Capital Market Dynamism: Asset Pricing in Indian Securities Market

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Abstract

The capital market in India has witnessed spectacular growth during the nineties. The trend was overwhelming euphoric in consequence with the process of reforms and the gradual shift towards economic liberalization replacing controls by the free market forces. Buoyed by the bull phase and an unrelenting appreciation in stock prices in 2004-05, the Initial Public Offering (IPO) market was quite active in 2005-06. The bullishness in the secondary market always spill over to the primary market. Before the Sensex came tumbling down from its 12,671 peak in May 2006, the sentiments of the bourses got carried over into the IPO market and many companies tapped the capital market to ride the upbeat sentiments by pricing their shares aggressively. This list includes some high profile companies such as Jet Airways, Shopper Stop, Suzlon Energy and Reliance Petroleum; it also featured stock market debuts by some unconventional companies in the new business such as multiplexes, aviation and broadcasting hitherto unpresented on the stock market.

Investment in securities market requires the study of relationship between the revenue and risk. This paper is an attempt to understand the empirical validity of the Standard CAPM model in India, and to ascertain relationship between return securities/portfolios and book to market equity ratio. The study is based on BSE Sensex companies that were part of the index from base year (1978-79) to 30th June, 2005. Market model is being used to calculate beta and alpha of the sample companies. This model is used by Black, Jensen and Scholes (1972) and other researchers. The paper is organized in four parts. Part 1 is the introduction; Part 2 presents objectives, hypothesis, data and methodology; Part 3 analyses the results; and Part 4 presents the summary and conclusions.

Introduction

Investment in securities market requires the study of relationship between the revenue and risk. Sharpe (1962), Lintner (1965) and Mossin (1968) have independently developed Capital Asset Pricing Model (CAPM). The studies conducted by Black, Jenson, and Scholes (1972), Fama and McBeth (1973), Terregrossa (2001), have supported the CAPM. After 1970s, CAPM came under attack as striking anomalies were reported by Reinganum (1981), Elton and Gruber (1984), Bark (1991), Harris et al. (2003). Researchers show that CAPM's Beta is not a good descriptor of the expected return of securities/ portfolios. Prominent among the CAPM anomalies are book to market equity (BE/ME) effect of {Chan, Hamao and Lakonishok (1991)} and Fama and French (1992, 1993, 1996, 1998, 2002). But studies by Kothari et al. (1995), Kothari and Shanken (1995) argue in defence of CAPM's Beta. Daniel and Titman (1997) argued that it is the characteristics rather than the covariance structure of returns that appear to explain the cross-sectional variation in stock returns.

The empirical evidence against the CAPM has generated a lot of debate and has called for major re-examination of the CAPM. While many studies have been conducted on Indian context, Studies by Varma (1988), Yalwar (1988) and Srinivasan (1988) have generally supported the CAPM theory. Studies by Gupta

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and Sehgal (2003) supported the factors model. Ansari (2000) has opined the studies of CAPM on the Indian markets are scanty and no robust conclusion existed on this model. This view motivates the present study. Therefore an attempt is made to explore if beta and book to market equity ratio explain the cross sectional variations in security portfolio return in Indian capital market.

The paper is organised in four parts. Part 1 is the introduction; Part 2 presents objectives, hypothesis, data and methodology; Part 3 analyses the results; and Part 4 presents the summary and conclusions. References are given after part 4 and the tables are presented after the references.

Objectives: This study is undertaken with the following objectives:

· To test the empirical validity of the Standard CAPM model in India.

· To ascertain relationship between return securities/portfolios and book to market equity ratio.

Hypotheses: Based on the available evidence on CAPM as discussed above; particularly from Fama and French (1992) model; the following hypotheses are formulated:

The Null Hypotheses are:

Ho: The intercept (Alpha) in the CAPM is not significantly different from zero.

Ho: Market betas are not the determinants of the cross-section of the expected security/ portfolio returns.

Ho: Book to market equity ratio does not explain the cross-section of Security/ portfolio returns.

The negations of the above null hypothesis are the null hypotheses.

