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Article

Capital Asset Pricing Model (CAPM) and Indian Stock Market: A Study of Relationship between Systematic Risk and Expected Returns

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Abstract: This paper looks at the suitability of CAPM in Indian stock market by evaluating relationship between systematic risk and anticipated returns of the chosen stocks that are listed on Bombay Stock Exchange (BSE). Study uses a sample of leading 30 companies in the index of BSE Sensex among 2016-2022 to analyze the association between beta, expected returns, and market risk premium. There is, however, also evidence that there are anomalies, including the effects of size and value that undermine the assumptions of the model. The findings are relevant to the risk-return relationship in the emerging markets, such as India, and give investors, portfolio managers and policy makers' information to evaluate equity investments. The study concludes that CAPM holds moderately well in explaining stock returns, with a significant positive relationship between beta and expected return.
Keywords: CAPM, Beta, Expected Returns, Indian Stock Market

JEL Classification: G12, G14, C58

1. Introduction

According to research into where the CAPM came from, it was mainly inspired by two studies. Harry Markowitz's 1952 paper "Portfolio Selection" was the first time someone gave a really good reason for choosing and diversifying a portfolio. Later, he wrote a book-length study (1959) that built on his mean-variance analysis and made portfolio theory one of the most important ideas in financial economics. Markowitz's study clearly shows how the CAPM came to be. After the publication of Markowitz's (1959) Portfolio Selection, Treynor (1961) initiated a systematic investigation into asset pricing theory with the explicit objective of developing a risk- adjusted valuation framework. His seminal work sought to establish theoretical foundations for market valuation that explicitly incorporated risk considerations.

Concurrently, Sharpe (1964) independently pursued research examining the functional relationship between asset prices and their risk characteristics. Sharpe, in his contribution to analysis, showed that portfolio has a downside, although it can be used to alleviate it. Diversification reduces some of the risk factors; the remaining systematic risk - and not the entire risk - is the factor that determines the price of an asset. He also noted that this was one of the key

risk factors that had not been adequately discovered in past literature. Sharpe applied the Markowitz portfolio selection paradigm to an equilibrium-based asset pricing model that can explain the exact connection between the security prices and the risk dimensions within them to contribute to the theoretical literature of risk-return dynamics in the financial market. Lintner proceeded to estimate the betas of 301 stocks of 1954-1963 using regressions, which were then found to have methodological shortcomings by Miller and Scholes especially in terms of beta estimation error.

Black, Jensen and Scholes (1972) solved these issues by introducing the portfolio grouping methods where the stocks were grouped into decile portfolios to eliminate the estimation bias. Their findings were empirical support of the two factor (zero-beta) CAPM specification. The influential work by Fama and MacBeth (1973) delivered three important results i) intercept terms greater than the risk-free rate, two-ii) confirmation of linear relationship between returns and beta and iii) improved model validity at elongated times. There is however, some subsequent empirical studies have produced inconclusive information on these relationships. CAPM can be calculated using the following formula:

$E(Ri)=Rf+\beta i[E(Rm)-Rf]$

Where-:

$E(Ri)$ → Expected return on the asset

Rf → Risk-free rate (e.g., government bond yield)

βi → Beta coefficient (measures the asset's volatility relative to the market)

$E(Rm)$ → Expected return of the market portfolio

$E(Rm)-Rf$→ Market risk premium (extra return for taking market risk)

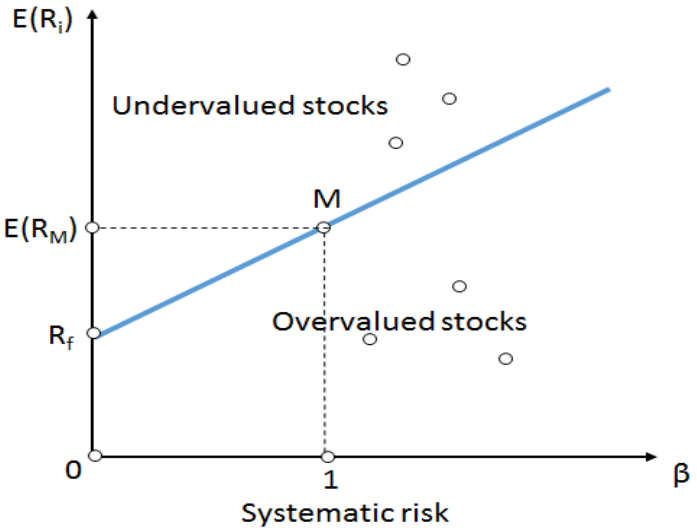
Beta (β), often known as the beta coefficient, measures how much more risky or volatile an asset or portfolio is compared to the whole market. Beta is a key part of the Capital Asset Pricing Model (CAPM) that helps you figure out how much money an asset will make by taking into account how sensitive it is to changes in the market and how much money the market is predicted to make. Computed via regression analysis, beta reflects the propensity of securities return to correlate with market fluctuations. A beta value of 1 signifies perfect alignment with market volatility, while $\beta < 1$ indicates lower volatility than the market. Conversely, $\beta > 1$ suggests heightened volatility relative to the market benchmark.

