained if investors evaluate their portfolio at least annually.

Bernstein, Peter L. 1997. "What Rate of Return Can You Reasonably Expect… or What Can the Long Run Tell Us about the Short Run?" *Financial Analysts Journal*, vol. 53, no. 2 (March/April):20–28.

By studying historical intervals when stock valuation (P/D or P/E) was the same at the end of the interval as at the beginning, one can avoid incorporating unexpected valuation changes into long-term rate of return studies. The analysis gives an equity risk premium of 3 percent, although the more interesting finding is that equity returns are mean-reverting whereas bond returns have no mean to which to regress. Thus, in the very long run and in real terms, stocks are safer than bonds.

Blanchard, Olivier J., Robert Shiller, and Jeremy J. Siegel. 1993. "Movements in the Equity Premium." *Brookings Papers on Economic Activity*, no. 2:75–138.

The authors show that the expected equity premium has gone steadily down since the 1950s from an unusually high level in the late 1930s and 1940s. Blanchard et al. show the positive relation between inflation and the equity premium, and they conclude that the equity premium is expected to stay at its current level of 2–3 percent if inflation remains low. Implications of this forecast for the macroeconomy are explored.

Brav, Alon, George M. Constantinides, and Christopher C. Geczy. 2002. "Asset Pricing with Heterogeneous Consumers and Limited Participation: Empirical Evidence." *Journal of Political Economy*, vol. 110, no. 4 (August):793–824.

This paper shows that the equity risk premium can be explained with a stochastic discount factor (SDF) calculated as the weighted average of the individual households' marginal rate of substitution. Important components of the SDF are cross-section variance and skewness of the households' consumption growth rates.

Brown, Stephen J., William N. Goetzmann, and Stephen A. Ross. 1995. "Survival." *Journal of Finance*, vol. 50, no. 3 (July):853–873.

This paper suggests that survival could induce a substantial spurious equity premium and at least partially explain the equity premium puzzle documented by Mehra and Prescott (1985). (That is, to explain it away, because the returns used to frame the "puzzle" were neither expected nor were they achieved by many investors.)

Campbell, John Y., Peter A. Diamond, and John B. Shoven. 2001. "Estimating the Real Rate of Return on Stocks over the Long Term." Social Security Advisory Board. (www.ssab.gov/Publications/Financing/estimated%20rate%20of%20return.pdf)

This collection of papers presented to the Social Security Advisory Board explores expected equity rates of return for the purpose of assessing proposals to invest Social Security assets in the stock market.

Under certain stringent conditions, the earnings-to-price ratio (E/P) is an unbiased estimator of the expected equity return. Noting that earnings are highly cyclical, Campbell, in "Forecasting U.S. Equity Returns in the 21st Century," produces a more stable numerator for E/P by taking the 10-year trailing

average of real earnings, E* (after Graham and Dodd;[10] see also Campbell and Shiller 1998, Shiller 2000, and Asness[11]). From this perspective, current data suggest that the structural equity risk premium is now close to zero or that prices will fall, causing the equity risk premium to rise to a positive number. A little of each is the most likely outcome. Departing from the steady-state assumptions used to equate E/P with the expected equity return and using a macroeconomic growth forecast and sensible assumptions about the division, by investors, of corporate risk between equities and bonds, a real interest rate of 3–3.5 percent is forecast, along with an equity risk premium of 1.5–2.5 percent geometric (3–4 percent arithmetic).

In "What Stock Market Returns to Expect for the Future?" Diamond explores the implications of an assumed 7 percent real rate of return on equities. Stocks cannot earn a real total return of 7 percent or else they will have a market capitalization of 39.5 times U.S. GDP by the year 2075 (assuming a 2 percent dividend-plus-share-buyback yield). In contrast, the current capitalization/GDP ratio is 1.5. Changing the GDP growth rate within realistic bounds does not change the answer much. To justify a real total return of 7 percent, stocks must fall by 53 percent in real terms over the next 10 years (assuming a 2 percent dividend yield). Increasing the dividend payout does reduce the projected capitalization/GDP ratio materially, but in no case does it reduce the ratio below 7.86 in 2075.

In "What Are Reasonable Long-Run Rates of Return to Expect on Equities?" Shoven examines what is likely to happen to rates of return over the next 75 years. Dividends are irrelevant, because of tax policy; what counts is total cash flow to the investor. In a steady state, the expected return on equities (per share) equals the dividend yield, plus the share buyback yield, plus the growth rate of macroeconomic aggregates. This analysis produces an expected real total return on equities of 6.125 percent (say, 6–6.5 percent). Because of high (3 percent) real rates as projected—not the very high, current TIPS yield—the equity risk premium is only 3–3.5 percent, but these projections require one to reduce the 7 percent real equity return projection used by the Social Security Advisory Board only a little. At a P/E of 15, the real equity return projection would be a little better than 7 percent.

Campbell, John Y., and Robert J. Shiller. 1998. "Valuation Ratios and the Long-Run Stock Market Outlook." *Journal of Portfolio Management*, vol. 28, no. 2 (Winter):11–26. (Updated in Cowles Foundation Discussion Paper #1295, Yale University, March 2001.)

The dividend-to-price ratio (D/P) can forecast either changes in dividend, which is what efficient market theory suggests, or changes in price, or both. Empirically, it forecasts only changes in price. At the current D/P, the forecast is extraordinarily bearish: The stock market will lose about two-thirds of its real value. The forecast becomes less drastically bearish (although still quite bearish) when one uses (dividend + share buybacks), earnings, the 10-year moving average of earnings in constant dollars, or other variables in the denominator. Real stock returns close to zero over the next 10 years are forecast. A number of statistical weaknesses in the analysis are acknowledged: The historical observations are not independent, and the analysis depends on valuation ratios regressing to their historical means, whereas the actual means are not known and could conceivably lie outside the historical range.

The 2001 update reaches the same conclusion and an even more bearish forecast.

[10]Benjamin Graham and David Dodd, *Security Analysis* (New York: McGraw-Hill, 1934).
[11]Clifford S. Asness, "Stocks versus Bonds: Explaining the Equity Risk Premium," *Financial Analysts Journal*, vol. 56, no. 2 (March/ April 2000):96–113.

Carhart, Mark M., and Kurt Winkelmann. 2003. "The Equity Risk Premium." In *Modern Investment Management*. Edited by William N. Goetzmann and Roger G. Ibbotson. Hoboken, NJ: John Wiley & Sons:44–54.

Historical perspective and an equilibrium estimate of the equity risk premium are discussed. The authors estimate that the U.S. corporate bond yield above Treasury bonds is 2.25 percent, and the expected U.S. corporate bond risk premium is thus 1.5 percent after subtracting an expected default loss of 0.75 percent. This amount (1.5 percent) is considered to be the lower bound of the current equity risk premium. Because equity volatility is two or three times higher than that of corporate bonds, the authors "cautiously" suggest an equity risk premium of 3 percent or higher.

Claus, James, and Jacob Thomas. 2001. "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets." *Journal of Finance*, vol. 56, no. 5 (October):1629–1666.

The Ibbotson or historical-extrapolation method gives ERP estimates that are much too high, relative to both purely utility-based estimates (Mehra and Prescott 1985) and estimates based on valuation (for example, Campbell and Shiller 1998). Estimates of the equity risk premium were calculated for each year since 1985 by subtracting the 10-year risk-free rate from the discount rate that equates U.S. stock market valuations with forecasted future flows, and results suggest that the equity risk premium is probably no more than 3 percent. International evidence from Canada, France, Germany, Japan, and the United Kingdom also support this claim. Known upward biases in analysts' earnings forecasts are corrected in making the estimates. Possible reasons why the historical method might have overstated the expected equity risk premium in recent years are discussed.

Cochrane, John H. 1997. "Where Is the Market Going? Uncertain Facts and Novel Theories." *Economic Perspectives*, Federal Reserve Bank of Chicago, vol. 21, no. 6 (November/December):3–37.

This paper summarizes the statistical evidence on average stock return and surveys economic theories that try to explain it. Standard models can only justify a low equity risk premium, whereas new models that can explain the 8 percent historical equity premium drastically modify the description of stock market risk. The author concludes that low forecast stock returns do not imply that the investor should change his portfolio unless he is different from the average investor in risk exposure, attitude, or information.

Constantinides, George M. 1990. "Habit Formation: A Resolution of the Equity Premium Puzzle." *Journal of Political Economy*, vol. 98, no. 3 (June):519–543.

Constantinides introduces habit persistence in an effort to explain the ERP puzzle. This model assumes that an investor's utility is affected by both current and past consumption and that a small drop in consumption can generate a large drop in consumption net of the subsistence level. The author shows that the historical equity premium can be explained if past consumption generates a subsistence level of consumption that is about 80 percent of the normal consumption rate.

———. 2002. "Rational Asset Prices." *Journal of Finance*, vol. 57, no. 4 (August):1567–1591.

This article examines the extent to which historical asset returns can be explained by relaxing the assumptions of the traditional asset pricing model. Constantinides reviews statistical evidence on historical equity returns and premiums and discusses the limitations of existing theories. The author suggests that it is promising to try to explain the equity risk premium by integrating the notions of incomplete market, life-cycle issues, borrowing constraints, and limited stock participation (i.e., stockholdings are concentrated in the hands of the wealthiest few), along with investors' deviation from rationality.

Constantinides, George M., John B. Donaldson, and Rajnish Mehra. 2002. "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 117, no. 1 (February):269–296.

As the correlation of equities with personal income changes over the life of the investor, so does the attractiveness of equities to that investor. The young, who should borrow to smooth consumption and

to invest in equities, can't do so. Therefore, equities are priced almost exclusively by middle-aged investors, who find equities to be unattractive. (Middle-aged investors have a shorter time horizon and also prefer bonds because they smooth consumption in retirement, as wages do when one is working.) The result is a decreased demand for equities and an increased demand for bonds relative to what it would be in a perfectly competitive market. Thus, equities are (on average, over time) underpriced and bonds are overpriced, producing a higher equity risk premium than predicted by Mehra and Prescott (1985).

Cornell, Bradford. 1999. *The Equity Risk Premium*. New York: Wiley.

The literature on the equity risk premium is extensively reviewed and somewhat popularized in this book. The conclusion is that the equity risk premium will be lower in the future than it was in the past. A premium of 3.5–5.5 percent over Treasury bonds and 5–7 percent over Treasury bills is projected.

Dichev, Ilia D. 2007. "What Are Stock Investors' Actual Historical Returns? Evidence from Dollar-Weighted Returns." *American Economic Review*, vol. 97, no. 1 (March):386–401. [added April 2008, abstract by Bruce D. Phelps, CFA]

For the NYSE and Amex, the author finds that dollar-weighted returns are 1.9 percent per year lower on average than value-weighted (or buy-and-hold) returns. For the NASDAQ, dollar-weighted returns are 5.3 percent lower. Similar results hold internationally. Because actual investor returns are lower than published returns, empirical measurements of the equity risk premium and companies' cost of equity are potentially overstated.

Diermeier, Jeffrey J., Roger G. Ibbotson, and Laurence B. Siegel. 1984. "The Supply of Capital Market Returns." *Financial Analysts Journal*, vol. 40, no. 2 (March/April):74–80.

Stock total returns must equal dividend yields plus the growth rate of dividends, which cannot, in the long run, exceed the growth rate of the economy. If infinite-run expected dividend growth exceeded infinite-run expected economic growth, then dividends would crowd out all other economic claims. Net new issues, representing new capital (transferred from the labor market) that is needed so the corporate sector can grow, may cause the dividend growth rate to be slower than the GDP growth rate. Thus, the equity risk premium equals the dividend yield (minus new issues net of share buybacks), plus the GDP growth rate, minus the riskless rate.

As far as we know, this is the first direct application of the dividend discount model of John Burr Williams (writing in the 1930s) and Myron Gordon and Eli Shapiro (in the 1950s) to the question of the equity risk premium for the whole equity market as opposed to an individual company. The "supply side" thread thus begins with this work.

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2002. *Triumph of the Optimists: 101 Years of Global Investment Returns*. Princeton, NJ: Princeton University Press.

This book provides a comprehensive examination of returns on stocks, bonds, bills, inflation, and currencies for 16 countries over the period from 1900 to 2000. This evidence suggests that the high historical equity premium obtained for the United States is comparable with that of other countries. The point estimate of the historical equity premium for the United States and the United Kingdom is about 1.5 percent lower than reported in previous studies, and the authors attribute the difference to index construction bias (for the United Kingdom) and a longer time frame (for the United States). The prospective risk premium that investors can expect going forward is also discussed. The estimated geometric mean premium for the United States is 4.1 percent, 2.4 percent for the United Kingdom, and 3.0 percent for the 16-country world index. Implications for individual investors, investment institutions, and companies are carefully explored.

———. 2003. "Global Evidence on the Equity Risk Premium." *Journal of Applied Corporate Finance*, vol. 15, no. 4 (Summer):27–38.

This article examines the historical equity risk premium for 16 countries using data from 1900 to 2002. The geometric mean annualized equity risk premium for the United States was 5.3 percent, and the average risk premium across the 16 countries was 4.5 percent. The forward-looking risk premium for the world's major markets is likely to be around 3 percent on a geometric mean basis and about 5 percent on an arithmetic mean basis.

———. 2006. "The Worldwide Equity Premium: A Smaller Puzzle." Working paper.

This paper is an updated version of Dimson, Marsh, and Staunton (2003). Using 1900–2005 data for 17 countries, the authors show that the annualized equity premium for the rest of the world was 4.2 percent, not too much below the U.S. equity premium of 5.5 percent over the same period.

The historical equity premium is decomposed into dividend growth, multiple expansion, the dividend yield, and changes in the real exchange rate. Assuming zero change in the real exchange rate and no multiple expansion, and a dividend yield 0.5–1 percent lower than the historical mean (4.49 percent), the authors forecast a geometric equity premium on the world index around 3–3.5 percent and 4.5–5 percent on an arithmetic mean basis.

Elton, Edwin J. 1999. "Presidential Address: Expected Return, Realized Return and Asset Pricing Tests." *Journal of Finance*, vol. 54, no. 4 (August):1199–1220.

At one time, researchers felt they had to (weakly) defend the assumption that expected returns were equal to realized returns. Now, they just make the assumption without defending it. This practice embeds the assumption that information surprises cancel to zero; evidence, however, shows they do not. The implications of this critique are applied to asset-pricing tests, not to the equity risk premium.

Fama, Eugene F., and Kenneth R. French. 1999. "The Corporate Cost of Capital and the Return on Corporate Investment." *Journal of Finance*, vol. 54, no. 6 (December):1939–1967.

The authors use Compustat data to estimate the internal rate of return (IRR) of the capitalization-weighted corporate sector from 1950 to 1996. This IRR, 10.72 percent, is assumed to have been the nominal weighted average cost of capital (WACC). By observing the capital structure and assuming a corporate debt yield 150 bps above Treasuries, and making the usual tax adjustment to the cost of debt, a nominal expected equity total return of 12.8 percent is derived, which produces an equity risk premium of 6.5 percent. The cash flow from the "sale" of securities in 1996 is a large proportion of the total cash flow studied, so the sensitivity of the result to the 1996 valuation is analyzed. Because the period studied is long, the result is not particularly sensitive to the exit price.

———. 2002. "The Equity Premium." *Journal of Finance*, vol. 57, no. 2 (April):637–659.

This paper compares alternative estimates of the unconditional expected stock return between 1872 and 2000, and provides explanation to the low expected return estimates derived from fundamentals such as dividends and earnings for the 1951–2000 period. The authors conclude that the decline in discount rates largely causes the unexplained capital gain of the last half-century.

Faugère, Christophe, and Julian Van Erlach. 2006. "The Equity Premium: Consistent with GDP Growth and Portfolio." *Financial Review*, vol. 41, no. 4 (November):547–564. [added April 2008; abstract by Stephen Phillip Huffman, CFA]

Two macroeconomic equity premium models are derived and tested for consistency with historical data. The first model illustrates that the long-term equity premium is directly related to per capita growth in GDP. The second model, based on a portfolio insurance strategy of buying put options, illustrates that debtholders are paying stockholders an insurance premium, which is essentially the equity premium.

Fisher, Lawrence, and James H. Lorie. 1964. "Rates of Return on Investments in Common Stocks." *Journal of Business*, vol. 37, no. 1 (January):1–21.

This paper presents the first comprehensive data on rates of return on investments in common stocks listed on New York Stock Exchange over the period from 1926 to 1960. The authors show that the annually compounded stock return was 9 percent with reinvestment of dividend for tax-exempt institutions during this period.

Geweke, John. 2001. "A Note on Some Limitations of CRRA Utility." *Economic Letters*, vol. 71, no. 3 (June): 341–345.

This paper points out that the equity premium calculated from the standard growth model in Mehra and Prescott (1985) is quite sensitive to small changes in distribution assumptions. As such, it is questionable to use this kind of growth model to interpret observed economic behavior.

Goyal, Amit, and Ivo Welch. 2006. "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction." Working paper.

This paper examines a wide range of variables that have been proposed by economists to predict the equity premium. The authors find that the prediction models have failed both in sample and out of sample using data from 1975 to 2004 and that out-of-sample predictions of the models are unexpectedly poor. They conclude that "the models would not have helped an investor with access only to the information available at the time to time the market" (p. 1).

Grinold, Richard, and Kenneth Kroner. 2002. "The Equity Risk Premium." *Investment Insights*, Barclays Global Investors, vol. 5, no. 3 (July):1–24.

The authors examine the four components of the expected equity risk premium separately (income return, expected real earnings growth, expected inflation, and expected repricing) and suggest a current risk premium of about 2.5 percent. The authors argue that neither the "rational exuberance" view (5.5 percent equity risk premium) and "risk premium is dead" (zero or negative premium) view can be justified without making extreme and/or irrational assumptions.

The authors also forcefully attack the "puzzle" literature by arguing that literature on the equity risk premium puzzle is too academic and is dependent on unrealistic asset-pricing models.

Ibbotson, Roger G., and Peng Chen. 2003. "Long-Run Stock Returns: Participating in the Real Economy." *Financial Analysts Journal*, vol. 59, no. 1 (January/February):88–98.

If one simply uses the dividend discount model to forecast stock returns, the forecast violates M&M dividend invariance because the current dividend yield is much lower than the average dividend yield over the period from which historical earnings growth rates were taken. Applying M&M intertemporally, lower dividend payouts should result in higher earnings growth rates. The solution is to add, to the straight dividend discount model estimate, an additional-growth term of 2.28 percent *as well as* using a current-dividend number of 2.05 percent, which is what the dividend yield would have been in 2000 if the dividend payout ratio had equaled the historical average of 59.2 percent. The equity risk premium thus estimated is about 4 percent (geometric) or 6 percent (arithmetic), about 1.25 percent lower than the straight historical estimate.

Ibbotson, Roger G., and Rex A. Sinquefield, 1976. "Stocks, Bonds, Bills and Inflation: Year-by-Year Historical Returns (1926–74)." *Journal of Business*, vol. 49, no. 1 (January):11–47. (Updated in *Stocks, Bonds, Bills and Inflation: 2006 Yearbook*; Chicago: Morningstar, 2006.)

Total equity returns consist of a stationary part (the equity risk premium) and a nonstationary part (the interest rate component, which consists of a real interest rate plus compensation for expected inflation). The estimator of the future arithmetic mean equity risk premium is the past arithmetic

mean premium, which is currently about 7 percent. To this is added the current interest rate, 4.8 percent (on 20-year Treasury bonds). The sum of these, about 12 percent, is the arithmetic mean expected total return on equities. This method is justified by the assertion that in the long run, investors should and do conform their expectations to what is actually realizable. As a result, the historical equity risk premium reflects equilibrium at all times and forms the proper estimator of the future equity risk premium. (Note that the 2006 update discusses other methods rather than supporting a doctrinaire "future equals past" interpretation of historical data.)

Jagannathan, Ravi, Ellen R. McGrattan, and Anna Scherbina. 2000. "The Declining U.S. Equity Premium." *Quarterly Review*, Federal Reserve Bank of Minneapolis, vol. 24, no. 4 (Fall):3–19.

The IRR equating expected future dividends from a stock portfolio with the current price is the expected total return on equities; subtracting the bond yield, one arrives at the equity risk premium. This number is estimated at historical points in time and is shown to have declined over the sample period (1926–1999). The expected total return on equities is about the same in the 1990s as it was in the 1960s, but the equity risk premium is smaller because bond yields have increased. The equity risk premium in 1999 is –0.27 percent for the S&P 500, –0.05 percent for the "CRSP portfolio," and 2.71 percent for the "Board of Governors stock portfolio" (a broad-cap portfolio with many small stocks that pay high dividend yields). The analysis is shown to be reasonably robust when tested for sensitivity to the dividend yield being too low because of share repurchases and the bond yield being too high. If dividend growth is assumed equal to GNP growth, instead of being 1.53 percentage points lower as it was historically, then the equity risk premium based on the S&P 500 rises to 1.26 percent.

Jorion, Philippe, and William N. Goetzmann. 1999. "Global Stock Markets in the Twentieth Century." *Journal of Finance*, vol. 54, no. 3 (June):953–980.

The U.S. equity market experience in the 20th century is an unrepresentative sample of what can and does happen. The high equity risk premium observed globally is mostly a result of high equity returns in the United States (with a 4.3 percent real capital appreciation return), which had a large initial weight in the GDP-weighted world index. All other surviving countries had lower returns (with a median real capital appreciation return of 0.8 percent), and there were many nonsurviving countries. Although the large capitalization of the United States was in a sense the market's forecast of continued success, investors did not know in advance that they would be in the highest-returning country or even in a surviving one. Nonsurvival or survival with poor returns should be factored in when reconstructing the history of investor expectations (and should conceivably be factored into current expectations too). This finding contrasts with that of Dimson, Marsh, and Staunton (2002, 2003, 2006).

Kocherlakota, Narayana R. 1996. "The Equity Premium: It Is Still a Puzzle." *Journal of Economic Literature*, vol. 34, no. 1 (March):42–71.

After reviewing the literature on modifications of investor risk preference and on market friction, the author suggests that the ERP puzzle is still unsolved. Kocherlakota concludes that the equity risk premium puzzle should be solved by discovering the fundamental features of goods and asset markets rather than patching existing models.

Kritzman, Mark P. 2001. "The Equity Risk Premium Puzzle: Is It Misspecification of Risk?" *Economics and Portfolio Strategy* (15 March), Peter L. Bernstein, Inc.

