CHAPTER 11: RISK, RETURN, AND CAPITAL BUDGETING

Measuring Systematic Risk

Concept of Beta:

■ Measures a stock's market risk, and shows a stock's volatility relative to the market.
■ Indicates how risky a stock is if the stock is held in a well-diversified portfolio.
■ If beta = 1.0, the security is just as risky as the market
■ If beta > 1.0, the security is riskier than market
■ If beta < 1.0, the security is less risky than market.
■ Most stocks have betas in the range of 0.5 to 1.5.
■ Risk free treasury bill has beta of zero

Amazon.com	2.49
Dell Computer	1.64
Ford	1.34
General Electric	.97
McDonald's	.90
Boeing	.76
Wal-Mart	.51
Pfizer	.46
ExxonMobil	.41
H.J. Heinz	.30

Why these Stocks have different betas?
Defensive stocks historically tend to vary less than the market portfolio; aggressive stocks have a history of more variation relative to the market portfolio.

The tendency of a stock to move up and down with the market is reflected in its Beta co-efficient (b) .

If b is equal to 1.0 the when the market moves up 10% the stock price will increase by 10% (and the same with a fall in the market).
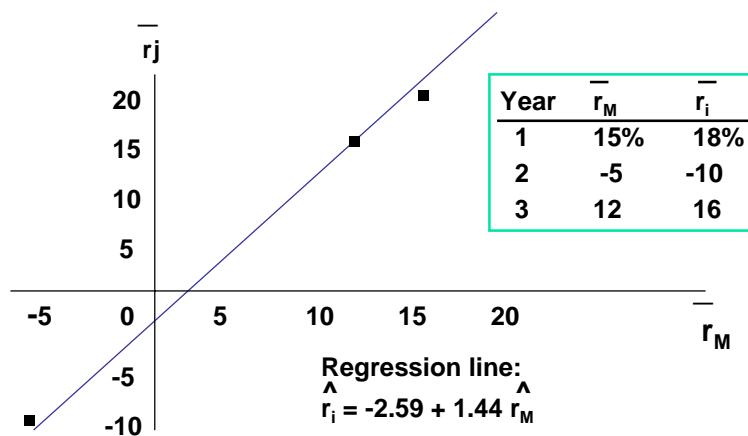
If b is equal to 2.0 the when the market moves up 10% the stock price will increase by 20% (and the same with a fall in the market).

The beta of the market equals 1.

Calculating betas

- Run a regression of past returns of a security against past returns on the market.
- The slope of the regression line (sometimes called the security's characteristic line) is defined as the beta coefficient for the security.

Illustrating the calculation of beta

$\bar{r_j}$

Year	$\bar{r_M}$	$\bar{r_i}$
1	15%	18%
2	-5	-10
3	12	16

20
15
10
5

-5   0   5   10   15   20

$\bar{r_M}$

-5
-10

Regression line:
$\hat{r_i} = -2.59 + 1.44 \hat{r_M}$

The beta of a portfolio = the sum of the betas of stocks weighted by the amount invested in each stock.

$$\beta_p = \sum_{j=1}^{n} w_j \beta_j = w_1\beta_1 + w_2\beta_2 + \ldots\ldots + w_n\beta_n$$

Note: The value of beta is required to solve for the "Required rate of return" in the CAPM model.

CAPM (Capital Asset Pricing Model)

- Investors must be rewarded with some "Risk Premium" i.e. return over an above the Risk Free return.
- This reward is in compensation for diversifiable risk measured by beta.