The risk-free rate of return is the hypothetical rate of interest on a riskless or risk-free investment. Examples of common proxies of this benchmark are short-term government securities, i.e. 91-day, 180-day and 365-day Treasury bills, central bank rates, and yields on sovereign bonds. In this research, the researcher will use Government of India bond yield issued by the Reserve Bank of India (RBI) as the proxy of a risk-free rate.

A bond is a legal document that indicates that the issuer will pay the bondholders the interest in a periodic fashion and will also pay up the amount of the bond when it expires. The Indian financial markets issue bonds by various organizations including the central and state governments, public sector companies, businesses and local governments. The realized rate of return is the actual rate of return on an investment within some period of time. Capitaline database which is also a popular distributor of financial information furnished the daily stock prices in BSE Sensex listed business and this was taken in the study as a basic principle of risk-return tradeoff according to which securities with greater risk-taking should pay investors a correspondingly high expected returns than less risky substitutes.

The expected returns versus the risk measures can be plotted to graphically illustrate the relationship and the resulting market line is downward-sloping, which proves the positive relationship between risk and expected return. In the Capital Asset Pricing Model (CAPM) model, this equilibrium relationship is mathematically stated in the form of a linear relation between the expected performance of a security E(Ri)) and its systematic risk (β). SML is the hypothetical point of equilibrium at which all theoretically fair priced securities are supposed to be along the line given

perfect market conditions and rational investor behavior as given by the CAPM assumptions. We can illustrate the concept by the diagram that follows:



The risk-return trade off implies that markets are efficient and that there is no alpha-profit. If a higher projected return can be found, people will rush to buy this investment, which will drive up its price. If the investor buys the investment after the price has gone up, she can expect a fair return based on the risk she took, but not more than that. The same thing happens with a security that has too much risk compared to its price: people will rush to sell it, and the price will drop until the risk matches the return of the stock and the market reaches equilibrium. The risk-return tradeoff is based on the idea that an investor expects a better return when they take on securities that are riskier. The risk-return tradeoff is a way to talk about the link between risk and reward. The hypothesis says that when risk goes up, the possible return also goes up; hence this is a straight line. In short, an investor is only willing to take on more risk if they get a bigger return.

2. Review of Literature

Miller and Scholes (1972) discovered that empirical constraints of the Capital Asset Pricing Model (CAPM) revealed serious statistical shortcomings when it comes to the utilization of the returns of individual securities. These methodological issues were resolved later in the research by use of portfolio-based methods. This methodological advancement was first done by Black, Jensen, and Scholes (1972) who built extensive portfolios of all securities listed on the New York Stock Exchange (NYSE) in the 1931-1965 history. Their classical study indicated a serious disparity with the theoretical forecasts: the connection among anticipated excess returns and systematic risk had non-proportional traits. They say so as they explicitly indicated that the traditional CAPM specification was overwhelmingly rejected (Black et al., 1972, p. 2) with reference to the initial formulation, of Sharpe (1964).

Gibbons and Ferson (1984) researched that asset pricing models are its ability to be empirically tested without observing the market portfolio or even the state variables. The development of this methodology is due to the loosening of the traditional assumption of unvarying risk premiums. Although time-varying risk premiums require modeling of conditional expected returns, its regression-based form has two important strengths, namely, (1) it can be used to perform standard specification tests, and (2) it is robust to informational incompleteness. Using the framework to analyze daily equity returns (19621980) the researchers did not obtain statistical results to reject a one-factor price model at four sub periods. These findings were consistent as they were repeated carrying out the analysis with the methodological approach by Gibbons (1982).

Chan et al. (1991) were one of the pioneers who studied cross-sectional determinants of returns in the Japanese equity market. Their empirical analysis identified four fundamental factors exhibiting statistically significant relationships with expected returns: (i) earnings yield, (ii) firm size, (iii) book-to-market ratio, and (iv) cash flow yield.

