Is An Introduction of Derivatives Trading Cause-Increased Volatility?

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INTRODUCTION

As the word suggests, *derivative* is a financial contract, which derives its value from its underlying variable. The variable can be any asset, index, interest rate, weather and so on. Derivatives provide a platform to the participants for hedging their real or potential exposure, speculating on the degree and the direction of the movement in underlying variable and finding and exploiting arbitrage opportunities arising out of temporary mispricing of various derivative products or the temporary violation of non arbitrage conditions between derivative contract and its underlying variable from which it derives value.

The major attraction of the derivative market for the traders is that it allows them to assume highly leveraged positions at low transaction costs and also allows them to crate some of the highly flexible and innovative payoffs by combining different derivatives products.

Introduction of derivatives contracts in Indian stock market can be traced back to less than a decade. On the recommendation of L. C. Gupta committee report on derivatives in March 1998, the government initiated necessary changes in SCRA and also removed other regulatory hurdles in order to facilitate the introduction of derivatives in Indian markets. Finally, index futures on benchmark indices (Sensex and Nifty-50) were introduced in June 2000, followed by an introduction of index options in June 2001, options in individual stocks were introduced in July 2001 and stock futures were introduced in November 2001. Despite the late introduction of derivatives in Indian markets, it has seen a phenomenal growth, both in terms of range of the products offered and also in terms of clocking large trading volumes. As per the information given in NSE Factbook-2008-NSE is ranked as the ninth largest derivatives exchange in the world, the second largest in terms of number of contracts traded in single stock futures and third largest in terms of number of contracts traded in index futures category. The average daily turnover in derivatives contracts in year 2007-08 was Rs. 52153 crore which is almost five times more than the average daily cash market turnover. It is worth noting that India has not only launched stock futures much earlier than some of the developed markets but it has been done with great success- stock futures contribute to almost 50% of average daily FandO segment turnover on National Stock Exchange.

This grand success story of rapid and successful introduction of futures and options in Indian stock markets has found many frowning eyebrows and received pounding from critics, especially during the massive fall of stock markets immediately after the general election of the year 2004. FandO trading was blamed for the rapid fall in the markets. One of the arguments against the introduction of derivatives trading is that derivatives' market is a market for speculators and there is a wide spread concern that it may have an adverse impact on the volatility of the spot market. On the other hand, it has been argued by the proponents of derivatives trading-that derivative market segment is dominated by large informed investors and therefore, this market is expected to be more efficient in price discovery and hence will ultimately reduce the volatility.

LITERATURE REVIEW

Increase in volatility in the market is not seen favorably in the market place and hence any event which alters, especially increases the volatility in the market place is to be scrutinized in detail. Introduction of derivatives affects such a critical issue and hence it has also been researched widely worldwide. There is a good amount of work done in India also-though with limited data available.

The research on testing the effect of derivatives trading on volatility of spot market is primarily focused on the following aspects:

- Introduction of derivatives and change in volatility in spot markets.
- If there is a change in volatility after the introduction of derivatives- can it be attributed to derivatives trading or it is due to some macroeconomic factors.
- If there is an increase in volatility with introduction of derivatives-is it because of better and faster transmission of news to the market or it is due to speculative activities and hence destabilizing in nature?

The question pertaining to impact of derivatives trading on spot cash market volatility has been studied mainly using the following two approaches:

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- By comparing cash market volatilities during the pre and post derivatives introduction period.
- By evaluating the impact of derivatives trading on the behaviour of the spot markets.

Despite a great amount of work done till date, literature is still inconclusive about the effect of introduction of derivatives trading on volatility of cash market- whether introduction of derivatives trading causes increase or decrease in volatility of cash market or it does not impact it at all.

One school of thought argues that the introduction of futures trading increases spot market volatility and therefore, destabilizes the market (Cox 1976, Figelwski 1981, Stein 1987, Harris 1989, Kamara 1992). Others argue that the introduction of futures reduces the cash market volatility and hence, stabilizes the market (Powers 1970, Schwarz and Laatsch 1991, Basal 1989, Conard, 1989, Kumar 1995).

