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Impact Factor (Cosmos: 6.262& I2OR: 3.585)

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Analysis of Volatility Patterns in Selected NSE-Listed Stocks using the Rogers–Satchell Drift-Independent Estimator

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Citation: Logeshwari, M. & Devi, K. (2026). Analysis of Volatility Patterns in Selected NSE-Listed Stocks using the Rogers–Satchell Drift-Independent Estimator. *Exploresearch*, 03(03), 44–50. <https://doi.org/10.62823/exre/03.03.254>

Article History:

Received: 02 August 2026

Revised: 18 August 2026

Accepted: 26 August 2026

Published: 15 September 2026

Keywords:

Stock Market Volatility, Rogers–Satchell Estimator, NSE NIFTY 50 OHLC Prices, Investment Risk, Portfolio Management, Volatility Measurement.

Abstract: Stock prices go up and down often because of things like how a company is doing what is happening in the economy what people think will happen and what the government is doing. Events around the world. These things can make prices go higher or lower and can lead to stock market volatility. Knowing about volatility is important because it helps people who invest understand how risky an investment might be. The study looks at how the prices changed for five companies that are listed on the NSE: Reliance Industries Limited, Tata Consultancy Services Limited (TCS) Infosys Limited, ICICI Bank Limited and Wipro Limited. The Rogers–Satchell Drift-Independent Estimator is used to measure their stock price volatility. Unlike methods that mainly use closing prices this estimator considers the opening, high, low and closing prices of each trading day. It therefore provides an understanding of price movements during the trading session and also works well when prices show a trend. The study covers 246 trading observations over a one-year period. The analysis considers volatility, annualised volatility mean daily range, estimator efficiency and bootstrap confidence intervals. The results show differences in volatility among the selected companies. Infosys had the annualised Rogers–Satchell volatility reaching 21.75%. Wipro came next with 20.55%. TCS recorded 19.03%. Reliance Industries showed 17.93%. ICICI Bank had 15.86%. These numbers mean that Infosys had price swings more than the others while ICICI Bank was steadier. TCS was also 1.73 times more efficient than the Close-to-Close method. Overall the findings indicate that volatility varies across the selected companies. The Rogers–Satchell estimator provides a view of stock price movements by considering OHLC prices rather, than only closing prices.

Introduction

The stock market is always changing because of business factors. Company performance, interest rates, inflation, government policies, global events and investor expectations can make share

prices rise or fall quickly. These changes in share prices are called stock market volatility. Knowing volatility is important because it helps investors see how risky an investment can be.

Volatility shows how much a stock price changes, over time. A stock that moves a lot and often is usually seen as uncertain and risky. Therefore studying volatility helps investors make investment decisions and manage risk in their portfolios. A common way to measure stock volatility is by using closing prices. However, closing prices alone may not capture the complete price movement during a trading day. The Open, High, Low and Close (OHLC) prices provide more detailed information about the changes that take place throughout the trading session. Therefore, using OHLC data gives a broader view of daily stock price movements and helps in measuring volatility more effectively.

Range-based volatility estimators were developed to make use of this additional price information. One such method is the Rogers–Satchell estimator, which uses the opening, highest, lowest and closing prices. A major advantage of this estimator is that it can measure volatility even when stock prices show a trend or drift. This makes it useful for analysing stocks with changing price patterns.