Investors do not know when they are going to need their money back (for consumption), so the terminal-wealth criterion used by Mehra and Prescott (1985) to frame the ERP puzzle greatly understates the risk of equities (but not of bonds). In addition, some investors face risk from "breaching a threshold" that is not captured by classical utility theory. Thus, a much higher equity risk premium is justified by utility theory than is proposed by Mehra and Prescott.

Longstaff, Francis A., and Monika Piazzesi. 2004. "Corporate Earnings and the Equity Premium." *Journal of Financial Economics*, vol. 74, no. 3 (December):401–421.

Most studies assume that aggregate dividends equal aggregate consumption. This article argues that separating corporate cash flow from aggregate consumption is critical because "corporate cash flows have historically been far more volatile and sensitive to economic shocks than has aggregate consumption" (p. 402). The authors show that the equity premium consists of three components, identified by allowing aggregate dividends and consumption to follow distinct dynamic processes. The first component is called the consumer-risk premium, which is the Mehra and Prescott (1985) equity risk premium proportional to the variance of consumption growth. The second component is the event-risk premium, which compensates for downward jumps. And the third component is the corporate-risk premium, which is proportional to the covariance between the consumption growth rate and the "corporate fraction" (defined as the ratio of aggregate dividends to consumption). Using a risk aversion parameter of 5, the three components are 0.36 percent, 0.51 percent, and 1.39 percent, summing to a total equity premium of 2.26 percent. The authors admit that their model does not solve the ERP puzzle completely and suggest that the ultimate resolution may lie in the integration of their model with other elements, such as habit formation or investor heterogeneity in incomplete markets.

Lundblad, Christian. 2007. "The Risk Return Tradeoff in the Long Run: 1836–2003." *Journal of Financial Economics*, vol. 85, no. 1 (July):123–150. [added April 2008; abstract by Yazann S. Romahi, CFA]

Although the risk–return trade-off is fundamental to finance, the empirical literature has offered mixed results. The author extends the sample considerably and analyzes nearly two centuries of both U.S. and U.K. market returns and finds a positive and statistically significant risk–return trade-off in line with the postulated theory.

Mankiw, N. Gregory. 1986. "The Equity Premium and the Concentration of Aggregate Shocks." *Journal of Financial Economics*, vol. 17, no. 1 (September):211–219.

This article shows that one cannot judge the appropriateness of the equity premium from aggregate data alone, as Mehra and Prescott (1985) did. In an economy where aggregate shocks are not dispersed equally throughout the population, the equity premium depends on the concentrations of these aggregate shocks in particular investors and can be made arbitrarily large by making the shock more and more concentrated.

Mankiw, N. Gregory, and Stephen P. Zeldes. 1991. "The Consumption of Stockholders and Non-Stockholders." *Journal of Financial Economics*, vol. 29, no. 1 (March):97–112.

This article examines whether the consumption of stockholders differs from that of nonstockholders and whether this difference helps to explain the historical equity risk premium. It shows that aggregate consumption of stockholders is more highly correlated with the stock market and is more volatile than the consumption of nonstockholders. A risk aversion parameter of 6 (relative to the magnitude of 30–40 in Mehra and Prescott 1985) can explain the size of the equity premium based on consumption of stockholders alone.

McGrattan, Ellen R., and Edward C. Prescott. 2000. "Is the Stock Market Overvalued?" *Quarterly Review*, Federal Reserve Bank of Minneapolis (Fall):20–40.

Standard macroeconomic growth theory (Cobb–Douglas, etc.) is used to value the corporate sector in the United States. The current capitalization-to-GDP ratio of 1.8 is justified, so the market is not overvalued. "[T]heory . . . predicts that the real returns on debt and equity should both be near 4 percent" (p. 26). Thus, the predicted equity risk premium is small.

———. 2001. "Taxes, Regulations, and Asset Prices." NBER Working Paper #8623.

This paper shows that the large run-up in equity value relative to GDP between 1962 and 2000 is mainly caused by (1) large reductions in individual tax rates, (2) increased opportunities to hold equity in a nontaxed pension plan, and (3) increases in intangible and foreign capital. The authors argue that the high equity risk premium documented by Mehra and Prescott (1985) is not puzzling after these three factors are accounted for. However, in the future, one should expect no further gains from tax policy; the currently expected real return on equities is about 4 percent, down from 8 percent in the early postwar period.

———. 2003. "Average Debt and Equity Returns: Puzzling?" *American Economic Review*, vol. 93, no. 2 (May):392–397.

This article shows that the realized equity premium in the last century was less than 1 percent after accounting for taxes, regulations, and diversification costs. The authors also argue that Treasury bills "provide considerable liquidity services and are a negligible part of individuals' long-term debt holdings" (p. 393). Long-term savings instruments replace short-term government debt in their equity premium calculation.

Mehra, Rajnish. 2003. "The Equity Premium: Why Is It a Puzzle?" *Financial Analysts Journal*, vol. 59, no. 1 (January/February):54–69.

The ERP puzzle literature is easily misunderstood because of its difficulty. Here, the puzzle is stated in language that is accessible to most finance practitioners. First, empirical facts regarding the returns and risks of major asset classes are presented. Then, the theory responsible for the "puzzle" is summarized. Modern asset pricing theory assumes that economic agents pursue and, on average, get fair deals. When one follows this line of reasoning to its conclusion, using the tools of classic growth and real business cycle theory, an equity risk premium of at most 1 percent emerges. An extensive discussion reveals why this is the case and addresses various attempts made by other authors to resolve the puzzle.

Mehra, Rajnish, and Edward C. Prescott. 1985. "The Equity Premium: A Puzzle." *Journal of Monetary Economics*, vol. 15, no. 2 (March):145–161.

In this seminal work, Mehra and Prescott first document the "equity premium puzzle" using a consumption-based asset-pricing model in which the quantity of risk is defined as the covariance of excess stock return with consumption growth and the price of risk is the coefficient of relative risk aversion. Because of the low risk resulting from the smooth historical growth of consumption, the 6 percent equity risk premium in the 1889–1978 period can only be explained by a very high coefficient of risk aversion in the magnitude of 30 to 40. Risk aversion parameters observed in other aspects of financial behavior are around 1. Such a risk aversion parameter is consistent with at most a 1 percent equity risk premium, and possibly one as small as 0.25 percent.

Note that Mehra and Prescott assumed that consumption was equal to aggregate dividends. Because consumption is very smooth and dividends are not as smooth, this comparison may be troublesome.

Philips, Thomas K. 1999. "Why Do Valuation Ratios Forecast Long-Run Equity Returns?" *Journal of Portfolio Management*, vol. 25, no. 3 (Spring):39–44.

In this article, the Edwards–Bell–Ohlson equation,

$$P_0 = B_0 + \sum_{i=1}^{\infty} \left\{ \frac{E\left[\left(ROE_i - r\right) B_{i-1}\right]}{\left(1+r\right)} \right\},$$

where P is price, B is book value, ROE is return on book equity, r is the expected return on equity, and i is the time increment, is first used to derive closed-form expressions for the expected return on equities, stated in terms of both dividends and earnings. Then, the GDP growth rate is introduced as an indicator of earnings growth. Share repurchases are considered to be a part of dividends. This setup leads to the following conclusions: (1) The expected return increases monotonically with book-to-price ratio (B/P), E/P, and D/P; (2) if a corporation's return on equity equals its cost of capital (expected return), then its price-to-book ratio (P/B) should be 1 and its expected return should equal E/P. The analysis suggests that nominal total expected equity returns shrank from almost 14 percent in 1982 to 6.5 percent in 1999 (a larger decline than can be explained by decreases in unanticipated inflation). This decrease in expected return was accompanied by very high concurrent actual returns that were misread by investors as evidence of an *increase* in the expected return. Going forward, investors will not get an increased return.

Rietz, Thomas A. 1988. "The Equity Risk Premium: A Solution." *Journal of Monetary Economics*, vol. 22, no. 1 (July):117–131.

Rietz suggests that the ERP puzzle can be solved by incorporating a very small probability of a very large drop in consumption. In such a scenario, the risk-free rate is much lower than the equity return. In an article published in the same issue, Mehra and Prescott argued that Rietz's model requires a 1 in 100 chance of a 25 percent decline in consumption to reconcile the equity premium with a risk aversion parameter of 10. However, the author says, the largest consumption decline in the last 100 years was only 8.8 percent. Campbell, Lo, and MacKinlay (see Note 3) point out that "the difficulty with Rietz's argument is that it requires not only an economic catastrophe, but one which affects stock market investors more seriously than investors in the short-term debt instruments" (p. 311).

But during the Great Depression, the stock market fell by 86 percent from peak to trough and dividends fell by about half; consumption by stockholders over that period thus probably fell by much more than 8.8 percent. Aggregate consumption at that time included many lower-income people, especially farmers, whose consumption was not directly affected by falling stock prices.

Shiller, Robert J. 2000. *Irrational Exuberance*. Princeton, NJ: Princeton University Press.

This influential book provides a wealth of historical detail on the equity risk premium. Using 10 years of trailing real earnings (see, originally, Graham and Dodd) to estimate normalized P/Es, Shiller concludes that the market is not only overpriced but well outside the range established by previous periods of high stock prices.

Siegel, Jeremy J. 1999. "The Shrinking Equity Premium." *Journal of Portfolio Management*, vol. 26, no. 1 (Fall):10–19.

In contrast to Siegel (2002), analysis of dividend and earnings multiples suggests a real return (not an equity risk premium) of only 3.1–3.7 percent for stocks, lower than the then-current real TIPS yield. Although then-current high prices suggest higher-than-historical earnings growth, investors are likely to realize lower returns than in the past. (Incidentally, past achieved returns are lower than index returns because of transaction costs and lack of diversification.) On the positive side, the Jorion and Goetzmann (1999) finding that world markets returned a real capital gain of only 0.8 percent from 1921 to the present, compared with 4.3 percent in the United States, is misstated because the analysis is of the median portfolio, not the average. The GDP-weighted average is only 0.28 percent short of the U.S. return and is higher than the U.S. return if converted to dollars (although Jorion and Goetzmann point out that the large initial size of the United States causes the annualized world index return to lie within 1 percent of the U.S. return by construction).

———. 2002. *Stocks for the Long Run*. 3rd ed. New York: McGraw-Hill.

Siegel argues for a U.S. equity risk premium of 2–3 percent, about half of the historic equity risk premium. He expects a future real return on equity of about 6 percent, justified by several positive factors. Siegel considers an equity risk premium as low as 1 percent but clearly sees that stocks must yield more than inflation-indexed bond yields (3.5 percent at the time of the book). He turns to earnings yield arguments to answer the question of how much more. A Tobin's *q* greater than 1 in 2001 leads Siegel to see the earnings yield as understated. In addition, the overinvestment in many technology companies led to a drop in the cost of productivity-enhancing investments, which allows companies to buy back shares or raise dividends. In technology, an excess supply of capital, overbuilding, and a subsequent price collapse provide a technological base to benefit the economy and future shareholder returns. Also, the United States is still seen as an entrepreneurial nation to attract a growing flow of investment funds seeking a safe haven, leading to higher equity prices. Furthermore, short-run room for growth in corporate profits is another positive factor for future real return enhancement.

———. 2005. "Perspectives on the Equity Risk Premium." *Financial Analysts Journal*, vol. 61, no. 6 (November/December):61–73.

This article reviews and discusses the ERP literature as follows: (1) a summary of data used in equity premium calculation and their potential biases, (2) a discussion of academic attempts to find models to fit the data, (3) the practical applications of some proposed models, and (4) a discussion of the future equity risk premium.

Siegel, Jeremy J., and Richard H. Thaler. 1997. "Anomalies: The Equity Premium Puzzle." *Journal of Economic Perspectives*, vol. 11, no. 1 (Winter):191–200.

Proposed resolutions of the ERP puzzle fall into two categories: (1) observations that the stock market is riskier, or the equity risk premium is smaller, than generally thought, and (2) different theoretical frameworks that would make the observed risk aversion rational. Neither approach has been "completely successful" in explaining why, if stocks are so rewarding, investors don't hold more of them.

Weil, Philippe. 1989. "The Equity Premium Puzzle and the Risk-Free Rate Puzzle." *Journal of Monetary Economics*, vol. 24, no. 3 (November):401–421.

A critique of the power utility function used by Mehra and Prescott (1985) is the tight link between risk aversion and intertemporal substitution. This article shows that the ERP puzzle cannot be solved by simply separating risk aversion for intertemporal substitution.

Weitzman, Martin L. "Prior-Sensitive Expectations and Asset-Return Puzzles." Forthcoming. *American Economic Review.*

This article presents one unified Bayesian theory that explains the ERP puzzle, risk-free rate puzzle, and excess volatility puzzle. The author shows that Bayesian updating of unknown structural parameters introduces a permanent thick tail to posterior expectation that can account for, and even reverse, major asset-return puzzles.

Welch, Ivo. 2000. "Views of Financial Economists on the Equity Premium and Professional Controversies." *Journal of Business*, vol. 73, no. 4 (October):501–537.

This paper presents the results of a comprehensive survey of 226 financial economists. The main findings are: (1) the average arithmetic 30-year equity premium forecast is about 7 percent; (2) short-term forecasts are lower than the long-term forecast, in the range of 6–7 percent; (3) economists perceive that their consensus is about 0.5–1 percent higher than it actually is.

———. 2001. "The Equity Premium Consensus Forecast Revisited." Working paper, Yale University.

The equity premium forecast in this 2001 survey declined significantly compared with the 1998 survey. The one-year forecast is 3–3.5 percent, and the 30-year forecast stands at 5–5.5 percent.

I would like to thank Laurence Siegel, research director of the Research Foundation of CFA Institute, for his assistance and for providing much of the foundation for this project with his earlier work on the equity risk premium. I am also grateful to the Research Foundation for financial support.

This publication qualifies for 1 CE credit.

S&P 500® January Price Return: -3.70%
S&P SmallCap 600® January Price Return: -3.45%

The Market

S&P 500

The market began 2010 with a six-day rally (the record is 7 days in 1987) until into the arms of volatility it fell. Over the following five days (days 10 through 14), the market moved at least 1% on higher volume. Later in January, three consecutive days of declines produced a 5.08% loss for the S&P 500, and saw the VIX jump from 17.58 to 27.31. The VIX settled the month at 24.66. The largest daily downturn, however, was the 2.21% decline on January 22nd, which, when compared to 2009 at this time, is mild.

The S&P 500 finished January down 3.70%, its second monthly loss (October 2009 at -1.98%) since the March 2009 recovery. The index is still 58.73% up from its March low, however. Of the 82 Januarys in the history of S&P 500 from 1929, 52 have been positive and 29 have been negative. Of the 52 January gains, 42 were positive for the entire year and 9 were down (1947 was flat). Of the 29 Januarys that were down, 18 were down for the year and 11 were up. The result is that 60 of the 81 (74.1%) Januarys in the index's history ended the full year in the same direction as it opened, and 21 did not (25.9%).

Nine of the ten sectors were down in January, with Health Care posting the only sector gain for the month, at +0.42%. Telecommunications was the sector that was down the most in January, with a 9.32% decline. T, which represents 52% of the sector, was down 9.53% for the month. One-year returns remain strongly positive for eight of the ten sectors, with Telecommunications and Utilities showing mild single-digit gains of +4.62% and +2.19%, respectively.

S&P SmallCap 600

The S&P SmallCap 600 started 2010 with a broad 2.11% advance. Unfortunately, that was the best day of the month for the index. As uncertainty set in with low volume, an upward seesaw period pushed the S&P SmallCap 600 up 3.42% by January 19th, to a market level not seen since October 1, 2008. From there, however, the markets turned negative due to a combination of domestic banking and tax issues, as well as global concerns over China pulling back on its lending. From January 19th on, the index declined 6.64% to post a 3.45% loss for the month; its second monthly loss (October 2009 at -5.79%) since the market recovery started in March 2009. Just as the opening gain was broad, the monthly loss was broad as well with just 188 issues up for the month averaging +9.57%, compared to 536 issues up in December 2009 averaging +10.38%, and 408 issues declining with an average of 7.91% in January versus 63 decliners averaging 5.14% in December 2009.

All ten sectors within the S&P SmallCap 600 were in the red for the month, with Telecommunications declining another 16.73% for a one-year decline of 43.06%. For the year, the other nine sectors remain positive. Of greater concern this month was Information Technology, which declined 6.59% due to concerns regarding sales and growth for 2010 – the sector makes up 17.23% of the index.

Percent Price Change: S&P 500

	JANUARY 2010	3-MONTHS 10/30/2009	YTD 1/30/2009	1-YEAR 1/31/2008	5-YEARS 1/31/2005	FROM 3/24/2000	10-YEARS ANNUALIZED
S&P 500	**-3.70%**	**3.64%**	**30.03%**	**-22.10%**	**-9.09%**	**-29.70%**	**-2.58%**
Consumer Discret	-2.95%	8.07%	50.70%	-10.93%	-14.63%	-20.06%	-1.83%
Consumer Staples	-1.25%	1.86%	18.93%	-4.47%	13.07%	62.68%	3.40%
Energy	-4.51%	-2.76%	9.74%	-23.57%	38.48%	96.10%	6.97%
Financials	-1.48%	1.00%	53.98%	-51.01%	-52.46%	-42.89%	-4.77%
Health Care	0.42%	11.56%	19.10%	-6.64%	7.26%	13.61%	0.50%
Industrials	-1.21%	8.57%	32.64%	-29.09%	-14.79%	-11.99%	-0.34%
Info Technology	-8.45%	1.50%	51.05%	-5.76%	8.69%	-65.39%	-7.57%
Materials	-8.66%	3.13%	43.00%	-26.82%	2.84%	33.80%	2.61%
Telecomm Svc	-9.32%	0.88%	4.64%	-31.44%	-12.86%	-67.16%	-10.38%
Utilities	-5.10%	4.01%	2.19%	-25.43%	3.89%	1.43%	-0.50%

Percent Price Change: S&P SmallCap 600

	JANUARY 2010	3-MONTHS (10/31/2009)	1-YEAR (1/31/2009)	2-YEAR (1/31/2008)	3-YEAR (1/31/2007)	FROM 10/9/2002	FROM 3/24/2000
S&P 600	**-3.45%**	**7.38%**	**37.05%**	**-14.48%**	**-21.29%**	**88.10%**	**46.55%**
Energy	-5.26%	3.74%	60.59%	-9.71%	1.62%	303.66%	302.64%
Materials	-8.01%	7.88%	62.65%	-24.88%	-28.20%	120.60%	77.72%
Industrials	-4.88%	4.64%	27.30%	-16.83%	-15.91%	116.51%	78.66%
Consumer Discret	-1.51%	7.41%	71.32%	-14.55%	-37.70%	38.20%	43.04%
Consumer Staples	-2.97%	7.97%	43.49%	22.40%	14.87%	119.80%	197.26%
Health Care	-1.41%	12.09%	29.63%	-9.55%	-3.01%	114.02%	119.27%
Financials	-0.17%	9.74%	18.29%	-35.00%	-50.98%	-1.04%	37.27%
Info Technology	-6.59%	5.83%	50.75%	-7.81%	-10.25%	115.33%	-45.84%
Telecomm Svc	-16.72%	-3.95%	-43.06%	-75.88%	-85.81%	-72.04%	-98.22%
Utilities	-3.88%	4.71%	1.63%	-4.61%	-7.29%	87.29%	109.23%

Breadth

Monthly Breadth: S&P 500

PERIOD	UP ISSUES	UNCHANGED ISSUES	DOWN ISSUES	AVERAGE % CHANGE	TOP 10 BY MKT VAL % AVG CHG	TOP 50 BY MKT VAL % AVG CHG	S&P 500 % CHANGE
Jan,'10	133	1	366	-3.16	-2.62	-2.89	-3.70
Dec,'09	377	0	123	4.63	-0.16	0.75	1.78
Nov,'09	403	2	95	5.19	5.65	6.29	5.74
Oct,'09	162	0	338	-3.52	-0.22	-0.65	-1.98

Monthly Breadth: S&P SmallCap 600

PERIOD	AVERAGE % CHANGE	UP ISSUES	AVERAGE % CHANGE	DOWN ISSUES	AVERAGE % CHANGE	TOP 100	BOTTOM 100	S&P 600 % CHANGE
Jan,'10	-2.38	188	9.57	408	-7.91	-3.02	-1.25	-3.45
Dec,'09	8.73	536	10.38	63	-5.14	9.73	8.78	8.49
Nov,'09	2.59	346	9.35	254	-6.61	4.48	-0.50	2.53
Oct,'09	-7.13	134	6.84	466	-11.14	-3.03	-15.79	-5.79

Earnings

S&P 500

With 214 issues (56.2% of the market value) reported, earnings on a weighted basis are running well above expectations, and are drastically better than the Q4 2008 comparisons – a quarter which posted the worst earnings in S&P 500 history. Sales in aggregate are running 4.1% ahead of estimates and 6.5% above Q4 2008. However, ex the Financials sector, sales are only up 2.6% from estimates and 3.3% from Q4 2008. Operating margins are high again at 8.09%, with S&P’s full quarter estimate at 7.22%, as slow growth is offset by prior cost cutting to produce a bottom-line improvement. As Reported margins are at 7.15%, and are expected to decline to 6.45% as some unusual items are posted. Overall, however, the numbers show continued bottom-line improvement but a much slower top-line advance. For the recovery to continue, sales will need to increase.

To date, 75.6% of the issues have beaten their estimated sales, with 57.9% beating last year's sales, and 48.3% beating both. 71.8% of the issues have beaten their estimated Operating EPS, with 65.6% beating last year's EPS, and 46.7% doing both.

S&P SmallCap 600

Price-to-earnings ratios were high based on 2009 EPS. EPS ratios were more moderate when based on 2010, however, reflecting the expected 81% gain in 2010 over 2009 after a 4% decline over 2008 and a 46% decline in 2007.

