

# **Validity of the Capital Assets Pricing Model: Evidence from the Indian companies – the NSE India.**

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**Abstract:** Capital Asset Pricing model (CAPM ) is widely researched, tested , and paradoxically both generally accepted and rejected model of asset pricing. From its beginning (1964) it has occupied the pride of place among the financial economist's research, and still part of the text books on finance in the leading business schools all over the world. The study covered monthly data of Indian companies' from the 'National Stock Exchange' (NSE) for the period 2005 to 2009. In our first model, betas are estimated where the risk free rate is the intercept term. The results show that for the State Bank Of India( SBIN) , HDFC bank , and Tata Motors , the betas are more than one and significant , and for the Reliance ,it is near one , and for Infosystch , it is less than one and statistically significant . The second model of ' Jen's alphas' results show that for only SBIN , and Reliance group, 'Jensen's alpha ' is positive , and for other three companies, it is negative. For positive values of ' Jensen's alpha, the conclusion is that those companies earned return more than the companies of similar betas , and for negative values , those companies earned less than the companies of similar betas. Over the sample period, for SBIN, HDFC, and Reliance companies, the actual return is are greater than the required returns, and for Tata Motors,, and Infosystch , the actual return is less than the required returns .There is an equity risk premium for many of the Indian securities during the sample period .On the whole, the CAPM model could satisfactorily explain the risk-return relationship in the Indian Stock market.

Key words: Capital Asset Pricing Model (CAPM ), Required Return , Betas, Risk modeling, Indian Companies, Stock markets , Risk and Returns .

JEL Classifications: G11, G12.G32

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## 1 Introduction

Capital Asset Pricing model (CAPM) is widely researched, tested, and paradoxically both generally accepted and rejected model of asset pricing. From its beginning (1964) it has occupied the pride of place among the financial economist's research, and still part of the text books on finance in the leading business schools all over the world. The study covered Indian companies' monthly data from the 'National Stock Exchange' (NSE) for the period 2005 to 2009. We have estimated the betas from the CAPM model where the return of each company is the dependent variable, and the price of the risk – the difference between the market return and the risk free rate is the independent variable and the intercept value is deemed as the risk free rate, for the monthly return of all those Indian companies. We then estimated the Jensen's alpha - first estimate an alpha with the return of the company is the dependent variable and the return of the market as the independent variable, and then multiply the risk free rate with unity minus the beta, and subtract the latter from the former - and find out if the Jensen's alpha is positive or not. If positive that company earns a return higher than the returns of the companies of similar betas. Lastly we have calculated the average actual return of each company and compared with the expected and required returns calculated from the CAPM model for each company. In the 2 section the CAPM theory and major criticisms of that theory are explained and the literature survey is given. In section 3 the models, results and the interpretations are given. The conclusions are given in section 4. The references are given section 5.

## 2 Literature survey

### 2.1 CAPM theory including the major criticisms

William Sharpe (1964) has taken forward Markowitz's (1959) variance-covariance analysis of the optimum portfolio choice through diversification, and Tobin's (1958) analysis of the optimum efficiency frontier as a straight line of the combination of risk free rate and risky assets by establishing the required return of a portfolio and even a firm or company as how much it is related to the market risk as whole, which cannot be further diversified and the price- beta -, and the price of risk in general –the difference between the market return and the risk free rate. The CAPM comes out of two things : Markowitz (1959) who showed how to create an efficient frontier, and James Tobin (1958) said if you hold risky securities and are able to borrow –buying stocks on the margin- or lend-buying risk free assets –and you do so at the same rate, then the efficient frontier is a single portfolio of risky securities plus borrowing and lending, and that dominates any other combination. Tobin's (1958) Separation Theorem says that you can separate the problem into first finding that optimal combination of risky securities

and then deciding whether to lend or borrow, depending on your attitude towards risk. It then showed that if there is only one portfolio plus borrowing and lending, it's got to be the market. If the markets were perfectly efficient, you'd buy the market and then use borrowing and lending to the extent you can. The beta of the security is the covariance of the security and market divided by the variance of the market; if the security co vary as much as the market, beta is equal to one, and if it varies less than the market, beta is less than one, and if it varies more than the market the beta is greater than one. One should be careful to note that if beta is greater than one it does not necessarily mean that the required or actual return will be always higher than that of a security whose beta is less than one. In William Sharpe's (1964) words "A greater than one beta means that in good times high returns are required to compensate for the expected low returns during the bad times! "The main criticism of the CAPM model has come from Fama and French (2004), where apart from the market or systematic risk, other important factors are (a) size factor – the difference between 100 percent long position in small size companies' stocks and 100 percent short position in large size companies' stocks, (b) the value factor – a long position in value stocks (stocks with a high ratio of book equity to market value) and a short position in "growth stocks" (stocks with a low ratio of book equity to market value). Pastor and Stambaugh (2003) have added liquidity of the companies as another factor to explain the required returns. Another related line of criticism has come from Ross (1977) in their contribution of the 'Arbitrage Pricing theory' (APT) which states that asset returns are linearly related to a set of indexes where each represent a factor that influences the return on an asset. What really matters are the deviations of the factors from their expected values. Some of the factors found relevant in this context are: (1) changes in expected inflation (2) unanticipated changes in inflation (3) unanticipated changes industrial production (4) unanticipated changes industrial production (5) unanticipated changes in default risk premium (5) unanticipated changes in the term structure of interest rates. The problem with the APT is that the factors are not well specified. Also APT makes no mention about the size or even signs of the factors. They have to be identified empirically. But CAPM as Sharp (1994) says if the expected return from a factor cannot be anything; if factor three does badly in bad times, the expected return from that factor ought to be very high. If that event is a random event that does not correlate whether or not times are bad, then the expected return should be zero. Sharp (1994) claims that CAPM has put some discipline and consistency into the process of assigning those expected values.