Data and Sample:

The study is based on BSE Sensex companies that were part of the index from base year (1978-79) to 30th June, 2005. Sensex consists of 30 companies. However, other companies that replaced a number of companies and that are/were part of Sensex during different times in the history of the index have been included in the study. The final list of 66 companies is selected based on two criteria: a) the companies selected should have been constituents of BSE Sensex and b) traded for minimum six months in a year during the study period. BSE-100 index is a market proxy and the weightage average yields of GOI securities are used as risk free returns for the respective years. The daily adjusted closing share prices and index from January 1, 1999 to June 30, 2005 are used for the study. To test the firm specific factor, in (BE/ ME) ratio is constructed based on the daily unadjusted closing prices, book value per share, outstanding number of shares are used. The data were collected from CMIE (Prowess package), BSE, RBI, DCA, SEBI websites. Over the years, researchers have used quarterly, monthly, weekly data to study the empirical relationship in the CAPM. Brown and Warner (1985) suggest that the daily prices are better as quarterly, monthly, weekly data do not provide a meaningful relationship between risk and return and hence daily price data are used in this study. Only capital gains component has been used in the estimating returns, as dividend information of companies is not available for all companies for all the years of the study period. Moreover, ignoring dividends would not pose a serious estimation bias in the light of the fact that the Indian companies' exhibit very low dividends yield ratios over the sample period. Further, the BSE–100 index that is used as proxy in the study does not incorporate dividends. Hence, including dividends while estimating security returns would have actually introduced a positive bias in the slope estimates of our time series regression.

Methodology: Standard form of CAPM

We have used market model to calculate beta and alpha of the sample companies. This model is used by Black, Jensen and Scholes (1972) and other researchers.

Phase I: Time Series Regression

We have calculated percentage and log returns of the sample data and then calculated mean returns. Terregrossa (2001) methodology has been used for grouping of sample companies by using three year period daily return for the period of study and then computed the intercept and beta for each of the sample periods and companies. For example, the daily prices for the first three years from January 1, 1999 to December 31, 2001 are used for computing the parameters to test the CAPM for the ex-post return of the year 2002. For the second set of three years, the first year id deleted and one additional year (2002) is added to test for the year 2003 and so on. The risk measures like beta, alpha are calculated using the following market model.

This term captures the variation in security I that are not captured by the market index m.

Phase II: Cross-sectional Univariate Regression using Individual Security's Beta

In the Phase II of the study, to test the CAPM, the realised return on each security for the period for every year starting January 1, 2002 to December 31, 2005 (for each year separately) are used. A second pass regression is run for the following:

If the CAPM holds, we can expect alpha in the above model to be closer to zero and beta to be significantly different from zeros and it captures the cross-sectional variations in security returns. The summarised results of the phase II regression are presented in Tables.

Book to Market Equity {in (BE/ME)} Ratio

Book to Market equity is the natural logarithm of the book value of the equity to market value of equity. The book value of equity has been computed by multiplying the book value per share with number of outstanding equity shares and market value of equity has been computed by multiplying the closing market price with number of outstanding equity shares. We use Fama and French methodology to test the impact on the cross-section of security portfolio returns for the sample stock of the BSE sensex. In this paper beta, in (BE/ME) variables are considered individually for fitting the univariate regression line and the combination of beta and in (BE/ME) ratio variables for fitting the multiple regression line.

Cross-section Univariate Regression using Individual Security's in (Book to market Equity) Ratio

Using the ln(BE/ME)ratio as independent variable and Ri – Rf as the dependent variable, a regression is run for the following:

If the factor model holds, we expect alpha to be closer to zero and the coefficient of in (BE/ME), to be significantly different from zero if it capture the cross sectional variation in security returns.

Cross-section Multiple Regression using Individual Securities bi and in (BE/ME) Ratio

The variation of security returns may be explained either one or more independent variables. In paragraphs 2.4.3 and 2.4.4, the univariate variables have been used to test the extent of these variables influence of the security returns. The study has been extended further to combination of independent variables, beta and ln (BE/ME) ratio, to test the variation in security returns. We sue Fama and French (1992) methodology. Using the beta and in (BE/ME) ratio as independent variables and R – R as the dependent variable, a multiple regressions is run for the following:

If the factor model holds, we expect alpha to be closer to zero and the combination of two variables, BE/ME ratio and beta to capture the cross-sectional variation in security returns.

