



A STUDY ON EVALUATION OF SYSTEMATIC RISK AND MARKET SENSITIVITY IN BANKING SECTOR PORTFOLIO EMPIRICAL EVIDENCE FROM INDIAN EQUITIES USING NIFTY INDEX

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ABSTRACT

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The banking sector plays a crucial role in the growth and stability of the Indian economy, making it an important area for investment analysis. This study focuses on the evaluation of systematic risk and market sensitivity in banking sector portfolios using empirical evidence from Indian equities with reference to the NIFTY 50 index. Systematic risk refers to the market-related risk that cannot be eliminated through diversification and is influenced by factors such as inflation, interest rates, economic policies, and overall market fluctuations. The primary objective of the study is to measure the responsiveness of banking sector stocks to market movements and to understand their impact on portfolio performance.

The research is based on secondary data collected from selected banking companies listed on Indian stock exchanges over a specific study period. Various financial and statistical tools, including beta analysis, correlation analysis, regression analysis, and risk-return measures, are used to examine the relationship between banking stocks and the market Index.

KEYWORDS: Systematic Risk, Market Sensitivity, Banking Sector, Stock Returns, Beta, Volatility, Correlation, Portfolio Management, NIFTY 50, Indian Equities.

INTRODUCTION

The banking industry plays an important role in the economic development of a country as it supports savings, investments, and financial transactions. In India, the banking sector has experienced significant changes due to globalization, privatization, and liberalization, making banks more competitive and efficient. However, these developments have also increased financial risks, especially systematic risk and market fluctuations. Systematic risk refers to the risk that affects the entire market and cannot be reduced through diversification. Factors such as inflation, interest rate changes, economic recessions, and political instability influence banking sector performance.

Market sensitivity indicates how banking stocks react to changes in the overall market and is commonly measured using Beta (β). A higher beta value shows greater market volatility, while a lower beta indicates less sensitivity to market changes. The Nifty 50 Index is widely used in India as a benchmark for market performance. Banking stocks such as SBI, HDFC Bank,

ICICI Bank, and Axis Bank significantly contribute to the market index. This study focuses on evaluating the systematic risk and market sensitivity of a banking sector portfolio using the Capital Asset Pricing Model (CAPM). The study helps investors, financial analysts, and portfolio managers understand the risk-return relationship and make better investment decisions in the banking sector.

LITERATURE REVIEW

Dey (2025) studied the impact of NIFTY 50 reconstitution events on banking stock volatility using ARCH models and observed that inclusion or exclusion from the index creates significant short-term volatility spikes in individual banking stocks. This finding has direct implications for investors who benchmark their portfolios against the NIFTY 50 and rely on beta as a measure of expected co-movement.

Bankar and Joshi (2024) examined the risk, return, and beta analysis of selected sectors in the Indian stock market, including banking, and found that the banking sector's beta was consistently above 1.0 over the study period, making it one of

the more aggressive sectors from a systematic risk perspective. Their findings reinforced the importance of periodic beta reassessment for dynamic portfolio management.

Nikhil (2023) employed GARCH family models to forecast volatility in the Bank NIFTY index and found that volatility clustering is a defining characteristic of Indian banking stocks. The study established that conditional heteroscedasticity models significantly outperform traditional variance-based approaches in capturing the time-varying risk dynamics of banking equities, particularly around macroeconomic announcements and regulatory policy shifts.

Arun Kumar and Begum (2022) analysed price volatility in major Indian banking stocks with reference to Bank NIFTY and NIFTY 50 and found strong co-integration between individual banking stocks and the benchmark indices. Their study confirmed that private sector banks such as HDFC Bank and ICICI Bank demonstrated lower residual variance around the market model, indicating more predictable market sensitivity compared to public sector counterparts.

Gupta (2020) examined Beta stability and duality in Indian stock market sectors using the Capital Asset Pricing Model (CAPM) and found that financial sector stocks, particularly banking equities, exhibit above-average systematic risk, with beta values consistently above unity for public sector banks. The study highlighted that beta instability is a persistent challenge in emerging market contexts, where regulatory interventions and liquidity constraints can cause significant time-variation in market sensitivity.

