The Relation Between Analysts' Forecasts of Long-Term Earnings Growth and Stock Price Performance Following Equity Offerings

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First Version: July, 1996
This Version: June, 1999

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* We thank Chris Allen, Sarah Eriksen and Sarah Woolverton for their research assistance. We are grateful for the comments and suggestions of two anonymous referees, S.P. Kothari (the discussant), Gordon Richardson (the editor), and participants of the 1998 Contemporary Accounting Research Conference. We also are grateful for the comments of participants in the summer research colloquiums at Harvard University and Stanford University and workshops at the University of California at Berkeley, Emory University, the University of Georgia, the University of Illinois at Urbana-Champaign, the University of Michigan, University of North Carolina at Chapel Hill, Washington University, and University of Waterloo. We thank I/B/E/S/ for providing earnings forecast data.

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Abstract

We evaluate the role of sell-side analysts' long-term earnings growth forecasts in the pricing of common equity offerings. We find that, in general, sell-side analysts' long-term growth forecasts are systematically overly optimistic around equity offerings and that analysts employed by the lead managers of the offerings make the most optimistic growth forecasts. Additionally, we find a positive relation between the fees paid to the affiliated analysts' employers and the level of the affiliated analysts' growth forecasts. We also document that the post-offering under performance is most pronounced for firms with the highest growth forecasts made by affiliated analysts. Finally, we demonstrate that the post-offering under performance disappears once we control for the over optimism in earnings growth expectations. Thus, the evidence presented in this paper is consistent with the 'equity issue puzzle' arising from overly optimistic earnings growth expectations held at the time of the offerings.

I. INTRODUCTION

This paper evaluates the role of sell-side analysts' long-term earnings growth forecasts in the pricing of common equity offerings. While it is well documented that firms experience unusually low stock returns in the five years following equity offerings (Loughran and Ritter 1995 and Spiess and Affleck-Graves 1995), the reason for this under performance is not well understood. Competing explanations include mismeasured risk-premia, research design biases, and overly optimistic expectations about future firm performance.[1] In this paper we examine the overly optimistic expectations explanation for the 'equity issue puzzle.' We investigate whether sell-side analysts' long-term growth forecasts are overly optimistic at the time of equity offerings and whether these overly optimistic expectations are reflected in stock prices. We also investigate whether the over optimism in analysts' forecasts and the corresponding overpricing of equity offerings is greatest for offers covered by analysts affiliated with the lead investment bank underwriting the offering.

The concern that sell-side analysts compromise their objectivity and independence in order to win investment-banking business is often discussed in the financial press.[2] This concern arises because analysts' employers, the investment banks, provide both brokerage services to investor clients and underwriting services to client firms. A conflict of interests arises when an analyst issues a negative recommendation for a stock that is simultaneously being solicited for underwriting business. This conflict of interest is

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[1]Brav and Gompers (1997), Barber and Lyon (1997) and Kothari and Warner (1997) discuss potential problems with measurement of risk premia and stock returns. Loughran and Ritter (1997) provide evidence suggesting that pricing multiples around the equity offerings are consistent with investors having overly optimistic expectations about future profitability.

[2]Examples include: "Who is pulling the strings?" by M. Celarier, *Euromoney*, April 1996; "Today's analyst often wears two hats," by R Lowenstein, *Wall Street Journal*, May 2, 1996; "Some analysts enter land of big bucks," by M. Baker, *Wall Street Journal*, July 2, 1996; and "Today, delivering good news is a way to ensure good business relationships," by M. Siconolfi, *Wall Street Journal*, May 18, 1998.

intensified by the fact that analysts earn large bonuses for bringing investment banking clients to his or her firm.[3]

Demonstrating the pressures on analysts, the *Wall Street Journal* has reported several alleged incidents of top executives withholding underwriting business from investment banks whose analysts reduce earnings forecasts or downgrade their firms' stock ratings. Most recently on March 23, 1999, the *Wall Street Journal* reported that after an analyst at Salomon Smith Barney, Colin Devine, cut his target price for Conseco from 36 to 32 and downgraded his rating of its stock from 'outperform' to 'neutral,'

> … people close to Salomon say Mr Hilbert [*CEO of Conseco*] called the head of research at Salomon to complain, and said Conseco would withhold business unless Mr Devine recanted. … Last year, Salomon was lead or co-manager on more than $7 billion of Conseco … securities. Salomon didn't participate in Conseco's two offerings this year, and won't be in on the next one, Conseco confirms.[4]

This conflict of interest has potentially costly consequences for investors purchasing underwritten securities.[5] For example, *Fortune Magazine* blames the rise and fall in Boston Chicken's stock price not on management's failure to disclose losses at the franchises, but rather on the aggressive pushing of the stock by the brokerage firms who underwrote Boston Chicken's many security offerings:

> Truth be told, the trouble is less with Boston Chicken and more with the folks who pushed its stock in spite of the warnings. Those red flags, for instance, didn't prevent analysts from Merrill Lynch, Alex Brown, and Morgan Stanley—Boston Chicken's recent underwriters—from strongly recommending the stock. Indeed, even as the share plunged in April [*1997*] amid reports of slowing sales, these three firms pushed through a mammoth $287.5 million bond offering. [6]

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[3] See "Some analysts enter land of big bucks," by M. Baker, *Wall Street Journal*, July 2, 1996, page C1.

[4] "Are there cracks in Conseco's house of acquisitions?" by S.J. Paltrow, *Wall Street Journal*, March 23, 1999, page C1.

[5] See also "Wild week for PIA Merchandising includes plummeting stock price, duel of underwriters," by E.S. Browning, *Wall Street Journal*, May 30, 1996, page C2.

[6] "The Boston Chicken Problem - The restaurant chain's rise and fall has been breathtaking. Who is to blame for the mess? Try all those brokerage firms that have been flacking the chichen peddler's puffed-up stock – even as problems mounted," by N. D. Schwartz, *Fortune*, July 7, 1997.

The objective of our research is to provide empirical evidence on whether analyst affiliation affects forecast optimism and in turn whether analysts' optimism is reflected in the stock prices of firms issuing equity. We focus our analysis on analysts' long-term earnings growth forecasts and directly relate the over optimism in these forecasts to the post-offering under performance, the 'equity issue puzzle.'

Compared to buy/sell recommendations and annual earnings forecasts, long-term growth forecasts provide a more powerful measure of market expectations useful for explaining the post-offering under performance. Since stock recommendations fall into only five categories, their ability to explain cross-sectional variation in post-offering returns is limited. The use of annual earnings forecasts as a measure of expectations is also limited because the long-run under performance in stock prices does not begin until several (usually six) months after the offerings and then continues for up to five years (see Loughran and Ritter 1995). Revisions in expectations about currently reported annual earnings are therefore not likely to explain the long-run under performance. The use of long-term growth forecasts also increases the power of our tests since analysts are frequently evaluated on the accuracy of their buy/sell recommendations and annual earnings forecasts, but not their long-term growth forecasts.[7] Thus, reputation effects are less likely to deter analysts from issuing overly optimistic long-term earnings growth forecasts. Finally, recent evidence in Stickel (1998) and Bradshaw (1999) indicate that forecast of long-term growth is an important factor in formulating the recommendation made by analysts. Thus, long-term growth is a number that is followed and used by the investment community.

The evidence presented in this paper is consistent with analysts biasing their forecasts of firms' long-term earnings growth around new equity offerings. The over-optimism in

[7]For example, the *Institutional Investor's* evaluation criteria for ranking analysts for their All-American Research Team specifically mentions short-term price performance and annual earnings forecast accuracy. Long-term growth forecast accuracy is not listed as a criteria (see, Stickel 1992).

these forecasts is most pronounced when the forecasting analyst is affiliated with the lead manager underwriting the offering. Additionally, the level of the growth forecast is positively related to the fees paid to the affiliated analysts' employers. We also document that the post-offering under performance is most pronounced for firms with the highest growth forecasts made by affiliated analysts. Our empirical tests demonstrate that once we control for the over optimism in earnings growth expectations the unusually low post-offering returns disappear. Thus, one interpretation of the evidence is that the 'equity issue puzzle' results from investors' naive reliance on overly optimistic long-term earnings growth forecasts made by analysts at the time of the equity offerings.[8]

The paper proceeds in five sections. The next section discusses existing research. The third section develops our empirical predictions. The fourth section describes our sample and data. The fifth section presents the results and the sixth section provides our conclusions.

