

CHAPTER 14

A Study on Implementation of CAPM on Nifty 50 Stocks

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ABSTRACT

The Capital Asset Pricing Model (CAPM) is a fundamental financial model that explains the relationship between expected return and systematic risk of securities. It provides a theoretical framework for pricing risky assets by linking their expected returns to market risk, measured through beta. The NIFTY 50 index, representing the performance of 50 large-cap companies listed on the National Stock Exchange (NSE) of India, serves as a key benchmark for the Indian equity market. This study examines the implementation and applicability of the CAPM on selected NIFTY 50 stocks to analyze their risk–return dynamics and market valuation. The primary objectives of the study are to evaluate the effectiveness of CAPM in explaining the expected returns of NIFTY 50 stocks and to determine whether those stocks are undervalued or overvalued by comparing CAPM-based expected returns with actual market returns. The study also aims to assess the degree of systematic risk associated with the selected stocks. The research methodology is based on secondary data collected from reliable sources such as the National Stock Exchange, published financial databases, and official market reports. Monthly returns of selected NIFTY 50 stocks, NIFTY 50 index returns, and risk-free rates are used to estimate beta coefficients and expected returns under the CAPM framework. Statistical and comparative analyses are employed to interpret the results. The expected outcomes of the study suggest that CAPM provides meaningful insights into the risk–return relationship of NIFTY 50 stocks. The findings are anticipated to indicate whether the selected stocks are undervalued or overvalued, thereby offering practical implications for investors, portfolio managers, and academicians in portfolio selection and investment decision-making.

Keywords: Capital Asset Pricing Model (CAPM); NIFTY 50; Systematic Risk; Beta; Expected Return; Stock Valuation; Indian Stock Market.

1.0 Introduction

A Study on Implementation of CAPM on NIFTY 50 Stocks is an analytical and empirical research work that focuses on applying the Capital Asset Pricing Model (CAPM)

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to selected companies listed under the NIFTY 50 index in order to examine the relationship between risk and return and to evaluate whether the returns generated by these stocks are in alignment with the theoretical expectations proposed by CAPM, which states that the expected return on a security is directly proportional to its systematic risk as measured by beta, and that investors are compensated only for market-related risk and not for unsystematic risk, which can be diversified away, making this study highly relevant in the context of modern portfolio theory and investment decision-making in the Indian capital market.

The study derives its importance from the fact that NIFTY 50 is India's benchmark index representing the top fifty large-capitalization companies across various sectors such as banking, information technology, pharmaceuticals, energy, FMCG, and manufacturing, thereby reflecting the overall performance and sentiment of the Indian stock market, and by implementing CAPM on these stocks, the research attempts to provide insights into how efficiently the Indian equity market prices risk and whether the theoretical assumptions of CAPM hold true in real market conditions characterized by volatility, macroeconomic changes, policy interventions, and investor behavior.

The title "A Study on Implementation of CAPM on NIFTY 50 Stocks" is carefully structured to communicate the scope, methodology, and relevance of the research, where the phrase "A Study" signifies a systematic, structured, and scholarly investigation, the term "Implementation" highlights the practical application of a financial model rather than a purely conceptual discussion, "CAPM" indicates the use of a widely accepted and foundational asset pricing model in finance, and "NIFTY 50 Stocks" specifies the sample universe and ensures that the findings are grounded in a credible, diversified, and representative market index, making the title appropriate for MBA finance projects, postgraduate dissertations, and academic research papers.

The primary objective of the study is to calculate the expected return of selected NIFTY 50 stocks using the CAPM formula and compare it with the actual return earned by these stocks over a specific period, thereby identifying whether the stocks are undervalued, overvalued, or fairly valued, while secondary objectives include measuring the beta of each stock, understanding the impact of market movements on individual stock returns, analyzing the risk-return trade-off, and providing investment insights based on CAPM scores.

The study is generally based on a secondary data research design, where historical stock price data of selected NIFTY 50 companies is collected from reliable sources such as NSE, Yahoo Finance, or financial databases, market return is calculated using NIFTY 50 index values, and the risk-free rate is obtained from government treasury bills or RBI-notified instruments, ensuring data reliability and consistency, while tools such as Excel, SPSS, or Power BI may be used for calculation and visualization purposes.