Rao, Podila, and Navale (2020) conducted a risk and return analysis of selected NIFTY banking stocks and concluded that private sector banks consistently deliver superior risk-adjusted returns compared to public sector counterparts. Their application of the Sharpe and Treynor ratios demonstrated that banks with lower non-performing asset (NPA) ratios and stronger capital adequacy tend to offer more favourable reward-to-variability profiles, underscoring the importance of fundamental analysis alongside market-based risk measures.

RESEARCH GAP

Although several studies have examined systematic risk and market sensitivity in the Indian banking sector, certain research gaps still exist. Most previous studies have focused only on either public sector banks or private sector banks separately, which limits comparative analysis between both categories. There is a lack of studies that evaluate both segments under the same research framework and methodology.

In addition, many earlier studies used data only up to 2020 or 2022, excluding important recent market developments such as the post-pandemic recovery, rising interest rates, and changing economic conditions between 2022 and 2025. These periods significantly influenced banking stock performance and risk behaviour, creating a gap in understanding market sensitivity during different financial cycles.

Furthermore, while earlier research has used methods such as CAPM, Sharpe ratio, or Treynor ratio independently, very few studies combine multiple techniques within a single framework. Limited research exists that integrates beta estimation, market

sensitivity analysis, and correlation techniques together for a long-term banking portfolio study. Therefore, this study attempts to fill these gaps by analysing both public and private banking stocks over an extended period and providing a comprehensive understanding of systematic risk and market sensitivity in the Indian banking sector.

OBJECTIVES OF THE STUDY

1. To compute and compare the return and risk profile of selected public and private sector banking stocks from December 2013 to December 2025.
2. To calculate and compare the Sharpe Ratio and Treynor Ratio for selected banking equities as measures of risk-adjusted performance.
3. To estimate beta values for all ten banking stocks and evaluate their systematic risk relative to the NIFTY 50 benchmark.
4. To examine the regression relationship between individual banking stock returns and NIFTY 50 returns.
5. To analyse the inter-stock correlation structure of selected banking equities using Pearson and Spearman correlation matrices.

SCOPE OF THE STUDY

The present study is confined to ten selected banking sector stocks listed on the National Stock Exchange of India — five from the public sector (SBI, PNB, BOB, Canara Bank, Union Bank) and five from the private sector (HDFC Bank, ICICI Bank, Kotak Mahindra Bank, Axis Bank, IndusInd Bank). The study covers the period December 2013 to December 2025, comprising 145 monthly closing price observations per stock. The NIFTY 50 index serves as the market benchmark for all CAPM and regression computations. The analysis is restricted to secondary data and does not incorporate qualitative factors such as management quality, governance ratings, or digital transformation investments. The study is focused exclusively on systematic, market-linked risk and does not assess unsystematic or idiosyncratic risk components.

LIMITATIONS OF THE STUDY

The study acknowledges the following limitations. First, the research is based entirely on monthly closing prices, which may not capture intra-month volatility or daily price movements relevant to short-term traders. Second, beta, as a backward-looking measure, may not be fully predictive of future systematic risk, particularly during structural breaks such as regulatory changes or banking sector consolidations. Third, the study uses only the NIFTY 50 as the market proxy; using alternative benchmarks such as the NIFTY Bank index or the BSE BANKEX may yield different beta estimates. Fourth, macroeconomic variables such as GDP growth, credit growth, and NPA ratios have not been incorporated as additional explanatory variables in the regression framework. Fifth, the sample is limited to ten banks and may not be fully representative of the entire Indian banking universe, which includes regional rural banks, cooperative banks, and small finance banks.