Fama and French (1992) adopt an empirical methodology conceptually aligned with Arbitrage Pricing Theory (Ross, 1976), proposing that firm size and book-to-market (B/M) ratios serve as proxies for latent risk factors. They say that even though size and B/M equity are not state variables on their own, the higher average returns on small stocks and high B/M stocks show that there are state variables that create risks in returns that can't be diversified (covariance) and that the market return doesn't show these risks and prices them separately from market betas. The study's final results go against the main idea of the Sharpe-Lintner-Black CAPM framework, which says that "Empirical results consistently reject the model's core prediction of a positive market beta-return relationship."

Obaiduilah (1994) empirical investigation of the "Capital Asset Pricing Model (CAPM)" in the Indian equity market analyzed monthly returns for thirty stocks over a sixteen-year period(1976- 1991). The study produced mixed results that neither consistently supported nor contradicted the model's predictions. Although the typically low coefficients of the squared beta terms (B 2) were consistent with CAPM implications, the statistical insignificance of primary beta coefficients in the multiple regression models was a direct contradiction of the basic prediction of the model that there would be a positive relationship between risk and returns. The author came up with these conflicting findings. The validity of question CAPM as an effective model of describing the price of assets in the Indian market context implies that theoretical underpinnings of the model may not provide adequate explanations of how pricing works in the emerging markets. The inconclusive findings of the research lead to further discussion of the applicability of CAPM to a cross-market as well as to the possible weaknesses of the usual asset pricing models in emerging markets. The research design used simple and multiple regression models in analyzing the non-linear impacts in the form of squared beta coefficients, but the study findings were limited due to a relatively small sample size and the possibility of omitted variable bias. These results are consistent with the wider academic issues regarding the empirical strength of CAPM, especially in non-Western markets.

Fama and French (1995) establish the two systematic patterns of stock returns, namely; the size effect states that small-cap stocks perform better than large-cap stocks, and the value premium states that high book-to-market (B/M) equities are better-performing than low B/M stocks. Their 1993 work has a similar framework as the one employed by Ross (1976) in his Arbitrage Pricing Theory. It is postulated that business size and B/M ratios are not inherent state variables per se, but they do indicate the underlying systematic risk issues that are not accounted by the conventional market beta. The authors propose that excess returns on small and value stocks provide investors with an exposure to unidentified sources of undiversifiable risk. These latent risk factors generate the return covariance that cannot be explained by the market portfolio itself, which implies that the asset pricing models need to include several dimensions of systematic risk rather than just one, as the single-factor CAPM theory. This theoretical approach can be used to understand the existence of stock characteristics that continue to explain cross-sectional variations in average returns.

Empirical evidence presented by **Fama and French (1996)** proves that the empirical relationship between book-to-market equity (BE/ME) and average stock returns cannot be explained by survivor bias. Their analysis also shows the consistent conclusions in terms of the beta premium in both cases of monthly and annual estimates of beta. The paper questions the explanatory ability of the conventional model known as the Capital Asset Pricing Model (CAPM) by demonstrating that the use of market beta alone does not explain cross-sectional differences in the expected returns. According to their results, the authors argue that the CAPM is not a complete asset pricing model even when it comes to the beta premium because it fails to account comprehensively the returns differentials that are related to value stocks.

Raghuram (2001) reviews the methodological framework and empirical tests initially created by Chen (1983) to do a comparative study of the Arbitrage Pricing Theory (APT) and the "Capital Asset Pricing Model (CAPM)". The t-test of APT factor loadings in a 105-security sample portfolio suggests that five factors are only statistically

significant at conventional level ($p < 0.05$). The discovery is consistent with all the existing empirical studies proposing that there are only three to five systematic risk factors that mainly explain equity returns, and APT seems to be capturing them all. A subsequent regression analysis indicates two important findings that confirm the theoretical superiority of APT: (1) the estimated intercept in the regression of actual portfolio returns against APT-predicted returns are close to unity, and (2) The APT factors have a strong explanatory ability of CAPM residual ($p < 0.01$), but the single market factor of CAPM cannot explain APT residual. All the above empirical results show that APT is a more extensive and statistically stringent construct in which to price assets when compared to the traditional CAPM specification because it accurately models various sources of systematic risk that affect security returns.