## **1.2 CAPM empirical studies in different countries**

Several tests have been carried out to ascertain the validity of the CAPM.

Pettengill et al (1995) reinvestigated the relationship between beta and returns conditional on the realised risk premium in different periods, whether it is positive (up) or negative (down). They propose

that when the realised risk premium is positive, there should be a positive relationship between the beta and return, and when the premium is negative, the beta and return should be negatively related. Their results document a positive relationship between beta and return in the US market for the period 1926 to 1990. They argue that high beta portfolios receive positive risk premium in up markets and high beta portfolios incur lower returns during down markets.

Cooper (2007) however proved that there is a large bias in that test. He stated that the test statistics that Pettengill et al suggested were almost guaranteed to satisfy the conditions they proposed, whatever the model that generates expected returns. That even if the CAPM was not true and there was a negative relationship between expected returns and beta, the test would detect statistically significant result in line with their hypothesis.

The reason for the bias is that high beta shares tend to go up when the market goes up, whatever the true asset pricing model. The higher the beta, the stronger the ex-post effect. Thus if they selected periods when, ex-post, the market has gone up, high beta stocks will have done better in these periods than low beta stocks. The coefficients of the relationship between beta and returns in these periods, is almost guaranteed to be positive, simply because of the definition of beta. This is the main test than Pettingill et al proposed. Cooper however claims that this tell little about the unconditional expected returns on assets, which is what the CAPM explains.

Ali Argun Karacabey(2001), tested the CAPM applied to Istanbul Stock Exchange (ISE) data over the period 1990-2000. The author run a monthly cross section regression on stocks excess return on a constant and expected beta conditional on the market excess return for the period January 1990 to December 2000. Taking the conditional nature of the relation between beta and return into account, the results of the test showed that there is a conditional relationship between beta and returns. Stock with higher betas has higher returns when the market risk premium is positive and lower returns when the market risk premium is negative. Thus the result of the conditional test support the prediction of CAPM

that beta is related to realised returns. They concluded that beta is still relevant and can be useful for portfolio managers and investors who want to invest in emerging markets.

Grigoris Michailidis et al (2006) carried out a study on testing the CAPM on emerging Greek Securities Market. They used weekly stock returns from 100 companies listed on the Athens Stock Exchange for the period January 1999 to December 2002. Their findings were not supportive of the CAPM's basic statement the higher risk (beta) is associated with higher returns.

Their tests also refuted the CAPM's prediction for the intercept to be equal to zero and the slope equal to the excess returns on the market portfolio. Their test however supported the CAPM's prediction of the expected return-beta relationship of linearity.

Al Refai (2009) carried out an empirical test of the relationship between risk and return in Jordan Capital Markets, the paper examined the relationship between beta and returns on the industrial portfolios of the financial market of Jordan using monthly data for the period of December 1999 to September 2008. The positive risk return relationship was rejected in this emerging market. The test was also conducted on the Pettengill et al model (1995) conditioning on segmenting the up (positive) and down (negative) market risk premium asset significant relationship between beta and returns. The study concluded that during up markets, there was a conclusive statistical evidence for a positive relationship between beta and the realised returns for the entire industrial portfolio, and in down markets, the negative relationship was also evident for a number of the industrial portfolios. They concluded that CAPM might not work in this emerging market.

Gürsoy and Rejepova (2007) tested the validity of the CAPM in Turkey by regressing the weekly risk premium against the beta coefficients of 20 portfolios, each including 10 stocks over the period of 1995 -2004. Their test results supported the hypothesis that the beta (systematic risk) is an important factor for determining the returns of a portfolio in Turkey.

They stated that estimation of beta, from past prices can be justifiably used by portfolio managers. The test result also made the suggestion that high beta-stocks perform higher in up-market conditions, whereas a low-beta stock is better investment in down-markets.

