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The CAPM: Exploring its Empirical Evidence on NSE Nifty-From the Period 2008 to 2023

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Abstract

The issue of forecasting or predicting asset returns is fundamental to financial economics and most often the Capital Asset Pricing Model (CAPM) is adopted for estimating the expected rate of return based on systematic risk. This paper focuses on the empirical testing of the CAPM in the Indian market based on the Nifty 50 index from April 2008 to March 2023, which covers the period of the COVID-19 pandemic, the Goods and Services Tax (GST) reforms and demonetisation. In the context of this study, Lintner, Miller and Scholes, Black, Jensen and Scholes tests are used with a new dataset to examine the CAPM. This study examines the empirical validity of the CAPM in the context of the Indian market, more specifically the Nifty 50 index, during a period of significant economic change. Thus, the analysis is centred around the interaction of systematic risk, residual variance and average returns. The study identifies a positive but non-significant relationship between average returns with systematic risk and a slightly higher risk-free return compared to that of Lintner. The variance of residuals also helps to explain average returns, while at the same time, actual returns are higher than market returns. The findings of the current study partially support Lintner, Miller and Scholes' earlier work while not supporting Black, Jensen and Scholes'(BJS) conclusions. In the context of the BJS methodology, 38 per cent of the securities have significant non-zero alphas, which means CAPM does not operate perfectly in the Indian market. The findings that alphas are non-zero indicate the inefficiency of the National Stock Exchange (Nifty 50), therefore, the need for regulation by agencies such as the Securities and Exchange Board of India (SEBI) arises. Equity analysts and portfolio managers must not only use CAPM for asset valuation blindly without appreciating its empirical flaws. This paper revisits the CAPM with recent data thus enriching the limited literature on the CAPM in the Indian scenario where CAPM has however a very restricted application in explaining asset returns in the context of the Nifty 50.

Keywords: Beta, CAPM, Efficient Market Hypothesis, Jensen's Alpha, Systematic Risk

1. Introduction

The Capital Asset Pricing Model (CAPM), independently developed by Treynor (1962, as cited in Perold 2004), Sharpe (1964), Lintner (1965), and Mossin (1966), remains one of the most influential models in financial economics for estimating the cost of equity or the required rate of return on investments. The theoretical foundation of the CAPM is derived from the Modern Portfolio Theory (1959) of Nobel laureate Harry Markowitz which emphasises the significance of systematic risk i.e., the risk that cannot be eliminated even by diversification. Although the CAPM has received criticism on various grounds. Its simplicity and theoretical elegance have ensured its widespread use in both academia and practice. Studies by Welch (2008), Graham and Harvey (1999), and Bruner *et al*. (1998) confirm that CAPM is a popular

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model for estimating the cost of capital. Despite earning popularity, the empirical performance of the CAPM has been a topic of debate. The great work of Fama and French (1993, 2004) shows the unavoidable limitations of the CAPM in explaining stock returns. The model explains the average returns to some extent but fails to account completely for the complexities of the financial markets. These limitations have led to further research into the applicability of CAPM across various markets especially developing economies like India.

Despite the relevance of the model, there is not much agreement among the researchers regarding the applicability of the CAPM in the Indian stock market. Most of the empirical studies of the CAPM focus on developed markets, with limited studies on emerging economies like India. Moreover, most of the studies in India are about pre-economic and regulatory changes which have caused the Indian market to change drastically. These changes may include the enactment of the Companies Act, 2013, the 2016 demonetisation, the Goods and Services Tax Act in 2017 and the 2014 and 2019 general elections, all of which have impacted the stock market dynamics. International and national shocks such as the 2008 financial crisis and the COVID-19 pandemic have introduced new layers of systematic risk that are not captured in earlier studies.

The changes and the relevance of the studies conducted before 2008 are reasonably outdated in understanding the current dynamics of the Indian stock market. Therefore, this study covers a long horizon from April 2008 to March 2023 to provide a timely and updated empirical examination of the CAPM in the Indian context.

By preparing a new data set and insights, this study aims to fill the gap in the literature and contribute to a deeper understanding of asset pricing in India. Further, the findings could have practical or policy implications for portfolio managers or stock analysts, especially in evaluating the market efficiency and guiding regulatory decisions. The results may offer valuable insights into steps needed to enhance market efficiency for government agencies like SEBI.