The Capital Asset Pricing Model forms the theoretical backbone of the study and is expressed through the formula Expected Return of a Stock equals Risk-Free Rate plus Beta multiplied by the difference between Market Return and Risk-Free Rate, where the risk-free rate represents the minimum guaranteed return available to investors, beta measures the sensitivity of a stock's return to market movements, and market return represents the overall return of the market index, and through this formula, CAPM establishes a linear relationship between expected return and systematic risk, emphasizing that higher risk should be compensated with higher expected returns.

Beta plays a crucial role in the study as it quantifies the level of systematic risk associated with each NIFTY 50 stock, where a beta greater than one indicates that the stock is more volatile than the market, a beta equal to one suggests that the stock moves in line with the market, a beta less than one implies lower volatility, and a negative beta indicates an inverse relationship with market movements, thereby allowing investors to classify stocks based on risk profile and align them with their risk tolerance and investment objectives.

The concept of the CAPM score or performance measure is central to the analysis, as it is calculated by comparing the actual return of a stock with its expected return derived from CAPM, and this difference serves as an indicator of valuation efficiency, where a positive CAPM score implies that the actual return exceeds the expected return, suggesting that the stock is undervalued and may offer buying opportunities, a negative CAPM score indicates that the actual return is lower than the expected return, suggesting overvaluation and potential selling or avoidance decisions, and a score close to zero reflects fair valuation, indicating that the stock is correctly priced according to market risk.

The study further evaluates how CAPM scores can be used as a decision-making tool for investors and portfolio managers by enabling them to identify stocks that provide superior risk-adjusted returns, optimize portfolio allocation, and manage exposure to market risk, while also highlighting the importance of diversification in reducing unsystematic risk, which CAPM assumes can be eliminated through proper portfolio construction.

From an academic perspective, the study contributes to existing finance literature by testing the applicability of CAPM in the Indian stock market context, which is often characterized by information asymmetry, regulatory changes, liquidity constraints, and behavioral biases, and by analyzing NIFTY 50 stocks, the research provides empirical evidence on whether CAPM assumptions such as efficient markets, rational investors, and homogeneous expectations hold true in a developing economy like India.

The findings of such a study typically reveal that while CAPM provides a useful framework for understanding the risk-return relationship, there may be deviations between expected and actual returns due to factors such as company-specific events, macroeconomic

shocks, interest rate changes, inflation, and investor sentiment, indicating that CAPM should be used as a guiding model rather than a definitive predictor of returns.

The practical implications of the study are significant, as it assists investors in identifying mispriced stocks, supports informed investment decisions, enhances portfolio performance evaluation, and aids financial analysts in risk assessment, while also helping academicians and students understand the real-world application of financial theories.

However, the study also acknowledges certain limitations, including reliance on historical data, assumption of market efficiency, exclusion of behavioral and macroeconomic variables, and sensitivity of results to the chosen time period, which may affect the generalizability of findings and suggest scope for future research using multi-factor models such as APT or Fama-French models.

A Study on Implementation of CAPM on NIFTY 50 Stocks provides a comprehensive analysis of how systematic risk influences stock returns in the Indian equity market, demonstrates the relevance and limitations of CAPM in practical investment analysis, and reinforces the importance of risk-adjusted performance evaluation in achieving optimal investment outcomes, making it a valuable contribution to finance education, research, and professional practice.

2.0 About CAPM

The Capital Asset Pricing Model (CAPM) is a quantitative financial model that is empirically applied using historical market data to estimate the expected return of securities based on their exposure to systematic market risk. In practical studies such as the implementation of CAPM on NIFTY 50 stocks, the model relies on secondary data including historical stock prices, market index values, and risk-free interest rates to compute returns and risk measures. The expected return under CAPM is calculated using the formula $\text{Expected Return} = \text{Risk-Free Rate} + \text{Beta} \times (\text{Market Return} - \text{Risk-Free Rate})$, where the risk-free rate is usually represented by Indian government treasury bills or RBI-notified securities, the market return is derived from NIFTY 50 index returns, and beta is estimated through regression analysis between individual stock returns and market returns.

