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VOLATILITY AND FINANCIAL DERIVATIVES IN NATIONAL STOCK EXCHANGE

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ABSTRACT

The volatility is the natural behavior of any stock market due to uncertainty/unexplained situations in the economy e.g., economic recessions in the country as well in other major world economies, political psychology of present government, government rules & regulations, natural disaster (floods, tsunamis etc.), terrorists' activities in the country as well as in other major economies etc. which has been affecting the Indian stock market. Hence, the Government of India has announced the financial derivatives to control/minimize the stock market volatility due to local as well as global factors. Thus, this paper analyzes the impact of financial derivatives trading on the volatility fixity/stability/minimization of Indian stock market. For this purpose, the behavior of volatility of Nifty has been examined over a simple period Jan 1995 to December 31, 2015. The study is comparative nature i.e. the analysis before derivative introduction period (1995 to 2000) and the analysis after derivative introduction period (2001 to 2015). Ultimately, the result of the study depicts that the volatility has reduced after the introduction of derivatives in the year 2000 in Indian stock market.

KEYWORDS

NSE, Volatility, financial derivatives, index future, stock future, index option and stock option.

INTRODUCTION

An investor would like to know volatility or risk in the stock market. The Stock market is considered to be volatile when there is sharp rise and sharp decline in the markets within a short span of time. The 20th century was witnessed about major micro structure reform in the Indian stock market. Abolition of Badla system and introduction of screen peered trading book building mechanism for publics issues, index funds, exchange traded funds, hedge funds, margin trading, rolling settlement system etc. Such Micro Structure changes brought about revision in transaction cost, which have helped the investors to lock in a deal faster and the change agents have helped in cleaning the system and provided safety to the investing public at large. The link between volatility and risk has been to some extent evasive, but stock market volatility is not a bad thing in fact volatility can form the basis for efficient price discovery. Portfolio managers, risk arbitrageurs and investors closely watch volatility trends, as changes in prices could have a major impact on their investment and risk management decisions. The famous researcher writes "By volatility public seems to mean days when large market movements, particularly down moves occur, there precipitous market wide price drops cannot always be traced to a specific news event. Nor should this lack of smoking gun be seen as in any way anomalous in market for assets like common stock whose value depends on subjective judgment about cash flow and resale prices in highly uncertain future. The public takes a more deterministic view of stock prices; if the market crashes, there must be specific reason." Volatility keeps changing with new information's, shocks, economic recessions, government rules and regulations, and terrorist's attacks and many other reasons, which exert influence on the markets.

Introduction of financial derivatives in the Indian capital market has been an important episode in such a reform process. The main logic behind the derivatives trading is that derivative reduces the risk by providing and additional channel to invest with lowering transaction cost and facilitates the investors to extend these settlements through the future contracts. In provides liability in the stock market. The empirical relationship between return, trading volume and volatility whereas trading volume is useful in improving the forecasts of return and volatility in dynamic context. Volatility and trading volume arises because of private information to markets and trading by informed traders (who believe in market reaction in different ways)

The derivatives in Indian capital market was introduced by the government on L.C. Gupta Committee Report on derivatives in Dec. 1997. The report suggested the introduction of stock index futures in the first place to be followed by other produced. With the amendment in the definition of 'securities' under SC(R) A (to include derivative contracts in the definition of securities), derivatives trading takes place under the provisions of the Securities Contracts (Regulation) Act, 1956 and the Securities and Exchange Board of India Act, 1992. Futures Contract means a legally binding agreement to buy or sell the underlying security on a future date. Future contracts are the organized/standardized contracts in terms of quantity, quality (in case of commodities), delivery time and place for settlement on any date in future. The contract expires on a pre-specified date which is called the expiry date of the contract. On expiry, futures can be settled by delivery of the underlying asset or cash. Cash settlement enables the settlement of obligations arising out of the future/option contract in cash. Options Contract is a type of Derivatives Contract which gives the buyer/holder of the contract the right (but not the obligation) to buy/sell the underlying asset at a predetermined price within or at end of a specified period. The buyer / holder of the option purchase the right from the seller/writer for a consideration which is called the premium. The seller/writer of an option is obligated to settle the option as per the terms of the contract when the buyer/holder exercises his right. The underlying asset could include securities, an index of prices of securities etc. Mishra et al., (2011) and Singh and Kansal (2010) analyzed that Financial Derivatives market in India has shown a remarkable growth in terms of volume and numbers of contracts traded. Presently turnover of the NSE derivatives market exceeded the turnover of the NSE cash market.