The CAPM test was also conducted by Uzair and Muhammad (2010) in Pakistan Institutional Framework. They examined the application of the CAPM on the Karachi Stock Exchange (KSE) to form an opinion about the validity and reliability of the model when applied to the institutional framework. They analysed 60 companies selected from KSE-100 index. Covering 6 years (2003-2008). They calculated the beta through variance/covariance approach in order to predict the required return from the underlying security. They used historical returns in calculating the results. The findings suggested that the CAPM gives accurate results for a limited period and for few companies only. Out of 360 observations, only 28 results supported CAPM, and measured relatively the correct systematic risk of the securities, while 332 were against it, hence the model were rejected in the institutional framework.

Andor et al (1999) tested the CAPM in the Hungarian Capital Markets, based on monthly data of 17 Hungarian companies listed on the Budapest Stock Exchange (BSE). They analysed data collected in the period 31<sup>st</sup> July 1991 to 1<sup>st</sup> June 1999. They run a regression and first found the ex-post relationship between the company's beta and their average returns. They concluded that the CAPM acceptably described the Hungarian Capital Market.

Gunnlaugsson(2004) Tested the validity of the CAPM on the Icelandic Stock Market, from January 1999 to May 2004. They indicated that the CAPM worked well in the small Icelandic Stock Market and that the beta coefficients, does explain returns better than on larger foreign stock markets. There was a strong relationship between the beta coefficient and stock returns in the research. Further the stock returns with high betas were higher than one would expect according to the CAPM. They concluded that the CAPM was valid in the Icelandic Stock market.

The study conducted on the validity of CAPM by Huang, (2000) covers period of eight years (1986-93) with sample size of 93 firms. It was applied on the two different sets a high risk and the other was low risk set. He found that the high risk sets are conflicting with CAPM whereas data from the low-risk set is consistent with CAPM. He concluded that the results of CAPM are not valid; the return calculated by the model does not interpret the actual position and could not be relied upon. There are some findings which support the argument that returns were not just based on the single risk factor. The study of Scheicher, (2000) covers period of twenty three years on a sample of twelve companies with 276 observations. The result of the study documents that the result of the GARCH or other multi risk factor models simply outperforms the CAPM results. The research conducted by Gomez and zapatro, (2003) covering period (1973-98) with sample size of 220 US securities from S&P 500 index. They use two risk factors one was standardized market systematic risk factor; and other was active management risk. The interpretation of these results is evidence of the two Beta model. The same study conducted in UK stock market with sample of 64 securities gave the results in favor of this model because of the similarities in the market structure of UK and US.

Fraser and Hamelink, (2004) documented that in early researches the findings conclude that the results of CAPM are accurate and correct but as the time passes the more accurate tools like APT outperforms the CAPM. Their study covered twenty two years period (1975-96) and the sample size was 7 sectors. The research conducted on the London stock exchange and results of CAPM were compared with the conditional GARCH model. The risk and return calculated by the GARCH model are correct that are negative in nature but when calculated through CAPM the finding did not match the actual situation which is correctly measured by the GARCH model. The same study conducted in the Australian stock market covering six years period (1988-93) with sample size of 8 sectors, gave the same results. They concluded that the results of GARCH model and Arbitrage Pricing Theory (APT) model are same but the findings of the CAPM are different, hence, decisions taken on the basis of CAPM might be misleading (Groenewold and Fraser, 1997).

The asymmetric approach focuses on the single equation specification bias or single Beta bias which was corrected and explained in the research of the Quo and Perron, (2005). They conducted research covering period of twenty seven years (1978-2004) with the sample size of 50 securities on US stock market and concluded that the CAPM only identify single equation factor which leads to the wrong estimation of the results. The literature also contains some of the researches that show CAPM does not take into account fully two important features found in most time series, namely, nonlinearity and structural instability (asymmetry). The research conducted by hung and Wu, (2005) covering 81 years (1924-2004) sample consist of 926

companies, takes into account the two above mentioned features. They concluded that the CAPM is the model that leads to inappropriate Betas, if not incorrect.

Another study conducted by Grigoris and Stavros, (2006) on Greek stock market covering five years period (1998-2000) with sample size of 100 securities listed on Athens Stock Exchange. The main finding of this study does not support basic statement like high risk and high level of return. They documented that CAPM provides better results for some years but overall it did not support the model. Hui and Christopher, (2008) conducted a study, covering eleven years (1996-2006) with sample size of 95 companies in United States and Japan institutional frame work, shows that CAPM fails to explain the exact return when applied to Japan and US stock markets. It significantly gives negative return which occurs as a result of the volatility. Volatility does influence stock returns. However, the volatility of the Japan and US stock prices predicts the time series of stock returns and is priced in the cross-section of stock returns. The returns calculated using the rates eventually give returns which do not show the accurate results on a particular time series.