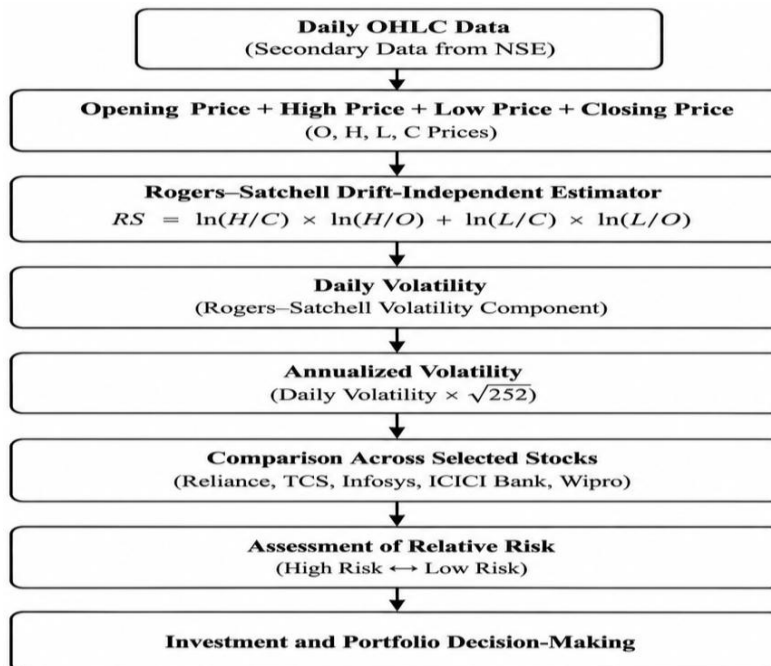
The present study applies the Rogers–Satchell estimator to five NSE-listed companies: Reliance Industries, TCS, Infosys, ICICI Bank and Wipro. These companies represent the energy, IT and banking sectors. The comparison of their volatility helps to understand how stock price risk differs among major companies across different sectors.

Objectives

- To analyse the volatility patterns of selected NSE-listed companies using the Rogers–Satchell Drift-Independent Estimator.
- To measure the volatility of selected companies listed on the NSE.
- To compare the volatility levels of the selected companies.
- To understand how the stock prices moved during the study period.
- To assess how useful the Rogers–Satchell estimator is for measuring stock market volatility.
- To provide insights that can help investors make better-informed investment decisions.

Conceptual Framework

The framework for this study is about how stock price info volatility measurement and investment risk all work together.



Review of Literature

Parkinson (1980) found a way to measure stock volatility by looking at the highest and lowest prices of the day. He showed that the daily trading range tells us a lot about price moves. Garman and Klass (1980) made it better by using the opening, lowest and closing prices. They showed that using info from the day is better than just using closing prices. Rogers and Satchell (1991) created the volatility estimator used in this study. It looks at price info and also thinks about price drift. Rogers, Satchell and Yoon (1994) compared ways to estimate volatility. They found the Rogers–Satchell method is very good when prices are trending. Yang and Zhang (2000) made an estimator that looks at both overnight and daytime price moves to give a picture. Andersen et al. (2001) Studied volatility using frequent data. They showed that watching prices often gives a better view of the market. Fama (1970) talked about the Efficient Market Hypothesis. This says stock prices change as people get info. This new info causes changes in both stock prices and their volatility.

Research Gap

Many researchers have studied stock market volatility using methods such as standard deviation and GARCH models. These methods are useful, but they mainly depend on closing prices and may not fully capture the price movements that happen during the trading day. The Rogers–Satchell estimator is different because it uses four important prices—opening, highest, lowest and closing prices. It is also considered useful for measuring volatility when stock prices show a trend or drift.

However, there is limited research that applies the Rogers–Satchell method to compare a small group of major NSE-listed companies from different sectors during the same study period. This study attempts to address this gap by comparing five major companies from the energy, IT and banking sectors. The comparison helps to understand how volatility differs among large and actively traded companies across different sectors.

Research Methodology

The study uses a descriptive and analytical research design. The descriptive part helps understand the overall movement of the selected stocks, while the analytical part focuses on measuring and comparing their volatility. The study follows a **quantitative approach** as it is based on numerical stock market data. Daily OHLC values are analysed mathematically to calculate the Rogers–Satchell volatility estimates.