Test for Alpha, Beta and ln(BE/ME) of Portfolios based on Cross-section Regression

The study has further focused on testing CAPM and factor model by forming portfolios. A portfolio has 5 securities is made with equal weights as suggested by Loknishok, Shliefer, and Vishny (1994) considering non-overlapping securities. In this set, portfolio 1 has been formed by choosing the first five securities having highest beta values; portfolio 2 is formed by choosing the next five securities and so on. Using this process, 13 portfolios have been formed with equal weightage to each security in the year 2002. Similar process is done for the subsequent test periods from 2003 to 2005. Similarly, another set of portfolio has been formed with market value weights as suggested by Fama and French (1992). For the purpose of testing CAPM, the realised return on each security for the period January 1, 2002 to December 31, 2002 is used as a measure for expected portfolio returns. A similar method has been used for the rest of the test period from January 1, 2003 to December 2004 and January 1, 2005 to June 30, 2005. We use similar formulae defined in paragraphs 2.4.2, 2.4.3, 2.4.4 and 2.4.5 to study the independent variables' effect on portfolio returns.

Company Attributes (Year t and Year t-1 analysis)

To test the ex-post returns of year t, we make two assumptions. In the first case we assume that investor can use value of book equity and market equity of year t-1 an use this information to make estimation of the returns of the year t. In the second case, we assume that investors are able to anticipate the values of BE and ME (book to market equity ratio of year t and based on these anticipated values, the expected returns are estimated. Based on the above assumption, we first test using year t values and later we test using year t-1 values of independent variables.

Cross-sectional Analysis: Year-wise regression

The CAPM is tested by running regressions on the realised returns of the individual years, viz., 2002, 2003, 2004 and 2005. The security's cross-sectional year-wise regression is done to test the extent of independent variable's influences on the security/portfolio returns.

Results And Analysis

- Test for Intercept (Alpha), Beta, book to market equity (ln(BE/ME)) ratio and the F value (Phase-II test: on the basis of the cross-section regression):

  The determinants of security/portfolio returns can be studied in different ways. The present study has been conducted by choosing two independent variables viz beta and ln (BE/ME) ratio. Univariate and multiple regression models are used independently to find out the extent of influence of these variables on security/portfolio returns. The results of the different securities/portfolios described in part 2.4.2, 2.4.3, 2.4.6, 2.4.7, 2.4.8 are presented in Tables (**Table No. I – XII**). The intercept and slope coefficient values are tested suing the t-test and the overall fit of the regression is tested using the F-test at 5% level of significance.

  We have a large number of cross section regressions for each independent variable. Security percentage returns with year-wise regression with year t values will have four regressions for four years tested (2002-2005). The same number of regression are obtained for percentage returns with equal weights using year t values, log returns with equal weights using year t values, log returns with equal weights using year t -1 values. To take the overall results in all the regressions, we count the total number of intercepts/slope coefficients by classifying these into two cases. In the first case, we take all the coefficient whose p-values are less than the level of significance (0.05) and in the second case, we take the coefficients whose p-values

are more than 0.05. If the majority of the alpha coefficient's p-values are more than 0.05, we conclude that alpha is not significantly different from zero and therefore accept the null hypothesis. If a large percentage of p-values of alpha are more than 0.05%, we accept null hypothesis. The similar process is used for beta, 1n(BE/ME) variables and also for the combination of beta and 1n(BE/ME). The total numbers of cross-sectional regressions for two univariate variables are 96 and that for a multiple regression it is 48.

Note: Number of cross sectional regressions:

When we use security returns, the total numbers of regressions for each univariate variables is 8. This is because, we have 4 regressions for year wise (individual years, viz. 2002 up to 2005) when we take year t weights; 4 regressions for year wise when we take the weights of year t – 1.

When we use security log returns, the total number regressions for each univariate variables is 8. When we use the percentage returns with equal weighted portfolios, the total number of regressions for each univariate variables is 8. When we use log returns with equally weighted portfolios, the total number of regressions for each univariate variables is 8. So, the total numbers of cross sectional regressions for two univariate variables are 96. Similar calculation has been done for multiple regressions.

- **Cross-sectional Univariate Regression Results of Percentage Returns: Case of Individual Securities**

  Table I shows that in 81% of the cases, the alpha values are significantly different from zero. Therefore, we reject the null hypothesis that alpha is equal to zero. The p-values of security beta are more than 0.05 and the F-test indicates that regression is not a good fit in 100% of the cases. Therefore, we accept the null hypothesis that beta does not significantly explain the variation in security returns. The p-values of security ln(BE/ME) are less than the 0.05 and the F-test indicates that regression is good fit in 62% of the cases. Therefore, we accept the alternate hypothesis that book to equity market ratio significantly explains the variation in security returns.

