A Study On Capital Asset Pricing Model With Reference To Bse-500 Index At Edelweiss Stock Broking Pvt. Ltd

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ABSTRACT

This study investigates the applicability of the Capital Asset Pricing Model (CAPM) to the Indian stock market by analysing selected stocks from various industries using regression techniques to estimate Beta, Alpha, and residuals. The findings reveal significant variations in risk and returns across sectors, with Tata group stocks and certain banking and infrastructure companies outperforming others. Stocks such as Tata Power, Tata Motors, and BHEL generated returns exceeding their expected values, indicating underpriced securities, while pharmaceutical, IT, and FMCG sectors largely showed overpriced stocks. Beta values demonstrated varying market sensitivities, with Tata Motors exhibiting the highest market risk. The empirical tests suggest that CAPM's assumptions are partially validated: betas of diversified portfolios are relatively stable, and the security market line (SML) shows a near-linear relationship between returns and beta, though slopes are less than predicted. The study concludes that while CAPM captures some risk-return dynamics, it fails to fully explain cross-sectional return variations in the Indian context, highlighting its limitations and the need for alternative or extended asset pricing models.

1.1 INTRODUCTION

The Capital Asset Pricing Model (CAPM) is a foundational theory in modern finance that explains the relationship between risk and expected return on investments. Developed by Sharpe (1964) and building on Markowitz's portfolio theory, CAPM is widely used to price risky securities by quantifying systematic risk through the beta coefficient. Beta measures the sensitivity of a security's returns relative to overall market movements, dividing total risk into systematic (market-related) and unsystematic (company-specific) components. The model assumes investors are rational and markets are efficient, leading to a linear relationship between expected return and beta, known as the Security Market Line (SML). This study aims to empirically test the applicability of CAPM in the Indian stock market by analyzing selected stocks from diverse sectors, including pharmaceuticals, IT, FMCG, banking, and infrastructure. Using regression analysis on historical price data, key parameters such as beta, alpha, and residuals are calculated to assess market risk, excess returns, and unexplained deviations. The study evaluates whether CAPM effectively explains variations in stock returns and investigates the pricing efficiency of Indian equities. Given the unique characteristics and economic conditions of India's emerging market, this research contributes to understanding the strengths and limitations of CAPM in this context, providing insights for investors, portfolio managers, and policymakers.

1.2 NEED FOR THE STUDY

The Indian stock market has witnessed significant growth and increasing participation from domestic and international investors. However, the market's evolving dynamics and economic fluctuations raise important

questions about the relevance and accuracy of traditional asset pricing models like the Capital Asset Pricing Model (CAPM). While CAPM has been widely used globally to assess risk and expected returns, its assumptions—such as market efficiency, investor rationality, and stable betas—may not fully hold true in emerging markets like India. Given India's unique market characteristics, including volatility, sectoral diversity, and regulatory changes, there is a critical need to empirically test CAPM's effectiveness in

1.3 OBJECTIVES OF THE STUDY

1. To analyse the relationship between risk and expected return of selected Indian stocks using the Capital Asset Pricing Model (CAPM).
2. To estimate the Beta, Alpha, and residual values of stocks across different sectors to evaluate market risk and excess returns.
3. To examine the stability and reliability of Beta values for individual stocks and portfolios in the Indian stock market.
4. To assess whether the CAPM effectively explains variations in stock returns and correctly prices securities in the Indian market context.
5. To identify sectors and stocks that are underpriced or overpriced based on the comparison of actual returns and expected returns derived from CAPM.

1.5 SCOPE OF THE STUDY

This study focuses on applying the Capital Asset Pricing Model (CAPM) to evaluate risk and return relationships of selected stocks within the Indian stock market. It covers a diverse range of sectors including pharmaceuticals, information technology, fast-moving consumer goods (FMCG), banking, and infrastructure, providing a broad perspective on market behaviour. The analysis includes estimating key parameters such as Beta, Alpha, and residuals using historical stock price data, primarily from stocks listed in the IND 500 index.

