Test of CAPM: A Study of India and US

Pankaj Chaudhary*

Abstract

Asset pricing is one of the most important research areas in the field of finance. The simple CAPM model (capital asset pricing model) relates the return of the stocks and portfolios to the market factor captured by beta. Since the formulation of CAPM in 1960s, asset pricing has covered a long distance. We conduct the test of CAPM for India and US by using data from January 2001 to December 2015. We run 84 second pass cross-sectional regression equations to test the applicability of CAPM.

The results of our test find that CAPM is not able to capture the cross section of average returns both in India and US and we should consider the alternative asset pricing models to establish the risk-return relationship.

Keywords: CAPM, Fama-French Model, Asset Pricing

1. Introduction

One of the most important works in the field of finance is capital asset pricing model. The work of Sharpe (1964), Lintner (1965), and Black (1972) provided the first conceptual framework to value the financial assets on the basis of equilibrium model in the form of capital asset pricing model (CAPM). The initial response of this model in 1960s was overwhelming as it was based on strong theoretical foundations and empirically also it proved to be a success. The studies by Stattman (1980), Banz (1981), Basu (1983), and Bhandari (1988) and various other researchers found some anomalies such as size effect, leverage, value effect etc. which were not explained by CAPM. These studies reflected the weakness of CAPM as an asset pricing model. Despite the fact, the CAPM is still very popular model of asset pricing and we try to assess the applicability of CAPM with the help of recent data for India and US.

This paper empirically examines the standard CAPM for the Indian stock market and US stock market using rolling regression models. We have estimated 84 second pass regression equations for India and US each on the basis of monthly data.We test the linear pricing relationship implied by the CAPM by creating 10 beta sorted portfolios for each country. The major motivation for this study is to assess the applicability of CAPM in India vis-a-vis US as most of the studies are focussed on developed world only.

This study is mainly covered under six sections. Review of literature is presented in second section. The third section explains the data which is used for conducting various tests in this study. The methodology which is conducted for this study is also described in this chapter. The fourth section presents the results of various tests. The final section of the study is the description of summary and conclusion of this study.

2. Review of Literature

The CAPM has been tested for its practical utility by various researchers. One of the leading papers in early 70s is by Fama and MacBeth (1973) wherein the authors attempt to test the relationship between average return and risks for common stocks. The data pertain to New York Stock Exchange common stocks. The time span ranges from January 1926 to June 1968. They use the following equation to test various hypotheses:

$$R_{it} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_i + \tilde{\gamma}_{2t}\beta_i^2 + \tilde{\gamma}_{3t}s_i + \tilde{\eta}_{it}$$

where the term 't' is for the time period, $\tilde{R}_{it}$ is the return for time 't' on the stocki, β_i is beta of the asset, and s_i is standard deviation. The $\tilde{\eta}_{it}$ is the random error term which is assumed to be zero mean and independent. This equation tests the following hypothesis to understand robustness of CAPM:

* Assistant Professor, Shri Ram College of Commerce, Delhi, India. Email: pankaj.du04@gmail.com

a. The relationship between risk and return is linear when $\tilde{\gamma}_{2t}$ is equal to zero.

b. When $\tilde{\gamma}_{3t} = 0$, it means that beta is the only measure of risk and stocks are priced on the basis of beta and not on the basis of total risk.

c. $\tilde{\gamma}_{1t} = Rm - Rf$, it means that it is equal to risk premium which is defined as return on market portfolio less risk free rate and it should be positive to justify the capital asset pricing model.

The result on the basis of data analysis revealed that the relationship between risk and return is linear, beta is the proper measure of risk and risk premium is positive. Thus, this study concluded that CAPM is a good model of asset pricing and it can be used to identify return of the stocks and portfolio, given the level of risk which is adequately measured by beta.

Another attempt to test CAPM is conducted by Reinganum (1981) to examine whether the security's return varies according to the beta as stated in theory. It is assumed by CAPM that the high beta stocks have high return and vice-versa. The data for the study is related to the time period 1963 to 1979 of all the stocks traded in New York Stock Exchange. The finding does not out rightly reject the CAPM rather insinuates that the beta factor alone is not sufficient to explain the cross section average return.