II. EXISTING RESEARCH

Prior and concurrent research investigates various aspects of analysts' optimism around equity offerings. This research can be partitioned into research focusing on short-term forecasts, research investigating long-term forecasts and recommendations, research investigating analyst affiliation, and research investigating the stock market response to analysts' forecasts. Below we briefly describe the existing research and our contribution to this literature.

Existing research provides no evidence that analysts' near-term (annual) earnings forecasts are more optimistic around equity offerings, initial or seasoned. Hansen and

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[8]Recent research demonstrates that managers manipulate earnings upward around new equity offerings [see Teoh, Welch and Wong (1998) and Rangan (1998)]. This research suggests that managers play a role in facilitating the markets' (and analysts') overly optimistic growth expectations around equity offerings. However, the large negative forecast errors (documented below) indicate that analysts are unable or unwilling to undo the manipulation of expectations by managers.

Sarin (1996) document that in general analysts' annual forecast errors around initial and seasoned equity offerings are not different than their forecast errors at other times [see also Ali (1996)]. They also find no difference in the near-term forecasts of affiliated and unaffiliated analysts [see also Lin and McNichols (1998a) who confirm these results].[9] Hansen and Sarin conclude that analysts are disciplined by reputation forces and consequently forecast credibly around equity offerings.

Noting that studies focusing solely on near-term earnings forecasts cannot resolve the question of whether concern for reputation is sufficient to offset pressures from investment banking relationships, Lin and McNichols (1998a) include an examination of analysts' long-term growth forecasts and stock recommendations. They document that affiliated analysts issue more optimistic long-term growth forecasts and stock recommendations than unaffiliated analysts around seasoned equity offerings. Michaely and Womack (1996) and Lin and McNichols (1998b) provide similar evidence for initial public offerings. Finally, without distinguishing between affiliated and unaffiliated analysts, Rajan and Servaes (1997) also document over optimism in analysts' long-term growth forecasts around initial public offerings (IPOs) and find that the firms with the highest projected growth experience the greatest post-IPO under performance. However, Rajan and Servaes do not attempt to explain the post-IPO under performance with the over optimism in analysts' growth forecasts.

Existing evidence on the effects of analysts' forecasts on the pricing of equities is indirect and mixed. Several papers document that stock prices react to the release of analysts' forecasts and stock recommendations, including Lin and McNichols and Michaely and Womack, who find a significant difference in the stock price reaction to affiliated versus unaffiliated analysts' recommendations around equity offerings. On the other hand, when

[9]Only Dugar and Nathan (1995) provide evidence that investment-banking affiliation affects the level of optimism in analysts' annual earnings forecasts. However, Dugar and Nathan's examination is not conditioned on an equity offering.

the examination is not conditioned on an equity offering, Dugar and Nathan (1995) find no significant difference in the stock price reactions to investment banking and non-investment banking analysts' stock recommendations. However, Dugar and Nathan present evidence consistent with the hypothesis that investors rely less on investment banking analysts' forecasts in forming their annual earnings expectations. In particular, they find that the strength of the relation between analysts' forecast errors and abnormal returns cumulated from the release of analysts' research reports to the next earnings announcement is stronger for non-investment banking analysts.

Overall the existing evidence is mixed and indirect regarding the extent to which investors rely on analysts' forecasts in forming the earnings expectations reflected in stock prices. None of the existing research directly links the over-optimism in analysts' forecasts around equity offerings to the post-offering under performance. Our contribution is providing a direct link. In addition, we also provide evidence that the over-optimism in analysts' long-term growth forecasts and corresponding overpricing of equity offerings is greatest for high growth firms covered by affiliated analysts. Finally, we are the first (to our knowledge) to document a systematic, positive relation between the magnitudes of affiliated analysts' growth forecasts and the underwriting fees paid to their employers.

III. HYPOTHESIS DEVELOPMENT

Below, we first discuss our predictions concerning analysts' earnings growth forecast errors and the biases in these forecasts. We then develop hypotheses concerning the possible ways in which the stock market incorporates information about these biases into stock prices.

Analysts' Forecast Errors

Previous research indicates that analysts tend to be overly optimistic in their forecasts of firms' earnings prospects (Abarbanell 1991; Brown, Foster, and Noreen 1985). The financial press suggests that the objectivity and independence of the analyst community steadily eroded during the 1980s because analysts abandoned primary research as a result of declining commission fees to pursue investment banking fees. The pursuit of investment banking fees gives analysts incentives to provide overly optimistic forecasts for firms with whom they have or wish to have underwriting relationships.

> When commissions on stock trading fell, investment research (which generated trading) no longer paid the freight. Today, analysts are supported partly by their corporate finance departments. And much of what they do -- marketing and preparing IPOs, for instance -- has little to do with pure research, and much to do with investment banking. In the U.S. in particular, investment banks have persuaded clients to hire underwriters on the basis of their analysts' selling power. ... In turn, the analyst's worth is increasingly dependent on his or her ability to bring in deals.[10]
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> Of course, some money managers grumble that big emphasis on new-issue fees taints research results if the analysts try to avoid saying anything negative about their underwriting clients. [11]

In this paper we hypothesize that sell-side analysts, in general, provide overly optimistic forecasts of issuing firms' long-term earnings growth in order to attract and retain underwriting business. In other words, we hypothesize that α_0 is less than zero in the following equation:

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1} \qquad (1)$$

The dependent variable, FE_{t+1}, is the analysts' forecast error, measured as realized long-term growth in earnings minus the analysts' forecast of long-term growth in earnings. Further, we hypothesize that analysts employed by the investment bank acting as the lead underwriter of the offering have even stronger incentives to make overly optimistic forecasts to lowering the offering firm's cost of capital. Alternatively, managers of the

[10]"Today's analyst often wears two hats," by R Lowenstein, *Wall Street Journal*, C1, May 2, 1996.

[11]"Some analysts enter land of big bucks," by M. Baker, *Wall Street Journal*, C1, July 2, 1996..

issuing firms may systematically select as their lead underwriter the investment bank employing the most optimistic analysts. Either way, we expect analysts employed by the lead underwriter to have the most optimistic forecasts. We refer to such analysts as affiliated and predict that α_0 will be more negative for these analysts.

Prior empirical evidence demonstrates that the optimism in analysts' long-term growth forecasts is increasing in the level of forecast growth [see Dechow and Sloan (1997), La Porta (1996), and Rajan and Servaes (1997)]. Firms receiving the highest long-term earnings growth forecasts, on average, also have larger forecast errors. Thus, the upward bias in analysts' forecasts appears to be driven primarily by the high growth forecasts given to the so-called 'glamour' stocks.[12] Following Dechow and Sloan, we model this phenomenon using a simple linear form:

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_{t+1} + \varepsilon_{t+1} \quad (2)$$

where $Growth_{t+1}$ is the analysts' forecasts of long-term earnings growth, and empirically, $1 < \alpha_1 < 0$.[13]

Use of this more detailed model of analysts' forecast errors, enables us to capture more of the predictable variation in the forecast errors. This, in turn, allows us to conduct more powerful tests of our stock price hypotheses, developed below. Equation (2) can also be used to investigate the nature of the incremental bias in affiliated analysts' long-term earnings growth forecasts. If the bias in affiliated analysts' long-term growth forecasts is unrelated to the level of forecast growth, then α_0 will be more negative for the affiliated analysts than for the unaffiliated analysts, and α_1 will be the same for the two groups.

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[12]Labeling these firms 'glamour' stocks, Lakonishok, Shleifer and Vishny (1994) argue that investors over-estimate the future profitability of high growth potential firms.

[13]This regression is identical to regressing realized growth on forecast growth. We use the specification in equation (2) to focus attention on analysts' forecast errors, which we use as our measure of unexpected earnings growth in the stock price tests developed below.

However, if the incremental bias in the affiliated analysts' forecasts is related to the level of forecast growth, then α_1 will be more negative for the affiliated analysts than for the unaffiliated analysts.

Finally, if analysts' overly optimistic forecasts are motivated by their desire to generate underwriting business, then we expect their forecasts of long-term earnings growth to be positively related to the fees paid to their employers, the lead managers underwriting the equity offerings. Thus, we hypothesize that after controlling for realized growth in earnings, the level of affiliated analysts' growth forecasts is higher the greater the fee basis paid to their employers. We also expect analysts' over optimism to be positively related to the fees paid to their employers.

Stock Prices

We develop predictions concerning stock price behavior under two competing hypotheses: 1) the efficient market hypothesis and 2) a naïve expectations hypothesis. Under both hypotheses, investors use information in analysts' long-term earnings growth forecasts to form expectations of future dividends. The competing hypotheses differ with respect to *how* investors use information in analysts' forecasts to form their expectations of future dividends. Under the efficient market hypothesis, investors fully anticipate, and therefore stock prices fully reflect, the predictable bias in analysts' long-term earnings growth forecasts. Under the second hypothesis, investors naively rely on analysts' long-term growth forecasts, neglecting to adjust for the predictable bias in these forecasts when forming their expectations of future dividends. Thus, under the second hypothesis, stock prices fail to reflect the predictable bias in analysts' long-term growth forecasts.