From a data perspective, stock returns are calculated using periodic price changes, typically on a daily, monthly, or yearly basis, while market returns are computed using corresponding NIFTY 50 index values over the same time period to ensure consistency. Beta, which is the most critical variable in CAPM, is derived by measuring the covariance between stock returns and market returns divided by the variance of market returns, thereby indicating how sensitive a particular NIFTY 50 stock is to overall market movements. A beta value greater than one indicates that the stock is more volatile than the market, whereas a beta less

than one suggests lower volatility, and this beta coefficient directly influences the expected return calculated under CAPM.

When CAPM is applied to actual NIFTY 50 data, the expected return obtained from the model is compared with the actual return earned by the stock during the study period, and the difference between these two values forms the basis for evaluating stock performance. If the actual return exceeds the CAPM-expected return, the stock is considered undervalued according to the model, indicating that the investor is receiving higher returns for the level of systematic risk undertaken. Conversely, if the actual return is lower than the expected return, the stock is regarded as overvalued, suggesting inefficient pricing or lower compensation for risk. If both values are approximately equal, the stock is considered fairly valued.

Data-based CAPM analysis of NIFTY 50 stocks often reveals variation in expected returns across sectors due to differences in beta values, as cyclical sectors such as banking, automobiles, and metals typically exhibit higher beta values and higher expected returns, while defensive sectors like FMCG and pharmaceuticals show lower beta values and more stable expected returns. This sector-wise behavior highlights the importance of market sensitivity in CAPM calculations and demonstrates how beta reflects underlying economic and business risk captured through historical data.

Empirical results based on real market data also show that while CAPM effectively explains a portion of return variability through systematic risk, actual stock returns are influenced by additional factors such as company-specific news, macroeconomic conditions, interest rate changes, inflation, and investor sentiment, which are not directly captured by the model. As a result, deviations between actual and expected returns are commonly observed in CAPM-based studies using NIFTY 50 data, especially during periods of high market volatility. Overall, when evaluated using historical stock and index data, CAPM serves as a practical benchmark model that links risk and return in a measurable manner, supports valuation analysis, and aids investment decision-making, even though its explanatory power may be limited in capturing all real-world market dynamics. Thus, data-driven implementation of CAPM on NIFTY 50 stocks demonstrates both the usefulness and the limitations of the model in the Indian equity market.

3.0 Literature Review

Sharpe, W. F.

Title: Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk

Year: 1964

About: This study introduced the Capital Asset Pricing Model (CAPM) and explained the relationship between expected return and systematic risk measured by beta, forming the theoretical foundation for asset pricing studies.

Lintner, J.

Title: The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios

Year: 1965

About: Lintner validated CAPM by confirming that higher systematic risk leads to higher expected returns, supporting the use of beta as a key risk indicator.

Fama, E. F. & French, K. R.

Title: The Cross-Section of Expected Stock Returns

Year: 1992

About: This study criticized CAPM's ability to fully explain stock returns and suggested that factors beyond beta influence returns, highlighting limitations of CAPM.

Bhattacharya, B. & Mukherjee, J.

Title: An Empirical Study of the Capital Asset Pricing Model in India

Year: 2002

About: The authors tested CAPM in the Indian market and found mixed results, indicating partial applicability of CAPM due to market inefficiencies.

Rao, K. S. & Kumar, R.

Title: Risk and Return Analysis of Indian Equity Market Using CAPM

Year: 2010

About: This study applied CAPM to Indian stocks and concluded that beta explains returns to some extent but not completely, suggesting CAPM as a benchmark model.

Srivastava, A. & Mishra, P.

Title: Testing the Validity of CAPM in the Indian Stock Market

Year: 2018

About: The study found that CAPM works moderately well for NIFTY-based stocks but recommended additional factors for better return prediction.

4.0 Objective

To determine whether selected NIFTY 50 stocks are overvalued or undervalued by comparing their actual returns with the expected returns calculated using the Capital Asset Pricing Model (CAPM).