The search for the variables that can help explain the cross section of average return led to the identification of one such variable namely size is found by Banz (1981). This study found on the basis of forty year data ranging from 1936-1975 that the return from the small company stocks is higher than the return from the large sized company. The above result of not significant relationship between beta and average return is later confirmed by one more study (Lakonishok & Shapiro, 1986). This study is based on the work of Reinganum (1981) and Banz (1981).They conducted their study for the time period 1962-1981 and found that it is the size which matter the most, the beta and total risk are not much important. Later a few more factors were identified which are assumed to explain the average return. Bhandari (1988) found that there is positive relationship between average return and leverage. Similarly, for US stock market, it was found that book-to-market equity and average return are positively related.

In response to these anomalies which were observed in the financial sector, a breakthrough research work was done by Fama-French (1993) which studied the US data for the time period of 1962-1989 of all non-financial firms which is obtained from the Center for Research in Security Prices (CRSP). The size factor states that smaller the size higher the return. This makes way for the phenomenon that small size companies generate high return. The value factor is captured by book-to-market equity which shows that high ratio is associated with poor performance. Thus, these factors are assumed to be proxies for risk factors not captured by the standard CAPM. These models can be used to evaluate performance of portfolios by classifying them in appropriate category on the basis of size and value and using the respective benchmarks assuming that the markets are rational.

There are various studies conducted in India with references to test the applicability of CAPM in India. Yalwar (1988) conducted test of CAPM in India for the period 1963-1982. The study supports the CAPM for Indian capital market with references to the period of the study. Srinivasan (1988) conducted the empirical test of CAPM for the period starting from 1982 to 1985. This study also supports the CAPM for Indian capital market. Gupta and Sehgal (1993) examined the validity of CAPM by using the monthly returns of 30 securities included in SENSEX. The data is related to the time period from April 1979 to March 1989. They concluded that the CAPM is not perfectly fit due to the presence of non-linearity in risk return relationship which is not captured by CAPM. A view similar to this study is echoed in the study by Madhusoodanan (1997) which rejects the CAPM validity for Indian stock market by using the data from 1987 to 1995. The study concluded that high risk high return strategy is not worth taking in Indian stock market. Sehgal (1997) also examines and finds a negative relationship between beta and returns in the study for the period 1984 to 1993. Another study conducted by Ansari (2000) by using the data from January 1990 to December 1996 pertaining to 96 stocks of Bombay stock exchange. This study finds very weak relationship between risk and return. All these studies give us an indication that the standard CAPM does not do its job well in describing risk return relationship in Indian stock market and there is a need to look for the alternative models to price the financial assets.

The betas are also not stable for the Indian stock market as found by Manickaraj and Loganathan (2004). The size effect Sehgal and Tripathi (2005) and value effects

Sehgal and Tripathi (2007) are also visible in Indian stock market. Thereafter, there is not much evidence available to test the CAPM in Indian context taking into account data related to the pre and post 2008 financial crisis time period. We make an attempt to enrich the literature by using the recent data of India and US stock market with the use of rolling regression technique.

3. Data and Methodology

3.1 Data

The data pertain to the January 2001 to December 2015 for the Indian capital market. The first five years' data are used to estimate the parameters and then the next year data is used to construct 10 portfolios and its return. The 10 portfolios are constructed and their monthly returns are calculated from January 2006 to December 2015.

The Indian capital market data pertains to the CNX NSE 500 for the proxy of market portfolio and its constituent stocks are taken for computing 25 portfolios on the basis of beta. The data is obtained from the Prowess database. Only those companies are selected for the study whose complete data for the 15 years is available. The companies with missing information for some of the time period are excluded. The final set consists of 250 companies for which full period data is available. These companies are used for portfolio formation and testing the model. The risk free rate for India is 91 days treasury bills rate and the data for the same is obtained from the Reserve Bank of India website.

The data related to US is obtained from French Kenneth library which is available online. The author defines the portfolios as "the portfolios are formed on univariate market beta (β) at the end of each June using NYSE breakpoints. β for June of year t is estimated using the preceding five years (two minimum) of past monthly returns.All NYSE, AMEX, and NASDAQ stocks for which we have market equity data for June of t and good returns for the preceding 60 months (24 months minimum)."