Following Collins, Kothari, Shanken and Sloan (1994), a simple model for testing these competing hypotheses is obtained within the framework of Campbell (1991). Campbell shows that using the traditional dividend discounting valuation model, abnormal stock returns can be approximated as a linear function of the unexpected growth in current dividends and the change in the expected growth of future dividends. By further invoking the common assumption that revisions in dividend expectations are correlated with revisions in earnings expectations, we can express abnormal returns as a linear function of unexpected growth in earnings:[14]

$$AR_{t+1} = \beta_1(\varepsilon_{t+1}^{*}) + \upsilon_{t+1} \tag{3}$$

The dependent variable, AR_{t+1}, measures the abnormal stock return in the five years following the equity offering. ε_{t+1}^{*} represents the market's assessment of the unexpected earnings growth in the five years following the equity offering. Finally, β_1 represents the valuation multiplier the market applies to unexpected earnings growth.[15]

Substituting the unexpected earnings growth implied by the model of analysts' forecast errors in equation (1) for ε_t^{*} in equation (3) gives:

$$AR_{t+1} = \beta_1 \, [FE_{t+1} - \alpha_0^{*}] + \upsilon_{t+1} \tag{4}$$

In this equation, α_0^{*} represents the market's assessment of the average bias in analysts' long-term growth forecasts. The efficient market hypothesis predicts that α_0^{*} will correspond to its counterpart in the equation (1), α_0. In other words, investors'

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[14] Note that our empirical tests do not involve specific predictions about the magnitude of the response coefficient, β_1. Instead, our tests simply require that abnormal returns are positively associated with unexpected earnings growth. Given this positive relation, we test whether the abnormal stock returns following an equity offering: (1) rationally respond to the unpredictable portion of the deviation between realized growth and analysts' growth forecast, $FE_{t+1} - \alpha_0$ or (2) naively respond to the total deviation between realized growth and analysts' growth forecasts, FE_{t+1}.

[15] In Campbell's model, the theoretical value of β_1 is one. Because we regress five-year returns on annualized growth rates, the theoretical value of β_1 in our specification is five. However, we expect β_1 to deviate from its theoretical value for two reasons. First, we use earnings growth rates in place of dividend growth rates. Second, our specification omits changes in growth expectations beyond the five-year forecast period (since they are not available). However, as indicated in footnote 14, our empirical tests are not based on predictions about the value of β_1. Rather, our tests simply require the relation between stock returns and unexpected earnings growth to be positive.

expectations of future earnings growth rationally anticipate the average bias in analysts' long-term growth forecasts. Thus, stock prices respond only to the unpredictable portion of the analysts' forecast error, ε_{t+1}, which is equal to $FE_{t+1} - \alpha_0$. The naïve expectations hypothesis predicts that α_0^* in equation (4) will equal zero, since investors naively believe that analysts' long-term growth forecasts are unbiased. Under this hypothesis, investors' expectations of future earnings growth equal the analysts' growth forecast. Thus, stock prices respond to the entire forecast error, FE_{t+1}.

The regression specification in equation (4) is non-linear in the regression coefficients β_1 and α_0^*. Hence, we conduct our statistical analysis using non-linear least squares. Specifically, we jointly estimate the following two equations using non-linear weighted least squares (see Mishkin 1983):

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_1 \, [FE_{t+1} - \alpha_0^*] + \upsilon_{t+1} \tag{5}$$

The market efficiency hypothesis is then evaluated by testing the cross-equation restriction that $\alpha_0^* = \alpha_0$, while the naïve expectations hypothesis is evaluated by testing the restriction that $\alpha_0^* = 0$.

While non-linear least squares is the appropriate statistical technique for our tests, we also provide parallel tests using ordinary least squares (OLS) to illustrate the intuition behind our tests for readers who feel more comfortable with OLS. Our OLS tests are conducted by estimating the two equations in (5) using OLS.

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_0 + \beta_1 \, FE_{t+1} + \upsilon_{t+1} \tag{5-OLS}$$

Comparing the abnormal return regression in equation (5-OLS) to the model in equation (4), we see that $\beta_0 = -\alpha_0^* \beta_1$. Hence, the market efficiency hypothesis implies that $\beta_0 = -\alpha_0 \beta_1$ (i.e., abnormal returns only respond to the unpredictable portion of the forecast error), while the naïve reliance hypothesis implies that $\beta_0 = 0$ (i.e., abnormal returns respond to the entire forecast error). Note that we cannot test the market efficiency restriction using OLS, because it is a non-linear cross-equation restriction (hence our original use of non-linear least squares). However, we can report the magnitudes of the OLS coefficients to illustrate the intuition behind the non-linear testing procedure.

Our second set of stock price tests examines the extent to which prices reflect information in the level of forecast growth about future forecast errors. Equation (2) above and the associated discussion indicate that forecast errors tend to be greater for firms with higher forecast growth. Substituting the forecast error prediction model in equation (2) for ε_t^* in equation (3) gives:

$$AR_{t+1} = \beta_1 \left[FE_{t+1} - \alpha_0^* - \alpha_1^* Growth_{t+1}\right] + \upsilon_{t+1} \tag{6}$$

In this equation ($\alpha_0^* + \alpha_1^*$ $Growth_{t+1}$) represents the market's assessment of the average bias in analysts' long-term growth forecasts. The efficient market hypothesis predicts that α_0^* and α_1^* will correspond to their counterparts in the forecasting equation, α_0 and α_1 in equation (2). In other words, investors' expectations of future earnings growth, while based on analysts' forecast of future growth, rationally anticipate the average bias in analysts' long-term growth forecasts. Thus, stock prices respond only to the unpredictable portion of the analysts' forecast error, ε_{t+1}, which is equal to ($FE_{t+1} - \alpha_0 - \alpha_1$ $Growth_{t+1}$). The naïve reliance hypothesis predicts that α_0^* and α_1^* in equation (6) equal zero since investors believe that analysts' long-term growth forecasts are without bias. Under this hypothesis, investors' expectation of future earnings growth is equal to analysts' growth forecast. Thus, stock prices respond to the entire forecast error, FE_{t+1}.

We again conduct our statistical tests by estimating equations (2) and (6) simultaneously using non-linear least squares.

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_{t+1} + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_1 [FE_{t+1} - \alpha_0^* - \alpha_1^* Growth_{t+1}] + \upsilon_{t+1} \tag{7}$$

The market efficiency hypothesis is then evaluated by testing the cross-equation restrictions that $\alpha_0^* = \alpha_0$ and $\alpha_1^* = \alpha_1$, while the naïve expectations hypothesis is evaluated by testing the restrictions that α_0^*=0 and α_1^*=0. We also report results using OLS by estimating the two equations in (7) using OLS.

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_{t+1} + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_0 + \beta_1 FE_{t+1} + \beta_2 Growth_{t+1} + \upsilon_{t+1} \tag{7-OLS}$$

Comparing the abnormal return regression in equation (7-OLS) to the model in equation (6), we see that $\beta_0 = -\alpha_0^* \beta_1$ and $\beta_2 = -\alpha_1^* \beta_1$. Hence, the market efficiency hypothesis implies that $\beta_0 = -\alpha_0 \beta_1$ and $\beta_2 = -\alpha_1 \beta_1$ (i.e., abnormal returns only respond to the unpredictable portion of the forecast error), while the naïve reliance hypothesis implies that $\beta_0 = 0$ and $\beta_2 = 0$ (i.e., abnormal returns respond to the entire forecast error). Note again that the market efficiency restrictions cannot be tested using OLS, because they are non-linear cross-equation restrictions. However, we report the magnitudes of the OLS regression coefficients to highlight the intuition behind our non-linear tests.

IV. Sample Formation and Variable Measurement

We require the following information to test our predictions: data on common stock offerings including the names of the lead managers of the offerings; analysts' long-term forecasts of earnings growth and the names of the firms for whom the analysts work; realized earnings growth; and stock returns. Details concerning the common stock offerings are obtained from the Securities Data Company, Inc. (SDC). Analysts' long-term forecasts of earnings growth and the names of their employers are obtained from Institutional-Broker-Estimates-System (I/B/E/S). Realized earnings growth rates are calculated using earnings data from Compustat. Monthly stock returns are obtained from the Center for Research in Security Prices (CRSP).