2. Literature Review and Research Gap

Srinivasan (1988) explored the CAPM from 1982 to 1985, finding initial support but highlighting the need for a larger dataset to draw definitive conclusions. Similarly, Yalwar (1988) studied a longer timeframe (1963–1982) and concluded that the CAPM was a reliable indicator of security returns, although the analysis focused on individual securities rather than portfolios. Varma (1988), using data from the Bombay Stock Exchange (BSE), also found support for the CAPM, using advanced methods like pooled time series cross-sectional regression and generalised least squares. However, several studies have questioned the robustness of the CAPM in the Indian context. Gupta and Sehgal (1993) found only weak support for the CAPM while studying 30 SENSEX stocks from 1979 to 1989 and Ray (1994), testing 170 stocks on the BSE from 1980 to 1991, concluded that the CAPM does not hold in the Indian capital market. Obaidullah (1994) also found inconclusive evidence regarding the CAPM's validity when testing the risk-return relationship for 30 BSE stocks from 1976 to 1991. Later studies reinforced these findings. Madhusoodanan (1997), examining 120 BSE stocks between 1987 and 1995 and Sehgal (1997), focusing on 1993 to 1994 data, found little correlation between risk and returns, suggesting the inadequacy of the CAPM. Ansari (2000), using the Black, Jensen and Scholes methodology, tested the CAPM on 96 BSE stocks and, despite some promising results, called for more robust testing. In a broader study covering 200 stocks from 1991 to 2003, Mohamed and Abirami (2004) also rejected the CAPM, finding it inapplicable in the Indian market. Dhankar and Singh (2005) compared the CAPM to Arbitrage Pricing Theory (APT) for Indian stocks and concluded that APT outperformed the single-factor CAPM. In the mid-2000s, Bahl (2006) supported the findings that the Fama-French Three-Factor Model (FF3M) better explains stock returns than the CAPM. Other studies in the same period, like those of Lazar and Yaseer (2009), Dey and Maitra (2009) and Diwani (2010), continued to find conflicting or negative evidence regarding the CAPM's relevance in India. Choudhary and Choudhary (2010) and Basu and Chawla (2010), examining different datasets and periods, also found no strong evidence supporting the CAPM hypothesis, reinforcing the trend of declining support for the model. However, Kumar and Rani (2020) offered partial support for the CAPM. Taneja (2010), analysing 187 CNX 500 stocks from 2004 to 2009, found that the CAPM could explain a significant portion (89.1%) of systematic risk in the Indian market. Similarly, Paul and Asarebea (2013) and Bajpai and Sharma (2015) found that the CAPM could partially explain stock returns, though multifactor models often outperformed it. Reddy and Durga (2015) also found mixed evidence, with the latter study providing partial support for the CAPM in the Nifty and Nifty Junior indices.

More recent studies have further undermined the relevance of the CAPM. Balakrishnan (2016) found that the model fails to capture anomalies like size, value and momentum effects in Indian stocks. Chaudhary (2016) and Kundu and Mukhopadhyay (2016) arrived at similar conclusions, finding mixed or poor explanatory power for the CAPM across different datasets. Hussain and Islam (2017) and Anwar and Kumar (2018) also concluded that the CAPM could not reliably explain stock returns in the Indian market, especially compared to multifactor models. Khudoykulov (2020) found that the CAPM performed worse than the Fama-French models, reinforcing the notion that the CAPM alone is insufficient in explaining returns. Sahai and Kumar (2021) provided further evidence that the CAPM fails to explain return variations, specifically noting the inability of the market risk premium to account for returns over time.

The studies outlined above present a mixed yet increasingly critical view of the CAPM in the Indian context. Early studies by Srinivasan (1988), Yalwar (1988) and Varma (1988) provided some support for the CAPM, but the majority of subsequent research points to its limitations, particularly in explaining risk-return relationships for Indian stocks. Studies from the 1990s onward Gupta and Sehgal (1993), Ray (1994), Obaidullah (1994), Madhusoodanan (1997), Ansari (2000) largely found weak or no support for the CAPM, often advocating for the use of multifactor models or alternative frameworks like APT. More recent research, particularly post-2005, has consistently highlighted the superiority of multifactor models (e.g., the FF3FM) over the CAPM. Studies by Bahl (2006), Harshita and Yadav (2015), Khudoykulov (2020) and Sahai and Kumar (2021) suggest that the CAPM fails to capture market anomalies and systematic risk in a way that is useful for Indian investors. At the same time, some studies by Taneja (2010), Paul and Asarebea (2013) have provided partial support for the CAPM, though this support is limited to specific datasets or timeframes.

Despite extensive research, the applicability of the CAPM in the Indian market remains a contested issue, particularly in the post-2008 financial crisis period. Few studies have comprehensively examined the CAPM in this more recent context, especially considering the increased market volatility and regulatory changes. Most previous research either focuses on earlier timeframes or concludes with mixed or inconclusive results. Moreover, the specific impact of global economic crises on CAPM's performance in Indian markets is underexplored.

This study seeks to fill this gap by analysing the empirical performance of the CAPM in the Indian stock market post-2008, using the Black, Jensen, and Scholes (1972) methodology. The objective is to provide a comprehensive analysis that reflects more recent market conditions and contributes to the ongoing debate regarding CAPM's validity in the Indian financial landscape.

3. Research Methodology

3.1 Nature of the Study

The paper is empirical. It uses secondary data collected from various reliable sources. Moreover, the study is an attempt to check the empirical validity of the CAPM in the Indian scenario, therefore, the research is deductive.