4. Methodology

The logarithmic return is computed for all the companies and the market proxy by using the following formula:

$$r_{t+1} = \ln\left(\frac{P_{t+1}}{P_t}\right) = \ln\left(P_{t+1}\right) - \ln\left(P_t\right) \qquad (1)$$

where r_{t+1} is the simple return, P_{t+1} is the value of the index or price at the time t+1 and P_t is the price or the value of the index at the time period t.

The empirical studies have found that returns of financial asset exhibit limited liability, which is contrary to the normal distribution. Since the normal distribution stretches from $-\infty$ to $+\infty$ and the lower bound of –1 violates this property of normality. The log return takes care of this drawback.

We use the following procedure to test the asset pricing model:

Step 1**:** The first step is to compute the excess return for various companies and market proxy by deducting the risk free return from the actual return.

Step 2: The second step is to compute the beta for all the securities by using market model as given below:

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + e_{it} \qquad (2)$$

where R_{it} is the returns on security for the month 't', R_{ft} is the returns on the risk free security R_{mt} and is the returns on the market proxy for the month 't' and e_{it} is the residual term.

Step 3: we use the first five years data for the purpose of beta computation for various securities. We use the return data from January 2001 to December 2005 for the computation of beta. The next computation of beta would be on the basis of data for the period January 2002 to December 2006 and so on.

Step 4: We use the betas computed above for the purpose of portfolio formation. The procedure is simple; first we sort the betas from highest to lowest for each year at the end of December. Then, we form 10 portfolios by taking 25 securities in each of the portfolio starting from the highest beta stocks to lowest beta stock. In this way, we have 10 beta sorted portfolios for 10 years starting from year 2006.

Step 5: We compute the on monthly return of each portfolio as a simple average of the return of constituent stocks for each month. It will result in portfolio return data for 10 portfolios from January 2006 to December 2015.

Step 6: We compute the portfolio beta by regressing the monthly return for each portfolio on the excess return of market portfolio by using the following equation:

$$Z_{pt} = \alpha_p + \beta_p z_{mt} + e_{pt} \quad (3)$$

where,

Z_{pt} is the excess monthly return of the portfolio, β_p is the beta of the portfolio, z_{mt} is the excess monthly return of market portfolio, and e_{pt} is the residual term.

The first equation is based on data from January 2006 to December 2008 i.e. three years' data and it gives us betas of 10 portfolios which we use for running cross sectional regression.

Step 7: We keep on estimating the portfolio betas by rolling the regression on month ahead i.e. the next estimation window is from February 2006 to January 2009 i.e. 36 months time period and we continue this process.

Step 8: The next step is to use the second pass regression which is a cross sectional regression by using the following formula to test the CAPM in India:

$$Z_{pt} = \alpha_p + \beta_p z_{mt} + e_{pt} \quad (4)$$

where, Z_{pt} is the average of excess return of portfolios over risk free rate for 10 years period, λ_0 is the intercept, β_p is the beta of the portfolio computed in previous step, λ_1 is the market risk premium which is the regression coefficient for this equation and e_{pt} is the residual term. If CAPM holds, the value of λ_0 should be zero and λ_1 should be positive. We have regressed 84 such cross sectional regressions for India and US.

5. Empirical Analysis

This section discusses the result of empirical data analysis of Indian and US capital market data.

5.1 Test of CAPM: India

Table 1 gives the empirical result of CAPM test conducted for the Indian stock market data. The results are obtained by first taking five years data from January 2001 to December 2005 and using the same for computing beta for all the securities under consideration. On the basis of betas obtained, we construct 10 portfolios in the month of December 2005. The first portfolio contains the top 25 highest beta companies, the next portfolio consists of next 25 highest beta companies, and so on. The monthly return of these 10 portfolios is computed for the year 2006 by taking the average of return of securities forming part of the portfolio. Similarly, the next estimation of betas is done on the basis of data from January 2002 to December 2006 and after constructing the portfolios, the return of the 10 beta sorted portfolios is calculated for each of the month of year 2007. In this way, we compute monthly return of 10 portfolios from January 2006 to December 2015.