Table 1 summarizes our sample formation. We extract from SDC a total of 7,636 common stock underwritten offerings made between 1981-1990. This sample period is chosen for two reasons. First, 1981 is the first year in which I/B/E/S consistently provides analysts' estimates of long-term earnings growth forecasts. Second, to calculate analysts' forecast errors, we require five years of future realized growth in earnings. Thus, the final year in the sample is 1990.

We require firms to be covered on CRSP, Compustat and I/B/E/S and to have sufficient stock return and earnings data to examine their post-offering performance. We also require at least one long-term forecast within the 12 month window (-9 to +3) surrounding the issue date of the equity offering. As detailed in table 1, we lose 1,723 firm-offerings because the issuing firm is not covered on CRSP or Compustat. An additional 218 observations are lost because the issuing firm is not covered by I/B/E/S. These observations tend to be initial public offerings by small market capitalization firms not listed on major exchanges (stocks trading on pink sheets). An additional 3,165 firm-offerings are lost because of insufficient stock return or earnings data on CRSP and Compustat. Exclusion of these observations is likely to create a survivorship bias, which may explain the less dramatic post-offering under performance for our sample compared to the under performance documented in prior research. Finally, long-term growth forecasts are unavailable within our window for 1,351 firm-offerings. These restrictions result in a final sample of 1,179 firm-offerings made by 1,006 firms, only one-fifth of the total number of equity offerings made in the sample period 1981-1990.[16] However, the offerings we examine account for 30 percent of the total dollar value of all equity issued during this time period. Further, for each calendar year the median asset value of firms in our sample falls in the top two to four size deciles on Compustat. Thus, the sample examined is of economic significance.

For our final sample of 1,179 firm-offerings, we have 7,169 analysts' long-term earnings growth forecasts within the 12 months (-9 to +3) surrounding the issue dates. Using the names of lead managers obtained from SDC and the names of analysts' employers obtained from I/B/E/S, we categorize individual analysts as either *affiliated* or *unaffiliated* with a particular firm offering. If the analyst is employed by the investment bank acting as the lead manager for the offering (or if the analysts is employed by a subsidiary or the parent of the investment bank), then the analyst is classified as affiliated. We classify 622 analysts' forecasts as affiliated and 6,547 as unaffiliated.

SDC also provides information on the fee paid to the underwriters of each equity offering. The underwriting fee is shared by the lead manager, the co-managers, and the syndicate or selling group of the offering. Since we define affiliated analysts as those analysts employed by the lead manager, we examine the portion of the underwriting fee that is paid to the lead manager. The fee basis (Fee) is calculated as the fee paid to the lead underwriter divided by the total dollar value of the equity offering.

We measure post-offering stock price performance using five-year market-adjusted buy-hold stock returns. To ensure that all analysts' forecasts are known prior to the stock return cumulation period, we begin the cumulation period three months after the equity offering. The existence of negative abnormal stock returns following equity offerings has

[16] These constraints eliminate all but 86 initial public offerings from the final sample. The tenor of the results is unchanged if the 86 IPOs are excluded from the analysis.

been shown to be robust with respect to a wide variety of CAPM-based models for measuring abnormal returns (see for example Loughran and Ritter, 1995). We therefore expect to learn little from repeating our analysis for a variety of abnormal return measures. We do note, however, that we explicitly avoid using empirically motivated pricing models, such as the three-factor model suggested in Fama and French (1993). We avoid such models because their ability to predict future stock returns may be attributable to naive expectations about future profitability. In other words, while the 'size' and 'market-to-book' factors may be systematically associated with stock returns following equity offerings, we seek to determine whether the lower stock returns can be explained by naive earnings expectations. [17] Since these factors are empirically motivated, they do not, in and of itself, provide a satisfactory explanation for the size and market-to-book effects in stock prices.

We follow the I/B/E/S procedure for computing five-year annualized growth rates in earnings. This consists of fitting a least squares growth line to the logarithms of six annual earnings observations, beginning with the earnings observation immediately preceding the equity offering. We chose not to use a discrete annualized geometric growth rates because these rates can be extremely volatile when the base year is close to zero or when the base year or final year in the series contains significant nonrecurring items. Fitting a least squares regression line avoids placing excessive weight on the first and last observations in the growth period, resulting in less volatile growth estimates especially when these years include substantial nonrecurring items.[18] Negative earnings

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[17] Brav and Gompers (1997) question whether the long-run under performance of initial public offerings is a unique anomaly or simply another manifestation of the Fama and French (1992, 1993) market-to-book, size anomaly. They document that the IPO anomaly is most pronounced for small firms with high market-to-book ratios. In this paper, we attempt to provide empirical evidence concerning why the anomaly exists. It is useful to note, however, that small firms with high-market-to-book ratios have the highest long-term growth forecasts and the largest analyst forecast errors.

[18] We use Compustat data item 18, earnings before extraordinary items, to minimize the effect of nonrecurring items. The results of this paper were also replicated using (i) operating income before special items after taxes (compustat data items #178 - #15 – #16 + #17) and (ii) I/B/E/S historical EPS growth reported in the fifth year following the equity offerings. The tenor of the results does not change using

values are set to missing, and if earnings are missing for either the first or last year of the six-year series, then we set the growth measure to missing.

V. RESULTS

Descriptive Statistics

Tables 2 and 3 provide descriptive details of our sample and an overview of our results. Formal statistical tests of our hypotheses are provided in tables 4 through 8. Panel A of table 2 provides means of analysts' forecasts and realized performance for our full sample of 7,169 analysts' long-term earnings growth forecasts. The mean abnormal stock return for the entire sample is -12.7 percent for the five years following the offering. This is a substantially less negative post-offering return than the -41.6 percent and -32.9 percent reported by Loughran and Ritter (1995) for initial public offerings and seasoned equity offerings, respectively.[19] One reason for this difference is the survivorship bias introduced by requiring our sample firms to have five years of earnings and stock return data following the equity offerings. Additionally, only firms followed by analysts are in our final sample and firms followed by multiple analysts are represented multiple times in the computation of the means.[20] Analyst following tends to be positively correlated with firm size (Bhushan, 1989) and smaller firms have the lowest post-offering abnormal stock price performance (Spiess and Affleck-Graves, 1995). Nevertheless, the long-run under performance of stock prices following equity offerings is clearly present in our sample.

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these alternative measures of realized growth. Thus, our results are not driven by analysts' failure to anticipate nonrecurring, special items.

[19] Loughran and Ritter (1995) note that the measurement of the long-run under performance of issuing firms is sensitive to the benchmark employed. If the NASDAQ value-weighted index is used instead of the CRSP NYSE-AMEX value-weighted index, they report post-offerings returns of -29.0% and -19.5% for initial public offerings and seasoned equity offerings, respectively.

[20] The total number of offerings represented in the sample is 1,179. If each offering receives equal weighting in the mean, the mean abnormal return declines to –18 percent.

The mean realized growth in earnings for the full sample over the five years following the offering is 5.7 percent. The corresponding mean forecast growth in earnings at the time of the offering is 16.2 percent. On average, the forecast error in the five-year earnings growth forecasts is -10.6 percent. Analysts tend to over-estimate earnings growth by greater than 10 percent per year in the five years following equity offerings.[21] The negative abnormal returns in the five years following the offering are consistent with investors having overly optimistic expectations of earnings growth. Later in the paper, we demonstrate that the magnitudes of the earnings growth expectations implicit in stock prices are similar to the growth forecasts issued by analysts.

Panel B of table 2 stratifies the sample by analyst affiliation. All analyst forecasts fall into one of four categories:

(i) Affiliated Analysts - Pure Deals, the forecast is made by an analyst who is affiliated with the lead underwriter of the offering and there are no long-term forecasts made by unaffiliated analysts;

(ii) Affiliated Analysts - Mixed Deals, the forecast is made by an analyst who is affiliated with the lead underwriter of the offering and there are also long-term forecasts made by unaffiliated analysts;

(iii) Unaffiliated Analysts - Mixed Deals, the forecast is made by an analyst who is unaffiliated with the lead underwriter of the offering and there are also long-term forecasts made by affiliated analysts; and

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[21] To assess whether a systematic bias exists in analysts' long-term growth forecasts during our sample period that is not associated with new issues, we collect all long-term growth forecasts found on I/B/E/S between the years 1981-1990. Comparing offer and non-offer years, the mean forecast growth is significantly higher for offering years, while the realized five-year earnings growth is significantly lower. Thus, while in general analysts over estimate growth rates for all firm-years on I/B/E/S during the period 1981-1990, analysts are significantly more overly optimistic in years in which firms issue equity. It is interesting to note, however, that pooling across offer and non-offer years, analysts' optimism does not differ significantly for issuing versus non-issuing firms.

