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INVESTMENT EFFICIENCY IN THE INDIAN BANKING SECTOR: A QUANTITATIVE ANALYSIS OF RETURN, RISK, AND SHARPE RATIOS

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ABSTRACT

This study examines the return, risk, and Sharpe ratio of selected private and public sector bank stocks in India over the period 2015–2024. The objective is to assess the risk-return efficiency and identify the most stable and rewarding investment options. Data analysis reveals that ICICI Bank offered the highest return among private banks, while Kotak Mahindra had the best risk-adjusted performance. Among public sector banks, Indian Bank showed the highest return but with extreme volatility, whereas Canara Bank offered a balanced performance. ANOVA results indicated no significant difference between mean returns and risks in both sectors. Sharpe ratio analysis further highlighted Kotak Mahindra and HDFC as top performers in the private sector, and Canara Bank in the public sector. NIFTY consistently served as a strong benchmark. The study provides insights into the relative performance of banking stocks for investors. Findings support strategic investment decisions based on risk-adjusted metrics.

KEY WORDS: *Return, Risk, and the Sharpe ratio, Private sector banks and Public sector banks in ANOVA, Bank Nifty index. Risk-adjusted performance,*

INTRODUCTION

The banking sector plays a pivotal role in the economic development of a country by mobilizing savings and channelling funds into productive investments. In India, both private and public sector banks are actively traded in the stock market, making them important investment avenues for institutional and retail investors. The performance of bank stocks is influenced by various factors such as interest rates, monetary policies, credit growth, and regulatory norms. Understanding the risk and return associated with these stocks is essential for informed investment decisions.

This study focuses on the comparative analysis of selected private and public sector bank stocks in India over the period 2015 to 2024. It evaluates their average return, associated risk, and risk-adjusted performance using the Sharpe ratio. Additionally, ANOVA is employed to assess whether there is any statistically significant difference between the mean return and risk values of the banks. The Bank Nifty index is used as a benchmark for comparison.

The study aims to identify which banks offer better investment opportunities based on risk-return efficiency. Such analysis helps investors differentiate between high-return/high-risk and stable-performing banks. It also provides insights into how well public and private sector banks have performed in the past decade, offering useful guidance for future portfolio construction and risk management strategies.

LITERATURE REVIEW

Raghavendra Rao, R. and Srinivasa Rao, Ch. (2022) the study focuses on evaluation of the performance and efficiency analysis of selected private sector banks with respect to some of the key indicators such as Total deposits, Total advances, Total Assets, Net Profit & Non-Performing Assets of last 10 years. takes they taken top 3 Private Sector banks namely HDFC Bank, ICICI Bank and Kotak Mahindra Bank. all the three banks could rectify the deficiencies stated above, surely, they will outperform in the banking sector and will surpass the public sector banks.

Venkateswarlu, R. and Viswanath, P. (2022), Return and risk are fluctuating in the investments due to external and internal factors. The investors may invest funds based on fundamental and technical analysis the later analysis helps to select the best portfolios. five years yearly data i.e 2017-2021 has been analysed to know the portfolio

performance, the tools used are average, standard deviation, correlation and covariance. The selected securities are Wipro, TCS, HDFC, SBI, Tech Mahindra and Bajaj FinServ. The correlation between portfolio (1) securities with (2) securities executing very highly negative relationship i.e., 98% it can be inferred that investors who are risk averters can choose this portfolio.

Nimmakanti Abhinay. and Ramanjaneyulu, N. (2022) in the study it states that the investors should be updated with latest information on the market trends and on the respective company profile in which they are invested. And also, the investors who are willing to earn maximum returns with minimum risk is necessary to have a clear understanding of the investment objectives, tax status and risk tolerance.

Sreenidhi, A. and Basaiah, P. (2021) This study covers the calculation of risk, return on securities in order to find out at what percentage of funds should be invested among scripts. The portfolio is constructed on to Reliance, Wipro and ITC only five years from 2016 - 2017 to 2020 – 2021. Standard deviation, Co-variance, Co-relation co-efficient, Return on portfolio, Risk of portfolio. It can be suggested that the portfolio with Reliance and Wipro has high returns and low risk, when compared with other portfolios.

