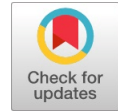


# Volatility Analysis of Indian Banking Sector using Bollinger Bands



Sandeep Bhattacharjee, Moumita Saha

**Abstract:** This research paper aims to analyze the bank volatility in India by examining various factors that contribute to fluctuations in the Indian banking sector. The study investigates the impact of regulatory reforms, macroeconomic indicators, financial stability, and global factors on bank volatility. The research utilizes a comprehensive dataset covering a period of one year i.e. (01-04-2022 to 31-03-2023) to provide an in-depth understanding of the dynamics of bank volatility in India. We have used Bollinger bands to understand the volatility of three premier banks in India namely, HDFC Bank, ICICI Bank and STATE BANK OF INDIA in Indian stock market. The findings of this study will contribute to the existing literature on banking in emerging markets, understand the factor of volatility in present times and will also provide valuable insights for policymakers and stakeholders in the Indian banking sector.

**Keywords:** Banks, Financial, India, Stocks, Volatility

## I. INTRODUCTION

### A. About Banks:

Banking is an essential part of the modern economy, and it plays a significant role in the economic growth and development of a country. The banking sector in India has undergone significant changes over the years, and it has evolved to become one of the most robust banking systems in the world. We have tried to explore the banking sector in India, including its history, structure, and role in the economy.

### B. History of Banking in India:

Banking has its origin in the Vedic period in India, and it is believed that the transition from money lending to banking occurred even before Manu, the great Hindu Jurist, who laid down the laws for debts and credits. The first bank in India was established in 1786, and it was called Bank of Hindustan. However, it failed after only a few years of operation. The next bank to be established was the General Bank of India in 1786, which also failed after a few years [19]. The State Bank of India was established in 1806 as the Bank of Calcutta, and it was later renamed as the Bank of Bengal.

In 1921, these three banks were merged to form the Imperial Bank of India, which was later nationalized in 1955 and renamed as State Bank of India. Structure of Banking System in India [19]. The Indian financial system comprises four segments or components: financial institutions, financial markets, financial instruments, and financial services. Banks come under the financial institutions segment. Financial institutions are intermediaries that mobilize savings and facilitate the allocation of funds to productive uses. There are different types of banks operating in India, including public sector banks (PSBs), private sector banks (PVBs), foreign banks, regional rural banks (RRBs), and cooperative banks [19].

### C. Structure of Banking in India:

**Public Sector Banks** Public sector banks (PSBs) are banks where a majority stake is held by the government. These banks have been working to provide banking services in urban and rural areas since 1970 [20]. These public sector banks account for nearly 70% of banking activity in India. PSBs have played a significant role in promoting financial inclusion by providing banking services to people who were previously excluded from formal banking channels [20].

**Private sector banks (PVBs)** are banks where most of the shares or value is not held by the government but by private shareholders. PVBs have been experiencing great progress in internet banking, ATMs, and other technology advancements. They are likely to expand their operations further into rural areas. **Foreign Banks** Foreign banks are banks that have their headquarters outside India but operate within India. These banks have been playing an important role in providing specialized services such as trade finance and foreign exchange transactions [20].

**Regional Rural Banks** Regional Rural Banks (RRBs) were established with the objective of providing credit and other facilities to small farmers, agricultural laborers, artisans, and small entrepreneurs in rural areas. **Cooperative Banks** Cooperative banks are owned by their members who are also their customers. These banks provide credit facilities to their members at reasonable rates [20].

### D. Role of Banking System in India

The banking system plays a crucial role in promoting economic growth and development by mobilizing savings and channeling them into productive investments. The Indian banking system has undergone significant changes over the years, and it has evolved to become one of the most robust banking systems in the world.

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The Reserve Bank of India (RBI) is the central bank of India and is responsible for regulating and supervising all banks operating within its jurisdiction. The RBI has been instrumental in promoting financial inclusion by encouraging banks to open branches in rural areas [20].

## A. About Stock Volatility:

Stock volatility is a measure of the degree of variation of stock prices over time. It is an important concept in finance as it helps investors and traders to assess the risk associated with investing in a particular stock. In India, the stock market has been growing rapidly over the years, and with this growth, there has been an increase in stock volatility [21]. This essay will explore the concept of stock volatility in India, including its causes, effects, and measures to mitigate it.

## B. Causes of Stock Volatility in India

1. **Economic Factors:** Economic factors such as inflation, interest rates, and GDP growth rate have a significant impact on stock volatility in India. For instance, a rise in inflation or interest rates can lead to a decrease in stock prices, while an increase in GDP growth rate can lead to an increase in stock prices (Bansal and Kaushal, 2019) [3].
2. **Political Factors:** Political factors such as government policies and regulations can also affect stock volatility in India. For example, changes in tax policies or trade agreements can have a significant impact on the stock market (Bansal and Kaushal, 2019) [3].
3. **Global Factors:** Global factors such as changes in oil prices or geopolitical tensions can also affect stock volatility in India. For instance, a rise in oil prices can lead to an increase in inflation, which can negatively impact the stock market (Bansal and Kaushal, 2019) [3].