Harris et al (2003) empirically examine ex-ante expectations returns of S&P 500 companies in the 1983-1998 time frames in order to examine the results of the application of the CAPM in both domestic and international forms. They claim that their findings show that, although there is a slight improvement of the domestic CAPM over its international counterpart, economically, there is no significant difference between the two. This observation is consistent during the sample period and among other groups of firms in respect to foreign sales exposure. The paper hypothesizes that in the case of large American companies, the decision on domestic and international CAPM specifications might be of less practical value in estimating cost of equity. These findings suggest that the magnitude of systematic risk in domestic markets is enough to explain large U.S. companies, and that global market integration can probably add significant value to the cost of equity estimates. The results are also relevant to the overall discussion on the integration of markets and specification of models in the context of asset prices, especially to practitioners who must make decisions concerning the right valuation frameworks to use on large-cap US equities.

Rao (2004) investigated the BSE Sensex stock returns (1999-2002) shows that beta is not an adequate explanatory factor of returns in the Indian capital market. Rather, variance and skewness become statistically significant risk variables, with better explanatory ability of equity returns. These results can be compared with empirical studies of other emerging markets in the Asia-Pacific, and they indicate that multifactor risk models can be more effective at explaining determinants of returns in the emerging economies than the classic CAPM model. The article points to the necessity of using higher moment risk measures (than beta) to estimate cost of equity in such markets.

Mohamed and Abirami (2004) show that they test the validity of CAPM on 200 stocks listed in the BSE (19912003) using the Sensex as the market proxy and 91-day T-bills as the risk-free rate. The second pass regression model they have tested discards the Sharpe-Lintner CAPM as it does not reveal any significant beta-return relationship. These findings are consistent with other evidence that standard asset pricing models might have to be modified to suit new markets as emerging markets such as India where institutional factors or other risk measures can be more explanatory of returns.

In a study, **Diwani (2010)** empirically provided a test of Capital Asset Pricing Model (CAPM) in Bombay Stock Exchange (BSE). The quantitative research examined the weekly stock returns of 28 firms that are listed on the BSE over a span of five years (November 2004- October 2009). The dataset was split into five subsamples to perform a more detailed analysis to increase its strength. The adjusted method resulted in an improved statistical outcome, although finally, the information failed to offer a definite justification on the application of CAPM in the BSE. These findings are being put in the increasing pool of evidence indicating that the CAPM does not apply to all markets, and in particular in emerging markets such as India, it is possible that additional risk factors or market-specific dynamics can significantly influence stock returns.

The method used by **Khan et al (2012)** was an empirical study concerning the application of Capital Asset Pricing Model (CAPM) in KSE which is a stock exchange in Pakistan and in Karachi. The research conducted on data of ten listed companies in the five (2006-2010) years revealed that there is not much empirical evidence on the validity of CAPM when the Pakistani market setting is considered. These findings went far against the basic predictions of the model, and further supported the previous doubts on the existence of a universal application model (Levy, 1997). Although the researchers found weak evidence of the applicability of CAPM, the researchers came to the conclusion

that the model did not render the accurate results with the use of KSE. Nevertheless, the paper still recognizes the long-term usefulness of CAPM as a conceptual model as it is still found useful in estimating the cost of capital (Moyer et al., 2001), the performance of investments, the study of market efficiency (Campbell et al., 1997), and the nature of the general market dynamics (Karnosky, 1993). The results are part of the literature that has been exploring asset.

Malik and Saini (2013) emphasize that investing in financial securities (shares, debentures and bonds) is profitable but has an inherent risk, which needs analytical abilities as well as emotional judgment. Investors consider securities as one of the possible investment sources, but they are aware of the risks involved and are likely to diversify through developing portfolios instead of putting funds into one asset. Portfolio management the strategic choice and the combination of securities- aid in reducing risk without reducing returns. Those investors who understand the portfolio theory and its practical implementation stand in a better position to realize the success of investment. The paper highlights the value of diversification and scientific construction of a portfolio to maximize the risk-return outcome.

Alam et al (2015) analyze five years period of closing returns of the top 30 listed firms in the Chittagong Stock Exchange (CSE) to assess the validity of the Capital Asset Pricing Model (CAPM). Their results indicate that there are statistically significant differences between the expected returns based on CAPM and observed returns on the standard risk levels. Such significant deviations indicate that the CAPM is not very reliable in predicting the performance of stock in CSE setting. The research finds that the inaccuracy in the model has the potential to misguide an investor trying to predict the future movement of stocks, and this makes the practical usefulness this model in this emerging market difficult.