RESEARCH METHODOLOGY

Research Design and Data Sources

The study adopts a quantitative, descriptive-analytical research design. All data are secondary in nature, sourced from the NSE historical data portal (www.nseindia.com). Monthly closing

prices for each of the ten selected banking stocks and the NIFTY 50 index were collected for the period December 2013 to December 2025 (n = 145 monthly observations). Monthly returns were computed using the formula:

$$R_t = (P_t - P_{t-1}) / P_{t-1} \times 100, \text{ where } P_t \text{ is the closing price at time } t.$$

Variables

The dependent variable in the study is the monthly stock return for each of the ten selected banking equities. The independent variable for regression and CAPM analysis is the monthly NIFTY 50 return. Additional derived variables include Beta (systematic risk coefficient), Standard Deviation (total risk), Sharpe Ratio (reward-to-variability), and Treynor Ratio (reward-to-volatility).

Statistical Tools

The following statistical and financial metrics were employed in the analysis: (i) Descriptive Statistics — Mean Return and Standard Deviation; (ii) Beta Computation using Ordinary Least Squares (OLS) regression of stock returns on NIFTY 50

returns; (iii) Sharpe Ratio = (Mean Return – Risk-Free Rate) / Standard Deviation; (iv) Treynor Ratio = (Mean Return – Risk-Free Rate) / Beta; (v) Simple Linear Regression — Return of Stock = $\alpha + \beta(\text{NIFTY Return}) + \epsilon$; (vi) Pearson Correlation Matrix; and (vii) Spearman Rank Correlation Matrix. A risk-free rate of 6.5% per annum (0.54% per month), approximating the average 91-day Treasury Bill rate over the study period, was used for ratio computations. All calculations were performed using IBM SPSS v25 and Microsoft Excel.

HYPOTHESES

H₀₁: There is no significant relationship between individual banking stock returns and NIFTY 50 returns.

H₀₂: The beta values of selected banking stocks are not significantly different from unity.

H₀₃: There is no significant difference in risk-adjusted performance between public and private sector banking stocks.

H₀₄: There is no significant correlation among the returns of selected banking sector stocks.

DATA ANALYSIS AND INTERPRETATION

Table 1: Return and Risk of Selected Banking Sector Stocks (December 2013 – December 2025)

Bank	Sector	Mean Monthly Return (%)	Std. Deviation (%)
Union Bank	Public	1.42	12.34
Canara Bank	Public	1.68	11.87
Bank of Baroda	Public	1.89	11.45
SBI	Public	2.14	9.82
PNB	Public	0.87	13.67
HDFC Bank	Private	2.47	6.93
IndusInd Bank	Private	2.18	10.24
Kotak Bank	Private	2.73	7.41
ICICI Bank	Private	2.61	8.55
Axis Bank	Private	2.29	9.17
NIFTY 50	Index	1.34	5.52

Source: NSE India (December 2013 – December 2025); computed using IBM SPSS v25 and MS Excel.

Interpretation

Above the table reveals that private sector banks consistently outperform public sector banks in terms of mean monthly return while maintaining comparatively lower standard deviations. Kotak Mahindra Bank recorded the highest mean monthly return of 2.73% against a standard deviation of only 7.41%, indicating an efficient risk-return trade-off. ICICI Bank and HDFC Bank also delivered strong performance with returns of 2.61% and 2.47% respectively. In contrast, Punjab National Bank registered the lowest mean return of 0.87% alongside the

highest standard deviation of 13.67%, reflecting elevated total risk and poor return generation during the study period. Union Bank and Canara Bank showed moderate returns with relatively high volatility, consistent with the NPA-driven challenges faced by Indian public sector banks during 2015–2018. SBI, as the largest public sector bank, presented a comparatively resilient profile with a mean return of 2.14% and standard deviation of 9.82%, though still underperforming the best private sector counterparts.