## C. Effects of Stock Volatility in India

1. **Investor Confidence:** High levels of stock volatility can lead to a decrease in investor confidence, which can result in a decrease in investment and trading activity (Goyal and Kumar, 2020) [6].
2. **Market Instability:** High levels of stock volatility can also lead to market instability, which can negatively impact the overall economy (Goyal and Kumar, 2020) [6].
3. **Risk Management:** High levels of stock volatility can make it difficult for investors and traders to manage risk effectively, which can result in significant losses (Goyal and Kumar, 2020) [6].

## D. Measures to Mitigate Stock Volatility in India

1. **Diversification:** Diversification is one of the most effective ways to mitigate stock volatility. By investing in a variety of stocks across different sectors and industries, investors can reduce their exposure to any one stock or sector (Kumar and Tiwari, 2018) [10].
2. **Risk Management Strategies:** Investors and traders can also use risk management strategies such as stop-loss orders or hedging to mitigate the impact of stock volatility (Kumar and Tiwari, 2018) [10].
3. **Government Policies:** The government can also implement policies and regulations that promote

stability and reduce volatility in the stock market (Kumar and Tiwari, 2018) [10].

## II. LITERATURE REVIEW

Bank volatility is a critical aspect of financial stability, as it directly affects the health of the banking sector and the overall economy. Understanding the factors influencing bank volatility in India is of utmost importance for policymakers, regulators, and market participants. This literature review aims to provide an overview of existing research on bank volatility in India, highlighting the key determinants, measurement techniques, and regulatory implications. Stock volatility refers to the degree of variation or fluctuation in the price of a stock over a specific period. Understanding stock volatility is crucial for investors, traders, and policymakers as it helps assess the risk associated with investment decisions and design appropriate strategies. This literature review aims to explore key studies and concepts related to stock volatility in India. Several factors have been identified as drivers of stock volatility in India. One significant determinant is macroeconomic indicators. Research by Jain and Biswal (2018) found that variables such as interest rates, inflation, exchange rates, and industrial production significantly influence stock market volatility [8]. Additionally, global shocks, such as changes in international oil prices and financial crises, have been identified as influential factors (Srivastava & Arora, 2016) [18]. Market microstructure characteristics, including trading volume, bid ask spread, and order flow, have also been found to impact stock volatility (Banerjee, 2019) [2].

Several studies have examined the relationship between macroeconomic factors and stock volatility in India. Patel and Mishra (2012) found that macroeconomic variables such as inflation, exchange rates, and interest rates significantly influence stock market volatility [15][22][23][25]. Similarly, Acharya and Rajput (2016) observed a significant impact of oil prices, exchange rates, and interest rates on stock market volatility in India [1]. Stock market volatility can vary across different sectors. Mishra and Mishra (2017) conducted a sector-wise analysis and found that the Information Technology (IT) sector in India exhibited higher volatility compared to other sectors [13]. They attributed this to the IT sector's exposure to global factors and technological changes. In contrast, sectors such as Pharmaceuticals and Consumer Goods demonstrated lower volatility.

The introduction of financial derivatives, such as futures and options, has had implications for stock market volatility in India. Mishra and Kumar (2014) examined the impact of stock index futures trading on the volatility of the underlying stocks in India and found a reduction in volatility after the introduction of stock index futures [12]. However, their study also highlighted the need for continuous monitoring of the derivatives market to mitigate potential risks.



Stock market volatility is not solely driven by fundamental factors but is also influenced by investor sentiment and behavioral biases. Behera and Tripathy (2018) investigated the impact of investor sentiment on stock market volatility in India and found a positive relationship [4]. They emphasized the role of sentiment indicators, such as investor surveys and media coverage, in predicting stock market volatility. Financial crises have a significant impact on stock market volatility. Kapoor and Kumar (2018) examined the impact of global financial crises on stock market volatility in India and found an increase in volatility during periods of crisis [9]. They emphasized the importance of policy measures and regulatory interventions to stabilize the market during turbulent times.

Various methodologies have been employed to measure stock volatility in India. One widely used method is the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. Studies by Gupta, Jhunjhunwala, and Mishra (2017) and Kumari and Dhal (2018) employed GARCH models to estimate volatility in the Indian stock market [7,11][25][26]. Volatility clustering and persistence were observed, indicating that stock returns in India exhibit significant volatility patterns over time. Other techniques, such as the exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) model and the stochastic volatility (SV) model, have also been utilized to capture the dynamics of stock volatility (Naidu, 2019; Sharma & Kumari, 2020) [14,17]. Understanding stock volatility has practical implications for market participants. High levels of volatility can indicate increased risk and uncertainty, leading to cautious investment behavior. Research by Bhattacharya and Kumar (2019) revealed that increased volatility adversely affects market liquidity and trading volume, indicating potential challenges for market participants [5]. Moreover, volatility clustering observed in the Indian stock market suggests the presence of nonlinearities and asymmetric responses to market shocks, which investors and risk managers need to consider when

formulating investment strategies (Sahoo & Mishra, 2017) [16].