The proponents of increase in price volatility argued that derivatives market is speculators' market and highly leveraged positions taken by them destabilizes the spot market, which in turn leads to increased volatility. On the other hand, several authors who found evidence of decreased volatility have argued that trading in derivatives improves market depth, enhances market efficiency by faster transmission of "recent news" in price and reduces the importance of "old news" and leads to increase in market liquidity.

Even those who found evidence for increase in volatility in spot market after introduction of derivatives trading have found two major issues.

- Harris (1989) commented that it is difficult to attribute the observed increase in volatility solely to derivative trading. So any increase in volatility due to some other macroeconomic factors should be captured separately.
- The other argument-the debate about whether increased volatility is undesirable is entirely misplaced. The increased volatility may be caused by information component or speculative component (destabilizing volatility). Antominiou and Holems (1995) argued that price depends on the information currently available in the market, derivatives trading can alter the available information for two reasons-first, derivatives trading attract additional traders in the market; second, as transaction costs in the derivatives segment of the market is lower than those in the spot market, new information may be transmitted to the derivatives market faster. Hence, derivatives market provides additional path to transmit information to the spot market and therefore, increase in spot market volatility is due to faster processing of new information and hence cannot be considered negative. In fact, it improves the price discovery by adjusting price to accommodate "recent news" and reduces the weightage of "old news" in the price.

Talking about the research done in India, many researchers found evidence for reduction in spot market volatility on introduction of Nifty futures (Thenmozhi (2002), Gupta (2002) Bandivadekar and Ghosh (2003)). Nath (2003) found reduction in volatility in most of the stocks after introduction of futures in most of the stocks. Many others found similar results. On the other hand, Shenbagaraman (2003) did not find evidence of change in spot market volatility on introduction of derivatives trading. Afsal and Mallikarjunappa (2007) also find that derivatives trading have no impact on spot market volatility.

DATA AND METHODOLOGY

Most of the researchers tested the effect of derivatives trading on the volatility of the spot market of the underlying using ARCH/GARCH conditional volatility models and rightly so as they are the most sophisticated ones. These models are beyond the interpretation capabilities of a layman or a trader. Hence, the researcher has decided to use a simpler approach to test the change in volatility by measuring change in relative volatility of the stocks on introduction of FandO trading using beta as a relative measure of volatility.

- Starting from July 2, 2001 to June 20, 2008, there are 46 instances where FandO trading was introduced on one or more securities on NSE, and as a result as on June 20, 2008, derivatives' trading was available on 217 stocks. (Source: NSE Fact-book, 2008).
- Out of 46 such instances of FandO introduction, the researcher has selected only those where the derivatives contracts were introduced in at least two stocks together. The objective is to avoid noise in the analysis. Also, the securities where FandO trading was permitted along with IPO listing were excluded from the sample, as there is no past volatility record to measure the change in the volatility.
- Using the elimination criteria mentioned above, the researcher finally selected 12 different derivatives introduction dates, which covers 182 stocks where derivatives contracts were introduced. These 182 stocks and twelve equally weighted portfolios were used for testing change in volatility. **(See Table-1)**
- The change in volatility is tested using relative change in volatility of daily stock return for the one-year prior to derivatives introduction and one year after the derivatives introduction.