3.2 Data Collection

The data required includes monthly closing adjusted prices of the stocks listed on the Nifty 50 index (taken from the Prowessiq spanning from April 2008 to March 2023) and riskfree rates (proxied by 91-day T-bill rates) taken from the website of the RBI. Thereafter, stock returns were calculated using Equation (1). The analysis focuses on monthly returns for empirical testing of the CAPM model.

$$R_{it} = \left(\frac{P_t - P_{t-1}}{P_{t-1}} \right) \quad \ldots(1)$$

where P_t is closing adjusted price at time t; P_{t-1} is closing adjusted price at the previous time period.

3.3 Description of the Variables of the Model

The basic tenet of the CAPM is that there is a positive linear relationship between the return of an asset and systematic risk β_i (called beta and calculated using Equation 3). Thus, the return of a security can be explained by called systematic risk only. Technically speaking, according to the CAPM (also called security market line in its graphical form), the Expected Return $E(R_i)$ of security i can be calculated using Equation (2).

$$E(R_i)=R_f+[E(R_m)-R_f]\times \beta_i \quad \ldots(2)$$

The model says that the expected return. $E(R_i)$ of security, i is the total of riskfree return R_f and the market risk premium $E[(R_m)-R_f]$ times β_i. Here $E(R_M)$ is expected return from the market index i.e., Nifty 50 in the present study.

$$\beta_i = \frac{\sigma_{i,M}}{\sigma_M^{2}} \quad \ldots(3)$$

Where $\sigma_{i,M}$ is the covariance between the returns of security i and market return; σ_M^2 is the variance of the market return.

3.4 Diagnosis of the Regression Assumptions

3.4.1. Normality of Residuals

The normality of the residuals has been tested using the Chi-square χ^2 test followed by the confirmation of the result with density function. If the p-value of the test statistic exceeds the significance level of 0.05, then the residuals can be considered normally distributed. The results of the tests have been presented in the appendix section and can be visually confirmed by Figure - A.1, Figure - A.2 and Figure - A.3.

3.4.2 Heteroscedasticity

The Breusch-Pagan test has been applied to check for heteroscedasticity. A p-value greater than the significance level of 0.05 indicates the absence of heteroscedasticity. The outcomes of this test are summarised in the appendix.

3.4.3 Multicollinearity

Multicollinearity is a problem which may arise in case of multiple regression such as equation (5), therefore, its testing becomes necessary. The Variance Inflation Factors (VIF) have been used to detect multicollinearity. A VIF value less than 10 is an indication of no serious multicollinearity. The variance inflation factors are shown in the appendix.

3.5 Tools Used

3.5.1 Lintner Test (1965)

Lintner's test is based on the first-pass regression (time-series regression) and the second-pass regression (cross-section regression). Let, there are *n* assets and their returns are obtained for T months. Further, we have the returns on a market index over the same period. After that the first-pass regression is run based on the following equation:

$$R_{it}=\alpha_i+\beta_i R_{mt}+u_{it} \quad \ldots(4)$$

Where is the historical return of a security i at a time t such that i = 1,2, 3, . . ., n and t = 1, 2, 3…, T; r_{mt} is the historical return of the market index, and u_{it} is the residual error. Furthermore, there are an equal number of regressions as securities. Therefore, equation (4) is run for n times to obtain the following the estimates of β_i and $Var(u_i)=S^2(u_i)$. Thereafter, the following cross-sectional regression is run

$$\bar{R}_i = \omega_1 + \omega_2\beta_i + \omega_3 S_2(u_i) + \varepsilon_i \quad \ldots(5)$$

The average return (denoted by $\bar{R}_i$ In (5)) calculated using Equation (6).

$$\bar{R}_i = \frac{1}{T}\left(\sum_{t=1}^{T} R_{it}\right) \quad ...(6)$$

where is the intercept, and are the coefficients of β_i and $S^2(u_i)$. Now, the Lintner (1965) null hypothesis (H_{o1}) is that:

$$H_{o1} : \omega_1 = R_f ; \omega_2 = R_m - R_f ; \omega_3 = 0$$

Thus, if the CAPM is valid under the Lintner's framework, the ω_1 should predict the riskfree rate; should predict market premiums and $S^2(u_i)$ should not play any role.

3.5.2 Miller and Scholes Test (1972)

The methodology suggested by Miller and Scholes is more or less the same as Lintner's test. The difference lies in the fact that apart from Equation (5) they run two more cross-regression equations given below:

$$\bar{R}_i = \gamma_1 + \gamma_2 \beta_i + e_i \quad ...(7)$$

$$\bar{R}_i = \phi_1 + \phi_2 S^2(u_i) + \varepsilon_i \quad ...(8)$$

Their null hypotheses are:

$$H_{o1} : \omega_1 = R_f ; \omega_2 = R_m - R_f ; \omega_3 = 0$$

$$H_{o2} : \gamma_{2=0}$$

$$H_{o3} : \phi_{2=0}$$

3.5.2 Black, Jensen and Scholes Test (1972) or BJS Test

Black, Jensen and Scholes suggested a time-series test to test the CAPM. They used the following equation for each security i:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + u_{it} \quad ...(9)$$

The left-hand side of Equation (9) is called the excess return ExR_i of security i over the risk-free return, while the expression. R_{mt}-R_{ft} on the right-hand side is called market risk premium or the excess return of the market portfolio over the risk-free return denoted by ExR_m The BJS null hypothesis for the validity of the CAPM is that should be statistically zero for each security. Thus, their null hypothesis is

$$H_{o4} : \alpha_i = 0.$$

4. Results and Discussion

4.1 Lintner Test

Table 1 summarises the first-pass regression results. The values of these betas have been used to run the second-pass regression.

