P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-IV* ISSUE-III*November-2016
E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

A Review of Capital Asset Pricing Model

Abstract

Stock price prediction is an important topic in finance and economics which has captured the interest of researchers over the years to develop predictive models. This paper presents the description of the most widely used risk return model The Capital Asset Pricing Model. All economic models, of which the CAPM is but one, are simplications of the real world. This model is focused on a more practical approach in stock valuation. Co-orporate have used CAPM in three related ways: First to determine the hurdle rates for corporate investments. Second to estimate the required returns for divisions, strategic business units or lines of business And, third to evaluate the performance of their divisions , units nor liner of business.

Keywords: Capital Asset Pricing Model, Risk –Free Rate of Return, Market Risk Premium, Beta.

Mrinalini Smita
Teacher,
Deptt.of Mathematics,
St. Xavier's College,
Ranchi

Anita Kumari
Assistant Professor,
Deptt.of Mathematics,
Ranchi College,
Ranchi

Introduction

Now-a-days stock market has rapid changes in the assessment of future. The IT revolution has changed the affairs of the stock market operation.Technical sources has been established. Any small incident of corporate sector is known by stock markets within the fraction of minutes. Online trading has changed the entire stock market operations drastically. Information is readily available to the markets. Risk is ginger and return is jam in stock market. The capital market theory (CAPM) deals with the relationship between Risk and Return factor. It reveals how the scrips are priced in the capital market. It has been propounded by Sharpe and it sometimes considered to be an extension of the Portfolio theory which was suggested by Markowitz. CAPM is an exercise in positive economics, concerned with two key questions.

1. What is the relationship between risk and return for an efficient portfolio?
2. What is the relationship between risk and return for an individual security?

The CAPM, in essence, predicts the relationship between the risk of an asset and its expected return. This relationship is very useful in two important ways:

1. It produces a benchmark for evaluating various investments. e.g. when we are analyzing a security we are interested in knowing whether the expected return from it is the line with its fair return as per the CAPM.
2. It helps to make an informed given about the return that can be expected from an asset that has not yet been traded in the market. e.g. how should a firm price its initial public offering of stock?

Although, the empirical evidence in the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical application. No wonder, the CAPM is a Centrepiece of Modern Financial Economics and William Sharpe, its principal originator, was awarded the Nobel prize in Economics.

Objective of the Study

1. To focus on market risk and thus help individual to select securities and prepare a portfolio.
2. To help in focusing attention on the increasingly complex nature of business
3. To make investment as social revolution by spreading awareness of capital investment in stock market.
4. To boost the confidence of stakeholders in financial industry to do more business with less risk
5. To enable public to invest wisely in stock market.

Methodology

The most of the data are secondary data collected from publication of research institutes, research journals, regarding text books, websites and Google searches.

Significance of the Study

This study will educate laymen for proper investment without any risk in stock market.

We want to make investment as 'social revolution'by spreading awareness of capital investment in stock market.

It will help in boosting the confidence of stakeholders in financial industry to do more business with less risk.

It will enable public to invest wisely in stock market.

Basic Assumptions of CAPM

CAPM is based on following assumptions:

1. Decision of the investor depends on the judgement of risk and return of securities and they are measured by standard deviations.
2. Individuals can borrow and lend freely at a riskless rate of return.
3. Capital markets are perfect i.e. information is freely and instantly available to all investors, securities are infinitesimally divisible and there are no transaction cost.
4. Investors have homogeneous expectations with regard to the expected return, standard deviation and variance of the return.
5. Investors are risk averse. Thus for a given rate of return, they will prefer a portfolio having lower risk. Conversely, for a given level of risk they will prefer a portfolio with higher return.
6. Risk and return are linearly related by beta i.e. risk and return are in equilibrium.
7. There are no taxes.
8. Individuals seek to maximize the expected utility of their portfolio over a single period planning horizon.

To apply the CAPM, we need to estimate the following factors that determine the CAPM line:

1. Risk –free rate
2. Market risk premium
3. Beta

Risk Free Rate

Money market is a combination of different kinds of financial assets. Some kinds of sources of finance is available for cheap rate of interest rates. At the same time financial money instruments are available for investment at the Risk free rate of interest. It is the theoretical rate of return of an investment with no risk of financial loss. One interpretation is that the risk free rate represents the interest that an investor would expect from an absolutely risk free investment over a given period of time. Theoretically, the return on a zero beta portfolio is the best estimate of the risk –free rate .Constructing zero beta portfolios, however, is costly and complex. Hence, the investor could borrow or lend any amount of fund at Risk free rate of interest. They can mix the blend of risk free assets with risky assets in order to reduce the risk level of the portfolio. The expected return on the combination of risky and risk free assets can be computed through the following formula:

$R_p = R_f x_f + R_m (1- x_f)$

R_p = Return on portfolio

X_f = Ratio of funds invested in risky assets

R_f = Risk free rate of return

Rm = Return on risky assets

1 – xf = Proportion of funds invested in risky assets

Illustration

Mr. Kamal invest 50% in risk free assetsand 50% in risky asstes. Calculate expected rrturn on the portfolio, if he borrowed at 12.5% of interest. The risky assets generate the return 20%.