Bajpai and Sharma (2015) examine a different form of the Capital Asset Pricing Model (CAPM) specification by suggesting a constrained form of the model which removes the intercept term in the cross-sectional regression in the second stage. Their empirical research shows that this revised model enhances the explanatory level of the model within the fact and circumstances of the Indian equity market considerably better. The paper demonstrates that the conventional CAPM model with an intercept term is not able to adequately explain risk-return factors, but the constrained model is able to explain more than 62% of change in returns as indicated by the large value of adjusted R-squared. These results indicate that with the right specifications with no intercept, the systematic risk factor (β) of the CAPM comes out as a statistically significant predictor of expected returns. The findings do support empirically the theoretical hypothesis that market risk is the leading factor in the explanations of the asset returns, but only under a condition of the proper constraint of the model. The study adds to the current debate on the applicability of CAPM in the emerging market by showing how the decision of specifying a model can make significant contributions to empirical findings and has significant implications on the academic research and practical investment analysis in the Indian market.

Wahab and Zada (2017) The Capital Asset Pricing Model is used in this study to look at the short- and long-term relationship between risk and expected return in the cement business in Pakistan. We got our data from the Pakistan Stock Exchange Database, Business Recorder, and Yahoo Finance. For this investigation, monthly data from July 2009 to June 2015 was also employed. Past research shows that this time frame has not yet been looked at for the CAPM analysis. The analysis was done with Microsoft Excel. In the short term, 114 observations were used for the analysis, which showed that just 7 of them support the CAPM. In the long run or on average, only 7 out of 19 companies exhibit good results using CAPM. So, based on the data in table 1-20, we can say that CAPM is not a good way for investors to figure out the risk and expected return.

The empirical research by **Garg (2019)** of the Nordic stock markets undermines the efficacy of the "Capital Asset Pricing Model (CAPM)" in estimating the returns, especially when it comes to estimating the returns of single securities. They use cross-sectional regression analysis to investigate the relationship between risk and returns, which shows no statistical significance of the beta coefficients and only 9 percent of variation in the returns, and more importantly, they found that by adding the residual variance, the explanatory power (R2=73 percent) has significantly increased, but the beta coefficient is insignificant. These findings give strong support to the invalidity of the major

assumptions of CAPM on the Nordic setting, as criticized by Miller et al. (1972) and Levy (1978). These facts indicate that investors need to be cautious when using CAPM to value or construct a portfolio in such markets since the model does not reflect the actual drivers of stock returns. Higher explanatory power of residual variance suggests that systematic risk might be overwhelmed with specific risk factors of the firm, which refutes the main theoretical propositions of the CAPM. The results are part of the emerging literature on the inappropriate universality of CAPM in different market environments.

3. Research Methodology

Capital Asset Pricing Model (CAPM): The analysis of the data involved in the study was based on the daily adjusted closing prices of 30 best-performing companies in terms of performance in the BSE Sensex index between January 1, 2016, to December 31, 2022, to determine the ability to make an effective application of the Capital Asset Pricing Model (CAPM) to the companies. The focus of the analysis was to find out whether the CAPM which is a model that attributes the expected returns to systematic risk (beta) holds true in these high performing companies in the Indian market context. The study aimed at confirming whether the CAPM is a relevant model that can be used to estimate the expected returns of these companies over the given seven-year period by analyzing the association between individual stock returns, market returns (measured by the Sensex) and the risk-free rate.

3.1 Objectives of the Study

- To scrutinize the applicability of CAPM in Bombay Stock Exchange Sensex index listed companies.
- To analyze the relationship between risk and return of BSE Sensex index listed companies.

3.2 Hypothesis of the Study

- H01= There is no significant applicability of CAPM in Bombay Stock Exchange Sensex index listed companies.
- H02= There is no significant relationship between risk and return of BSE Sensex index listed companies.

3.3 Descriptive Statistical Tools

3.3.1 Average/Mean:

The mean, which is also referred to as the arithmetic mean is a basic statistic central tendency measure in statistics. This is a common average because it is a computation of all the values in an observed data and then dividing the total by the number of observations. The mean gives a summary of the central value of a dataset and is thus effective in comparing the mean of various groups or population. Simple arithmetic mean can be mathematically represented as below:

$$\overline{X} = \frac{\sum X}{N} \quad \text{..... (1)}$$

3.3.2 Standard Deviation (S.D.):

The idea of standard deviation was mathematically evolved by Karl Pearson in 1893 as a basic statistic dispersion measure. As the most robust and frequently utilized metric of variability, standard deviation (denoted by the Greek symbol σ) quantifies the average distance of individual data points from the arithmetic mean. This measure is alternatively characterized as the root mean square deviation, as it represents the square root of the average squared deviations from the mean. The mathematical formulation of standard deviation is expressed as:

$$\sigma = \sqrt{\frac{\sum(X - \bar{X})2}{n-1}}$$ …………………………………. (2)