In Pakistan a study conducted by Eatzaz and Attiya, (2008) on Karachi stock market with the sample size of 49 stocks covering period of twelve years (1993-2004). They applied CAPM and matched their results with the conditional multi risk factors model taking macroeconomic factors as an evidence of the risk. They concluded that the traditional CAPM performs well in explaining the risk and return relationship but the results are only convincing for few stocks and only for few years. They supported conditional multifactor model over the traditional single factor model for decision making. Another study in local institutional setting was conducted by Hanif, (2010) covering four years period (2004-2007) sample covering the tobacco sector only documented that CAP Model is not applicable in pricing the assets in local institutional frame work as required returns calculated through Beta are not accurate.

Donghui and Xi (2007) Tested the CAPM on the Chinese Stock Market. They tested to see if it holds true in the Shanghai Stock Exchange (SSE). They used weekly stock returns from 100 companies listed on the SSE during 01/01 2000 to 31/12/2005. They tested the CAPM using Black, Jensen and Scholes (1972) (time series test) and Fama and Macbeth (1973) (Cross-Sectional test) methods were used to test the CAPM.

They found that the expected returns and betas are linear related with each other during the entire period 01/01 2000 to 31/12/2005, which implied a strong support of the CAPM hypothesis.

On the other hand, as the CAPM hypothesizes for the intercept to be equal to zero and the slope equal to the average risk premium, the test conducted by Donghui and Xi refuted the above hypothesis and offered evidence against the CAPM. According to the findings of the



empirical test, they concluded that the Capital Asset Pricing Model does not give a valid description of the Chinese Stock Market during 01/01/2000 to 31/12/2005.

Philip Gharghori et al (2012) have analyzed four proxies for value-growth: book-to-market, sales-to-price, earnings-to-price and cash-flow-price to explain the equity returns in Australia. Their findings show that in aggregate, book-to-market best explains the cross-sectional variation in Australian equity returns. They have further segregated the value-growth firms into positive and negative earning firms. After segregating firms it was found that in the negative earning sample, book-to-market is the best value-growth proxy whereas in the positive earning sample, cash-flow-to price has the highest level of significance and is thus the superior value-growth proxy.

Campbell and Vuolteenaho (2004) propose a two-beta Intertemporal Capital Asset Pricing Model (ICAPM) and argue that size and value anomalies can be satisfactorily explained within their theoretical framework and that the TBI model outperforms in cross-sectional explanation, that is, for the 1963-2001 period, the explanatory power is 50 per cent compared to 3.10 per cent for the traditional CAPM. Campbell and Vuolteenaho break down the original CAPM beta of a stock market portfolio into two components: the cash-flow beta that reflects the risk of future cash flows and the discount rate beta that reflects the risk of the market future discount rate. They point that cash-flow beta is related to long-run risk with a higher market price and the discount rate beta is related to short run risk with a lower market price. For decomposition, Campbell and Vuolteenaho use a vector autoregressive (VAR) method that was introduced by Campbell (1991).

### 3.1 Models and Variables

$$\text{Model 1} \quad R_{it} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + U_t$$

$R_{it}$  is the return of the security  $j$ . The return is calculated by percent change in security  $j$  price

$R_{ft}$  is the risk free interest rate.  $R_{mt}$  is the return of the market index.  $U_t$  is the error term in the regression.  $\alpha$  and  $\beta$  are the parameters in the regression.

Monthly adjusted closing price of stocks which was available publicly is used and the returns on the stock prices are calculated by finding the percentage change in adjusted closing price from one month to the next. The annualised returns are found by multiplying the results by 12. For example the information on State Bank of India shows that from 01/11/2005 to 01/12/2009 the adjusted closing prices were 2270.05 and 2235.1 respectively. The annualised returns is found as

$$=12 * (Pt - Pt-1) / (Pt-1)$$

$$=12 * (2270.05 - 2235.1) / 2235.1$$

$$=0.18764261$$

This method is used in calculating the Returns for both the stock prices for all five securities and the Market Returns from the S&P CNX Nifty.

The Risk Free Rate is obtained in time series data from 01/01/2005 to 31/2/2009. Treasury bill rates from the Reserve Bank of India are used to represent the risk free rate. The monthly-end yields to maturity of SGL Transactions, in Central Government dated securities are used. The data collected are adjusted to correspond to the data of returns on the stock prices and the Nifty. For instance the rate for 01/12/2009 which is 4.8555% is rewritten as 0.04855 to correspond to the stock returns of 0.18764261 and Nifty returns of 0.401414748 for the same day.

The market proxy is the S&P CNX Nifty which is the leading index for large companies listed on the National Stock Exchange of India. This is used to represent the market data. Time series data from 01/01/2005 to 31/12/2009 are collected and the returns estimated using simple arithmetic to find the percentage change in price from one period to another.

## Model 2 *The Jensen's Alpha*

Another measure of the performance of the stock is to look at the intercept, which provides a simple measure of performance of the stock during the period of regression, when returns are measured against the expected returns from the CAPM.

