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Volatility modelling of Indian stock and index futures

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Abstract
Financial derivatives have become one of the largest markets of the world within the past two decades. Both long term and short term investors of stock market can mitigate risk of their stock market position and can get protection by having suitable position in the futures contract of the same stock or index. Derivatives have high speculative nature, they are risky and they can increase volatility of the market. Volatility is the degree of the change in the current price of an asset with respect to its average past prices. Developed markets give high returns with low volatility for a longer period of time. ARCH model and GARCH (1, 1) model are the methods which are used in this study for modeling financial time series that reveals time-varying volatility of futures. From this study an evidence of time varying volatility is found which shows clustering, high persistence and predictability of futures in Indian market.

Keywords: derivatives, futures, volatility, ARCH, GARCH

1. Introduction
From the introduction of derivatives the trading on stock index futures has grown fast. Recently derivative markets developed importance because of their vital role in the economy. Also depending on the current scenario of the market due to the epidemic, derivatives market has a high potential. The increasing investments in derivatives have attracted the interest in this area. By using derivative products, the price risk can be transferred partially or fully. With the increasing volume of trade in the derivatives market, the volatility analysis is of great use to the investors. The awareness of derivatives market is comparatively less in India, when compared to other developed countries. The globalization of financial markets has increased the number of traders over the decade by providing a wide variety of market and trading investment options. Since the share price of the stock can increase or decrease in the future, it can lead to volatility of the market and causing a greater risk to the investor. So the volatility estimation is important in derivatives market. The security pricing is influenced by volatility of the markets. So the time varying volatility of futures is important for investors to be measured so as to make the appropriate investment decision in derivatives markets. The effect of risk that arises due to the futures trading can be minimized and profit on futures trading can be improvised if suitable volatility models are designed. ARCH model and GARCH (1, 1) model are the methods which are used in this study for modeling financial time series that reveals time-varying volatility of futures.

2. Literature review
About Derivatives
Gahlot Ruchika, Datta Saroj and K. Kapil Sheeba (2010) [20] analyzed the influence of derivative trading on stock market volatility. They did the analysis by taking closing prices of S&P CNX Nifty as well as closing prices of five derivative stocks and five normal stocks. The result show varied effect. These results can be used to make investment decision.
Kohli (2010) [12] noted that equity derivatives are a significant element of the Indian securities market. The index options have been observed with the highest growth followed by Index Futures, Stock Futures and Stock Options from the analysis of the NSE data.
Ashutosh Vashishtha (2010) [2] observed that derivative turnover has grown from 2365 crores to Rs 11010482 crores, within 8 years. In India derivative trading has exceeded cash segment in terms of both volume and turnovers.
Kumari (2011) [13] in her paper described the origin of derivatives trading and its historical developments timeline, the different types of traded derivatives products, the policies and regulations, its trend and growth, future scenario and challenges of derivatives markets in India. The author from her research concluded that Indian derivatives markets is still in an emerging stage and assures that there is a great scope for more development.
Chira Oldani (2011) [26] in his journal focused on the assumption that the prices of the commodities are influenced by their derivatives. The inclusion of derivatives in the financial market has increased the volume of transactions and general price strength.
Sunita Narang (2012) [15] studied on the impact and implications of derivative trading in spot market. It has also focused on derivative trading enhancing the volatility and stability of financial market.
Bhagwat (2012) [25] in their study observed the remarkable growth of derivatives market. The study explained that the turnover of derivatives trading has increased when compared to the cash market segment. They also studied the major role of derivatives in determining price discovery.
SEBI Annual Report (2013) [22] explains the growth of Indian capital markets during the Global Financial crisis and

it assured that we are on a revival stage. The report explains in detail different policies that were taken during the year to reinforce the Indian regulatory framework of capital markets. The report also remarks that derivatives markets have evolved over the years as the single largest segment in Global Financial Markets with a turnover much higher than that of equity and bond markets. In the Indian securities market equity derivatives segment is the most energetic, lively and central segment.

Chukkapalli Dhruva Teja (2018) [5] noted that derivatives market is an innovation to cash market. In cash market the profit or loss of the investor depends on the market price of the underlying asset. The investor may incur huge profits or losses. But in derivatives segment the investor enjoys huge profits with limited problem.