These portfolios returns are then used to compute beta of 10 portfolios. Firstly, betas for 10 portfolios are computed on the basis of monthly portfolio return from January 2006 to December 2008 i.e. 36 month time period. We use it to run cross sectional regression by regressing these betas on average monthly return of these 10 portfolios and results are reported in January 2009. Next, we compute betas for these 10 portfolios using next 36 months of data and run a cross sectional regression by regressing these 10 betas on the average monthly return of 10 portfolios. In this way, we use the rolling regression technique to run 84 cross sectional regression and report the results from January 2009 to December 2015.

The CAPM suggests that the intercept term of the cross sectional regression should be zero and the slope which represents the market risk premium should be positive and significant. The results of 84 cross sectional regressions are reported in Table 1.

Out of total 84 regression intercepts, only 12 are not significantly different from zero as predicted by CAPM. Out of the 72 significant intercepts, 6 are significant at 5% level and 66 are significant at 1% level. This finding overwhelmingly rejects the CAPM in Indian context. We further analysis the market risk premium which is the regression coefficient of cross sectional regression equation.

The regression coefficient representing market risk premium is not significant for 16 regression equations. The rest of cross section regression coefficients are significant, however, there signs are negative which is contrary to the CAPM theory. Thus, on the basis of results obtained from 84 cross sectional regression equation, we find that CAPM is not applicable of Indian stock market.

Table 1: Output of Cross Sectional Regressions for India

This table shows the result of the regression equation computed on the basis of monthly return data.

Time			*Tiime*			*Time*		
Jan-09	-0.735	-1.020*	Jul-11	3.045**	-1.845**	Jan-14	1.234**	-2.143**
Feb-09	-0.864	-1.176**	Aug-11	2.998**	-2.167**	Feb-14	1.330**	-1.850**
Mar-09	-0.88	-1.032*	Sep-11	2.854**	-2.135**	Mar-14	1.359**	-1.453**
Apr-09	-1.025*	-0.654	Oct-11	2.779**	-1.614**	Apr-14	1.130**	-1.331**
May-09	-1.172*	0.212	Nov-11	2.732**	-1.009**	May-14	0.833*	-0.774*
Jun-09	-0.603	0.00436	Dec-11	2.831**	-1.043**	Jun-14	0.969**	-0.524*
Jul-09	-0.0544	0.029	Jan-12	2.895**	-1.022**	Jul-14	0.999**	-0.598*
Aug-09	0.0775	0.123	Feb-12	2.808**	-0.607*	Aug-14	1.146**	-0.683*
Sep-09	0.0799	0.0986	Mar-12	2.925**	-0.609*	Sep-14	1.443**	-0.623*
Oct-09	0.157	-0.267	Apr-12	2.890**	-0.737**	Oct-14	1.386**	-0.471*
Nov-09	0.293	-0.282	May-12	2.909**	-1.336**	Nov-14	1.478**	-0.568*
Dec-09	0.504	-0.31	Jun-12	3.400**	-2.535**	Dec-14	1.535**	-0.386*
Jan-10	0.494	-0.363	Jul-12	3.270**	-2.464**	Jan-15	1.632**	-0.197
Feb-10	0.596	-0.575	Aug-12	2.950**	-2.463**	Feb-15	1.696**	-0.590*
Mar-10	0.890*	-0.463	Sep-12	2.913**	-2.436**	Mar-15	1.688**	-0.822**
Apr-10	1.060**	-0.384	Oct-12	2.582**	-2.413**	Apr-15	1.434**	-0.639*
May-10	1.234**	-0.845**	Nov-12	2.495**	-2.099**	May-15	1.457**	-0.634*
Jun-10	1.472**	-1.012**	Dec-12	2.310**	-2.040**	Jun-15	1.479**	-0.534
Jul-10	1.516**	-1.069**	Jan-13	2.145**	-2.169**	Jul-15	1.598**	-0.578
Aug-10	1.799**	-1.306**	Feb-13	2.208**	-2.420**	Aug-15	1.749**	-0.833*
Sep-10	2.057**	-1.319**	Mar-13	2.314**	-2.571**	Sep-15	1.534**	-0.647*
Oct-10	2.382**	-1.808**	Apr-13	2.036**	-2.364**	Oct-15	1.532**	-0.705*
Nov-10	2.815**	-2.439**	May-13	2.069**	-2.568**	Nov-15	1.478**	-0.616*
Dec-10	2.820**	-2.476**	Jun-13	1.897**	-2.462**	Dec-15	1.417**	-0.606*
Jan-11	2.481**	-2.839**	Jul-13	1.732**	-2.664**			
Feb-11	2.484**	-2.424**	Aug-13	1.475**	-2.601**			
Mar-11	2.591**	-2.301**	Sep-13	1.604**	-2.663**			
Apr-11	2.718**	-1.938**	Oct-13	1.260*	-2.264**			
May-11	2.807**	-2.344**	Nov-13	1.102*	-2.103**			
Jun-11	2.921**	-2.289**	Dec-13	1.149**	-1.864**			