The evidence of this measure is done by considering the rearrangement of the CAPM

$$R_1 = R_f + \beta (R_m - R_f)$$

$$= R_f + \beta R_m - \beta R_m$$

$$= R_f (1 - \beta) + \beta R_m$$

When we compare this formulation to that of the returns ( $R_1$ ) of the stock to the return equation in the regression, which is

$$R_1 = \alpha + \beta R_m$$

The intercept  $\alpha$  equals  $R_F(1 - \beta)$

A comparison of the intercept  $\alpha$  to the  $R_F(1 - \beta)$  provides a measure of the stock's performance as per the CAPM.

Thus if  $\alpha > R_F(1 - \beta)$  the stock did better than expected during the regression period

if  $\alpha = R_F(1 - \beta)$  the stock did as well as expected during the regression period

if  $\alpha < R_F(1 - \beta)$ , the stock did worse than expected during the regression period

The difference between  $\alpha$  and  $R_F(1 - \beta)$  is called the Jensen's alpha. This provides a measure of whether the stock in question earned a higher return than or less than its required return, given both the market performance and risk.

A simple linear regression is run to determine the intercept to be used in finding the Jensen's alpha. In this regression, the dependent variable  $y$  is the return on the stock and the independent variable is the market return. The Jensen's alpha will be determined to measure whether the stock in question earned a higher return or lesser return than its required return, given both the market performance and risk, and also to find out if the stock earned returns higher than companies of similar beta.

### Model 3 Comparison of Actual Return and Expected Returns

The expected return for the companies are the averages of the  $\beta$  s multiplied by the excess return of the market over the risk free rates, where the  $\beta$  s are only the different for different companies ( same for one company).The actual returns are the per cent age changes in stock prices of each companies, which is a standard way of finding returns . As mentioned already the  $\beta$ s mostly determine the expected returns. Finally, the required rate of return is where the average risk free rate is added to the expected excess return.

### **3.2 The Sample Selection and Data Collection**

The five companies are selected from the 10 most active securities listed on the National Stock Exchange of India. These companies were selected to cover some of the most important sectors of the economy. These include Information Technology (Infosystch), Oil and Gas (Reliance Group of Companies), automobile (Tata Motors), and Finance (State Bank of India and HFDC Bank). Monthly data for the period 2005 to 2009 is collected and analyzed. The period was chosen because it is characterized by high and low values for both the returns on the stock and the market index(S&P CNX) Nifty.

Data would be collected from secondary sources. This would be mainly through the internet from website of the National Stock Exchange of India and the Reserve Bank of India. Other sources would be from books, journals, articles and magazines from renowned authors.

### **3.3 Profile of Indian Companies Used In the Study**

The Profiles of the five companies used in the study are listed below. The Companies are selected from the active securities listed on the Indian Stock Exchange

#### ***3.3.1 The State Bank of India***

The State Bank of India traces its ancestry to British India, through the Imperial Bank of India to the founding in 1806 of the Bank of Calcutta making it the oldest commercial bank in the Indian Subcontinent. The government of India nationalized the, Imperial Bank of India in 1955, with the, Reserve Bank of India taking a 60% stake ad renamed it the State Bank of India. In 2008, the Government took over the Stake held by the Reserve Bank of India. The State Bank

of India has range of banking products overseas. The State Bank Group with over 16,000 branches has the largest branch network in India. The Bank has an asset base of \$250billion and \$195billion in deposits. It has a market share among Indian Commercial banks of about 20% in deposits and advances. SBI accounts for almost one-fifth of the nation's loans.<sup>1</sup>

As of May 2008, the bank had 21 subsidiaries and 10,186 branches. SBI was adjudged the best bank in India for 2008 by 'The Banker' Magazine of the Financial Times Ltd. SBI is the only Indian bank the Features in Fortune's top 100 banks. It is also the second largest bank in the world, measured by the number of branches and employee strength. Macroeconomic risk is the biggest risk of SBI, given its size and penetration and exposure in India. Government regulations and country's macroeconomic policies affect SBI's expansion and liquidity the most. Key ratios such as Cash/Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate and Reserve Repo rate are all controlled by the government and affect the bank's liquidity.<sup>2</sup>

### **3.3.2 Tata Motors Ltd**

Tata Motors Ltd was established in 1945, and is India's largest automobile company. Tata Motors has consolidated revenues of Rs. 70, 938, 55 crores (USD 14 billion) in 2008-2009. It is the leader in Commercial vehicles in and among the top three in passenger vehicles with winning products in the compact size car and utility vehicle segment. The Company is the world's fourth largest truck manufacturer and the world's second largest bus manufacturer. Tata Motors is the first company from India's engineering sector to be listed on the New York Stock Exchange (September 2004) and has emerged as an international automobile company. Tata Motors is expanding its international footprints established through exports since 1961. The Company's commercial and passenger vehicles are already being marketed in several

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<sup>1</sup> [http://en.wikipedia.org/wiki/state\\_Bank\\_of\\_India](http://en.wikipedia.org/wiki/state_Bank_of_India).