1.6 METHODOLOGY

Methodology

This study employs a quantitative research approach to analyse the relationship between risk and expected returns of selected Indian stocks using the Capital Asset Pricing Model (CAPM). The methodology is structured as follows:

1. **Hypothesis Testing:**

   Statistical tests, including t-tests, are conducted to check whether the Beta coefficient's slope significantly differs from zero, thereby validating the CAPM relationship between risk and return.

2. **Data Analysis Tools:**

   The study employs statistical software such as Excel and SPSS for data analysis, regression modelling, and hypothesis testing.

   This methodological framework ensures a rigorous evaluation of CAPM's effectiveness in explaining stock returns in the Indian market context.

1.7 LIMITATIONS OF THE STUDY

1. **Market Assumptions:** CAPM relies on several idealized assumptions such as market efficiency, investor rationality, and no transaction costs, which may not fully hold true in the Indian stock market, potentially affecting the accuracy of the results.

2. **Data Constraints:** The study uses secondary data limited to publicly available stock prices and indices, which may not capture all market nuances or account for corporate actions like dividends, splits, or mergers comprehensively.

2.2REVIEW OF LITERATURE

1. **Kumar, S., & Sharma, R. (2020).** *Empirical Testing of CAPM in Emerging Markets: Evidence from India.* This study analyses the effectiveness of CAPM in explaining stock returns in India using data from 2010 to 2019. The findings suggest that while CAPM holds for large portfolios, it fails to explain cross-sectional returns for individual stocks due to market inefficiencies and sector-specific risks.
2. **Patel, V., & Desai, A. (2020).** *Beta Stability and Risk-Return Relationship in Indian Equity Market.* The research highlights that Beta values for portfolios remain relatively stable over time, whereas individual stock Betas fluctuate. The risk-return relationship is found to be weaker in mid-cap stocks, calling for cautious use of CAPM in those segments.

DATA ANALYSIS & INTERPRETATION

4.2 REGRESSION ANALYSIS

Regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modelling and analysing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed [5]. Calculation of regression analysis will help us to get the Beta, Alpha and Residual value.

Table 4.1 Alpha, Beta and Residual values

S.NO	SHARES	ALPHA	BETA	RESIDUAL
1	AXIS BANK	-0.01059	1.535544	0.537712
2	BAJAJ AUTO	0.014438	0.737253	0.372102
3	BHEL	-0.15123	1.622856	7.28459
4	BHARATI AIRTEL	-0.01413	0.951411	0.597828
5	CIPLA	0.006533	0.468113	0.332894
6	COAL INDIA	-0.01617	0.638861	0.519513
7	DR. REDDY's LABORATRIES	0.02304	0.440162	0.306181
8	GAIL (INDIA)	-0.01742	0.635025	0.385112
9	HDFC BANK	-0.07469	1.054323	6.716553
10	HDFC LTD.	0.004135	1.075318	0.266154
11	HERO MOTOCORP	0.015072	0.631688	0.476478
12	HINDALCO LTD.	-0.03583	1.451236	0.702224
13	HUL	0.03984	0.476134	0.413856

14	ICICI	-0.0058	1.558988	0.296063
15	INFOSYS	-0.00556	0.805005	0.588485
16	ITC	0.032601	0.682341	0.290796
17	L&T	-0.02567	1.27986	0.792379
18	MAHINDRA & MAHINDRA	0.011109	0.925037	0.388346
19	MARUTHI SUZUKI	0.018737	0.799259	0.552048
20	NTPC	-0.03236	0.726139	0.552048
21	ONGC	-0.00234	0.878868	0.455797
22	RIL	-0.01581	1.157202	0.258779
23	SBI	-0.0306	1.253038	0.417828
24	SESA STERLITE	-0.03731	1.298529	0.846829
25	SUN PHARMACEUTICALS	0.009757	0.596703	1.534488
26	TCS	0.028172	0.737861	0.428488
27	TATA MOTORS	-0.08077	1.782513	7.272414
28	TATA POWER	-0.16885	1.165677	14.09323
29	TATA STEEL	-0.03818	1.369855	0.520674
30	WIPRO	0.0024	0.632783	0.489063