Data Source

The study uses secondary data collected from financial market sources such as the National Stock Exchange, Yahoo Finance and Moneycontrol. The data include four daily stock price values:

- Opening price
- Highest price
- Lowest price
- Closing price

These values are used to calculate the daily Rogers–Satchell volatility. The study covers a one-year period and includes 246 trading observations. A total of 252 trading days is used as the basis for annualising the volatility.

Five companies from the NIFTY 50 were selected for the analysis.

Company	Sector
Reliance Industries Limited	Energy / Diversified
Tata Consultancy Services Limited	Information Technology
Infosys Limited	Information Technology
ICICI Bank Limited	Banking
Wipro Limited	Information Technology

These companies were chosen based on their market importance, trading activity, sector representation, and availability of historical stock price data.

Rogers–Satchell Estimator

The Rogers–Satchell estimator uses four daily prices:

- **O** = Opening price
- **H** = Highest price

- **L** = Lowest price
- **C** = Closing price

The formula used in the study is:

$$RS = \ln\left(\frac{H}{C}\right) * \ln\left(\frac{H}{O}\right) + \ln\left(\frac{L}{C}\right) * \ln\left(\frac{L}{O}\right)$$

Using all four OHLC prices helps capture the stock's intraday price movements more effectively. The main advantage of this method is that it can measure volatility even when the stock price shows a drift or general upward or downward movement.

Data Analysis Procedure

The analysis followed these stages:

- Collection of daily OHLC data.
- Cleaning and organising the stock price data.
- Calculation of the daily Rogers–Satchell volatility component.
- Calculation of daily volatility.
- Annualisation of volatility.
- Calculation of mean daily price range.
- Comparison with Close-to-Close, Parkinson and Garman–Klass estimators.
- Calculation of efficiency ratios.
- Calculation of bootstrap confidence intervals.
- Comparative interpretation of the five selected companies.

Analysis and Discussion

Overall Rogers–Satchell Results

Table 1: Consolidated results shows meaningful differences in the volatility behaviour of the five selected companies.

Company	Daily Rs Volatility	Annual Rs Volatility	Efficiency Over Close-to-Close	Mean Daily Range
reliance industries	1.33%	17.93%	1.36×	1.72%
TCS	1.20%	19.03%	1.73×	1.84%
INFOSYS	1.37%	21.75%	1.66×	2.05%
ICICI Bank	1.00%	15.86%	1.37×	1.53%
WIPRO	1.29%	20.55%	1.55×	1.98%

Figure 1: Comparison of Annualised Rogers–Satchell Volatility of Selected NSE Stocks