Operating EPS Change: S&P 500

QUARTERTLY CHANGE	Q2 2009 OVER Q2 2008	Q3 2009 OVER Q3 2008	Q4 2009 OVER Q4 2008	Q1 2010 OVER Q1 2009
S&P 500	-18.85%	-1.12%	17966.84%	69.56%
Consumer Discretionary	65.35%	157.35%	1019.15%	676.41%
Consumer Staples	8.11%	4.62%	8.62%	9.24%
Energy	-66.26%	-71.39%	49.80%	1621.39%
Financials	196.09%	124.71%	112.56%	439.59%
Health Care	4.13%	10.11%	19.56%	10.55%
Industrials	-37.18%	-40.63%	-19.67%	10.31%
Information Technology	-20.55%	3.03%	122.00%	73.09%
Materials	-64.80%	-33.90%	142.73%	143.17%
Telecommunication Services	-16.41%	-10.58%	-2.30%	-4.20%
Utilities	-5.93%	-4.99%	6.85%	9.58%

Operating EPS Change: S&P SmallCap 600

QUARTERTLY CHANGE	Q2 2009 OVER Q2 2008	Q3 2009 OVER Q3 2008	Q4 2009 OVER Q4 2008	Q1 2010 OVER Q1 2009
S&P SmallCap600	-57.13%	-35.55%	493.88%	429.73%
Consumer Discretionary	-59.66%	358.06%	329.84%	281.99%
Consumer Staples	11.56%	29.63%	-20.91%	-15.48%
Energy	-67.30%	-81.54%	120.96%	318.75%
Financials	-150.98%	-402.69%	118.69%	170.44%
Health Care	-1.77%	31.90%	10.66%	19.31%
Industrials	-45.62%	-32.85%	9.16%	55.84%
Information Technology	-95.01%	-1.50%	1085.37%	410.76%
Materials	-39.48%	-12.02%	181.71%	31381.27%
Telecommunication Services	-102.48%	-75.38%	113.10%	-51.93%
Utilities	0.32%	-42.44%	11.48%	11.83%

Returns

Monthly Returns: S&P 500

MONTH OF	PRICE CLOSE	PRICE CHANGE	1 MONTH % CHANGE	3 MONTH % CHANGE	6 MONTH % CHANGE	1 YEAR % CHANGE
01/2010	1073.87	-41.23	-3.70%	3.64%	8.75%	30.03%
12/2009	1115.10	19.47	1.78%	5.49%	21.30%	23.45%
11/2009	1095.63	59.44	5.74%	7.35%	19.20%	22.25%
10/2009	1036.19	-20.88	-1.98%	4.93%	18.72%	6.96%
09/2009	1057.08	36.45	3.57%	14.98%	32.49%	-9.37%
08/2009	1020.62	33.14	3.36%	11.04%	38.84%	-20.44%
07/2009	987.48	68.16	7.41%	13.14%	19.57%	-22.08%
06/2009	919.32	0.18	0.02%	15.22%	1.78%	-28.18%
05/2009	919.14	46.33	5.31%	25.04%	2.56%	-34.36%
04/2009	872.81	74.94	9.39%	5.68%	-9.90%	-37.01%
03/2009	797.87	62.77	8.54%	-11.67%	-31.59%	-39.68%
02/2009	735.09	-90.79	-10.99%	-17.98%	-42.70%	-44.76%
01/2009	825.88	-77.37	-8.57%	-14.75%	-34.84%	-40.09%

Monthly Returns: S&P SmallCap 600

MONTH OF	PRICE CLOSE	PRICE CHANGE	1 MONTH % CHANGE	3 MONTH % CHANGE	6 MONTH % CHANGE	1 YEAR CHANGE
01/2010	321.14	-11.49	-3.45%	7.38%	8.59%	37.05%
12/2009	332.63	26.02	8.49%	4.79%	23.97%	23.78%
11/2009	306.62	7.56	2.53%	1.45%	15.75%	20.83%
10/2009	299.06	-18.37	-5.79%	1.13%	14.61%	3.96%
09/2009	317.43	15.21	5.03%	18.30%	42.71%	-11.99%
08/2009	302.22	6.50	2.20%	14.09%	46.74%	-21.98%
07/2009	295.73	27.40	10.21%	13.33%	26.21%	-20.53%
06/2009	268.32	3.43	1.30%	20.63%	-0.15%	-26.48%
05/2009	264.89	3.96	1.52%	28.61%	4.39%	-32.99%
04/2009	260.93	38.50	17.31%	11.36%	-9.29%	-31.13%
03/2009	222.43	16.47	8.00%	-17.23%	-38.33%	-38.99%
02/2009	205.96	-28.36	-12.10%	-18.84%	-46.83%	-43.37%
01/2009	234.32	-34.41	-12.80%	-18.55%	-37.03%	-37.60%

Dividends

S&P 500

2009 marked the worst year on record for dividends since 1955. For the year, there were 1,191 increases, which is a drop of 36.4% from the 1,874 increases of 2008, and a 52.6% decline from the 2,513 increases of 2007. The year saw 804 decreases, marking a 631% gain over the 110 decreases of 2007.

In January, 15 issues increased, 3 initiated, 0 decreased and 0 suspended versus 17 increases, 0 initiations, 10 decreases, and 1 suspension for the same period in 2009 and 31 increases, 0 initiations, 5 decreases, and 1 suspension for January 2008. For the month, payers outperformed non-payers by losing less: payers were down 2.48% compared to non-payers decline of 4.75%. Outside of the S&P 500 (NY, ASE, NASD common) dividends continued to improve. January saw 133 increases compared to 114 increases for January 2009 and 223 increases for January 2008, and 17 decreases for the month compared to 92 decreases in January 2009 and 20 decreases in January 2008.

Issue Indicated Dividend Rate Change: S&P 500

	INCREASES	INITIALS	DECREASES	SUSPENSIONS
2010: January	15	3	1	0
2009: January	17	0	10	1
2008: January	31	0	5	1
2007: January	28	1	1	1

Dividend Total Return Performance: S&P 500

	Average S&P 500 Payers	Average S&P 500 Non-payers
Month - average change	-2.48%	-4.75%
12 Month	35.82%	62.99%
Issues	366	134
Average Yield	2.03%	

World Markets

Global markets started 2010 positive, continuing to add to their 34% 2009 record. However, as January progressed, the markets lost momentum. While rates remained relatively stable, China moved to restrict its lending policy and excess liquidity in an effort to reduce the speed of growth. As a result, China posted a 10.7% Q4 2009 GDP gain, while in the United States, Q4 2009 GDP came in higher than expected at 5.7%. For the month, emerging markets were mixed, with seven markets gaining and thirteen declining. Overall, emerging markets were down 5.33%, with Egypt up 8.34% and Taiwan (-6.86%), China (-8.49%), and Brazil (-10.62%) all declining. Developed markets were down 3.97% in January, with 22 of the 25 markets in the red. Notable was Japan, which gained 2.00%, Greece which declined 10.86% due to debt issues, and the United States which was down 3.51% for the month.

S&P Global Broad Market Index (BMI): Emerging, January 2010

BMI MEMBER	1-MONTH	3-MONTHS	1 YEAR	2-YEARS
Global	**-4.12%**	**1.77%**	**40.45%**	**-21.47%**
Global Ex-U.S.	**-4.56%**	**0.01%**	**46.43%**	**-22.24%**
Emerging	**-5.33%**	**3.12%**	**83.31%**	**-11.68%**
Egypt	8.34%	-2.17%	72.67%	-33.37%
Turkey	3.87%	16.66%	128.75%	0.64%
Indonesia	3.14%	11.64%	155.55%	-8.21%
Czech Republic	3.11%	0.00%	51.61%	-25.56%
Russia	2.44%	9.08%	144.23%	-33.56%
Chile	1.98%	14.90%	68.66%	11.51%
Israel	1.17%	12.39%	61.26%	8.63%
Morocco	0.61%	-3.04%	15.84%	-24.42%
Hungary	0.48%	2.56%	132.88%	-25.45%
Malaysia	-0.43%	0.65%	50.41%	-17.59%
Poland	-1.61%	4.30%	83.79%	-33.41%
India	-4.35%	7.07%	92.76%	-21.55%
Philippines	-4.80%	2.83%	65.36%	-20.07%
Thailand	-5.12%	2.35%	71.25%	-12.61%
South Africa	-5.29%	4.52%	66.91%	-2.01%
Mexico	-5.55%	6.23%	67.88%	-17.82%
Peru	-5.78%	-3.61%	84.80%	3.61%
Taiwan	-6.86%	6.11%	89.69%	-1.33%
China	-8.49%	-4.15%	65.47%	-9.41%
Brazil	-10.62%	-1.51%	93.46%	-5.85%

S&P Global Broad Market Index (BMI): Developed, January 2010

BMI MEMBER	1-MONTH	3-MONTHS	1 YEAR	2-YEARS
Developed	**-3.97%**	1.60%	36.31%	-22.57%
Developed Ex-U.S.	**-4.37%**	-0.72%	39.57%	-24.42%
Denmark	**2.32%**	3.73%	45.83%	-19.91%
Finland	**2.01%**	7.33%	39.78%	-43.76%
Japan	**2.00%**	0.72%	13.40%	-21.53%
Ireland	**-1.60%**	6.21%	54.33%	-56.13%
Belgium	**-2.21%**	-0.33%	56.64%	-42.30%
Sweden	**-2.33%**	-2.27%	81.62%	-14.09%
Switzerland	**-2.85%**	0.26%	36.85%	-10.91%
Netherlands	**-3.40%**	2.17%	48.63%	-22.99%
United States	**-3.51%**	4.37%	32.67%	-20.52%
Austria	**-3.55%**	-4.98%	62.25%	-39.56%
Norway	**-4.12%**	5.66%	78.79%	-22.51%
United Kingdom	**-4.37%**	0.02%	41.59%	-28.01%
New Zealand	**-4.84%**	-4.66%	50.53%	-31.39%
Korea	**-5.01%**	2.99%	67.25%	-18.34%
Singapore	**-5.57%**	3.70%	76.54%	-10.39%
Hong Kong	**-6.07%**	-3.75%	57.29%	-17.62%
France	**-6.89%**	-2.54%	38.22%	-25.28%
Canada	**-7.07%**	3.17%	51.35%	-19.66%
Australia	**-7.28%**	-3.32%	84.57%	-18.80%
Italy	**-8.05%**	-6.18%	32.12%	-40.22%
Germany	**-8.40%**	-2.49%	37.41%	-30.76%
Portugal	**-9.62%**	-10.10%	31.06%	-34.63%
Greece	**-10.86%**	-30.37%	19.09%	-57.94%
Luxembourg	**-10.99%**	13.31%	66.00%	-34.94%
Spain	**-11.17%**	-10.20%	35.00%	-26.11%

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2014 OASDI Trustees Report

2. Estimates as a Percentage of Gross Domestic Product

This section contains long-range projections of the operations of the theoretical combined Old-Age and Survivors Insurance and Disability Insurance (OASI and DI) Trust Funds and of the Hospital Insurance (HI) Trust Fund, expressed as a percentage of gross domestic product (GDP). While expressing fund operations as a percentage of taxable payroll is the most useful approach for assessing the financial status of the programs (see section IV.B.1), expressing them as a percentage of the total value of goods and services produced in the United States provides an additional perspective.

Table VI.G4 shows non-interest income, total cost, and the resulting balance of the combined OASI and DI Trust Funds, of the HI Trust Fund, and of the combined OASI, DI, and HI Trust Funds, expressed as percentages of GDP on the basis of each of the three alternative sets of assumptions. Table VI.G4 also contains estimates of GDP. For OASDI, non-interest income consists of payroll tax contributions, proceeds from taxation of benefits, and reimbursements from the General Fund of the Treasury, if any. Cost consists of scheduled benefits, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. For HI, non-interest income consists of payroll tax contributions (including contributions from railroad employment), up to an additional 0.9 percent tax on earned income for relatively high earners, proceeds from taxation of OASDI benefits, and reimbursements from the General Fund of the Treasury, if any. Cost consists of outlays (benefits and administrative expenses) for insured beneficiaries. The Trustees show income and cost estimates on a cash basis for the OASDI program and on an incurred basis for the HI program.

The Trustees project the OASDI annual balance (non-interest income less cost) as a percentage of GDP to be negative throughout the projection period under the intermediate and high-cost assumptions, and to be negative through 2076 under the low-cost assumptions. Under the low-cost assumptions the OASDI annual deficit as a percentage of GDP decreases through 2018. After 2018, deficits increase to a peak in 2033 and then decrease through 2076, after which annual balances are positive, reaching 0.07 percent of GDP in 2088. Under the intermediate assumptions, annual deficits decrease from 2014 to 2015, generally increase through 2037, decrease from 2037 through 2051, and mostly increase thereafter. Under the high-cost assumptions, annual deficits increase throughout the projection period.

The Trustees project that the HI balance as a percentage of GDP will be positive throughout the projection period under the low-cost assumptions. Under the intermediate assumptions, the HI balance is negative for each year of the projection period except for 2015-21. Annual deficits increase through 2049 and remain relatively stable thereafter. Under the high-cost assumptions, the HI balance is negative for all years of the projection period. Annual deficits reach a peak in 2075 and mostly decline thereafter.

The combined OASDI and HI annual balance as a percentage of GDP is negative throughout the projection period under both the intermediate and high-cost assumptions. Under the low-cost assumptions, the combined OASDI and HI balance is negative through 2015, positive from 2016 through 2024, negative from 2025 through 2037, and then positive and mostly rising thereafter. Under the intermediate assumptions, combined OASDI and HI annual deficits decline from 2014 through 2017, increase from 2017 through 2041, and mostly decrease through 2052. After 2052, annual deficits generally rise, reaching 2.18 percent of GDP by 2088. Under the high-cost assumptions, combined annual deficits rise throughout the projection period.

By 2088, the combined OASDI and HI annual balances as percentages of GDP range from a positive balance of 0.85 percent for the low-cost assumptions to a deficit of 7.01 percent for the high-cost assumptions. Balances differ by a much smaller amount for the tenth year, 2023, ranging from a positive balance of 0.11 percent for the low-cost assumptions to a deficit of 1.82 percent for the high-cost assumptions.

The summarized long-range (75-year) balance as a percentage of GDP for the combined OASDI and HI programs varies among the three alternatives by a relatively large amount, from a positive balance of 0.53 percent under the low-cost assumptions to a deficit of 4.20 percent under the high-cost assumptions. The 25-year summarized balance varies by a smaller amount, from a positive balance of 0.35 percent to a deficit of 2.12 percent. Summarized rates are calculated on a present-value basis. They include the trust fund balances on January 1, 2014 and the cost of reaching a target trust fund level equal to 100 percent of the following year's annual cost at the end of the period. (See section IV.B.4 for further explanation.)

Table VI.G4.—OASDI and HI Annual and Summarized Income, Cost, and Balance as a Percentage of GDP, Calendar Years 2014-90

	Percentage of GDP									
	OASDI			HI			Combined			GDP in dollars
Calendar year	Income[a]	Cost	Balance	Income[a]	Cost	Balance	Income[a]	Cost	Balance	(billions)
Intermediate:										
2014	4.46	4.92	-0.45	1.45	1.50	-0.05	5.92	6.42	-0.50	$17,557
2015	4.57	4.94	-.37	1.47	1.44	.03	6.04	6.38	-.34	18,426
2016	4.59	4.97	-.38	1.49	1.44	.05	6.08	6.41	-.33	19,377
2017	4.63	5.01	-.38	1.51	1.45	.06	6.14	6.46	-.32	20,400
2018	4.67	5.06	-.39	1.53	1.48	.05	6.20	6.55	-.34	21,475
2019	4.70	5.13	-.44	1.54	1.50	.04	6.24	6.63	-.39	22,578
2020	4.71	5.21	-.50	1.55	1.53	.02	6.27	6.74	-.47	23,694
2021	4.73	5.29	-.55	1.56	1.56	[b]	6.30	6.85	-.55	24,815
2022	4.75	5.38	-.63	1.57	1.60	-.03	6.32	6.98	-.66	25,935
2023	4.76	5.48	-.72	1.58	1.63	-.05	6.34	7.11	-.77	27,091
2025	4.76	5.66	-.90	1.60	1.74	-.15	6.36	7.41	-1.05	29,575
2030	4.76	6.01	-1.25	1.63	1.91	-.28	6.39	7.92	-1.53	36,750
2035	4.75	6.16	-1.41	1.66	2.06	-.40	6.41	8.21	-1.81	45,659
2040	4.73	6.12	-1.39	1.67	2.17	-.50	6.40	8.29	-1.89	57,003
2045	4.70	6.03	-1.33	1.69	2.24	-.55	6.39	8.27	-1.88	71,254
2050	4.67	5.97	-1.30	1.70	2.26	-.56	6.37	8.24	-1.87	88,833

2055	4.64	5.97	-1.33	1.72	2.27	-.54	6.36	8.24	-1.88	110,392
2060	4.61	6.01	-1.40	1.74	2.28	-.54	6.35	8.29	-1.94	136,921
2065	4.58	6.05	-1.47	1.76	2.31	-.55	6.34	8.36	-2.02	169,890
2070	4.55	6.09	-1.54	1.77	2.35	-.57	6.32	8.44	-2.11	211,004
2075	4.52	6.10	-1.57	1.78	2.38	-.59	6.31	8.47	-2.16	262,181
2080	4.50	6.07	-1.57	1.79	2.37	-.58	6.29	8.44	-2.15	325,644
2085	4.48	6.08	-1.61	1.80	2.36	-.55	6.28	8.44	-2.16	403,770
2090	4.46	6.14	-1.68	1.82	2.34	-.52	6.28	8.48	-2.20	499,900
Summarized rates: c										
25-year:										
2014-38	5.33	5.87	-.54	1.64	1.83	-.19	6.97	7.70	-.73	
50-year:										
2014-63	5.04	5.91	-.87	1.67	2.00	-.34	6.71	7.91	-1.20	
75-year:										
2014-88	4.91	5.93	-1.02	1.70	2.08	-.39	6.61	8.01	-1.41	
Low-cost:										
2014	4.44	4.85	-.40	1.45	1.45	b	5.90	6.29	-.40	17,771
2015	4.58	4.77	-.18	1.47	1.35	.12	6.06	6.12	-.06	19,032
2016	4.59	4.73	-.14	1.49	1.32	.17	6.08	6.05	.03	20,464
2017	4.65	4.73	-.08	1.51	1.30	.21	6.16	6.04	.12	21,918
2018	4.71	4.76	-.06	1.53	1.31	.22	6.23	6.07	.16	23,335
2019	4.74	4.80	-.06	1.54	1.29	.24	6.28	6.09	.18	24,843
2020	4.76	4.84	-.08	1.55	1.29	.25	6.31	6.13	.18	26,401
2021	4.79	4.88	-.09	1.56	1.30	.26	6.34	6.18	.17	27,969
2022	4.82	4.93	-.12	1.57	1.30	.26	6.38	6.24	.15	29,611
2023	4.84	4.99	-.16	1.57	1.31	.27	6.41	6.30	.11	31,324
2025	4.84	5.10	-.26	1.59	1.34	.25	6.44	6.44	-.01	35,064
2030	4.85	5.28	-.43	1.64	1.34	.30	6.49	6.62	-.13	46,398
2035	4.85	5.31	-.45	1.68	1.31	.37	6.53	6.61	-.08	61,419
2040	4.85	5.20	-.35	1.71	1.23	.48	6.56	6.43	.13	81,834
2045	4.84	5.06	-.22	1.74	1.17	.57	6.58	6.23	.35	109,456
2050	4.82	4.97	-.14	1.77	1.12	.65	6.59	6.08	.51	146,344
2055	4.81	4.93	-.12	1.80	1.08	.72	6.61	6.01	.60	195,464
2060	4.80	4.93	-.13	1.83	1.07	.76	6.63	6.00	.63	261,102
2065	4.79	4.91	-.11	1.85	1.08	.76	6.64	5.99	.65	349,338
2070	4.78	4.87	-.09	1.87	1.11	.76	6.65	5.98	.66	468,439
2075	4.77	4.80	-.03	1.88	1.13	.75	6.65	5.94	.72	629,283
2080	4.77	4.71	.06	1.89	1.14	.75	6.66	5.85	.81	845,859
2085	4.77	4.68	.09	1.91	1.14	.77	6.67	5.82	.86	1,135,314
2090	4.77	4.72	.06	1.93	1.15	.78	6.70	5.86	.84	1,521,298
Low-cost (Cont.):										
Summarized rates: c										
25-year:										

2014-38	5.36	5.28	.08	1.64	1.37	.27	6.99	6.65	.35	
50-year:										
2014-63	5.12	5.13	-.01	1.70	1.25	.45	6.82	6.38	.43	
75-year:										
2014-88	5.03	5.03	b	1.75	1.22	.53	6.77	6.24	.53	
High-cost:										
2014	4.49	5.01	-.52	1.45	1.56	-.11	5.94	6.57	-.63	17,268
2015	4.54	5.14	-.61	1.47	1.54	-.08	6.01	6.69	-.68	17,750
2016	4.57	5.26	-.68	1.49	1.57	-.08	6.06	6.83	-.77	18,332
2017	4.60	5.35	-.75	1.51	1.61	-.10	6.11	6.97	-.85	19,002
2018	4.64	5.46	-.82	1.53	1.68	-.15	6.17	7.15	-.98	19,710
2019	4.65	5.58	-.92	1.54	1.74	-.19	6.20	7.32	-1.12	20,442
2020	4.67	5.70	-1.03	1.56	1.81	-.25	6.23	7.51	-1.29	21,200
2021	4.68	5.80	-1.12	1.57	1.89	-.32	6.25	7.69	-1.44	21,983
2022	4.69	5.92	-1.23	1.59	1.98	-.39	6.28	7.90	-1.62	22,758
2023	4.70	6.05	-1.36	1.60	2.06	-.46	6.29	8.11	-1.82	23,522
2025	4.70	6.31	-1.62	1.61	2.29	-.68	6.30	8.60	-2.30	25,060
2030	4.68	6.85	-2.17	1.63	2.76	-1.12	6.32	9.61	-3.30	29,275
2035	4.66	7.16	-2.49	1.65	3.28	-1.63	6.31	10.44	-4.12	34,167
2040	4.63	7.25	-2.61	1.66	3.77	-2.11	6.29	11.01	-4.72	39,978
2045	4.59	7.25	-2.66	1.66	4.21	-2.55	6.25	11.46	-5.21	46,683
2050	4.54	7.26	-2.72	1.66	4.51	-2.85	6.20	11.77	-5.57	54,209
2055	4.49	7.34	-2.84	1.66	4.68	-3.02	6.16	12.02	-5.86	62,586
2060	4.45	7.46	-3.01	1.67	4.77	-3.11	6.12	12.24	-6.12	71,948
2065	4.41	7.61	-3.20	1.67	4.82	-3.14	6.08	12.43	-6.34	82,599
2070	4.37	7.77	-3.41	1.68	4.87	-3.19	6.05	12.64	-6.59	94,757
2075	4.33	7.92	-3.59	1.69	4.90	-3.20	6.02	12.81	-6.79	108,592
2080	4.29	8.02	-3.73	1.70	4.86	-3.16	5.99	12.88	-6.89	124,200
2085	4.25	8.14	-3.88	1.71	4.79	-3.08	5.96	12.93	-6.97	141,718
2090	4.22	8.25	-4.03	1.72	4.83	-3.12	5.94	13.09	-7.15	161,487
Summarized rates: c										
25-year:										
2014-38	5.32	6.57	-1.26	1.64	2.50	-.86	6.96	9.07	-2.12	
50-year:										
2014-63	4.98	6.86	-1.88	1.65	3.30	-1.65	6.63	10.16	-3.53	
75-year:										
2014-88	4.83	7.07	-2.24	1.66	3.63	-1.97	6.49	10.70	-4.20	

[a] Income for individual years excludes interest on the trust funds. Interest is implicit in all summarized values.

