EQUITY VALUATION

Capital Asset Pricing Model – CAPM

This model describes the relationship between risk and expected return and is used in the pricing of risky securities.

The equation used for CAPM is as follows:

$r = R_f + \text{beta} \times (Km - R_f)$

Where

r is the expected rate of return on a security
R_f is the return rate of a "risk-free" investment
K_m is the return rate of the appropriate asset class

The general idea behind CAPM is that investors need to be compensated in two ways: time value of money and risk. The time value of money is represented by the risk-free (R_f) rate in the formula and compensates investors for placing money in any investment over a period of time. The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (β) that compares the returns of the asset to market returns over a period of time and to the market premium ($K_m - R_f$).

The CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. If this expected return does not meet or beat the required return, then the investment should not be undertaken.

Example: Using the CAPM model, one can compute the expected return of a stock: if the risk-free rate is 3%, the beta (risk measure) of the stock is 2 and the expected market return over the period is 10%, the stock is expected to return 17% (3%+2(10%-3%)).

Example: What will be the required return on a stock given that the risk-free rate is 8%, the expected return on the market portfolio is 12%, and the beta of the stock is 2?

$r = R_f + \text{beta} \times (Km - R_f)$
$r = 8\% + 2 \times (12\% - 8\%)$
$r = 16\%$

Beta

The **Beta i**s a key parameter in the capital asset pricing model (CAPM). It can also be defined as the risk of the stock to a diversified portfolio. Therefore, the beta of a stock will be much lower than its (the stock's) standard deviation.

Facts about beta

- If $\beta > 1.0$, the security moves more than the market when the market moves
- If $\beta < 1.0$, the security moves less than the market when the market moves.
- So, if $\beta > 1.0$, the asset has more risk relative to the market portfolio and if $\beta < 1.0$, the asset has less risk relative to the market portfolio.
- Since all risk is measured relative to the market portfolio, the beta of the market is 1.0.

Estimating Beta

Estimation using formula: $\beta = (\sigma I,m/\sigma^2 m)$

Estimating beta for a portfolio of assets

$$\beta_p = \sum_{i=1}^{n} w_i \beta_i$$

Example: Suppose that we have three securities whose co-variances with the market portfolio are:

- $\sigma 1,M = 153$, $\sigma 2,M = 257$, $\sigma 3,M = 236$
- $\sigma M = 15.2$

Ans:

$\beta 1 = 153/(15.2)^2 = 0.66$

$\beta 2 = 257/(15.2)^2 = 1.11$

$\beta 3 = 236/(15.2)^2 = 1.02$

Example: Find the beta on a stock XYZ given that its expected return is 12%, the risk-free rate is 4%, and the expected return on the market portfolio is 10%.

Ans:

r = R_f + beta x (Km - R_f)

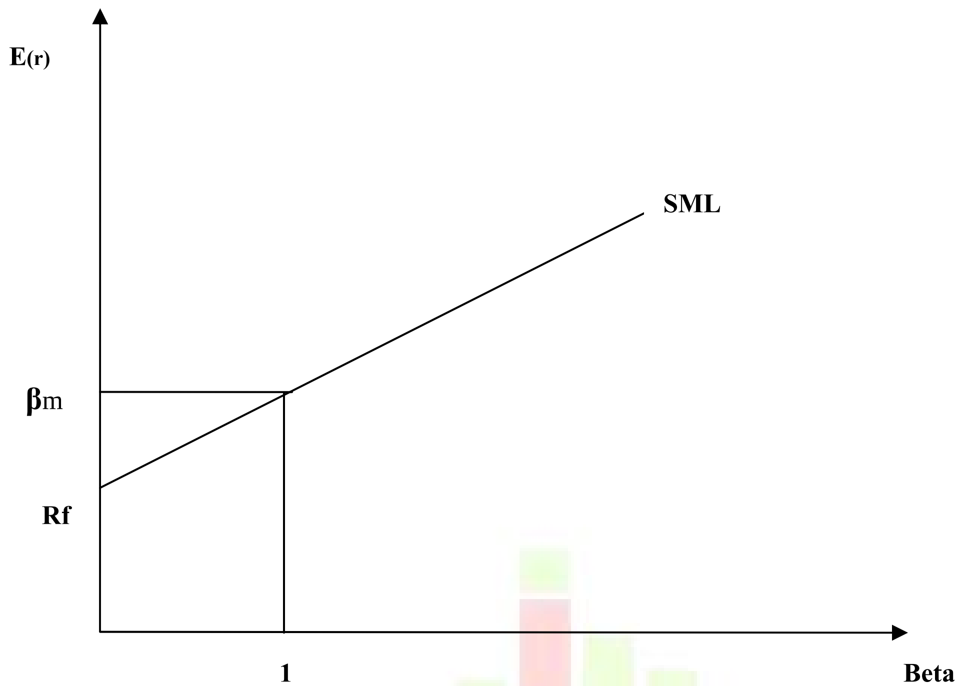
12% = 4% + beta x (10% - 4%)