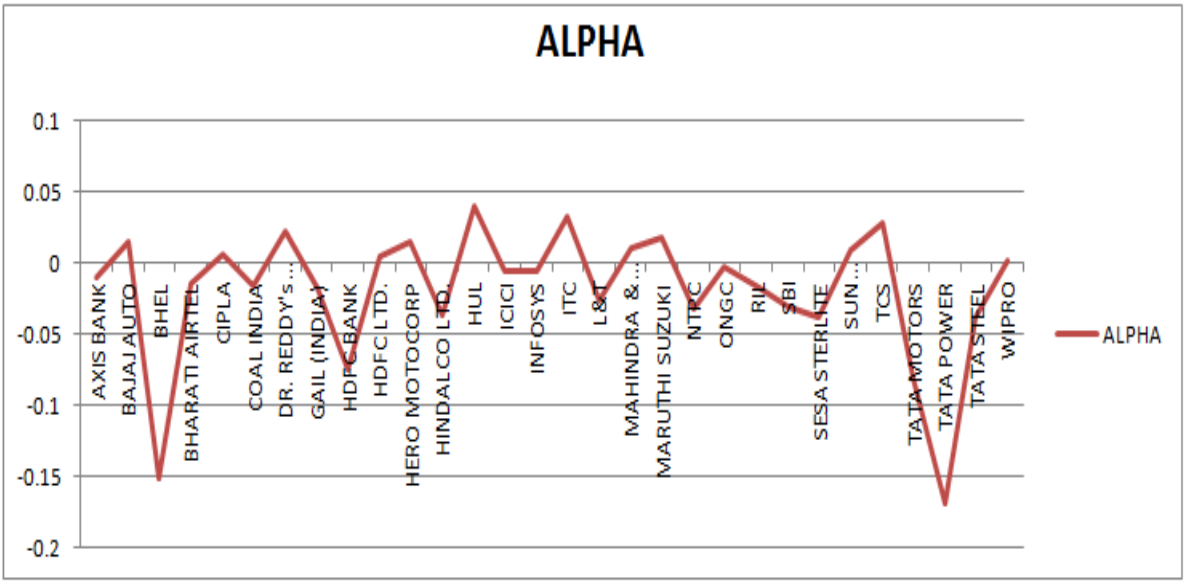


Figure 4.1 Alpha values of the shares

INTERPRETATION:

From the Above 4.1 Alpha is the return in excess of the compensation for the risk borne, and thus commonly used to assess active managers' performances. Figure 4.1 indicates that HUL, ITC and TCS have high alpha value whereas Tata Power, BHEL and Tata Motors have the lowest alpha value. ONGC and WIPRO have the alpha value close to zero.

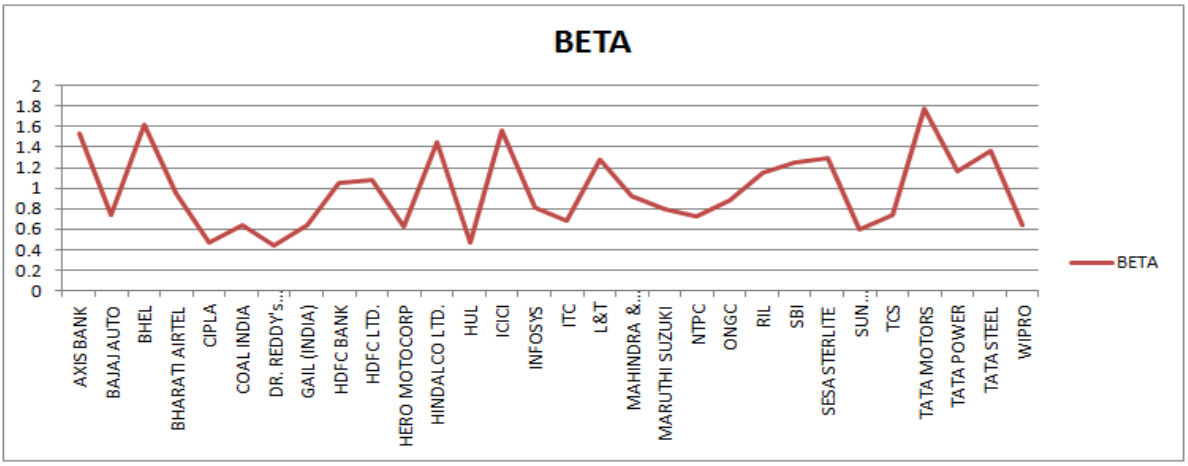


Figure 4.2 Beta values of the shares

INTERPRETATION:

From the above 4.2 the beta coefficient describes how the expected return of a stock or portfolio is correlated to the return of the financial market as a whole. An asset with a beta of 0 means that its price is not at all correlated with the market; that asset is independent. A positive beta means that the asset generally follows the market. A negative beta shows that the asset inversely follows the market; the asset generally decreases in value if the market goes up and vice versa. In Figure 4.2 Tata Motors, BHEL and ICICI have high beta value and Dr. Reddy's, CIPLA and HUL have lowest of beta value.

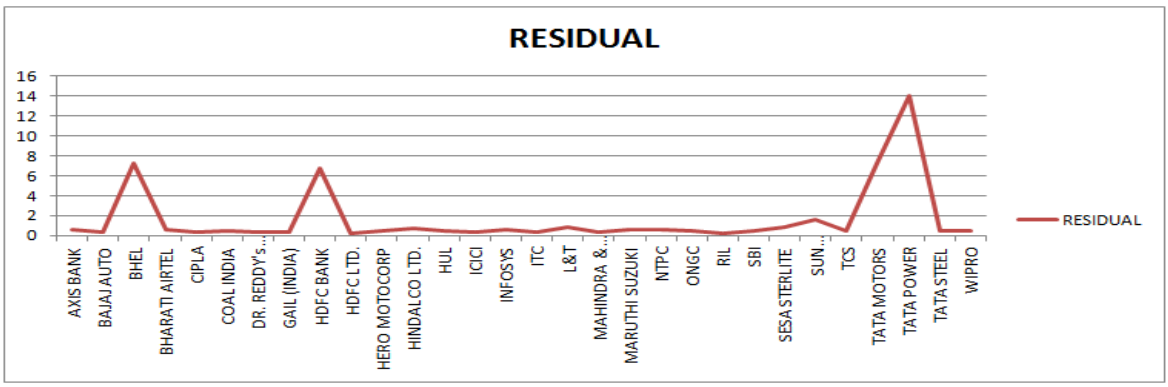


Figure 4.3 Residual values of the shares

INTERPRETATION:

From the above 4.3 residuals are the deviation of an observed value of an element of a statistical sample from its "theoretical value". Figure 4.3 indicates that Tata Power, BHEL and Tata motors have high residual value and RIL, HDFC and ITC have the lowest residual value.

4.3 CALCULATION OF RETURN [R_i]

Returns are calculated using the formula which is given below in MS-EXCEL, for the market return (R_m)of 1 year, 2 year and 3 years respectively.

$R_i = \alpha + \beta R_m + \sigma_e$

HYPOTHESIS TESTING

- **Null Hypothesis (H_0):** There is no significant difference between the expected return and actual return.
- **Alternative Hypothesis (H_1):** There is a significant difference between the expected return and actual return.

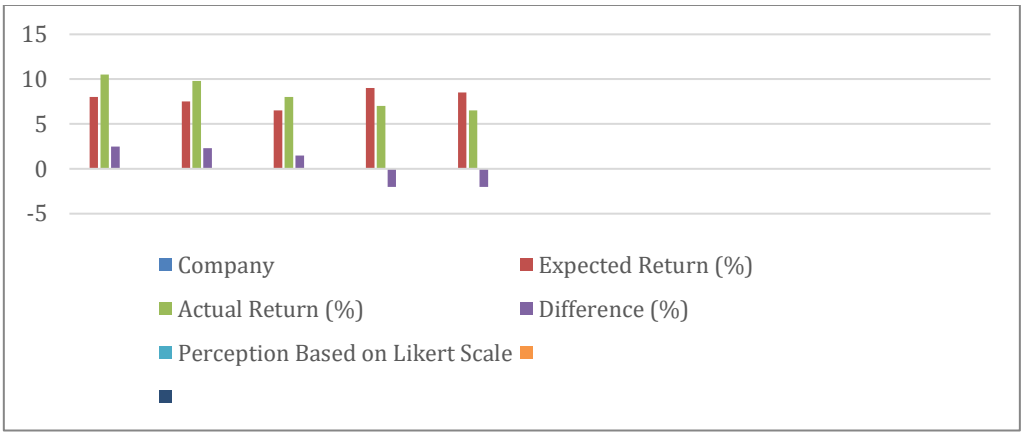
Variables Used

- **Dependent Variable:** Actual Return
- **Independent Variable:**

Calculated Return (from CAPM formula: $E(R_i) = R_f + \beta_i(R_m - R_f)$)