Jayanth Konanki, and Basaiah, P. (2020) The study is on Comparative Analysis of Risk and Return with Reference to Stocks of Bank Nifty. the study is limited to 12 banks (Axis Bank, Bank of Baroda, Federal Bank, HDFC Bank, ICICI Bank, IDFC First Bank, IndusInd Bank, Kotak Mahindra Bank, Punjab National Bank, Ratnakar Bank Limited, State Bank of India, Yes Bank listed under the bank nifty index in the National Stock Exchange and for the period of one year only i.e., from January 2019 to December 2019. From the study it is suggested that investment in Axis Bank, IDFC First Bank, IndusInd Bank, Kotak Mahindra Bank, RBL Bank, SBI Bank, ICICI Bank would be feasible because they have positive returns compared to others who have negative returns.

RESEARCH GAP

While several studies have analyzed the performance of Indian banks based on financial ratios, profitability, or macroeconomic indicators, limited research has focused specifically on comparing return, risk, and risk-adjusted performance (Sharpe ratio) across both private and public sector banks over an extended period. Most existing literature evaluates short-term performance or focuses only on one category of banks, overlooking a comprehensive, decade-long comparison. Additionally, statistical testing using ANOVA to examine the significance of differences in return and risk is often missing in prior studies. This study fills the gap by offering a comparative, data-driven analysis from 2015 to 2024, integrating Sharpe ratio evaluation and ANOVA testing, while also benchmarking all stocks against the Bank Nifty index, providing deeper insights into risk-return efficiency in the Indian banking sector.

NEED OF THE STUDY

The Indian banking sector has undergone significant transformation over the past decade, influenced by policy reforms, digitalization, changing economic conditions, and market volatility. As both private and public sector banks play a crucial role in financial intermediation, understanding their stock performance is vital for investors, policymakers, and financial analysts. With increasing investor participation in equity markets, there is a growing need to evaluate which banks offer better risk-adjusted returns.

This study is necessary to help stakeholders identify efficient investment options by analyzing the return, risk, and Sharpe ratios of selected banks over ten years (2015–2024). It also aims to fill the gap in comparative performance analysis using statistical tools like ANOVA, which are rarely applied in banking stock studies. By benchmarking performance against the Bank Nifty index, the study offers clear insights into the investment efficiency of individual bank stocks, guiding smarter and more informed financial decisions.

RESEARCH METHODOLOGY

1. Research Design

This study employs a descriptive and analytical research design to evaluate and compare the stock performance of selected private and public sector banks in India. The analysis focuses on key financial metrics including return, risk, and Sharpe ratio over a ten-year period, enabling a structured assessment of investment efficiency.

2. Objectives of the Study

1. To measure and compare the average returns and risk levels of selected private and public sector banks.
2. To assess risk-adjusted performance using the Sharpe Ratio.

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3. To examine whether there is a statistically significant difference between return and risk values using Analysis of Variance (ANOVA).
4. To benchmark individual bank performance against the Bank Nifty Index.

3. Sample Design

The study includes **ten banks** selected through **purposive sampling**:

- **Private Sector Banks:** HDFC Bank, ICICI Bank, Axis Bank, Kotak Mahindra Bank, and IDBI Bank.
- **Public Sector Banks:** Indian Bank, Bank of Baroda, Union Bank, Punjab National Bank, and Canara Bank.

The **Bank Nifty index** is used as a benchmark for comparative analysis.

4. Data Collection

The research is based on **secondary data** collected from:

- NSE/BSE historical stock reports
- Annual reports of banks
- RBI publications
- Reliable financial portals (e.g., Money Control, Yahoo Finance, Bloomberg)

5. Period of Study

The data spans ten years **from 2015 to 2024**, capturing long-term trends in stock performance and risk behaviour across different economic cycles.

6. Tools and Techniques

- **Return:** Calculated as the annual average percentage change in stock prices.
- **Risk:** Measured using **standard deviation** of annual returns, representing volatility.
- **Sharpe Ratio:** Used to evaluate risk-adjusted returns, calculated by:
  - Sharpe Ratio=RP−RF/σ

  where:
  RP = Average Return of the stock
  RF = Risk-Free Rate (assumed as 5.88%)
  σ\sigma = Standard Deviation of Return
- **ANOVA:** Applied to test if the differences in mean return and risk across banks are statistically significant.