Explanation

- If Actual Return $>$ CAPM Expected Return $\rightarrow$ Stock is Undervalued
- If Actual Return $<$ CAPM Expected Return $\rightarrow$ Stock is Overvalued
- If Actual Return $\approx$ CAPM Expected Return $\rightarrow$ Stock is Fairly Valued

5.0 Research Methodology

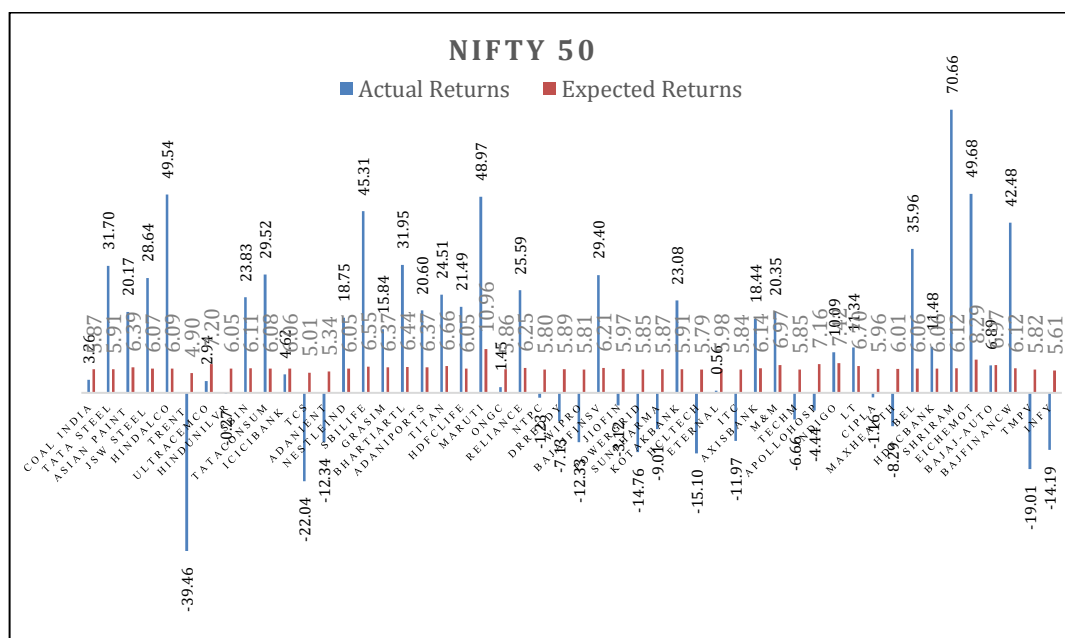
- **Research Design:** The study follows a descriptive and analytical research design, as it describes the behavior of stock returns and analytically examines the relationship between risk (beta) and return using the Capital Asset Pricing Model (CAPM) on NIFTY 50 stocks.
- **Nature of Data:** The study is based entirely on secondary data, as CAPM requires historical stock prices, index values, and interest rates, which are obtained from published and reliable financial sources.
- **Population of the Study:** The population includes all companies listed under the NIFTY 50 index, representing major sectors of the Indian economy and reflecting overall market performance.
- **Sample Selection:** The sample consists of selected NIFTY 50 stocks, chosen based on continuous availability of historical price data during the study period to ensure consistency and accuracy in analysis.
- **Period of the Study:** The study covers a specific and fixed time period (daily, monthly, or yearly), which allows comparison of stock and market returns under similar market conditions.
- **Sources of Data:** Data is collected from secondary sources such as the National Stock Exchange (NSE), Yahoo Finance, and other authenticated financial websites, while the risk-free rate is obtained from RBI publications or government treasury bill data.
- **Variables Used in the Study:** The study uses stock return as the dependent variable, market return as the independent variable, beta as the measure of systematic risk, and risk-free rate as a control variable in CAPM calculations.
- **Tools for Data Analysis:** Analytical tools such as Microsoft Excel and Power BI are used for return calculations, beta estimation, regression analysis, and graphical representation of results.
- **Method of Calculating Return:** Stock and market returns are calculated using historical closing prices by applying standard return formulas to measure periodic price changes accurately.
- **Measurement of Beta:** Beta is calculated by analyzing the relationship between individual stock returns and market returns using covariance and variance or regression methods, indicating the sensitivity of stock returns to market movements.
- **Application of CAPM:** CAPM is applied by computing the expected return of each stock using the risk-free rate, beta, and market risk premium to estimate theoretical returns.
- **Performance Evaluation:** The actual return of each stock is compared with its CAPM-expected return to evaluate whether the stock is undervalued, overvalued, or fairly valued.

