

# ICICI Bank vs SBI: A Comparative Analytical Study Using NIFTY Data (2011–2021)

Github- [https://github.com/sourishdey2005/SBI\\_ICICI\\_Stocks-.git](https://github.com/sourishdey2005/SBI_ICICI_Stocks-.git)

This study conducts a comparative financial analysis of two major Indian banking institutions—ICICI Bank and the State Bank of India (SBI)—using daily stock data from the NIFTY Index over a 10-year period (2011–2021). The aim is to evaluate their performance, risk-return profiles, correlation behavior, and statistical properties using both traditional financial metrics and advanced time-series techniques.

## Dataset Summary:

- Time Period: June 1, 2011 – April 30, 2021
- Total Observations: 2,456 trading days
- Features Analyzed:
  - Price: Open, High, Low, Close, Last, VWAP
  - Volume Metrics: Total Traded Volume, Turnover, Trades
  - Delivery Metrics: Deliverable Volume, % Deliverable

## Tools and Libraries:

### Python-based tools including:

- pandas, numpy, matplotlib, seaborn
- statsmodels, arch, copulae, hmmlearn, yfinance
- Statistical techniques: VAR, GARCH, ADF test, Hurst exponent

### Stock Price Evolution:

- ICICI Bank showed strong upward momentum, starting near ₹1,100 in 2011 and closing above ₹1,700 by 2021.
- SBI, in contrast, was more volatile and slower-growing, starting around ₹2,300 and ending around ₹1,100 (due to stock splits).

### Descriptive Statistics (2011–2021):

Metric	ICICI Close Price	SBI Close Price
Mean (₹)	604.15	905.46
Median (₹)	394.60	303.72
Max (₹)	1794.10	2945.75
Min (₹)	183.00	150.85
Std. Dev (Volatility)	384.08	888.62

### Daily & Cumulative Returns:

Metric	SBI	ICICI
Annualized Return	1.15%	8.64%
Annualized Volatility	45.85%	43.38%
Sharpe Ratio	0.025	0.199
Sortino Ratio	0.025	0.205
Max Drawdown	-82.47%	Less severe

### ADF Test (Stationarity):

Stock	ADF Statistic	p-value
SBI	-1.93	0.3199
ICICI	-2.26	0.1839

## Time-Series Models & Dependence Structures

### Copula Analysis (Dependence Modeling):

- Lower tail dependence is high between ICICI & SBI—when one crashes, the other likely does too.
- Supports risk management strategies (e.g., portfolio hedging).

### GARCH Models:

- Volatility clustering observed in both stocks.
- ICICI's volatility is more mean-reverting, while SBI exhibits prolonged high-volatility phases.

#### Fourier & Wavelet Analysis:

- Dominant cycles were detected at ~100–250 day frequencies, reflecting semi-annual financial trends.
- Wavelet plots reveal SBI had more intense localized volatility during crisis years.

#### Markov Regimes:

- ICICI's regimes switched fewer times than SBI's—ICICI is more stable across bull/bear phases.

Parameter	Winner	Reason
Volatility	ICICI	Lower, more stable
Return	ICICI	Higher CAGR
Risk-Adjusted Perf.	ICICI	Better Sharpe/Sortino
Drawdown	ICICI	Shallower losses
Momentum Trends	ICICI	Sustained growth trajectory
Granger Causality	SBI	Predictive influence on ICICI
Arbitrage Potential	Both	Ideal pair due to high correlation

Statistic	SBI Close	ICICI Close	SBI Volume ( $\times 10^6$ )	ICICI Volume ( $\times 10^6$ )
Mean	905.46	604.15	19.25	14.64
Median	303.72	394.60	13.11	11.25
Max	2,945.75	1,794.10	262.67	286.86
Min	150.85	183.00	0.088	0.081
Std Deviation	888.62	384.08	22.94	15.00
Skewness	0.73	0.87	3.15	3.82
Kurtosis	1.58	2.01	14.22	17.49

## Returns, Distributions, and Quantiles

### Daily Returns Analysis:

Metric	SBI	ICICI
Mean Daily Return	0.00005	0.00033
Median Return	0.00013	-0.00019
Std Deviation	0.01891	0.01725
Sharpe Ratio	0.0252	0.1991
Sortino Ratio	0.0251	0.2053

### Quantile Summary of Daily Returns:

Quantile	SBI (%)	ICICI (%)
1%	-5.55%	-5.11%
5%	-3.38%	-3.31%
25%	-1.19%	-1.15%
50%	+0.01%	-0.02%
75%	+1.20%	+1.21%
95%	+3.45%	+3.66%
99%	+6.01%	+6.33%

## Global Benchmarking and Cross-Market Comparisons

In order to contextualize the relative performance of ICICI and SBI in a broader global landscape, we compare their financial metrics against prominent global banking institutions such as JPMorgan Chase, HSBC, and Bank of China. This comparative framework helps evaluate Indian banks not only within their domestic confines but as global participants in capital markets.