Studies on stock index futures

Y.K. Tse (2002) [28] examines the stock returns volatility in the Tokyo Stock Exchange. ARCH, GARCH and exponential weighted moving average (EWMA) models are used to measure the volatility of stock index future. From the analysis it is shown that the EWMA method gives the best forecasts. These findings have effects in forecasting movements of market volatility.

O.P Gupta (2002) [8] noticed that after the introduction of the index futures for both Nifty and Sensex indices the overall volatility of the stock market has reduced.

Premalata Shenbagaraman (2003) [17] conducted an analysis to understand the impact of index futures and index options contracts trading on the volatility of underlying stock index in India. The study was based on CNX Nifty and CNX Nifty Futures. GARCH and EGARCH model were used in this research. The result shows that derivatives improves the liquidity of the stock market and reduces lack of data in the stock market. And the results also show that derivative, do not help in destabilize the underlying market.

Alexakis Panayiotis (2007) [1] investigated the after effects of the introduction of Stock Index Futures on the volatility of the Spot equity market. This is done to understand the stabilizing and destabilizing effects of them. The arithmetical results indicated that the Futures trading index is in uniformity with efficient market operation because it creates a stabilizing effect in the spot market by decreasing volatility. It improves the speed and quality of the information flow.

Ziemba (2016) [30] brings out the notable features of the futures market in his paper 'Understanding the U.S. Index Futures Stock Market Using Research'. He states that by excluding transactions costs the markets are efficient with correct price and risk premium cannot be earned without taking additional risk. Cash flows, institutional practices, and behavioral biases affect the markets which affect the optimal betting size, volatility effects, operational risks, risk management, slippage and the prediction of stock market crashes. One of the recent concepts related to futures market is the introduction of universal futures and upcoming futures on bitcoin.

Studies on futures analysis

Kawaller (1987) [11] investigated daily 1-minute data by conducting 3 stages least squares regression test. This was done to identify the lead-lag association of S&P 500 Cash and futures. He found lead-lag relationship where futures market was found more efficient than cash market. He also concluded that on expiry date futures maintains at least the same minimum lead as much as on other trading days prior to expiry.

Raghavendra (2013) [18] studies focused on the price fluctuations of Nifty indices for a period of 16 years which was divided into two phases. The first phase from 1996 to 2002 when derivatives were not introduced in India, and Phase Two, from 2002 to 2012, that is, after the introduction of derivatives. A risk-return analysis was conducted to study on the impact of derivatives in spot market.

Isaac Ankamah-Yeboah, Max Nielsen and Rasmus Nielsen (2017) [10] observed the price formation of the salmon futures exchange traded internationally. The study identifies the long run relationship between the spot market price and futures contract prices by analyzing data from 2006 to 2015. In addition, it is clear that the spot price provides directional role in the price detection for 1, 2 and 6 months futures contract. On the other hand, the 3, 4, 5, 9 and 12 months futures contract provide the expected directional role in the price detection and support a matured market, which is an important price risk management tool. The diverse finding indicates that it is a maturing or near matured futures market. From the analysis of the futures contract it is evident that the shorter the length of the futures contract, the higher the volatility.

Ramasamy and Prabakaran (2017) [19] studied the influence of analyzing the risk and return on stock futures trading in Indian derivatives market. Their study illustrates the comparative return analysis of Infosys stock future and TCS stock future. From their study they conclude that the stock futures volatility was found to be lesser than the market volatility. Indian derivatives markets were more unstable throughout their study period. This risk-return analysis helps the investors to take suitable investment decision.

About volatility modelling

Thenmozhi (2002) [26] concluded in her studies that Volatility in Nifty cash market reduced after introduction of Nifty futures and futures markets lead cash market by one day but spot market does not have any impact on futures market. She examined the lead-lag relationship between Nifty cash and Nifty futures by using simultaneous equation modeling, ordinary least squares and two stage least squares regression on closing price returns.

Weixian Wei (2002) [27] in his studies found that the when the sample for the study did not have multiple shocks then the GARCH model is suitable for the estimation. It was concluded that the GJR model is not suitable for forecasting.

Hetamsaria and Deb (2004) [9] using data of the time-period June 9, 1999 to August 1, 2003 of NSE 500 and S&P CNX Nifty index, analyzed the influence of index futures on the Indian stock market volatility. The GARCH model was used to get the result and it is evident that futures trading results in spot market volatility reduction. It was also found that domestic market factors had an important role in determining the volatility of the Nifty index while international factors are found to have irrelevant role.