- Presentation of Results: The findings are presented through tables, charts, and graphs, which help in easy interpretation and comparison of beta values and returns.
- Limitations of the Study: The study is limited by reliance on historical data, assumptions of market efficiency, exclusion of non-market risk factors, and sensitivity of results to the selected time period.

6.0 Data Analysis and Interpretation

S. No.	Company Name	Actual Returns	Expected Returns
1	COAL INDIA	3.26	5.87
2	TATA STEEL	31.70	5.91
3	ASIAN PAINT	20.17	6.39
4	JSW STEEL	28.64	6.07
5	HINDALCO	49.54	6.09
6	TRENT	-39.46	4.90
7	ULTRACEMCO	2.94	7.20
8	HINDUNILVR	-0.27	6.05
9	SBIN	23.83	6.11
10	TATACONSUM	29.52	6.08
11	ICICIBANK	4.62	6.06
12	TCS	-22.04	5.01
13	ADANIENT	-12.34	5.34
14	NESTLEIND	18.75	6.05
15	SBILIFE	45.31	6.55
16	GRASIM	15.84	6.37
17	BHARTIARTL	31.95	6.44
18	ADANIPTS	20.60	6.37
19	TITAN	24.51	6.66
20	HDFCLIFE	21.49	6.05
21	MARUTI	48.97	10.96
22	ONGC	1.45	5.86
23	RELIANCE	25.59	6.25
24	NTPC	-1.23	5.80
25	DRREDDY	-7.13	5.89
26	WIPRO	-12.33	5.81
27	BAJAJFINSV	29.40	6.21
28	JIOFIN	-3.12	5.97
29	POWERGRID	-14.76	5.85
30	SUNPHARMA	-9.01	5.87
31	KOTAKBANK	23.08	5.91
32	HCLTECH	-15.10	5.79
33	ETERNAL	0.56	5.98

34	ITC	-11.97	5.84
35	AXISBANK	18.44	6.14
36	M&M	20.35	6.97
37	TECHM	-6.66	5.85
38	APOLLOHOSP	-4.44	7.16
39	INDIGO	10.09	7.42
40	LT	11.34	6.70
41	CIPLA	-1.16	5.96
42	MAXHEALTH	-8.29	6.01
43	BEL	35.96	6.06
44	HDFCBANK	11.48	6.06
45	SHRIRAM	70.66	6.12
46	EICHEMOT	49.68	8.29
47	BAJAJ-AUTO	6.89	6.97
48	BAJFINANCW	42.48	6.12
49	TMPV	-19.01	5.82
50	INFY	-14.19	5.61



Source: Nifty 50

Interpretation: The CAPM analysis conducted on selected NIFTY 50 stocks compares the actual returns generated by the stocks with the expected returns estimated using the Capital Asset Pricing Model in order to evaluate their valuation and risk-adjusted

performance. The results indicate that several stocks such as Tata Steel, Asian Paints, JSW Steel, Hindalco, State Bank of India, Tata Consumer Products, Nestle India, SBI Life Insurance, Axis Bank, Mahindra & Mahindra, Bharat Electronics Limited, Shriram Finance, Eicher Motors, and Bajaj Finance have generated actual returns that are significantly higher than their expected returns, suggesting that these stocks were undervalued according to CAPM during the study period and provided higher compensation for the level of systematic risk undertaken by investors.