$$\text{Beta x} = \frac{12\% - 4\%}{10\% - 4\%}$$

Beta x = 1.33

Securities Market Line

The securities market line (SML) is a straight line that graphs the relationship between risk and return.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.



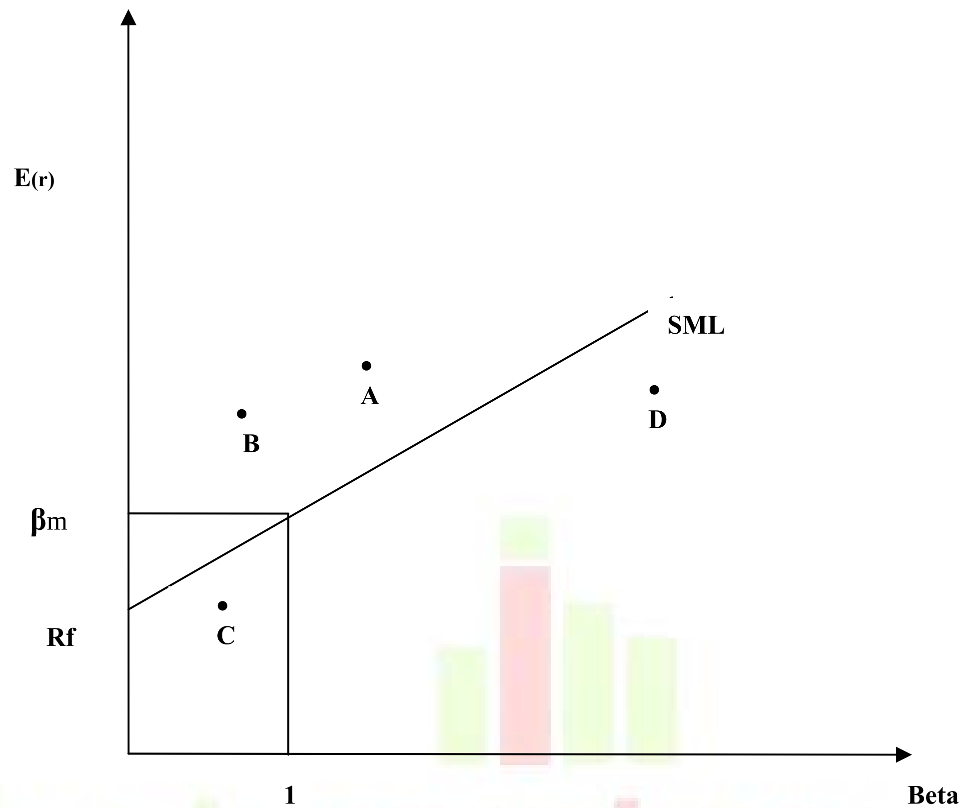
The line helps to graph the systematic/market risk versus return of the whole market at a certain time and shows all risky marketable securities. It is a useful instrument in determining weather an asset that is being considered for a portfolio offers a reasonable expected return for risk. The Individual securities are plotted on the SML graph. If the security's risk in opposition to expected return is plotted above the SML, it is undervalued since the investor is accepting a greater return for the inherent risk. And a security plotted below the SML is overvalued since the investor would be accepting less return for the amount of risk assumed.