(iii) Unaffiliated Analysts - Pure Deals, the forecast is made by an analyst who is unaffiliated with the lead underwriter of the offering and there are no long-term forecasts made by affiliated analysts.

The first category of Affiliated Analysts - Pure Deals consists of only 131 forecasts. The mean abnormal return for this sample is -32.3 percent, which is much more negative than the average returns for the entire sample, -12.7 percent. The forecast errors are also larger for this sample. The mean forecast error for Affiliated Analyst - Pure Deals is -14.8 percent, while the forecast error for the entire sample is -10.6 percent. These results are consistent with the affiliated analysts issuing more overly optimistic earnings growth forecasts and with investors sharing these overly optimistic earnings expectations. The statistics show a similar pattern for the 491 forecasts in the Affiliated Analysts - Mixed Deals category. The mean abnormal return is -21.3 percent, which is more negative than the average for the entire sample, and the mean forecast error is -14.3 percent, which is also more negative than the average for the entire sample.

The deals followed by unaffiliated analysts have the least negative abnormal returns and the least biased forecasts. For the 2,938 forecasts in the Unaffiliated Analysts - Mixed Deals category, the mean abnormal return is -12.3 percent and the mean forecast error is -10.5 percent.[22] For the 3,609 deals in the Unaffiliated Analysts - Pure Deals category, the mean abnormal return is -11.3 percent and the mean forecast error is -10.0 percent. This is consistent with the unaffiliated analysts issuing relatively less overly optimistic earnings growth forecasts and with investors sharing these less overly optimistic earnings expectations.

[22] The Affiliated Analysts-Mixed Deals and Unaffiliated Analysts-Mixed Deals represent the same underlying set of deals. The reason stock returns are more negative for the affiliated analysts is that the ratio of affiliated to unaffiliated analysts tends to be larger for the deals with more negative abnormal stock returns.

Table 3 reports the number of observations, mean abnormal returns, and mean forecast errors for the sample stratified by both analyst affiliation and forecast growth. Forecast errors tend to be larger for firms with higher forecast growth. Stratifying the sample by forecast growth therefore provides a further opportunity to examine the relation between variation in forecast errors and variation in abnormal returns.

Growth portfolios are formed by ranking all analysts' long-term growth forecasts and assigning observations in equal numbers to three portfolios (low, medium, and high) based on these rankings. If long-term growth forecasts are correlated with analyst affiliation, then the number of observations in each forecast growth portfolio will not necessarily be equally proportioned across sub-samples. This is illustrated in panel A of table 3. The affiliated analysts tend to be concentrated in the high forecast growth portfolio, with between 47 to 60 percent of observations being in this portfolio. The unaffiliated analysts tend to be more evenly distributed across the three forecast growth portfolios with between 31 to 33 percent being in the high growth portfolio.[23]

Panel B of table 3 reports the mean forecast errors for the affiliation and forecast growth sub-samples. Within analyst affiliation categories, the forecast errors are consistently more negative in the high forecast growth portfolio. Within the high forecast growth portfolios, the forecast errors are also consistently more negative for the affiliated analysts than for the unaffiliated analysts. Thus, analysts' over-optimism is most pronounced for the high growth portfolios, and within the high growth portfolio, affiliated analysts make the most overly optimistic forecasts. These regularities are mirrored in the mean abnormal returns reported in panel C of table 3. Firms in the high forecast growth portfolios experience the greatest long-run under performance, and within the high growth portfolios, the abnormal stock returns are consistently more negative for

[23] A 2x3 chi-square test comparing the distribution of affiliated analysts to the distribution of unaffiliated analysts across the forecast growth portfolios rejects the null that portfolio assignment is unrelated to analyst affiliation at the 0.0001 level.

affiliated analysts deals than for the unaffiliated analysts deals. Thus, firms' long-term stock price under performance is greatest when affiliated analysts project high earnings growth.

Overall, the descriptive evidence presented in table 3 indicates that analysts' long-term growth forecasts are the most overly optimistic when they are high and when they are made by affiliated analysts. The earnings expectations embedded in stock prices incorporate a similar pattern of forecast errors. We provide more formal statistical tests of these propositions later in the paper.

Tests of Bias in Analysts' Long-Term Earnings Growth Forecasts

Table 4 provides statistical tests of the differences in the forecast errors for the affiliated and unaffiliated analysts. We have no specific predictions concerning differential biases for the pure and mixed deals. We therefore combine forecasts for pure and mixed deals for both the affiliated and unaffiliated categories to increase the power of our statistical tests. Panel A of table 4 presents the distribution of forecast errors. Recall from table 2 that the mean forecast error for the entire sample is -10.6 percent. Panel A reveals that the forecast errors for affiliated analysts are consistently more negative than for the unaffiliated analysts. The mean forecast error for the affiliated analysts is -14.4 percent, while the mean forecast error for the unaffiliated analysts is -10.3 percent. A t-test for difference in means rejects the null of equality (p-value = 0.003), confirming our prediction that affiliated analysts tend to issue more optimistic long-term earnings growth forecasts. Panel A also reveals that the larger negative mean forecast error for affiliated (versus unaffiliated) analysts is driven by their over-optimistic forecasts of growth (p-value of 0.000) and not by lower growth realizations for firms they follow (p-value of 0.956).

To examine the sensitivity of the forecast errors to the growth expectation, in panel B of table 4 we estimate the regression of forecast errors on forecast growth in earnings. For the entire sample the regression results are similar to those reported by Dechow and Sloan (1997). The intercept is close to zero and the coefficient on forecast growth in earnings is -0.678. These coefficients indicate that realized growth in earnings is only about one-third of forecast growth in earnings. This, in turn, indicates that analysts' over-optimism is greater for firms with greater growth prospects. The results for the unaffiliated analysts are similar to the results for the entire sample. However, the results for the affiliated analysts indicate that while the intercept remains indistinguishable from zero, the coefficient on forecast growth in earnings falls to -0.832. This coefficient indicates that realized growth in earnings is only about one-sixth of forecast growth in earnings for forecasts issued by affiliated analysts. A Chow-test rejects the null hypothesis that the coefficient on forecast earnings growth is the same in the affiliated and unaffiliated regressions (p-value = 0.048). Thus, the over-optimism in affiliated analysts' growth forecasts, relative to unaffiliated analysts' growth forecasts, is more severe for 'glamour stocks' with high growth prospects.[24]

In table 5 we investigate whether the level of the affiliated analysts' growth forecasts, as well as the optimistic bias in their forecasts, is positively related to the fees paid to their employers (the lead underwriters of the equity offerings). Panel A documents a positive relation between the affiliated analysts' growth forecasts and the fee basis paid to their employers. Recall that the fee basis is the percentage of the dollar value of the offering paid to the lead manager. For each 100 basis points paid to the lead manager, analysts' growth forecasts increase by 650 basis points (6.5 percentage points).[25] Including

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[24]To control for firm size, we also included the log of total assets as an additional explanatory variable in the regressions presented in tables 4 as well as the regressions presented below in tables 6 and 7. The tenor of the results remains unchanged.

[25]Although we do not report these results, it is interesting to note that there is a significantly higher fee basis paid for the affiliated versus the unaffiliated deals. In particular, when an analyst working for the lead manager provides a forecast of long-term earnings growth, the average fee basis paid to the lead

realized growth as an additional explanatory variable demonstrates that affiliated analysts' growth forecasts are unrelated to the level of the realized growth in earnings, while their forecasts remain positively related to the fees basis paid to their employers.

Panel B of table 5 examines whether the optimistic bias in affiliated analysts' growth forecasts is significantly related to the fee basis paid to their employers. The first regression shows that analysts' forecast errors are a function of the fee basis - affiliated analysts are more optimistic in their growth forecasts, the higher the fee basis. For each 100 basis points paid to the lead manager, affiliated analysts' over-estimate earnings growth by 470 basis points (4.7 percentage points). However, the fee basis explains very little of the cross-sectional variation in analysts' forecast errors (the adjusted R^2 is only 0.4 percent). Further, the coefficient on the fee basis falls to less than 100 basis points and becomes insignificant after controlling for the level of analysts' growth forecasts, as indicated in regression 2 in panel B of table 5. Comparing the R^2s reported in the B panels of tables 4 and 5, we see that the fee basis variable adds little to our understanding of analysts' forecast errors. In fact, the adjusted R^2 falls from 10.52 in table 4 to 10.38 in table 5 when Fee is included as an additional explanatory variable. Thus, in our stock price tests, presented in the next section, we do not consider the predictive power of the fee basis in explaining stock returns.

