PORTFOLIO MANAGEMENT

6 Portfolio Management

Covering Study Session 12, Readings 49 through 51 Worth 5% of the exam or about 12 questions

STUDY SESSION 12

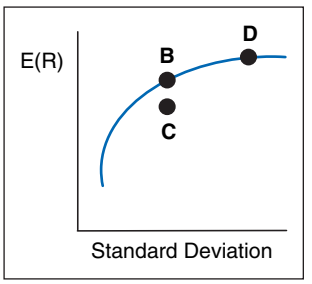
This session covers required rate of return determination, asset allocation, portfolio theory, and capital market theory. The tools presented here provide the broad framework within which asset classes and individual assets are analyzed, valued, and chosen for a portfolio. While capital market theory can be daunting on the first reading, Level I has always emphasized the fundamental relationships on which the theory is built. Understand the concepts and master a few calculations, and you'll do well on this section of the exam.

Reading 49

The Asset Allocation Decision

This reading discusses the portfolio management process—a series of logical steps a manager takes to meet a client's investment objectives in light of their constraints—and the importance of asset allocation.

for each level of risk are called Efficient portfolios and trace the Efficient Frontier. You can see this best in a picture:



For every level of standard deviation along the x-axis, the Efficient Frontier records the portfolio with the highest expected return (e.g., portfolios B and D). No investor would choose portfolio C because portfolio B has a higher expected return for the same level of risk. What you cannot see in this picture is that the asset allocation of the portfolios along the Efficient Frontier changes to provide different risk-return combinations. Portfolio D, for example, might correspond to our earlier 70% equity portfolio while portfolio B might represent our 30% equity portfolio. Higher return – higher risk, just as risk aversion says it should be.

Optimal Portfolios. The Efficient Frontier presents the best risk-return subset of all possible portfolios. Investors choose from among this subset based on their individual risk tolerance.

Let's imagine an investor looking along the Efficient Frontier for the portfolio with the most risk she thinks she can tolerate (portfolio B, for example) and then looking left to read off the rate of return. This investor says to herself: "This return is too low. I guess I'll have to accept more risk if I want more return." This process continues until the investor is satisfied with the trade-off embedded in her portfolio choice. Theoretically, the investor chooses the portfolio at the point of tangency between the efficient frontier and their highest indifference curve. Portfolios that are optimal for one investor will not be optimal for others.

Reading 51

An Introduction to Asset Pricing Models

This reading presents the Capital Asset Pricing Model (CAPM). This model builds on the portfolio theory discussed in Readings 49 and 50 and concludes that only systematic (or market-related) risk is relevant. The reading, therefore, starts with the assumption that investors are Markowitz-efficient diversifiers. The effect of adding risk-free assets to portfolio decisions leads to the conclusion that only systematic risk matters. The reading concludes by explaining how the CAPM can be used to identify misvalued assets.

This body of thought is labeled **Capital Market Theory** (CMT), and like all theories, it starts with assumptions:

- All investors want to locate the most suitable portfolio on the **efficient frontier.**
- Investors can borrow or lend unlimited amounts at the *risk-free rate*.
- All investors have *homogeneous expectations*. This means they see the same investment opportunities on the efficient frontier.
- All investors have the same *one-period time horizon.*
- All investments are *infinitely divisible*, so that investors can buy or sell fractional shares of any asset or portfolio.

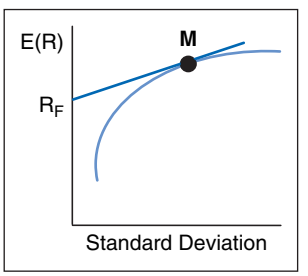
- *No taxes or transactions costs* exist in buying or selling assets.
- There is *no inflation* or it is perfectly forecasted.
- Capital markets are in equilibrium.

CMT adds two elements that are crucial to the conclusion about systematic risk: the risk-free asset and the market portfolio:

Risk-free Asset. A risk-free asset has:

- an entirely certain expected return.
- a zero standard deviation of return.
- a zero covariance with any risky asset or portfolio.