Identifying undervalued and overvalued assets

- In equilibrium, all assets and portfolios of assets should fall on the SML.
- Therefore, we can compare a security's estimated (or expected) return with its required return from the SML (CAPM) to determine if the asset is overvalued or undervalued.
- If a security's expected return is below its required return, based upon the SML, it is overvalued and if a security's estimated return is above its required return, based upon the SML, it is undervalued.
- In terms of the SML, this means that securities that plot above the SML are undervalued and securities that plot below the SML are overvalued.

Example of using the SML to identify overvalued and undervalued assets

If we compare required returns to expected returns, investments A and B are undervalued and investments C and D are overvalued. Graphically, this means investments A and B plot above the security market line and investments C and D plot below the security market line.



P/E Ratio

When it comes to valuing stocks, the price/earnings ratio is one of the oldest and most frequently used metrics. P/E is the ratio of a company's share price to its per-share earnings. As the name implies, to calculate the P/E, you simply take the current stock price of a company and divide it by its earnings per share (EPS).

Example: if a share is selling at Rs.10 and is currently earning 50 paise per share, the P/E ratio for that share is:

$$\frac{\text{Price}}{\text{EPS}} = \frac{10}{.5} = 20$$

Example: if stock B is trading at 24 and the earnings per share for the most recent 12 month period is 3, it implies that stock B has a P/E ratio of 24/3 or 8.

Most of the time, the P/E is calculated using EPS from the last four quarters. However, occasionally the EPS figure comes from estimated earnings expected over the next four quarters. This is known as the leading or projected P/E. A third variation uses the EPS of the past two quarters and estimates of the next two quarters.

It's difficult to say whether a particular P/E is high or low, but there are a number of factors one should consider. First, a common rule for evaluating a company's share price is that a company's P/E ratio should be comparable to company's growth rate. If the ratio is much higher, then the stock price is high compared to history. Contrastingly, if the price is much lower, then the stock price is low compared to history. Secondly, it is useful to look at the forward and historical earnings growth rate.

For example, if a company has been growing at 10% per year over the past five years but has a P/E ratio of 75, then conventional wisdom would say that the shares are expensive. Third, it's important to consider the P/E ratio for the industry sector. For example, consumer products companies will probably have very different P/E ratios than internet service providers. Finally, a stock could have a high trailing-year P/E ratio, but if the earnings rise, at the end of the year it will have a low P/E after the new earnings report is released. Thus a stock with a low P/E ratio can accurately be said to be cheap only if the future-earnings P/E is low. If the trailing P/E is low, investors may be running from the stock and driving its price down, which only makes the stock look cheap.

Dividend Discount Model – DDM

DDM is a procedure for valuing the price of a stock by using predicted dividends and discounting them back to present value. The idea is that if the value obtained from the DDM is higher than what the shares are currently trading at, then the stock is undervalued. When using the dividend discount model, the type of industry involved and the dividend policy of the industry is important in choosing which of the dividend discount models to employ. As mentioned earlier, the intrinsic value of a share is the present value of all dividend cash flows discounted at the appropriate discount factor. For those familiar with the calculation of yield in fixed income analysis, the concepts are similar.