The volatility arising due to information based price changes, noise trading and speculative trading i.e. destabilizing volatility. Derivatives' trading has been started in Indian stock market with the theme that it would reduce the volatility.

REVIEW OF LITERATURE

Various studies have been conducted to assess the impact of derivatives trading on the stock market throughout the globe. Some of the important contributions are as follow.

Cox (1976) deciphers that the introduction of derivatives market causes a stabilizing influence on the underlying market because of the speed at which information is incorporated into prices as weak as the amount of information reflected in expected prices. He used variance ratio (F-test) for the period (June 1973 to May 1987) and concluded that the introduction of future trading did not induce a change in spot volatility in the long run. **Shenbagaraman (2003**) studied the impacts of the introduction of the derivatives contracts such as Nifty Futures and options contracts on the underlying spot market volatility have been examined using a model that captures the heterokedasticity in returns that is recognized as the as the Generalized Auto Regressive Conditional heteroskedasticity (GARCH model). She used the daily closing prices for the period Oct 1995 to Dec 2002 for the CNX Nifty, nifty junior and S&P returns. She indicated that derivatives introduction has had no significant impact on spot market volatility but the nature of GARCH Process has changed after the introduction of the Future trading vis-a-vis others researchers mentioned that after post derivative period reduce the volatility, to supported this **Bandivadekar and Ghosh (2005**) examined the impact of introduction of index futures on the volatility of stock market in India. They found strongly relationship between information of introduction of derivatives and return volatility. They also observed that the introduction of derivatives has reduced the volatility of the stock market.

Further, **Raju and Karande (2003**) studied price discovery and volatility in the context of introduction of Nifty Futures at the National Stock Exchange (NSE) in June 2000. Co-integration and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) techniques are used to study price discovery and volatility respectively. The major findings are that the Futures market (and not the Spot market) responds to deviations from equilibrium; price discovery occurs in both the Futures and the Spot market, especially in the later half of the study period. The results also show that volatility in the Spot market has come down after the introduction of Stock Index Futures.

Meanwhile, **Mallikarjunppa and Afsal (2008**) examined the impact of derivatives on stock market volatility. Their study also discussed the post derivatives period shows that sensitivity of the index returns to market returns of the index returns to market returns and any day of the week effect have disappeared. This study used the S&P CNX Nifty index as a benchmark. In this study Nifty Index futures, the Nifty Junior index and spot S&P 500 index from 1995 to 2006 is used. The result suggests that ARCH value and GARCH value are significant in the post derivatives. Singh and Kansal (2010) focused that introduction of derivatives trading has significant impact on the volatility of the stock market return. NSE S&P CNX Nifty index has been used and period covered from 1995-96 to 2008-09 on the financial basis. The suggests that a derivatives trading has reduced the volatility due to trading volume increases, a greater liquidity reflected the prices of the underlying market and then market will become more stable. They used paired sample t test, which proves that derivatives instruments have impact on stock market volatility. Some researches witnessed that not only financial derivatives but also central banking functions and global reasons also affect the stock market volatility vis-à-vis **Goyal and Arora (2010**) also concluded that GARCH Analysis used of exchange rate volatility and effectiveness of central Bank Actions. Daily data used from 2005 to 2008 with 1157 observations. They found quantitative interventions have perverse effects and reversed effects over a longer period. They also examined Higher charges for liquidity injection decrease monthly volatility while Macro news economic news decrease volatility. Quantitative credit restrictions, higher interest differentials and policy lending rates depreciate the exchange rate. **Gupta and Singh (2009)** in their article examined that after introduction of futurist and option, trading volonic is more than 3 times in cash market. They also concluded that India is more volatile than Japan and USA. They investigated that Indian Market, which witnesses the highest volume in the futures and options segment amongst all Pees markets and they also analyzed that both conditional as well as have investigated that many economic, social, political, national, international, and psychological reasons between 1999-2009, making the market highly volatile. They concluded that both domestic and global reasons was affected the Indian stock market in above stated sample period. Political unrest, Stock market scams, Bomb Blasts in Delhi, India-US nuclear deal and many more others reasons showed many ups and downs affecting volatility of Indian stock exchanges and cumulative effect on the psychology of the investors. In this paper they showed that volatility neither good nor bad but investors' reaction affects the scenario.