[b] Between 0 and 0.005 percent of GDP.

[c] Summarized rates are calculated on a present-value basis. They include the value of the trust funds on January 1, 2014 and the cost of reaching a target trust fund level equal to 100 percent of annual cost at the end of the period.

Note: Totals do not necessarily equal the sums of rounded components.

To compare trust fund operations expressed as percentages of taxable payroll and those expressed as percentages of GDP, table VI.G5 displays ratios of OASDI taxable payroll to GDP. HI taxable payroll is about 25 percent larger than the OASDI taxable payroll throughout the long-range period; see section 1 of this appendix for a detailed description of the difference. The cost as a percentage of GDP is equal to the cost as a percentage of taxable payroll multiplied by the ratio of taxable payroll to GDP.

Table VI.G5.—Ratio of OASDI Taxable Payroll to GDP, Calendar Years 2014-90

Calendar year	Intermediate	Low-cost	High-cost
2014	0.352	0.353	0.352
2015	.353	.354	.352
2016	.356	.357	.354
2017	.359	.361	.355
2018	.361	.365	.357
2019	.363	.367	.358
2020	.364	.369	.358
2021	.365	.370	.358
2022	.365	.372	.359
2023	.365	.373	.358
2025	.364	.373	.357
2030	.362	.372	.353
2035	.360	.372	.350
2040	.358	.371	.347
2045	.356	.371	.343
2050	.354	.370	.338
2055	.351	.369	.334
2060	.348	.368	.330
2065	.346	.367	.326
2070	.343	.367	.322
2075	.341	.366	.318
2080	.339	.366	.314
2085	.337	.366	.311
2090	.336	.367	.308

Projections of GDP reflect projected increases in U.S. employment, labor productivity, average hours worked, and the GDP deflator. Projections of taxable payroll reflect the components of growth in GDP along with assumed changes in the ratio of worker compensation to GDP, the ratio of earnings to worker compensation, the ratio of OASDI covered earnings to total earnings, and the ratio of taxable to total covered earnings.

Over the long-range period, the Trustees project that the ratio of OASDI taxable payroll to GDP will decline mostly due to a projected decline in the ratio of wages to employee compensation. Over the last five complete economic cycles, the ratio of wages to employee compensation declined at an average annual rate of 0.25 percent. The Trustees project that the ratio of wages to employee compensation will continue to decline, over the 65-year period ending in 2088, at an average annual rate of 0.03, 0.13, and 0.23 percent for the low-cost, intermediate, and high-cost assumptions, respectively.

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Journal of Accounting Research
Vol. 28 No. 2 Autumn 1990
Printed in U.S.A.

Predicting Individual Analyst Earnings Forecasts

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1. *Introduction*

In this study I propose and test a model that predicts individual analyst forecasts of corporate earnings per share (*EPS*) using the change in the mean consensus forecast of other analysts since the date of the analyst's current outstanding forecast; the deviation of the analyst's current forecast from the consensus forecast; and cumulative stock returns since the date of the analyst's current forecast. I find that these three variables explain about 38% of the variability in analyst forecast revisions. While there is evidence of a relation between changes in earnings expectations and price changes, virtually all of the explanatory power of my model arises from *other* analyst forecasts.

Section 2 describes the data bases used and the sample selection process. Section 3 presents the model and method for predicting individual analyst forecasts. Section 4 reports the bias and accuracy of the predicted forecasts. Conclusions are in section 5.

2. *Data Bases and Sample Selection Process*

Individual analyst forecasts of annual *EPS* are supplied by Zacks Investment Research (Zacks). Daily returns data for firms listed on the New York Stock Exchange or American Stock Exchange are provided by the Center for Research in Security Prices (*CRSP*) at the University of Chicago.

* University of Pennsylvania. I received helpful comments from Larry Brown, Nick Gonedes, Prem Jain, Rick Lambert, Dave Larcker, Don Lewin, Jody Magliolo, participants at the 1989 International Symposium on Forecasting, and an anonymous referee. I appreciate the financial support of the KPMG Peat Marwick Foundation, Deloitte Haskins & Sells, and the Institute for Quantitative Research in Finance. I am also grateful to Zacks Investment Research, Inc. for supplying the analyst forecasts.

Individual analyst forecast revisions included in the sample meet these four criteria: (1) the forecast revision and the fiscal year-end of the firm are within 1980–85; (2) stock return data are available on the *CRSP Daily Returns File* of NYSE and ASE firms; (3) the forecast revision date is within 200 trading days of the date of the analyst's prior forecast and within the current fiscal year of the firm; (4) there are at least two analysts with an outstanding forecast for the firm on the dates of the original forecast and the revision.

Table 1 summarizes the sample selection process. Of the approximately 3,600 firms on the Zacks data base for fiscal year-ends within 1980–85, about 1,500 have revisions that meet the sample selection criteria. No industry appears to be missing from the final sample, which includes many banks and utilities as well as industrial companies. However, excluded firms are, on average, smaller than sample firms. Thus, the inferences made from the final sample may not be applicable to very small firms with analyst following.

3. *Predicting Individual Analyst Earnings Forecasts*

3.1 THE MODEL AND METHOD FOR PREDICTING FORECASTS

I use publicly available information released since the date of an analyst's current forecast to predict his next forecast. Assume the current day is day $t - 1$. Define $FRCST_{i,a,t}$ as a revised forecast of EPS for company i to be issued by analyst a on day t and define $FRCST_{i,a,t-v}$ as the current outstanding forecast dated v days prior to day t. A positive relation is hypothesized between each of the following three pieces of information and the change in investors' expectations of $FRCST_{i,a,t}$ between day $t - v$ and $t - 1$:

1. The change in the mean consensus forecast of other analysts

TABLE 1

Summary of Sample Selection Process for Individual Forecast Revisions

	Revisions
Total revisions on Zacks files dated within the 1980–85 calendar period and within the current fiscal year of the firm for firms with fiscal year-ends within the 1980–85 period	263,962
Revisions excluded:	
Firm not on *CRSP* file of NYSE and ASE firms	(59,810)
Date of the forecast is more than 200 trading days after the date of the analyst's prior forecast	(6,843)
Only one analyst with an outstanding forecast	(5,996)
Remaining revisions included in forecast prediction regressions (table 2)	191,313
Revisions within the 1980 calendar year	(16,613)
Remaining revisions included in measures of forecast predictability (table 3)	174,700

following firm i between days $t - v$ and $t - 1$. This change proxies for new information released after date $t - v$.

2. The difference between the mean consensus forecast of other analysts following firm i on day $t - v$ and analyst a's forecast on day $t - v$. Zacks supplies brokerage houses with a "deviation report," which officials at Zacks believe pressures analysts to issue forecasts closer to the consensus.
3. The cumulative return to firm i from days $t - v$ to $t - 1$, multiplied by the forecast by analyst a on day $t - v$. This return also proxies for new information released after date $t - v$.

To mitigate potential problems from calendar clustering, the sample is segregated into 144 subsamples on the basis of the semimonthly period in which day t falls, and tests are performed on the data by *subsample*. This design subsumes any cross-sectional temporal dependence *within* subsamples and reduces any cross-sectional temporal dependence *between* subsamples. The significance of mean results from these 144 subsamples is determined by dividing the mean by its standard error, which is the estimated standard deviation of the 144 observations divided by the square root of 144 (see Fama and MacBeth [1973]).

I estimate the following ordinary least squares regression for each of the 144 subsamples:

$$(FRCST_{i,a,t} - FRCST_{i,a,t-v}) = \beta_0 + \beta_1\ (CONS_{i,t-1} - CONS_{i,t-v}) + \beta_2\ (CONS_{i,t-v} - FRCST_{i,a,t-v}) + \beta_3\ (FRCST_{i,a,t-v} * CR_{i,(t-v,t-1)}) + \epsilon_{i,a,t}.$$

$CONS_{i,t-1}$ is the mean consensus forecast, excluding analyst a, of EPS for company i on day $t - 1$ and is calculated as the equally weighted average of all other individual forecasts.[1] $CR_{i,(t-v,t-1)}$ is the cumulative stock return for firm i from day $t - v$ to day $t - 1$.

3.2 EMPIRICAL RESULTS FOR PREDICTING INDIVIDUAL ANALYST FORECASTS

Table 2 reports the mean results of the 144 regressions. The mean coefficient on each explanatory variable is significantly different from zero.[2] The mean-adjusted R-square is .38.[3] The results suggest that an individual analyst's next forecast is a positive function of all three proxy

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[1] Because there can be up to 200 days between forecasts, cross-sectional dependence of error terms between subsamples is a concern. The sensitivity of the results to this source of dependence is examined in section 3.3.

[2] The mean Pearson correlation between the first two independent variables is −.47; between the first and third independent variables, .14; and between the last two independent variables, −.04.

[3] The regression results are sensitive to the use of weighted least squares regression. Weighting the variables by the inverse of the current outstanding forecast, the inverse of price per share, and the inverse of the cross-sectional standard deviation of forecasts results in mean-adjusted R-squares of .28, .32, and .38, respectively. A divisor less than \$.20 is arbitrarily set equal to \$.20, and the variables are truncated by setting any measure less than −3 or greater than +3 to be equal to −3 and +3, respectively.

TABLE 2

Relation Between Changes in Analyst Forecasts and Other Information

	Mean Regression Results from Temporally Independent Regressions						
	Mean Coefficients				Mean-Adjusted R-square	Total Number of Revisions	Number of Regressions
	β_0	β_1	β_2	β_3			
All revisions	−.07[b]	.90[b]	.44[b]	.11[b]	.38	191,313	144
(t-statistic)[a]	(−21.44)	(48.69)	(35.62)	(15.86)			
By analyst reputation							
"All-Americans"	−.08[b]	.88[b]	.40[b]	.11[b]	.35	63,055	144
"Non-All-Americans"	−.07[b]	.92[b]	.48[b]	.10[b]	.40	128,258	144
Two independent variables	−.06[b]	.92[b]	.45[b]		.37	191,313	144
	−.07[b]	.63[b]		.12[b]	.26	191,313	144
	−.17[b]		.10[b]	.21[b]	.04	191,313	144
Using only forecast revisions from every 15th semimonthly period and restricting v to be less than 125	−.07[b]	.86[b]	.36[b]	.09[c]	.30	10,306	10

By number of analysts following the firm							
2–7 analysts	$-.08^{b}$	$.76^{b}$	$.38^{b}$	$.11^{b}$	.27	55,410	144
8–11 analysts	$-.07^{b}$	$.99^{b}$	$.46^{b}$	$.10^{b}$	.41	41,205	144
12–17 analysts	$-.06^{b}$	1.02^{b}	$.52^{b}$	$.09^{b}$	.47	51,180	144
18–39 analysts	$-.07^{b}$	$.96^{b}$	$.57^{b}$	$.09^{b}$	.51	43,518	144

Mean regression results for the relation between changes in analyst a's forecast of EPS and other publicly available information released since analyst a's current forecast and before analyst a's next forecast. Regressions use a sample of individual analyst forecast revisions from the 1980–85 period. The form of the estimated relation is:

$$(FRCST_{i,a,t} - FRCST_{i,a,t-v}) = \beta_0 + \beta_1(CONS_{i,t-1} - CONS_{i,t-v}) + \beta_2(CONS_{i,t-v} - FRCST_{i,a,t-v}) + \beta_3(FRCST_{i,a,t-v} * CR_{i(t-v,t-1)}) + \epsilon_{i,a,t}$$

where $FRCST_{i,a,t-v}$ = the current outstanding forecast of EPS for firm i by analyst a, a forecast which is dated v days prior to day t.

$FRCST_{i,a,t}$ = forecasted EPS for firm i by analyst a on day t, a day on which the forecast is revised.

$CONS_{i,t-1}$ = mean consensus estimate of EPS for firm i on day $t-1$, excluding analyst a.

$CR_{i(t-v,t-1)}$ = cumulative common stock return for firm i from day $t-v$ to day $t-1$.

[a] The t-statistics are calculated by using the estimated standard deviation of the estimated coefficients.
[b] The estimated coefficient is significantly different from zero at less than the .01 level.
[c] The estimated coefficient is significantly different from zero at less than the .05 level.

variables. The estimated coefficients imply that a $1.00 change in the mean forecast of other analysts since the date of an analyst's current forecast changes the expectation of the analyst's next forecast by $.90; an analyst's next forecast is expected to close the deviation between the mean forecast of other analysts and the analyst's forecast by approximately 44%; and cumulative share price gains or losses of 10% since an analyst's current forecast changes the expectation of the analyst's next forecast by 1.1%. The negative intercept suggests that analysts initially overestimate earnings, at least during 1980–85, and subsequently revise those forecasts downward by $.07 per revision, ceteris paribus.[4]

Table 2 also reports a comparison of the predictability of forecasts made by analysts on the *Institutional Investor* annual "All-American Research Team" with that of other analysts. Forecast revisions by analysts who are first-, second-, and third-team "All-Americans" in any year within 1981–85 are segregated from those of other analysts, and regressions are performed. Based on paired comparisons t-tests, where differences are computed semimonthly, the mean difference in β_1 is .037 (t-statistic = 1.48), the mean difference in β_2 is .081 (t-statistic = 3.68), and the mean difference in R-square is .049 (t-statistic = 3.26). Thus, ceteris paribus, the forecasts of "All-Americans" are less likely to "follow the crowd" and are less predictable than forecasts by other analysts.[5]

3.3 SENSITIVITY ANALYSES

The estimated coefficients are not sensitive to performing one regression with all 191,313 observations, although the significance levels of the t-statistics are higher. Using a single regression, the coefficients (t-statistics) for β_0, β_1, β_2, and β_3 are −.08 (−75.04), .86 (326.46), .41 (190.10), and .11 (54.24), respectively.

The regression results are sensitive to the exclusion of single independent variables. The results reported on table 2 suggest that most of the explanatory power of my model arises from the change in the consensus and the deviation of the forecast from the consensus forecast. The marginal explanatory power of price changes is very small.

Table 2 also reports regression results for subsamples restricted to be 14 semimonthly periods apart and revisions that are dated within 125 trading days of the date of the prior forecast. The semimonthly periods used end on the following dates: 1/15/80, 8/31/80, 4/15/81, 11/30/81, 7/

[4] A similar upward bias over the same period has been documented for *Value Line Investment Survey* forecasts by Abarbanell [1989] and in my own unpublished analysis of *IBES* mean consensus forecasts.

[5] The mean and median number of analysts following (1) firms followed by "All-Americans" and (2) firms followed by others are (1) 12.2 and 11 and (2) 12.3 and 11, respectively. Thus, the differences in model fit between "All-Americans" and other analysts are not associated with the differences in model fit reported in section 3.3 for analyst following.

15/82, 2/28/83, 10/15/83, 5/31/84, 1/15/85, and 8/31/85. Restricting the sample to these ten semimonthly periods ensures that any portion of the change in *FRCST* cannot be in more than one semimonthly period. The estimated coefficients are again significantly different from zero.

The results are somewhat sensitive to grouping revisions by the number of analysts with an outstanding forecast. As reported in table 2, the mean-adjusted R-square for the quartile of firms with the least analyst following is .27. The mean-adjusted R-squares for the remaining three quartiles are .41, .47, and .51, respectively.

The mean coefficients are relatively insensitive to performing regressions on a firm-by-firm basis before averaging. Regressions are performed for firms with at least 30 forecast revisions over the 1980–85 period. This procedure allows the intercept to vary across firms (see Murphy [1985]). There are 1,047 firms meeting this requirement, for which the mean coefficients for β_0, β_1, β_2, and β_3 are −.09, .80, .54, and .08, respectively. The individual firm coefficients are unbiased, but not independent; thus, t-statistics are not calculated. The mean-adjusted R-square for a random sample of 50 of these firms is .39. Thus, there is no apparent advantage to allowing the intercept to vary on a firm-by-firm basis.

The mean coefficient for $CR_{i,(t-v,t-1)}$ declines somewhat when cumulative abnormal returns, measured as market model residuals (e.g., Fama [1976]) and mean-adjusted returns (see Masulis [1978]), are substituted.[6] Using market model residuals and mean-adjusted returns results in estimated coefficients (t-statistics) for β_3 of 0.05 (8.62) and 0.05 (9.93), respectively. However, for both definitions, the explanatory power of abnormal returns is negligible, and the mean-adjusted R-square is again .38.

4. The Bias and Accuracy of Predicted Individual Analyst Forecasts

This section evaluates the predictive ability of the model using the following measure:

$$\text{"Updated" } PFE_{i,a,t} = (FRCST_{i,a,t} - E_{t-1}(FRCST_{i,a,t}))/FRCST_{i,a,t},$$

where $PFE_{i,a,t}$ is defined as the percentage forecast error[7] and:

$$E_{t-1}(FRCST_{i,a,t}) = FRCST_{i,a,t-v} + \hat{\beta}_0 + \hat{\beta}_1\ (CONS_{i,t-1} - CONS_{i,t-v}) + \hat{\beta}_2\ (CONS_{i,t-v} - FRCST_{i,a,t-v}).$$

[6] For both definitions, parameters are estimated over event days +251 to +350, with at least 30 days of returns required for sample inclusion.

[7] The results discussed below are not sensitive to scaling the forecast error by price per share or the cross-sectional standard deviation of analyst forecasts at day $t - 1$. I used the procedures described in n. 3 for mitigating the small-denominator problem.

TABLE 3
Bias and Accuracy of Predicted Individual Analyst Forecasts

Percentage Forecast Error	Distribution of Percentage Forecast Error					
	Mean	Percentiles				
		10%	25%	50%	75%	90%
Using current outstanding forecast: $(FRCST_{i,a,t} - FRCST_{i,a,t-v})/FRCST_{i,a,t}$	−.160	−.364	−.119	−.036	.020	.074
Using "updated" forecast: $(FRCST_{i,a,t} - E_{t-1}(FRCST_{i,a,t})^*)/FRCST_{i,a,t}$	−.045	−.161	−.038	.011	.054	.122

Absolute Percentage Forecast Error	Distribution of Absolute Percentage Forecase Error					
	Mean	Percentiles				
		10%	25%	50%	75%	90%
Using current outstanding forecast: $\lvert FRCST_{i,a,t} - FRCST_{i,a,t-v}\rvert/FRCST_{i,a,t}$	.235	.015	.029	.063	.150	.429
Using "updated" forecast: $\lvert FRCST_{i,a,t} - E_{t-1}(FRCST_{i,a,t})\rvert/FRCST_{i,a,t}$	.181	.008	.020	.048	.109	.289

Distribution of measures of the bias and accuracy in predicted individual analyst forecasts. Percentage forecast error, a measure of bias, and absolute percentage forecast error, a measure of accuracy, are calculated from forecast revisions dated within the 1981–85 period. The number of revisions is 174,700.

* $E_{t-1}(FRCST_{i,a,t})$ = the expected next forecast of *EPS* for firm i by analyst a as of day $t - 1$. This expectation uses publicly available information released since day $t - v$, the date of the analyst's current forecast. See table 2 for definitions of other variables.

The parameters β_0, β_1, and β_2 are estimated using data from the prior year.[8] Because of the low marginal explanatory power of past price changes noted on table 2, β_3 is not estimated or used.

As a benchmark, I use the following measure of the predictability of individual analyst forecast revisions.

$$\text{"Naive" } PFE_{i,a,t} = (FRCST_{i,a,t} - FRCST_{i,a,t-v})/FRCST_{i,a,t}.$$

"Naive" *PFE* conditions expectations of the next forecast on only the current outstanding forecast and is analogous to a random walk model.

Table 3 reports signed percentage forecast errors (measures of bias) and unsigned (absolute) percentage forecast errors (measures of accuracy). The distribution of "updated" *PFE* is more symmetrically distributed around zero and has smaller absolute values than "naive" *PFE*.[9]

[8] The regression results of the prior section are also relatively insensitive to the forecast year. Because prior year data are used for parameter estimation, there are no 1980 "updated" forecasts. This leaves 5 years or 120 semimonthly periods.

[9] Subtracting the regression intercept from each outstanding forecast and using the resulting number as the expected forecast results in a mean percentage forecast error of −12.0% and a mean absolute forecast error of 22.2%. Thus, the improvement in predictive ability from using "updated" forecasts is not simply due to the intercept term.

I used paired comparisons t-tests to evaluate the significance of the differences in bias and accuracy. The differences in bias ("naive" *PFE* minus "updated" *PFE*) and accuracy (absolute "naive" *PFE* minus absolute "updated" *PFE*) are computed at the individual analyst level, and a mean difference is computed by semimonthly period. Significance is determined by dividing the mean of the semimonthly mean differences by its standard error. Aggregated in this manner, the mean difference in bias is -11.3% (t-statistic $= -32.17$) and the mean difference in accuracy is 5.2% (t-statistic $= 31.55$). Thus, "updated" forecasts are less biased and more accurate predictors of future forecasts than the analyst's current forecast.

5. *Conclusions*

My model predicts an individual analyst's next *EPS* forecast by updating his current forecast for subsequent information. "Updated" forecasts from this model are less biased and more accurate predictors of future forecasts than the analyst's current forecast. Possible extensions of this line of research include examining whether or not "updated" forecasts are better predictors of future reported earnings; using "updated" forecasts as measures of market expectations; and using the dispersion of "updated" forecasts as measures of earnings uncertainty.

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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Joseph T. Kelliher, Chairman;
Suedeen G. Kelly, Marc Spitzer,
Philip D. Moeller, and Jon Wellinghoff.

