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CAPM

Outline

- Introduction
- Risk
- Beta Coefficient
- CAPM
- Assumptions
- SML

Introduction

- A theory of risk and return for securities on a competitive capital market.
- Introduced by Jack Treynor, William Sharpe, John Lintner, Jan Mossin.
- Sharpe, Markowitz and Merton Miller jointly received the Nobel Memorial Prize in Economics for this contribution; 1990.

Systematic and Unsystematic Risk

- **Systematic risk :**
  - Risk that influences a large number of assets. Also called *market risk*.
  - Uncontrollable; Undiversifiable
  - Cannot be eliminated

- **Unsystematic Risk :**
  - Risk that influences a single company or a small group of companies
  - Controllable; Diversifiable
  - Can be mitigated through diversification

Beta Coefficient

- Measure of the relative systematic risk of an asset.

- Key parameter for CAPM

- Assets with betas larger than 1.0 have more systematic risk than average, and vice versa

$$\beta_j = COV(r_j, r_m) / Var(r_m)$$

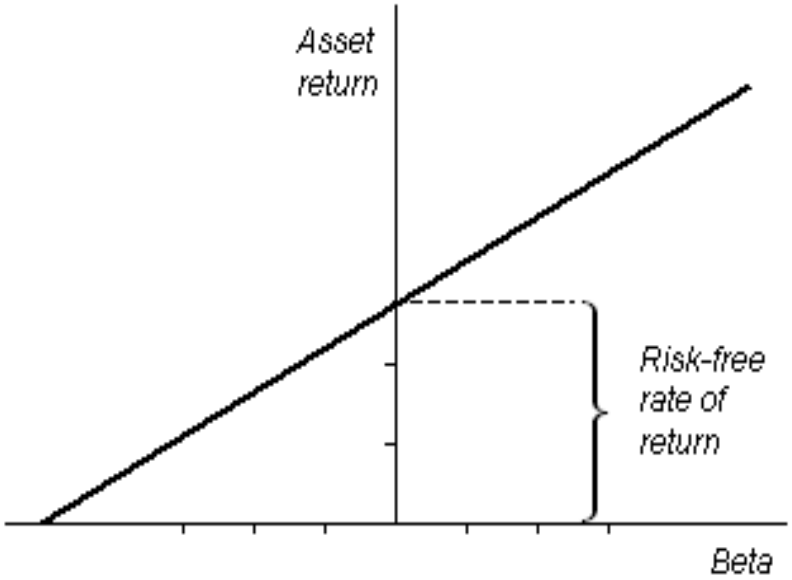
- Because assets with larger betas have greater systematic risks, they will have greater expected returns.

- Eg. Microsoft's beta is 1.3; its stock price is supposed to rise or fall by 13%, when the whole market rises or falls by 10%

CAPM

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

- In CAPM, $E(R_i)$ depends on
  - R_f, the pure time value of money.
  - $E(R_M) - R_f$, the reward for bearing systematic risk.
  - β_i, the amount of systematic risk.



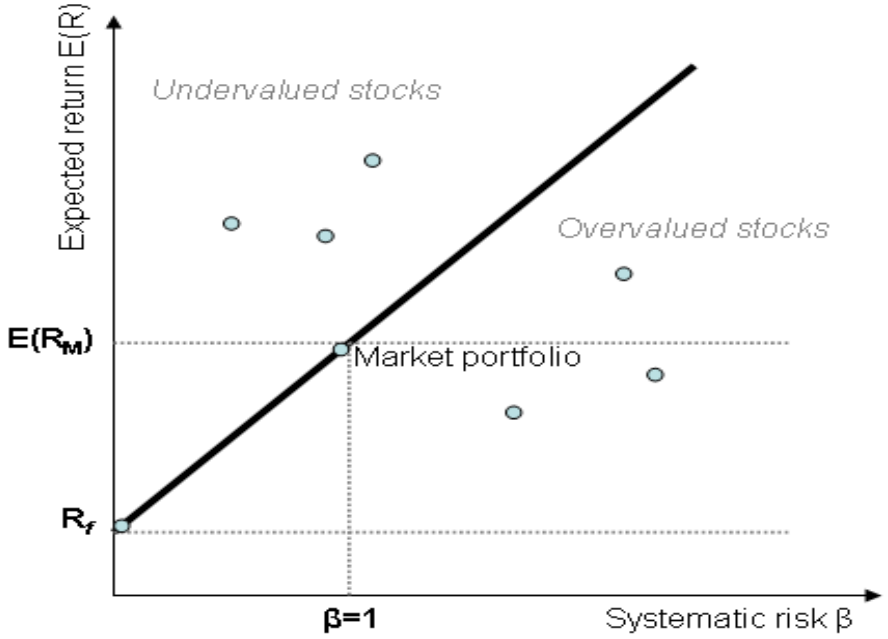
Assumptions:

- All investors aim to maximize economic utilities.
- Are rational and risk-averse.
- Are broadly diversified across a range of investments.
- Are price takers, i.e., they cannot influence prices.
- Can lend and borrow unlimited amounts under the risk free rate of interest.
- Trade without transaction or taxation costs.
- Deal with securities that are all highly divisible into small parcels.
- Assume all information is available at the same time to all investors.

Security Market Line:

- The SML essentially graphs the results from the capital asset pricing model (CAPM) formula.
- The x-axis represents the risk (beta), and the y-axis represents the expected return.
- The market risk premium is determined from the slope of the SML.
- The relationship between β and required return is plotted on the securities market line (SML) which shows expected return as a function of β.

Security Market Line:



Problems of CAPM

- Assume that the variance of returns is an adequate measurement of risk. This might be justified under the assumption of Normally Distributed returns.
- Homogeneous expectations.
- No taxes or transaction costs.
- Assumes rational and risk-averse investors.
- Does not adequately explain the variation in stock returns. Empirical studies show that low beta stocks may offer higher returns than the model would predict.

More…

- APT : Arbitrage Pricing Theory

▪Often viewed as an alternative of CAPM
▪more flexible assumption requirements.
▪describes the price where a mispriced asset is expected to be
▪the expected return of a financial asset can be modeled as a linear function of various macro-economic factors or theoretical market indices, where sensitivity to changes in each factor is represented by a factor-specific beta coefficient.

Thank You