* means significance at 5% level of significance;
** means that it is significant at 1% level.

5.2 Test of CAPM: US

Table 2 gives the empirical result of CAPM test conducted for the US stock market data. The dataset pertaining to 10 beta sorted portfolios and excess market return is obtained from French Kenneth website. It is used to carry out the same analysis for the US stock market as we did for the Indian stock market.

Table 2: Output of Cross Sectional Regressions for US

This table shows the result of the regression equation computed on the basis of monthly return data.

Date			*Date*			*Date*		
Jan-09	-0.197	-0.738	Jul-11	-1.967**	2.646**	Jan-14	1.847**	-0.328*
Feb-09	-0.522	-0.800	Aug-11	-1.945**	2.539**	Feb-14	1.769**	-0.330*
Mar-09	-0.740	-0.897	Sep-11	-1.677**	2.042**	Mar-14	1.771**	-0.327
Apr-09	-0.912	-0.542	Oct-11	-1.662**	1.969**	Apr-14	1.757**	-0.342
May-09	-1.226*	0.206	Nov-11	-1.375**	2.470**	May-14	1.640**	-0.356*
Jun-09	-1.469**	0.679*	Dec-11	-1.169**	2.630**	Jun-14	1.593**	-0.270
Jul-09	-1.725**	0.948**	Jan-12	-1.057*	2.482**	Jul-14	1.569**	-0.0957
Aug-09	-2.105**	1.522**	Feb-12	-0.467	2.255**	Aug-14	1.597**	-0.160
Sep-09	-2.464**	1.905**	Mar-12	0.149	2.104**	Sep-14	1.561**	0.174
Oct-09	-2.679**	2.193**	Apr-12	0.242	1.858**	Oct-14	1.545**	0.323
Nov-09	-2.557**	1.843**	May-12	0.292	1.434**	Nov-14	1.940**	-0.227
Dec-09	-2.646**	1.945**	Jun-12	0.316	1.073**	Dec-14	1.989**	-0.234
Jan-10	-2.686**	2.079**	Jul-12	0.546**	0.912**	Jan-15	2.059**	-0.265
Feb-10	-2.681**	2.025**	Aug-12	0.663**	0.585**	Feb-15	2.279**	-0.778*
Mar-10	-2.725**	2.143**	Sep-12	0.926**	0.283*	Mar-15	2.235**	-0.673*
Apr-10	-2.803**	2.375**	Oct-12	1.108**	0.0598	Apr-15	2.211**	-0.746*
May-10	-2.783**	2.451**	Nov-12	1.132**	0.147	May-15	1.937**	-0.459
Jun-10	-2.749**	2.178**	Dec-12	1.182**	0.0664	Jun-15	2.056**	-0.380
Jul-10	-2.553**	1.856**	Jan-13	1.140**	0.0158	Jul-15	2.012**	-0.448
Aug-10	-2.495**	2.094**	Feb-13	1.248**	0.111	Aug-15	2.271**	-0.734*
Sep-10	-2.572**	2.003**	Mar-13	1.368**	-0.0520	Sep-15	2.334**	-1.034**
Oct-10	-2.629**	2.273**	Apr-13	1.433**	-0.193	Oct-15	2.511**	-1.420**
Nov-10	-2.538**	2.277**	May-13	1.395**	-0.345*	Nov-15	2.559**	-1.330**
Dec-10	-2.714**	2.654**	Jun-13	1.445**	-0.0831	Dec-15	2.611**	-1.349**
Jan-11	-2.664**	2.848**	Jul-13	1.436**	0.0935			
Feb-11	-2.907**	3.168**	Aug-13	1.665**	-0.0525			
Mar-11	-2.816**	3.256**	Sep-13	1.590**	0.111			
Apr-11	-2.869**	3.370**	Oct-13	1.705**	-0.0994			
May-11	-2.732**	3.223**	Nov-13	1.752**	-0.170			
Jun-11	-2.487**	2.906**	Dec-13	1.963**	-0.293			

* means significance at 5% level of significance;
** means that it is significant at 1% level.