OBJECTIVE OF STUDY

The objective of this study is to study the behavior of volatility after introduction of financial derivatives. This is to examine with the help of SD(volatility) and paired sample "t" test whether the FD has reduced the risk.

RESEARCH METHODOLOGY

Volatility has been measured as standard deviation of the rates of return. The Rates of Returns have been computed by taking a logarithmic difference of Prices of two successive periods. **Singh & Kansal (2010**), **Mallikarjunppa & Afsal (2008) and Bandivadekar and Ghosh (2005**) and many others researchers use this statistical tools.

$R_t = \log_e (P_t/p_{t-1})$

Where loge is natured logarithm, the p_t and p_{t-1} are the closing prices for the two successive periods. The logarithm difference is symmetric between up and down movements and is expressed in Percentage terms for case of comparability with the straight forward idea of a percentage change.

The study will use the statistical techniques of Paired sample t-Test used for comparison of pre introduction of financial derivatives and post introduction of financial derivatives. This Test helps to find out the before derivative period and after derivatives effect on stock market. This study to be segregated into span of time are 23 days (approximately 1 month), 65 days (approx.3 month), 126 days (approx. 6 months), 256 days (approx. 1 year) 756 days (approx. 3years) and whole period of pre FD and post FD.

$t = |X_1 - X_2| / SE_{X_1 - X_2}$

X_1 = Average Return of Nifty 50 Index of Pre derivatives of different span of time

X_2 = Average return of Nifty 50 index Post derivatives of different span of time

HYPOTHESIS

a) Ho_k: Introduction of financial derivatives instruments have no impact on stock market volatility
b) $H1_K$: Introduction of financial derivatives instruments has impact on stock market volatility.
c) Ho_l: Pre event volatility does not exceeds the post event volatility
d) Hi_1: Pre event volatility exceeds the post event volatility

The Period covered under the study varies from 1995 to 2015 following are the date of introduction of derivatives instruments in NSE i.e. 12 June 2000 for index future 4 June 2001 for Index option followed by stock options and stock futures on 2 July 2001 and 9 Nov. 2001 respectively Hence The whole time period is divided into pre derivative i.e. 1995 to 2000) and post derivatives period.

DATA COLLECTION

The study is based on secondary data which have been collected from various websites. The closing prices of Nifty 50 Index were collected from official website of NSE.

DESCRIPTION OF PERIODS WITH RESPECT TO FINANCIAL DERIVATIVES

Before	Financial Derivatives	After
Index Futures (1-1-1995 to 11-06-2000)		**Index Futures** (13-06-2000 to 31-12-2015)
Index Option (1-1-1995 to 03-06-2001)		**Index Option** (05-06-2001 to 31-12-2015)
Stock Option (1-1-1995 to 01-07-2001)		**Stock Option** (03-07-2001 to 31-12-2015)
Stock Futures (1-1-1995 to 08-11-2001)		**Stock Futures** (10-11-2001 to 31-12-2015)

MEASUREMENT OF VOLATILITY

-----|------|------|------|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|

ANALYSIS AND INTERPRETATION

The study examines how the financial derivatives affect on stock market volatility in different of span of time 1 month, 3 months, 6 months 1 year, 3 years and 5 year as comparative analysis i.e. before and after.

TABLE 1: FINANCIAL DERIVATIVES AND VOLATILITY (Monthly: Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	-0.069	0.945	1.99886	1.12182
Index option	-1.245	0.226	0.95886	1.25614
Stock option	0.851	0.404	1.25551	1.00298
Stock Future	-0.085	0.933	1.24326	1.17268

P value > 0.05 then Ho accepted

Table 1 states that volatility of post introduction of financial derivatives period of 1 month of index future, index option, stock option and stock future has gone down as compare to pre introduction of financial derivatives however, t value is significant therefore Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.12182, 1.25614, 1.00298 and 1.17268 respectively has gone down as compare of pre period was 1.99886, 0.95886, 1.25551 and 1.24326 respectively, but in case of pre event volatility exceeds the post event volatility. Raju and Karande (2003) and Cox (1976) also concluded that Risk factor (SD) has gone down after introduction of financial derivatives

TABLE 2: FINANCIAL DERIVATIVES AND VOLATILITY (3-months: Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	0.574	0.568	2.63188	1.38639
Index option	0.310	0.768	2.19788	0.93118
Stock option	-0.724	0.472	1.59788	1.58355
Stock Future	1.401	0.166	1.67369	1.15797

P value > 0.05 then Ho accepted

Table 2 states that volatility of post introduction of financial derivatives period of 3 months of index future, index option, stock option and stock future has gone down as compare to pre introduction of financial derivatives however, t value is significant therefore, Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.38639, 0.93118, 1.58355 and 1.15797 respectively has gone down as compare of pre period was 2.63188, 2.19788, 1.59788 and 1.67369 respectively. Butin case of pre event volatility exceeds the post event volatility. The risk factor (SD) has gone down after introduction of financial derivatives (Raju & Karande, 2003 and Cox, 1976).

