Part IV 3 b). APT

Financial Markets and Investments

Adapted from Bodie, Kane and Marcus' slides, McGraw-Hill/Irwin

1. APT

Arbitrage - arises if an investor can construct a zero investment portfolio with a sure profit

Security mispricing can allow risk-free profit with simultaneous buy and sell

- Since no investment is required, an investor can create large positions to secure large levels of profit
- In efficient markets, profitable arbitrage opportunities will quickly disappear

APT

1. APT

$$r_P = E(r_P) + \beta_P F + e_P$$

F = some factor

- For a **well-diversified** portfolio:

  e_P approaches zero

  Similar to CAPM,

1. APT

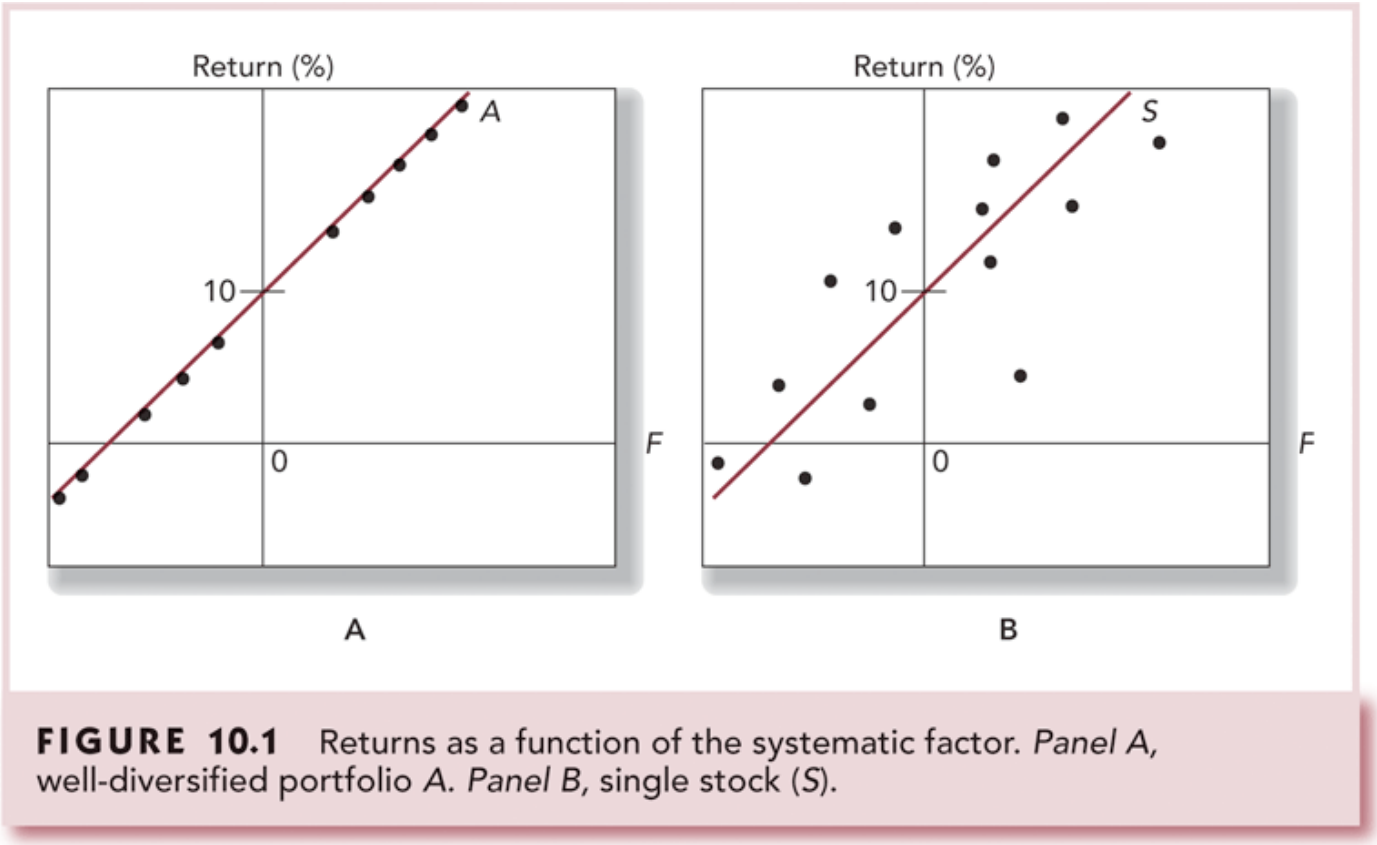

FIGURE 10.1 Returns as a function of the systematic factor. *Panel A*, well-diversified portfolio *A*. *Panel B*, single stock (*S*).