Table-1: Selected FandO Introduction Dates On NSE and Number of Stocks

Date of FandO Introduction at NSE	Number of Securities
July 02, 2001	22
January 31, 2003	9
August 29, 2003	8
September 26, 2003	4
April 20, 2005	27
May 12, 2005	17
May 27, 2005	9
September 15, 2006	2
December 29, 2006	25
May 14, 2007	30
September 6, 2007	14
November 30, 2007	15

- To test the change in relative volatility of stocks where derivative trading was introduced, beta before the introduction on derivatives trading and beta after introduction of derivatives trading was calculated. SandP CNX 500 index was chosen as representative of the market for the following reasons:
  1. FandO trading is not introduced in this index and hence, any permanent change in index volatility, which would have happened due to introduction of derivatives trading in those cases where derivatives' trading was introduced, will not affect the analysis.
  2. Another major reason for choosing SandP CNX 500 is that it is India's first broad-based benchmark of the Indian capital market. The SandP CNX 500 represents about 95.11% of total market capitalization and about 94.84% of the total turnover on the NSE as on March 31, 2009.
- To measure the relative change in volatility beta of each stock, stock beta was calculated using one-year daily return data of the stock and benchmark index SandP CNX 500. Beta was again calculated by using daily return data for one year after the introduction of derivatives contracts. To avoid bias in result, instead of measuring change in beta for one stock and analyzing, average beta was calculated by using every individual stock's beta where FandO trading was introduced on the same day. The same steps were repeated for all twelve FandO introduction dates chosen for the analysis. Average betas were calculated for twelve such FandO introductions, and then were used to calculate a mean beta value for a portfolio of equally weighted twelve average betas.
- Also, change in return after introduction of derivatives contracts was measured using paired t-test to test any linkage with change in volatility and change in returns. Excess average daily returns using excess market return method was calculated by subtracting average daily return on SandP CNX 500 from corresponding period average daily return for a stock or a portfolio.

RESULTS AND ANALYSIS

As presented in **Table-2,** change in relative volatility-which is measured by change in average beta of all the stocks in which FandO trading was introduced on the same day-has found statistically significant decrease in relative volatility on five, increase in relative volatility on four and no significant change in relative volatility on three occasions out of total twelve portfolios formed. Hence, the evidence on change in volatility on introduction of FandO trading is quite inconclusive. The similar result was found when change in relative volatility was measured by calculating mean beta-using average beta of twelve individual portfolios under consideration and by assigning them equal weightage (calculating simple arithmetic mean of average betas for twelve individual portfolios), As presented in **Table-4**, Mean Before-Average Beta value was 1.17 and Mean After-Average Beta value was 1.08 which t statistics for paired t-test of negative 1.05 is not significant.

However, when change in relative volatility was measured independently using all 182 stocks using change in beta as a measure of change in volatility-it was found that the Average After Beta value was 0.98 vs. Average

Before Beta value was 1.07 with t-stat of –2.45 and with p-value as low as 0.008 makes it significant at significance level of as low as 1% (**See Table-5**). Hence, if any evidence is present, it is for decrease in relative volatility and the fear of FandO trading- that it leads to increase in volatility is out of place.

While testing the change in volatility, interesting results have emerged about the effect of introduction of derivatives trading on average daily excess returns of underlying stocks and portfolios. The results are presented in **Table-3**.There is a significant decrease in the excess returns of nine out of twelve portfolios under study and no significant difference was found in three portfolios. Similar results are found when mean- average excess daily return was calculated using average daily returns of twelve equally weighted portfolios under consideration. Mean excess return of –0.014% was found in one year measurement period after the introduction of FandO trading whereas, the corresponding figure of 0.124% was found in the period prior to introduction of FandO trading, the t-stat of –2.23 with p value of 0.023 on paired t-test provides evidence for significant decrease in daily excess return in one year period after introduction of FandO trading (**See Table-4**). When tested for change in daily excess return using all 182 stocks under study independently in which FandO trading was introduced (as presented in **Table-5),** average daily returns of 0.0024% were found in one year period after the FandO trading was introduced, as compared to 0.1% in the corresponding period prior to FandO trading. This shows a clear trend of reduction in excess returns in the post event period.

Table 2: Change In Average Relative Volatility After FandO Trading Introduction.

