CAPM (pronounced "cap-M")

The Capital Asset Pricing Model is essentially the reduction of Modern Portfolio Theory into a single factor model—with that single factor being called Beta. Instead of a matrix of covariances between all securities in the market, there is only one covariance coefficient: Beta, the covariance between a security and the **market**.

A security's Beta measures the amount of movement expected in the security's price for a given movement in the market in general. For instance, if a security has a Beta of 1.5, it is expect to move up 1.5% for every 1% upward move in the market; and move down 1.5% for every 1% downward move in the market.

CAPM is used as a model for the pricing of risky assets. It describes the relationship between **risk** and **expected return**. The CAPM model provides a means with which the future cash flows of an asset can be discounted. The riskier the asset, the lower the present value of its future cash flows.

The CAPM formula is:

$$E(r_i) = r_f + \beta_i(E(r_m) - r_f)$$

Where:

- $E(r_i)$ is the expected return on asset *i*
- β_i is the Beta of asset *i*
- $E(r_m)$ is the expected market rate of return
- r_f is the risk-free rate of interest

The left side of the equation is the expected—also called "required"—rate of return on security *i* . The right side consists of the risk-free rate (generally given by the rate on US Treasuries) plus the Beta of the security, times the

Market Risk Premium

(which is the risk-free rate subtracted from the expected rate of return on the market portfolio).

The primary determinant of this rate of return is the security's Beta. The risk-free rate and market risk premium would be the same for all securities.

If a security cannot match the required rate of return for a certain level of risk, it is considered a poor investment according to CAPM. If a security exceeds the required rate of return, it is considered a good investment according to CAPM.

CAPM is attributed to William Sharpe, who shared in the Nobel Prize for Economics for his work. However Lintner and Mossin also introduced in independantly.

The Beta Coefficient

Beta is the measure of sensitivity to **systematic risk**—this is risk inherent in the market, which cannot be diversified away.

$$\beta_i = \frac{Cov(r_i, r_m)}{Var(r_m)}$$

The Beta coefficient is a parameter of the Capital Asset Pricing Model, and is often used to determine the discount rate in DCF (Discounted Cash Flow) Analysis used by stock analysts. However, the empirical studies on the utility of Beta are mixed.