Return, Risk and the Security Market Line

Systematic and Unsystematic Risk

Systematic risk

Risk that influences a large number of assets. Also called *market risk*.

Unsystematic risk

Risk that influences a single company or a small group of companies. Also called *unique* or *asset-specific risk*.

Total risk = Systematic risk + Unsystematic risk

Diversification and Risk

- In a large portfolio, some stocks will go up in value because of positive company-specific events, while others will go down in value because of negative company-specific events.
- Unsystematic risk is essentially eliminated by diversification, so a portfolio with many assets has almost no unsystematic risk.
- Unsystematic risk is also called *diversifiable* risk, while systematic risk is also called *nondiversifiable* risk.

The Systematic Risk Principle

- The systematic risk principle states that the reward for bearing risk depends only on the systematic risk of an investment.
- So, no matter how much total risk an asset has, only the systematic portion is relevant in determining the expected return (and the risk premium) on that asset.

Measuring Systematic Risk

Beta coefficient (β)

Measure of the relative systematic risk of an asset. Assets with betas larger than 1.0 have more systematic risk than average, and vice versa.

- Because assets with larger betas have greater systematic risks, they will have greater expected returns.
- Note that not all betas are created equal.

Measuring Systematic Risk

Company	Beta 🛱
Exxon	.65
AT&T	.90
IBM	.95
Wal-Mart	1.10
General Motors	1.15
Microsoft	1.30
Harley-Davidson	1.65
America Online	2.40

Portfolio Betas

- The standard deviation of a portfolio has no simple relation to the standard deviation of the assets in the portfolio.
- In contrast, a portfolio beta can be calculated just like the expected return of a portfolio.
 - In general, you can multiply each asset's beta by its portfolio weight and then add the results to get the portfolio's beta.

The Reward-to-Risk Ratio

- Notice that all the combinations of portfolio expected returns and betas fall on a straight line.
- Slope= $\frac{E(R_A) R_f}{\beta_A} = \frac{20\% 8\%}{1.6} = 7.50\%$
- What this tells us is that asset A offers a *reward-to-risk* ratio of 7.50%. In other words, asset A has a risk premium of 7.50% per "unit" of systematic risk.

Implications

In general ...

- The reward-to-risk ratio must be the same for all assets in a competitive financial market.
- If one asset has twice as much systematic risk as another asset, its risk premium will simply be twice as large.
- Because the reward-to-risk ratio must be the same, all assets in the market must plot on the same line.

The Fundamental Result



The Security Market Line

Security market line (SML)

Graphical representation of the linear relationship between systematic risk and expected return in financial markets.

· For a market portfolio,

SML slope
$$= \frac{E(R_M) - R_f}{\beta_M} = \frac{E(R_M) - R_f}{1}$$
$$= E(R_M) - R_f$$

The Security Market Line

 The term *E*(*R_M*) – *R_f* is often called the market risk premium because it is the risk premium on a market portfolio.



 $\Im \beta_i$, the amount of systematic risk.

The Security Market Line



Where Do Betas Come From?

- · A security's beta depends on

 - o how volatile the security is relative to the market.
- A security's beta is equal to the correlation multiplied by the ratio of the standard deviations.

$$\beta_i = \operatorname{Corr}(R_i, R_M) \times \frac{\sigma_i}{\sigma_m}$$

Why Do Betas Differ?

- Betas are estimated from actual data. Different sources estimate differently, possibly using different data.
 - For data, the most common choices are three to five years of monthly data, or a single year of weekly data.
 - To measure the overall market, the S&P 500 stock market index is commonly used.
 - The calculated betas may be adjusted for various statistical reasons.

The investment process

The Investment Process

- · Specify objectives
- Identify constraints (investment horizon, regulations, tax considerations, unique needs)
- Formulate an investment policy (active, passive, or some mix of active and passive)
- Monitor performance
- Reevaluate and modify portfolio as determined from monitoring

The Investment Process

- Asset Allocation—allocation of an investment portfolio across broad asset classes
- Security Selection—choice of specific securities within each asset class
- Security Analysis—analysis of the value of the securities