- **Cross-sectional Multiple Regression Results of Percentage Returns: Case of Individual Securities**

  Table II shows that in 75% of the cases, the alpha values are significantly different from zero. Therefore, reject the null hypothesis that alpha is not significantly different from zero. While the p-values of ln(BE/ME) slope, co-efficient are less than 0.05 in 62% of the cases, the p-values of beta slope coefficients are more than 0.05 in 100% of the cases. This indicates that the ln(BE/ME) ratio explains the variation in security returns whereas and beta doesnot significantly explain the variations in security returns. The F-test indicates that the regression is good fit in the majority of the years. Therefore, we may conclude that the combinations of ln(BE/ME) slope, and beta explains the variation in security returns but individually only ln(BE/ME) explains the security returns.

- **Cross-sectional Univariate Regression Results of Log Returns: Case of Individual Securities**

  Table III shows that 56% of the cases, the alpha value is significantly different from zero. Therefore, we accept the alternate hypothesis that alpha is equal to zero. The p-values of security beta and ln(BE/ME) are more than the 0.05 and the F-test indicate that the regression is not a good fit in majority of the cases. Therefore, we accept the null hypothesis that neither security beta, nor security book to market equity ratio explain thee variation in security returns.

- **Cross-sectional Multiple Regression Results of Log Returns: Case of Individual Securities**

  Table IV shows that in 75% of the cases, the alpha values are significantly different from

zero. Therefore, we accept the null hypothesis that alpha is not equal to zero. The test for ln(BE/ME) and slope coefficients shows that in majority of the years, slope coefficients are equal to zero. Further, the F-test also indicates that the regression is not a good fit in the majority of the years. This reveals that the variables both individually as well as in combination donot capture the variation in security returns.

- **Cross-sectional Univariate Regression Results of Percentage Returns with Equally Weighted Portfolios**

  Table V shows that in 75% of the cases, the alpha values are significantly different from zero. The p-values of ap and ln(BE/ME) slope coefficients are more than the level of significance and the F-test indicate that the regression is not a good fit in majority of the cases. Therefore, we accept the null hypothesis that none of the independent variables significantly explain the variation in portfolio returns.

- **Cross-sectional Multiple Regression Results of Percentage Returns with Equally Weighted Portfolios**

  Table VI shows that 62% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and ap slope coefficients shows that in majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the 100% of the cases. This reveals that the variables, both individually and in combination both capture the variation in portfolio returns.

- **Cross-sectional Univariate Regression Results of Percentage Returns with Market Value Weighted Portfolios**

  Table VII shows that 75% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The p-values of ap and ln(BE/ME) slope coefficients are more than the level of significance and the F-test indicates that the regression is not good fit in majority of the cases. Therefore, we accept the null hypothesis that none of the independent variables significantly explain the variation in portfolio returns.

- **Cross-sectional Multiple Regression Results of Percentage Returns with Market Value Weighted Portfolios**

  Table VIII shows that 62% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and slope coefficients shows that in majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the majority of the cases. This reveals that the variables, both individually and in combination both capture the variation in portfolio returns.

- **Cross-sectional Univariate Regression Results of Log Returns with Equally Weighted Portfolios**

  Table IX shows that 56% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and slope coefficients shows that in majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the majority of the cases. Therefore, we accept the null hypothesis that none of the independent variables significantly explain the variation in portfolio returns.

- **Cross-sectional Multiple Regression Results of Log Returns with Equally Weighted Portfolios**

  Table X shows that 62% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and ap slope coefficients shows that in

majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the majority of the cases. This reveals that the variables, both individually and in combination both capture the variation in portfolio returns.

- **Cross-sectional Univariate Regression Results of Log Returns with Market Value Weighted Portfolios**

  Table XI shows that 62% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and ap slope coefficients shows that in majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the majority of the cases. Therefore, we accept the null hypothesis that none of the independent variables significantly explain the variation in portfolio returns.

- **Cross-sectional Multiple Regression Results of Log Returns with Market Value Weighted Portfolios**

  Table XII shows that 62% of the cases, the alpha value is not significantly different from zero. Therefore, we accept the null hypothesis that alpha is equal to zero. The test for ln(BE/ME) and ap slope coefficients shows that in majority of the years, the slope coefficients is equal to zero and the F-test also indicates that the regression is not a good fit in the majority of the cases. This reveals that the variables, both individually and in combination both capture the variation in portfolio returns.