1. APT

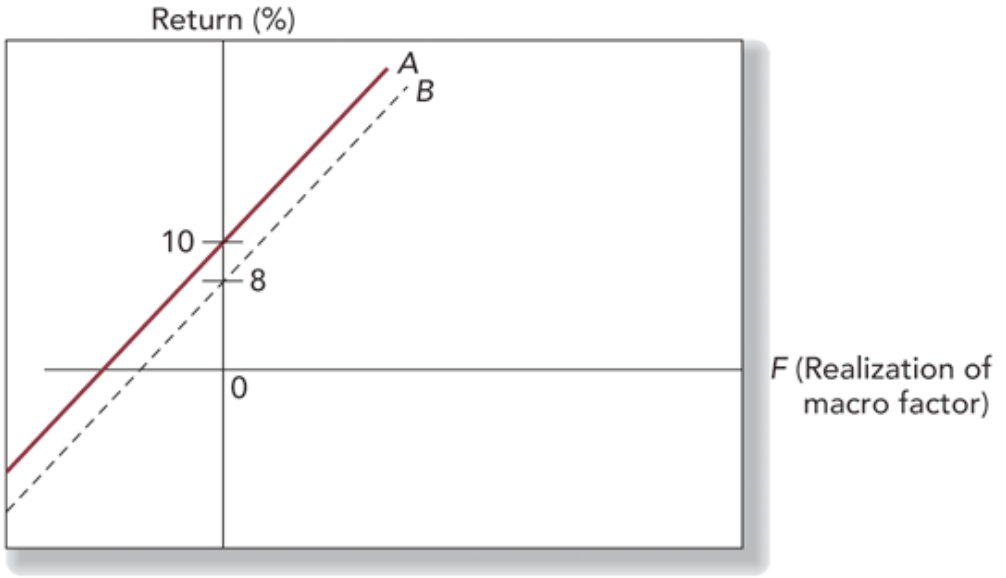

FIGURE 10.2 Returns as a function of the systematic factor: an arbitrage opportunity

