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IMPACT OF DERIVATIVES TRADING ON MARKET VOLATILITY AND LIQUIDITY

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ABSTRACT

Derivatives trading in the stock market have been a subject of enthusiasm of research in the field of finance. The derivatives are defined as the future contracts whose value depends upon the underlying assets. The main logic behind the derivatives trading is that derivatives reduce the risk by providing an additional channel to invest with lower trading cost and it facilitates the investors to extend their settlement through the future contracts. It provides extra liquidity in the stock market. Now, one of the most important issues that have occupied the financial managers and the academicians in Finance all over the world is the financial markets volatility and Liquidity. So here, an attempt has been conducted to find out the impact of derivatives trading on market volatility and liquidity. The purpose of this research paper is to examine the volatility in the Indian stock market after the introduction of futures and option contracts. Various volatility forecasting approaches are used such as ARCH, GARCH and EGARCH models using the data for a sample period of 10 years from April 1997 to March 2010. The closing prices in the end of the day have been used. NSE Nifty 50 index has been used as a proxy of stock market return. The conditional volatility of inter day market returns before and after the introduction of derivatives products are estimated with the GARCH model. The analysis concluded that the derivatives trading have done its work. It has enhanced the efficiency of the stock market by reducing the spot market volatility and by enhancing the liquidity.

KEYWORDS

Derivatives, Impact, Liquidit, Volatility.

INTRODUCTION

The global liberalisation and integration of financial markets has created new investment opportunities, which in turn require the development of new instruments that are more efficient to deal with the increased risks. The most desired instruments that allow market participants to manage risk in the modern securities trading are known as derivatives.

MEANING OF DERIVATIVES

A derivative is basically a bet. Yes, the stock market is a bet, but at least when you buy a stock, you own a part of the company that provides goods or services. So, it usually has some intrinsic value. But, when you own a derivative, you own nothing. Derivatives include such things as options and futures. The word "derivative" originates from mathematics. It refers to a variable, which has been derived from another variable, i. e. Y = f(X)

WHERE: Y (dependent variable) = DERIVATIVE PRODUCT
X (independent variable) = UNDERLYING ASSET

A financial derivative is a product that derives value from the market of another product. Hence derivative market has no independent existence without an underlying asset. The price of the derivative instrument is contingent on the value of underlying assets. One very interesting example to understand the concept of underlying asset is considering "curd" as derivative. The price of the curd always depends on the price of milk. In other words, we can say the underlying asset on which the value of curd depends is the milk.

MAIN DERIVATIVE PRODUCTS

FORWARDS

A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the futures at today's pre-agreed price.

FUTURES

A future contract is an agreement between two parties to buy or sell an asset at a certain time in the future at the certain price. Futures contracts are the special types of forward contracts in the sense that these are standardized exchange traded contracts. All the futures contracts are settled in cash at NSE.

TWO TYPES OF FUTURES CONTRACTS ARE AS FOLLOWS

Index futures: Index futures are the future contracts where the underlying asset is the index. This is of great help when one wants to take a position on market movements.

Stock Futures: A stock futures contract is a standardised contract to buy or sell a specific stock at a future date at an agreed price.

OPTIONS

An Option is a contract which gives the right, but not an obligation, to buy or sell the underlying at a stated date and at a stated price. While the buyer of an option pays the premium and buys the right to exercise his option, the writer of an option is the one who receives the option premium and therefore obliged to sell/buy the asset if the buyer exercises it on him.

OPTIONS ARE OF TWO TYPES

- **Call Option**

Gives the buyer a right, but not the obligation to buy a given quantity of the underlying asset, at a give price on or before a given future date.

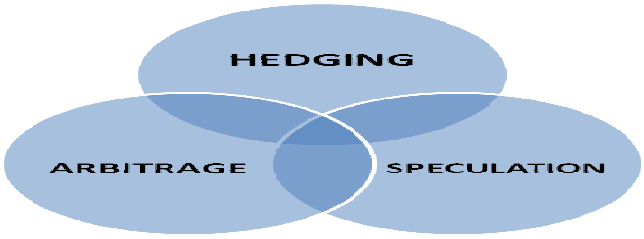
- **Put Option**

Gives the buyer a right but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date.