The cross-sectional regression results are shown in Table 2. The discouraging result, which does not support beta as a measurement of risk, is that there is a positive (but insignificant relationship being the p-value 0.1117 greater than the significance level 0.05) between the average return and the systematic risk. Therefore, the systematic risk does not have good power to explain the average returns. Thus, the CAPM is partially supported here with regard to the prediction of a positive relationship between the average returns and the systematic risk. Panel (A) of Figure 1 shows this relationship. There is a positive and significant relationship (the p-value 0.0022 being less than the significance level 0.05) between the average return and the variance of residuals. Thus, the variance of the residuals significantly explains the average returns. Panel (B) of Figure 1 graphs this relationship. The p-value of the F-statistic is less than the significance level of 0.05, therefore, the R^2 0.3517 is significant. In this way, the systematic risk β_i a variance of residuals $S^2(u_i)$ significantly explain the average returns. The intercept term is 0.007078 while the actual average 91-T bills yield serving as the risk-free rate is 0.005129. Thus, the risk-free rate predicted by the model is marginally greater than the average risk-free rate. The market risk estimated by the model is 0.003775 or 00.3775 per cent, however, the actual average market return on the portfolio is calculated to be 0.00722 or 00.722 per cent. Thus, the model undervalues the market return.

According to the CAPM, the expected return of security must be linearly related to its systematic risk (beta). While the findings of Lintner (1965) showed a significant relationship with an R^2 of 0.541, our study

Table 1. The first-pass regression

Nifty 50 Stocks Symbols*	αi	$\bar{R}_i$	β_i	S2(ui)
ADANIENT	0.020387	0.03237	1.65941	0.02782
ADANIPORTS	0.007144	0.01604	1.23270	0.00762
APOLLOHOSP	0.016334	0.02022	0.53818	0.00799
ASIANPAINT	0.015772	0.02045	0.64790	0.00438
AXISBANK	0.005285	0.01604	1.48923	0.00459
BAJAJ-AUTO	0.012090	0.01934	1.00495	0.00596
BAJAJFINANCE	0.027065	0.03826	1.55078	0.00903
BAJAJFINSV	0.01724	0.02841	1.54645	0.01271
BPCL	0.007333	0.01470	1.02020	0.00754
BHARTIAIRTL	0.002327	0.00760	0.73085	0.00538
BRITANNIA	0.018763	0.02217	0.47188	0.00459
CIPLA	0.007803	0.01066	0.39631	0.00522
COALINDIA	-0.002622	0.00039	0.41694	0.00463
DIVISLAB	0.012996	0.01644	0.47660	0.00739
DRREDDY	0.011896	0.01469	0.38656	0.00596
EICHERMOT	0.025689	0.03199	0.87339	0.00784
GRASIM	0.003865	0.01121	1.01714	0.00524
HCLTEC	0.014943	0.02012	0.71665	0.00670
HDFCBANK	0.009342	0.01666	1.01325	0.00160
HDFCLIFE	0.000941	0.00271	0.24465	0.00188
HEROMOTOCO	0.004993	0.01026	0.72909	0.00507
HINDALCO	0.003065	0.01439	1.56881	0.00913
HINDUNILVR	0.013310	0.01558	0.31390	0.00393
HDFC	0.005224	0.01258	1.01873	0.00218
ICICIBANK	0.005308	0.01619	1.50764	0.00385
ITC	0.00800	0.01155	0.49163	0.00309
INDUSINDBANK	0.011841	0.02439	1.73836	0.00703
INFY	0.010977	0.01483	0.53370	0.00551
JSWSTEEL	0.010372	0.02128	1.51128	0.01078
KOTAKBANK	0.008954	0.01862	1.33882	0.00433
LT	0.001849	0.01182	1.38078	0.00384
M&M	0.007519	0.01539	1.08971	0.00506
MARUTI	0.010283	0.01775	1.03469	0.00582
NTPC	-0.001749	0.00331	0.70032	0.00424
NESTLEINDIA	0.011004	0.01278	0.24654	0.00245
ONGC	-0.003255	0.00386	0.98586	0.00496
POWERGRID	0.003851	0.00828	0.61309	0.00274
RELIANCE	0.0042210	0.01172	1.03870	0.00366
SBILIFE	0.002143	0.00407	0.26724	0.00211
SBIN	0.002950	0.01276	1.35960	0.00581
SUNPHARMA	0.011058	0.01492	0.53559	0.00562

Table 1. Continued...