7. Statistical Tools Used

- **Microsoft Excel** for preliminary data analysis
- **SPSS** for ANOVA and variance calculations

8. Scope and Limitations

The study is confined to listed Indian banks (NSE/BSE) and excludes cooperative, regional rural, and foreign banks. The findings are specific to the 2015–2024 period and are subject to variation in economic or regulatory changes in the future.

DATA ANALYSIS

Table No:01

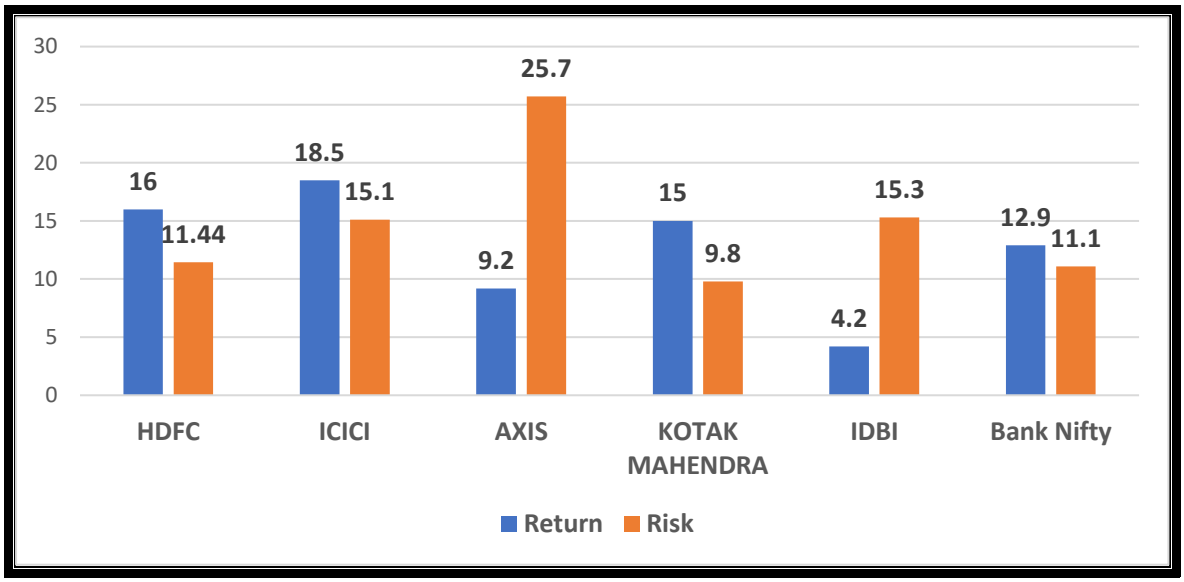
Consolidated Statement of Return and Risk of Private Sector Banks Stocks in India during the Period of 2015 to 2024

S.NO	Name of the Private Banks	Return	Risk
1	HDFC	16	11.44
2	ICICI	18.5	15.1
3	AXIS	9.2	25.7
4	KOTAK MAHENDRA	15	9.8
5	IDBI	4.2	15.3
6	Bank Nifty	12.90	11.10

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Graph No:01

Consolidated Graph of Return and Risk of Private Sector Bank Stocks in India during the Period of 2015 to 2024



1. ICICI Bank provided the highest average return (18.5%), but it also came with relatively high risk (15.1%), indicating strong growth but with volatility.
2. Kotak Mahindra Bank delivered a balanced performance, with a good return (15%) and the lowest risk (9.8%), suggesting it is the most stable and efficient investment among the listed banks.
3. HDFC Bank showed a high return (16%) with moderate risk (11.44%), making it another strong performer with a healthy risk-return balance.
4. Axis Bank had a very high risk (25.7%) but a low return (9.2%), indicating poor risk-adjusted performance and high volatility for investors.
5. IDBI Bank had both a low return (4.2%) and high risk (15.3%), making it the least attractive investment option among the banks studied.
6. The Bank Nifty index gave a benchmark return of 12.9% with risk at 11.1%.
   - Banks like **ICICI, HDFC, and Kotak** outperformed the index in terms of return.
   - Only **Kotak Mahindra** also had **lower risk than the index**, reinforcing its risk efficiency

Table No:02
ANOVA on Consolidated Return

Groups	Count	Sum	Average	Variance
Return	5	62.9	12.58	33.562
Risk	5	77.34	15.468	38.30212

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	20.85136	1	20.85136	0.5803	0.468055	5.317655
Within Groups	287.4565	8	35.93206			
Total	308.3078	9				

Hypotheses

- **Null Hypothesis (H_0):** There is **no significant difference** between the means of return and risk (i.e., $\mu_1 = \mu_2$).
- **Alternative Hypothesis (H_1):** There **is a significant difference** between the means of return and risk (i.e., $\mu_1 \neq \mu_2$).