Summary And Conclusions

Investments are made in stock markets in expectations of returns in excess of the risk free rate. This paper has attempted to test the validity of the market beta and ln(BE/ME) ratio (univariate regression) and combination of beta and ln(BE/ME) ratio in explaining the security/portfolio returns in the India capital markets. The overall conclusion of this study are summarised as follows:

- The result of the present study shows that intercept (alpha) is equal to risk free rate of returns. But beta does not explain the variation in security/portfolio returns. Therefore we can conclude that while intercept test of CAPM proves the theory, the beta test goes against the standard form of CAPM theory. Our study relating to beta confirms with studies undertaken by Reiganum (1981), Bark (1991), Harris et al (2003), Gupta and Sehgal (1993), Madhusoodanan (1997), Sehgal (1997), Ansari (2000), Manjunatha et al (2006, 2007).

- Fama and French (1992) conjecture that ln(BE/ME) ratio turn out to be the most significant variable in the US markets in explaining the cross section of the security returns. We have tested whether ln(BE/ME) ratio is significant to explain the security/portfolio returns. In our study, in univariate regression, ln(BE/ME) ratio does not explain the variation in security log returns, the portfolio returns under the percentage and log returns series when portfolios are formed with equal weights as well as market value weights. However, ln(BE/ME) explains the variations in security returns when returns are computed using percentage changes. In multiple regression, the combination of beta and ln(BE/ME) ratio explains the variation in security returns when percentage returns are considered. While the results of the present day confirms with studies undertaken by Mohanty (2002), the results are inconsistent with studies undertaken by Fama and French (1992).

The conclusions are that the intercept (alpha is equal to risk free rate of returns, but neither beta nor ln(BE/ME) ratio significantly explain the variation in individual security and portfolio returns. It is also observed that in multiple regression the combination of beta and ln(BE/ME) ratio donot explains the variation in security/portfolio returns in majority of the cases in Indian capital market. Further works like parsimonious model as suggested by Fama and French (1992,1993, 1995,1996), Sehgal (2003), Connon and Sehgal (2003) are needed in the Indian

context by taking in combination of market factors, firms specific factors and macroeconomic factors. The empirical findings of this paper would be useful to investors and financial analysts as the results prove that beta and BE/ME ratios are not enough in explaining the asset pricing in Indian capital markets.

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Table I: Cross-sectional Univariate Regression of Results of Security Percentage Results

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
1	19		100			100	38			38
2								62	62	

Table II: Cross-sectional Multiple Regression Results of Security Percentage Returns

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	25		38					38
2		75		62	100		62	

Table III : Cross-sectional Univariate Regression Results of Security Log Returns

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
	A	R	A	R	F	NF	A	R	F	NF
1	44		100			100	62			62
2		56						38	38	

Table IV: Cross-sectional multiple Regression Results of Security Log Returns

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	75		62					62
2		25		38	100		38	

Table V:. Cross-sectional Univariate Regression Results of Percentage Returns with Equity Weightage Portfolios

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
	A	R	A	R	F	NF	A	R	F	NF
1	75		100			100	88			88
2		25						12	12	

Table VI: Cross-sectional Multiple Regression Results of Percentage Returns with Equity Weightage Portfolios

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	62		88					100
2		38		12	100			

Table VII: Cross sectional Multiple Regression Results of Percentage Returns with Market Value Weighted Portfolios

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
1	75		75			75	100			100
2		25		25	25					

Table VIII: Cross sectional Multiple Regression Results of Percentage Returns with Market Value Weighted Portfolios

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	62		100		38			62
2		38				62	38	

Table IX: Cross sectional Univariate Regression Results of Log Returns with Equal Value Weighted Portfolios

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
1	56		100			100	62			62
2		44						38	38	

Table X: Cross Sectional Multiple Regression Results of Log Returns with Equal Value Weighted Portfolios

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	62		88					88
2		38		12	100		12	

Table XI: Cross-sectional Univariate Regression Results of Log Returns with Market Value Weighted Portfolios

	Alpha		Beta		SigF		Ln(BE/ME)		SigF	
1	69		62			62	88			88
2		31		38	38			12	12	

Table XII: Cross-sectional Multiple Regression Results of Log Returns with Market Value Weighted Portfolios

	Alpha		Ln(BE/ME)		Beta		Sig F	
1	62		88		62			88
2		38		12		38	12	