Tests of the Pricing of Bias in Analysts' Long-Term Earnings Growth Forecasts

In this section, we investigate whether the systematic bias in analysts' forecasts of earnings growth is reflected in stock prices. We first present our non-linear weighted least squares regressions, since these regressions allow us to conduct statistical tests of

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manager is one percent of the total dollar-value of the offering. However, when only unaffiliated analysts provide growth forecasts, the average fee basis paid to the lead underwriter is 0.71 percent. The mean fee bases are significantly different at the 0.001 level.

the non-linear restrictions implied by our hypotheses. We then present the corresponding OLS regression results.

Since multiple analysts' forecasts can relate to a single equity offering, we conduct our pricing analysis using a single 'consensus' observation for each offering, in order to avoid cross-sectional dependence.[26] The forecast of growth in earnings used for each observation is the mean of the forecasts relating to the offer. We conduct the pricing tests for three samples. The first sample consists of all firm-offerings represented by the entire sample of analysts' forecasts. This sample provides a check for consistency between our results and the results in Dechow and Sloan (1997) and also provides a benchmark for our subsequent samples. The second sample includes all firm-offerings for which we have an affiliated analyst forecast, and includes both Affiliated Analysts - Pure Deals and Affiliated Analysts - Mixed Deals from table 2. In computing the mean forecast for the mixed deals, we exclude forecasts made by unaffiliated analysts. This sample allows us to examine whether affiliated analysts' forecasts are priced, irrespective of the availability of unaffiliated forecasts. The third sample includes all firm-offerings for which we have unaffiliated forecasts, and includes both Unaffiliated Analysts - Pure Deals and Unaffiliated Analysts - Mixed Deals. The computation of mean forecasts for the mixed deals excludes forecasts made by affiliated analysts. This sample allows us to examine whether unaffiliated analysts' forecasts are priced, irrespective of the availability of affiliated forecasts.[27]

Table 6 investigates the pricing of the consensus forecast errors by estimating the system of equations developed in section three:

[26]In addition, cross-sectional dependence may arise if some firms make more than one offering within five years. To address this concern, we re-estimated our results using only the first offering made by each firm. The tenor of the results is unchanged.

[27] Ideally, we would like to be able to take the sample of mixed deals and test whether the affiliated or the unaffiliated analysts' forecasts are priced. Unfortunately, because of the relatively small differences between the affiliated and unaffiliated forecasts on the mixed deals, we cannot statistically discriminate between these two alternatives.

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_1 [FE_{t+1} - \alpha_0^*] + \upsilon_{t+1} \quad (5)$$

Recall that α_0 represents the mean forecast error in analysts' forecasts of long-term earnings growth issued around the equity offerings. If investors rationally anticipate the bias in analysts' forecasts, then the earnings expectation embedded in stock prices will result in $\alpha_0^* = \alpha_0$. Alternatively, if investors naively rely on analysts' forecasts of long-term growth in earnings, then the earnings expectations embedded in stock prices will result in α_0^* being equal to zero. The system of equations is estimated jointly using nonlinear weighted-least-squares and the cross-equation restrictions implied by the competing hypotheses are tested using a likelihood ratio test.[28]

The nonlinear weighted least squares parameter estimates for the system of equations in (5) are reported in panel A of table 6. The estimate of the mean forecast error for all deals, α_0, is -12.1 percent. This figure differs slightly from the corresponding figure in table 2 of -10.6 percent. The reason for the difference is that observations are weighted at the individual analyst level in table 2 and at the individual issuer level (using consensus analyst forecasts) in table 6. The implied estimate of the mean forecast error in the stock price equation, α_0^*, is -2.9 percent.[29] This estimate is significantly different from the

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[28] This joint estimation procedure has several advantages over a two-step procedure. First, it produces more efficient estimates of parameters because each equation uses information in the other in the estimation process. Second, the joint estimation procedure generates valid test statistics because it accounts for the uncertainty in estimates of the error terms. That is, the joint estimation procedure uses the ε that is *expected* to minimize the mean-square errors in the first equation to form expectations in the second equation, whereas the two-step procedure uses the actual ε that minimized the mean-square errors. Thus, in finite samples, the two-step procedure makes an overly strong assumption about expectation formation. Conceptually, the two-step procedure forms expectations with information from the future as well as from the past, which clearly goes beyond the rational expectations principle. The joint estimation procedure does not suffer from this problem. Details of the joint estimation procedure are described in Mishkin (1983).

[29]Verifying that the asymptotic equivalence of α_0^* and $(-\beta_0/\beta_1)$ holds for the three finite samples examined, we note that all estimates of α_0^* reported in table 6 are equivalent to the ratios of the OLS estimated coefficients $(-\beta_0/\beta_1)$ reported in table 7.

rational value of -12.1 percent (p-value = 0.001), rejecting market efficiency, but is not significantly different from the naive value of zero (p-value = 0.511). Thus, we are unable to reject the hypothesis that investors rely on analysts' forecasts of long-term growth in earnings as if the forecasts are unbiased. Another way of stating this result is that we are unable to reject the hypothesis that investors' naive reliance on analysts' forecasts potentially explains the under performance of stock prices following equity offerings.

The mean forecast errors for the affiliated and unaffiliated deals also differ slightly at the issuer level versus the analyst level. However, we continue to find the affiliated analysts are more overly optimistic than the unaffiliated analysts, with forecast errors of -14.3 percent and -11.8 percent, respectively. Despite the differences in the actual forecast errors, the implied estimates of the forecast errors in stock prices are quite similar. The forecast error implicit in stock prices for the affiliated deals is -2.7 percent, while for the unaffiliated deals it is -2.2 percent. In both cases, market efficiency is rejected, but in neither case is the hypothesis that investors naively rely on analysts' forecasts rejected. Thus, despite the difference in the magnitude of the forecast errors for affiliated and unaffiliated analysts' forecasts, we are unable to reject the hypothesis that they are both incorporated into stock prices.

We present the results of corresponding OLS regressions in order to illustrate the intuition behind the non-linear regression results. Recall from the discussion in section three that the corresponding OLS regressions for the system in panel A are:

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_0 + \beta_1 FE_{t+1} + \upsilon_{t+1} \qquad (5\text{-OLS})$$

Panel B of table 6 presents the results for the stock return regressions only. The forecasting regressions involves no non-linearities, and so the OLS results are identical to those reported using non-linear least squares in panel A. The first thing to note from the OLS stock return regressions in panel B is that β_1, the earnings response coefficient in the stock return regressions, is significantly positive and takes on the same value as its counterpart in the non-linear regressions. This equality again arises because this term involves no non-linearities. The positive coefficient reflects the well-documented positive response of stock returns to earnings surprises.

Non-linearities enter the equation with the coefficients that relate to our competing hypotheses. Recall that market efficiency predicts that stock returns will only respond to the unpredictable component of the forecast error ($FE_{t+1} - \alpha_0$). Thus, the intercept in the OLS regression, β_0, will load up to remove the predictable component of the forecast error, (α_0), so that $\beta_0 = -\alpha_0 \beta_1$. Concentrating on the *All Deals* column, market efficiency generates the prediction that $\beta_0 = -\alpha_0 \beta_1 = -(-0.121) \times (1.171) = 0.142$. On the other hand, the naïve reliance hypothesis implies that the market responds to the entire forecast error (FE_{t+1}), so that $\beta_0 = 0$. The estimated value of β_0 is an insignificant 0.034, which is much closer to the naïve reliance hypothesis prediction of zero, than to the market efficiency hypothesis prediction of 0.142. At an intuitive level, the statistical tests in our non-linear regressions indicate that we can reject the market efficiency hypothesis that $\beta_0 = 0.142$, but we cannot reject the naïve reliance hypothesis that $\beta_0 = 0$. Similarly, we see that β_0 is also insignificantly different from zero in the remaining two columns in panel B of table 6, indicating that the naïve reliance hypothesis is not rejected for either the affiliated or unaffiliated sub-groups.