Interpretation of Results

1. **F-Statistic = 0.5803**
   This is the test statistic calculated to compare the variability **between groups** (returns vs. risks) to the variability **within groups**.

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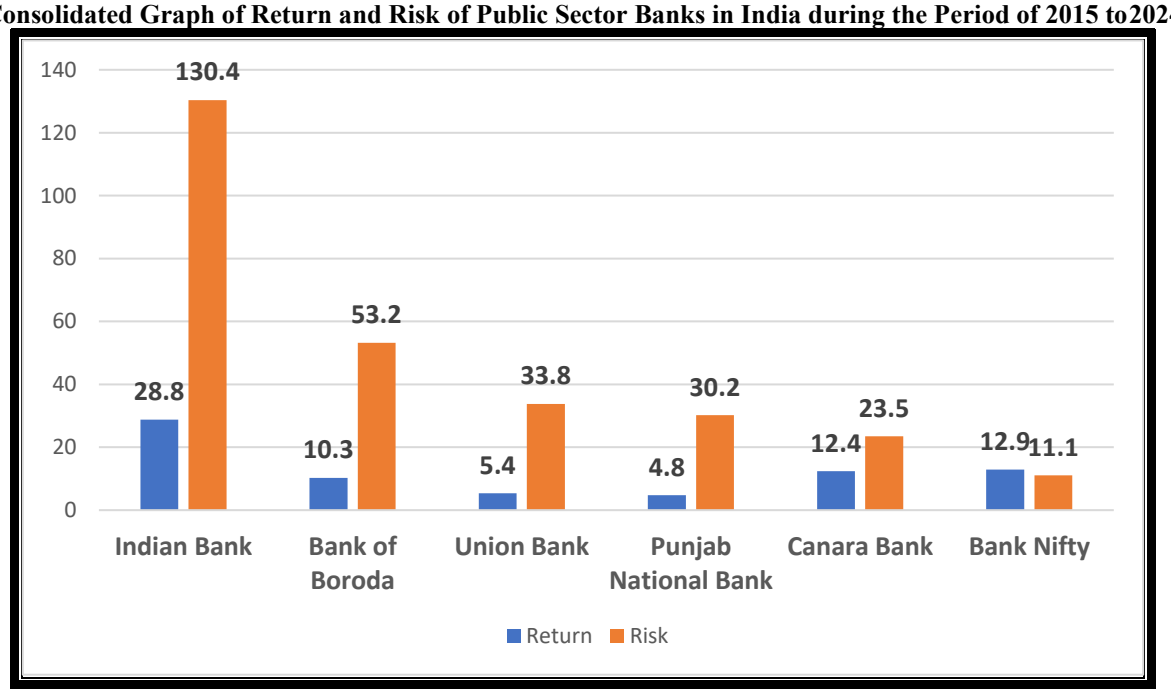
2. **P-value = 0.4681**
   The p-value is **greater than 0.05**, which means there is **no statistically significant difference** between the return and risk values.
3. **F-critical = 5.3177**
   Since the **F-statistic (0.5803) < F-critical (5.3177)**, we **fail to reject the null hypothesis**.

There is no significant difference between the mean return and mean risk of the selected private sector banks during the period 2015 to 2024.
In simple terms, the variation in return and risk is statistically similar, and any observed difference is likely due to random chance, not a real difference in the population.