3.3.3 Skewness:

Skewness tells you how far the distribution is from being symmetrical. If the skewness is not equal to 0, then the distribution is not symmetrical. A normal distribution is fully symmetrical.

$$\text{Skewness} = \frac{nM_3}{(n-1)(n-2)S^3} \quad \ldots\ldots(3)$$

3.3.4 Slope:

One of the most fundamental statistical methods for measuring the slope of two variables is slope. In this thesis, we can find beta by using slope. Beta shows how the Sensex return affects the stock return. For that reason, the researchers gathered daily closing prices for the Sensex and daily stock prices for the BSE-30 companies during the study period. We found Beta by using the formula slope (β) = slope (Y, X), where Y is the company's returns and X is the market returns. The formula is as follows:

$m = (y_2 - y_1) / (x_2 - x_1)$………………………………. (4)

3.3.5 Return:

The stock prices or share prices of the companies looked at in this study came from the BSE website. To find the real return, you can alternatively take the closing prices, remove the closing price from the opening price, and divide that by the opening price. The formula is as follows:

$$Actual\ Return = \frac{OpeningPrice - ClosingPrice}{ClosingPrice} \quad \ldots\ldots (5)$$

3.3.6 Beta:

Beta is used to gauge the systematic risk which is a measure of the influence of the market on the price of securities. Beta is calculated by determining the difference between the market and the security returned. Beta1 will be in the market. When the beta is more than 1, then the stock is more risky than the market. A beta that is below 1 indicates that a stock is less risky than the market is. When beta equals 0 the risk equals that of the market, negative beta is not common.

$$\beta_p = \frac{Cov(R_p, R_m)}{Var(R_m)} \quad \ldots\ldots (6)$$

3.3.7 Augmented Dickey Fuller Test

The Augmented Dickey Fuller (ADF) Test is used to determine whether the series is stationary or not. A process is considered to be stationary in case of no change in the mean and variance with time. Otherwise stated, a time series is stable when the distribution of its probabilities does not change across the time period in question. The most widespread test is the ADF test that examines the unit root issue.

4. Results

Table no. 4.1 Shows the Descriptive Analysis

Stock	Mean	Median	Mode	SD	KU	SK	MIN.	MAX.
NTPC	1230.943	1229.6	734.7	382.6257	-1.35238	-0.20536	526.7	1939.35

TATAMOTORS	327.0831	327.95	433.2	174.5989	-0.97411	0.329273	65.3	780.75
HUL	2274.038	2274.55	2561.5	291.4434	-0.81186	-0.39757	1659.7	2812.05
INFY	1230.943	1230.6	734.7	382.6257	-1.35238	-0.20536	526.7	1939.35
ASIANPAINT	2511.736	2575	3335.55	710.12	-1.4764	-0.33212	1307	3574.65
TITAN	1893.793	1893.5	3284.3	758.2433	-1.15251	0.361142	798.05	3716.45
HCLTECH	995.2594	996.75	1131.15	215.662	1.27860	-0.85803	404.95	1504.3
BHARTIARTL	612.031	684.75	693.95	185.2419	0.96936	0.085188	301.05	1037.4
MARUTI	7650.178	7653.35	8720.3	1312.4	-0.12816	0.329019	4011.65	10792
ULTRACEMCO	5958.265	5956.15	7655.3	1676.811	-1.17074	0.071461	3011.95	10503.15
NESTLEIND	17448.77	17580.15	20482.35	3449.452	-0.18966	-0.19805	10105.7	26595.5
TCS	2848.65	2854.85	3380.6	635.1169	-1.38005	-0.32675	1636.1	4019.1
SUNPHARMA	716.5817	726.95	462.1	254.735	1.27599	0.255985	324	1262
LT	1676.666	1666.6	2213.15	569.6917	0.719289	0.917806	708.3	3527.05
BAJAJFINANCE	2823.876	2824.765	3265.786	678.9876	0.87654	0.987612	998.98	4578.87
ICICIBANK	645.4544	650.25	710.05	216.0017	-1.40012	0.047821	283.9	1037.1
POWERGRID	204.4713	204.45	198.1	23.23899	-0.50279	-0.01379	143.85	266
AXISBANK	455.6721	456.628	298.396	172.5873	0.98354	0.976575	158.77	359.674
BAJAJFINSV	5345.879	5343.3	7292.95	1762.504	-1.321	-0.26001	1829.9	8167.5
RELIANCE	2045.367	2041.35	2314.3	499.3285	-1.1317	-0.53109	883.85	2840
KOTAKBANK	1683.981	1685.8	1763.9	464.3924	-0.58254	-0.64342	1100.35	2210.55
INDUSINDBK	1102.966	1103	1172.75	325.3932	-0.43994	-0.32946	301.2	1819.95
HDFCBANK	1534.708	1531.6	1656.3	355.7685	0.628533	0.823074	765.45	2494.35
JSWSTEEL	508.1278	509.65	757.1	223.0329	-1.65502	-0.16906	140	880.4
SBIN	408.1903	411.4	516.35	138.1218	-1.26673	-0.12996	150.85	655.6
ADANIPORTS	596.4358	582.75	739.65	206.0507	-1.40837	-0.08237	207.45	1094.15
M&M	1249.875	1249.875	631.3	673.5546	-0.71274	0.626282	269.25	1734.6
TATASTEEL	550.2896	327.525	105.85	421.1387	-0.81468	0.720692	139.5	515.55