USES OF DERIVATIVES

HEDGING

Hedging is a tool to reduce the inherent risk in an investment. Various strategies designed to reduce investment risk using call option, put option, short selling, & futures are used for hedging. The basic purpose of a hedge is to reduce the risk of loss. E.g. farmers can sell future contracts on the crop to a speculator before the harvest. The farmer off- loads (or hedges) the risk that the price will rise or fall, and the speculator accepts the risk with the possibility of a large reward. The farmer knows for certain the revenue he will make a profit if the price rises but also risks making a loss if the price falls.



ARBITRAGE

The future price of an underlying asset is function of spot price & cost of carry adjusted for any return on investment. However, due to uncertainty about interest rates, distortions in spot price, or uncertainty about the future income stream, price in future market may not truly reflect the expected spot price in future. This imbalance in future & spot price gives rise to arbitrage opportunities. Transaction made to take advantage of temporary distortions in the market is known as arbitrage transactions.

SPECULATION

You may have very strong opinion about the future market price of a particular asset based on past trends, current information & future expectations. Likewise you may also have an opinion about the overall market trend. To take advantage of such opinion, individual asset or the entire market (index) could be sold or purchased. Position taken either in cash market of derivative market on the basis of personal opinion is known as speculation.

MEANING OF LIQUIDITY

Liquidity is the ability of an investment to be easily converted into cash with little or no loss of capital and with minimum delay. An example of a highly liquid asset is a short term bank bill, while property is a relatively illiquid investment. A liquid asset is a security or other investment that is actively traded and can be readily converted to cash. For example: A stock like General Electric (GE), which has a large number of outstanding shares and trades on the NYSE, is a highly liquid security that has a ready market. By contrast, thinly traded penny stocks often have few bids to buy and few offers to sell. As such, they do not have a ready market and are considered to have low liquidity. Illiquid securities can be quite volatile since the few trades that do occur can have a significant impact on the price.

MEANING OF VOLATILITY

It's basically the variation from the average value over a measurement period. If a price varies a great deal from day to day, the volatility will be high, and conversely if the day to day variation is low, the value of volatility will be low as well.

Volatility is calculated as standard deviation as it is the standard measurement device used worldwide to calculate the volatility. Standard deviation is a statistical term that provides a good indication of volatility .It measures how widely values (closing prices for instance) are dispersed from the average. Dispersion is the difference between the actual value (closing price) and the average value (mean closing price). Larger the difference between the two, higher will be the standard deviation and higher will be the volatility and vice-versa.

IMPORTANCE OF THE STUDY

The importance of the study lies in the findings of the study undertaken. With the help of this study, we will come to know the following:

- The Meaning of derivatives.
- Uses of the derivatives.
- Impact of the derivatives on market volatility and liquidity.

Derivatives have led to the reduction of volatility in the stock prices and increase in the liquidity of securities, which is good for the growth and development of stock market.

REVIEW OF LITERATURE

A number of empirical studies have been conducted in India on the impact of derivatives trading on market volatility and liquidity. Edwards (1988), Mayhew (1992), Spyros I. Spyrou (1997), Abhilash S. Nair (2001), Bologna and Cavallo (2002), Snehal Bandivadekar and Saurabh Ghosh (2005) etc. have conducted various studies to find out the impact of derivatives trading on market volatility and liquidity. The studies reviewed above have taken one or the other aspect of derivative trading and market volatility. There was a mixed opinion about the impact of derivatives trading. That's why an attempt has been made in this study to find out the impact of derivative trading.

OBJECTIVES OF STUDY

1. To study the impact of introduction of financial derivative trading on the volatility of Indian stock market.
2. To study the market wide factors contributing to the changes in spot market volatility and its effect on stock market returns.
3. To study the impact of introduction of financial derivative trading on the liquidity of Indian stock market.

RESEARCH METHODOLOGY

ARCH AND GARCH MODEL

ARCH and GARCH models have been employed to estimate the conditional volatility of stock market returns and the impact of the derivatives trading.