Table No:02
Consolidated Statement of Return and Risk of Public Sector Banks in India during the Period of 2015 to 2024

S.NO	Number of Public Sector Banks	Return	Risk
1	Indian Bank	28.8	130.4
2	Bank of Boroda	10.3	53.2
3	Union Bank	5.4	33.8
4	Punjab National Bank	4.8	30.2
5	Canara Bank	12.4	23.5
6	Bank Nifty	12.90	11.10

Graph No: 02
Consolidated Graph of Return and Risk of Public Sector Banks in India during the Period of 2015 to2024



Key Inferences

1. Indian Bank shows the highest return (28.8%), but also exhibits extremely high risk (130.4%), making it highly volatile and unpredictable — attractive to aggressive investors but not suitable for risk-averse ones.
2. Canara Bank is the best performer in terms of risk-return balance among public sector banks.
   - It has a moderate return (12.4%) with the lowest risk (23.5%) among the listed PSBs, though still riskier than the Bank Nifty.
3. Union Bank and Punjab National Bank (PNB) have low returns (5.4% and 4.8%) with moderate risks (33.8% and 30.2%), indicating poor risk-return performance.
4. Bank of Baroda offers a moderate return (10.3%) but is coupled with high risk (53.2%), which may not justify the level of volatility unless returns improve.
5. Bank Nifty Index gives a return of 12.9% with very low risk (11.1%), serving as a benchmark.
   - It outperforms most PSBs in terms of risk-efficiency

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ANOVA Tale :03

Groups	*Count*	*Sum*	*Average*	*Variance*
Return	4	49.3	12.325	126.7025
Risk	4	247.6	61.9	2187.48

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	4915.361	1	4915.361	4.248033	0.08493	5.987378
Within Groups	6942.548	6	1157.091			
Total	11857.91	7				

Hypothesis

- **Null Hypothesis (H_0):** There is no significant difference between the means of "Return" and "Risk".
- **Alternative Hypothesis (H_1):** There is a significant difference between the means of "Return" and "Risk".

Interpretation

The **F-statistic (4.248)** is **less than** the **F-critical value (5.987)**.

The **P-value (0.08493)** is **greater than** the typical significance level of **0.05 (5%)**.

Since F < F crit and P > 0.05, we fail to reject the null hypothesis.

This means that there is no statistically significant difference between the mean Return and mean Risk at the 5% significance level

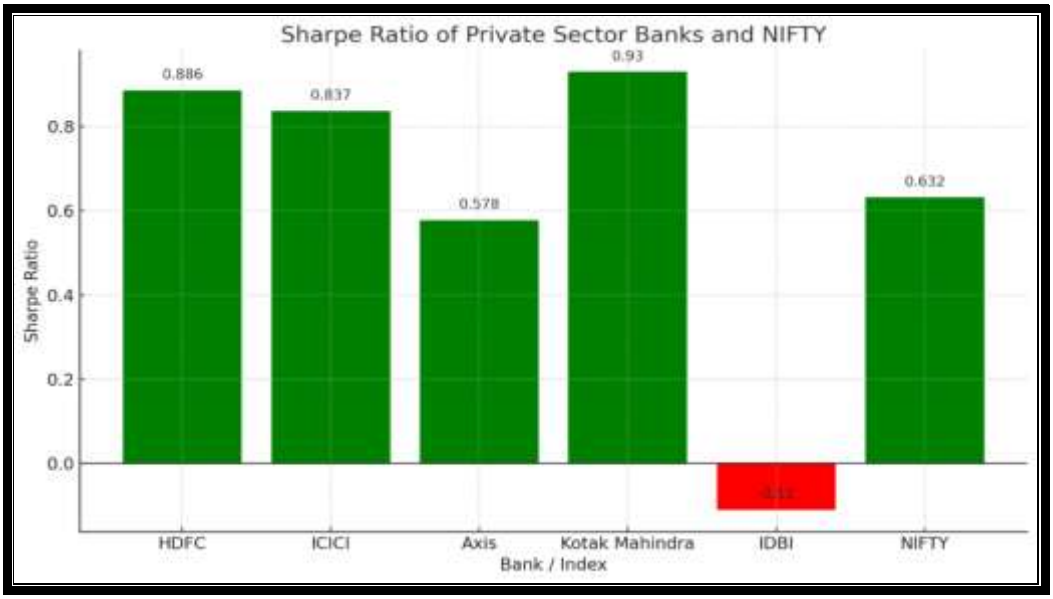
Table No: 04

A Statement of Sharpe Ratio of the Private Sector Banks During the Period of 2015 to 2024

Sl. No	Bank/Index	RP (%)	RF (%)	S.D (%)	Sharpe Ratio
1	HDFC	16.00	5.88	11.44	**0.886**
2	ICICI	18.50	5.88	15.10	**0.837**
3	Axis	14.40	5.88	14.70	**0.578**
4	Kotak Mahindra	15.00	5.88	9.80	**0.930**
5	IDBI	4.20	5.88	15.30	**-0.110**
6	NIFTY	12.90	5.88	11.10	**0.632**

Graph No:03

A Graph of the Sharpe Ratio of the Private Sector Banks During the Period of 2015 to 2024



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Interpretation

Top Performers

- **Kotak Mahindra (0.930):** Best Sharpe Ratio, indicating efficient return for lower risk. Ideal for conservative investors.
- **HDFC (0.886):** Strong balance of return and risk, making it a safe and profitable option.
- **ICICI (0.837):** Highest return, but higher volatility slightly reduces its risk-adjusted appeal.