Banerjee and Sarkar (2006) [3] modelled volatility based on the daily returns of the NSE considering 5-minute interval data. The study showed that GARCH models predict the market volatility better than the other models such as historical average, EWMA. Analysing the different GARCH models it was found that the asymmetric GARCH models gives better result when compared to the symmetric

GARCH models. It was also observed that the change in volume of trade has a positive impact on market volatility.

Selvam and Raja (2007) [24] found that volatility is the degree of change in the current price of an asset from its average past prices. Higher the deviation, higher the volatility. It shows the time varying volatility of the closing prices, which shows clustering, great persistence and predictability for majority of the Asian market indices.

Selvam and Indhumathi (2009) [23] did an empirical analysis to understand the relationship between financial derivatives products and the Bombay Stock Exchange spot market volatility. GARCH model is used for volatility analysis. The result shows that the volatility of spot market index has increased after the introduction of derivatives.

Chandra Pati and Rajib (2010) [4] used their paper to estimate conditional volatility at different time period and examine the level to which trading volume is used as a proxy for information. The persistence of futures market volatility via NSE Index, Nifty index futures, CRISIL, etc. is explained. The paper gives clear evidence about leverage effect, which means that negative shocks increase the futures market volatility when compared to positive shocks of the same degree. Their findings are important for the traders, regulatory bodies, and practitioners. A positive price-volume volatility relationship shows that only when there is price uncertainty related with the underlying asset a new futures contract would be successful. The greater the trading volume greater the volatility and hence there is a need for better regulatory restrictions.

Sathya Swaroop Debasish (2011) [21] examined the volatility fluctuations of the Indian stock market by the introduction of futures contract. The study uses different volatility estimators and concludes that there is no significant change in the volatility of spot market due to introduction of futures contract.

Govind Chandra Patra & Shakti Ranjan Mohapatra (2013) [7] measured the volatility in spot and futures markets along with the chosen stocks, which are Reliance Industries, Infosys, Hindustan Unilever, HDFC, Hindalco, ACC, Tata Steel, L&T, SBI and Tata Motors. The stock futures return of near month contracts are considered. This study separately measures the volatility in spot and future market then compared the conditional and unconditional volatility in these markets. It is observed that the instability is lower in futures market compared to spot market from the selected nine out of ten stocks. The findings of the study indicate there turns in futures market show lesser volatility than returns in underlying spot market.

Lim and Sek (2013) [14] conducted empirical analyses to model the volatility of stock market in Malaysian stock market. The GARCH type models were used to model the volatility of stock market. Performances were compared based on three statistical error measures tools, such as MSE, RMSE, and MAPE for in and out sample analyses. Empirical results revealed that symmetric and asymmetric GARCH models had different performances in different time frames.

Floros and Salvador (2016) [6] studied the daily data of 36 international futures markets like currencies, commodities, stock indices, interest rates and bonds to understand the influence of open interest and transaction volume on the volatility of futures markets. They found that the market depth has an influence on the unpredictability of futures markets but the direction of this effect depends on the type of contract, and there is evidence of a direct simultaneous association amongst trading volume and futures volatility for all futures contracts.

Yao Yao (2016) [29] studied that stock index future can be used for risk management or investment. The trading of stock index futures is influenced by volatility of the stock market but the direction and degree of the impact is controversial in various researches. In this paper the effect of CSI 300 index futures on spot market is analyzed using GARCH model. By using a sample of the daily data of 10 years, a dummy variable is added to the variance equation of the GARCH model. By assessing the data 5 years before and after the launch of CSI 300 index futures, it was observed that the futures market transactions increased the volatility in the spot market. The stock futures can be used as a hedging instrument. Different programs are necessary to manage stock market volatility and financial stability.

From the review of literature, it can be concluded that researchers and financial organizations have carried out research studies covering various aspects of Financial Derivatives both nationally and globally. The present study is different from the above studies in terms of both time period and the sample.

3. Methodology

Research is conducted based on secondary data collected from the official websites of NSE to empirically analyze the daily closing prices of near month futures contracts of 10 stocks belonging to Nifty 50 and develop a volatility model.