DATA BASE

Stock market return is calculated from the daily closing prices of the NSE stock index S&P CNX Nifty 50. CNX Nifty 50 has been used in the analysis as the proxy of stock market return. We also consider the impact of return in Nifty Junior, on which derivative products have not been introduced. The reason is to know whether the derivatives products are the only factors affecting the market volatility or there are some others factors also. A comparison of fluctuations in volatility between Nifty Junior and Nifty 50 may provide a clue to segregate the fluctuations due to introduction of future products and due to other market factors. The analysis is based on daily time series data. Data for the stock indices (Nifty 50, Nifty Junior and S&P 500) has been used for the period of April 1997 to March 2010. The closing prices in the end of the day have been used.

TABLE 1:- DATE OF INTRODUCTION OF DERIVATIVES PRODUCTS

Derivative Products	Date of Introduction	Underlying IndEX
Index Futures	June 2000	SENSEX, S& P Nifty
Index Options	June 2001	SENSEX, S& P Nifty
Stock Futures	Dec. 2001	SENSEX, S& P Nifty

PRE AND POST PERIOD

The whole time period is divided into two sub-time periods. First is pre-derivatives introduction period that is from April 1997 to June 2000 for index futures, April 1997 to December 2000 for stock futures and from Jan 1998 to June 2001 for index options. Second sub-time period is post-derivatives period from the above categorizations to March 2010. Data are collected from the secondary sources for the purpose of this study. The data are collected from the website of national stock exchange namely www.nseindia.com.

ANALYSIS AND INTERPRETATION

In this section the results, tables and figures are given with their interpretation. First, simple statistics have been tested then GARCH models are estimated.

TABLE 2: COMPARISON OF NSE RETURN FOR PRE AND POST PERIODS

Time periods	Mean	S. D.	Max.
Pre INDF	0.000625	0.013219	0.09321
Post INDF	0.000691	0.010224	0.09744
t-value	0.144	p-value	NS
Pre STF	-4.994E-05	0.013887	-0.042312
Post STF	0.0008174	0.009741	0.068938
t-value	2.009	p-value	<0.05
Pre OPT	2.219E-05	0.009682	0.063367
Post OPT	0.0006762	0.008143	0.069019
t-value	1.959	p-value	<0.05

In Table-2, we have analyzed the volatility (S. D) of NSE Nifty 50 for pre and post period of introduction of derivatives with some other statistical results, and found that the volatility in the NSE (calculated from NIFDR) has a decreasing trend after introduction of the derivatives as the SD values have gone down.

RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN

Models of GARCH error have been estimated for several set of variables. The return series (NIFDR) is selected to test the models. NSE return is a dependent variable. The whole data set is divided into two periods of time, Pre-derivatives introduction period and post-derivatives introduction period. First, the GARCH model has been tested with the dummy variables for whole length of data for each set, and then the GARCH error has been examined for the pre and post introduction period.

TABLE - 3: RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN PRE-INTRODUCTION OF INDEX FUTURES

Parameters	Par. Estimate	t-value	p-value
U^2_{t-1}	0.140343	6.441	<0.01
H_{t-1}	0.038130	2.986	<0.01
INDFN	-0.28916	0.762	NS
Constant	0.001352	4.211	<0.01

R-square = 0.266
F-ratio = 95.27
No. of Observations = 789

Table 3 shows the result of GARCH estimate for pre-index futures introduction period and Table 4 shows the result of GARCH estimate for post index futures introduction period. The R^2 is found to be 0.2661 and 0.1785 respectively in both the models. For both the period GARCH effect is significant as it is clear from the p-value.

TABLE - 4: RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN POST-INTRODUCTION OF INDEX FUTURES

Parameters	Par. estimate	t-value	p-value
U^2_{t-1}	0.324631	6.149	<0.01
H_{t-1}	0.569142	5.492	<0.01
INDFN	-0.260178	10.470	<0.01
Constant	0.000117	3.967	<0.01

R-square = 0.1785
F-ratio = 160.14
NO. of observations = 2214

The coefficients reported in Table 3 and 4 show that in the GARCH variance equation, (b_2) 'old news' components have gone up and b_1 'recent news' components have also gone up in the post Index-future period and these estimates are significant at one per cent level. It can be concluded that introduction of the Index futures has increased the impact of recent news and reduced the asymmetric information. The period of the introduction of the stock futures is different and result has shown that stock future trading is reducing the volatility, though not significantly.