Composition of Proxy Groups for Determining Gas and Oil Pipeline Return on Equity — Docket No. PL07-2-000

PROPOSED POLICY STATEMENT

(Issued July 19, 2007)

1. In this proposed Policy Statement, the Commission is proposing to update its standards concerning the composition of the proxy groups used to decide the return on equity (ROE) of natural gas and oil pipelines. Firms engaged in the pipeline business are increasingly organized as master limited partnerships (MLPs). Therefore, the Commission proposes to modify its current policy regarding the composition of proxy groups to allow MLPs to be included in the proxy group. This proposed Policy Statement explains the standards that the Commission would require to be met in order for an MLP to be included in the proxy group. The Commission proposes to apply its final Policy Statement to all gas and oil pipeline rate cases that have not completed the hearing phase as of the date the Commission issues its final Policy Statement. The Commission intends to decide on a case-by-case basis whether to apply the final Policy Statement in cases that have completed the hearing phase. Finally, the Commission is requesting comments on this proposed Policy Statement. Initial comments are due 30 days after publication of this order in the *Federal Register*, with reply comments due 50 days after publication in the *Federal Register*.

I. Background

2. Since the 1980s, the Commission has used a Discounted Cash Flow (DCF) model to develop a range of returns earned on investments in companies with corresponding risks for determining the ROE for natural gas and oil pipelines. The DCF model was originally developed as a method for investors to estimate the value of securities, including common stocks. It is based on "the premise that a stock is worth the present value of its future cash flows, discounted at a market rate commensurate with the stock's risk."[1] Unlike investors, the Commission uses the DCF model to determine the ROE to be included in the pipeline's rates, rather than to estimate a stock's value. Therefore, the Commission solves the DCF formula for the discount rate, which represents the rate of

[1] *Ozark Gas Transmission System*, 68 FERC ¶ 61,032 at 61,104, n. 16 (1994).

return that an investor requires in order to invest in a firm. Under the resulting DCF formula, ROE equals current dividend yield (dividends divided by share price) plus the projected future growth rate of dividends.

3. The Commission uses a two-step procedure for determining the constant growth of dividends: averaging short-term and long-term growth estimates.[2] Security analysts' five-year forecasts for each company in the proxy group, as published by Institutional Brokers Estimate System (IBES), are used for determining growth for the short term; long-term growth is based on forecasts of long-term growth of the economy as a whole, as reflected in the Gross Domestic Product. The short-term forecast receives a 2/3 weighting and the long-term forecast receives a 1/3 weighting in calculating the growth rate in the DCF model.[3]

4. Most gas pipelines are wholly-owned subsidiaries and their common stock is not publicly traded, and this is also true for some jurisdictional oil pipelines. Therefore, the Commission uses a proxy group of firms with corresponding risks to set a range of reasonable returns for both natural gas and oil pipelines. The Commission then assigns the pipeline a rate within that range or zone, to reflect specific risks of that pipeline as compared to the proxy group companies.[4]

5. The Commission historically required that each company included in the proxy group satisfy the following three standards.[5] First, the company's stock must be publicly traded. Second, the company must be recognized as a natural gas or oil pipeline company and its stock must be recognized and tracked by an investment information service such as Value Line. Third, pipeline operations must constitute a high proportion of the company's business. Until the Commission's 2003 decision in *Williston Basin*

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[2] *Northwest Pipeline Co.*, 71 FERC ¶ 61,309 at 61,989-92 (1995) (Opinion No. 396), 76 FERC ¶ 61,068 (1996) (Opinion No. 396-A), 79 FERC ¶ 61,309 (1997) (Opinion No. 396-B), *reh'g denied*, 81 FERC ¶ 61,036 (1997) (Opinion No. 396-C); *Williston Basin Interstate Pipeline Co.*, 79 FERC ¶ 61,311, *order on reh'g*, 81 FERC ¶ 61,033 (1997), *aff'd in relevant part, Williston Basin Interstate Pipeline Co.,* 165 F.3d 54 (D.C. Cir. 1999)(*Williston Basin*).

[3] The Commission presumes that existing pipelines fall within a broad range of average risk, and thus generally sets pipelines' return at the median of the range. *Transcontinental Gas Pipe Line Corp.*, 84 FERC ¶ 61,084 at 61,423-4 (1998) Opinion No. 414-A, *reh'g*, 85 FERC ¶ 61,323 (1998) (Opinion No. 414-B), *aff'd North Carolina Utilities Commission v. FERC*, 340 U.S. App. D.C. 183 (D.C. Cir) (unpublished opinion).

[4] *Williston Basin* at 57 (*citation omitted*).

[5] *Transcontinental Gas Pipe Line Corp.*, 90 FERC ¶ 61,279 at 61,933 (2000).

Interstate Pipeline Co.,[6] the third standard could only be satisfied if a company's pipeline business accounted for, on average, at least 50 percent of a company's assets or operating income over the most recent three-year period.

6. As a result of mergers, acquisitions, and other changes in the natural gas industry, fewer and fewer interstate natural gas companies have satisfied the third requirement. Thus, in *Williston*, the Commission relaxed this requirement for the natural gas proxy group. Instead, the Commission approved a pipeline's proposal to use a proxy group based on the corporations listed in the Value Line Investment Survey's list of diversified natural gas firms that own Commission-regulated natural gas pipelines, without regard to what portion of the company's business comprises pipeline operations.

7. In *HIOS*[7] and *Kern River*, the only fully litigated section 4 rate cases decided since *Williston*, the Commission again drew the proxy group companies from the same Value Line list. When those cases were litigated, there were six such companies: Kinder Morgan Inc., the Williams Companies (Williams), El Paso Natural Gas Company (El Paso), Equitable Resources, Inc., Questar Corporation, and National Fuel Gas Corporation. The Commission excluded Williams and El Paso on the ground that their financial difficulties had lowered their ROEs to a level only slightly above the level of public utility debt, and the Commission stated that investors cannot be expected to purchase stock if lower risk debt has essentially the same return. This left a four-company proxy group, three of whose members derived more revenue from the distribution business, rather than the pipeline business. In *Kern River*, the Commission adjusted the pipeline's return on equity 50 basis points above the median in order to account for the generally higher risk profile of natural gas pipeline operations as compared to distribution operations.

8. In both *Kern River* and *HIOS*, the Commission rejected pipeline proposals to include MLPs in the proxy group. The pipelines contended that MLPs have a much higher percentage of their business devoted to pipeline operations, than most of the corporations that the Commission currently includes in the proxy group.

9. Unlike corporations, MLPs generally distribute most available cash flow to the general and limited partners in the form of quarterly distributions. Most MLP agreements define "available cash flow" as (1) net income (gross revenues minus operating expenses) plus (2) depreciation and amortization, minus (3) capital investments the partnership must

[6] *Williston Basin Interstate Pipeline Company*, 104 FERC ¶ 61,036 at P 35, n. 46 (2003).

[7] *High Island Offshore System, L.L.C.*, 110 FERC ¶ 61,043, *reh'g denied*, 112 FERC ¶ 61,050 (2005), *appeal pending*.

make to maintain its current asset base and cash flow stream.[8] Depreciation and amortization may be considered a part of "available cash flow," because depreciation is an accounting charge against current income, rather than an actual cash expense. As a result, the MLP's cash distributions normally include not only the net income component of "available cash flow," but also the depreciation component. This means that, in contrast to a corporation's dividends, an MLP's cash distributions generally exceed the MLP's reported earnings. Moreover, because of their high cash distributions, MLPs usually finance capital investments required to significantly expand operations or to make acquisitions through debt or by issuing additional units rather than through retained cash, although the general partner has the discretion to do so.

10. In rejecting the pipelines' proposals in *HIOS* and *Kern River* to include MLPs in the proxy group, the Commission made clear that it was not making a generic finding that MLPs cannot be considered for inclusion in the proxy group if a proper evidentiary showing is made.[9] However, the Commission pointed out that data concerning dividends paid by the proxy group members is a key component in any DCF analysis, and expressed concern that an MLP's cash distributions to its unit holders may not be comparable to the corporate dividends the Commission uses in its DCF analysis. In *Kern River*, the Commission explained its concern as follows:

> Corporations pay dividends in order to distribute a share of their earnings to stockholders. As such, dividends do not include any return *of* invested capital to the stockholders. Rather, dividends represent solely a return *on* invested capital. Put another way, dividends represent profit that the stockholder is making on its investment. Moreover, corporations typically reinvest some earnings to provide for future growth of earnings and thus dividends. Since the return on equity which the Commission awards in a rate case is intended to permit the pipeline's investors to earn a profit on their investment and provides funds to finance future growth, the use of dividends in the DCF analysis is entirely consistent with the purpose for which the Commission uses that analysis. By contrast, as Kern River concedes, the cash distributions of the MLPs it seeks to add to the proxy group in this case include a return *of* invested capital through an allocation of the partnership's net income. While the level of an MLP's cash distributions may be a significant factor in the unit holder's decision to invest in the MLP, the Commission uses the DCF analysis solely to determine the pipeline's return on equity. The Commission provides for the return of invested capital through a separate depreciation allowance.

[8] The definition of available cash may also net out short term working capital borrowings, the repayment of capital expenditures, and other internal items.

[9] *Kern River Gas Transmission Company*, 117 FERC ¶ 61,077 (2006) (Opinion No. 486) at P 147, *reh'g pending.*

> For this reason, to the extent an MLP's distributions include a significant return of invested capital, a DCF analysis based on those distributions, without any adjustment, will tend to overstate the estimated return on equity, because the 'dividend' would be inflated by cash flow representing return of equity, thereby overstating the earnings the dividend stream purports to reflect.[10]

11. The Commission stated that it could nevertheless consider including MLPs in the proxy group in a future case, if the pipeline presented evidence addressing these concerns. The order suggested that such evidence might include some method of adjusting the MLPs' distributions to make them comparable to dividends, a showing that the higher "dividend" yield of the MLP was offset by a lower long-term growth projection, or some other explanation why distributions in excess of earnings do not distort the DCF results for the MLP in question. However, the Commission concluded that Kern River had not presented sufficient evidence to address these issues, and that the record in that case did not support including MLPs in the proxy group.

12. In addition, *Kern River* pointed out that the traditional DCF model only incorporates growth resulting from the reinvestment of earnings, not growth arising from external sources of capital.[11] Therefore, the Commission stated that if growth forecasted for an MLP comes from external capital, it is necessary either (1) to explain why the external sources of capital do not distort the DCF results for that MLP or (2) propose an adjustment to the DCF analysis to eliminate any distortion. The Commission's orders in *HIOS* reached the same conclusions.

13. In some oil pipeline rate cases decided before *HIOS* and *Kern River*, the Commission included MLPs in the proxy group used to determine oil pipeline return on equity on the ground that there were no corporations available for use in the oil proxy group.[12] In those cases, no party raised any issue concerning the comparability of an MLP's cash distribution to a corporation's dividend. However, that issue did arise in the first oil pipeline case decided after *HIOS* and *Kern River*, involving SFPP's Sepulveda Line.[13] The Commission approved inclusion of MLPs in the proxy group in that case on the grounds that the MLPs in question had not made distributions in excess of earnings. The Sepulveda Line order therefore analyzed the five MLPs that have been used to determine SFPP's ROE: Buckeye Partners, L.P., Enbridge Energy Partners, L.P., Enron

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[10] *Id.* at P 149-50.

[11] *Id.* at P 152.

[12] *SFPP, L .P.*, 86 FERC ¶ 61,022 at 61,099 (1999).

[13] *SFPP, L.P.*, 117 FERC ¶ 61,285 (2006) (SFPP Sepulveda order), *rehearing pending*.

Gas Liquids (Enron),[14] TEPPCO Partners, L.P., and Kaneb Partners, L.P. (later Valero Partners), now NuStar Energy, L.P**.** The order reviewed each entity for the year 1996 and the previous four years, and held that four of the firms had had income (earnings) in excess of distributions and that their incomes (earnings) were stable over that period with minor exceptions. The order found these facts sufficient to address the concerns expressed in *HIOS* and *Kern River*. The fifth firm, Enron, had distributions in excess of income (earnings) in four of the five years. While the Commission did not preclude use of such MLPs, Enron did not meet the *HIOS* test and was excluded as unrepresentative.

II. <u>Discussion</u>

14. As discussed below, the Commission proposes to permit inclusion of MLPs in a proxy group. However, the Commission proposes to cap the "dividend" used in the DCF analysis at the pipeline's reported earnings, thus adjusting the amount of the distribution to be included in the DCF model. The Commission would leave to individual cases the determination of which MLPs and corporations should actually be included in the natural gas or oil proxy group. However, participants in these cases should include as much information as possible regarding the business profile of the firms they propose to include in the proxy group, for example, based on gross income, net income, or assets.

15. The Supreme Court has stated that "the return to the equity owner should be commensurate with the return on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."[15] The Commission is concerned that its current approach to determining the composition of the proxy group for determining gas and oil pipeline return on equity is, or will, require the use of firms which are less and less representative of either natural gas or oil pipeline business risk.

16. As has been discussed, there are fewer and fewer publicly traded diversified natural gas corporations that have interstate gas pipelines as their predominant business line, whether this is measured on a revenue, income, or asset basis. As such, there are fewer diversified natural gas companies available for inclusion in a natural gas pipeline proxy group which may reasonably be considered representative of the risk profile of a natural gas pipeline firm. Moreover, at this point the only publicly traded oil pipeline firms are controlled by MLPs, which makes the issue of a representative proxy group more acute.

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[14] Enron Gas Liquids was not affiliated with Enron, Inc. at that time, but was a former affiliate that was spun off in the early 1990's.

[15] *FPC v. Hope Natural Gas Co.*, 320 U.S. 591 (1944); *Bluefield Water Works & Improvement Co. v. Public Service Comm'n*, 262 U.S. 679 (1923).

17. Cost of service ratemaking requires that the firms in the proxy group be of comparable risk to the firm whose equity cost of capital is at issue in a particular rate proceeding. If the proxy group is less than clearly representative, this may require the Commission to adjust for the difference in risk by adjusting the equity cost-of-capital, a difficult undertaking requiring detailed support from the contending parties and detailed case-by-case analysis by the Commission. Expanding a proxy group to include MLPs whose business is more narrowly focused on pipeline activities would help ameliorate this problem. Thus, including MLP natural gas pipelines in the equity proxy group should reduce the need to make adjustments since the proxy group is more likely to contain firms that are representative of the regulated firm whose rates are at issue. Including MLPs will also recognize the trend to greater use of MLPs in the natural gas pipeline industry and address the reality of the oil pipeline industry structure.

18. The Commission's primary concern about including MLPs in the proxy group has arisen from the interaction between use of the DCF analysis to determine return on capital while relying on a depreciation allowance for return of capital. The Commission permits a pipeline to recover through its rates both a return *on* equity and a return *of* invested capital. The Commission uses the DCF analysis solely to determine the return *on* equity component of the cost-of-service. The Commission provides for the return *of* invested capital through a separate depreciation allowance. Given the purpose for which the Commission uses the DCF analysis, the cash flows included in that analysis must be limited to cash flows which may reasonably be considered to reflect a return *on* equity. Such cash flows include that portion of an MLP's cash distribution derived from net income, or earnings.

19. To the extent an MLP makes distributions in excess of earnings, it is able to do so because partnership agreements define "cash available for distribution" to include depreciation. This enables the MLP to make cash distributions that include return *of* equity, in addition to return *on* equity. However, because the Commission includes a separate depreciation allowance in the pipeline's cost-of-service, a DCF analysis including cash flows attributable to depreciation would permit the pipeline to double recover its depreciation expense, once through the depreciation allowance and once through an inflated ROE. Adjusting an MLP's cash distribution to exclude that portion of the distribution in excess of earnings addresses this problem.

20. The Commission recognizes that it raised several concerns in *Kern River* as to whether adjusting the MLP's cash distribution down to the level of its earnings would be sufficient to eliminate the distorting effects of including MLPs in the proxy group. The Commission pointed out that corporations generally do not pay out all of their earnings in dividends, but retain some earnings in order to generate future growth. The Commission also suggested that the DCF model is premised on growth in dividends deriving from reinvestment of current earnings, and does not incorporate growth from external sources, such as issuing debt or additional stock.

21. The Commission believes that these concerns should not render unreliable a DCF analysis using the adjusted MLP results. The market data for the MLPs used in the DCF analysis should itself correct for any distortions remaining after the adjustment to the cash distribution described above. For example, the IBES growth projections represent an average of the growth projections by professionals whose business is to advise investors.[16] The level of an MLP's cash distributions as compared to its earnings is a matter of public record and thus known to the security analysts making the growth forecasts used by IBES. Therefore, the security analysts must be presumed to take those distributions into account in making their growth forecasts for the MLP. To the extent an MLP's relatively high cash distributions reduce its growth prospects that should be reflected in a lower growth forecast, which would offset the MLP's higher "dividend" yield.

22. In order to test the validity of this assumption, the Commission reviewed the most recent IBES growth forecasts for five diversified energy companies and six MLPs in the natural gas business. The average IBES forecast for the corporations is 9 percent, while the average IBES forecast for the MLPs is 6.17 percent, or nearly 300 basis points lower.[17] Thus, the security analysts do project lower growth rates for the MLPs than for the corporations.

23. In addition, the fact MLPs may rely upon external borrowings and/or equity issuances to generate growth is not a reason to exclude them from the proxy group. Most pipelines organized as corporations also use external borrowings and to some extent equity issuances. To the extent that gas or oil pipelines are controlled by diversified energy companies with unregulated assets (either federal or state), the financial practices may be the same, although perhaps not as highly leveraged, and the results are likewise reflected in the IBES projections. A prudent investor deciding whether to invest in a security will reasonably consider all factors relevant to assessing the value of that security. The potential effect of future borrowings or equity issuances on share values of either MLPs or corporations is one such factor. Since a DCF analysis is a method for investors to estimate the value of securities, it follows that such an analysis may reasonably take into account potential growth from external capital.

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[16] Opinion No. 414-B, 85 FERC at 62,268-70.

[17] The IBES forecasts were prepared as of May 31, 2007 applying the current DCF model for the corporate sample and using distributions capped at earnings for the MLPs. Thus the short term growth rates for the five diversified gas corporations were: (1) National Fuel Gas Corporation, 5 percent; (2) Questar Corporation, 9 percent; (3) Oneok, Inc., 9 percent; (4) Equitable Resources Inc., 10 percent; and (5) Williams Companies, 12 percent. The short term growth rates for the six gas MLPs were: (1) Oneok Partners, L.P., 5 percent; (2) TEPPCO Partners, L.P., 5 percent; (3) TC Pipelines, L.P., 5 percent; (4) Boardwalk Pipeline Partners, L.P., 7 percent, (5) Kinder Morgan Energy Partners, L.P., 7 percent, and (6) Enterprise Products Partners, L.P., 8 percent.

24. The Commission does, however, recognize that an MLP's lack of retained earnings may render cash distributions at their current level unsustainable, and thus still unsuitable for inclusion in the DCF analysis. Therefore, the Commission intends to require participants proposing to include MLPs in the proxy group to provide a multi-year analysis of past earnings. An analysis showing that the MLP does have stable earnings would support a finding that the cash to be included in the DCF calculation is likely to be available for distribution, thus replicating the requirement of the corporate model of a stable dividend.

III. <u>Procedure for Comments</u>

25. The Commission invites interested persons to submit written comments on its proposed policy to permit the inclusion of MLPs in the proxy group to be used to determine the equity cost of capital of natural gas and oil pipelines. The comments may include alternative proposals for determining a representative proxy group given that (1) few natural gas companies meet the Commission's traditional standards for inclusion in the proxy group, and (2) the only publicly traded oil pipeline firms available for inclusion in the proxy group are controlled by MLPs. Comments may also address the analysis advanced in this proposed policy statement, alternative methods for adjusting the amount of the MLP's distribution to be included the DCF analysis, and the relevance of the stability of MLP earnings.

26. Comments are due 30 days from the date of publication in the *Federal Register* and reply comments are due 50 days from the date of publication in the *Federal Register*. Comments must refer to Docket No. PL07-2-000, and must include the commentor's name, the organization it represents, if applicable, and its address. To facilitate the Commission's review of the comments, commentors are requested to provide an executive summary of their position. Additional issues the commentors wish to raise should be identified separately. The commentors should double space their comments.

27. Comments may be filed on paper or electronically via the eFiling link on the Commission's web site at http://www.ferc.gov. The Commission accepts most standard word processing formats and commentors may attach additional files with supporting information in certain other file formats. Commentors filing electronically do not need to make a paper filing. Commentors that are not able to file comments electronically must send an original and 14 copies of their comments to: Federal Energy Regulatory Commission, Office of the Secretary, 888 First Street N.E., Washington, D.C. 20426.

28. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commentors are not required to serve copies of their comments on other commentors.

IV. Document Availability

29. In addition to publishing the full text of this document in the *Federal Register*, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (http://www.ferc.gov) and in the Commission's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, N.E., Room 2A, Washington D.C. 20426.

30. From the Commission's Home Page on the Internet, this information is available in the Commission's document management system, eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number (excluding the last three digits) in the docket number field.

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By the Commission.

(S E A L)

Kimberly D. Bose,
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The Earnings Numbers Game: Rewards to Walk Down and Penalties to Walk Up Of Analysts' Forecasts of Earnings

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First draft, July 29, 2008
This draft, July 30, 2009

JEL Classification: G14; M41
Keywords: Analysts' Forecasts; Earnings Guidance; Walk down; Walk up; Market Efficiency

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We appreciate the valuable comments from Ying Cao, Kevin Chen, Taiyuan Chen, Zhaoyang Gu, Gilles Hilary, David Hirshleifer, Kaiwai Hui, Ross Jennings, Bin Ke, Kevin Koh, Clive Lennox, Oliver Li, Tom Lys, Paul Malatesta, Gordon Richardson, Katherine Schipper, Lakshmanan Shivakumar, Franco Wong, Zhihong Chen, TJ Wong, Woody Wu, Guochang Zhang, especially Daniel Cohen, and workshop participants at the Chinese University of Hong Kong, the City University of Hong Kong, University of California, Irvine, Hong Kong University of Science and Techonology, and the 2008 Chulalongkorn Accounting and Finance Symposium.

