CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In modern portfolio theory, the total risk of a security can be divided into two components : systematic or market risk and unique or unsystematic risk. The unique or unsystematic risk reflects changes in return on a security that are not associated with return on the market but are caused by factors which are specific to that particular security, and affect the price changes of the security in a unique manner. Such risk can be eliminated through diversification. Thus, this risk is also known as diversifiable risk. The systematic or market risk of a security, on the other hand, measures the sensitivity of the security to the market movements. It is the risk that arises from the relationship between the return of a security and the return on the market. This type of risk cannot be eliminated through diversification.

A model linking the market risk and return that has been widely used in modern portfolio analysis is the Capital Asset Pricing Model (CAPM) developed by Sharpe(1964) and Lintner(1965) but based largely on the earlier works of Markowitz(1952) and Tobin(1958). The CAPM specifies the relationship between risk and required rates of return on assets when they are held in well-diversified portfolios. As in all financial theories, a number of assumptions were made in the development of CAPM; they are summarised as follows:

1. All investors are single-period expected utility of terminal wealth maximizers who choose among alternative portfolios on the basis of each portfolio's expected return and standard deviation.

2. All investors can borrow or lend an unlimited amount at a given risk-free rate of interest, R_F , and there are no restrictions on short sales of any asset.

3. All investors have identical estimates of the expected values , variances and covariances of returns among all assets; that is, investors have homogeneous expectations.

4. All assets are perfectly divisible and perfectly liquid(that is, marketable at the going price).

5. The are no transaction costs and taxes.

6. All investors are price takers(all investors assume their own buying and selling activity will not affect stock prices.

7.The quantities of all assets are given and fixed(i.e. all information is available without cost to all investors).

2.2 Capital Asset Pricing Model (CAPM)

The development of CAPM began with the work of Sharpe(1964). He expressed the need for the existence of an economic theory that could deal with conditions of risk, while attempting to predict the behaviour of capital markets. He showed that under assumptions that investors are risk-averters, have similar (probabilistic) beliefs about the future performance of various assets and can borrow or lend funds at a risk-free interest rate, market prices of capital assets will adjust so that the predicted risk of each efficient portfolio's rate of return is linearly related to its predicted expected rate of return. This relationship can be represented by the following equation :

$$E(R_i) = R_F + \{[E(R_M) - R_F]/\sigma_M\}\sigma_i \quad \text{------------------------(2.1)}$$

where

$E(R_i)$ = Expected return of portfolio i

R_F = risk-free rate of return
$E(R_M)$= Expected return on portfolio M made up of risky securities
σ_M = Standard deviation of portfolio M
σ_i = Standard deviation of portfolio i

The above equation can be represented graphically as in Figure 2.1. Point R_F is the risk-free rate of interest. In market equilibrium, an investor will be able to attain any desired point along a capital market line. The slope of the capital market line can be regarded as the reward per unit risk borne.

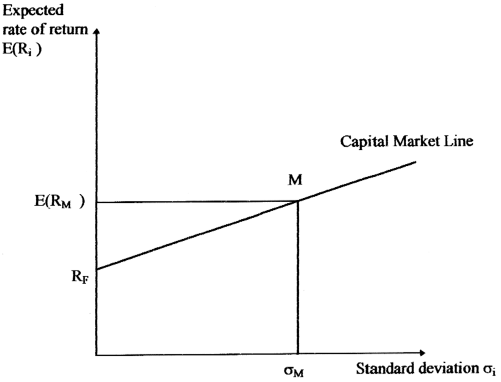

Figure 2.1 : The Capital Market Line

In examining the relationship between the expected rate of return and the risk of individual securities, Sharpe argued that there is no consistent relationship between their expected rate of return and total risk measured by the standard deviation. Instead there is a consistent relationship between their expected rate of return and systematic risk. The slope of the Capital Market Line, that is, equal to

$[E(R_M) - R_F \quad] / \sigma_M$, is also called standardized risk premium.

The further development of this relationship takes us from risk and return on efficient portfolios to risk and return on individual securities. Under the CAPM theory, the systematic risk of a security is measured by its beta coefficient and the relationship between a security's risk and its return is known as the Security Market line (SML) and is represented by the following equation:

$$E(R_i) = R_F + \{E\,(R_M) - R_F\}\beta_i \qquad (2.2)$$

Where

$E(R_i)$ = expected rate of return on the ith stock

R_F = riskless rate of return

$E\,(R_M)$ = expected rate of return on an average stock ($\beta = 1.0$) or market portfolio

β_i = the beta coefficient of the ith stock

$\{E\,(R_M) - R_F\}$ = the market risk premium (RP_m)

$\{E\,(R_M) - R_F\}\beta_i$ = the risk premium on the ith stock (RP_i)

Equation 2.2 can be represented graphically in Figure 2.2.