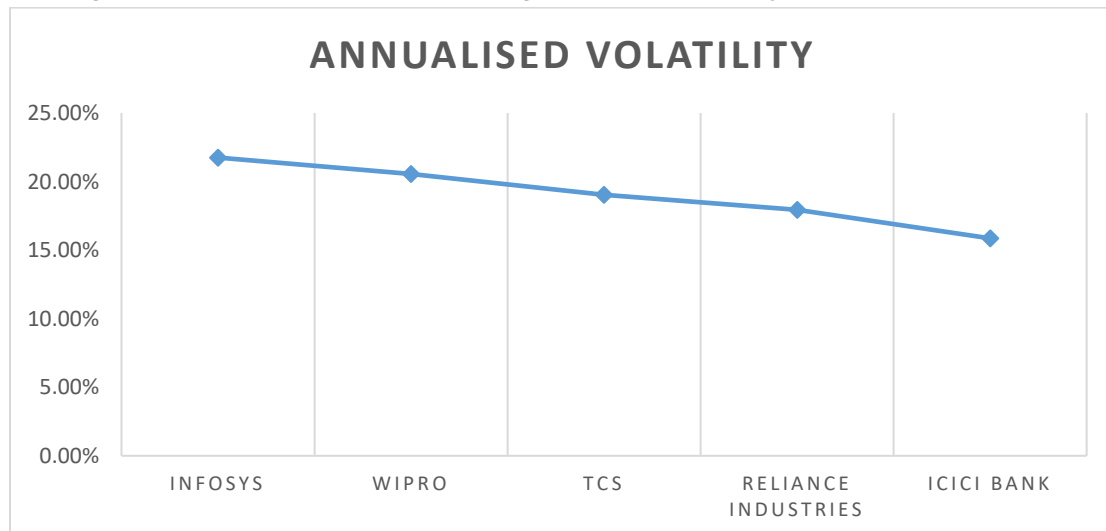


Table 1 shows that the five selected companies had levels of volatility during this study. Infosys had the annualised RS volatility at 21.75% while ICICI Bank had the lowest at 15.86%. TCS and Wipro also had volatility while Reliance Industries stayed in the middle. Looking at the picture the results show that volatility is different for every company, even within the NIFTY 50. This happens because each company has its way of moving in the market.

Reliance Industries

Reliance Industries had an annualised Rogers–Satchell volatility of 17.93% with a daily range of 1.72%. This shows an amount of price movement compared to the other companies. The 95% bootstrap confidence interval was between 16.76% and 18.99% with an error of 0.57%. This suggests the volatility estimate was quite steady.

The Rogers–Satchell estimate of 17.93% was lower than the Close-to-Close estimate of 20.94% with an efficiency ratio of 1.36 $\times$. Overall Reliance Industries showed fairly steady volatility during the study. The results show that Reliance Industries had balanced price movements during the time we studied.

Tata Consultancy Services

TCS had an annualised Rogers–Satchell volatility of 19.03% with a volatility of 1.20% and a mean daily range of 1.84%. One of the interesting things about TCS is its efficiency ratio of 1.73 $\times$. This was the highest efficiency ratio among all five companies in this study. It means the Rogers–Satchell method gave a useful volatility estimate for TCS when compared to the Close-to-Close measure. In terms of volatility TCS was in the middle. TCS had volatility than Reliance Industries and ICICI Bank but less than Infosys and Wipro. We can say TCS is a moderate-volatility stock that also has the estimator efficiency of the companies we picked.

INFOSYS

Infosys had the annualised Rogers–Satchell volatility of the five companies at 21.75%. This means Infosys saw the price swings during the study. The daily volatility for Infosys was 1.37%, which was also the highest in the group. The mean daily range for Infosys was 2.05%, which was again the highest. The maximum daily range hit 7.40%, which shows there were some days when the stock price moved a lot.

The 95% bootstrap confidence interval for Infosys was between 20.34% and 23.20% with an error of 0.71%. This shows that Infosys had the price uncertainty among the companies. However high volatility does not mean a stock is bad; it just means investors deal with price swings and more risk so managing that risk is very important.

ICICI Bank

ICICI Bank had the lowest annualised Rogers–Satchell volatility at 15.86% meaning it had fewer price swings during the study. The daily volatility was 1.00% and the mean daily range was 1.53%. Both of these were the lowest in our sample. ICICI Bank had smaller price movements during the study. The 95% bootstrap confidence interval for ICICI Bank was between 14.94% and 16.81% with an error of 0.47%. This shows the volatility estimate was quite stable. The efficiency ratio was 1.37 $\times$. The Rogers–Satchell estimate of 15.86% was lower than the Close-to-Close annualised volatility of 18.59%. Out of all the stocks we looked at ICICI Bank had the stable trading pattern based on the Rogers–Satchell measure.

WIPRO

Wipro had an annualised Rogers–Satchell volatility of 20.55%, which puts it in place after Infosys. The daily volatility for Wipro was 1.29%. The mean daily range was 1.98%. Wipro had noticeable price movements during the study. Its volatility was higher than Reliance Industries, TCS and ICICI Bank. A bit lower than Infosys. Overall Wipro is in the high-volatility group so investors should think about how risk they can take.