Date of Derivatives Trading Introduction	Number of stocks In Which Derivatives Trading Introduced	Average Beta After Introduction of Derivatives Trading	Average Beta Before Introduction of Derivatives Trading	t-stat For Paired Test	P Value For Paired Test	Change In Relative Volatility
July 02, 2001	22	0.88	0.74	3.25	0.0019	Increased
January 31, 2003	9	1.30	1.52	-1.95	-0.046	Decreased
August 29, 2003	8	1.38	1.55	-14.77	Almost zero	Decreased
September 26, 2003	4	1.16	1.06	2.698	0.036	Increased
April 20, 2005	27	0.53	0.97	-5.31	Almost zero	Decreased
May 12, 2005	17	0.58	1.03	-5.05	Almost zero	Decreased
May 27, 2005	9	1.05	1.19	-1.66	-0.067	Decreased
September 15, 2006	2	1.43	1.70	-2.73	0.11	No significant change
December 29, 2006	25	1.08	1.13	-0.69	0.24	No significant change
May 14, 2007	30	1.26	1.08	2.30	1.7	Increased
September 6, 2007	14	0.99	1.19	-1.18	0.13	No significant change
November 30, 2007	15	1.05	0.82	2.29	0.018	Increased

Table 3: Change In Equally Weighted-Average Daily Excess Return (over SandP CNX 500) After FandO Trading Introduction

Date Derivatives Trading Introduction	Number of Stocks	Average Excess Daily Returns (Before)	Average Excess Daily Returns (After)	t-stat For Paired t test	P Value For Paired t test	Change In Average Excess Daily Return
July 02, 2001	22	0.036	0.16	-2.57	0.009	Decreased
January 31, 2003	9	-0.005	0.1	-1.926	0.04	Decreased
August 29, 2003	8	0.035	0.27	-4.02	0.003	Decreased
September 26, 2003	4	0.07	0.16	-1.75	0.09	Decreased
April 20, 2005	27	-0.027	0.09	-3.04	0.002	Decreased
May 12, 2005	17	-0.05	0.049	-2.09	0.0263	Decreased
May 27, 2005	9	-0.015	0.16	-4.75	Almost Zero	Decreased
September 15, 2006	2	0.19	0.013	2.17	0.137	No significant change
December 29, 2006	25	0.082	0.037	0.86	0.197	No significant change
May 14, 2007	30	0.065	0.085	-0.49	0.31	No significant change
September 6, 2007	14	-0.1	0.09	-3.09	0.004	Decreased
November 30, 2007	15	-0.14	0.096	-3.00	0.005	Decreased

Table 4: Mean-Average Beta and Mean -Average Excess Return Changes In 12 Equally Weighted Portfolios Post FandO Trading Introduction

Mean Before-Average Beta for twelve equally weighted portfolios	Mean After-Average Beta for twelve equally weighted portfolios	t-statistics and p value	Interpretation	Mean-average excess daily excess return on equally weighted (Before)	Mean- Average excess daily return on equally weighted portfolios (After)	t-statistics and p value	Interpretation
1.08	1.17	-1.06, p-value 0.15	No significant change	-0.014	0.124	-2.23, p-value 0.023	Decreased

Table 5: Average Beta and Average Excess Return Changes In All 182 Stocks Post FandO Trading Introduction

Average Before-beta for all stocks	Average After-Beta for all stocks	t-statistics and p value	Interpretation	Mean- Average excess daily return (Before)	Mean-Average excess daily return(After)	t-stat and p-value	Interpretation
0.98	1.07	-2.45, p-value 0.008	Decreased	0.0024	0.1	-5.6, p-value-Almost zero	Decreased

CONCLUSION

As it is evident from the study, introduction of derivatives trading does not lead to any significant increase in relative volatility of the stocks -in fact, there is a very weak evidence suggesting reduction in volatility in post FandO trading period. However, there was a clear evidence of decline of excess daily return in a one year period after the introduction of FandO trading when compared to the corresponding one year period prior to FandO trading introduction.

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