NPTEL

Course Name: Security Analysis and Portfolio Management

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Session 25: Arbitrage Pricing Theory

1. Explain the meaning of Arbitrage Pricing Theory (APT) and its major assumptions?

Ans:

Arbitrage Pricing Theory: Multiple factors expected to have an impact on all assets. Similar to the CAPM, the unique effects of multiple factors are independent and will be diversified away in a large portfolio. APT assumes that, in equilibrium, the return on a zero-investment, zero-systematic-risk portfolio is zero when the unique effects are diversified away.

Assumptions:

- Capital markets are perfectly competitive
- Investors always prefer more wealth to less wealth with certainty
- The stochastic process generating asset returns can be expressed as a linear function of a set of *K* factors or indexes

$$R_t = E_t + b_{i1}\delta_i + b_{i2}\delta_i + \ldots + b_{ik}\delta_k + \varepsilon_i$$

For i = 1 to N where:

R_i = return on asset i during a specified time period

E_i = expected return for asset i

b_{ik} = reaction in asset i's returns to movements in a common factor

δ_k = a common factor with a zero mean that influences the returns on all assets

ε_i = a unique effect on asset i's return that, by assumption, is completely diversifiable in large portfolios and has a mean of zero

N = number of assets

2. What is the difference between CAPM and APT?

Ans:

CAPM is criticized because of the difficulties in selecting a proxy for the market portfolio as a benchmark. APT does not assume:

- A market portfolio that contains all risky assets, and is mean-variance efficient

- Normally distributed security returns
- Quadratic utility function

Contrast this with CAPM's insistence that only beta is relevant, APT argues that multiple factors expected to have an impact on all assets:
Inflation

- Growth in GNP
- Major political upheavals
- Changes in interest rates etc.

3. What is the implication of empirical evidence with respect to Arbitrage Pricing Theory?

Ans:
Implication of various empirical evidence with respect to Arbitrage Pricing Theory:

- Not Conclusive as the number of factors remain unexplained
- If returns are not explained by a model, it is not considered rejection of a model; however if the factors do explain returns, it is considered support
- APT has no advantage because the factors need not be observable, so equivalent sets may conform to different factor structures
- Empirical formulation of the APT may yield different implications regarding the expected returns for a given set of securities
- The theory cannot explain differential returns between securities because it cannot identify the relevant factor structure that explains the differential returns
- Not able to answer various anomalies persistent in stock market: Small-firm effect, momentum effect, January anomaly
- APT is difficult to put into practice in a theoretically rigorous fashion. Multifactor models of risk and return attempt to bridge the gap between the practice and theory by specifying a set of variables.