Introduction

Chapter 1
Risk vs Return

- There is a trade off between risk and expected return
- The higher the risk, the higher the expected return
**Example** (Table 1.1, page 2)

Suppose Treasuries yield 5% and the returns for an equity investment are:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>+50%</td>
</tr>
<tr>
<td>0.25</td>
<td>+30%</td>
</tr>
<tr>
<td>0.40</td>
<td>+10%</td>
</tr>
<tr>
<td>0.25</td>
<td>-10%</td>
</tr>
<tr>
<td>0.05</td>
<td>-30%</td>
</tr>
</tbody>
</table>
Example continued

- We can characterize investments by their expected return and standard deviation of return

- For the equity investment:
  - Expected return = 10%
  - Standard deviation of return = 18.97%
Combining Risky Investments (page 5)

\[ \mu_P = w_1 \mu_1 + w_2 \mu_2 \]

\[ \sigma_P = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 \rho w_1 w_2 \sigma_1 \sigma_2} \]

\[ \mu_1 = 10\% \]
\[ \mu_2 = 15\% \]
\[ \sigma_1 = 16\% \]
\[ \sigma_2 = 24\% \]
\[ \rho = 0.2 \]
Efficient Frontier of Risky Investments (Figure 1.3, page 6)
Efficient Frontier of All Investments
(Figure 1.4, page 6)
Systematic vs Non-Systematic Risk
(equation 1.3, page 7)

We can calculate the best fit linear relationship between return from investment and return from market

\[ R = \alpha + \beta R_M + \varepsilon \]

Systematic Risk
(non-diversifiabile)

Non-systematic risk
(diversifiable)
The Capital Asset Pricing Model
(Figure 1.5, page 9)

\[ E(R) - R_F = \beta [E(R_M) - R_F] \]
Assumptions

- Investors care only about expected return and SD of return
- The $\varepsilon$’s of different investments are independent
- Investors focus on returns over one period
- All investors can borrow or lend at the same risk-free rate
- Tax does not influence investment decisions
- All investors make the same estimates of $\mu$’s, $\sigma$’s and $\rho$’s.
Alpha

- Alpha measure the extra return on a portfolio in excess of that predicted by CAPM

\[ E(R_P) = R_F + \beta (R_M - R_F) \]

so that

\[ \alpha = R_P - R_F - \beta (R_M - R_F) \]
Arbitrage Pricing Theory

- Returns depend on several factors.
- We can form portfolios to eliminate the dependence on the factors.
- This leads to result that expected return is linearly dependent on the realization of the factors.
Risk vs Return for Companies

- If shareholders care only about systematic risk, should the same be true of company managers?
- In practice companies are concerned about total risk
- Earnings stability and company survival are important managerial objectives
- “Bankruptcy costs” arguments show that managers are acting in the best interests of shareholders when they consider total risk
What Are Bankruptcy Costs?
(Business Snapshot 1.1, page 15)

- Lost sales (There is a reluctance to buy from a bankrupt company.)
- Key employees leave
- Legal and accounting costs
Approaches to Bank Risk Management

- Risk aggregation: aims to get rid of non-systematic risks with diversification
- Risk decomposition: tackles risks one by one
- In practice banks use both approaches
Credit Ratings

<table>
<thead>
<tr>
<th>Moody’s</th>
<th>S&amp;P and Fitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa</td>
<td>AAA</td>
</tr>
<tr>
<td>Aa</td>
<td>AA</td>
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<tr>
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<td>A</td>
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<tr>
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<td>BBB</td>
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<td>CC</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

Investment grade bonds

Non-investment grade bonds
Subdivisions

- Moody’s divides Aa into Aa1, Aa2, Aa3.
- S&P and Fitch divide AA into AA+, AA, and AA−
- Other rating categories are subdivided similarly except AAA (Aaa) and the two lowest categories.