As derived from the above literature study, we need to understand how some major bank stocks in India have behaved in the recent times. Further, certain alternate hypotheses were considered:

- a. Stock volatility of major Indian banks stocks remain less with respect to time factor. (H1)
- b. Stocks in similar cluster (Indian bank cluster) may behave consistently similarly with respect to time factor (H2).

### III. DATA COLLECTION

The data analysis has been conducted on the data fetched using stock history function in Microsoft Excel 365 enterprise version (licensed version). We have collected data for three significant Banks stocks that includes **HDFC BANK, ICICI BANK and State Bank of India** for the period of one year approx. i.e., between 01-04-2022 to 31-03-2023 (249 days of stock trading). Later, we used Bollinger band for volatility analysis using R console version3.4.0 for all the 3 stocks namely HDFCBANK, ICICIBANK, SBIN.

#### The Coding of the Stocks (As Per Availability in SENSEX) Were:

STOCK NAMES	STOCK CODES
HDFC BANK	HDFCBANK
ICICI BANK	ICICIBANK
State Bank of India	SBIN

Formula used for 3 bands in Bollinger band: -

<p><b>Middle Band = 20-day simple moving average (SMA)</b>  <b>Upper Band = 20-day SMA + (20-day standard deviation of price x 2)</b>  <b>Lower Band = 20-day SMA - (20-day standard deviation of price x 2)</b></p>
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### IV. DATA ANALYSIS

#### A. HDFC Bank

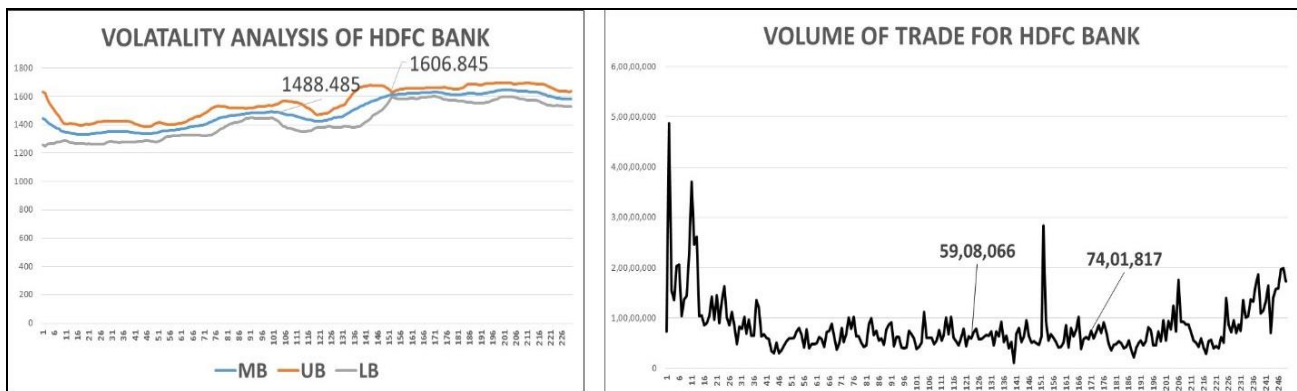


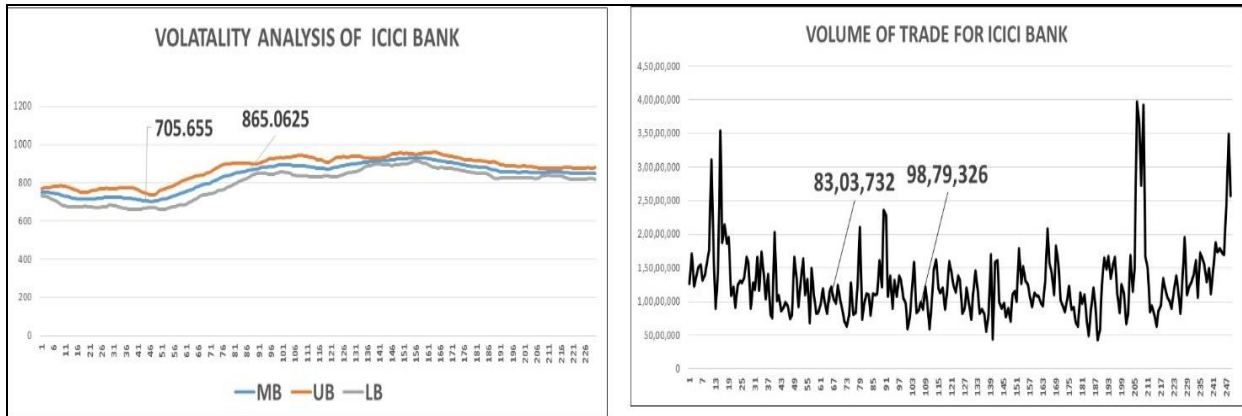
Figure 1. Volatility Analysis and Volume of Trade for HDFC BANK