3.1 Research Objectives

- To evaluate futures market operations in equity derivatives.
- To study risk management with the help of derivatives.
- To analyze the pattern of returns in the Indian futures market.
- To evaluate the volatility of stock and index futures in National Stock Exchange of India.

3.2 Hypothesis of the study

H_0: There is no ARCH effect.

H_A: There is ARCH effect.

3.3 Sample Size

To analyze the market National Stock Exchange is considered and Nifty 50 is taken as the index. Stock market return has been calculated from the daily closing prices of the NSE Nifty 50. The stock futures data of 10 companies has been chosen based on market capitalization. The contract expiry date chosen is the last Thursday of every 3rd month of the financial years 2018-19 and 2019-20.

Table 1: Sample of Study

S. No	Name of the Company
1	TCS
2	Infosys
3	Reliance
4	Maruti Suzuki
5	Kotak Bank
6	ITC
7	HUL
8	HDFC Bank
9	Bharti Airtel
10	Ultra Tech Cement

3.3 Data Collection
The study is based on secondary data, which have been collected from website of NSE. The daily closing prices of the near month futures contract traded on NSE's F&O exchange for duration of 2 years was collected from the official website of NSE. Data corresponding to last Thursday of every third month from April 2018 to March 2020 was selected for analysis.

3.4 Data Analysis Tools
ARCH (1) model
Under the ARCH model, the autocorrelation in volatility is modeled by allowing the conditional variance of the error term, σ^2_t, to depend on the immediately previous value of the squared error.

$$\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1}$$

Garch (1, 1) model
The GARCH model allows the conditional variance to be dependent upon previous own lags, so that the conditional variance equation in this case is,

$$\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \beta\sigma^2_{t-1}$$

Where,

σ^2_t	=	Conditional variance on current day.
$\alpha_0, \alpha_1, \beta$	=	GARCH parameters. (Constants)
u^2_{t-1}	=	Previous day error term.
σ^2_{t-1}	=	Conditional variance on previous day.

Eviews
This software is used for data organization, performing the econometric and statistical analysis, generating forecasts and model simulations, and creating high quality graphs and tables. It is used to conduct Unit Root test, ARCH and GARCH Test and forecast a volatility model.

Returns
To apply GARCH model, daily closing price have to be converted into returns. The following equation is used to convert daily closing prices into return.

$$\text{Daily Return} = \frac{\text{Today's Closing price} - \text{Yesterday's Closing price}}{\text{Yesterday's Closing Price}} * 100$$

4. Data Analysis and Interpretation
The data analysis steps are
1. Find Daily Returns using the daily closing prices.
2. Plot series for visualization.
3. Test for ARCH effects.
4. If ARCH effect is present estimate ARCH and GARCH Models.
5. Interpret results.
6. Compare the results based on different criteria's and choose the appropriate model.

Interpretation

1. Bharti Airtel
- There is no significant volatility clustering in the returns.
- In the given observation period, there are lots of shocks in the return.
- Towards the end period of first quadrant of year 2020 there is high volatility because of the spread of COVID19 pandemic.
- The given returns series is Homoscedastic.

2. HDFC Bank
- There is no significant volatility clustering in the returns.
- In the given observation period, there is a shock in the last month of third quadrant of year 2019.
- The end period of first quadrant of year 2020 shows high volatility because of the spread of Covid19 pandemic.
- The given returns series is Homoscedastic.

3. Hindustan Unilever
- There is some significant volatility clustering in the returns during the period of 2nd, 3rd and 4th quadrant of the year 2018 as well as in the 1st and 2nd quadrant of the year 2019.
- In the given observation period, there is a shock in the last month of 3rd quadrant as well as in the first month of 4th quadrant of year 2019.
- By the end of March 2020 there is high volatility because of the spread of COVID19 pandemic.
- The given returns series is Heteroskedastic. So it contains ARCH effect. The ARCH model of Hindustan Unilever is as follows,

$$\sigma_t^2 = 1.57301576388 + 0.302767537727 * u_{t-1}^2$$

Where, σ_t^2= Variance at day t.
U_{t-1}= Error on the previous day.