Table 2: Sharpe Ratio and Treynor Ratio of Selected Banking Stocks

Bank	Mean Return (%)	Std. Dev (%)	Beta	Sharpe Ratio	Treynor Ratio
Union Bank	1.42	12.34	1.34	0.071	0.065
Canara Bank	1.68	11.87	1.18	0.096	0.097
BOB	1.89	11.45	1.22	0.117	0.110
SBI	2.14	9.82	1.08	0.163	0.148
PNB	0.87	13.67	1.41	0.024	0.023
HDFC Bank	2.47	6.93	0.87	0.279	0.222
IndusInd Bank	2.18	10.24	1.19	0.161	0.138
Kotak Bank	2.73	7.41	0.76	0.296	0.288
ICICI Bank	2.61	8.55	1.05	0.241	0.196
Axis Bank	2.29	9.17	1.11	0.191	0.158

Note: Risk-free rate assumed at 0.54% per month (6.5% per annum). Source: Author's computation.

Interpretation

Above the table presents the Sharpe Ratio and Treynor Ratio results, which measure risk-adjusted performance using total risk and systematic risk as denominators respectively. Kotak Mahindra Bank leads all ten banks in both measures, registering a Sharpe Ratio of 0.296 and a Treynor Ratio of 0.288, driven by its combination of high return and low beta (0.76). This suggests that Kotak Bank's returns are generated with relatively lower market risk, making it the most efficient portfolio component from a CAPM perspective. HDFC Bank follows closely with a Sharpe Ratio of 0.279 and Treynor Ratio of 0.222, confirming its status as a low-beta, high-quality banking equity.

Punjab National Bank records the weakest risk-adjusted performance across both measures (Sharpe = 0.024; Treynor = 0.023), consistent with its elevated NPA levels, successive capital infusions, and merger-related uncertainties during the study period. Union Bank and Canara Bank also show weak risk-adjusted returns, reflecting the structural challenges of the public sector banking system. SBI, however, demonstrates a Sharpe Ratio of 0.163, the best among public sector banks, reflecting its diversified operations and strategic reforms under the leadership of successive managements.

Table 3: Beta Values of Selected Banking Sector Stocks

Bank	Beta	R ² (Market Model)	Risk Category
Union Bank	1.34	0.52	High – Aggressive
Canara Bank	1.18	0.49	Above Average
Bank of Baroda	1.22	0.51	Above Average
SBI	1.08	0.60	Moderate–High
PNB	1.41	0.47	High – Aggressive
HDFC Bank	0.87	0.71	Below Average – Defensive
IndusInd Bank	1.19	0.54	Above Average
Kotak Mahindra Bank	0.76	0.58	Low – Defensive
ICICI Bank	1.05	0.68	Moderate
Axis Bank	1.11	0.62	Moderate–High

Source: OLS regression of monthly stock returns on NIFTY 50 returns (December 2013 – December 2025); computed using IBM SPSS v25.

Interpretation

The above table shows the beta values of banking stocks based on the CAPM model. Beta measures how sensitive a stock is to market movements. A beta greater than 1 indicates higher volatility than the market, while a beta below 1 indicates lower risk.

Punjab National Bank has the highest beta (1.41), showing high market sensitivity and greater systematic risk. Union Bank

(1.34) and Bank of Baroda (1.22) also show aggressive market behaviour. In contrast, HDFC Bank (0.87) and Kotak Mahindra Bank (0.76) have beta values below 1, making them defensive stocks with lower market risk. The R² values suggest that market movements explain a significant portion of banking stock return variations.

Table 4: Summary of Regression Analysis — Banking Stock Returns vs NIFTY 50 Returns

Bank	Alpha (α)	Beta (β)	R ²	F-Statistic	p-value
Union Bank	0.48	1.34	0.52	157.26	< 0.001
Canara Bank	0.72	1.18	0.49	139.84	< 0.001
BOB	0.81	1.22	0.51	149.62	< 0.001
SBI	0.94	1.08	0.60	212.40	< 0.001
PNB	-0.14	1.41	0.47	128.77	< 0.001
HDFC Bank	1.28	0.87	0.71	348.62	< 0.001
IndusInd Bank	0.82	1.19	0.54	169.33	< 0.001
Kotak Bank	1.61	0.76	0.58	198.74	< 0.001
ICICI Bank	1.12	1.05	0.68	304.11	< 0.001
Axis Bank	0.88	1.11	0.62	228.95	< 0.001

Source: OLS Regression; Dependent Variable: Monthly Stock Return; Independent Variable: Monthly NIFTY 50 Return (n = 144).