SML (Security Market Line) ➜ $k_j = \hat{r}_f + \beta_j (\hat{r}_m - \hat{r}_f)$

Security Market Line Shows relationship between risk as measured by beta (b) and the required rate of return for individual securities

k_j =   Required rate of return on stock "j"

$\hat{r}_f$ =   Risk-Free rate of return (T-Bill rate)

$\hat{r}_m$ =   Required rate of return on the market portfolio

β_j =   Beta of stock "j"

$(\hat{r}_m - \hat{r}_f)$ = Market risk premium

Example: The rate of return on treasury bills is 5%, the rate of return on the market portfolio is 12%. Find the required rate of return on an asset whose market risk is 1.5 times that of the market portfolio.
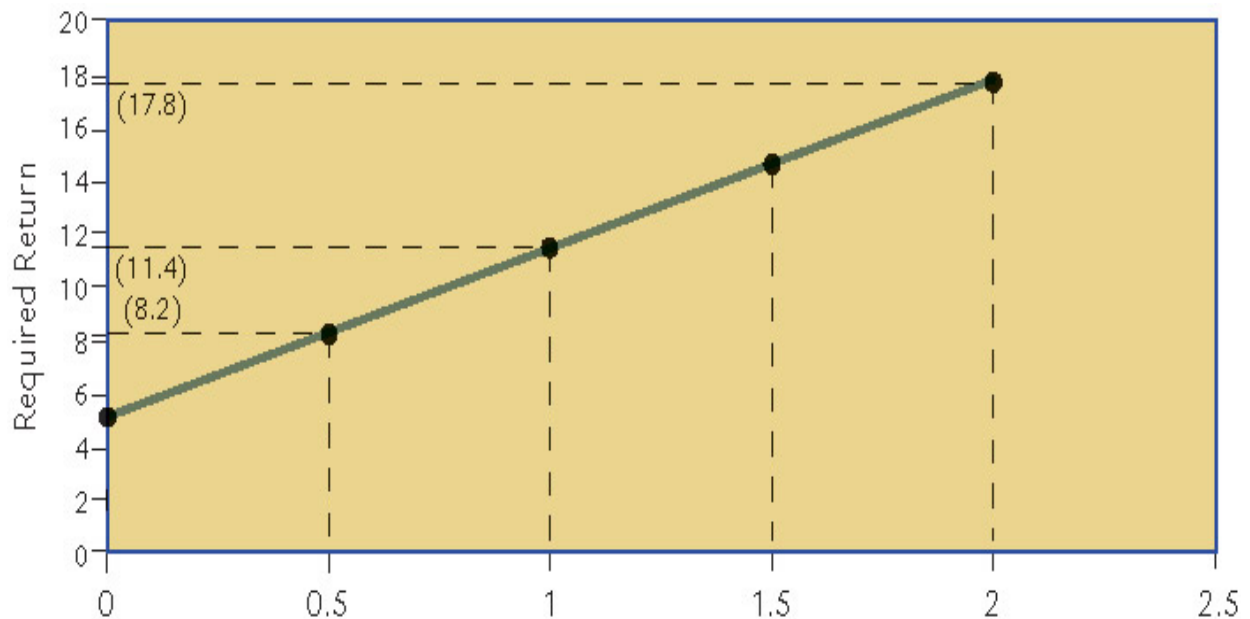
$\hat{r}_f$ =   5%

$\hat{r}_m$ =   12%

β_j =   1.5

$(\hat{r}_m - \hat{r}_f)$ = 12% - 5% = 7%

k_j = 5% + 1.5 (7%) = 15.5 %

SML

- The required rate of return on an asset can change because of either :
    - changes in the risk free rate
    - changes in the risk premium (change in risk aversion)
    - changes in the stock beta

- At one period of time the required returns among assets are different only because of the difference in those assets' betas.

Expected rate of return versus required rate of return!!!!!!

Project beta versus company beta!!!!!!

Comments on CAPM:

- Research shows that systematic risk explains less than 5% of the observed return for individual stocks
- Still used extensively

APT

- There are multiple systematic risk factors
- Does not specify the number of factors nor what they are specifically

Fama-French Three Factor Model

- Required rate of return on a security is a function of:
  - Market risk factor
  - Firm size risk factor
  - Book-to-market ratio risk factor