# Fundamentals of Corporate Finance

THIRD EDITION

Jonathan Berk
STANFORD UNIVERSITY

Peter DeMarzo
STANFORD UNIVERSITY

Jarrad Harford
UNIVERSITY OF WASHINGTON

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### Why Not Estimate Expected Returns Directly?

If we have to use historical data to estimate beta and determine a security's expected return (or an investment's cost of capital), why not just use the security's historical average return as an estimate for its expected return instead? This method would certainly be simpler and more direct.

The answer is that it is extremely difficult to infer the average return of individual stocks from historical data. Because stock returns are so volatile, even with 100 years of data we would have little confidence in our estimate of the true average. (Imagine drawing 100 numbers from a swimming pool full of widely ranging numbers and being asked to guess the average of all of the numbers in the pool.) Worse, few stocks have existed for 100 years, and those that have probably bear little resemblance today to what they were like 100 years ago. If we use less than ten years of data, we would have very little confidence in our estimate at all. In fact, if the volatility of the stock's return is 20%, it turns out that we would need 1600 years of data to be 95% confident that our estimate of its true average return was within +/−1% of being correct!

On the other hand, the linear regression technique allows us to infer beta from historical data reasonably accurately with just a few years of data. Thus, in theory at least, using beta and the CAPM can provide much more accurate estimates of expected returns for stocks than we could obtain from their historical average return.

**required return** The expected return of an investment that is necessary to compensate for the risk of undertaking the investment.

Because investors will not invest in this security unless they can expect at least the return given in Eq. 12.6, we also call this return the investment's **required return**.

The CAPM is the main method used by most major corporations to determine the equity cost of capital. In a survey of CFOs, Graham and Harvey found that more than 70% rely on the CAPM, and Bruner, Eades, Harris, and Higgins reported that 85% of a sample of large firms rely on it.[5] It has become the most important model of the relationship between risk and return, and for his contributions to the theory, William Sharpe was awarded the Nobel Prize in Economics in 1990.

## EXAMPLE 12.6

### Computing the Expected Return of a Stock

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#### PROBLEM

Suppose the risk-free return is 3% and you measure the market risk premium to be 6%. Apple has a beta of 1.2. According to the CAPM, what is its expected return?

#### SOLUTION

**PLAN**

We can use Eq. 12.6 to compute the expected return according to the CAPM. For that equation, we will need the market risk premium, the risk-free return, and the stock's beta. We have all of these inputs, so we are ready to go.

**EXECUTE**

Using Eq. 12.6:

$$E[R_{AAPL}] = r_f + \beta_{AAPL}(E[R_{Mkt}] - r_f) = 3\% + 1.2(6\%) = 10.2\%$$

**EVALUATE**

Because of Apple's beta of 1.2, investors will require a risk premium of 7.2% over the risk-free rate for investments in its stock to compensate for the systematic risk of Apple stock. This leads to a total expected return of 10.2%.

[5] J. Graham and C. Harvey, "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics* 60 (2001): 187–243; and R. Bruner, K. Eades, R. Harris, and R. Higgins, "Best Practices in Estimating the Cost of Capital: Survey and Synthesis," *Financial Practice and Education* 8 (1998): 13–28.

We can compute the expected return of the portfolio two ways. First, we can use the CAPM (Eq. 12.6) to compute the expected return of each stock and then compute the expected return of the portfolio using Eq. 12.3.

Or, we can compute the beta of the portfolio using Eq. 12.7 and then use the CAPM (Eq. 12.6) to find the portfolio's expected return.

### EXECUTE

Using the first approach, we compute the expected return for PFE and GOOG:

$$E[R_{PFE}] = r_f + \beta_{PFE}(E[R_{Mkt}] - r_f) \qquad E[R_{GOOG}] = r_f + \beta_{GOOG}(E[R_{Mkt}] - r_f)$$

$$E[R_{PFE}] = 3\% + 0.7(6\%) = 7.2\% \qquad E[R_{GOOG}] = 3\% + 0.9(6\%) = 8.4\%$$

Then the expected return of the equally weighted portfolio $P$ is:

$$E[R_P] = 0.5(7.2\%) + 0.5(8.4\%) = 7.8\%$$

Alternatively, we can compute the beta of the portfolio using Eq.12.7:

$$\beta_P = w_{PFE}\beta_{PFE} + w_{GOOG}\beta_{GOOG}$$

$$\beta_P = (0.5)(0.7) + (0.5)(0.9) = 0.8$$

We can then find the portfolio's expected return from the CAPM:

$$E[R_P] = r_f + \beta_P(E[R_{Mkt}] - r_f)$$

$$E[R_P] = 3\% + 0.8(6\%) = 7.8\%$$

### EVALUATE

The CAPM is an effective tool for analyzing securities and portfolios of those securities. You can compute the expected return of each security using its beta and then compute the weighted average of those expected returns to determine the portfolio's expected return. Or, you can compute the weighted average of the securities' betas to get the portfolio's beta and then compute the expected return of the portfolio using the CAPM. Either way, you will get the same answer.

## Summary of the Capital Asset Pricing Model

The CAPM is a powerful tool that is widely used to estimate the expected return on stocks and investments within companies. To summarize the model and its use:

- Investors require a risk premium proportional to the amount of *systematic* risk they are bearing.
- We can measure the systematic risk of an investment by its $\beta$, which is the sensitivity of the investment's return to the market's return. For each 1% change in the market portfolio's return, the investment's return is expected to change by $\beta$ percent due to risks that it has in common with the market.
- The most common way to estimate a stock's beta is to regress its historical returns on the market's historical returns. The stock's beta is the slope of the line that best explains the relation between the market's return and the stock's return.
- The CAPM says that we can compute the expected, or required, return for any investment using the following equation:

$$E[R_i] = r_f + \beta_i(E[R_{Mkt}] - r_f)$$

which when graphed is called the *security market line*.

## The Big Picture

The CAPM marks the culmination of our examination of how investors in capital markets trade off risk and return. It provides a powerful and widely used tool to quantify the return that should accompany a particular amount of systematic risk. We have already reached our