Nifty 50 Stocks Symbols*	αi	$\bar{R}_i$	β_i	S2(ui)
TCS	0.014156	0.01826	0.56858	0.00460
TATACONSUM	0.009851	0.01593	0.84211	0.00533
TATAMOTORS	0.006088	0.01845	1.71238	0.01217
TATASTEEL	0.000378	0.01221	1.63947	0.01005
TECHM	0.009161	0.01657	1.02642	0.00874
TITAN	0.019723	0.02637	0.92103	0.00640
UPL LTD.	0.009308	0.01830	1.24557	0.00759
ULTRACEMCO	0.009931	0.01714	0.99927	0.00525
WIPRO	0.006341	0.01107	0.65543	0.00602

* https://finance.yahoo.com/quote/%5ENSEI/components/
Source: Authors' calculation.

Table 2. The second-pass regression

Correlation and Allied Statistics	
Multiple R	0.593050632
R^2	0.351709052
Adjusted R^2	0.324122203
Standard Error	0.006138035
Observations	50

ANOVA

	Df	MS	F-stat	p-value
Regression	2	0.00048	12.74916	0.0000(Significant)*
Residual	47	0.00000		
Total	49			
Variables	Coefficients	t-stat	p-value	Remarks
ω_1	0.007078	3.351432	0.0016	Significant*
β_i	0.003775	1.621255	0.1117	Insignificant*
$S^2(u_i)$	0.833352	3.233321	0.0022	Significant*

*At 5% significance level.
Source: Authors' calculation.

found an R^2 of 0.3517, but yes, the average returns are positively related to systematic risk. This discrepancy may be credited to the specific issues of the Indian stock market e.g., higher volatility which differs from the mature markets where the CAPM was initially developed and the time has its impact.

However, this difference in results is consistent with the findings of Fama and French (1992), where beta is reported to be not the only factor explaining average returns. Fama and French (1993) found that size and value factors apart from beta were more significant in explaining stock returns. Our results reinforce this notion, suggesting that while beta is insignificant, it is insufficient on its own in the context of the Nifty 50, which may be influenced by additional risk factors not captured by the CAPM.

One key finding of our study is the significant role of residual variance in explaining average returns, a result consistent with Miller and Scholes (1972). They concluded that the residual variance (representing idiosyncratic risk) could contribute to explaining returns. In contrast to the CAPM's assumption that only systematic risk is priced, our findings suggest that idiosyncratic risk plays a non-negligible role in the Indian market. This aligns with the results of the study by Bali *et al*. (2011), who found that idiosyncratic volatility is a priced risk factor in certain markets.

This may imply that in less efficient or emerging markets, where stock prices are more prone to mispricing, investors demand compensation for both systematic and idiosyncratic risks. The underdeveloped arbitrage mechanisms in such markets may prevent the elimination of idiosyncratic risk, thereby leading to its significance in explaining returns.

The partial validation of the CAPM in our study suggests that while systematic risk (beta) is important, it is not the sole determinant of asset returns in the Indian market. This supports the argument by Roll (1977), who pointed out that the CAPM's assumptions, particularly the market portfolio assumption, may not hold in real-world scenarios, especially in emerging markets like India.

Further, there is a significant relationship between residual variance and returns suggesting that investors in India may also consider the factors other factors. This challenges the core prediction of the CAPM that only beta can explain the returns. This finding encourages a reconsideration of asset pricing models in India, as market inefficiencies and investor behaviour may lead to deviations from the theoretical propositions of the CAPM.

4.2 Miller and Scholes Test

The Miller and Scholes test results are shown in Table 3. The interpretation of the regression results of Equation (5) is the same as that of Lintner's test. With reference to the regression of Equation (7), it shows that systematic risk significantly explains the average return because the p-value is less than the significance level of 0.05. However, the R^2 is only 0.19099 which is the lowest among the three equations, and the predicted risk-free rate is 0.008572, which is marginally higher than the average risk-free rate of 0.005129. With reference to Equation (8), the variance of the residuals significantly explains the average returns because the p-value does not cross the significance level of 0.05.

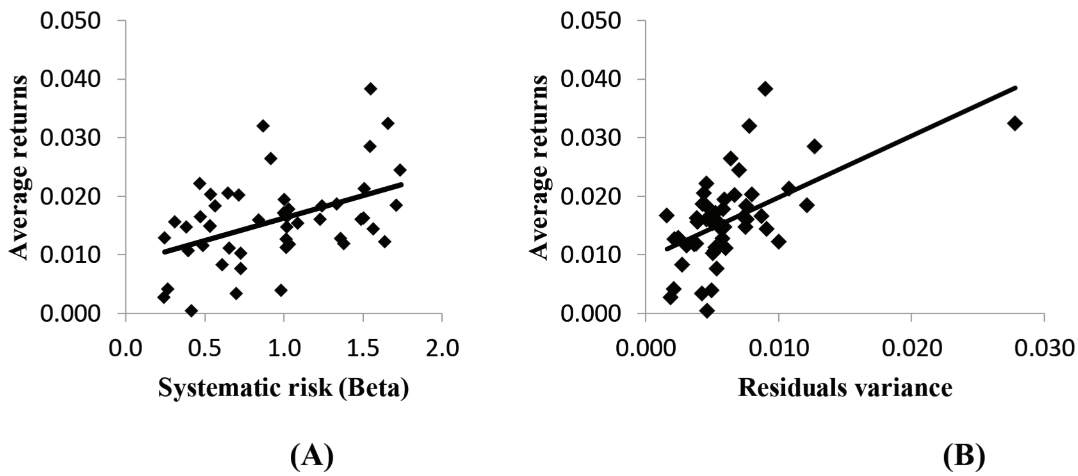

Figure 1. Relationship between average returns residuals variance.
Source: Authors' creation.

