Analysis

Future Trading and Stock Market Volatility: A study of Bank Nifty

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Abstract

Futures are considered as important tool for risk hedging but it may add to the volatility of the market. The objective of this paper is to investigate the impact of future trading on volatility of stock prices of banking sector. The sample data consist of closing prices of Bank Nifty as well as closing prices of individual banks from April 1, 2003 to March 31, 2008. The study uses least square method and EGARCH model to capture the leverage effect and volatility clustering phenomenon of data. The evidences suggest that introduction of future doesn't affect volatility of Bank Nifty as well as individual banks except Axis, IDBI and ICICI banks. The result also shows the presence of leverage effect i.e. good and bad news doesn't have equal effect on volatility. This paper will contribute to evaluate the impact of future trading on stock market volatility of banking sector. Since this study is carried out on banking sector, it will not be easy to generalize the results and further research is required to evaluate how introduction of future trading affect other sectors.

Keywords: EGARCH, Volatility, Bank nifty, Derivatives

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Introduction

A derivative is financial instrument which derives its value from the underlying asset. The price of derivatives is driven by the spot price of underlying asset. The main objectives for introducing derivatives in India were to fully integrate the Indian financial markets with globally developed countries, to improve the information efficiency and to provide tools for risk management.

In India, derivatives trading started in June 2000 with introduction of Index future followed by index options in June 2001, and options and futures on individual securities in July 2001 and November 2001, respectively. Since inception, NSE established itself as the sole market leader in this segment in the country and during 2008-09, it accounted for 99 % of the market share (NSE, 2009). The total turnover on the F&O Segment was Rs. 11,010,482 crore (US $ 2,161,037 million) during 2008-09.The average daily turnover during 2008-09 was Rs.45, 311 crore (US $ 8,893 million).

Most of the Indian studies are conducted on S&P CNX Nifty. Only few studies are conducted on sector based indices as SEBI is introducing more future and option contracts on these indices. In this paper, we will study the impact of future trading on Bank Nifty. Bank Nifty Index is an index comprised of the most liquid

and large capitalized Indian Banking stocks. It provides investors and market intermediaries with a benchmark that captures the capital market performance of Indian Banks. The index will have 12 stocks from the banking sector which trade on the National Stock Exchange.

The total traded value for the last six months of Bank Nifty Index stocks is approximately 96.46% of the traded value of the banking sector. Bank Nifty Index stocks represent about 87.24% of the total market capitalization of the banking sector as on March 31, 2009.

The total traded value for the last six months of all the Bank Nifty Index constituents is approximately 15.26% of the traded value of all stocks on the NSE. Bank Nifty Index constituents represent about 7.74% of the total market capitalization as on March 31, 2009.

This research intends to achieve following objectives:

1. To study the impact of future on volatility of stock prices of Bank Nifty and individual banks.
2. To measure the leverage effect with the help of EGARCH model.
3. To analyze whether volatility of public sector bank differ from private sector bank.

Literature Review

Majority of the studies reported reduction in the cash market volatility after introduction of derivatives trading. Freris (1990) using Hang Seng index in Hong Kong, Baldauf and Santoni (1991) using the S&P 500 index in the USA, Chatrath et al. (1995) for S&P 100 index in the USA, Pericli and Koutmos (1997) using S&P 500 index in USA, Antoniou et al. (1998) using the S&P 500 index in the USA, Dennis and Sim (1999) for Australia, and Cohen (1999) for the USA, Japan and UK support this proposition. Pilar and Rafael (2002) for Spain and Bologna and Cavallo (2002) for Italy also found decrease in stock market volatility after the introduction of stock index futures.

The alternative proposition is that derivative trading increase the volatility in stock market. Lee and Ohk(1992) for Japan , UK and USA , Kamara et al. (1992) for the S&P 500 in USA , Antoniou and Holmes (1995) for the FTSE 100 in UK, Chang et al. (1999) for the Nikkie index in Japan, found support to this proposition. Butterworth (2000) for the FTSE Mid 250 index in the UK, Chiang and Wang (2002) for TAIEX futures in Taiwan , Ryoo and Smith (2004) for the Korean stock market and Pok and Poshakwala (2004) for the Malaysian stock market found an increase in the volatility of the cash market after introduction of stock index future. Yu (2001) found that the volatility of stock

returns increased in the USA, France, Japan and Australia, but didn't change in the UK and Hong Kong on introduction of futures.