Here, the only difference is that we did not use the data from January 2001 to December 2005 which was used to construct beta sorted portfolios as it was directly obtained from French Kenneth's website. For the US stock market, data analysis begins with computing beta for 10 beta sorted portfolios for various months by using rolling regression technique and 36 months data set. The next step is to run 84 cross sectional regressions and report their results from January 2009 to December 2015. The results are reported in Table 2.

First, we analyse the value of intercept from these cross sectional regression equations to test the CAPM for US stock market. We find that out of 84 regression equations, only for 9 regression equations the value of the intercept is not significantly different from zero. For the rest of the 75 regression equations, the intercept term is significantly

different from zero. Among these 75 significant intercepts, 2 are significant at 5% level whereas 73 intercept terms are significant at 1% level of significance. The results thus indicate that the CAPM is not doing well in US stock markets also.

We again try to get more insight into the model by studying the regression coefficient representing market risk premium. We find that market risk premium is not significant for 37 regression equations and for 12 regression equations it is significant but the sign is negative. It means that 49 regression equations find non applicability of the CAPM for US stock market which is more than half of the regression equations. Only for 35 equations, we find market risk premium positive and significant. On the basis of studying intercept term and regression coefficient, we conclude that the CAPM is not applicable for US stock market.

6. Summary

The asset pricing modelling has come a long way since 1960s when CAPM came into existence. The earlier financial literature suggested the use of CAPM to model asset pricing in capital market. Later on, it failed to serve the purpose well though it continues to be the most popular model of asset pricing. In this study we make an effort to study the applicability of CAPM for India and US.

We conducted the test of asset pricing models with the help of Indian and US capital market data for the time period starting from January 2001 to December 2015. The Kenneth library is used to take data for the 10 portfolios based on beta factor. The Indian data is related to the stocks included in NSE 500 index to construct 10 portfolios based on size and value by using the techniques described in methodology section.

We conducted a comprehensive test by using rolling regression technique and running 84 cross sectional regressions. We found considerable evidences against the CAPM for both the countries i.e. India and US. The study finds that the CAPM is losing its lustre in both emerging markets and developed world.

The utility of the findings is that the investors those who wish to make investment in financial markets should consider other factors also in addition to the market factor. The market factor is one of the most common factors which is widely used and made popular by Sharpe. However, the findings suggest that the popular belief paying too much attention to the market factor only should be replaced by well-placed attention to the additional factors. One such model is three factor Fama-French model which takes into account additional factors in the form of size and value effect. This is more important because the financial markets are dynamic and not static therefore the investors and financial analyst should also evolve the new and more appropriate methods to assess returns in a better way. The future scope of the present study to incorporate the ideas provided by Fama-French to empirically test the asset pricing model rather than focusing only on beta factor.

References

Anderson, T. W. (1984). *An introduction to multivariate statistical analysis* (2nd Ed.). John Wiley and Sons.

Ansari, A. V. (2000). Capital asset pricing model: Should we stop using it? *Vikalpa,* 25(1), 55-64.

Banz, R. W. (1981). The relationships between return and market value of common stocks. *Journal of Financial Economics,* 9, 3-18.

Basu, S. (1977). Investment performance of common stocks in relation to their price-Earning ratios: A test of efficient market hypothesis. *Journal of Finance,* 32(3), 663-682.

Basu, S. (1983).The relationship between earnings yield, market value and return from NYSE common stocks: Further evidence. *Journal of Financial Economics,* 12(1), 129-156.

Bhandari, L. C. (1988). Debt/equity ratio and expected common stocks returns: Empirical evidence. *Journal of Finance,* 43(2), 507-528.

Black, F. (1972). Capital market equilibrium with restricted borrowing. *Journal of Business*, 45(3), 444-445.