$R_p = R_f x_f + R_m(1 – x_f)$

$= 12.5x\ 0.5 + 20\ (1 – 0.5)$

$= 6.25 + 10.00$

$= 16.25$

Treasury bills are the most common example of asset that offer a risk free rate of return. It is important to note that risk free rate of return is subject to inflation risk, where by returns are eaten away by inflation over time. Also risk free rate of return carries interest rate risk, meaning that when interest rate rise, Treasury prices fall and vice –versa. Fortunately, in periods of rising interest rates, Treasury prices tends to fall less than other bonds do.

Market Risk Premium

Market risk premium ,also known as Equity risk premium , is the difference between the expected return on a market portfolio and the risk –free rate. Since the market risk premium is same for all securities, the total risk premium varies directly with systematic risk measured by beta. A security's beta of less than 1 means security's returns are less sensitive to the changes in the market returns. The security's required rate of return will be less than the market rate of return. On the other hand , if the security's beta is greater than 1, then its systematic risk is greater than the aggregate market.CAPM measures required rate of return on equity investment and it is an important element of modern portfolio theory.

Formula

Market Risk Premium= Stock market return – Risk –free rate.

Beta (β)

The risk in the return of an asset is divided into two parts – Systematic risk is risk related to the return from market as a whole and cannot be diversified away. Non –systematic risk that is unique to the asset and can be diversified away by choosing a large portfolio of different assets.CAPM argues that the return should depend only on systematic risk. In tha CAPM, Beta is the role asset –specific or portfolio –specific factor. The beta (β) of an asset is a measure of sensitivity of its returns to returns from the market. It can be positive and negative. It is the indication of the percentage change in the price of the stock related to the percentage changes in the market index.8 There are three kinds of beta – High beta in which the stock has a beta of more than 1.These are aggressive stocks like banking , infrastructure etc. Low beta is the stock has a beta of less than 1.These are defensive stocks like pharma, IT, FMCG etc. The stock's beta is 0 is the neutral beta. These stocks have trend of their own and are not linked in anyway with the index movement.defence stocks, telecom stocks etc. Since at any given time, the forecasts for the risk free rate and the market premium are the same for every asset or portfolio, Beta above links the

investor's expectations or returns from the asset or portfolio with his /her expectations of return from the market. Fouse, a practitioner, argued that because beta is an exceptional estimate based on

1. The financial risk and business risk of a firm and
2. The degree to which a firm's business covaries with the total economy, Beta should be predictable.

The CAPM formula is Expected return on asset = $R_f+\beta(R_m-R_f)$ ……(1)

Where,

R_m = return on the portfolio of all available instruments

R_f = Return on a risk –free investment and

β(the greek letter) = a parameter measuring systematic risk

When β=0, an asset's returns are not sensitive to returns from the market. It means the stock price is unrelateted the market index. In this case ,it has no systematic risk and equation (1) shows that its expected return is the risk-free rate;

When β=0.5 , the excess return on the asset over the risk- free rate is on average half of the excess return of the market over the risk –free rate;

When β=1 the expected return in the asset equals to the return on the market ;

A high beta (greater than 1) moderate or high price volatility.

When β=-1, it indicates a negative relationship with the market index.

A beta of 1.5 forecasts a 1.5%change in the return on an asset for every 1% change in the return on the market.