<sup>2</sup> [http://www.wikinvest.com/stock/State\\_Bank\\_of\\_India](http://www.wikinvest.com/stock/State_Bank_of_India)

countries in Europe, Africa the Middle East, South East Asia, South Asia and South America. The Company also has franchisee/joint venture assembly operations in Kenya, Bangladesh, Ukraine, Russia, Senegal and South Africa.<sup>3</sup>

### **3.3.3 HFDC Bank Ltd**

The Housing Development Finance Corporation Ltd (HDFC) was among the first to receive an approval from the Reserve Bank of India (RBI) to set up a bank in the private sector as part of the RBI's liberalization of the Indian Banking Industry in 1994. The bank was incorporated in August 1994 in the name of 'HDFC Bank Ltd'. HDFC Bank commenced operations as a scheduled Commercial Bank in January 1995. HDFC is India's premier housing finance company and enjoys an impeccable track record in India as well as in international markets. Since its inception in 1997, the corporation remains the market leader in mortgages. HDFC has experience in the financial markets and has a large shareholder base. Thus, HDFC was ideally positioned to promote a bank in the Indian environment.

As at 31<sup>st</sup> December 2009, the authorized share capital of the bank was Rs. 550crore. The HDFC group holds 23, 87% of the banks equity and about 16, 94% of the equity is held by the ADS Depository (in respect of the bank's American Depository Shares (ADS) issue. 27, 46% of the equity is held by Foreign Institutional investors. The bank has about 458,683 shareholders. The shares are listed on the National Stock Exchange of India and the Bombay Stock Exchange. The Bank's American Depository Shares (ADS) are listed on the New York Stock Exchange (NYSE) under the symbol 'HDB' and the Bank's Depository Receipts (GDR's) are listed on the Luxembourg Stock Exchange.<sup>4</sup>

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<sup>3</sup> [http:// www.tatamotors.com/our\\_world/profile.php](http://www.tatamotors.com/our_world/profile.php)

<sup>4</sup> [http:// www.hdfc.com](http://www.hdfc.com)

### **3.3.4 Reliance Ltd.**

The Reliance group was founded by Dhirubhai .H. Ambani (1933-2002) and is India's largest private sector enterprise with businesses in the energy and materials value chain. The flagship company Reliance industries Ltd is a Fortune 500 company and is the largest private sector company in India.<sup>5</sup>The Reliance group started with textiles in the late seventies and integrated vertically into the polyester, fibre, intermediates, plastics, petrochemicals, petroleum refining and oil and gas exploration and production- to be fully integrated along the materials and energy value chain.

Reliance enjoys global leadership in its businesses being listed the largest polyester yarn and fibre producer in the world and among the top five to ten producers in the world in major petrochemical products. The major group companies are Reliance industries Ltd. (including main subsidiary Reliance Retail Ltd) and Reliance Industries Infrastructure Limited.<sup>6</sup> The Reliance Industries Ltd (NSE: RELIANCE) is India's largest private sector conglomerate (by market value) with an annual turnover of US\$35,9billion and profit of US\$4,85billion for the fiscal year ending in March 2008.The founder Ambani has been a pioneer in introducing financial instruments like fully convertible debentures to the Indian stock markets. He was also one of the entrepreneurs to draw retail investors to the stock market.<sup>7</sup>

### **3.4.5 Infosys Technologies Ltd**

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<sup>5</sup> Fortune is a global business magazine published by Time Inc's Fortune Money Group. The magazine is especially known for its annual features ranking companies by revenue.

<sup>6</sup> <http://www.ril.com-date> accessed 15/02/2010

<sup>7</sup> [http://www.wikipedia.org/wiki/Reliance\\_Industries](http://www.wikipedia.org/wiki/Reliance_Industries).date accessed 10/03/2010

Infosys is India's second largest software company and is recognized globally for its world-class management practices and work ethics. It offers services like software development, maintenance, and consulting, testing and packaging implementation. Infosys offers all these services through its highly integrated and globally recognized delivery model. The company's revenues and profits have grown at compounded rates of 35% each during the period FY03 to FY09. Infosys Technologies Ltd is engaged in Information Technology business. The Company is listed on the National Stock Exchange of India as INFOSYSTCH

The Company was incorporated in 1981. Infosys Technology Ltd is a global technology service firm that defines, designs and delivers Information Technology (IT) enabled business solutions to its clients. The Company provides end-to-end business solutions that leverage technology for its clients, including consulting design, and development.