The Earnings Numbers Game:
Rewards to Walk Down and Penalties to Walk Up
Of Analysts' Forecasts of Earnings

Abstract

We provide a comprehensive study of the valuation consequences to meeting/beating analysts' forecasts (*MBE*) versus missing expectations conditioned on the forecast revision path prior to the earnings announcement. We find that investors reward firms that walk down forecasts to achieve a positive earnings surprise and penalize firms that walk up forecasts to achieve a negative earnings surprise. The reward and penalty are not justified by subsequent cash flow performance and the post-event return reversal suggests that investors were partially misled by strategic motives belying the forecast revisions. There is higher insider net selling and more new issues for walk down firms, and higher insider net buying and more repurchases for walk up firms. The capital market incentives for selling and *MBE* reward disappear in recent periods, suggesting that investors learn to discount a walk down. However, the walk up penalty and capital market incentives to depress prices for buying by insiders and the firm remain even in recent years.

1. Introduction

Prior studies have documented that the equity market rewards firms that meet or beat analysts' earnings expectations (hereafter *MBE*) and penalize those that do not.[1] The immediate price reaction to an *MBE* event at the earnings announcement date is generally positive whereas firms that miss forecasts generally experience a negative price reaction. The stock returns in the fiscal period (quarterly or annual) of the earnings are also higher for *MBE* firms than miss firms, even when they have the same initial analysts' forecast at the start of the period and the same actual reported earnings at the end of the period. We refer to the higher period returns for *MBE* firms over miss firms after controlling for the size of the forecast revision if any and the surprise as the *MBE* reward.

Two forecast paths lead to an *MBE* event. The first, which has received attention in the literature, is the walk down revision path *OP* where the initial optimistic forecasts are guided down to pessimistic levels prior to the earnings announcement date. The second path *PP* begins and ends with pessimistic earnings forecasts during the quarter. Similarly, two different forecast revision paths lead to a miss event. The initial pessimistic forecast is guided up to become optimistic before the earnings announcement date in the walk up *PO* path whereas the initial and final forecasts remain optimistic in the *OO* path. Figure 1 summarizes the trajectory of these four analysts' forecast revision paths.

When the underlying economic fundamentals fail to deliver earnings that meet or beat analysts' expectations, managers can avoid negative earnings surprises by managing reported earnings upward (Cheng and Warfield, 2005) or guiding analysts' expectations

[1] See Bartov, Givoly, and Hayn (2002), Kasznik and McNichols (2002), Richardson, Teoh, and Wysocki (2004), Brown and Caylor (2005), Skinner and Sloan (2002), and Vickers (1999). Jiang (2008) shows that beating benchmarks is also rewarded in the debt market.

downwards (Soffer, Thiagarajan, and Walther, 2000). This phenomenon is often referred to as the "earnings numbers game" and is viewed unfavorably by regulators (Levitt, 1998) and the media (Cohen, 1991). Bartov and Cohen (2008) report that forecast guidance is more widespread than earnings management to achieve *MBE*, and so the former is the focus in this paper that considers analysts' revision paths.

Our first objective is to study the incentives of the firm and managers to play the numbers game by managers guiding analysts' forecasts either downwards to a beatable level or upwards for a deliberate miss outcome. While the walk down phenomenon has been studied in the literature, the incentives to a walk up for a miss event have not. For incentives, we consider new equity issues or repurchases by the firm, and insider net selling by the managers in the months after the earnings' announcement.

Our second objective is to investigate the extent to which investors are cognizant of the strategic incentives that belie the earnings numbers game. We compare the period return to the future operating performance between firms with a walk down (*OP*) of analysts' forecasts to an *MBE* event versus firms that did not walk down and so miss expectations (*OO*) to study whether the *MBE* reward is justified. Similarly, we also compare the period return and future operating performance between firms with a walk up (*PO*) of analysts' forecasts to a deliberate miss event versus those that did not and so achieve an *MBE* (*PP*) to study whether the miss penalty is justified.

If investors only partially discount for strategic motives associated with a walk down, they will reward a walk down to an *MBE* firm (*OP*) when compared with *OO*. Similarly, investors will penalize firms that walk up to a miss (*PO*) compared to *PP*. If the subsequent true underlying performance for either the strategically motivated walk down or walk up firms, however, is not much different from their corresponding benchmark firms, then the reward and penalty are not justified.

We also examine whether investors' response to the earnings surprise is contingent on the revision path prior to the earnings announcement. If investors are somewhat skeptical of the positive earnings surprise from a walk down *OP* firm relative to a *PP* firm, their stock price reaction will be more muted. Similarly, investors' reaction to a negative earnings surprise from a walk up *PO* firm would also be more muted relative to the *OO* firm. However, the positive reaction for *OP* and negative reaction for *PO* are overreactions relative to full discounting by fully attentive investors. Therefore, walk down *OP* firms and walk up *PO* firms will experience a post-event return reversal. Since an *MBE* event is good news and a miss bad news, we need to adjust the post-event returns for the effects of the well-known post-earnings announcement drift anomaly (PEAD).[2]

The general sample period spans from the first quarter of 1984 to the last quarter of 2006.[3] There were dramatic changes in the regulatory regime governing the communication between analysts and management after 2000. Regulation Fair Disclosure (Reg FD) was instituted October 23, 2000, the Sarbanes-Oxley Act (SOX) was enacted on July 30, 2002, and Regulation Analyst Certification (Reg AC) became effective April 14, 2003. Prior research and anecdotal evidence also suggest a substantial increase in the use of analysts' estimates as a benchmark for firm performance, and increased prevalence of the expectations game in the 1990s (e.g. Richardson et al., 2004).[4] The widespread

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[2] See Bernard and Thomas (1989).

[3] We choose to study quarterly periods over annual periods to increase the number of observations and so maximize the power of our tests.

[4] Several financial information sources began providing earnings benchmarks based on analysts' forecasts on the Internet in the mid-1990s. One of the best known, First Call, introduced its service to the web in 1994.

publicity and regulatory crack-down on the earnings numbers game in recent years likely have raised investor awareness of the *MBE* phenomenon. (Jain and Rezaee, 2006; Bartov and Cohen, 2008; Koh et al., 2008). Therefore, as a third objective, we examine whether the path-dependant return reactions are also time period specific. Given the likely regime change at the dates noted above, we partition the sample period into three sub-periods, 1984-1994, 1995-2000, and 2001-2006.

For firms with initial optimistic forecasts, we find that the market rewards firms that walk down the forecasts to an *MBE* event (*OP*) compared to the miss firms (*OO*), consistent with Richardson et al. (2004). However, the walk down reward disappears after 1995, consistent with increased investor awareness of the earnings numbers game from the popular press and academics. In contrast, we find that firms that walk up forecasts to a miss event (*PO*) are penalized relative to firms that beat forecasts from the start (*PP*) in all three sub-periods.

For the short-window market reaction to earnings surprises following different forecast revision paths, we find that the market's reaction is significantly smaller for surprises achieved through switching of expectations with walk down *OP* or walk up *PO* revision paths, as compared to their counterparts with consistent optimism (*OO*) or consistent pessimism (*PP*) respectively throughout the quarter. This evidence suggests that investors do discount somewhat for such earnings games. Whether they discount appropriately and sufficiently or not can only be determined by evaluating post-event operating performance and post-event return reversals.

For the walk down *OP* firms relative to the *OO* firms, the subsequent quarter ROA increases only in the two earlier sub-periods. Moreover, the increase is not from an increase in cash flows from operations. If accruals are more easily managed than cash flows from operations, the results suggest that *OP* firms are in effect no better performers than *OO* firms. The *MBE* reward of *OP* firms over *OO* firms in the early period is therefore not justified, implying that investors are misled by the walk down. The disappearance of the *MBE* reward in later periods, however, suggests that investors learn to discount the walk down.

Similarly, the poorer next quarter earnings performance of walk up *PO* firms relative to *PP* firms occurs only in the early periods, and is not supported by worse cash flows. In other periods, neither the earnings nor cash flow performances are all that different. However, investors continue to punish walk up *PO* firms relative to *PP* firms in later sub-periods, suggesting that investors may not be sufficiently attentive to the strategic incentives of *PO* firms to obtain a miss event.

If investors do not fully discount the information in the *positive* earnings surprises achieved through a walk down path, *OP* firms will be temporarily overvalued and a stock return reversal is likely to follow. However, given the existence of the post-earnings announcement drift, which we consider to be driven by a different source, the reversal will dampen the magnitude of the upward-return drift related to PEAD and may not be strong enough to dominate it. A similar argument about temporary undervaluation can be applied to the *PO* path, in which case we expect that the future return reversal for a walk up will offset part of the downward PEAD drift. Consistent with this conjecture, we find that the PEAD effect is dampened among the switching *OP* and *PO* firms than among the consistent *OO* and *PP* firms, controlling for the magnitude of earnings surprises. We find that over time the magnitude of PEAD for *OP* and *PO* firms converges to that of *OO* and

PP firms, which is again consistent with investors' increased awareness of the numbers game.

Turning to incentives, consistent with Richardson et al. (2004), we find that *OP* firms engage in more stock selling activities (insider net sales and equity issuance) than *OO* firms following earnings announcements, but not in the latest sub-period. The disappearance of these incentives in 2001-2006 is consistent with the earlier returns results that investors no longer reward the numbers game and that the managers are aware of the change in investor reaction.

The new finding is that walk up (*PO)* firms engage in more stock purchase activities (insider net purchases and equity repurchases) than *PP* firms following earnings announcements, which supports the interpretation that the walk up *PO* path is a strategy managers employ to depress the firm's short-term stock price to facilitate buying at a cheap price.

We contribute to the literature in several ways. We provide a comprehensive study of the valuation consequences for the four expectations revision patterns. The four-way comparison of the future stock return and operating performance tests allow us to investigate more fully whether the market reward to *MBE* or penalty to a miss is justified. We also contribute to the earnings surprise literature by documenting that the market's reaction to earnings surprises is dependent on the expectations revision path. We extend Richardson et al.'s (2004) analysis on firm and managerial capital market incentives to the walk up sample and demonstrate that managers also have incentives to deliberately miss benchmarks. Overall, our findings have implications for regulators, capital market participants, and researchers who wish to better understand the causes and consequences of earnings expectations guidance.

2. Related Literature and Research Questions

2.1. Market Reward to Meeting or Beating Earnings Expectations (MBE)

The capital markets penalize severely those firms whose reported earnings fail to meet market expectations (Skinner and Sloan, 2002). Not surprisingly, therefore, anecdotal and academic evidence suggests that firms seek to avoid reporting negative earnings surprises (Degeorge, Patel, and Zeckhauser, 1999; Dechow, Richardson, and Tuna 2003; Brown and Caylor, 2005) either by upward earnings management (Cheng and Warfield, 2005) and/or downward forecast guidance (Matsumoto, 2002; Bartov, Givoly, and Hayn, 2002) to attain *MBE*, with the latter mechanism being more prevalent (Bartov and Cohen, 2008). In addition to the event stock price reactions, Bartov et al. (2002) also document that firms with non-negative earnings surprises have higher stock returns over the whole fiscal period compared to firms with negative earnings surprises controlling for the magnitude of forecast errors.

In interpreting these findings, the literature implicitly assumes that the walk down expectations management strategy (*OP*) is rewarded by the capital markets. However, there has been no systematic study of how and whether the period returns and the event reactions are related to the analyst forecast revision paths leading up to the earnings surprise. Both walk down *OP* and *PP* paths result in *MBE*. Similarly, firms with negative surprises are either walk up *PO* or *OO* firms. To evaluate whether there is an *MBE* reward to a walk down requires conditioning on an initial optimistic forecast and then comparing period returns between final pessimistic forecast firms to firms where the forecasts are not walked down but stayed optimistic. In other words, the comparison of the period returns should be between *OP* and *OO* firms. Similarly, to evaluate the penalty to a walk up leading to a miss forecast, the comparison should be between *PO* and *PP* firms. To summarize, we evaluate the following:

1a**.** *Ceteris paribus, are stock returns over the quarter higher for OP firms than for OO firms?*

1b. *Ceteris paribus, are the stock returns over the quarter higher for PP firms than for PO firms?*

Our next question relates to the fact that there is no consensus in the literature on whether the reward to *MBE* is rational. On the one hand, Malmendier and Shanthikumar (2007) find that small investors do not account for the bias in analyst forecasts, and that their trading behavior induces negative abnormal returns. On the other hand, Bartov et al. (2002) suggest that the premium to *MBE* is a leading indicator of future performance and is not associated with any subsequent stock return reversal, consistent with a rational explanation for the documented reward. To investigate whether the reward to *MBE* is rational, we conduct three analyses that specifically takes into account path-dependency.

First, we compare the future operating performance between *OP* and *OO* firms, and between *PP* and *PO* firms. If the walk down to achieve *MBE* was strategic to game the market, then the future performance of *OP* firms should not differ much from *OO* firms. Similarly, if the walk up to miss expectations was strategic to game the market, there should also be little difference between the future performance between *PO* and *PP* firms.

2a: *Ceteris paribus, does OP have better future operating performance than OO?*

2b: *Ceteris paribus, does PP have better future operating performance than PO?*

Next, we examine whether the earnings surprise event reaction is also path-dependent. Since both *OP* and *PP* firms achieve *MBE*, it would be useful to know if investors adjust for how *MBE* is achieved. Given the more likely strategic nature of *OP* in achieving *MBE*, if the market is at least partially rational, it would discount the positive earnings surprise of *OP* relative to *PP*. Similarly, when comparing walk up *PO* with *OO*, investors may discount for the strategic motive of the miss event through a walk up.

3a: *Ceteris paribus, is the positive market reaction to an earnings surprise from OP smaller than to an earnings surprise from PP?*

3b: *Ceteris paribus, is the negative market reaction to an earnings surprise from PO smaller than to an earnings surprise from OO?*

Even if the reaction to earnings surprise is path-dependant, the differential reaction does not reveal whether investors are able to see through the expectations guidance game fully. To investigate this question, we need to examine whether subsequent price reversals, if any, are path-dependant. The test here is complicated by the presence of PEAD, which may be driven by other causes. To tease out the effects of PEAD, we use the returns conditioned on the size of SUE from the relatively non-strategic groups *OO* and *PP* groups as estimates of PEAD for the strategic revision path groups *OP* and *PO*. Therefore, we test the following:

4. Is the post-earnings-announcement drift weaker for the OP and PO revision paths than for the PP and OO revision paths?

2.2 Guidance to Drive Down the Firm's Short-term Price

The extant literature on expectations guidance focuses almost exclusively on managers' incentives to achieve *MBE* targets. Richardson et al. (2004) report increased new issues and net insider selling associated with a walk down *OP* path as compared with the *OO* path. On the flip side, managers may also have incentives to miss forecasts so as to benefit from the temporarily depressed stock prices, as when they intend to purchase the firm's stock either on their firm's behalf (via stock repurchases or a management buyout) or on their own personal account (via insider purchases or options grants). Similar incentives have been documented using the earnings management mechanism (Gong et al. (2008) for stock repurchases, McAnally et al. (2008) for stock option grants). To the best of our knowledge, no study to date has examined the incentives for a walk up revision path as an expectations guidance mechanism to depress price. We test this hypothesis:

H5. *For a firm with an initial pessimistic forecast, the likelihood of observing a walk up forecast revision path prior to the earnings announcement increases in managers' incentives to purchase its firm's stock after the earnings announcement, either via insider net buying on personal account or via a repurchase of the firm's stock.*

3. Data and Descriptive Statistics

3.1 Data

Individual analysts' forecasts of quarterly earnings are from Thompson Financial I/B/E/S for the period spanning 1984 to 2006. Following the literature (Bartov et al., 2002; Kasznik and McNichols, 2002), we require firm quarter observations to satisfy the following criteria: (1) there are at least two individual earnings forecasts in the quarter (not necessarily by the same analyst) at least 20 trading days apart; (2) the release date of the earliest forecast is on the same day of or after the previous quarter's earnings announcement;[5] and (3) the release date of the latest forecast precedes the current quarter's earnings release date by at least three days.

Actual earnings numbers are from I/B/E/S for comparability with the earnings forecasts. Other financial accounting data are from COMPUSTAT and stock returns data from CRSP. The total number of firm-quarter observations in the full sample is 122,053, covering the period from January 1984 to December 2006.

Insider-trading data are from the Thompson Financial insider trading database (TFN). We follow Richardson et al. (2004) and examine only open market sales and purchases. In addition, we only include trades by directors or officers to ensure that we capture the trading activities of those individuals who most likely have an impact on the reporting process of the firm. The variable *INSIDERSALE* combines the information of insider sales and purchases and denotes the net percentage of shares sold by officers or directors within one-month after the earnings announcement date. It is positive if insiders taken together are net sellers and negative when insiders are net purchasers.

We study a firm's trading incentives by considering two types of securities transactions: equity issuance and equity repurchases. The equity issuance and repurchase variables are derived from the statement of cash flows (COMPUSTAT data item 84 and item 93, respectively) and are scaled by the market capitalization at the beginning of the quarter.[6] To be consistent with the construction of *INSIDERSALE*, we combine the scaled equity issuances and repurchases to create the variable *FIRMSALE*, with a positive value

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[5] Bartov et al. (2002) require that all the forecasts be made at least three trading days after the release date of the previous quarter's earnings. However, we find that a significant portion (3% for day 0, 16% for day 1, and 5% for day 2 relative to the preceding earnings announcement day) of all the forecasts for the next quarter is made within three days of the preceding earnings announcement. Following Bartov et al.'s (2002) criteria does not qualitatively change our reported results.

[6] As a robustness check, we combine the COMPUSTAT information with equity issuances or repurchases data extracted from the SDC to ensure data accuracy. The results are similar.

denoting net equity issuance and a negative value denoting net equity repurchases.

3.2 Time-series Patterns of the Four Expectations Revision Paths

Table 1 reports the time-series distribution of the four forecast revision paths. We find that the walk down *OP* path is not the most frequent revision path, accounting for only 17% of the total paths in sub-period 1984-1994, increasing to over 25% in sub-period 1995-2000, and declining back to below 15% in the post-scandal sub-period 2001-2006. This observed pattern is consistent with Richardson et al.'s (2004) finding that walk down is most prevalent in the second half of the 1990s. It is also consistent with Bartov and Cohen (2008) and Koh et al. (2008), who argue that managers' financial disclosure and guidance behaviors change following the Sarbanes- Oxley Act of 2002.

The relative frequency of the *PP* path increases dramatically from around 30% in the mid-1980s to about 55% in the mid-2000s, consistent with prior findings of an increased number of *MBE* firms in more recent years. Our evidence indicates that *MBE* firms are not primarily driven by walk down firms especially in more recent years.

In stark contrast to the *PP* path, the relative frequency of *OO* decreases from more than 40% in the mid-1980s to about 20% in our latest sub-period. This may explain why studies in the 1980s tend to document that analysts are on average optimistic, while studies using more recent data find that analysts are on average pessimistic. The walk up *PO* path accounts for less than 10% of the sample in most years and shows a slight decline from 9% in the earliest sub-period to about 6% in the two later sub-periods.

3.3 Descriptive Statistics

Table 2 provides descriptive statistics for our sample partitioned into the four forecast revision paths. *OP* firms are on average larger and have higher market-to-book than *OO* firms. They also outperform *OO* firms both in the current and next quarters, when measured using both return on assets (ROA) and cash flow from operations (CFO).[7] The quarterly returns (CAR_ERROR) and event day returns (CAR_SURP) are also better for *OP* than those for *OO*, whereas the post-quarter return reversals (CAR_PEAD) are larger for *OO* than *OP*. When comparing *PP* to *PO*, we find very similar results in that *PP* firms outperform *PO* firms. These univariate results are consistent with Bartov et al.'s (2002) proposition that *MBE* is a leading indicator of future performance, even for the walk down *OP* firms.

Comparing the two paths *OP* and *PP* that lead to *MBE*, *PP* firms outperform *OP* firms in all dimensions, both current and future ROA and CFO, and stock returns, which suggests that the positive earnings surprises of *PP* firms convey more reliable good news than those of *OP* firms. For the two revision paths leading to a negative surprise or miss event, we find that *OO* firms perform significantly worse than *PO* firms, suggesting that *OO* firms are more reliably bad news firms than *PO* firms.

In the next section, we perform multivariate analyses to control for the magnitude of the earnings surprise, size of the analyst revisions and other confounding factors in the above comparisons that will allow for more definitive inferences. We test for whether the analyst revision path preceding the earnings announcement has implications for firms' future performance, and whether investors understand these implications.

7 Untabulated t-test results show that all these differences, except for Δ_CFO and CAR_PEAD, are statistically significant.

4. Investor Reactions to the Four Analysts' Revision Paths

4.1 Reward to walk down and penalty to walk up (Q1a and Q1b)

We first examine whether the prior finding of a reward to the *MBE* event itself extends to the more recent periods. As in past studies, the valuation reward is measured as the incremental market-adjusted quarterly return for *MBE* firms (*OP* and *PP*) relative to miss firms (*OO* and *PO*) after controlling for the magnitude of the forecast error and earnings surprise. Specifically, we run the following regression:

$$CAR\_ERROR_{j,q} = \beta_0 + \beta_1 ERROR_{j,q} + \beta_2 SURP_{j,q} + \beta_3 DMBE_{j,q} + \varepsilon_{j,q}, \qquad (1)$$

$CAR\_ERROR_{j,q}$ is firm *j*'s market-adjusted stock return cumulated from three days after the release date of the earliest forecast for quarter *q* ($FEARLIEST_{j,q}$) to one day after quarter *q*'s earnings announcement.

$ERROR_{j,q} = (EPS_{j,q}-FEARLIEST_{j,q})/PRICE_{j,q-1}$ is the forecast error for quarter *q*, calculated as quarter *q*'s I/B/E/S actual earnings minus quarter *q*'s earliest forecast, scaled by the beginning-of-quarter stock price.[8]

$SURP_{j,q} = (EPS_{j,q}-FLATEST_{j,q})/PRICE_{j,q-1}$ is firm *j*'s earnings surprise for quarter *q*, calculated as quarter *q*'s actual earnings minus quarter *q*'s latest forecast ($FLATEST_{j,q}$), scaled by the beginning-of-quarter stock price.

$DMBE_{j,q}$ is the indicator variable set to one if $\mathrm{SURP}_{j,q}>=0$, and zero otherwise. If there are multiple forecasts on the earliest or latest forecast day of the quarter, we take the mean forecast of that day to calculate *ERROR* or *SURP*.

To capture the possible nonlinear relation between earnings surprise and returns we split *SURP* into two variables, $SURP^+$ and $SURP^-$ and include an indicator variable

[8] As in Richardson et al. (2004) we also use an alternative specification by identifying *FLATEST* (*FEARLIEST*) as the latest (earliest) consensus analyst forecast using two-week windows. The results are qualitatively similar.