The usual proxy for the risk-free asset is U.S. Treasury Bills. While T-Bills are not totally risk free because they do not protect against unexpected inflation, for example, they are close.



Adding the risk-free asset to the possible set of portfolios changes the risk-return possibilities for investors. Every portfolio on the line connecting the risk-free rate and the Efficient Frontier is superior to portfolios on the Efficient Frontier. This line is called the **Capital Market Line** (CML). The portfolio at the point of tangency is the **Market Portfolio**—the portfolio of all risky assets in proportion to their market value. Portfolios along the CML are simple (linear) combinations of the risk-free asset and the Market Portfolio. The Market Portfolio is the only risky portfolio anyone would hold and is the only source of risk. The Market Portfolio is completely diversified across all assets—domestic and international. All investors choose a combination of the risk-free asset and the market portfolio, according to their risk tolerance. All portfolios are two-asset portfolios—the Market Portfolio and the risk-free asset. These results are rather startling and won the authors a Nobel Prize.

Expected return on a portfolio of the risk-free asset and the Market Portfolio is:

Eqn. 51.1 $$E(R_p) = w_{Rf}(R_{Rf}) + (1 - w_{Rf})\,E(R_M)$$

Because the risk-free asset has no variance, the standard deviation of this portfolio simplifies to:

Eqn. 51.2 $$E(\sigma_{port}) = (1 - w_{Rf})\,\sigma_M$$

Implications of CMT. The two important implications of CMT are: 1. Systematic risk is the only risk that matters, and 2. The CAPM specifies the risk-return trade-off.

Systematic Risk

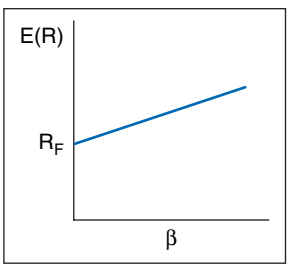
Total Risk = Systematic (market-related) Risk + Unsystematic (firm-specific) Risk

This equation says that total risk (variance) for an individual asset is made up of two parts: systematic (market-related) and unsystematic (firm-specific). The key observation here is that firm-specific risk goes away as you add securities. If risk-averse investors hold portfolios because they don't like risk, it stands to reason that they will diversify away all the risks that they can. Because diversification is cheap, no one should expect to be paid for assuming unsystematic risk. Therefore, systematic risk is the only risk that matters. Systematic risk is measured by an asset's covariance with the Market Portfolio—the only risky portfolio.

Diversification eliminates unsystematic risk. Diversification cannot reduce systematic risk, regardless of how many stocks are in the portfolio.

Capital Asset Pricing Model (CAPM)

The CAPM is remarkable because it tells us what should be the expected or required rates of return on all risky assets. The **Security Market Line** (SML) represents this relationship.



CAPM is computed as follows:

Eqn. 51.3 $$E(R_i) = R_{Rf} + \beta_i[E(R_M - R_{Rf}]$$

Where $E(R_i)$ is the appropriate expected rate of return on security or portfolio i, R_F is the risk-free rate, $E(R_M)$ is the expected return on the market, and β_i (beta) is defined as $Cov_{i,M}/\sigma^2_M$.

Beta may be viewed as a standardized measure of systematic risk because it reflects the risk that matters—covariance with the Market Portfolio. Beta is also the *slope* of the **characteristic line,** which is the regression line of the return on an individual company's return as a function of the return on a market portfolio proxy like the S&P 500 index. The **Characteristic Line** results from the regression of the returns on an individual security against the returns on the Market Portfolio. The slope of this line (regression coefficient) is beta.

This is a favorite territory for multiple choice questions. **Remember:**

- The CML uses standard deviation as the measure of risk, while the SML uses beta as the measure of risk.
- The SML applies to all securities and portfolios and the CML applies only to efficient portfolios.
- If the exam gives you graphs, look at which variable is displayed on the horizontal axis. The CML uses total risk or standard deviation on the horizontal, while the SML uses systematic risk or beta.