### 3.5 Results Tables

CAPM Results for India -**Table 1** for the model:  $R_{it} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + U_t$

	$\alpha$	$\beta$	R <sup>2</sup>
State Bank Of India	0.137 (0.1389) (0.9873)	1.169 (0.1303) (8.97*)	0.59
Tata Motors	0.044 (0.1588) (0.277)	1.3577 (0.1492) (9.0956*)	0.6
RELIANCE GROUP	0.0612 (0.0019) (32.1453*)	0.9979 (0.00123) (80.6964*)	0.99
HDFC Bank Ltd.	0.05591 (0.12496) (0.4475)	1.18222 (0.1174) (10.07*)	0.64
INFOSYSTCH Ltd.	0.0262 (0.15968) (0.1641)	0.48933 (0.15003) 3.2615*	0.16

**CAPM Table 2** Jensen's  $\alpha$

	$\alpha$	Jensen's $\alpha$
State Bank Of India	0.1265	0.3244
Tata Motors	-0.0664	-0.044648
Reliance Group	0.041	0.03729
HDFC Bank Ltd.	0.0445	0.055595
Infosystch Ltd	0.00466	-0.0263828

**CAPM Table 3:** Actual Return, Expected Return, and Required Returns

Company	Beta	Actual Return	Expected Return	Required Return
SBIN	1.1695	40%	20.59%	26.57%
HDFC	1.18239	32%	20.47%	26.45%
TATA MOTORS	1.1591	25.50%	20.05%	26.03%
INFOSYST Ltd.	0.490164	12%	8.48%	14.46%
RELIANCE	0.9379	26.20%	8.47%	14.45%

### 3.5.1 Discussion of the results

As given in Table no.1, the  $\alpha$  value is statistically insignificant and the null hypothesis that it is not significantly different from zero is accepted for all shares except Reliance Group shares. This supports the CAPM theory's prediction that when the excess expected return of a security above the risk free rate is taken as the dependent variable, the  $\alpha$  value will be statistically not different from zero. This implies the non-systematic risks can be diversified easily away. The  $\beta$  coefficient for the State Bank Of India is 1.169 and is highly statically significant

at 5 % level..If the beta is more than one , it means , according to Shape, William( 1998) , during ‘ good times the securities need to be compensated more for the same security will be doing badly during the bad times’ or its expected return is higher than that of the markets in general. They are risky, and the SBIN securities are risky and have higher expected returns. In Table 2 the Jensen’s  $\alpha$  is positive for SBIN stocks, and it means that SBI stocks have been getting returns more than the returns of the similar betas securities. It also means that SBIN earned actual return higher than the required return. The Table 3 results also clearly show that the actual return for SBIN shares has been much higher than the expected return and the required return.

For Tata Motors, as given in Table 1, the beta value is 1.357 and the expected return has been higher than that of the market and hence an aggressive and risky stock. But its Jensen’s  $\alpha$  is negative. Hence Tata Motors did not earn the actual return as much as its required return, and also it did not earn the returns similar to that of the same beta shares. Interestingly, the aforesaid finding and interpretation is consistent with the results in Table 3 , where we can also observe that the Tata Motors’ actual return is less than that of the required return . This share return has not fared well for investors.

For Reliance Group, as given in Table 1 the  $\alpha$  value is statistically significant. When the excess return of the share is taken as the dependent variable the  $\alpha$  value in the regression should not be significant according the CAPM theory. Therefore the foregoing result contradicts the CAPM theory. The non-systematic risk also determines the return for Reliance group shares. Beta of reliance group is 0.9978, and this implies the expected returns are almost approximately same as that of the market return. When the market is doing good, this security will give good actual returns and when the market is doing badly this security will give bad returns. As given Table 2 the Jensen’s  $\alpha$  is positive for Reliance group securities and this implies the actual return of the Reliance group securities is greater than the required return and this security gives return higher than securities of the similar betas. Interestingly, the foregoing results are further corroborated by the results given in Table 3 where the actual return of Reliance shares is greater than the required return.

For HDFC Bank Ltd. Shares, when the excess return of the share is taken as the dependent variable, the  $\alpha$  is not significantly different from zero and this corroborates the CAPM

theory as non- systematic risks are diversified away and do not deserve the expected return. The beta value is 1.1822 and this shows that the expected return is slightly higher than that of the market and more or less similar to the State Bank of India shares, where the higher risk factor is a pattern for the banking equities in India, which generally do better in good times and do badly in bad times. In Table 2 the Jensen's  $\alpha$  is positive and this shows that the actual return is higher than the required return, and the HDFC Bank shares deliver higher returns than the returns of the similar beta equities. The aforesaid results and the interpretation about Jensen's  $\alpha$  for HDFC Bank equities are further corroborated by the results shown in Table 3 where the actual return of the HDFC Bank is higher than that of its required return.