In the first study on the impact of listing options on the Chicago Board of Exchange, Nathan Associates (1974) reported that the introduction of options had helped stabilize the cash market. This result has been supported by Skinner (1989). Freund et al. (1994) and Bollen (1998) have found that the direction of volatility effect is not consistent over time.

There are conclusions of 'no effects' also in the literature of derivative listing. Kabir (1999) observes significant decline in stock price with the introduction of option trading, but no significant change in the volatility of underlying stocks. Dennis and Sim (1999) document little or no significant impact of future trading on spot market volatility for Australian market and for the three nations of Maxico, Brazil, and Hungary, respectively. Rahman(2001) for DJIA index, Antoniou et al. (1998) for S&P 500, Mallikarjunappa and Afsal (2008) for Bank Nifty reported no change in volatility after the introduction of derivative trading. Drimbetas et al. (2007) studied the effect of introduction of future & options on the volatility of underlying index i.e. FTSE/ASE 20 Index by using EGARCH model. He reported reduction in the conditional volatility of index and consequently increases its efficiency.

Kim et al. (2004) explored the relationship between the trading activities of the Korea Stock Price Index 200 derivatives contracts and their underlying stock market volatility. He found positive contemporaneous relationship between the stock market volatility and the derivative volume while the relationship is negative between the volatility and open interest.

Pilar and Rafael (2002) investigated the effect of the introduction of derivatives on the volatility and on the trading volume of the underlying Ibex 35 index of Spanish market using GJR model. It is found that trading volume of Ibex 35 increased and the conditional volatility declined after derivative markets are introduced.

Rahman (2001) examined the impact of trading in DJIA index futures and futures options on the conditional volatility of component stocks. He estimated the conditional volatility of intraday returns for each stock before and after the introduction of derivatives using GARCH model. The result indicates that there is no structural change in the conditional volatility of component stocks after introduction of derivatives.

Antoniou et al. (1998) examined the impact of future trading on the volatility of S&P 500 index with asymmetric GARCH model and found that introduction of future doesn't have a detrimental effect on the underlying spot market.

Pericli and Koutmos (1997) estimated the volatility of Standard & Poor's (S&P) 500 index after introduction of future trading by using EGARCH model and found decline in the volatility of S&P index

Antoniou and Holmes (1995) studied the volatility of FTSE 100 index using GARCH model and found significant increase in cash market volatility after introduction of FTSE 100 index in 1984.

Lee & Ohk (1992) examined the effects of introducing index futures trading on volatility of stock return in Australia, Hong Kong, Japan, United Kingdom, and United States of America. They found that stock volatility increased significantly shortly after the listing of the stock index future, with the exception of the stock markets in Australia and Hong Kong.

Hodgson and Nicholas (1991) studied the impact of All Ordinary Share Price Index (AOI) futures on the Associated Australian Stock Exchanges over the All Ordinary Share Index by estimating standard deviation of daily and weekly returns to measure the change in volatilities of the underlying Index and found that the introduction of futures and options trading has not affected the long term volatility.

Chan et al. (1991) estimated intraday volatility of S&P 500 and major market index future by using bivariate GARCH model and found strong intermarket dependence in the volatility of cash

market and future market. It was also shown that the intraday volatility pattern originates either in stock or future market demonstrated predictability in the other market.

Laatch (1991) measured the effect oh introduction of future by comparing the volatility of individual stocks within the Major Market Index (MMI) to control the sample of stocks that were not in the index and concluded that there was no significant effect on volatility.

Harris (1989) studied the impact of index future on S&P 500 and a non- S&P 500 group of stocks by comparing daily return volatilities during the pre-futures and post future period. He observed increased volatility after introduction of index futures.

Mallikarjunappa and Afsal (2008) studied impact of future trading on spot market volatility of CNX Bank Nifty, a sector based index by using GARCH model and Chow test for parameter stability. The results showed that derivatives doesn't have any stabilizing (or destabilizing) effect by decreasing (or increasing) the volatility.

Vipul (2006) used S&P CNX Nifty Index and individual stocks (both derivative and non derivative) to study the impact of derivative trading on the stock market volatility. He applied extreme value measure of volatility and GARCH model and found strong evidence of reduction in Extreme Value and

GARCH volatility after introduction of derivatives for all the underlying (except Nifty).

Nagaraj and Kiran (2004) studied the impact of introduction of the NSE Nifty index futures on Nifty Index volatility using ARMA-GARCH model. They also examined the effect of September 11 terrorist attacks on the Nifty spot-futures relation and found relation between futures trading activity and spot volatility after September 11 attacks.