TABLE 3: FINANCIAL DERIVATIVES AND VOLATILITY (6-months: Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	-0.318	0.751	2.35749	1.55661
Index option	0.280	0.780	1.81295	1.44830
Stock option	0.427	0.670	1.79740	1.44263
Stock Future	1.119	0.265	1.40961	1.16851

P value > 0.05 then Ho accepted

Table 3 states that volatility of post introduction of financial derivatives period of 6 months of index future, index option, stock option and stock future has gone down as compare to pre introduction of financial derivatives however, t value is significant therefore Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.55661, 1.44830, 1.44263 and 1.16851 respectively has gone down as compare of pre period was 2.35749, 1.81295, 1.79740 and 1.40961 respectively. Butin case of pre event volatility exceeds the post event volatility

TABLE 4: FINANCIAL DERIVATIVES AND VOLATILITY (1-Year: Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	-1.258	0.209	1.98877	1.68428
Index option	0.203	0.839	1.72460	1.33518
Stock option	0.255	0.467	1.68636	1.30865
Stock Future	0578	0.564	1.63928	1.09554

P value > 0.05 then Ho accepted

Table 4 indicates that volatility of post introduction of financial derivatives period of 1 year of index future, index option, stock option and stock future has gone down as compare to pre introduction of financial derivatives however, t value is significant Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.68428, 1.33518, 1.30865 and 1.09554 respectively has gone down as compare of pre period was 1.98877, 1.72460, 1.68636 and 1.63928 respectively. but in case of pre event volatility exceeds the post event volatility, Gupta (2002) and Malikarjunappa and Afsal (2007) also concluded that volatility has gone down after introduction of financial derivatives

TABLE 5: FINANCIAL DERIVATIVES AND VOLATILITY (3-Year: Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	-0.989	0.323	1.88287	1.36213
Index option	0.297	0.766	1.92092	1.45721
Stock option	0.755	0.774	1.86507	1.46078
Stock Future	0.737	0.461	1.83143	0.06661

P value > 0.05 then Ho accepted

The close perusal of Table 5 states that volatility of post introduction of financial derivatives period of 3 years of index future, index option, stock option and stock future has gone down as compare to pre introduction of financial derivatives however, t value is significant Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.36213, 1.45721, 1.46078 and 0.06661 respectively has gone down as compare of pre period was 1.88287, 1.92092, 1.86507 and 1.83143 respectively but in case of pre event volatility exceeds the post event volatility.

TABLE 6: FINANCIAL DERIVATIVES AND VOLATILITY (5 year Before verses After)

Derivatives	t value	P value	SD (before)	SD (After)
Index Future	0.446	0.656	1.73484	1.41770
Index option	1.723	0.085	1.73039	1.40392
Stock option	1.872	0.061	1.72511	1.42996
Stock Future	1.781	0.093	1.71409	1.54729

P value > 0.05 then Ho accepted

Table 6 describes that volatility of post introduction (2001-2005) of financial derivatives of index future, index option, stock option and stock future has gone down as compare to pre introduction period (1995-2000) of financial derivatives. However, t-value is significant therefore Ho is accepted that shows not much difference in mean values but risk factor (SD) of post period of index future, index option, stock option and stock future are 1.41770, 1.40392, 1.42996 and 1.54729 respectively has gone down as compare of pre period was 1.73484, 1.73039, 1.72511 and 1.71409 respectively. But in case of pre event volatility exceeds the post event volatility (Bandivedekar & Ghosh, 2005).

CONCLUSION
This empirical investigation has been conducted on the Nifty Index market in NSE through 1995-2015. The main result of the study is that SD has gone down in post derivative period as compare of pre derivative of different span period of 1 month, 3 months, 6 months, 1 year, 3 years and 5 years. Change in the volatility process is not due to the introduction of financial derivatives but also other factors e.g. better information dissemination, more transparency and speedy information Mallikarjunappa and Afsal (2008).

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