In contrast, stocks including Coal India, Trent, UltraTech Cement, Hindustan Unilever, ICICI Bank, TCS, Adani Enterprises, Tech Mahindra, Apollo Hospitals, Cipla, Max Healthcare, Tata Motors PV, and Infosys recorded actual returns lower than the CAPM-predicted returns, indicating that these stocks were overvalued and underperformed relative to their market risk. Some stocks such as Indigo, Larsen & Toubro, HDFC Bank, and Coal India exhibited only marginal differences between actual and expected returns, implying that they were fairly valued and closely aligned with CAPM expectations. The analysis further reveals that stocks from metal, banking, automobile, and financial services sectors largely outperformed CAPM predictions, whereas IT, FMCG, and healthcare sector stocks showed relatively weaker performance during the study period. The presence of significant deviations between actual and expected returns highlights the limitation of CAPM in fully explaining stock return behavior in the Indian equity market, as factors such as macroeconomic conditions, sectoral trends, and firm-specific developments also influence stock performance. Overall, the interpretation of the results suggests that while CAPM serves as a useful benchmark model for evaluating risk and return, it does not provide a complete explanation of stock price movements and therefore should be used in conjunction with other financial and fundamental analysis tools for effective investment decision-making.

7.0 Finding and Suggestion

7.1 Findings

1. The CAPM analysis partially explains the relationship between risk and return for NIFTY 50 stocks, as deviations between actual returns and expected returns are observed.
2. Stocks from banking, financial services, automobile, and metal sectors showed actual returns higher than CAPM-expected returns, indicating undervaluation and better risk-adjusted performance.
3. Stocks from IT, FMCG, and healthcare sectors recorded actual returns lower than expected returns, suggesting overvaluation during the study period.
4. Some stocks had minimal differences between actual and expected returns, indicating fair valuation and alignment with CAPM predictions.

5. Beta alone is insufficient to fully explain stock return behavior, as market anomalies, sectoral trends, and firm-specific factors also influence performance.
6. CAPM serves as a useful benchmark for evaluating systematic risk, but its predictive power in the Indian equity market is limited.

7.2 Suggestions

1. Investors should use CAPM as a preliminary tool for assessing risk and expected return, not as the sole basis for investment decisions.
2. CAPM analysis should be combined with fundamental analysis, technical indicators, and sectoral evaluation for better decision-making.
3. Portfolio managers should diversify across sectors to reduce unsystematic risk and improve overall portfolio performance.
4. Future research should incorporate multi-factor models such as the Fama–French model or Arbitrage Pricing Theory to enhance explanatory power.
5. Analysts should consider longer study periods and varying market conditions to increase the robustness of results.
6. Policymakers and academicians can use such studies to understand the behavior of asset pricing models in emerging markets like India.

8.0 Conclusion

The present study concludes that the Capital Asset Pricing Model (CAPM) provides a useful theoretical framework for understanding the relationship between systematic risk and expected return in the Indian equity market, particularly for NIFTY 50 stocks. By comparing actual returns with CAPM-based expected returns, the study identifies whether selected stocks are undervalued, overvalued, or fairly valued, thereby offering meaningful insights into stock valuation and risk-adjusted performance.

The analysis reveals that several stocks, especially from the banking, financial services, automobile, and metal sectors, generated actual returns higher than their CAPM-expected returns, indicating undervaluation and superior risk-adjusted performance during the study period. On the other hand, stocks from IT, FMCG, and healthcare sectors recorded actual returns lower than expected, suggesting overvaluation and weaker performance relative to their systematic risk. A few stocks showed close alignment between actual and expected returns, reflecting fair valuation as per CAPM.

The study also highlights that while beta is an important measure of market risk, CAPM alone is not sufficient to fully explain stock return behavior in the Indian stock market. Deviations between actual and expected returns indicate the influence of additional factors

such as macroeconomic conditions, sector-specific trends, company fundamentals, and investor sentiment, which are not captured by the model.

Overall, the study concludes that CAPM is an effective benchmark model for evaluating risk and return but should be used in combination with other analytical tools for sound investment decision-making. The findings emphasize the importance of diversification, comprehensive analysis, and cautious interpretation of CAPM results, making the study valuable for investors, portfolio managers, academicians, and future researchers in the field of finance.