DSMALLSURP in an alternative specification below as:

$$CAR\_ERROR_{j,q} = \beta_0 + \beta_1 ERROR_{j,q} + \beta_2 SURP^{+}{}_{j,q} + \beta_3 SURP^{-}{}_{j,q} + \beta_4 DMBE_{j,q} \\ + \beta_5 DSMALLSURP_{j,q} + \varepsilon_{j,q} \quad \text{.} \qquad (1a)$$

$SURP^{+}$ ($SURP^{-}$) takes the value of *SURP* when *SURP* is greater (smaller) than zero, and zero otherwise. *DSMALLSURP* equals one if the absolute value of *SURP* is smaller than 0.02% (Koh et al., 2008).[9]

The empirical results for these regressions are in Table 3. Panel A exhibits that, even after controlling for the forecast error (*ERROR*) and earnings surprise, *MBE* firms still observe a higher market-adjusted stock return for the entire quarter in both the earlier Bartov's (2002) sample and more recent sample (1998-2006).[10]

MBE firms include *PP* and *OP* firms. The walk down *MBE* firms (*OP*) are more likely to have behaved strategically and, if investors discount for the greater likelihood of *MBE* gaming, they may not reward *OP* firms with a valuation premium. Therefore, we estimate regression (1) with only *OP* and *OO* firms to test Q1a for each year in our sample.[11] Column I of Table 4 reports only the *DMBE* coefficients and associated *t*-statistics for brevity. For the sub-period before 1995, *DMBE* is significantly positive in nine out of eleven years. During the 1995 to 2000 period, when the financial press and academics focused extensively on the earnings guidance game, the documented reward exists only in one out of the six years. Between 2001 and 2006 period when high profile accounting scandals occurred, the reward completely disappears. The premium average a highly significant 2.5% in the 1984-1994 period but actually reverse sign to an

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[9] Other cut-off points are also used; however, the main results are similar.
[10] Bartov et al. (2002) require the firms in their sample to have a December fiscal year-end, while we do not impose this restriction. Untabulated results show that this has little impact on the results.
[11] Untabulated results for each sub-period yield very similar conclusions to the yearly regressions.

insignificant -0.34% in this latest period. Overall, results indicate that investors reward *MBE* regardless of how it is achieved in the early periods but learn to question the credibility of reported good earnings news after a walk down of the analysts' forecast.

To investigate whether investors punish a walk up *PO* path, we present the comparison between *PP* and *PO* in Column II of Table 4. The penalty to *PO* firms relative to *PP* firms (equivalently the reward to *PP* firms relative to *PO* firms), remains high throughout the entire sample period, averaging about 2.4%. Investors therefore do not seem to be aware of potential strategic motives for a walk up to a deliberate miss through time.

Recent evidence suggests that the reward to *MBE* diminishes after the Sarbanes-Oxley Act (Koh et al., 2008). Our analysis implies that this result is driven by the disappearance of the reward in the walk down group.

4.2 Rationality in the Market's Reward to Walk Down and Penalty to Walk Up

We demonstrate that investors penalize walk up *PO* throughout our sample period, and a reward to walk down *OP* in the early sample period. The next question is whether these valuation effects are justified by the underlying performance of the firm. In this sub-section, we conduct three tests to examine this issue.

4.2.1 MBE and Future Operating Performance (Q2a and Q2b)

If the reward to walk down (*OP)* and penalty to walk up (*PO)* are justified, we would like to see that *OP* firms perform better in future relative to *OO* firms, and vice versa between *PP* firms and *PO* firms. We run the following regressions to investigate the issue:

$$\Delta\_ROA_{j,q} = \phi_0 + \phi_1 ERROR_{j,q} + \phi_2 SURP^{+}{}_{j,q} + \phi_3 SURP^{-}{}_{j,q} + \phi_4 DSMALLSURP_{j,q} + \phi_5 DMBE_{j,q} + +\phi_6 MV_{j,q} + \phi_7 MTB_{j,q} + \varepsilon_{j,q} \tag{2}$$

$$\Delta\_CFO_{j,q} = \phi_0 + \phi_1 ERROR_{j,q} + \phi_2 SURP^{+}{}_{j,q} + \phi_3 SURP^{-}{}_{j,q} + \phi_4 DSMALLSURP_{j,q} + \phi_5 DMBE_{j,q} + \phi_6 MV_{j,q} + \phi_7 MTB_{j,q} + \varepsilon_{j,q}, \tag{3}$$

Δ_ROA is the change in return on assets (*ROA*) one quarter ahead.

Δ_CFO is the change in cash flow from operations (*CFO*) one quarter ahead.

MV is the logarithm of the market value of equity.

MTB is the market-to-book ratio.

The results are reported in Table 5. We correct for the time-series dependence of the performance measures by clustering at the firm level to obtain White standard errors to compute *t*-statistics (Petersen, 2009). In Panel A, ROA increase is larger for *OP* than *OO* during 1984 to 2000, but the CFO change between these firms is not significantly different in any of the sub-periods. If managers have more discretion in reporting ROA than CFO using accruals management, these findings suggest that, in the earlier years of the sample, investors reward good news surprises even when the firms do not deliver higher future CFO but they catch on to the walk down game over time.

We use one-quarter-ahead performance measures for the above tests because learning is more likely when the underlying economic fundamentals (i.e., future performance) are revealed within a short period of the gaming event. The results are similar when we use one-year-ahead change in ROA and CFO.

Panel B of Table 5 reports the next-quarter performance of *PP* versus *PO*. The *PP* valuation premium over *PO* does not seem to be justified. *PP* does not deliver consistently higher future operating performance in the three sub-periods. The only significant difference in performance measure is the increase in ROA over the next quarter for the first sub-period. The change in CFO in the next quarter is no different between the two groups of firms in all three sub-periods, and the change in CFO is actually smaller for *PP* than *PO* firms using annual data in the 1995-2000 sub-period. The evidence therefore suggests that valuation penalty for "walk up to miss" firms is not justified.

4.2.2 Short-window Price Reaction to Earnings Surprises (Q3a and Q3b)

If investors understand the underlying gaming nature of walk down or walk up revision paths, they would consider the forecast revision path leading up to the earnings announcement when responding to the earnings surprise. We test whether they do so using the following regressions in equation (4) for the good news firms *PP* and *OP* and in equation (5) for the bad news firms *OO* and *PO*:[12]

$$CAR\_SURP_{j,q} = \delta_0 + \delta_1 SURP_{j,q} + \delta_2 DSMALLSURP_{j,q} + \delta_3 OP_{j,q} + \varepsilon_{j,q} \tag{4}$$

$$CAR\_SURP_{j,q} = \gamma_0 + \gamma_1 SURP_{j,q} + \gamma_2 DSMALLSURP_{j,q} + \gamma_3 PO_{j,q} + \varepsilon_{j,q}\,, \tag{5}$$

where $CAR\_SURP_{j,q}$ is the market-adjusted return for firm *j* in quarter *q* cumulated from two days after the latest forecast date for the quarter to one day after the earnings release date.[13] *OP* indicator variable is set to one for *OP* firms, and zero for *PP* firms in regression (4). Similarly, *PO* indicator variable is set to one for *PO* firms, and zero for *OO* firms. If investors discount the information in earnings surprises resulting from a walk down *PO* or a walk up *OP*, we predict that $\delta_3<0$ and $\gamma_3>0$.

The results are reported in Table 6 for each year. For brevity, we only report the

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[12] Splitting *SURP* into $SURP^+$ and $SURP^-$ in the regression does not qualitatively change the main results. We use this simplified version for brevity.
[13] The results are similar if we use a three-day window around the earnings announcement date.

coefficients and associated *t*-statistics on *OP* and *PO* indicator variables. Consistent with our prediction for Q3a, δ_3 in Column I is significantly negative in all 23 years, indicating that investors do pay attention to the revision path. They are skeptical about the positive earnings surprises achieved through a walk down and hence apply some discounting of the good news. The coefficient is much more negative in the latest 3 years, consistent with heavier discounting in recent years.

Column II also confirms that negative earnings surprises attained through a walk up are perceived by the capital markets to be less credible (*Q3b*). The estimated coefficient on *PO* indicator variable, γ_3, is significantly positive in all 23 years, consistent with investors discounting bad news that is achieved through a walk up.

In summary, investors do seem to realize the strategic nature of the positive earnings news achieved through a walk down and the negative earnings news achieved through a walk up and adjust their price reaction accordingly.

4.2.3 Stock Return Reversal Analyses (Q4)

The above analysis on the short-window price reaction only reveals that investors realize, at least to some degree, the strategic nature associated with both a walk down and a walk up. However, it does not answer the question of whether investors adjust *fully* in their price response. To address this issue, we check for future stock return reversals for the two strategic revision paths, *OP* and *PO*.

For each calendar quarter, we form five equal-sized portfolios based on the magnitude of SURP across all the sample firms. Then, within each quintile we separate firms into two groups, one containing the strategic firms *OP* and *PO* and the other containing the non-strategic (or at least less strategic) firms *OO* and *PP*. For each group, we calculate the average return in the subsequent quarter (CAR_PEAD) for each quintile for all three sub-periods. The hedge portfolios for the SUE strategy are constructed by buying the highest SURP quintile and shorting the lowest SUE quintile for the strategic *OP* and *PO* sub-group and for the non-strategic *PP* and *OO* sub-group. By ranking all firms on SURP first, we use the same cut-offs for the SUE quintile, and therefore control for the magnitude of earnings surprises between the strategic and non-strategic subgroups. The average CAR_PEAD and the hedge returns are reported in Table 7 for the two sub-groups for each of the sub-periods.

The hedge returns in the *PP* and *OO sub*-group average 4.87%, 6.20%, and 5.0% respectively for the three sub-periods, which are comparable to the magnitudes reported in the literature (Bernard and Thomas, 1989; Livnat and Mendenhall, 2006). In contrast, the hedge return in the *OP* and *PO* sub-group which comprises the walk down and walk up sample is not significant in 1984-1995 sub-period, increases to 2.22% in the second sub-period and to 4.04% during 2001 to 2006.

We interpret the above results as follows. The post-quarter returns are largely driven by the effect of PEAD in the non-strategic sample. For the strategic sample, however, the post-quarter returns will depend on how the PEAD effect offsets the return reversals from insufficient discounting of preceding quarter earnings surprises from strategic walk down or walk up activities. Note that the return reversals operate in the opposite direction from the PEAD effect. In the earliest period, investors did not discount sufficiently for these strategic motives so the return reversals tend to be large and of sufficient magnitude to completely offset the PEAD effect, resulting in no hedge returns. If one uses the hedge return from PEAD in the non-strategic sample of -4.87% as an estimate of the PEAD effect for this sub-period, then the return reversal from the correction of the overreaction to the earnings surprise in the strategic sample is actually about 4.61%, which is statistically significant.

In contrast, in the latest sub-period when there is much less overreaction to the earnings surprise for the strategic sample (as reported in the previous sub-section), the small return reversals are insufficient to dampen the PEAD effect. Therefore the hedge returns from the SUE strategy show a net significant 4.04% for the strategic sample, which is almost as large as the PEAD effect for the less strategic sample of 5.03%.

Summarizing the results in this section, we find that before 1994, compared to firms with consistent optimistic forecasts *OO*, initial optimistic forecast firms that walked down their forecasts to a positive earnings surprise enjoy a stock return premium that is not justified by later operating performance. This premium is diminished after the mid-1990s. In contrast, firms with consistent pessimistic forecasts *PP* continue to enjoy a premium over those with initial pessimistic forecasts that walk up their forecasts to miss expectations, and this premium is not justified by later operating performance. So while investors have learned to discount *MBE* from a strategic walk down of forecasts, they remain overly pessimistic about walk up firms. A walk up motive seems less intuitive than a walk down motive and has not been of as much focus of attention from the regulators and the media. We consider explicitly the incentives to both a walk down and a walk up by managers and firm next.

5. Equity Trading Incentives

In this section we examine how net selling behavior of insiders and new issues or repurchases by firms may affect incentives to walk down or walk up forecasts.

5.1 The Walk Down Revision Path and Equity Transaction Incentives (H5)

Richardson et al. (2004) find that firms that issue more equity and whose managers are net sellers of the firm's stock after an earnings announcement are more likely to walk down forecasts. They hypothesize that these incentives are induced by the market reward to *MBE*. Since our previous section results show that the *MBE* reward from a walk down is much diminished in later periods, we test whether these incentives have diminished in the more recent periods. Following Richardson et al., we estimate the following logistic regression for the *OP* and *OO* sample:

$$\begin{aligned} OP_{j,q} &= \beta_0 + \beta_1 INSIDERSALE_{j,q} + \beta_2 FIRMSALENOW_{j,q} + \beta_3 FIRMSALESNEXT_{j,q} \\ &+ \beta_4 MTB_{j,q} + \beta_5 SIZE_{j,q} + \beta_6 ROA_{j,q} + \beta_7 RD_{j,q} + \beta_8 LITG_{j,q} + \beta_9 CHEARN_{j,q} + \varepsilon_{j,q} \end{aligned}, \qquad (6)$$

INSIDERSALE is the net percentage of shares traded within one month after the earnings announcement; it is positive when insiders are net sellers and negative when insiders are net purchasers.

FIRMSALENOW is the issuance or repurchase of common and preferred equity during the quarter; a positive amount denotes equity issuance (COMPUSTAT data item 8 deflated by beginning-of-quarter market value) and a negative amount denotes stock repurchases (COMPUSTAT data item 93 deflated by beginning-of-quarter market value).

FIRMSALENEXT is the *FIRMSALENOW* value in the subsequent quarter.

RD is the research and development expenditure scaled by average total assets.

LITIG is an indicator variable equal to one for high litigation risk industries as defined in Matsumoto (2002), and zero otherwise.

CHEARN is an indicator variable equal to one for a positive change in earnings from the same quarter in the prior year, and zero otherwise.

The results of regression (6) are in Panel A of Table 8. Consistent with Richardson et al. (2004), we find that *OP* revision path is more frequent in firms with subsequent net insider sales and equity issuance in the early sub-period. Interestingly, net insider sales is statistically insignificant and equity issuance even reverses its sign in the post-scandal period (2001-2006), which suggests that these incentives disappear once investors stop rewarding a walk down to *MBE*.

5.2 Walk Up and Equity Transaction Incentives (H5)

We observe in our sample period a relatively small and somewhat stable proportion (9% in earliest period and 6% in later sub-periods) of walk up *PO* firms. Are these *PO* paths merely a random outcome or are they also driven by capital market-related incentives? To test our hypothesis *H5*, that *PO* is a strategic move by managers to walk up forecasts to elicit a temporarily dampening of the stock price and thereby facilitate equity buying, we re-estimate regression (6) by contrasting *PO* and *PP* firms with the indicator variable set to one for *PO*. We expect that $\beta_1<0$ and $\beta_3<0$.

Panel B of Table 8 reports our findings. The coefficient estimate on INSIDERSALE, β_1, is significantly negative for each of the three sub-periods, consistent with the prediction that insiders buy more following a walk up of forecasts to a deliberate miss. FIRMSALENEXT is significantly negative, indicating firm repurchase of stock, in the earliest period 1984-1994. In sum, the walk down and walk up paths are related to managerial incentives to sell equity for the former and to buy equity for the latter either on personal account or on behalf of the firm. The insignificant coefficients on *FIRMSALENEXT* in periods after 1995, in contrast to the persistent significance of *INSIDERSALE* suggest that managers have stronger incentives to trade on their own account than for the firms' benefit when playing the numbers game.

We also consider analysts' incentives to cooperate in this earnings numbers game. We find that analysts of walk down firms and those of walk up firms are rewarded with greater accuracy in the subsequent quarter or year. We do not tabulate these results as they are similar to Ke and Yu (2006) though they did not interpret their results for the walk up case and their period ends in 2000. As Ke and Yu suggests, the results imply that cooperative analysts are rewarded with greater access to management, and so are able to be more accurate (though more biased). Past literature also note that investment banks that employ analysts with favorable forecasts are more likely to be selected to underwrite new equity issuances and tender offer repurchases.

7. Conclusions

In this paper we find evidence of a coherent relation between managers' incentives and investors' response to the *MBE* event via a walk down of analysts' forecasts and a miss event via a walk up of analysts' forecasts, and how the relation evolved over time. The past literature suggests that managers walk down analyst forecasts to report positive earnings surprises so as to boost firms' stock prices and facilitate stock selling.

Consistent with this view, we find that investors do reward a walk down with a valuation premium over the quarter that the phenomenon occurs, and that managers take advantage of the temporary valuation premium to sell equity on personal account or on behalf of the firm. However, the valuation premium is erased once investors become aware of the strategic motive underlying a walk down of analysts' forecasts to achieve a positive earnings surprise in recent years. Once the valuation premium is erased, managers have less incentive to sell stock.

On the flip-side, we find that managers have incentives to depress stock prices to facilitate their buying shares on personal account or firm repurchases with a walk up of forecasts to deliberately miss analysts' expectations. Our evidence shows that walk up firms are indeed punished by investors relative to those that experience consistent pessimistic forecasts in the quarter and so meet or beat expectations. In response, managers are more likely to buy shares on personal account or the firm to repurchase stocks in walk up firms. Investors do not appear to have learned to discount for these strategic motives even in recent years.

When they exist, the valuation premium for a walk down to *MBE* and the penalty of a walk up to a miss are not warranted by future operating performance. In general, the future cash flows are no different for walk down firms and walk up firms when compared to consistent optimistic forecast firms and consistent pessimistic forecast firms respectively. In more careful tests, we find that the valuation premium or penalty is the result of insufficient discounting for potential strategic motives behind walk down or walk up gaming. Instead, investors overreact to earnings surprises following walk down or walk up, and their subsequent return reversals offset the well-known PEAD effect.

In sum, we find evidence that there are rewards to the earnings numbers game for firms and managers at investors' expense. In more recent years, the rewards to a walk down have largely disappeared when investors have become aware of the phenomenon.

However, the rewards to a walk up, a phenomenon that has been largely ignored in the literature and by regulators and the press, continue to exist. Investors therefore need to be more skeptical of intentional bad news surprises from a walk up revision of analysts' forecasts.

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TABLE 1: Annual Distribution of the Four Expectations Revision Paths

Year	OP	OP(%)	OO	OO(%)	PP	PP(%)	PO	PO(%)	Total	OP(%)	OO(%)	PP(%)	PO(%)
1984	258	16.0	689	42.8	506	31.4	158	9.8	1,611				
1985	358	15.8	1,024	45.2	654	28.9	228	10.1	2,264				
1986	447	17.2	1,024	39.4	855	32.9	273	10.5	2,599				
1987	400	15.4	927	35.7	998	38.4	273	10.5	2,598				
1988	487	15.6	1,080	34.5	1,270	40.6	292	9.3	3,129				
1989	557	15.2	1,464	40.1	1,284	35.1	349	9.6	3,654				
1990	680	17.7	1,533	39.9	1,285	33.4	344	9.0	3,842				
1991	766	19.0	1,519	37.6	1,436	35.5	321	7.9	4,042				
1992	836	18.1	1,584	34.2	1,834	39.6	376	8.1	4,630				
1993	804	19.5	1,245	30.3	1,740	42.3	325	7.9	4,114				
1994	1,228	18.6	1,769	26.8	3,107	47.1	492	7.5	6,596	0.17	0.35	0.38	0.09
1995	1,416	20.6	1,763	25.7	3,216	46.8	470	6.8	6,865				
1996	1,519	21.1	1,571	21.8	3,582	49.8	527	7.3	7,199				
1997	1,567	20.4	1,588	20.6	4,069	52.9	467	6.1	7,691				
1998	1,848	25.1	1,536	20.9	3,629	49.3	346	4.7	7,359				
1999	1,572	22.8	1,210	17.5	3,811	55.2	315	4.6	6,908				
2000	1,271	21.9	1,015	17.5	3,247	55.9	278	4.8	5,811	0.22	0.21	0.52	0.06
2001	1,892	29.8	1,161	18.3	3,029	47.6	276	4.3	6,358				
2002	1,326	20.6	1,092	16.9	3,689	57.3	336	5.2	6,443				
2003	1,156	17.2	1,318	19.6	3,835	57.0	421	6.3	6,730				
2004	1,178	16.2	1,452	20.0	4,141	57.0	500	6.9	7,271				
2005	1,246	15.9	1,724	21.9	4,330	55.1	555	7.1	7,855				
2006	942	14.5	1,510	23.3	3,583	55.3	449	6.9	6,484	0.19	0.20	0.55	0.06
Total	23,754	0.19	30,798	0.25	59,130	0.48	8,371	0.07	122,053				

In the denotation of each of the paths (*OP*, *OO*, *PP*, and *PO*), the first letter refers to the optimistic(O)/pessimistic(P) status of the first forecast of the quarter, and the second letter refers to the optimistic(O)/pessimistic(P) status of the last forecast of the quarter. A forecast is labeled as O (P) if it is higher than (lower than or equal to) the actual earnings of the quarter. *OP* corresponds to walk down and *PO* corresponds to walk up.