4.3 Black, Jensen and Scholes Test

Table 4 shows the time series regression results obtained from Equation (9). According to the table, the ExR_m is positively related to For each security. Moreover, all the p-values against the betas are zero implying (except Coal India Ltd.) that ExR_m is significant in explaining the excess returns. As far as the alphas are concerned, they are significantly different from zero in 38% (19 securities out of 50) of the cases and not significantly different from zero in 62% of the cases, as shown in Figure 2. However, the CAPM is not empirically supported by the test because all the alphas are not significantly equal to zero. Thus, the BJS null hypothesis is rejected in 62% of cases.

The finding that 38% of the securities have statistically significant non-zero alphas is an important critique of the CAPM and the efficient market hypothesis. The CAPM postulates that the alpha of a well-priced security (if markets are efficient) must be zero. However, consistent with Black *et al*. (1972), our study shows that many securities have significant alphas, suggesting potential inefficiencies in the market. These are results consistent with the conclusions of Basu (1977), stating that the Indian stock market shows certain inefficiencies creating challenges for the CAPM to fully account for the security returns. Further, studies such as Fama (1991) have raised questions on the ability of the CAPM to explain security returns in emerging markets, which are often less efficient due to various reasons like weaker regulation, and asymmetry of information. The results of this study are consistent with such studies, seeking the need for more sophisticated models of asset pricing.

Table 3. The second-pass regression

Coefficient Standard error t-statistic p-value	0.007078 (0.002112) 3.351432 0.0016	0.003775 (0.002329) 1.621255 0.1117 Insignificant*	0.833352 (0.257738) 3.2333210.0022 Significant*	R^2 = 0.3517 Adjusted R^2 = 0.32412	Equation (5)
Coefficient standard error t-statistic p-value	0.008572 (0.002173) 3.54519 0.0009	0.007704 (0.002174) 3.545194 0.0004 Significant*	-	R^2 = 0.19099	Equation (7)
Coefficient standard error t-statistic p-value	0.009272 (0.00165) 5.623921 0.0000	-	1.051418 (0.22356) 4.703128 0.0000 Significant*	R^2 = 0.30119	Equation (8)

*At 5% significance level
Source: Authors' calculation.

Table 4. The BJS test results

Nifty 50 Stocks Symbols	α_i	P-value	β_i	P-value	R2
ADANIENT	0.0644	0.0000	1.7130	0.0000	0.3267
ADANIPORTS	0.0215	0.0118	1.2296	0.0000	0.4722
APOLLOHOSP	-0.0070	0.4227*	0.6359	0.0000	0.1813
ASIANPAINT	-0.0035	0.5902*	0.6965	0.0000	0.3297
AXISBANK	0.0320	0.0000	1.4204	0.0000	0.6586
BAJAJ-AUTO	0.0137	0.0685*	1.0285	0.0000	0.4439
BAJAJFINANCE	0.0590	0.0000	1.5072	0.0000	0.5307
BAJAJFINSV	0.0482	0.0000	1.4902	0.0000	0.4389
BPCL	0.0054	0.5193*	0.9628	0.0000	0.3558

Table 4. Continued...