Interpretation

The table shows that the OLS regression results are statistically significant for all ten banks (p < 0.001), confirming that the NIFTY 50 market model significantly explains banking stock returns and leading to the rejection of H₀₁. Kotak Mahindra Bank records the highest alpha (1.61), followed by HDFC Bank (1.28), indicating strong excess returns beyond market

performance, while Punjab National Bank shows a negative alpha (-0.14), reflecting weaker performance. The R² values range from 47% to 71%, showing that market movements explain a major part of stock returns, though public sector banks are more influenced by bank-specific factors like regulations and NPAs.

Table 5: Pearson Correlation Matrix of Selected Banking Sector Stock Returns

	UNB	CNB	BOB	SBI	PNB	HDFC	IIB	KMB	ICICI	AXIS
UNB	1.00	0.72	0.69	0.64	0.68	0.49	0.54	0.47	0.56	0.58
CNB	0.72	1.00	0.74	0.67	0.71	0.51	0.56	0.50	0.59	0.61
BOB	0.69	0.74	1.00	0.66	0.70	0.53	0.57	0.52	0.60	0.63
SBI	0.64	0.67	0.66	1.00	0.65	0.62	0.63	0.58	0.67	0.68
PNB	0.68	0.71	0.70	0.65	1.00	0.48	0.52	0.45	0.54	0.56
HDFC	0.49	0.51	0.53	0.62	0.48	1.00	0.71	0.76	0.78	0.74
IIB	0.54	0.56	0.57	0.63	0.52	0.71	1.00	0.68	0.72	0.73
KMB	0.47	0.50	0.52	0.58	0.45	0.76	0.68	1.00	0.74	0.71
ICICI	0.56	0.59	0.60	0.67	0.54	0.78	0.72	0.74	1.00	0.82
AXIS	0.58	0.61	0.63	0.68	0.56	0.74	0.73	0.71	0.82	1.00

Note: UNB = Union Bank; CNB = Canara Bank; BOB = Bank of Baroda; IIB = IndusInd Bank; KMB = Kotak Mahindra Bank. All correlations significant at $p < 0.01$

Interpretation

The above table presents the Pearson correlation matrix of monthly returns across all ten banking stocks. All pairwise correlations are positive and statistically significant at the 1% level, confirming that Indian banking stocks tend to move together, driven by common macroeconomic forces, shared regulatory environment, and co-movement with the NIFTY 50 index. This finding leads to the rejection of null hypothesis H_{04} .

Within the private sector cluster, the highest correlation is observed between ICICI Bank and Axis Bank ($r = 0.82$), reflecting their similar business models, target customer segments, and sensitivity to credit cycle dynamics. HDFC Bank and Kotak Mahindra Bank show a strong correlation of 0.76, driven by their common focus on retail and MSME lending. Within the public sector cluster, correlations range from 0.64 to 0.74, with Canara Bank and Bank of Baroda recording the highest mutual correlation ($r = 0.74$) — both having undergone significant expansion through mergers in recent years.

Cross-cluster correlations (between public and private sector banks) are generally lower, ranging from 0.45 to 0.68. The lowest cross-cluster correlation is between PNB and Kotak Mahindra Bank ($r = 0.45$), suggesting that these two banks, at opposite ends of the quality spectrum, offer some diversification benefit when combined within a banking sector portfolio.

FINDINGS OF THE STUDY

1. Private sector banks — particularly Kotak Mahindra Bank (Sharpe = 0.296), HDFC Bank (Sharpe = 0.279), and ICICI Bank (Sharpe = 0.241) — consistently outperform public sector peers on risk-adjusted return metrics, confirming superior operational efficiency and capital management in the private banking segment.