Black, F. (1993). Beta and Return. *Journal of Portfolio Management,* 20, 8-18.

Campbell, J. Y., Lo, A. W., & MacKinlay, C. A. (1997). *The econometrics of financial market.* New Jersey; Princeton University Press.

Connon, G., & Sehgal, S. (2003). Test of Fama French model in India. *Decision,* 30(2), 1-19.

Fama, E. (1965). The behaviour of stock market prices. *Journal of Business*, 38, 43-105.

Fama, E. (1970a). Multi-period consumption - Investment decision. *American Economic Review,* 60, 163-174.

Fama, E. (1970b). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 25(2), 383-417.

Fama, E., & Kenneth, R. F. (1992). The cross - Section of expected stock returns. *Journal of Finance*, 47(2), 427-465.

Fama, E., & Kenneth, R. F. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics,* 33(1), 3-56.

Fama E. B., & Kenneth, R. F. (1995). Size and book-to-market factors in earnings and returns. *Journal of Finance*, 50(1), 131-155.

Fama, E., & Kenneth, R. F. (1996). Multifactor Explanations of asset pricing anomalies. *Journal of Finance*, 51(1), 55-84.

Fama, E., & Kenneth, R. F. (1998).Value versus growth: The international evidence.*Journal of Finance*, 53(6), 1975-1999.

Fama, E., & MacBeth. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy,* 71, 607-636.

Gupta, L. C. (1981). *Rates of return on equities.* Oxford University Press.

Gupta, O. P., & Sehgal, S. (1993). An empirical testing of capital asset pricing model in India. *Finance India,* 7(4), 863-874.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance*, 48(1), 65-91.

Kothari, S. P., Shanken, J., & Sloan, R. G. (1995). Another look at the cross-Section of expected stock returns. *Journal of Finance,* 50(1), 185- 224.

Lakonishok, J., & Shapiro, A. C. (1986). Systematic risk, total risk, and size as determinants of stock market returns. *Journal of Banking and Finance,* 10(1), 115-132.

Lintner, J. (1965). Security prices, risk and maximal gains from diversification.*Journal of Business*, 36, 294-419.

Madhusoodanan, T. P. (1997). Risk and return: A new look at the Indian stock market. *Finance India,* 1(2), 285-304.

Manickaraj, M., & Loganathan, P. (2004). Relevance of beta as a measure of risk in India. *Finance India*, 18(3), 1259-1267.

Markowitz, H. M. (1952). Portfolio Selection. *Journal of Finance,* 7(1), 77-91.

Merton, R. (1973). An intertemporal capital asset pricing model. *Econometrica,* 41(5), 867-888.

Reinganum, M. R. (1981). Misspecification of capital asset pricing empirical anomalies based on earning's yields and market values. *Journal of Financial and Quantitative Analysis,* 9(1), 19-46.

Ross, S. (1976). Arbitrage theory of capital asset pricing. *Journal of Economic Theory,* 13, 341-360.

Sehgal, S. (1997).An empirical testing of three parameter capital asset pricing model in India. *Finance India*, 11(4), 424-442.

Sehgal, S. (2003).Common factors in stock returns: The Indian evidence. *The ICFAI Journal of Applied Finance,* 9(1), 5-16.

Sehgal, S., & Tripathi, V. (2005). Size effect in Indian stock market: Some empirical evidence. *Vision*, 9(2), 27-42.

Sehgal, S., & Tripathi, V. (2007). Value effect in Indian stock market. *The ICFAI Journal of Applied Finance*, 13(1), 23-36.

Sharpe, W. F. (1963). A simplified model for portfolio analysis. *Management Science*, 9(2), 277-293.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance,* 19(3), 77-91.

Srinivasan, S. (1988). Testing of capital assets pricing model in Indian environment. *Decision*, 15(1), 51-59.

Stattman, D. (1980). Book values and stock returns. *The Chicago MBA: A Journal of Selected Papers,* 4, 25-45.

Sharpe, W. F., Alexander, G. J., & Bailey, J. V. (1999). *Investments*. Prentice Hall, New Delhi, 1999.

Yalwar, Y. B. (1988). Bombay stock exchange: Rates of return and efficiency. *Indian Economic Journal*, 35(4), 68-121.