4. Infosys
- There is no significant volatility clustering in the returns graph.
- In the given observation period, there is a shock in the last month of third quadrant of the year 2018 as well as in 2019.
- The end period of first quadrant of year 2020 shows high volatility because of the spread of COVID19 pandemic.
- The given series is not Heteroskedastic.

5. ITC Limited
- There is some significant volatility clustering in the returns graph during the period of 3rd and 4th quadrant of the year 2018 as well as in the 1st, 2nd and 3rd quadrant of the year 2019.
- There is a shock in the last month of 3rd quadrant of the year 2019 as well as in the first month of 1st quadrant of year 2020.
- By the end of March 2020 there is high volatility because of the spread of COVID19 pandemic.
- The given series is Heteroskedastic.
- Among the ARCH and GARCH model since the Schwartz criterion is less for GARCH model, it can be used for volatility prediction.
- The GARCH model variance equation of ITC Limited is as follows,

$$\sigma_t^2 = 0.2448716397 + 0.21522017125 * U_{t-1}^2 + 0.710239693593 * \sigma_{t-1}^2$$

Where, σ_t^2= Variance at day t.

U_{t-1}= ARCH term or Error on the previous day.

σ_{t-1}^2 = GARCH term or Variance at the previous day.

- The sum of ARCH and GARCH terms is large, which indicates the persistence of volatility shocks.
- So once the shock is formed it will remain in the forecasts of variance for many periods in the future.

6. Kotak Mahindra Bank

- There is some significant volatility clustering in the returns graph during the period of 3rd and 4th quadrant of the year 2018.
- There is a shock in the last month of 4th quadrant of the year 2018.
- March end of 2020 shows high volatility because of the spread of COVID19 pandemic.
- The given series is Heteroskedastic.
- Among the ARCH and GARCH model since the Schwartz criterion is less for GARCH model so it can be used for volatility prediction.
- The GARCH model variance equation of Kotak Bank is as follows,

$$\sigma_t^2 = 0.459079364047 + 0.229639972805*U_{t-1}^2 + 0.622418462247*\sigma_{t-1}^2$$

Where, σ_t^2= Variance at day t.

U_{t-1}= ARCH term OR Error on the previous day.

σ_{t-1}^2= GARCH term OR Variance at the previous day.

- The sum of ARCH and GARCH terms is large, which indicates the persistence of volatility shocks.
- This indicates that the effect of today's shock remains in the forecasts of variance for many periods in the future.

7. Maruti Suzuki

- Volatility clusters can be observed throughout the whole period of the returns graph.
- There is a shock in the last month of 3rd quadrant of the year 2019.
- March end of 2020 shows high volatility because of the spread of COVID19 pandemic.
- The given series is Heteroskedastic. The GARCH model of Maruti Suzuki is as follows,

$$\sigma_t^2 = 0.309783641561 + 0.157027197936*U_{t-1}^2 + 0.783250737928*\sigma_{t-1}^2$$

Where, σ_t^2= Variance at day t.

U_{t-1}= ARCH term OR Error on the previous day.

σ_{t-1}^2= GARCH term OR Variance at the previous day.

- The sum of ARCH and GARCH terms is large, which indicates the persistence of volatility shocks.
- It shows that the effect of shock remains in the forecasts of variance for many periods in the future.

8. Reliance

- Volatility clusters can be observed throughout the whole period of the returns graph.
- There is a shock in August 2019.
- March end of 2020 shows high fluctuations because of the spread of COVID19 pandemic.
- The given series is Heteroskedastic. The GARCH model of Reliance is as follows,

$$\sigma_t^2 = 0.427624310895 + 0.279307745103*U_{t-1}^2 + 0.638892094124*\sigma_{t-1}^2$$

Where, σ_t^2= Variance at day t.

U_{t-1}= ARCH term OR Error on the previous day.

σ_{t-1}^2= GARCH term OR Variance at the previous day.

- The sum of ARCH and GARCH terms is large, which indicates the persistence of volatility shocks.
- It indicates that the effect of shock remains in the forecasts of variance for many periods in the future.

9. TCS

- There is no significant volatility clustering in the returns graph.
- There is a shock in May 2018.
- The end period of first quadrant of year 2020 shows high instability because of the spread of COVID19 pandemic.
- There is no ARCH effect.