CAPM Assumptions Relaxed

The CAPM dominated investment thinking for many years. Even though it may have fallen out of favor, nothing else has really taken its place. Consequently, you'll need to know what happens when the CAPM assumptions are relaxed.

Differential Borrowing and Lending Rates. There is only one risk-free rate in the model. Investors, however, cannot borrow and lend at the same rate. Two rates mean two CMLs. One implication of differential borrowing and lending rates is that *the borrowing portfolio is not as profitable* as when it was assumed investors could borrow at the risk-free rate. An alternative model that does not require just one risk-free rate is the **Zero-Beta Model.** Zero-beta means a portfolio that is uncorrelated with the market portfolio. The big difference is that the risk-free rate is replaced by the return on the Zero-beta portfolio.

Transactions Costs. If investors have to pay transactions costs, investors may not be able to correct all mispricings because the cost of buying or selling may exceed the gain implied by the mispricing. Transactions costs also limit diversification because, at some point, the additional costs of diversification would exceed its benefits.

Heterogeneous Expectations and Planning Periods. If investors' expectations differ, the CML and the SML cease to be a single line and become a band.

Taxes. When investors pay taxes, there are major differences in the **CML** and **SML.**

Using Capital market Theory to Identify Mispriced Securities. All securities ***should*** lie on the SML because the SML depicts the risk-return trade-off. Using a separate pricing model, like the dividend discount model, we can estimate the value of a security and compare it to the SML and identify any mispricing. The three steps are:

1. Calculate the *required rate of return* using the **CAPM.**
2. Determine the *market-implied expected rate of return* using an alternative methodology such as the dividend discount model.
3. Compare the two returns and if:
   - Market-implied expected return > **CAPM** required return, the security is *undervalued.*
   - Market-implied expected return = **CAPM** required return, the security is *correctly valued.*
   - **CAPM** required return > Market-implied expected return, the security is *overvalued.*

Mispriced securities is favorite territory for a multiple choice question. Work through the following example to be sure you understand the process.

This study session will generate about 12 questions. Expect an even split between calculation and qualitative questions.

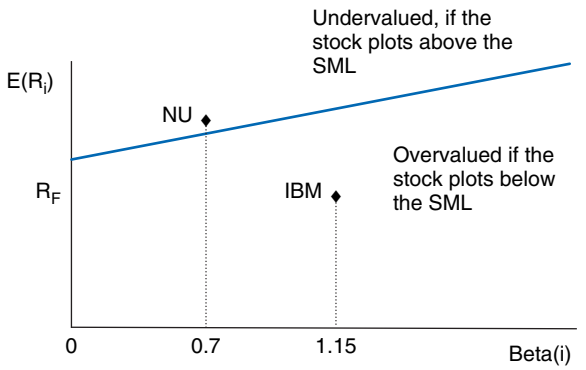
EXAMPLE 51.1 Using the Security Market Line (SML) in Valuation. The risk-free rate of return is expected to be 6% over the coming year, while the expected return on the market portfolio is 14%. Assume that IBM has a **beta** of 1.15 and Northwest Utilities has a beta of 0.7. Your research department has used the dividend discount model to estimate the expected returns on IBM and NU as 14% and 12%, respectively. You have decided to use this information to determine if IBM and NU appear to be valued correctly by the market.

Solution:
The required returns on these assets using the **CAPM** are:

$(R_{IBM}) = 6 + 1.15\ (14 - 6) = 15.2\%$
$(R_{NU}) = 6 + 0.70\ (14 - 6) = 11.6\%$

These **CAPM**-generated required rates of return compare with the market-implied expected rates of return produced by the DDM as follows:

Stock	CAPM Return	DDM Return	Valuation
IBM	15.2%	14%	Overvalued
NU	11.6%	12%	Undervalued



Thus, this table and the graph below indicate that IBM is *overvalued* and NU is *undervalued*.