Moderate Performers

- **NIFTY (0.632):** Market benchmark with average Sharpe efficiency. Serves as a good comparison base.
- **Axis Bank (0.578):** Offers decent returns, but relatively higher risk reduces its efficiency.

Poor Performer

- **IDBI (-0.110):** Returns are **lower than the risk-free rate**, leading to a negative Sharpe Ratio, **indicating risk without adequate compensation**.

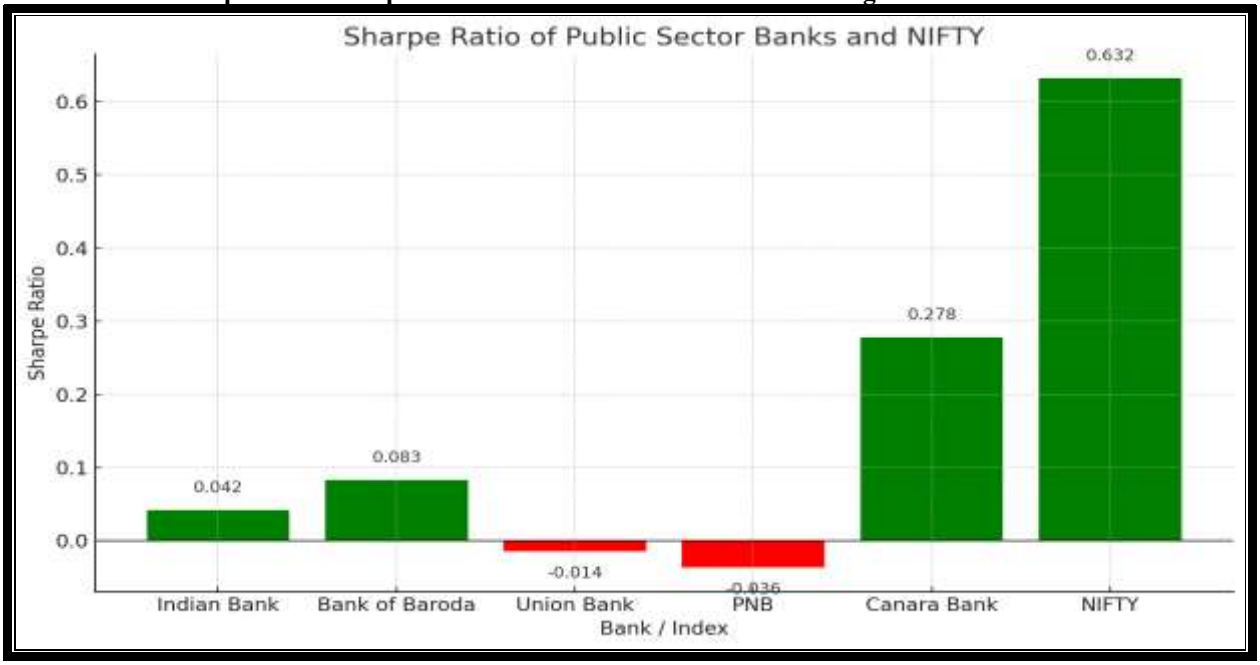
Table No:05

A Statement of Sharpe Ratio of the Public Sector Banks During the Period of2015 to 2024

Sl. No	Public Sector Bank	RP (%)	RF (%)	S.D (%)	Sharpe Ratio
1	Indian Bank	11.30	5.88	130.40	**0.042**
2	Bank of Baroda	10.30	5.88	53.20	**0.083**
3	Union Bank	5.40	5.88	33.80	**-0.014**
4	Punjab National Bank	4.80	5.88	30.20	**-0.036**
5	Canara Bank	12.40	5.88	23.50	**0.278**
6	NIFTY	12.90	5.88	11.10	**0.632**

Graph No:04

A Graph of the Sharpe Ratio of the Public Sector Banks During the Period of 2015 to 2024



Sharpe Ratio Analysis

Top Performer

- **NIFTY (0.632)** has the **highest Sharpe Ratio**, serving as a strong benchmark with solid risk-adjusted returns.
- **Canara Bank (0.278)** is the **best performer among public sector banks**, with a decent return and relatively lower risk.