Table 7 investigates the pricing of analysts' forecast errors after conditioning on the level of forecast growth by estimating the following system of equations developed above in section three:

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_{t+1} + \varepsilon_{t+1}$$

$$AR_{t+1} = \beta_1 [FE_{t+1} - \alpha_0^* - \alpha_1^* Growth_{t+1}] + \upsilon_{t+1} \tag{7}$$

The nonlinear weighted least squares parameter estimates for this system of equations are reported in panel A of table 7. Recall from the analyst level results in table 4 that the forecast errors tend to be more optimistic for 'glamour stocks' with high levels of forecast growth. While the magnitude of the coefficients is somewhat different for the issuer-level results, we find the same general relations in table 7. For all deals, the coefficient on forecast growth in earnings, α_1, is -0.329. This indicates that realized growth is only about two-thirds as large as forecast growth. As with the results, in table 4, α_1 is more negative for the affiliated analysts, indicating that affiliated analysts tend to be even more overly optimistic than their unaffiliated counterparts for high growth stocks. If investors rationally anticipate this bias in analysts' forecasts, then the earnings expectation embedded in stock prices will result in $\alpha_1^* = \alpha_1$. Alternatively, if investors naively rely on analysts' forecasts of long-term growth in earnings, then the earnings expectations embedded in stock prices will result in $\alpha_1^* = 0$. The system of equations is again estimated jointly using nonlinear weighted-least-squares and the cross-equation restrictions implied by the competing hypotheses are tested using a likelihood ratio test.

The results indicate that the earnings expectations embedded in stock prices correspond much more closely with the naive reliance hypothesis than with the market efficiency hypothesis. The estimated values of α_1^* are 0.138, -0.032 and 0.380 for *all deals*, *affiliated deals* and *unaffiliated deals*, respectively. These compare to the predicted values of –0.329, -0.621 and –0.325, respectively, under the market efficiency hypothesis and predictions of zero in all three cases for the naïve reliance hypothesis. While the market efficiency hypothesis is rejected in all three cases, the naïve reliance hypothesis cannot be rejected in any of the three cases. It is of interest that the point estimates of α_1^*

are fairly large and positive for the *all deals* and *unaffiliated deals* categories. Under market efficiency, these coefficients are predicted to be negative, while under naive reliance, they are predicted to be zero. One explanation for why these coefficients are positive is that investors are pricing affiliated analysts' forecasts, and this induces a positive bias in the coefficients on the unaffiliated analysts' forecasts when both types of analyst forecasts are present. In other words, investors are pricing the affiliated analysts more overly optimistic forecasts, and because stock prices are responding to the greater optimism in affiliated analysts' forecasts, stock prices reflect more optimistic expectations than those implied by the unaffiliated analysts' forecasts.[30] Overall, the results in table 7 suggest that the poor stock price performance in the years following equity offerings arises because investors naively price affiliated analysts' extreme over-optimism for 'glamour stocks' with strong growth prospects.

The OLS results in panel B of table 7 serve to illustrate the intuition behind the non-linear regression results presented in panel A. Again, panel B presents the OLS regression results for the stock return regressions only, since OLS results for the forecasting regressions are identical to those presented in panel A. Recall that market efficiency predicts that stock returns will only respond to the unpredictable component of the forecast error, (FE_{t+1} - α_0 - α_1 $Growth_{t+1}$). Thus, β_2, the coefficient on forecast growth in the OLS regression will load up to remove the portion of the forecast error that can be predicted by forecast growth (α_1 $Growth_{t+1}$), so that $\beta_2 = -\alpha_1 \beta_1$. Concentrating on the *All Deals* column, market efficiency generates the prediction that $\beta_2 = -\alpha_1 \beta_1 = -(-0.329)$ x (1.163) = 0.383. On the other hand, the naïve reliance hypothesis implies that the market responds to the entire forecast error, (FE_{t+1}), so that $\beta_2 = 0$. The estimated value of β_2 is –0.161, which is insignificantly different from the naïve reliance hypothesis

[30] Replicating the pricing tests for the deals with only unaffiliated analysts provides evidence consistent with this conjecture. The value of α_1^* falls from 0.380 reported in table 8 for the full sample to 0.134.

prediction of zero, but significantly different from the market efficiency hypothesis prediction of 0.383.

VI. CONCLUSION

In this study, we provide evidence consistent with the hypothesis that sell-side analysts make overly optimistic long-term earnings growth forecasts for firms issuing equity. We also show that the overly optimistic forecasts are reflected in stock prices. Together these results suggest that investors' reliance on analysts' overly optimistic forecasts provides one potential explanation for the 'equity issue puzzle.'

Our evidence has potential policy implications. Our evidence suggests that the co-existence of brokerage services and underwriting services in the same institution leads sell-side analysts to compromise their responsibility to brokerage clients in order to attract underwriting business. Investment banks claim to have 'Chinese walls' to prevent such conflicts of interests. Our evidence raises questions about the reliability of these 'Chinese walls.' We document that analysts affiliated with the lead underwriter of an offering tend to issue more overly optimistic growth forecasts than unaffiliated analysts. Further, the magnitude of the affiliated analysts' growth forecasts is positively related to the fee basis paid to the lead underwriters. Finally, equity offerings covered only by affiliated analysts experience the greatest post-offering under performance, suggesting that these offerings are the most overpriced.

Our results also suggest a characterization of over-priced 'glamour stocks' (Lakonishok, Shleifer and Vishny, 1994). 'Glamour stocks' tend to have high growth opportunities and therefore these firms actively seek new equity capital. Consequently, their management has incentives to maximize stock price to lower the cost of raising external capital. Sell-side analysts affiliated with investment banks also have incentives to assist with maximizing the issuing firm's stock price, because doing so generates higher underwriting fees. Under this scenario, the systematic over-optimism in the forecasts of unaffiliated analysts may result from their efforts to attract underwriting clients. An interesting topic for future research would be to examine whether firms' choices of investment banks for underwriting services are influenced by the optimism in the earnings forecasts issued by analysts affiliated with the investment banks.

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TABLE 1

Sample Formation

7,636	Common stock offerings within the time period 1981-1990 (underwritten offerings only, excludes rights offerings)
-1,723	Firm-offerings not covered on CRSP or Compustat
-218	Firm offerings not covered on I/B/E/S
-3,165	Firm-offerings with incomplete data on CRSP or Compustat
-1,351	Firm-offerings with no long-term earnings growth forecasts within the 12 months (-9 to +3) surrounding the offer date
1,179	Final sample of firm-offerings

Data on common stock offerings is obtained from the Securities Data Company, Inc.

TABLE 2

Profile of Analyst Forecasts and Post-Offering Performance

Panel A: Entire sample

	Mean Abnormal returns	*Mean Realized earnings growth*	*Mean Forecast earnings growth*	*Mean Forecast error*	*Number of observations*
All analysts	-0.127	0.057	0.162	-0.106	7,169

Panel B: Sample stratified by analyst affiliation

	Mean Abnormal returns	*Mean Realized earnings growth*	*Mean Forecast earnings growth*	*Mean Forecast error*	*Number of observations*
Affiliated analysts - Pure deals	-0.323	0.097	0.233	-0.148	131
Affiliated analysts -Mixed deals	-0.213	0.045	0.186	-0.143	491
Unaffiliated analysts -Mixed deals	-0.123	0.048	0.150	-0.105	2,938
Unaffiliated analysts -Pure deals	-0.113	0.064	0.165	-0.100	3,609

Abnormal returns = cumulative five-year buy and hold market adjusted stock returns beginning three months after the issue date. A value-weighted market index is used to adjust for market performance.
Realized earnings growth = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.
Forecast earnings growth = analysts' long-term forecast of earnings growth obtained from I/B/E/S.
Forecast error = Realized earnings growth - Forecast earnings growth.

TABLE 3

Profile of Analyst Forecast Errors and Post-Offering Performance Stratified by Analyst Affiliation and Forecast Earnings Growth

Range of forecast earnings growth for each portfolio	*Firms where analysts predict LOW Growth* [-100% - 10%]	*Firms where analysts predict MEDIUM Growth* [11% - 17%]	*Firms where analysts predict HIGH growth* [18% - 100%]
Panel A: Number (percent) of analysts with forecasts			
Affiliated analysts -Pure deals Total number of analysts = 131	19 (15%)	33 (25%)	79 (60%)
Affiliated analysts - Mixed deals Total number of analysts = 491	119 (24%)	140 (29%)	232 (47%)
Unaffiliated analysts - Mixed deals Total number of analysts = 2,938	1,016 (35%)	996 (34%)	926 (31%)
Unaffiliated analysts - Pure deals Total number of analysts = 3,609	1,133 (31%)	1,298 (36%)	1,178 (33%)
All analysts (Total=7,169)	*2,287 (32%)*	*2,467 (34%)*	*2,415 (34%)*
Panel B: Mean Forecast error			
Affiliated analysts -Pure deals	-0.156	-0.108	-0.238
Affiliated analysts - Mixed deals	-0.061	-0.055	-0.239
Unaffiliated analysts - Mixed deals	-0.052	-0.058	-0.215
Unaffiliated analysts - Pure deals	-0.033	-0.091	-0.174
All analysts	*-0.042*	*-0.075*	*-0.198*
Panel C: Abnormal returns			
Affiliated analysts -Pure deals	-0.110	-0.224	-0.431
Affiliated analysts - Mixed deals	0.031	0.003	-0.501
Unaffiliated analysts - Mixed deals	0.002	-0.022	-0.398
Unaffiliated analysts - Pure deals	-0.098	-0.079	-0.166
All analysts	*-0.048*	*-0.054*	*-0.288*

Abnormal returns = cumulative five-year buy and hold market adjusted stock returns beginning three months after the issue date. A value-weighted market index is used to adjust for market performance.