The DDM equation is:

$$V(0) = \frac{D(1)}{(1+k)} + \frac{D(2)}{(1+k)^2} + \frac{D(3)}{(1+k)^3} + \cdots \frac{D(T)}{(1+k)^T}$$

In the DDM equation

- $V(0)$ = the present value of all future dividends
- $D(t)$ = the dividend to be paid t years from now
- k = the appropriate risk-adjusted discount rate

Example: Suppose a stock will pay three annual dividends of Rs200 per year, and the appropriate risk-adjusted discount rate, k, is 8%. What is the value of the stock today?

$$V(0) = \frac{D(1)}{(1+k)} + \frac{D(2)}{(1+k)^2} + \frac{D(3)}{(1+k)^3}$$

$$V(0) = \frac{200}{(1+0.08)} + \frac{200}{(1+0.08)^2} + \frac{200}{(1+0.08)^3} = 515.42$$

The Constant Growth Rate Model

Assume that the dividends will grow at a constant growth rate *g*.
Then, the dividend next period (t + 1) is:

$$D(t+1) = D(t) \times (1+g)$$

- In this case, the DDM formula becomes:

$$V(0) = \frac{D(0)(1+g)}{k-g}\left[1-\left(\frac{1+g}{1+k}\right)^{T}\right] \quad \text{if } k \neq g$$

$$V(0) = T \times D(0) \quad \text{if } k = g$$

Example: Suppose the current dividend is Rs.10, the dividend growth rate is 10%, there will be 20 yearly dividends, and the appropriate discount rate is 8%. What is the value of the stock, based on the constant growth rate model?

$$V(0) = \frac{D(0)(1+g)}{k-g}\left[1-\left(\frac{1+g}{1+k}\right)^{T}\right] \quad \text{if } k \neq g$$

$$V(0) = \frac{10 \times (1.10)}{.08-.10}\left[1-\left(\frac{1.10}{1.08}\right)^{20}\right] = 243.86$$

Thus the price of the stock should be 243.86.

The Constant Perpetual Growth Model

Assuming that the dividends will grow forever at a constant growth rate *g*, the DDM formula becomes:

$$V(0) = \frac{D(0) \times (1+g)}{k-g} = \frac{D(1)}{k-g} \quad g < k$$

Example: In mid-2004, the dividend paid by the XYZ Company, was 1.40.
Using D(0)=1.40, k = 6.5%, and g = 1.5%, calculate an estimated value for XYZ.

$$V(0) = \frac{1.40 \times (1.015)}{.065-.015} = 28.42$$

The Two-Stage Dividend Growth Model

The two-stage dividend growth model assumes that a firm will initially grow at a rate g1 for T years, and thereafter grow at a rate g2 < k during a perpetual second stage of growth.

$$V(0) = \frac{D(0)(1+g_1)}{k-g_1}\left[1-\left(\frac{1+g_1}{1+k}\right)^T\right] + \left(\frac{1+g_1}{1+k}\right)^T \frac{D(0)(1+g_2)}{k-g_2}$$

Part 1 is the present value of the first T dividends
Part 2 is the present value of all subsequent dividends.

Example: Suppose ABC has a current dividend of D (0) = 5, which is expected to "shrink" at the rate g1 of -10% for 5 years, but grow at the rate g2 of 4% forever. With a discount rate of k = 10%, what is the present value of the stock?

$$\mathrm{V(0)} = \frac{\mathrm{D(0)(1+g_1)}}{\mathrm{k-g_1}}\left[1-\left(\frac{\mathrm{1+g_1}}{\mathrm{1+k}}\right)^{\mathrm{T}}\right] + \left(\frac{\mathrm{1+g_1}}{\mathrm{1+k}}\right)^{\mathrm{T}} \frac{\mathrm{D(0)(1+g_2)}}{\mathrm{k-g_2}}$$

$$\mathrm{V(0)} = \frac{5.00(0.90)}{0.10-(-0.10)}\left[1-\left(\frac{0.90}{1+0.10}\right)^5\right] + \left(\frac{0.90}{1+0.10}\right)^5 \frac{5.00(1+0.04)}{0.10-0.04}$$

$$= 14.25 + 31.78$$

$$= 46.03.$$

The total value of 46.03 is the sum of a 14.25 present value of the first five dividends, plus a 31.78 present value of all subsequent dividends.