1. APT

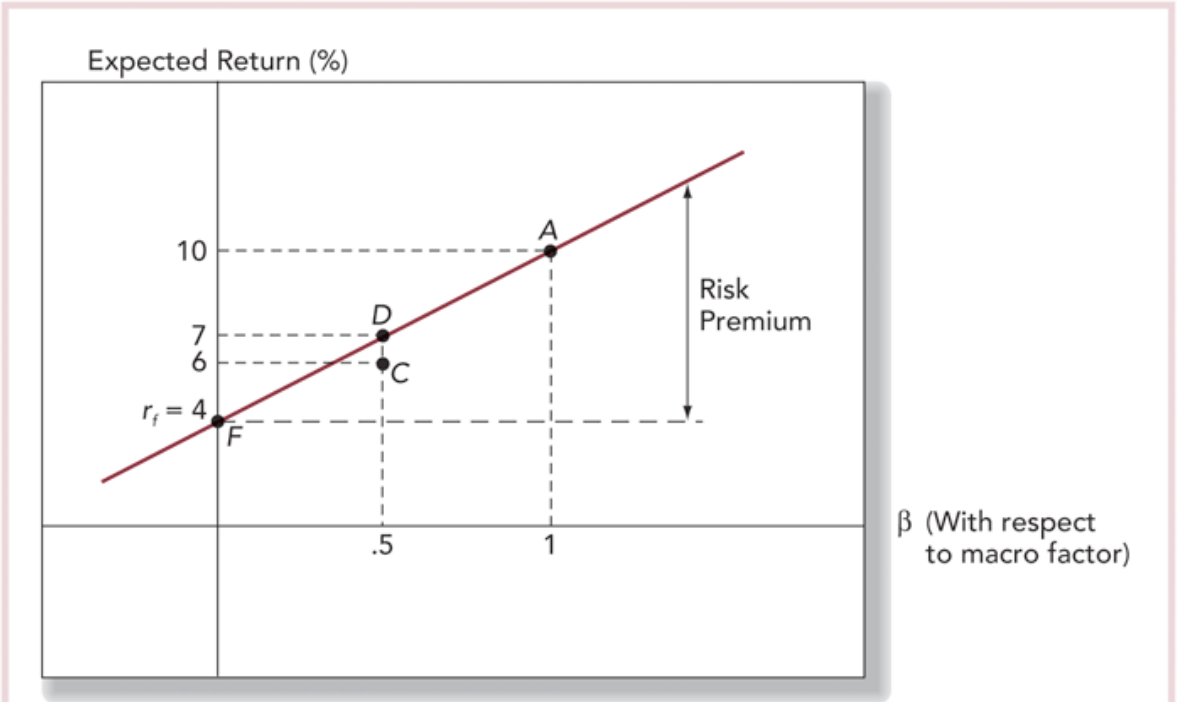

FIGURE 10.3 An arbitrage opportunity

APT

1. APT

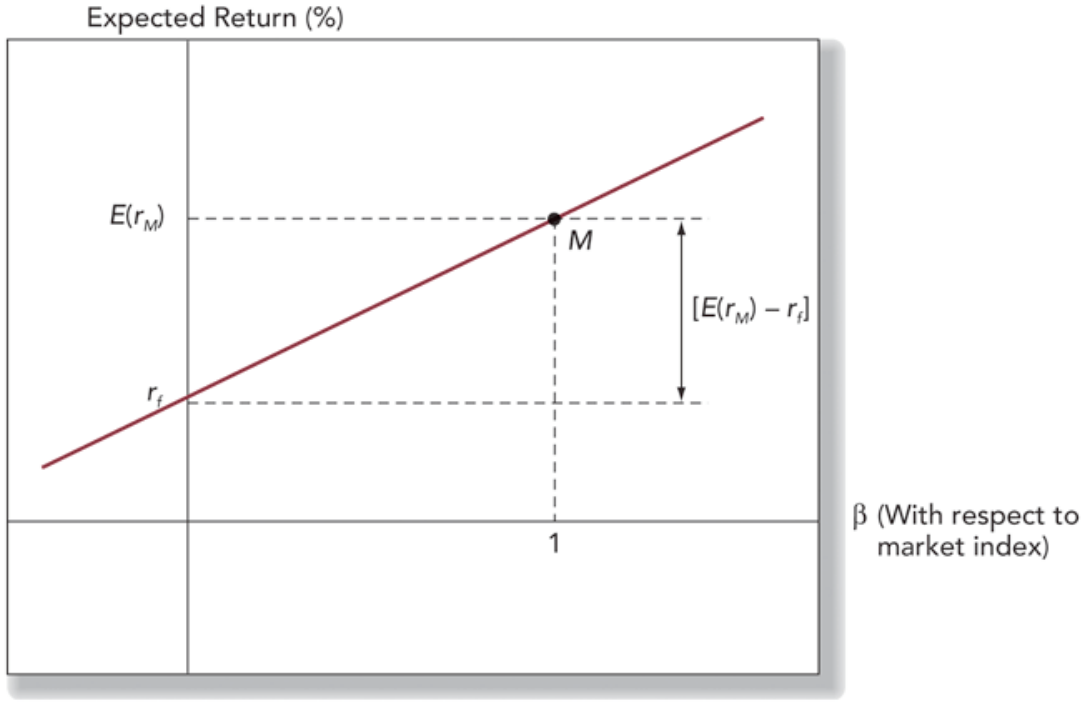

FIGURE 10.4 The security market line

APT

1. APT and CAPM compared

- APT applies to well diversified portfolios and not necessarily to individual stocks
- With APT it is possible for some individual stocks to be mispriced - not lie on the SML
- APT is more general in that it gets to an expected return and beta relationship without the assumption of the market portfolio
- APT can be extended to multifactor models

APT

3. Multifactor APT

- Use of more than a single factor
- Requires formation of factor portfolios
- What factors?
  - Factors that are important to performance of the general economy
  - Fama-French Three Factor Model

APT

3. Multifactor APT

- Two – Factor Model

$$r_i = E(r_i) + \beta_{i1}F_1 + \beta_{i2}F_2 + e_i$$

- The multifactor APR is similar to the one-factor case
  - But need to think in terms of a factor portfolio
    - Well-diversified
    - Beta of 1 for one factor
    - Beta of 0 for any other

APT

3. Multifactor APT : Example

- Work of Chen, Roll, and Ross
  - Chose a set of factors based on the ability of the factors to paint a broad picture of the macro-economy

3. Multifactor APT : Another Example

- **Fama-French Three-Factor Model**
- The factors chosen are variables that on past evidence seem to predict average returns well and may capture the risk premiums

$$r_{it} = \alpha_i + \beta_{iM} R_{Mt} + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + e_i$$

- Where:
  - SMB = Small Minus Big, i.e., the return of a portfolio of small stocks in excess of the return on a portfolio of large stocks
  - HML = High Minus Low, i.e., the return of a portfolio of stocks with a high book to-market ratio in excess of the return on a portfolio of stocks with a low book-to-market ratio

APT

4. Multifactor CAPM and the APT

- A multi-index CAPM will inherit its risk factors from sources of risk that a broad group of investors deem important enough to hedge
- The APT is largely silent on where to look for priced sources of risk