Illustrations

1. Suppose that the risk –free rate Rf is 5% and the return on the market is 13% Equation (1) shows that, when beta of an asset is zero, its expected return is 5%. When β= 0.75%, its expected return is
   0.05 + 0.75 X (0.13-0.05) = 0.11 or 11%
2. If the risk-free rate is 6% and market risk premium is 12% and b of security is 1.5. What is the expected return on security under CAPM? What would be expected return if β was 2?
   Risk premium= β X market risk premium
   = 1.5 x12 =18.0
   Expected return on security =risk premium + risk free rate = 18.0+6 = 24%
   $R = I_{rf} + (R_m – R_f)X \beta$
   = 6% + (12% -6%) 1.5
   = 6% + 9%
   = 15%
   When β is 2
   Return = risk x β
   =12 x 2.0
   = 24%
   Expected return on security = 24% + 6%
   = 30%
   $Return = I_{rf} +(R_m – R_f)X \beta$
   = 6% + (12-6) x2
   = 6% + 12%
   = 18%
3. The risk free rate of return is 8% and the market rate of return is 17%. Betas for four shares P,Q,R and S are respectively 0.60,1.00,1.20 and -0.20. What are the required rate of breturn on these four shares?
   Using the formula,
   $Return = I_{rf} +(R_m – R_f)X \beta$
   R_P = 0.08 + (o.17-0.08)x0.60
   = 0.134 or 13.4%
   R_Q = 0.08 + (o.17-0.08)x1.00
   = 0.017 or 17.0%
   R_R = 0.08 + (o.17-0.08)x1.20
   = 0.188 or 18.8%
   R_S = 0.08 + (o.17-0.08)x-0.20
   = 0.062 or 6.2%
   Q with beta of 1.00 has a return equal to the market return. P has beta lower than 1.00, therefore its required rate of return is lower than the market return. R has a return greater than the market return since its beta isgreater than 1.00. S has a return lower than the risk free rate since it has a negative beta.

When using beta, there are a number of issues that one needs to be aware of –

1. Betas may change with time
2. Betas may be different depending on the direction of the market.
3. The estimated beta will be biased the security does not frequently trade.
4. The beta is not necessarily a complete measure of risk.
5. Beta is a measure of co-movement, not volatility. It is possible for a security to have "zero beta" and higher volatility than the market.

High beta stocks are best to own in a strong bull market (If ,for a long period , stock market face a fall in prices of securities) but are worst to own in a bear market(it is a period when prices are primarily declining , usually for a long period of time).

Merits and Demerits of CAPM Model

The CAPM is widely used financial theory, for both analysts of financial securities and financial managers, that establishes a linear relationship between the required return on an investment and risk. Its popularity may be attributed to the factors that CAPM is simple and intuitively appealing risk –return model .Its basic message that diversifiable risk does not matter, is accepted by everyone. At the heart of the model are its underlying assumptions, which many criticize as being unrealistic and might provide basis for the major drawbacks of the model.

1. Model is Ex-Ante. It is based on expectations. The inputs are Ex-Post –based on past data.
2. Historical data regarding market return, risk-free rate of return and betas vary differently for different period. Therefore, expected return cannot be found out precisely.
3. The assumption that the investors can borrow and lend at a risk-free rate, is unattainable in reality. Individual investors are unable to borrow (or lend) at the rate the US government can borrow at. Therefore, the minimum required return line might actually be less steep (provide a lower return) than the model calculates.
4. Business that use CAPM to assess an investment need to find a beta. However, the

project of determining accurately is difficult and can affect the reliability of the outcome.

Implications and Relevance of CAPM

CAPM has the Following Implications

1. Investors always combine a risk –free asset with a market portfolio of risky assets. They will invest in risky assets in proportion to the market value with the help of this concept of CAPM.
2. Investors can expect returns from their investments according to the risk. This implies a linear relationship between the asset's expected return and its beta.

The concepts of risk and return as developed under CAPM have intuitive appeal and they are quite simple to understand. Financial managers use these concepts in a number of financial decision –making such as valuation of securities, cost of capital measurement, investment risk analysis etc.

Conclusion

No model is perfect but each should have a few characteristics that make it useful and applicable. CAPM, while criticized for its unrealistic assumptions, provides a more useful outcome than either the Dividend Discount Model or Weighted Average Cost of Capital in many situations. It is easily calculated and stress-tested. And when used in conjunction with other aspects of an investment mosaic, it can provide unparalleled yield data that can support or eliminate a potential investment.Although, the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical application. CAPM has a strong potential for prediction and can compete favourably with existing techniques for stock price prediction.

References

1. Wikipedia
2. Google search on CAPM Model ,Sept 23 2016, 10:05 pm
3. Investopedia.com
4. Bhalla,V.K. 'Fundamentals of investment management pp 336-350
5. Singh Preeti , 'Investment Management (Security Analysis and Portfolio Management)' pp395-434
6. Chandra Prasanna, 'Investment Analysis and Portfolio Management ',pp 8.1-8.28
7. Maheswari , Yogesh ' Investment management' pp 234-241
8. Hull, John C. and Basu Sankarshan,'Options, Futures and Other Derivatives'. Pp 84-85
9. Babu, G.R. ,'Portfolio Management including security analysis' pp514-516
10. Shah, Kirtan,'Portfolio Analysis and Management'
11. Pandey, I.M., 'Financial management ' pp 96-99.