Form the above table no. 4.1 the normality of the data the skewness value and kurtosis value should be 0 and 3 respectively, and p-value must be less than 0.05. In table-4.1 that is framed after applying unit root ADF test, we can clearly see that the all 30 companies which is listed in BSE SENSEX index on basis of market cap pre financial crisis having the skewness value are -0.20536, 0.329273, -0.39757, -0.20536, -0.33212, 0.361142, -0.85803, 0.085188, 0.329019, 0.071461, -0.19805, -0.32675, 0.255985, 0.917806, 0.987612, 0.047821, -0.01379, 0.976575, -0.26001, -0.53109, -0.64342, -0.32946, 0.823074, -0.16906, -0.16906, -0.12996, -0.08237, 0.626282, 0.720692 respectively which is approximates to stationarity. With kurtosis value -1.35238, -0.97411, -0.81186, -1.35238, -1.4764, -1.15251, 1.27860, 0.96936, -0.12816, -1.17074, -0.18966, -1.38005, 1.27599, 0.719289, 0.87654, -1.40012, -0.50279, 0.98354, -1.321, -1.1317, -0.58254, -0.43994, 0.628533, -1.65502, -1.26673, -0.08237, -0.71274, -0.81468 that are nearly normality. Moreover, all companies' returns and BSE SENSEX index are having a significant p- value that is less than o.05. That concluded that data are stationarity and null hypothesis that is data having unit root is rejected and alternative hypothesis data are stationary is accepted.

Table no. 4.2 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	0.958765	6.908765	6.23758	-0.671185	Under
2017	0.648332	5.688484	6.58671	0.898226	Over
2018	1.009851	6.286907	6.226552	-0.060355	Under
2019	0.689421	5.914921	6.248731	0.333811	Over
2020	1.037484	6.647212	4.985783	-1.661429	Under
2021	0.99052	5.93456	4.55673	-1.37783	Under
2022	1.03456	6.87431	6.85632	0.01799	Over

On the basis of table no. 4.2 in year 2016, 2018, 2020, 2021 the securities are unevaluated and in 2017, 2019, 2022 the securities are over valuated. The Securities expected return is higher/ lower than its required return, based on its beta and the market risk premium.

Table no. 4.3 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	0.98765	7.895432	6.456797	-1.354386	Under
2017	1.23768	6.124587	6.458764	0.334177	Over
2018	1.76532	4.987567	5.984759	0.997192	Over
2019	0.98762	6.973276	6.765219	-0.212381	Under
2020	0.65874	5.653587	5.983569	0.329982	Over
2021	0.95376	4.54987	4.78652	0.23665	Over
2022	1.07654	5.98721	6.87591	0.88870	Over

According to table no. 4.3 in year 2017, 2018, 2020, 2021, 2022 the securities are overvalued it means CAPM gives direction to investors the securities' expected return is lower than its required rate of return which is based on its beta and the market risk premium. In year 2016 and 2019 the securities are undervalued.

Table no. 4.4 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	0.785751	6.027549	6.275892	0.248343	Over
2017	0.984378	6.457315	6.025784	-0.431531	Under
2018	1.027465	5.846217	6.156782	0.310565	Over
2019	1.082798	6.573146	6.658914	0.085768	Over
2020	0.827542	7.549824	5.954789	1.595075	Over
2021	0.97685	6.92176	5.82182	-1.09994	Under
2022	0.88521	4.86543	5.32645	0.46102	Over

On behalf of above table no. 4.4 in year 2016, 2018, 2019, 2020, 2022 the securities are overvalued and in year 2017, 2021 the security is undervalued. This pattern indicates market mispricing relative to systematic risk (Beta),

where undervalued securities provided excess returns and overvalued securities provided deficient returns compared to the CAPM prediction.