## Volatility Analysis of Indian Banking Sector using Bollinger Bands

As seen in the figure1, the Bollinger band for HDFC BANK seems to fluctuate between 123rd day (28-09-2022) to 171th day (08-12-2022) of stock trade. Therefore, high amount of volatility exists during this period when stocks traded varied between 59,08,066 to 74,01,817 units.

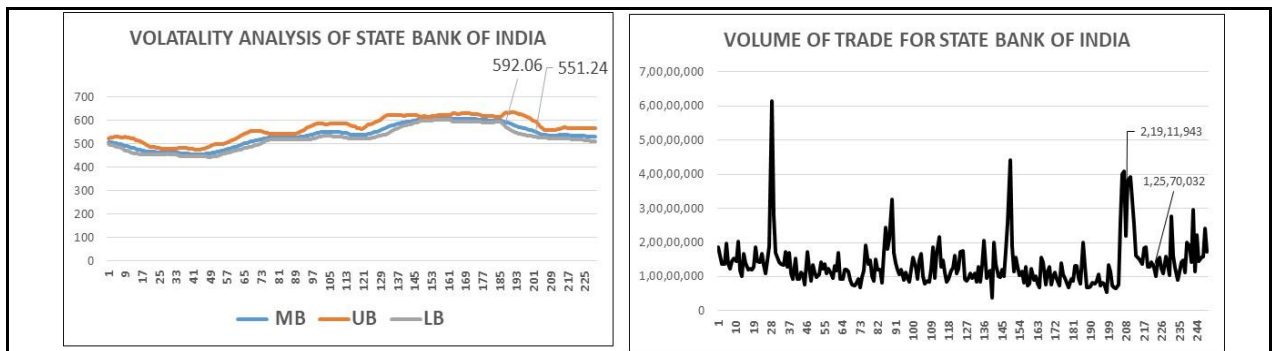
### B. ICICI Bank



**Figure 2. Volatility Analysis and Volume of Trade for ICICI BANK**

As seen in the figure1, the Bollinger band for ICICIBANK seems to fluctuate between 64th day (04-07-2022) to 107th day (06-09-2022) of stock trade. Therefore, high amount of volatility exists during this period when stocks traded varied between 83,03,732 to 98,79,326 units.

### C. State Bank of India



**Figure 3. Volatility Analysis and Volume of Trade for STATE BANK OF INDIA**

As observed in figure 3, the Bollinger band for STATE BANK OF INDIA seems to fluctuate between 208th day (31-01-2023) to 222nd day (20-02-2023) of stock trade. Therefore, high amount of volatility exists during this period when stocks traded varied between 2,19,11,943 to 1,25,70,032 units.

## V. RESULTS

The results can be summarized as:

1. The Bollinger band for HDFC BANK seems to fluctuate between 123rd day (28-09-2022) to 171st day (08-12-2022) of stock trade [ see Figure 1].
2. The Bollinger band for ICICIBANK seems to fluctuate between 64th day (04-07-2022) to 107th day (06-09-2022) of stock trade [ see Figure 2].
3. The Bollinger band for STATE BANK OF INDIA seems to fluctuate between 208th day (31-01-2023) to 222nd day (20-02-2023) of stock trade [see Figure 3].

Also, the window period between 06-09-2022 to 20-02-2023 seems a region for volatility for all three stocks.

Technically, prices are relatively high when above the upper band and relatively low when below the lower band. However, “relatively high” should not be regarded as

bearish or as a sell signal. Likewise, “relatively low” should not be considered bullish or as a buy signal. Prices may be high or low for other economic reason.

## VI. CONCLUSION

We can further interpret that Stock volatility of major Indian Banks stocks remain less with respect to time factor. (H1). Also, Stocks in similar cluster (Banks cluster) may behave consistently similarly with respect to time factor (H2). Therefore, both of our hypothesis i.e.H1, H2 stand as true and can be considered as a more common phenomenon in present and future times. Our research was limited for a given time and based on data collected for 249 days of above discussed stock prices. The results might vary if more or lesser time is considered which remains another constraint of this research. The paper can be used by academicians and policy makers to determine how policies may be restructured or adjusted as per prevailing future expectations of growth of different economies.

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Authors Contributions	All authors have equal participation in this article.

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