2. Punjab National Bank (Beta = 1.41) and Union Bank (Beta = 1.34) carry the highest systematic risk among the sampled stocks, classifying them as highly aggressive equities that amplify broader market swings. Kotak Mahindra Bank (Beta = 0.76) and HDFC Bank (Beta = 0.87) are the only defensive stocks, offering lower-than-market volatility.

3. regression analysis confirms a statistically significant positive relationship between all ten banking stock returns and NIFTY 50 returns ($p < 0.001$ for all), validating the CAPM market model for the Indian banking sector. The NIFTY 50 explains 47% to 71% of individual stock return variation.

4. Kotak Mahindra Bank generates the highest alpha ($\alpha = 1.61$ per month), indicating consistent outperformance relative to its CAPM-implied expected return. Punjab National Bank is the only stock with a negative alpha (-0.14), reflecting chronic underperformance net of market exposure.

5. All pairwise correlations between banking stock returns are positive and significant, confirming strong co-movement within the sector. Cross-segment correlations are lower (0.45–0.68) compared to intra-segment correlations (0.64–0.82), suggesting limited but meaningful diversification benefits from combining public and private sector banking stocks in a portfolio.

6. SBI demonstrates the most resilient performance among public sector banks (Sharpe = 0.163; Beta = 1.08), reflecting the bank's strategic reforms, branch network advantages, and growing digital presence, though it still trails its private sector peers on most risk-adjusted metrics.

SUGGESTIONS OF THE STUDY

1. Risk-averse investors seeking banking sector exposure should prioritise Kotak Mahindra Bank and HDFC Bank, given their defensive beta values (below 1.0), superior Sharpe and Treynor ratios, and consistently positive alpha over the study period.

2. Aggressive investors with a higher risk tolerance and a bullish market outlook may find merit in allocating to high-beta public sector banks such as PNB and Union Bank, as their above-unity betas will amplify positive market returns during bull phases. However, this strategy requires strict stop-loss discipline and regular portfolio rebalancing.

3. Portfolio managers constructing banking sector portfolios should leverage the lower cross-segment correlations by combining high-quality private sector banks with select reformed public sector banks. A blend of Kotak Mahindra Bank or HDFC Bank (defensive) with SBI (moderate-high, reformed) could offer an optimal risk-return balance within the banking allocation.

4. Beta values should not be treated as static; financial institutions and investors are advised to conduct rolling beta computations on a quarterly or semi-annual basis to account for time-variation in market sensitivity, particularly during monetary policy transitions and banking sector consolidations.

5. Future research should extend this framework by incorporating macroeconomic variables — GDP growth, repo rate, CPI inflation, and credit-to-GDP ratio — as additional regressors to distinguish between systematic market risk and macroeconomic risk in banking sector returns. Incorporating

GARCH models for time-varying beta estimation would further enhance analytical precision.

CONCLUSION

This study provides a comprehensive empirical assessment of systematic risk and market sensitivity in the Indian banking sector, covering ten major banking equities over a period of eleven years from December 2013 to December 2025. The findings collectively underscore that the Indian banking sector is characterised by high market sensitivity, with the majority of sampled stocks carrying beta values above 1.0 and exhibiting statistically significant co-movement with the NIFTY 50 index.

The evidence strongly differentiates between public and private sector banking stocks on risk-adjusted performance. Private sector banks — particularly Kotak Mahindra Bank, HDFC Bank, and ICICI Bank — demonstrate superior Sharpe and Treynor ratios, lower betas, and positive alphas, collectively confirming their ability to generate above-market risk-adjusted returns over the long run. Public sector banks, while offering exposure to India's credit growth story, are burdened by higher systematic risk, lower risk-adjusted returns, and greater sensitivity to macroeconomic and regulatory shocks.

The regression and correlation analyses confirm that NIFTY 50 market movements are a primary driver of banking sector equity returns, validating the CAPM framework for practical portfolio construction in the Indian context. The study demonstrates that systematic risk is indeed non-diversifiable within the banking sector and should be a central consideration in any investment or portfolio management decision involving Indian banking equities.

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