Moderate Performers

- **Bank of Baroda (0.083)** and **Indian Bank (0.042)** have **very low Sharpe Ratios**, indicating minimal excess return for the high risk involved — especially Indian Bank with an extremely high standard deviation (130.4%).

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Underperformers

- **Union Bank (-0.014)** and **Punjab National Bank (-0.036)** have **negative Sharpe Ratios**, meaning their returns do **not justify the risk** — the returns are lower than the risk-free rate.

FINDINGS OF THE STUDY

Based on the analysis of return, risk, ANOVA, and Sharpe ratio for selected private and public sector bank stocks in India during the period 2015–2024, the following key findings are derived:

1. ICICI Bank recorded the highest average return (18.5%) among private sector banks but with relatively high risk (15.1%), indicating aggressive growth potential.
2. Kotak Mahindra Bank emerged as the most stable and efficient private sector bank, offering a good return (15%) with the lowest risk (9.8%), and the highest Sharpe ratio (0.930).
3. HDFC Bank provided a balanced performance with high return (16%) and moderate risk (11.44%), making it a strong and consistent performer.
4. IDBI Bank showed poor performance, with low return (4.2%) and high risk (15.3%), resulting in a negative Sharpe ratio, which signals an inefficient risk-reward trade-off.
5. Among public sector banks, Indian Bank delivered the highest return (28.8%), but with extremely high volatility (130.4%), making it highly risky for conservative investors.
6. Canara Bank was the best performer among PSBs in terms of risk-adjusted return, with a moderate return (12.4%) and the lowest risk (23.5%) among its peers.
7. Union Bank and PNB had both low returns and moderate risks, resulting in negative Sharpe ratios, indicating returns lower than the risk-free rate.
8. The Bank Nifty index offered a return of 12.9% with low risk (11.1%), outperforming many individual public sector banks in terms of risk efficiency.
9. The Sharpe Ratio analysis favoured Kotak Mahindra, HDFC, and ICICI in the private sector, and Canara Bank in the public sector.
10. ANOVA results for both sectors showed no statistically significant difference between the means of return and risk, suggesting that observed differences may be due to randomness rather than structural performance variation.

SUGGESTIONS

1. Investors seeking stable and efficient returns should consider stocks like Kotak Mahindra and HDFC Bank, as they offer favorable risk-return profiles with consistently high Sharpe ratios.
2. Aggressive investors willing to take on higher risk for potential high rewards may explore ICICI Bank and Indian Bank, but must be cautious due to their elevated volatility.
3. IDBI, Union Bank, and Punjab National Bank should be approached with caution, as their returns do not justify the associated risks, evidenced by low or negative Sharpe ratios.
4. Canara Bank, among public sector banks, shows promising performance with relatively better risk-adjusted returns and should be considered by moderate-risk investors.
5. Portfolio managers and retail investors can use the Bank Nifty index as a benchmark for performance comparison and as a low-risk diversification option.
6. Further studies can include more banks, a broader time frame, or incorporate macroeconomic indicators like inflation, interest rates, and GDP growth for a more holistic analysis.

CONCLUSION

The study provides a comprehensive evaluation of the **risk-return characteristics and investment efficiency** of selected private and public sector bank stocks in India from **2015 to 2024**. The analysis reveals that **private sector banks**, particularly **Kotak Mahindra, HDFC, and ICICI**, generally outperform public sector banks in terms of **risk-adjusted returns**. On the other hand, among PSBs, only **Canara Bank** stands out as a relatively strong performer.

The application of **Sharpe Ratio** effectively highlights the disparity in risk compensation among different banks, while **ANOVA testing confirms** that there is no statistically significant difference between the mean return and risk values across groups.

The findings emphasize the importance of analyzing both **absolute returns and volatility** before making investment decisions, and demonstrate how statistical and financial tools can be used together to assess the performance of financial assets more accurately.

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