Realized earnings growth = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.

Forecast earnings growth = analysts' long-term forecast of earnings growth obtained from I/B/E/S.

Forecast error = Realized earnings growth - Forecast earnings growth.

TABLE 4

Tests of the Bias in Analysts' Forecasts of Long-Term Earnings Growth

Panel A: Distribution of variables for affiliated and unaffiliated analysts (p-values for tests of equal means)

		Mean	*Standard Deviation*	*Lower Quartile*	*Median*	*Upper Quartile*	*Number of Obs.*
Forecast Error	*Affiliated*	-0.144	0.340	-0.241	-0.079	0.012	622
	Unaffiliated	-0.103	0.287	-0.191	-0.059	0.024	6547
	p-value	0.003					
Forecast Earnings Growth	*Affiliated*	0.201	0.133	0.120	0.178	0.250	622
	Unaffiliated	0.159	0.114	0.090	0.130	0.200	6547
	p-value	0.000					
Realized Earnings Growth	*Affiliated*	0.056	0.322	-0.036	0.077	0.203	622
	Unaffiliated	0.057	0.280	-0.026	0.071	0.183	6547
	p-value	0.956					

Panel B: Sensitivity of forecast errors to forecast of long-term earnings growth

$$FE_{t+1} = \alpha_0 + \alpha_1 \text{ Growth}_t + \varepsilon_{t+1}$$

	α_0	α_1	*p-value for equal* α_1	*Adjusted* R^2 *(%)*	*Number of observations*
Entire sample - All analysts	0.004	-0.678**		7.33	7,169
Total affiliated analysts	0.023	-0.832**		10.52	622
			0.048		
Total unaffiliated analysts	0.002	-0.654**		6.79	6,547

** significant at the one percent level.

Realized earnings growth = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.

Forecast earnings growth (Growth $_{t+1}$) = analysts' long-term forecast of earnings growth obtained from I/B/E/S.

Forecast error (FE $_{t+1}$) = Realized earnings growth - Forecast earnings growth.

TABLE 5

Tests of the Relation Between Affiliated Analysts' Forecasts of Long-Term Earnings Growth and the Underwriting Fee Paid to Their Employers

Panel A: Sensitivity of affiliated analysts' forecast of long-term earnings growth to the fee paid to the lead manager and realized earnings growth

$$Growth_t = \gamma_0 + \gamma_1 Fee_t + \gamma_2 R\_Growth_{t+1} + \mu_t$$

	γ_0	γ_1	γ_2	*Adjusted R^2 (%)*	*Number of observations*
Regression 1	0.134**	0.065**		6.80	622
Regression 2	0.134**	0.064**	0.026	7.01	622

Panel B: Sensitivity of affiliated analysts' forecast errors to the fee paid to the lead manager and the forecast of long-term earnings growth

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_t + \alpha_2 Fee_t + \varepsilon_{t+1}$$

	α_0	α_1	α_2	*Adjusted R^2 (%)*	*Number of observations*
Regression 1	-0.096**		-0.047*	0.40	622
Regression 2	0.016	-0.840**	0.008	10.38	622

** significant at the one percent level.
* significant at the six percent level.
Realized earnings growth (R_Growth_{t+1}) = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.
Forecast earnings growth ($Growth_{t+1}$) = analysts' long-term forecast of earnings growth obtained from I/B/E/S.
Forecast error (FE_{t+1}) = Realized earnings growth - Forecast earnings growth.
Fee basis (Fee_t) = Fee paid to the lead manager divided by the total dollars raised in the offering.

TABLE 6

Results of Nonlinear Weighted and Ordinary Least Squares Regressions Examining the Pricing of the Systematic Bias in Analysts' Forecasts of Long-Term Earnings Growth. Forecast Errors are Conditioned on Proximity to Equity Offerings.

Panel A: Non-linear weighted least squares

$$FE_{t+1} = \alpha_0 + \varepsilon_{t+1}$$
$$AR_{t+1} = \beta_1 [Fe_{t+1} - \alpha_0^*] + \upsilon_{t+1}$$

	All deals	*All deals with affiliated analysts*	*All deals with unaffiliated analysts*
α_0	-0.121**	-0.143**	-0.118**
α_0^*	-0.029	-0.027	-0.022
β_1	1.171**	1.254**	1.102**
Tests of the cross-equation restrictions (p-value for likelihood ratio tests)			
Market efficiency ($\alpha_0^* = \alpha_0$)	0.001	0.001	0.001
Naïve expectations ($\alpha_0^* = 0$)	0.511	0.674	0.602
Number of observations	1179	440	1070

Panel B: Ordinary least squares

$$AR_{t+1} = \beta_0 + \beta_1 FE_{t+1} + \upsilon_{t+1}$$

	All deals	*All deals with affiliated analysts*	*All deals with unaffiliated analysts*
β_0	0.034	0.034	0.024
β_1	1.171**	1.254**	1.102**
Adjusted R^2	0.070	0.089	0.066
Number of observations	1179	440	1070

** significant at the one percent level.

Abnormal returns (AR_{t+1}) = cumulative five-year buy and hold market adjusted stock returns beginning three months after the issue date. A value-weighted market index is used to adjust for market performance.

Realized earnings growth = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.

Forecast earnings growth ($Growth_{t+1}$) = analysts' long-term forecast of earnings growth obtained from I/B/E/S.

Forecast error (FE_{t+1}) = Realized earnings growth - Forecast earnings growth.

TABLE 7

Results of Nonlinear Weighted and Ordinary Least Squares Regressions Examining the Pricing of the Systematic Bias in Analysts' Forecasts of Long-Term Earnings Growth. Forecast Errors are Conditioned on Proximity to Equity Offerings and the Level of Forecast Earnings Growth.

Panel A: Non-linear weighted least squares

$$FE_{t+1} = \alpha_0 + \alpha_1 Growth_{t+1} + \varepsilon_{t+1}$$
$$AR_{t+1} = \beta_1 [FE_{t+1} - \alpha_0^* - \alpha_1^* \text{ Growth}_{t+1}] + \upsilon_{t+1}$$

	All deals	All deals with affiliated analysts	All deals with unaffiliated analysts
α_0	-0.058**	-0.018	-0.058**
α_1	-0.329**	-0.621**	-0.325**
α_0^*	-0.054	-0.021	-0.091
α_1^*	0.138	-0.032	0.380
β_1	1.163**	1.257**	1.084**
Tests of the cross-equation restrictions (p-value for likelihood ratio tests)			
Market efficiency ($\alpha_0^* = \alpha_0$ and $\alpha_1^* = \alpha_1$)	0.001	0.001	0.001
Naïve expectations ($\alpha_0^* = 0$ and $\alpha_1^* = 0$)	0.516	0.894	0.489
Number of observations	1179	440	1070

Panel B: Ordinary least squares

$$AR_{t+1} = \beta_0 + \beta_1 FE_{t+1} + \beta_2 \text{ Growth}_{t+1} + \upsilon_{t+1}$$

	All deals	*All deals with affiliated analysts*	*All deals with unaffiliated analysts*
β_0	0.063	0.027	0.098
β_1	1.163**	1.257**	1.084**
β_2	-0.161	0.040	-0.412
Adjusted R^2	0.069	0.086	0.066
Number of observations	1179	440	1070

** significant at the one percent level.

Abnormal returns (AR_{t+1}) = cumulative five-year buy and hold market adjusted stock returns beginning three months after the issue date. A value-weighted market index is used to adjust for market performance.

Realized earnings growth = five-year annualized growth rates calculated by fitting a least squares growth line to the logarithms of the six annual observations, beginning with the offer year and ending in the fifth year after the offer year.

Forecast earnings growth (Growth $_{t+1}$) = analysts' long-term forecast of earnings growth obtained from I/B/E/S.

Forecast error (FE_{t+1}) = Realized earnings growth - Forecast earnings growth.