Nifty 50 Stocks Symbols	α_i	P-value	β_i	P-value	R2
BHARTIAIRTL	-0.0131	0.0668*	0.7550	0.0000	0.3223
BRITANNIA	-0.0133	0.0409	0.4865	0.0000	0.1925
CIPLA	-0.0253	0.0005	0.4771	0.0000	0.1600
COALINDIA	0.0332	0.0005	-0.1322	0.2206**	0.0084
DIVISLAB	-0.0167	0.0466	0.5287	0.0000	0.1446
DRREDDY	-0.0207	0.0075	0.4892	0.0000	0.1476
EICHERMOT	0.0166	0.0537*	0.8517	0.0000	0.2947
GRASIM	0.0066	0.3486*	1.0471	0.0000	0.4848
HCLTEC	0.0004	0.9632*	0.7724	0.0000	0.2836
HDFCBANK	0.0092	0.0186	0.9958	0.0000	0.7355
HDFCLIFE	-0.0410	0.0000	0.3377	0.0000	0.1989
HEROMOTOCO	-0.0114	0.0983*	0.7373	0.0000	0.3264
HINDALCO	0.0383	0.0000	1.5661	0.0000	0.5528
HINDUNILVR	-0.0270	0.0000	0.3573	0.0000	0.1296
HDFC	0.0058	0.2027*	1.0077	0.0000	0.6762
ICICIBANK	0.0345	0.0000	1.4642	0.0000	0.7142
ITC	-0.0203	0.0003	0.5523	0.0000	0.3020
INDUSINDBANK	0.0538	0.0000	1.6646	0.0000	0.6369
INFY	-0.0137	0.0607*	0.6121	0.0000	0.2294
JSWSTEEL	0.0430	0.0000	1.5247	0.0000	0.4979
KOTAKBANK	0.0264	0.0000	1.2723	0.0000	0.6217
LT	0.0230	0.0002	1.3335	0.0000	0.6727
M&M	0.0149	0.0309	1.1229	0.0000	0.5299
MARUTI	0.0112	0.1327*	1.0115	0.0000	0.4409
NTPC	-0.0181	0.0049	0.7429	0.0000	0.3668
NESTLEINDIA	-0.0318	0.0000	0.3214	0.0000	0.1552
ONGC	-0.0036	0.5994*	0.9958	0.0000	0.4731
POWERGRID	-0.0174	0.0008	0.6640	0.0000	0.4145
RELIANCE	0.0073	0.2113*	1.0517	0.0000	0.5759
SBILIFE	-0.0380	0.0000	0.3666	0.0000	0.2053
SBIN	0.0238	0.0015	1.3314	0.0000	0.5784
SUNPHARMA	-0.0154	0.0351	0.5797	0.0000	0.2112
TCS	-0.0088	0.1876*	0.6396	0.0000	0.2802
TATACONSUM	0.0026	0.7150*	0.8889	0.0000	0.3980
TATAMOTORS	0.0489	0.0000	1.6849	0.0000	0.5158
TATASTEEL	0.0398	0.0000	1.6321	0.0000	0.5498
TECHM	0.0111	0.2228*	1.0313	0.0000	0.3535
TITAN	0.0158	0.0434	0.9386	0.0000	0.3817
UPL LTD.	0.0207	0.0159	1.1740	0.0000	0.4464
ULTRACEMCO	0.0100	0.1549*	1.0017	0.0000	0.4621
WIPRO	-0.0111	0.1447*	0.7282	0.0000	0.2798

*significantly different from zero at a 5% significance level.
**insignificant at 5 percent significance level.
Source: Authors' calculation.

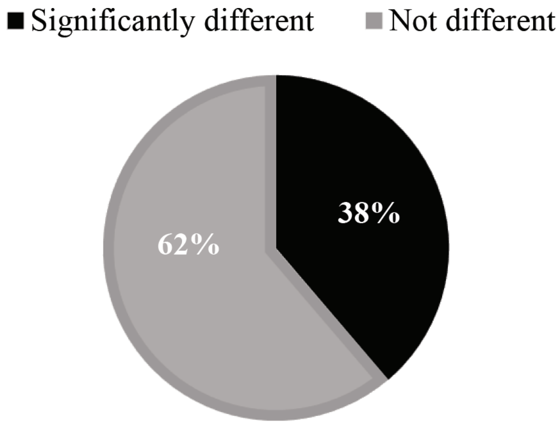

Figure 2. The percentage of the cases in which α_i is significantly different from zero.
Source: Author's creation.

5. Conclusion

The beta of a security is an important factor in its pricing and is positively related to its average returns, but the findings of this study do not completely fit with this notion. Although a positive relationship between beta and average returns is observed, it is statistically insignificant. Additionally, the estimate of the risk-free rate is fairly good (though a slightly higher estimate). Further, it appears that the variance of residuals significantly explains average returns, consistent with Lintner's conclusions. The study further aligns with the findings of Miller and Scholes (1972). Their cross-sectional study established a positive and significant relationship between beta and average returns, a result partially mirrored in this data. Additionally, the relationship between residual variance and average returns reinforces their conclusion.

Despite these partial confirmations of previous works, this report suggests a more cautious interpretation of the CAPM's validity. Black *et al*. (1972) concluded that the CAPM could not be empirically dismissed. In this regard, our results show that some securities have alphas equal to zero indicating a deviation from the core prediction of the CAPM that all alphas must be zero. This deviation implies inefficiency in the National Stock Exchange, which weakens the empirical support for the CAPM and challenges the efficient market hypothesis.

This study reveals that stock analysts should be cautious when relying on the CAPM for security pricing. They should consider its empirical validation. The CAPM may misrepresent expected returns under current market conditions of inefficiency. Therefore, practitioners should use multi-factor models like the Fama-French three or five-factor model which may offer more accurate explanations of asset returns in the Indian market. This study suggests the need for a refined approach in asset pricing models, specifically when applied to emerging markets like India. In addition, the findings further suggest that the SEBI and other regulatory bodies should look for measures to enhance market efficiency. This suggests that researchers can take into account more factors e.g., value, size, or momentum, to understand the market behavior more effectively. As far as the limitations of the study are concerned, this study is based on Nifty 50 only over the period (2008–2023). Considering other market indices (e.g., Nifty 100 or 500) or changing the timeframe may generate additional insights into the applicability of the CAPM. Moreover, the Indian stock market is not defined by the NSE only, therefore, the study could not be generalised to the entire Indian stock market. There is substantial room for further investigation into alternative models that may better capture the complexities of asset pricing in Indian markets. Researchers could explore the integration of behavioural finance theories to address market inefficiencies or test the validity of multi-factor models across different periods and market segments. Additionally, future work could assess the impact of regulatory changes or policy interventions by SEBI on market efficiency and investor behaviour.