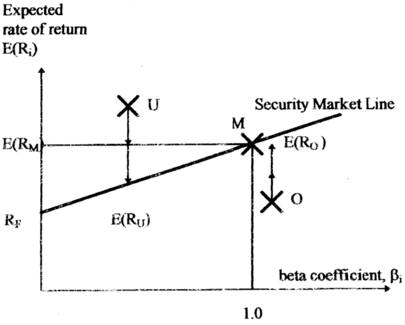

Figure 2.2 : The Security Market Line

The term β_i is defined as

$$\beta_i = Cov(r_i, r_m) / \sigma^2_M \quad (2.2a)$$

Where

$Cov(r_i, r_m)$ = Covariance of return of the ith stock with the market

σ^2_M = variance of return for the market index

β_i = beta coefficient of the ith stock

One property of beta is that the beta of a portfolio is simply the weighted average of the betas of its component securities, where the proportions invested in the securities are the respective weights. That is, the beta of a portfolio can be calculated as

$$\beta_p = \sum_{i=1}^{n} x_i \beta_i \text{ --(2.2b)}$$

where x_i = fraction of the investment in ith security.

Since every security plots on the SML, so will every portfolio. This means that efficient portfolios plot on both CML and SML, whereas inefficient portfolios plot only on the SML.

Sharpe calls β_i as the systematic risk, the component of the asset's total risk, σ_i which explains much of the variation in the return of asset i in response to changes in the return of the market portfolio M. The unsystematic portion of total risk can be easily diversified away by holding a portfolio of several different securities. However, systematic risk affects all stocks in the market and is therefore practically undiversifiable. Clearly, it is much more difficult to eliminate systematic risk.

In the search for assets which will minimize their risk exposure at a given level of expected return, investors will tend to focus on assets' undiversifiable systematic risk. They will bid up the prices of assets with low systematic risk (that is, low beta coefficients). On the other hand, assets with high beta coefficients will experience low demand and market prices that are low relative to the assets' income. That is, assets with high levels of systematic risk will tend to have high expected returns. This may be seen by noting in equation 2.3 that the expected return is higher after the purchase price for the asset falls. Obviously, the $E(R_i)$ ratio will be larger after the denominator decreases.

$$E(R_i) = [\,E(P_{t+1}) - P_t + d_t\,] / P_t \quad \text{------------------------------} (2.3)$$
$$= \text{expected income / market purchase price}$$

Where

$E(R_i)$ = Expected rate of return of ith stock

$E(P_{t+1})$ = Expected end-of-period price for period t, or equivalently, the beginning price for period t+1

P_t = Market price at beginning of period for ith stock

d_t = Cash dividend in period t from stock i

An asset with high systematic risk (that is, a high beta) will experience price declines until the expected return it offers is high enough to induce investors to assume this undiversifiable risk. This price level is the equilibrium price, and the expected return is the equilibrium rate of return for that risk-class.

Figure 2.2 shows the Security Market Line (SML) which graphically depicts the results of the price adjustments (that is, the equilibrium prices and expected returns) from this risk-averse trading. Any vertical line drawn on Figure 2.2 is a risk-class for systematic risk. The SML relates an expected return to each level of systematic risk. These expected returns can be interpreted as the appropriate discount rates K or cost of capital investors expect for that amount of systematic risk.

Systematic or undiversifiable risk is the main factor risk-averse investors should consider in deciding whether a security yields enough rate of return to induce them to buy it. Other factors, such as the 'glamour' of the stock and the company's financial ratios, are important only to the extent they affect the security's risk and return.

After an asset's average return and systematic risk have been estimated, they may be plotted in reference to the SML. In equilibrium every asset's E(R) and beta systematic risk coefficient should plot exactly on the SML. To see why this is true, consider Figure 2.2, which shows two assets denoted O and U. Asset U is underpriced because its average rate of return is too high for the level of systematic risk it bears. Asset O is overpriced because its rate of return is too low to induce investor to accept its undiversifiable risk. These two assets should move to the SML as shown by the arrows to their equilibrium position at the points marked M.

To see why assets O and U are incorrectly priced, consider equation (2.3a), which defines the expected rate of return for a common stock.

$$E(R) = \frac{\text{Expected capital gains or loss + expected cash dividends}}{\text{purchase price}} \quad \text{------(2.3a)}$$

To reach their equilibrium positions on the SML, assets O and U must go through a temporary price readjustment. Assuming the assets' systematic risk remains unchanged, the return of U must fall to $E(R_u)$ and the return of O must rise to $E(R_o)$. To accomplish this equilibrium rate of return, the denominator of equation (2.3a) must rise for asset U and fall for asset O. Assets O and U or any marketable capital asset (such as portfolio, stock, bond, or real estate) will be in disequilibrium unless its risk and return lie on the SML. Supply and demand will set to work as outlined above to correct any disequilibrium from the SML.

As discussed above, beta coefficient is a measure of the market risk of a security under market equilibrium, therefore closely related to market movements. A security whose beta coefficient is greater than one is termed a volatile security while a security whose beta coefficient is less than one is regarded as defensive security. Volatile security should rise faster than the market when market goes up, and fall faster when the market declines. However, defensive securities should rise slower than the market when the market goes up, and fall slower when the market declines. Hence, volatile securities should perform better than defensive securities in a rising market and worse in a falling market.

Beta is now widely accepted in the academic circles and also increasingly recognised and used by investment community. In Malaysia, the beta coefficients of all component stocks of the widely-followed KLSE CI (KLSE Composite Index) were computed by Kok(1990) in co-operation with the Research/Publication Department of the KLSE. The computation of beta coefficients serves not only the industry for the purposes of formulating investment strategies, but also facilitates systematic studies of risk and return of securities in the Malaysia equities market. Hence, as mentioned earlier(in Chapter One) it is the objective of current study to explore the extent to which the beta coefficients are useful for predicting the future returns of securities.