12 Return, Risk, and the Security Market Line

### Expected and Unexpected Returns

- The return on any stock traded in a financial market is composed of two parts.
  - The normal, or expected, part of the return is the return that investors predict or expect.
  - The uncertain, or risky, part of the return comes from unexpected information revealed during the year.

\[
E(R) - R = E(R) + U
\]

### Announcements and News

- Firms make periodic announcements about events that may significantly impact the profits of the firm.
  - Earnings
  - Product development
  - Personnel
- The impact of an announcement depends on how much of the announcement represents new information.
  - When the situation is not as bad as previously thought, what seems to be bad news is actually good news.
  - When the situation is not as good as previously thought, what seems to be good news is actually bad news.
- News about the future is what really matters.
  - Market participants factor predictions about the future into the expected part of the stock return.
  - Announcement = Expected News + Surprise News

### Systematic and Unsystematic Risk

- **Systematic risk** is risk that influences a large number of assets. Also called market risk.
- **Unsystematic risk** is risk that influences a single company or a small group of companies. Also called unique risk or firm-specific risk.

\[
\text{Total risk} = \text{Systematic risk} + \text{Unsystematic risk}
\]

### 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.
- **Systematic** risk is also called *non-diversifiable* risk.

### The Systematic Risk Principle

- What determines the size of the risk premium on a risky asset?
- The systematic risk principle states:

  *The expected return on an asset depends only on its systematic risk.*

- 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

- To be compensated for risk, the risk has to be special.
  - Unsystematic risk is not special.
  - Systematic risk is special.
- The Beta coefficient ($\beta$) measures the relative systematic risk of an asset.
  - Assets with Betas larger than 1.0 have more systematic risk than average.
  - Assets with Betas smaller than 1.0 have less systematic risk than average.
- Because assets with larger betas have greater systematic risks, they will have greater expected returns.
  
  *Note that not all Betas are created equally.*

Portfolio Expected Returns and Betas for Asset A

The Reward-to-Risk Ratio

- Notice that all the combinations of portfolio expected returns and betas fall on a straight line.
- Slope (Rise over Run):
  
  $\frac{E(R_A) - R_f}{\beta_A} = \frac{16\% - 4\%}{1.6} = 7.50\%$

  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.

The Security Market Line (SML)

- The Security market line (SML) is a graphical representation of the linear relationship between systematic risk and expected return in financial markets.
- For a market portfolio,
  
  $\frac{E(R_M) - R_f}{\beta_M} = \frac{E(R_M) - R_f}{1}$

  $= E(R_M) - R_f$

The Security Market Line, II.

- The term $E(R_M) - R_f$ is often called the market risk premium because it is the risk premium on a market portfolio.
- For any asset $i$ in the market:
  
  $\frac{E(R_i) - R_f}{\beta_i} = \frac{E(R_M) - R_f}{\beta_i}$

  $\Rightarrow E(R_i) = R_f + \left[ \frac{E(R_M) - R_f}{\beta_i} \right] \times \beta_i$

  Setting the reward-to-risk ratio for all assets equal to the market risk premium results in an equation known as the capital asset pricing model.
The Security Market Line, III.

• The Capital Asset Pricing Model (CAPM) is a theory of risk and return for securities in a competitive capital market.

\[ E(R_i) = R_f + \beta_i \times (E(R_m) - R_f) \]

• The CAPM shows that \( E(R) \) depends on:
  – \( R_f \), the pure time value of money.
  – \( E(R_m) - R_f \), the reward for bearing systematic risk.
  – \( \beta_i \), the amount of systematic risk.

Risk and Return Summary, I.

<table>
<thead>
<tr>
<th>Table 12.2: Risk and Return Summary</th>
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<tbody>
<tr>
<td>1. Total risk: The total risk of an investment is measured by the variance, or, more commonly, the standard deviation of its return.</td>
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<tr>
<td>2. Total return: The total return on an investment has two components: the expected return and the unexpected return. The unexpected return comes about because of unforeseen events. The risk from investing comes from the possibility of an unexpected event.</td>
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<tr>
<td>3. Systematic and unsystematic risk: Systematic risk is also called market risk. It refers to the portion of risk that affects all assets to some degree because the effects are macroeconomic. Unsystematic risk is the portion of risk that affects single assets or small groups of assets.</td>
</tr>
<tr>
<td>4. The effect of diversification: Some, but not all, of the risk associated with a risky investment can be diversified away. The market is not composed of assets, but as a whole, is a portfolio of all assets. The beta measures the variabilities of the total market.</td>
</tr>
<tr>
<td>5. The systematic risk principle and beta: Because unsystematic risk can be entirely diversified by diversification, the systematic risk principle states that the reward for bearing risk depends only on the level of systematic risk. The level of systematic risk is the standard deviation of the asset return.</td>
</tr>
</tbody>
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A Closer Look at Beta

• \( R - E(R) = m + \epsilon \), where \( m \) is the systematic portion of the unexpected return.

\[ m = \beta \times (R_m - E(R_m)) \]

So, \( R - E(R) = \beta \times (R_m - E(R_m)) + \epsilon \)

• In other words:
  – A high-beta security is simply one that is relatively sensitive to overall market movements.
  – A low-beta security is one that is relatively insensitive to overall market movements.

Where Do Betas Come From?

• A security’s beta depends on:
  – How closely correlated the security’s return is with the overall market’s return, and
  – How volatile the security is relative to the market.

\[ \beta_i = \frac{\text{Corr}(R_i, R_m) \times \sigma_i}{\sigma_m} \]
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.

Extending CAPM

- The CAPM has a stunning implication:
  - What you earn on your portfolio depends only on the level of systematic risk that you bear
  - As a diversified investor, you do not need to worry about total risk, only systematic risk.
- But, does expected return depend only on Beta? Or, do other factors come into play?
- The above bullet point is a hotly debated question.

Important General Risk-Return Principles

- Investing has two dimensions: risk and return.
- It is inappropriate to look at the total risk of an individual security.
- It is appropriate to look at how an individual security contributes to the risk of the overall portfolio
- Risk can be decomposed into nonsystematic and systematic risk.
- Investors will be compensated only for systematic risk.

The Fama-French Three-Factor Model

- Professors Gene Fama and Ken French argue that two additional factors should be added.
- In addition to beta, two other factors appear to be useful in explaining the relationship between risk and return.
  - Size, as measured by market capitalization
  - The book value to market value ratio, i.e., B/M
- Whether these two additional factors are truly sources of systematic risk is still being debated.