Comparative Discussion

The results show that volatility changes among large companies traded on the NSE. Based on annualised Rogers–Satchell volatility we can rank the companies from highest to lowest:

Highest Volatility → Lowest Volatility

Infosys (21.75%) → Wipro (20.55%) → TCS (19.03%) → Reliance Industries (17.93%) → ICICI Bank (15.86%)

This comparison highlights that each company experienced different levels of price fluctuations during the study period. The differences may also be linked to the different industries and business environments in which these companies operate.

Technology companies in the sample—especially Infosys and Wipro—recorded comparatively higher volatility. ICICI Bank showed the lowest volatility, while Reliance and TCS remained in the middle range. The findings show that Infosys and Wipro had higher levels of risk, while ICICI Bank and Reliance Industries showed comparatively more stable price movements during the study period.

Findings and Suggestions

Findings

- Infosys had the annualised volatility at 21.75% making it the most volatile stock of the five companies during the study.
- Wipro had the highest volatility with an annualised Rogers–Satchell volatility of 20.55% showing higher price swings.
- TCS had moderate volatility. The annualised volatility for TCS was 19.03%. Even though TCS was in the middle for volatility TCS had the efficiency ratio of 1.73×.
- Reliance Industries had fairly moderate price movements. The annualised volatility for Reliance Industries was 17.93%, which's higher than ICICI Bank but lower than TCS, Wipro and Infosys.
- ICICI Bank had the lowest volatility. The annualised volatility for ICICI Bank was 15.86% making it the stable stock in our sample during the study.
- The Rogers–Satchell estimator was more efficient than the Close-to-Close measure for all the companies in this study.
- The bootstrap results show that the volatility estimates are consistent and the confidence intervals show the range where these estimates likely sit.
- Volatility was quite different among these NSE-listed companies. This shows that even large stocks do not always have the risk so investors should check each stock one by one.

Suggestions

- Think about both risk and return: Investors should look at both returns and price swings before they decide to invest. Higher returns can come with uncertainty.
- Pick lower-volatility stocks if you want stability: ICICI Bank and Reliance Industries had lower volatility during the study. This might help investors who want investments.
- Watch high-volatility stocks closely: Infosys and Wipro had higher volatility. Investors holding these stocks should be ready for price changes and know how much risk they can handle.
- Spread out your investments: Investing in companies and different sectors can help lower your risk so you do not rely on just one stock.
- Use volatility measures based on OHLC: The Rogers–Satchell estimator uses opening, high, low and closing prices. This gives a view of daily price moves than just using closing prices.
- Watch the bigger market: Things like interest rates, inflation, government rules, the economy and how investors feel can change stock prices and should be part of your volatility analysis.
- Use data in future studies: Future research could look at more NSE-listed companies from different sectors to get a better comparison of volatility.
- Look at a time frame: Using a longer study period, like five or ten years could help us understand volatility better under different market conditions.
- Compare different ways to measure volatility: Future studies could compare the Rogers–Satchell method with other ways like Parkinson, Garman–Klass, Yang–Zhang, ARCH and GARCH to see the differences.

Conclusion

This study looked at how much the prices of five NSE-listed companies—Reliance Industries, TCS, Infosys, ICICI Bank and Wipro—moved using the Rogers–Satchell Drift-Independent Estimator. The results showed differences in how they moved. Infosys had the annualised volatility at 21.75%, followed by Wipro at 20.55% TCS at 19.03% Reliance Industries at 17.93% and ICICI Bank at 15.86%.

The findings show that big well-known companies can have different levels of price swings. The Rogers–Satchell method is helpful because it uses the daily Open, High, Low and Close (OHLC) prices and accounts for price drift.

Overall Infosys and Wipro had price uncertainty while ICICI Bank and Reliance Industries were more stable. However high volatility does not mean a stock is bad; it just means the price moves more. Investors should look at volatility along, with expected returns how the company is doing, the market and how risk they can personally handle.

The study concludes that the Rogers–Satchell estimator is a tool to compare stock volatility and understand investment risk. These findings can help investors and people managing portfolios make choices when checking the risk of NSE-listed stocks.

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