### Global Benchmarking Indicators (2020):

Metric	ICICI	SBI	JPMorgan Chase	HSB C	Bank of China
ROE (%)	14.2	7.5	15.8	5.3	11.1
NIM (%)	3.67	2.87	2.43	1.68	2.17
Cost-to-Income Ratio (%)	41.8	52.9	54.7	64.1	39.5

Tier 1 Capital (%)	16.1	11.9	14.4	15.2	12.7
--------------------	------	------	------	------	------

ICICI's ROE and efficiency ratios are comparable, and in some cases superior, to global peers, reinforcing its capability to attract foreign institutional investments. SBI lags behind in profitability but shows strength in retail penetration and CASA mobilization.

### Stress Testing and Monte Carlo Simulations

To evaluate the robustness of both banks under extreme market conditions, a stress test using Monte Carlo simulations was conducted over 10,000 hypothetical return paths, incorporating real volatility and correlation data from the past 10 years.

#### Simulation Parameters:

- Time Horizon: 1 year
- Initial Capital: ₹10 lakh
- Mean Daily Returns: Derived from historical log returns
- Volatility: Daily standard deviation over rolling 60-day windows
- Correlation: 0.92 (Pearson)

#### Key Stress Test Outcomes:

Statistic	ICICI Portfolio	SBI Portfolio
Expected Return	₹10.92 lakh	₹10.12 lakh
5% VaR	-₹1.45 lakh	-₹2.63 lakh
Worst-Case Loss	-₹3.80 lakh	-₹6.12 lakh

Prob. of Loss	32.8%	45.1%
---------------	-------	-------

This clearly demonstrates that ICICI is not only more resilient under uncertainty but also provides a tighter range of return expectations. SBI, being more volatile and policy-sensitive, carries higher tail risk.

### **Sectoral Spillover and Contagion Analysis**

Using Vector Autoregression (VAR) and Impulse Response Functions (IRF), we examine how shocks in banking stocks affect other sectors such as infrastructure, FMCG, and NBFCs. ICICI's movements triggered more pronounced spillovers to NBFCs and IT, while SBI's shocks affected government bond yields and PSU stocks.

Top Sectors Affected by ICICI and SBI (IRF results):

Shock Origin	Top Spillover Sector	Lag of Impact	Response Direction
ICICI	NBFC, IT	2–3 days	Positive/Neutral
SBI	PSU Banks, Infra	3–5 days	Volatile/Negative

These dynamics can help in sector rotation strategies, especially during earnings announcements or macroeconomic events. ESG (Environmental, Social, and Governance) Integration

Over the past decade, ESG has emerged as a critical parameter for institutional investment. Both SBI and ICICI have made notable ESG disclosures, but differ significantly in implementation.

### **ESG Metrics Comparison:**

Parameter	SBI	ICICI
-----------	-----	-------



<b>Carbon Footprint Reported</b>	<b>Yes</b>	<b>Yes</b>
<b>Green Bond Issuance</b>	<b>₹4,000 Cr</b>	<b>₹7,500 Cr</b>
<b>ESG Rating (MSCI, 2021)</b>	<b>BB</b>	<b>A</b>
<b>Gender Diversity Ratio</b>	<b>18%</b>	<b>27%</b>

ICICI's ESG leadership enhances its appeal to global ESG-focused funds. SBI, while compliant, lags in social and governance metrics.

### Legal and Compliance Risk Review

Both banks have faced legal scrutiny over the years. ICICI was subject to inquiries regarding conflict of interest in loan disbursements (2018), while SBI has faced litigation regarding bad loan recovery processes.

**Legal Case Impact Score (Qualitative):**

- ICICI: Medium
- SBI: Low to Medium

The effect on share price volatility during these incidents showed transient spikes, but long-term impact was minimal due to strong institutional backing and quick regulatory compliance.

### **Behavioral Finance and Sentiment Analytics**

Using a corpus of over 20,000 tweets and 500+ news headlines per year, sentiment polarity analysis was conducted via NLP models. ICICI showed higher positive sentiment especially post-2017 due to tech-forward initiatives and strong earnings.

### **Sentiment Polarity Score (Avg):**

- **ICICI: +0.36**
- **SBI: +0.12**

**This reinforces ICICI's perception as a dynamic institution. SBI's sentiment was more neutral due to mixed views on government ownership and NPAs.**

### **Overall Strategic Outlook and Final Conclusion**

**The extensive analytical journey—spanning descriptive statistics, volatility modeling, macroeconomic context, global benchmarks, and sentiment studies—positions ICICI as a more robust, future-ready institution with stronger capital buffers, lower tail risk, and better digital adoption.**

**SBI, while rich in legacy, carries greater systemic responsibility and policy exposure, making it susceptible to non-economic pressures.**

### **Final Strategic Verdict:**

- **ICICI: Core long-term holding, attractive for growth investors and global funds.**
- **SBI: Tactical exposure for event-based opportunities or macro policy-driven trends.**

**This comparative framework not only enriches equity research methods but also aids in better portfolio allocation, risk management, and policy evaluations within India's evolving banking landscape.**