Hetamsaria and Deb (2004) explored the impact of index futures on the Indian stock market volatility using GARCH model and have shown that the introduction of futures results in a reduction in the spot market volatility. It also showed that domestic market factors represented by the NSE 500 had a significant effect, in determining the volatility of the Nifty index but the other international factors are found to have significant effect.

Nath (2003) used the IGARCH model to study the behavior of stock market volatility after the introduction of futures and concluded that the volatility of Nifty index had fallen in the post future period.

Thenmozhi (2002) used the variance ratio test and Ordinary Least Square Multiple Regression Technique to study the impact of the introduction of Nifty index futures on underlying Nifty index volatility in the Indian markets and concluded that futures trading have reduced the volatility in the spot market.

Shenbagaraman (2002) examined the impact of introduction of the NSE Nifty index futures on nifty index by using GARCH and concluded that future has not led to any change in the volatility of the underlying stock index but the structure of volatility seems to have changed in post future period.

Research Gap:

This study is different from the existing literature on three grounds. First, only one study has been conducted on Bank Nifty which hasn't considered the component stocks. Secondly, it uses EGARCH model to measures leverage effect which states that bad news and good news doesn't have equal effect on the volatility. Thirdly, it tries to compare volatility of public sector banks with private sector banks.

Research Methodology

Data Collection

This paper studies the impact of future trading on the volatility of banking sector. To represent the banking sector, Bank Nifty has been selected along with its component scrips. Bank Nifty has 12 component banks of which Axis Bank, HDFC Bank, ICICI Bank,

Kotak Mahindra Bank and PNB are private and Bank of Baroda, Bank of India, Canara Bank, IDBI Bank, Oriental Bank of Commerce, SBIN and Union Bank of India are public banks. The data is collected for 8 years i.e. 01-04-2003 to 31-03-2008. The data is collected from the website of NSE. This paper uses the daily closing prices of Bank Nifty and Nifty Junior Index to study the impact of future trading on volatility of index.

Methodology

We have used Augmented Dickey- Fuller test and Phillips-Perron test to check the of stationarity of series. The hypothesis of ADF and PP test is:

H_0= The series has unit root

H_1= The series has no unit root.

ARCH LM test is used to test the ARCH effect. The null hypothesis is:

H_0= There is no ARCH effect.

H_1= There is ARCH effect..

In order to analyze the impact of future trading on volatility of Bank Nifty and component scrips, the use of conditional volatility seems to be suitable. We chosen EGARCH model proposed by Nelson (1991) instead of GARCH model to capture asymmetric feature of data. The EGARCH model do not hold the assumption of symmetrical effect on Volatility, allowing for different handling of good and bad news and don't have

restriction of positive sign on ARCH and GARCH coefficients. The specification that has been used is:

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 \text{Dummy} + h_t$$

Dummy variable is included in the mean equation to measure the impact of future which is 0 before introduction of future and 1 after their introduction. Positive coefficient of dummy implies positive effect on the volatility and negative coefficient implies negative effect after introduction of future.

$$\log(\sigma_t^2) = \omega + \alpha \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \lambda \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} - \sqrt{\frac{2}{\pi}} \right| + \beta \log(\sigma_{t-1}^2)$$

ω represent the constant, α measures the response of volatility to yesterday's news, λ shows leverage effect which can be known from testing the hypothesis that $\lambda=0$. The impact is asymmetric if λ 0. β measures the persistence effect of volatility.

Least square method is used to measure the volatility of Kotak Mahindra Bank as it can't reject the null hypothesis of no ARCH effect.

Empirical Results

The results were obtained on the basis of R_t which is rate of return r in period t, computed as logarithmic first difference of daily closing prices. The stationarity of data is checked by using Augmented Dickey-Fuller test and Phillips-Perron test and results are shown in Table1.

Both test reject null hypothesis of unit root and implies that all the series are stationary and significant at 1% as computed value is less than test critical value.

Table 1: Unit Root Test

Bank	ADF Test	PP Test	
	t statistic	Adj. t-Stat	
Bank Nifty	-17.6694	-270.748	-
Axis Bank	-17.89639	-382.9402	-
Bank of Baroda	-18.56686	-342.7320	-
Bank of India	-22.55775	-624.0592	-
Canara Bank	-19.59519	-412.3016	-
HDFC Bank	-16.64307	-558.8117	-
ICICI Bank	-16.32700	-580.4848	-
IDBI Bank	-17.67239	-1087.854	-
Kotak Mahindra Bank	-21.23101	-425.4563	-
OBC	-18.86424	-274.5517	-
PNB	-19.41910	-697.2389	-
SBIN	-17.28760	-887.4821	-
Union Bank	-19.27458	-444.2270	-
Test critical values (ADF)	-2.566822 (1%)	-1.941078 (5%)	-1.616528 (10%)

Test critical values (PP)	-2.568028 (1%)	-1.941243 (5%)	-1.616417 (10%)

Table 2 shows descriptive statistic of returns of individual stock and Bank Nifty. The average return and standard deviation of Bank Nifty and all individual banks is positive. The average return of private banks i.e. 0.0014634 is higher than average return of public banks i.e. 0.001144.

