Chapter 11
Risk, Return, and Capital Budgeting

Topics Covered
- Measuring Market Risk
- Portfolio Betas
- Risk and Return
- CAPM and Expected Return
- Security Market Line
- CAPM and Stock Valuation

Chapter 11 Objectives
- To be able to measure and interpret the market risk, or beta of a security.
- To relate the market risk of a security to the rate of return that investors demand and apply this rate to stock valuation.
- To calculate the opportunity cost of capital for a project.
As you add stocks to your portfolio, unique risk is reduced.

Note:
- The market compensates investors for accepting risk - but only for **market risk**. Unique risk can and should be diversified away.
- So - we need to be able to measure market risk. We use **beta** as a measure of market risk.

The Concept of Beta
- **Beta** measures how the return of an individual asset (or even a portfolio) varies with the market portfolio (a stock index like the S&P 500).
- $\beta = 1.0$ : same risk as the market (average stock)
- $\beta < 1.0$ : less risky than the market (defensive stock)
- $\beta > 1.0$ : more risky than the market (aggressive stock)
- Beta is the slope of the regression line ($y = a + \beta x$) between a stock’s return ($y$) and the market return ($x$) over time, $\beta$ from simple linear regression.
- $\beta_i = \text{Covariance}_{i,m}/\text{Var. Mkt. Var.} = \rho_{im} \sigma_i \sigma_m / \sigma_m^2$
Portfolio Beta

- The β for a portfolio of stocks is the weighted average of the individual stock βs.
  \[ \beta_p = \sum w_j \beta_j \]
- **Example:** What is the portfolio beta for a portfolio consisting of 25% Best Buy with \( b = 2.2 \), 40% General Electric with \( b = 1.1 \), and 35% PepsiCo. with \( b = 0.4 \).

Relating Market Risk and Required Return: the CAPM

- Here’s the word story: a stock’s required (expected) rate of return = risk-free rate + the (stock’s) risk premium.
- The main assumption is investors hold well diversified portfolios = only concerned with market risk.
- A stock’s risk premium = measure of market risk X market risk premium.

CAPM Equation

- Market risk premium = \( r_m - r_f \)
- Risk premium = \( \beta(r_m - r_f) \)
- \( r = r_f + \beta(r_m - r_f) \)
CAPM Example

- What is Yahoo’s required return if its β = 3.3, the current 3-mo. T-bill rate is 2%, and the historical market risk premium of 8% is demanded?

The Security Market Line (SML)

- A graphical representation of the CAPM equation.
- Gives required (expected) returns for investments with different betas.
- Y axis = expected return, X axis = beta
- Intercept = risk-free rate = 3-month T-bill rate (B = 0)
- Slope of SML = market risk premium
- For the following SML graph, let’s use the current 3-month T-bill rate of 2% and assume investors expect a market risk premium equal to the historical market risk premium of 8%.
- Graph \( r = 2\% + B(8\%) \)
- Expected market return (B=1) = 2 + 1(8%) = 10%

Our SML: \( r_f = 2\%, r_m = 10\% \)
Application of CAPM to Stock Valuation

- Can use CAPM to calculate a stock’s required return for valuation purposes.
- Also, in equilibrium, our previous expected return formulas should equal CAPM return.
- Expected Dividend Yield + Expected Capital Gains Yield = CAPM required return
- \((\text{Div}_1 + \text{P}_1 - \text{P}_0)/\text{P}_0\) or \(\text{Div}_1/\text{P}_0 + g = \text{CAPM}\)

Buy Best Buy?

- Best Buy’s recent stock price is $55.50 and the expected next annual dividend is $0.50. According to Yahoo Finance (Reuters), Best Buy’s beta is 2.2 and the stock price is expected to be $62.60 in a year.
- The 3-month T-bill rate is 1.7% and the market risk premium is the historical average of 7.7%.
- Based on the above information, would you recommend buying Best Buy?

Buy Best Buy?
Bullwinkle, is this really a good deal?

- Your stockbroker, Boris Badanov, calls you with a hot stock tip to buy Fearless Leader Moose-Control Inc. The stock is currently selling for $20 a share. You gather the following data to evaluate Boris' recommendation. The risk free rate is 2%, and you demand a 10.5% return on the market. Fearless Leader's current dividend is $2 a share. You decide to get other necessary estimates from a third-party, Rocky Enterprises. Rocky has estimated that Fearless Leader's beta is 2.0 and that the stock's dividend will grow at a constant 10 percent rate.

Based on your estimates is Boris' recommendation to buy Fearless Leader Moose-control a good one? What do you think the stock is worth?

Example: Have a pretzel.

- The common stock of Marge's Pretzels currently sells for its equilibrium price of $30 a share. Marge's current dividend is $1.91 and is expected to grow at a 10% constant annual rate forever. The current risk-free rate is 3%, and the required return on the market is 11%.
- What is the beta for Marge's Pretzels?
- What would be the new equilibrium stock price of Marge's Pretzels if the risk-free rate increases to 4% and the required market return increases to 13%?
Bullwinkle, is this really a good deal?

Marge’s Beta

Marge’s CAPM changes
The project cost of capital depends on the use to which the capital is being put. Therefore, it depends on the risk of the project and not the risk of the company. For now, we can assume a firm uses only equity financing. (We’ll relax this assumption in Chapter 12.) Given this assumption, we can use the market risk of the project and the CAPM to find the opportunity cost of capital.

Example - Based on the CAPM with rf = 3% and market risk premium of 9%, MAD-Doctor Inc. (insert maniacal laughter here) has a cost of capital of 3% + 2.1(9%) = 21.9%. A breakdown of the company’s investment projects is listed below. When evaluating a new tissue re-animation investment, which cost of capital should be used?

- 1/3 Lightning Power Generation B=1.6
- 1/3 Surgical Equipment B=2.0
- 1/3 Tissue Re-animation B=2.7
- AVG. B of assets = 2.1