TABLE 2: Descriptive Statistics by Earnings Expectation Revision Path

Panel A: Firm-Level Variables

	OP (Walk Down)		OO		PP		PO (Walk Up)	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median
ERROR	-0.004	-0.002	-0.008	-0.004	0.003	0.001	0.002	0.001
SURP	0.001	0.001	-0.005	-0.002	0.002	0.001	-0.002	-0.001
ROA	0.006	0.009	0.001	0.007	0.015	0.015	0.010	0.012
Δ_ROA	-0.007	-0.002	-0.009	-0.002	0.002	0.001	0.000	0.000
CFO	0.019	0.021	0.015	0.018	0.027	0.027	0.023	0.025
Δ_CFO	-0.002	-0.002	-0.003	-0.002	0.001	0.001	0.000	-0.000
CAR_ERROR	-0.056	-0.047	-0.061	-0.053	0.049	0.034	0.021	0.010
CAR_SURP	0.001	-0.003	-0.030	-0.024	0.025	0.016	-0.001	-0.004
CAR_PEAD	-0.005	-0.008	-0.020	-0.021	0.015	0.010	-0.011	-0.010
MV	4337	812	3346	707	5566	1116	5219	1050
MTB	2.627	2.025	2.438	1.865	3.263	2.454	2.927	2.205
INSIDERSALE	0.001	0.000	0.004	0.000	0.002	0.000	0.001	0.000
FIRMSALENOW	0.005	0.000	0.005	0.000	0.006	0.000	0.005	0.000
FIRMSALENEXT	0.004	0.000	0.003	0.000	0.005	0.000	0.005	0.000
RD	0.004	0.000	0.004	0.000	0.004	0.000	0.004	0.000
CHEARN	-0.034	-0.002	-0.033	-0.003	-0.028	0.001	-0.023	0.000
LITIG	0.230	0.000	0.191	0.000	0.236	0.000	0.183	0.000

OP, PP, OO and PP refer to patterns of forecast revision paths for each firm-quarter. The first letter refers to the optimistic(O)/pessimistic(P) status of the first forecast of the quarter, and the second letter refers to the optimistic(O)/pessimistic(P) status of the last forecast of the quarter. A forecast is labeled as O (P) if it is higher than (lower than or equal to) the actual earnings of the quarter. *ERROR* is the difference between the actual EPS from I/B/E/S and the earliest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. *SURP* is the difference between the actual EPS from I/B/E/S and the latest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. *ROA* is return on assets. *CFO* is cash flow from operations deflated by assets. The quarterly change of ROA or CFO is measured relative to the same quarter in the previous year, namely, $\Delta\_ROA_q = ROA_{q+1} - ROA_{q-3}$; $\Delta\_CFO_q = CFO_{q+1} - CFO_{q-3}$.

CAR_ERROR is cumulative market-adjusted returns over the period from three trading days after the first forecast to one trading day after the current-quarter earnings announcement. *CAR_SURP* is cumulative market-adjusted returns for the period from the last forecast for the quarter to one day after the current-quarter earnings announcement. *CAR_PEAD* is cumulative market-adjusted returns over the period from one day after the current-quarter earnings announcement to the next earnings announcement. *MV* is the logarithm of the market value of equity. *MTB* is the market-to-book ratio.

INSIDERSALE is the net percentage shares sold/purchased by the top management or directors of the firm within the one-month period after the earnings announcement. It is positive for net insider sales, and negative for net insider purchases. *FIRMSALENOW* is the issuance/repurchase of common and preferred equity during the quarter. It represents equity issuance (COMPUSTAT*#8* deflated by beginning-of-quarter market value) when positive; and stock repurchase (COMPUSTAT*#93* deflated by beginning-of-quarter market value) when negative. *FIRMSALENEXT* is the issuance/repurchase of common and preferred equity in the quarter subsequent to the quarter concerned. *RD* denotes R&D expenditures scaled by average total assets. *LITIG i*s an indicator variable equal to one for high litigation risk industries as defined in Matsumoto (2002), and zero otherwise. *CHEARN* is an indicator variable equal to one for a positive change in earnings from the same quarter in the prior year, zero otherwise.

TABLE 3: The Existence of MBE Reward

	ERROR	SURP	D*MBE*	$SURP^+$	$SURP^-$	DSMALLSURP	Adjusted R^2	Nobs
Panel A: 1984-1997 sample period								
MODEL1	5.292	-0.464					6.8%	60834
	51.39	***-3.32***						
MODEL2	5.220	-2.135	0.042				7.8%	60834
	50.94	***-13.91***	***25.48***					
MODEL3	5.559			3.125	-2.157	-0.008	7.5%	60834
	53.68			***12.90***	***-12.83***	***-4.21***		
MODEL4	5.437		0.047	0.396	-3.583	-0.026	8.5%	60834
	52.77		***26.86***	*1.51*	***-20.43***	***-12.54***		
Panel B: 1998-2006 sample period								
MODEL1	7.609	-0.826					6.7%	61219
	55.78	***-3.93***						
MODEL2	7.519	-2.304	0.033				7.0%	61219
	55.17	***-9.94***	***15.04***					
MODEL3	7.828			2.376	-3.389	-0.021	7.2%	61219
	57.21			***7.38***	***-12.30***	***-9.29***		
MODEL4	7.710		0.045	0.306	-5.434	-0.033	7.8%	61219
	56.48		***19.69***	*0.91*	***-18.50***	***-14.22***		

The dependent variable CAR_ERROR is defined as the cumulative market-adjusted returns over the period from three trading days after the first forecast to one trading day after the current-quarter earnings announcement.

ERROR is defined as actual EPS from I/B/E/S minus the earliest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. SURP is actual EPS from I/B/E/S minus the latest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. DMBE equals one if SURP>=0, and zero if SURP<0. $SURP^+$ equals SURP when SURP>=0, and zero otherwise. $SURP^-$ is set to SURP when SURP<0, and zero otherwise. DSMALLSURP equals one if the absolute value of SURP is smaller than 0.02%, and zero otherwise.

Bold numbers indicate significance at the 5% level (two-tailed *t*-test).

TABLE 4: Time Series Pattern of the Rewards to MBE

Dependant Variable: CAR_ERROR

	I		II	
Year	OP vs. OO	*t-stat*	PP vs. PO	*t-stat*
1984	0.0391	***3.08***	0.0105	*0.77*
1985	0.0364	***3.39***	0.0122	*1.08*
1986	0.022	***1.96***	0.0379	***3.36***
1987	0.0346	***3.16***	0.0249	***2.28***
1988	0.0294	***2.90***	0.0277	***2.99***
1989	0.0128	*1.40*	0.0268	***2.98***
1990	0.0229	***2.15***	0.0053	*0.42*
1991	0.0316	***3.36***	0.0265	***2.29***
1992	0.0201	***2.14***	0.0321	***3.00***
1993	0.0052	*0.50*	0.0318	***2.88***
1994	0.0209	***2.59***	0.0105	*1.16*
1984-1994	0.0250	***7.98***	0.0224	***6.85***
1995	0.0096	*1.11*	0.0407	***4.18***
1996	-0.0059	*-0.63*	0.0185	***1.97***
1997	0.0204	***2.27***	0.0351	***3.29***
1998	-0.0073	*-0.80*	0.0141	*1.07*
1999	0.0117	*0.94*	0.0514	***3.31***
2000	0.0019	*0.13*	0.0278	*1.42*
1995-2000	0.0051	*1.15*	0.0313	***5.47***
2001	0.0132	*1.30*	0.0152	*0.93*
2002	-0.0236	***-2.06***	0.027	***2.15***
2003	-0.0093	*-0.93*	0.0144	*1.37*
2004	-0.0034	*-0.38*	0.0243	***3.01***
2005	0.0072	*0.92*	0.0192	***2.35***
2006	-0.0042	*-0.48*	0.0277	***3.02***
2001-2006	-0.0034	*-0.64*	0.0213	***8.90***
1984-2006	0.0124	***3.59***	0.0244	***10.55***

For Column I and II, we report β_4 and its *t*-statistics for the regression:

$$CAR\_ERROR_{j,q} = \beta_0 + \beta_1 ERROR_{j,q} + \beta_2 SURP^{+}{}_{j,q} + \beta_3 SURP^{-}{}_{j,q} + \beta_4 DMBE_{j,q} + \beta_5 DSMALLSURP_{j,q} + \varepsilon_{j,q} \quad (1a)$$

CAR_ERROR is cumulative market-adjusted returns over the period from three trading days after the first forecast to one trading day after the current quarter earnings announcement. CAR_SURP is cumulative market-adjusted returns for the period from the last forecast for the quarter to one day after the current-quarter earnings announcement.

ERROR is defined as actual EPS from I/B/E/S minus the earliest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. SURP is actual EPS from IBES minus the latest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. DMBE equals one if SURP>=0, and zero if SURP<0. $SURP^{+}$ equals SURP when SURP>=0, and zero otherwise. $SURP^{-}$ is set to SURP when SURP<0, and zero otherwise. DSMALLSURP equals one if the absolute value of SURP is smaller than 0.02%, and zero otherwise.

Bold numbers indicate significance at the 5% level (two-tailed *t*-test).

TABLE 5: Comparison of Future Performance between MBE vs. non-MBE firms

Panel A OP (Walk Down) vs. OO

		INTERCEPT	ERROR	SURP+	SURP-	DSMALL SURP	DMBE (OP)	SIZE	MTB	Adjusted R^2
Δ_ROA	Sub 1: 1984-1994	-0.012	0.403	0.049	-0.134	-0.002	0.003	0.002	-0.001	
		-4.28	***7.81***	*0.20*	***-1.83***	***-1.88***	***4.03***	***7.99***	***-2.09***	*2.2%*
	Sub 2: 1995-2000	-0.013	0.823	-0.077	0.020	-0.003	0.003	0.002	0.000	
		-5.12	***6.83***	*-0.14*	*0.11*	***-2.04***	***2.06***	***6.63***	*-0.76*	*3.2%*
	Sub 3: 2001-2006	-0.046	0.540	0.336	0.077	-0.001	0.000	0.002	0.001	
		-7.61	***4.05***	*0.74*	*0.30*	*-0.40*	*-0.20*	***5.77***	***4.00***	*2.7%*

		INTERCEPT	ERROR	SURP+	SURP-	DSMALLSURP	DMBE (OP)	SIZE	MTB	Adjusted R^2
Δ_CFO	Sub 1: 1984-1994	0.004	0.160	0.164	-0.141	-0.001	0.001	0.000	-0.001	
		1.16	***1.77***	*0.42*	*-0.90*	*-0.60*	*0.85*	*-1.20*	***-2.78***	*0.4%*
	Sub 2: 1995-2000	-0.004	0.294	0.249	-0.268	-0.001	0.000	0.000	-0.001	
		-1.22	***3.08***	*0.60*	***-1.93***	*-0.81*	*-0.13*	*0.36*	*-1.29*	*0.5%*
	Sub 3: 2001-2006	-0.006	0.105	-0.153	-0.184	0.000	0.001	0.000	0.000	
		-1.64	*0.78*	*-0.49*	*-1.05*	*0.04*	*1.19*	*1.41*	*0.61*	*0.3%*

TABLE 5: Comparison of Future Performance between MBE vs. non-MBE firms (Cont')

Panel B: PP vs PO (Walk Up)

		INTERCEPT	ERROR	SURP+	SURP-	DSMALLSURP	DMBE (PP)	SIZE	MTB	Adjusted R^2
Δ_ROA	Sub 1: 1984-1994	-0.004	0.347	-0.115	-0.334	-0.001	0.002	0.000	0.000	
		-1.68	***3.09***	*-0.95*	*-1.07*	*-1.77*	***2.49***	***3.24***	***2.78***	*0.9%*
	Sub 2: 1995-2000	-0.002	0.700	-0.130	0.270	-0.003	0.001	0.000	0.001	
		-0.96	***4.36***	*-0.52*	*0.46*	***-4.18***	*0.90*	*-0.10*	***5.61***	*1.2%*
	Sub 3: 2001-2006	-0.014	1.020	-0.628	0.639	-0.001	0.001	0.000	0.001	
		-4.11	***6.51***	***-2.28***	*1.31*	*-1.34*	*1.04*	*0.84*	***5.31***	*1.3%*

		INTERCEPT	ERROR	SURP+	SURP-	DSMALLSURP	DMBE (PP)	SIZE	MTB	Adjusted R^2
Δ_CFO	Sub 1: 1984-1994	0.001	0.207	-0.041	0.545	-0.002	0.001	0.000	0.000	
		0.36	*1.21*	*-0.19*	*1.06*	***-1.84***	*0.79*	*-0.08*	*-1.76*	*0.4%*
	Sub 2: 1995-2000	-0.003	0.467	0.093	-0.742	0.000	-0.001	0.000	0.000	
		-1.14	***2.24***	*0.39*	***-1.93***	*0.35*	*-0.61*	*-0.84*	*1.59*	*0.4%*
	Sub 3: 2001-2006	0.005	0.521	0.159	0.189	0.000	0.001	-0.001	0.001	
		1.54	***3.64***	*0.72*	*0.64*	*0.49*	*0.69*	***-2.79***	***3.75***	*0.6%*

ROA is return on assets. CFO is cash flow from operations deflated by total assets. The quarterly change of ROA or CFO is measured relative to the same quarter in the previous year, namely, $\Delta\_ROA_q = ROA_{q+1} - ROA_{q-3}$; $\Delta\_CFO_q = CFO_{q+1} - CFO_{q-3}$. SIZE is the logarithm of the market value of equity. MTB is the market-to-book ratio. All ROA- and CFO-related variables are restricted to be within 100% of total assets.

ERROR is defined as actual EPS from I/B/E/S minus the earliest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. SURP is actual EPS from I/B/E/S minus the latest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. DMBE equals one if SURP>=0, and zero if SURP<0. $SURP^+$ equals SURP when SURP>=0, and zero otherwise. $SURP^-$ is set to SURP when SURP<0, and zero otherwise. DSMALLSURP equals one if the absolute value of SURP is smaller than 0.002%, and zero otherwise.

All regressions include quarter dummies and the errors are clustered by firm. Bold numbers indicate significance at the 5% level (two-tailed *t*-test).

TABLE 6: Short Window Price Reaction to Earnings Surprises of Different Paths Leading to MBE vs. non-MBE

	Dependant Variable: CAR_SURP			
	I (MBE)		II (non-MBE)	
Year	OP. vs. PP	t-stat	PO. vs. OO	t-stat
1984	-0.0103	*-1.35*	0.0213	***2.30***
1985	-0.0130	***-2.05***	0.0282	***4.23***
1986	-0.0203	***-3.14***	0.0131	***2.05***
1987	-0.0209	***-3.08***	0.0243	***3.07***
1988	-0.0134	***-2.83***	0.0084	*1.34*
1989	-0.0157	***-3.08***	0.0158	***3.00***
1990	-0.0197	***-3.45***	0.0239	***3.22***
1991	-0.0167	***-3.04***	0.0220	***3.1***
1992	-0.0121	***-2.44***	0.0185	***2.61***
1993	-0.0082	*-1.72*	0.0159	***2.42***
1994	-0.0095	***-2.66***	0.0204	***3.86***
1984-1994	-0.0145	***-10.79***	0.0193	***11.30***
1995	-0.0139	***-3.70***	0.0231	***3.98***
1996	-0.0105	***-2.70***	0.0274	***4.37***
1997	-0.0160	***-4.23***	0.0268	***4.12***
1998	-0.0106	***-2.27***	0.0321	***3.56***
1999	-0.0076	*-1.53*	0.0125	*1.21*
2000	-0.0138	***-2.00***	0.0215	*1.48*
1995-2000	-0.0121	***-9.70***	0.0239	***8.74***
2001	-0.0058	*-1.05*	0.0370	***3.21***
2002	-0.0158	***-3.17***	0.0149	*1.45*
2003	-0.0131	***-3.18***	0.0250	***3.99***
2004	-0.0163	***-4.28***	0.0248	***4.17***
2005	-0.0237	***-6.67***	0.0317	***6.23***
2006	-0.0248	***-6.01***	0.0252	***4.29***
2001-2006	-0.0166	***-5.78***	0.0264	***8.67***
1984-2006	-0.0144	***-13.78***	0.0223	***15.56***

For Column I , we report δ_3 and its *t*-statistics for the regression:

$$CAR\_SURP_{j,q} = \delta_0 + \delta_1 SURP_{j,q} + \delta_2 DSMALLSURP_{j,q} + \delta_3 OP_{j,q} + \varepsilon_{j,q} \qquad (4)$$

For Column II, we report γ_3 and its *t*-statistics for the regression:

$$CAR\_SURP_{j,q} = \gamma_0 + \gamma_1 SURP_{j,q} + \gamma_2 DSMALLSURP_{j,q} + \gamma_3 PO_{j,q} + \varepsilon_{j,q} \qquad (5)$$

CAR_ERROR is cumulative market-adjusted returns over the period from three trading days after the first forecast to one trading day after the current-quarter earnings announcement. CAR_SURP is cumulative market-adjusted returns for the period from the last forecast for the quarter to one day after the current-quarter earnings announcement.

SURP is actual EPS from I/B/E/S minus the latest EPS forecast made for the quarter, deflated by the beginning-of-quarter stock price. DSMALLSURP equals one if the absolute value of SURP is smaller than 0.02%, and zero otherwise.

Bold numbers indicate significance at the 5% level (two-tailed *t*-test).

Table 7 Comparison of Trading Profits of the PEAD Strategy

Panel A: 1984-1994 period

SURP	OP and PO		PP and OO		Difference	
Rank	CAR_PEAD	t-stat	CAR_PEAD	t-stat	CAR_PEAD	t-stat
1	0.0029	*0.33*	-0.0225	***-5.18***	-0.0258	***-2.72***
2	-0.0094	***-2.47***	-0.0200	***-6.74***	-0.0098	***-2.49***
3	-0.0092	***-2.15***	0.0021	*0.6*	0.0113	***1.99***
4	-0.0024	*-0.61*	0.0213	***8.02***	0.0237	***5.54***
5	0.0055	*1.09*	0.0262	***7.71***	0.0207	***3.77***
Hedge	0.0026	*0.32*	0.0487	***11.47***	-0.0471	***-4.59***

Panel B: 1995-2000 period

SURP	OP and PO		PP and OO		Difference	
Rank	CAR_PEAD	t-stat	CAR_PEAD	t-stat	CAR_PEAD	t-stat
1	-0.0287	***-2.07***	-0.0404	***-3.95***	-0.0232	*-1.42*
2	-0.0349	***-2.98***	-0.0192	*-1.77*	0.0034	*0.25*
3	-0.0196	*-1.56*	-0.0094	*-1.83*	0.0010	*0.08*
4	-0.0024	*-0.16*	0.0086	*1.25*	-0.0087	*-0.52*
5	-0.0065	*-0.35*	0.0216	***2.47***	0.0119	*0.61*
Hedge	0.0222	***2.07***	0.06200	***8.68***	-0.0399	***-2.62***

Panel C: 2001-2006 period

SURP	OP and PO		PP and OO		Difference	
Rank	CAR_PEAD	t-stat	CAR_PEAD	t-stat	CAR_PEAD	t-stat
1	-0.0080	*-1.02*	-0.0060	*-0.63*	0.0020	*0.24*
2	-0.0003	*-0.04*	-0.0032	*-0.45*	-0.0030	*-0.51*
3	0.0047	*0.66*	0.0037	*0.86*	-0.0010	*-0.15*
4	0.0118	*1.14*	0.0232	***3.15***	0.0114	***2.02***
5	0.0324	***2.50***	0.0443	***5.20***	0.0119	*1.36*
Hedge	0.0404	***3.37***	0.0503	***10.41***	-0.0100	*-0.75*

For each calendar quarter, we form five equal-sized portfolios based on the magnitude of SURP. Then we construct two hedge portfolios by buying the highest SURP quintile and shorting the lowest SURP quintile within the OP-PO group and PP-OO group, respectively. The average hedging returns over the subsequent quarter (CAR_PEAD) and its associated t-statistics are reported for each group and sub-period.

Bold numbers indicate significance at the 5% level (two-tailed *t*-test).

TABLE 8: Incentives and Alternative Analysts' Forecast Revision Paths

Panel A: Insider Sales/ Stock Issuance and Walk Down

OP vs. OO (PATH=1 for OP, 0 for OO)

	1984-1994		1995-2000		2001-2006	
Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value
INTERCEPT	-0.945	**0.000**	-0.071	**0.005**	-0.130	**0.000**
INSIDERSALE	42.582	**0.000**	27.299	**0.001**	10.982	0.155
FIRMSALENOW	1.372	0.070	1.153	0.118	-2.900	**0.000**
FIRMSALENEXT	3.226	**0.000**	2.276	**0.018**	-1.328	0.160
MTB	0.008	0.445	0.013	0.097	-0.018	**0.037**
SIZE	0.000	**0.009**	0.000	**0.015**	0.000	**0.018**
ROA	13.486	**0.000**	7.484	**0.000**	4.866	**0.000**
RD	4.107	**0.040**	2.438	0.112	5.185	**0.006**
CHEARN	-0.170	0.069	-0.245	**0.005**	0.159	0.213
LITIG	0.047	0.234	0.112	**0.004**	0.432	**0.000**
-2 Log L	25133.27		23165.07		21019.60	
Likelihood	354.34	0.00	251.34	0.00	227.88	0.00
1	6637		8724		7459	
0	13448		8180		7876	

Panel B: Insider Purchase/ Stock Repurchase and Walk Up

PO vs. PP (PATH=1 for PO, 0 for PP)

	1984-1994		1995-2000		2001-2006	
Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value
INTERCEPT	-1.287	**0.000**	-1.892	**0.000**	-2.057	**0.000**
INSIDERSALE	-46.641	**0.000**	-39.977	**0.000**	-47.513	**0.000**
FIRMSALE	-0.398	0.664	-1.447	0.122	2.017	**0.026**
FIRMSALENEXT	-2.383	**0.046**	-0.579	0.616	0.211	0.855
MTB	-0.002	0.845	-0.045	**0.000**	0.010	0.324
SIZE	0.000	0.705	0.000	**0.009**	0.000	0.163
ROA	-7.855	**0.000**	-6.717	**0.000**	-4.730	**0.000**
RD	-1.756	0.442	0.505	0.782	-4.545	0.090
CHEARN	0.370	**0.004**	0.195	0.100	-0.023	0.888
LITIG	-0.012	0.815	-0.201	**0.001**	-0.362	**0.000**
-2 Log L	17154.185		14512.371		15586.838	
Likelihood	110.532	0.000	185.562	0.000	139.164	0.000
1	3345		2261		2420	
0	14607		20338		21742	

INSIDERSALE is the net percentage of shares traded in the one-month period after the earnings announcement, and it is positive when insiders are net sellers and negative when insiders are net purchasers. FIRMSALENOW is issuance/repurchase of common and preferred equity during the current quarter. It represents net equity issuance (COMPUSTAT data item 8 deflated by beginning-of-quarter market value) when positive; and net stock repurchase (COMPUSTAT data item 93 deflated by beginning-of-quarter market value) when negative. FIRMSALENEXT is the issuance/repurchase of common and preferred equity in the quarter subsequent to the quarter concerned. RD denotes research and development expenditures scaled by average total assets. LITIG is an indicator variable equal to one for high litigation risk industries as defined in Matsumoto (2002), and zero otherwise. CHEARN is an indicator variable equal to one for a positive change in earnings from the same quarter in the prior year, zero otherwise. SIZE is the logarithm of market value of equity. MTB is the market-to-book ratio. ROA is return on assets.

Bold numbers indicate significance at less than the 5% level (chi-square test).

Figure 1: Four-way comparison