The negative skewness of Bank Nifty as well as Bank of Baroda, Canara Bank, Kotak Mahindra Bank, Oriental Bank of Commerce, PNB, Union Bank of India and SBIN exhibits that the returns distributions of the market have higher probability of providing negative returns. The skewness of return is positive for Axis Bank, Bank of India, HDFC Bank, ICICI Bank and IDBI Bank. The high values of kurtosis as compared to 3, exhibits that returns of Bank Nifty as well as individual banks have a heavier tail than the standard normal distribution. The Jarque-Bera test the normality of return which is significant at 5% level as p value is less than 0.05.

Table 2: Descriptive Statistic

Bank	Mean	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Bank Nifty	0.001314	0.020865	-0.65556	8.215907	1514.933
					(0.000000)

Axis Bank	0.002373	0.031600	0.344268	8.780856	1776.526
					(0.000000)
Bank of Baroda	0.000932	0.034576	-0.280252	8.192347	1447.829
					(0.000000)
Bank of India	0.001481	0.034423	0.120403	6.088262	502.5565
					(0.000000)
Canara Bank	0.000889	0.032496	-0.096024	6.410684	619.4640
					(0.000000)
HDFC Bank	0.001381	0.022765	0.288068	20.06793	15287.13
					(0.000000)
ICICI Bank	0.001207	0.174445	0.055060	11.61398	4468.231
					(0.000000)
IDBI Bank	0.001336	0.196217	0.188350	581.8415	17562601
					(0.000000)
Kotak Mahindra Bank	0.001094	0.043675	-8.859469	162.4980	1348844
					(0.000000)
OBC	0.000777	0.032373	-0.425877	10.67635	3156.576
					(0.000000)
PNB	0.001262	0.050713	-0.297602	10.11831	2774.462
					(0.000000)
SBIN	0.001251	0.076135	-0.085436	5.862969	483.9505
					(0.000000)
Union Bank of India	0.001342	0.033485	-0.007445	7.106989	898.9015
					(0.000000)

Figures in ( ) represent p value.

EGARCH

The presence of ARCH effect is checked by ARCH LM test at lag1. The results of ARCH LM reject the null hypothesis of no ARCH effect (p value<0.05) except in case of Kotak Mahindra Bank as shown in table 4. It implies that volatility is not following the ARCH specification. It is not time-varying but constant. So, Standard Deviation (or variance) of the error in traditional regression model (OLS) is the better measurement of the volatility for Kotak Mahindra Bank.

Table 4: ARCH Test

Bank	F-statistic	Obs*R-squared
Bank Nifty	363.5296	282.2278
	(0.000000)	(0.000000)
Axis Bank	82.82583	77.81810
	(0.000000)	(0.000000)
Bank of Baroda	480.5492	349.1810
	(0.000000)	(0.000000)
Bank of India	87.52115	81.93756
	(0.000000)	(0.000000)
Canara Bank	59.79977	57.20057
	(0.000000)	(0.000000)
HDFC Bank	327.7535	260.2545
	(0.000000)	(0.000000)
ICICI Bank	584.5273	416.4214
	(0.000000)	(0.000000)
IDBI Bank	119.1315	108.9693
	(0.000000)	(0.000000)
Kotak Mahindra Bank	**0.025000**	**0.025040**
	(0.874392)	**(0.874268)**
OBC	369.3436	286.3788

	(0.000000)	(0.000000)
PNB	200.5468	174.0289
	(0.000000)	(0.000000)
SBIN	129.0322	118.3680
	(0.000000)	(0.000000)
Union Bank of India	147.6417	132.5270
	(0.000000)	(0.000000)

Figures in ( ) represent p value

Table 5 shows the results of EGARCH. for Bank Nifty. ω is intercept which is negative and significant for Bank Nifty. α shows response of volatility to market news which is positive and significant. λ shows leverage effect which is negative and significant. β represent the persistence of volatility which is very high i.e. 0.888235. Dummy's coefficient is negative and insignificant implying that market volatility is not influenced by the introduction of futures trading.