As far as INFOSYSTCH Ltd. securities the results in Table show that the  $\alpha$  value for excess return of this security is not statistically different from zero and hence broadly support the CAPM hypothesis of no return for non-systematic risks, the beta coefficient is approximately 0.5 only and hence its expected return is only half of that of the market though the beta coefficient is statically different from zero. It means INFOSYSTCH Ltd. securities may not do very badly during the bad times and hence the expected return is less and the actual return during market booms will not be commensurate with market returns. In India, the so called 'IT' or technology stocks, their returns are not highly correlated with general market and macroeconomic factors of the domestic economy and mostly dependent on foreign exchange and other international factors. Though the assumption of the CAPM theory may be that any investor is always invested in all the market securities in proportion to the market capitalization, such an assumption may not always be practically applied by investors, and hence to diversify the risks in the Indian contexts, investors should also invest in securities like INFOSYSTCH Ltd. where betas are low. However, the as given in Table 2 the Jensen's  $\alpha$  is negative for INFOSYSTCH Ltd securities and hence the actual return has been lower than the required return, and than lower than that of the securities of similar betas.

Interestingly, the aforesaid results and interpretation about Jensen's  $\alpha$  results are corroborated by the Table 3 data of the actual return and the required return for INFOSYSTCH Ltd securities. The actual returns are lower than the required returns.

By looking at the Table 3 results of the actual and expected returns we can make some observations: (1) In India the expected and required returns in their arithmetic order of magnitudes, are relatively higher numbers, even after we consider the fact that in multiplying by twelve the monthly returns numbers, for equity returns may not be very appropriate to convert them into annual returns as dividends are not paid every quarter unlike in the money markets. In all cases except two securities- Tata Motors, and INFOSYST Ltd., the actual returns are greater than the required returns .If we take the expected /required return as proxies for the unconditional mean returns , and the actual returns as the conditional mean returns, we can compare our results to the results and analyses of Fama E.F and French K.R ( 2002) that though for a very long period of 1872 to 2000 the conditional expected returns –which they proxy as dividend yields plus the growth rate of dividends- approximate to unconditional expected returns- which they calculate as the dividend yields plus the capital gain/loss for the stocks, for more recent periods their conditional expected returns constructed from the former proxy as dividend yields plus the growth rate of dividends , is much lower than the actual capital gains / losses returns of the stocks , and therefore there is much equity risk premiums in the most recent periods. We, therefore, also find an actual equity risk premiums for most Indian stocks in our sample periods.

The positive relationship between beta and actual returns may not be true for all the securities and during all times as obviously even the required return is related also to the market risk premium – the price of risk- apart from the risk itself-betas- , and market risk premiums or the returns of the markets will be very high during good times, but will be lower during the bad times. The Tata Motors securities have one of the high betas, but yields lower actual returns compared to the SBIN, Reliance group, and HDFC Bank securities. Jensen's  $\alpha$  results also showed that Tata Motors has performed worse than the securities of similar Betas.

#### **4. Conclusions**

The CAPM hypothesis that no returns provided for non-systematic risks, is corroborated for all four securities. It is not corroborated for just one security-Reliance Group. If we look at the betas and returns, we notice that the risk is related to returns and the CAPM has passed the test. On the whole, the CAPM model could satisfactorily explain the risk-return relationship in the Indian Stock market. However, the positive relationship between beta and actual returns may not be true for all companies. For instance, Tata Motors has one of the high betas, but yields a lower return compared to the State Bank of India, Reliance and HDFC Bank. Of course we also have to remember that a high beta may give high actual returns when the markets are booming and when markets are going down a high beta security can give a lower actual return as well. In that sense the required return can always deviate from the actual returns. It is claimed to be the great strength of the CAPM theory that the market risk proxy – the beta- is also indicating that when the times are bad, those high beta securities may do very badly as well, and other proxies for risk like size, value against growth, etc may not indicate how those securities can do badly in bad times! To the extent that those other proxies for risk indicate that their actual return can fall during bad times; they are also equally good as market risk proxies, even according to Sharpe (1998).

As an extension of the theories of Markowitz ( 1952 ) and James Tobin (1958 ) , CAPM theory of Sharpe believes that the investor hold always a well diversified portfolio of market securities .However, as a matter of practical advice to Indian equity investors ,we can inform that the technology stocks like INFOSYST Ltd., as low beta securities, should be held to diversify risks when investing in other high beta securities. This is because the low beta securities may not do very badly during bad times.

Jensen's  $\alpha$  results help to conclude that the securities – State Bank of India, Reliance Group, and HDFC bank- delivered better returns than securities of similar betas.

We take our long term average actual returns of the securities as their unconditional required returns and the expected return for the companies are the averages of the  $\beta$  s multiplied by the excess return of the market over the risk free rates If the risk free rate is added to that we get the required returns . These latter required returns are assumed as

the conditional required returns. Then as averages of the actual returns are much higher for at least three of the securities in our sample that there is excess equity premium in our sample. This finding is in line with the findings and conclusions of Fama and French (2002).

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