10. Ultratech Cement CO.

- There is some significant volatility clustering in the returns graph during the period of 2nd, 3rd and 4th quadrant of the year 2018 as well as in the 1st and 2nd quadrant of the year 2019.
- In the given observation period, there is a shock in October 2018 and one in September 2019.
- March end of 2020 shows high unpredictability because of the spread of COVID19 pandemic.
- The given series is Heteroskedastic. Among the ARCH and GARCH model since the Schwartz criterion is less for GARCH model, so GARCH model is more suitable for volatility measurement.
- The GARCH model of Ultratech Cement Co. is as follows,

$$\sigma_t^2 = 1.37705815555 + 0.175942233681*U_{t-1}^2 + 0.503179998038*\sigma_{t-1}^2$$

Where, σ_t^2= Variance at day t.

U_{t-1}= ARCH term OR Error on the previous day.

σ_{t-1}^2= GARCH term OR Variance at the previous day.

- The sum of ARCH and GARCH terms is moderate.
- It signifies that the effect of shock will not remain in the forecasts of variance for a longer period of time.

11. Nifty

- Significant volatility clustering can be seen in the returns graph during the whole period of observation.
- Shock can be observed in September 2019.
- March end of 2020 shows high randomness because of the spread of COVID19 pandemic.

- The given series is Heteroskedastic. At 5% significance level ARCH model is best suitable for predicting volatility in Nifty Futures Index.
- The ARCH model of Nifty Futures Index is as follows,

$$\sigma_t^2 = 0.458179869928 + 0.862256116049 * u_{t-1}^2$$

Where, σ_t^2= Variance at day t.
U_{t-1}= Error on the previous day.

5. Discussions and Results

Findings

- ADF tests indicated that the returns of CNX Nifty Futures Index and all the selected stock futures are stationary at level during the time period 11th April 2018 to 26th March 2020. Stationarity of data is required to apply various econometric models.
- Serial correlation has been checked by correlogram, and it has been found that the daily returns are correlated.
- From the Heteroskedasticity test, it is found that CNX Nifty futures index, HUL, Kotak Bank, ITC, Maruti Suzuki, Reliance and Ultratech Cement Co. have heteroscedasticity, while Bharti Airtel, Infosys, TCS, and HDFC Bank are homoscedastic.
- Heteroscedasticity indicates volatility clustering. So for those with heteroscedasticity ARCH/GARCH model was applied.
- ARCH model was developed for CNX Nifty future index and HUL, while GARCH (1, 1) model was developed for Kotak Bank, ITC, Maruti Suzuki, Reliance and Ultratech Cement Co.
- It was observed that by March 2020, there is very high volatility in the market due to the outbreak of COVID19 pandemic.

Suggestions

- In this study, historical data is used for creating the volatility model. Instead if we use real time data, the obtained model will be more accurate.
- To deal with asymmetry in the volatility, GARCH model is not sufficient for accurate modelling. For dealing such situations it is highly recommended to go for higher version of GARCH model such as EGARCH, TGARCH, etc.
- By applying machine learning to the volatility modeling, the back-test bias can be reduced and the performance of live strategies can be improved.
- Artificial Neural Network (ANN) can be used in volatility prediction.

6. Conclusion

Futures is one of the most important segment in Indian derivatives market. In the past two decades financial derivatives have become one of the largest market in the world. The traditional stock market and the futures market as a part of derivative market is an area where investors find high risk on both, the principal invested amount and the expected returns. Both long term and short term investors of stock market can mitigate risk of their stock market position and can get protection by having suitable position in the futures contract of the same stock or index. It is also observed that investors show great interest in the derivatives market. When the investors invest money in the derivatives market without proper knowledge of the market and without developing suitable strategies it will lead to loss of money. The risk involved in futures trading can be minimized and profit on futures trading can be improvised through designing suitable investment strategies. Some of the major factors that affect the daily fluctuations in the market are weather, war, epidemic, debt, refugee displacement, land reclamation and all micro & macro-economic factors.
The empirical analysis of the data with ARCH and GARCH models suggests that volatility in the Indian futures market keep changing over time and volatility clustering exists in most of the companies. With an efficient volatility model and proper knowledge about the market, the hedgers, speculators and arbitrageurs can trade profitably in a highly volatile market. With the use of artificial intelligence, machine learning and real time data, the limitations of this study can be overcome. Thus there is scope for better volatility modeling which helps in generating more accurate results.

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