Table 5: EGARCH

Bank Nifty	Coefficient	Prob.
ω	-1.03622	0.0000
α	0.19548	0.0000
λ	-0.14501	0.0000
β	0.888235	0.0000

Dummy	-0.00048	0.5873

Table 6 shows the result of EGARCH for individual banks. ω is negative and significant for all the Banks showing depressing impact on the volatility in the market. α represents the response of volatility to yesterday's news The volatility is more sensitive to market events for HDFC Bank and Union Bank of India. α is positive for all banks except IDBI bank indicating that volatility is negatively related to market news. λ measures the leverage effect which means that good and bad news don't have equal effect on the volatility. The negative value indicates that bad news cause greater volatility as compared to good news and positive value shows that good news cause greater volatility as compared to bad news. λ is negative and significant for Axis Bank, Bank of India, Canara Bank, HDFC Bank, ICICI Bank, Oriental Bank of Commerce and Union Bank of India. λ is positive for IDBI Bank, PNB,Bank of Baroda (not significant) and SBIN (not significant). β shows persistence effect which is ranging from 0.055285 to 0.987699. The average persistence effect is higher for private bank i.e 0.906722 as compared to public bank i.e 0.759076. The persistence effect of IDBI Bank is lowest which is not significant. The coefficients dummy is not

significant implying that market volatility is not influenced by the introduction of futures trading.

Table 6: EGARCH

Bank	ω	α	λ	β	Dummy
Axis Bank	-0.868713	0.279058	-0.046733	0.905729	-0.002887
	(0.0000)	(0.0000)	(0.0016)	(0.0000)	(0.0215)
Bank of Baroda	-1.243439	0.332399	**0.332399**	0.855041	**-0.001210**
	(0.0000)	(0.0000)	**(0.0660)**	(0.0000)	**(0.4396)**
Bank of India	-1.270868	0.274219	-0.116674	0.844492	**9.64E-05**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	**(0.9533)**
Canara Bank	-1.526188	0.270204	-0.096893	0.809068	**-0.000906**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	**(0.5798)**
HDFC Bank	-2.130372	0.430365	-0.104214	0.765795	**0.001285**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	**(0.2195)**
ICICI Bank	-0.239439	0.148922	-0.208241	0.975644	-0.003629
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
IDBI Bank	-3.606670	-0.263460	0.468014	**0.055285**	0.042998
	(0.0000)	(0.0076)	(0.0000)	**(0.7969)**	(0.0019)
OBC	-0.548199	0.240652	-0.043902	0.948014	**-0.001534**
	(0.0000)	(0.0000)	(0.0028)	(0.0000)	**(0.2907)**
PNB	-0.309214	0.255942	0.073741	0.979720	**-0.001834**

	(0.0000)	(0.0000)	(0.0000)	(0.0000)	**(0.2952)**
SBIN	-0.265482	0.262241	**0.021039**	0.987699	**-0.001778**
	(0.0000)	(0.0000)	**(0.0810)**	(0.0000)	**(0.2662)**
Union Bank of India	-1.630767	0.446199	-0.106259	0.813935	**-0.001577**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	**(0.2623)**

Figures in ( ) represent p value

As we know that Arch LM fails to reject null hypothesis of no ARCH effect, we will try to check volatility by using least square method. Results are shown in Table 7.

Table 7: Least Square Method

Variable	Coefficient	Prob
C	0.001577	0.3952
RET(-1)	0.017835	0.5283
DUMMY	-0.000924	0.7100

The lagged return doesn't significantly affect the return. The coefficient of dummy is not significant implying that volatility of Kotak Mahindra Bank is not affected by introduction of future.

Conclusion

With the objective of analyzing the impact of introduction of future trading on the spot market volatility of banking sector, we examined the volatility behavior of Bank Nifty along with its

component scrips. The result shows that the volatility of Bank Nifty is not affected by introduction of future. The present work carried out by using Bank Nifty suggest that introduction of future doesn't have any stabilizing or destabilizing effect on banking sector as experienced by other sectors. The analysis also shows that introduction of future doesn't affect the volatility of most of the banks. Leverage effect is present in Bank Nifty as well as in most of banks except Bank of Baroda and SBIN. On an average, persistence effect is high which signifies that shocks will take long time to die. The paper suggest that there is mixed effect on volatility of public and private sector bank. Since this study is carried out on banking sector, it will not be easy to generalize the results and further research is required to evaluate how introduction of future trading affect other sectors.

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