Portfolio Selection

Chapter 8
Charles P. Jones, Investments: Analysis and Management,
Ninth Edition, John Wiley & Sons
Portfolio Selection

• Diversification is key to optimal risk management
• Analysis required because of the infinite number of portfolios of risky assets
• How should investors select the best risky portfolio?
• How could riskless assets be used?
Building a Portfolio

• Step 1: Use the Markowitz portfolio selection model to identify optimal combinations
  – Estimate expected returns, risk, and each covariance between returns

• Step 2: Choose the final portfolio based on your preferences for return relative to risk
Portfolio Theory

• Optimal diversification takes into account all available information

• Assumptions in portfolio theory
  – A single investment period (one year)
  – Liquid position (no transaction costs)
  – Preferences based only on a portfolio’s expected return and risk
An Efficient Portfolio

- Smallest portfolio risk for a given level of expected return
- Largest expected return for a given level of portfolio risk
- From the set of all possible portfolios
  - Only locate and analyze the subset known as the efficient set
    - Lowest risk for given level of return
Efficient Portfolios

- Efficient frontier or Efficient set (curved line from A to B)
- Global minimum variance portfolio (represented by point A)
Selecting an Optimal Portfolio of Risky Assets

- Assume investors are risk averse
- Indifference curves help select from efficient set
  - Description of preferences for risk and return
  - Portfolio combinations which are equally desirable
  - Greater slope implies greater the risk aversion
Selecting an Optimal Portfolio of Risky Assets

• Markowitz portfolio selection model
  – Generates a frontier of efficient portfolios which are equally good
  – Does not address the issue of riskless borrowing or lending
  – Different investors will estimate the efficient frontier differently
    • Element of uncertainty in application
The Single Index Model

- Relates returns on each security to the returns on a common index, such as the S&P 500 Stock Index
- Expressed by the following equation
  \[ R_i = a_i + \beta_i R_M + e_i \]
- Divides return into two components
  - a unique part, \( \alpha_i \)
  - a market-related part, \( \beta_i R_M \)
The Single Index Model

- \( b \) measures the sensitivity of a stock to stock market movements
- If securities are only related in their common response to the market
  - Securities covary together only because of their common relationship to the market index
  - Security covariances depend only on market risk and can be written as:

\[
S_{ij} = \beta_i \beta_j \sigma_M^2
\]
The Single Index Model

• Single index model helps split a security’s total risk into
  – Total risk = market risk + unique risk
    \[ s_i^2 = \beta_i^2 [s_M] + s_{ei}^2 \]

• Multi-Index models as an alternative
  – Between the full variance-covariance method of Markowitz and the single-index model
Selecting Optimal Asset Classes

• Another way to use Markowitz model is with asset classes
  – Allocation of portfolio assets to broad asset categories
    • Asset class rather than individual security decisions most important for investors
  – Different asset classes offers various returns and levels of risk
    • Correlation coefficients may be quite low
Asset Allocation

• Decision about the proportion of portfolio assets allocated to equity, fixed-income, and money market securities
  – Widely used application of Modern Portfolio Theory
  – Because securities within asset classes tend to move together, asset allocation is an important investment decision
  – Should consider international securities, real estate, and U.S. Treasury TIPS
Implications of Portfolio Selection

• Investors should focus on risk that cannot be managed by diversification

• Total risk = systematic (nondiversifiable) risk + nonsystematic (diversifiable) risk
  – Systematic risk
    • Variability in a security’s total returns directly associated with economy-wide events
    • Common to virtually all securities
  – Both risk components can vary over time
    • Affects number of securities needed to diversify
Portfolio Risk and Diversification

The graph illustrates the relationship between the number of securities in a portfolio and the portfolio's risk. As the number of securities increases, the portfolio risk decreases, approaching the market risk. The curve shows that with a large number of securities (100+), the portfolio risk is significantly lower than the market risk.
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