TABLE - 5: RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN PRE-INTRODUCTION OF INDEX OPTIONS

Parameters	Par. estimate	t-value	p-value
U^2_{t-1}	0.439164	4.836	<0.01
H_{t-1}	0.563481	6.944	<0.01
INOPTN	0.446891	8.355	<0.01
Constant	0.000245	9.467	<0.01

R-square = 0.2467
F-ratio = 113.20
No. of Observations = 1041

TABLE - 6: RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN POST-INTRODUCTION OF INDEX OPTIONS

Parameters	Par. Estimate	t-value	p-value
U^2_{t-1}	0.516374	4.658	<0.01
H_{t-1}	0.351768	3.567	<0.01
INOPTN	0.020181	2.892	<0.01
Constant	0.000123	14.997	<0.01

R-square = 0.1087
F-ratio = 79.60
No. of Observations = 1962

It becomes clear from the tables 5 and 6 that for both the period the information impact is significant and supporting the result of the table-5. After the introduction of index options the coefficient of recent new (b_1) has gone up and old news (b_2) has gone down. This indicates the uncertainties in the stock market have gone down and the volatility has been reduced. This result rejects the null hypothesis that derivatives have not reduced the volatility of NSE spot market.

The above tests have resulted different things. As we have mentioned that we have taken three time periods that are decided by three important derivatives products. Index futures were introduced from June 2000 and 2000-2001 was the period of a big scam in the stock market. Since 2002 the stock market was able to be taken its stable position and further even at present the stock market has recorded an efficient position. This may be the reason that result for period of options introduction is more trustable.

But the question is whether the derivatives products are the only reasons to reduces/increase the volatility, or are there some others factors affecting the volatility of stock market return? To solve this problem the other variables as NIFJDRT, S&P500DRt and Derivatives turnover are included as explanatory variables to control the effect of the index futures. The following models are related to this practice.

TABLE-7: RESULT OF GARCH (1, 1) ESTIMATE FOR NSE RETURN FOR THE WHOLE PERIOD ADJUSTED BY NIFTY JUNIOR AND S&P500 RETURN

Parameters	Par. Estimate	t-value	p-value
U^2_{t-1}	0.351329	7.859	<0.01
H_{t-1}	0.537472	14.956	<0.01
INDFN	0.000187	1.497	NS
NIFJDR	-0.095622	9.129	<0.01
S$P500DR	0.017215	1.254	NS
Constant	0.000106	3.789	<0.01

R-square = 0.2261
F-ratio = 175.12
Number of Observations = 3003

Though the R^2 came to be only 0.2261 but it is highly significant as indicated by the F-ratio is 175.12. It is clear from the result tabulated in table-7 that the coefficient b_2 for Nifty Junior return volatility is significant at 1% significant level with negative sign indicating that the other factors (market factors) have significantly reduced the volatility in the stock market.

FINDINGS OF THE STUDY

- The general finding is that introduction of derivatives trading has significant impact on the volatility of the stock market return.
- We also found that derivatives are not a single factor affecting the stock market risk (volatility). There are some other market factors also.
- A lot of efforts have been done by SEBI to control the volatility of the NSE market.

SUGGESTIONS

- Investors are not very aware about the derivative products traded in stock market. So, it is advisory that awareness should be provided to the investors about these products.
- Though the trading through derivatives in increasing day by day and more new derivatives products have been introduced, the volatility is not much controlled. The functioning area or the size of the market has been speeded enough. In this situation strong regulatory system is desired for well-functioning of the stock market.

CONCLUSION

High volatility is considered as high risk in the stock market. To reduce this risk factor in the Indian stock market, a number of steps are being adopted by the market regulators. Introduction of derivatives trading is one of them. The analysis concluded that the derivatives trading have done its work. It has enhanced the efficiency of the stock market by reducing the spot market volatility and enhancing the liquidity.

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