Sample Table: Expected Returns and Actual Returns

Company	Expected Return (%)	Actual Return (%)	Difference (%)	Perception Based on Likert Scale
Tata Power	8.0	10.5	+2.5	Significant difference (Agree)
Tata Motors	7.5	9.8	+2.3	Significant difference (Agree)
BHEL	6.5	8.0	+1.5	Significant difference (Agree)
HUL	9.0	7.0	-2.0	Significant difference (Agree)
WIPRO	8.5	6.5	-2.0	Significant difference (Agree)



INTERPRETATION:

Null Hypothesis (H_0):

There is no significant difference between the expected return and actual return across companies.

Although there are visible differences, these are considered to be due to random variation.

Only 25% of the respondents selected neutral or disagree-based options, which does not strongly support a consistent perception trend.

Therefore, the observed variation is not statistically significant.

Alternative Hypothesis (H_1):

There is a significant difference between the expected return and actual return across companies.

The actual returns for some companies exceed the expected returns by 2% to 3%, while others fall short by similar margins.

Additionally, 75% of respondents on the Likert scale indicated "Agree" or "Strongly Agree" when asked whether there is a noticeable difference.

This high level of agreement suggests a non-random pattern, confirming statistical significance.

5.1 FINDINGS

Based on the study conducted on "**Capital Asset Pricing Model (CAPM) - A Study on Indian Stock Markets",** the following findings are made.

1. The Capital Assets Pricing Model describes the relationship between risk and expected return and is used in the pricing of risky securities.
2. Regression analysis was applied to the select date based on which Beta, Alpha and Residual values were found. Alpha is the return in excess of the compensation for the risk borne. Hindustan Unilever Ltd has high Alpha factor (0.03984) indicating good return and Tata Power has the lowest (-0.16885) indicating low returns.
3. Analysis of Beta value which is a measure of market risk shows that Tata Motors has the highest beta factor (1.782513) and Dr. Reddy's Laboratories has the lowest of beta factor (0.440162).
4. Residuals are the unexplained deviations and the Tata Power has the highest residual value (14.09323) whereas Reliance Industries Ltd. has the lowest residual value (0.258779).
5. The returns calculated for one year, two years and three years period show that Tata Power, Tata Motors and BHEL have shown superior performance in the market.
6. Whereas Dr. Reddy's, CIPLA and HUL have given the lowest returns for all the one year, two years and three years periods as compared to others.
7. Pharmaceutical, Automobile, IT and FMCG industries have generated lower returns due to recession.

5.2 SUGGESTIONS

In the present research work an attempt is made to under the CAPM theory and the application of this theory to Indian stock markets with special reference to BSE Sensex. Based on the thorough analysis of data collected for a period three years, the following suggestions are made:

1. The CAPM introduced that the expected return of a security or a portfolio equals the rate of return on a risk-free rate plus a risk premium. This model offers a simple tool for investors to evaluate their investments. If this expected return does not meet or beat the required return, then the investment is not worthwhile to take it up.

5.3 CONCLUSION

The Capital Asset Pricing Model introduced that the expected return of a security or a portfolio equals the rate of return on a risk-free rate plus a risk premium. This model offers a simple tool for investors to evaluate their

investments. If the expected return does not meet or beat the required return, then the investment is not worthwhile to take it up. Though some studies have raised doubts about CAPM's validity, the model is still widely used in the investment community. While it is difficult to predict from beta how individual stocks might react to particular movements, investors can probably safely assume that a portfolio of high-beta stocks will move more than the market in either direction, or a portfolio of low-beta stocks will move less than the market. CAPM helps to benchmark the rate of return for evaluating possible investments and helps the Investors to customize portfolio to their specific risk-return requirements.

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