6. Appendix

6.1 Lintner Test

6.1.1 Normality of Residuals from Equation (5).

Test Statistic : $\chi^2 = 4.111$ with p-value $\chi^2(2) > 4.111 = 0.12803$

Result: A P-value greater than 0.05 indicates that residuals are appropriately normally distributed as confirmed by Figure A.1.

6.1.2 Breusch-Pagan Diagnosis Heteroskedasticity

Null Hypothesis: There is no Heteroskedasticity.
Test Statistic: LM = 0.4832 with p-value = 0.7853
Result: No heteroskedasticity is present.

6.1.3 Variance Inflation Factors (VIF)

Beta: 1.375
Residuals: 1.375
Result: No multicollinearity is observed because VIF <10.

6.2 Miller and Scholes Test

6.2.1 Normality of Residuals in Equation (7)

Test statistic: $\chi^2 = 2.811$ with p-value χ^2 (2) > 2.811 = 0.2452

Result: A P-value greater than 0.05 indicates that residuals are appropriately normally distributed as confirmed by Figure A.2 also.

6.2.2 Breusch-Pagan Diagnosis Heteroskedasticity

Null hypothesis: There is no Heteroskedasticity.
Test statistic: LM = 0.536178 with p-value = 0.464021.

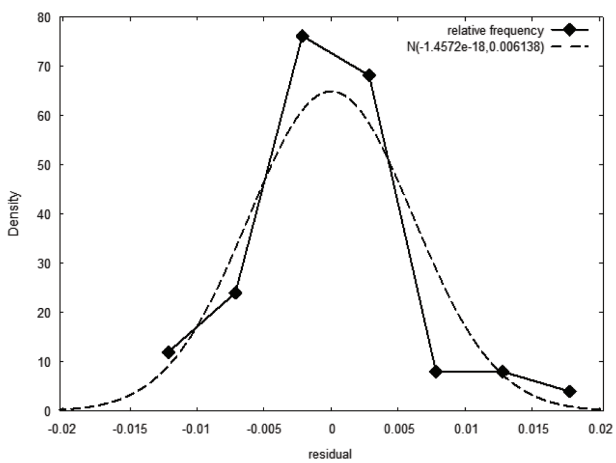

Figure A.1. Normality of residuals.

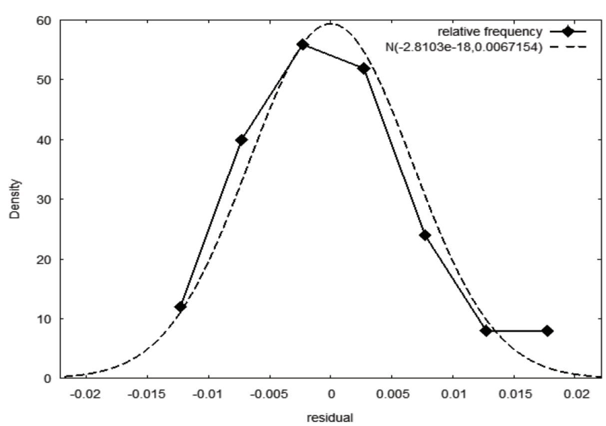

Figure A.2. Normality of residuals.

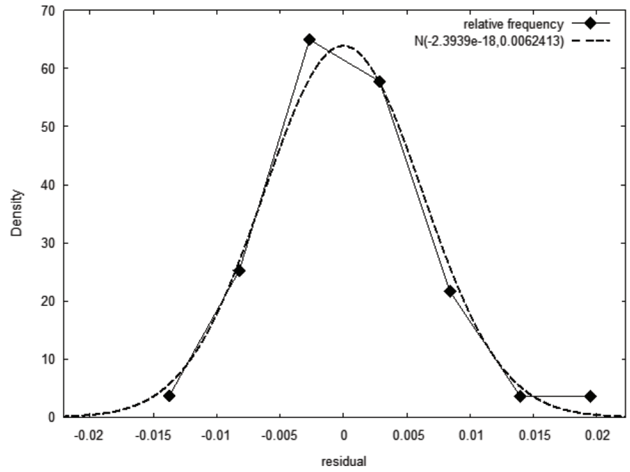

Figure A.3. Normality of residuals.

Result: No heteroskedasticity is present.

6.2.2 Normality of Residuals from Equation (8)

Test Statistic : $\chi^2 = 5.465$ with p-value χ^2 (2) > 5.465 = 0.0651

Result: A P-value greater than 0.05 indicates that residuals are appropriately normally distributed as confirmed by Figure A.3 also.

6.2.3 Breusch-Pagan Diagnosis Heteroskedasticity

Null hypothesis: There is no Heteroskedasticity.

Test Statistic: LM = 0.513844 with p-value =0.473480.
Result: No heteroskedasticity is present.

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