Table no. 4.5 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	0.793584	5.996472	6.493541	0.497069	Over
2017	0.993254	6.548236	6.754891	0.206655	Over
2018	1.057954	6.756982	6.981472	0.22449	Over
2019	1.133872	6.547857	6.332547	-0.21531	Under
2020	0.873541	6.254789	6.293345	-0.038556	Under
2021	1.03752	5.97521	6.13276	0.15755	Over
2022	0.97376	6.03321	5.98724	-0.04597	Under

The table no. 4.5 shows the securities are overvalued in year 2016, 2017, 2018 and 2021 it means it represents the securities expected return is less than its required rate of return. Another side in year 2019, 2020 and 2022 the securities are undervalued it means expected return is greater than its required rate of return.

Table no. 4.6 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	1.035672	6.564834	6.954782	0.389948	Over
2017	1.103759	6.254837	6.453287	0.198451	Over
2018	0.995813	5.657923	5.246893	-0.41103	Under
2019	0.852759	7.658214	6.992586	-0.665628	Under
2020	1.553712	5.698245	5.952585	0.25434	Over
2021	1.32481	6.21751	6.92431	0.70680	Over
2022	0.99582	5.98265	5.85329	-0.12936	Under

As per above Table no. 4.6 in year 2016, 2017, 2020, 2021 the securities are overvalued and in 2018, 2019, 2022 the securities are undervalued. It means CAPM gives different results in most of the cases. The observed results point to a discrepancy in how the market priced these securities in relation to their inherent risk Specifically, the shares that were undervalued delivered performance that surpassed what their level of systematic risk would typically warrant.

Table no. 4.7 Shows the Expected Return, Beta and Actual Return

Year	Beta	Actual Return	Expected Return	Difference	Under/ Over Valued
2016	1.065821	6.253879	6.332548	0.078669	Over
2017	1.145687	6.496737	6.674515	0.177778	Over
2018	1.255648	6.995876	6.639547	0.356329	Over
2019	0.954873	6.115894	6.328974	0.21308	Over
2020	0.893547	6.996823	6.012583	-0.98242	Under

2021	0.99634	5.98451	6.32567	0.34116	Over
2022	1.03456	6.72154	5.99571	-0.72583	Under

According to table no. 4.7 in year 2016, 2017, 2018, 2020, 2021 the securities are overvalued it means CAPM gives direction to investors the securities' expected return is lower than its required rate of return which is based on its beta and the market risk premium. In years 2020 and 2022 the securities are undervalued.

5. Discussion

From the above results it is very evident that CAPM provides important information for the investors point of view but it shows the differences between expectations and the reality are very high. This result clearly illustrates that CAPM doesn't work for all sorts of portfolios. There are 18 packages that are too expensive and 17 that are too cheap out of 6 portfolios in 7 years. The Beta values are likewise all over the place, from very high to very low. The results of this study backup what many other studies have found, as seen in the first section. The findings of this research support those of many other studies, as observed in the first part. Findings in this paper indicate that the CAPM is not applicable to stock market of India BSE; therefore, the null hypothesis may be rejected. The inconsistencies are too high to the extent that CAPM cannot be applied in BSE. The results highlight that the developing market situation in India leads to the necessity of customized price model following the features of the local market microstructure and characteristics of investor behavior, and hybrid models can be more likely to provide a good fit in the market than traditional CAPM.

6. Conclusion

This research study by the researcher test whether CAPM is applicable in Bombay Stock Exchange (BSE). The comparison between the expected and actual returns at a given nominal risk level is found to be very high after examining the closing returns of the top 30 companies in a span of seven years. Therefore, any discoveries can make investors make inaccurate decisions on future stock movements. The differences are so high to point to the fact that CAPM does not perform in BSE, however, but it is a relevant model for pricing of securities.

The findings have implications on investors, portfolio managers and policymakers whereas seems to the direct relationship between systematic risk and returns of companies. In the case of asset pricing, the predictability of returns may be increased by the use of multifactor models (e.g., Fama-French three-factor or five-factor models). In order to construct a portfolio, it might be necessary to use more risk measures and have beta as the only measure. To regulators, transparency and institutional involvement may enhance the applicability of CAPM in the long run by enhancing the efficiency of the market.

In conclusion, while CAPM remains relevant as a theoretical benchmark, its real-world implementation in India requires adaptations to account for local market microstructure and behavioral factors. Future research could explore conditional CAPM variants or hybrid models tailored to emerging market dynamics, ensuring more robust asset pricing frameworks.

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