Volatility and return: A study with special reference to the selected banking sectoral stocks of NSE

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Abstract

Banking sector in India have witnessed a tremendous growth in terms of their volume of business in the recent past and contributed significantly for the growth story of Indian economy. As per the Reserve Bank of India (RBI), India's banking sector is sufficiently capitalized and well-regulated. Credit, market and liquidity risk studies suggest that Indian banks are generally resilient and have withstood the global downturn well. Hence, an attempt has been made in this paper to understand the performance delivered by the banking sector stocks and the volatility associated with that performance during the study period. For this purpose, the daily price behavior of the selected banking stocks was considered and to understand the volatility, GARCH family model was applied. Data were collected for the period from January 2008 to June 2018, when the market has witnessed both the prolonged bear and bull phase. It was found that private sector stocks have delivered higher returns than the public sector banks and they have witnessed more volatility during the study period.

Keywords: Banking stocks, Volatility, Return, GARCH Model.
JEL Classification: C32, C53

Introduction

Investment is the employment of surplus funds with aim of earning additional income and capital appreciation. The pleasure of present consumption is sacrificed with the intention to get a good return in the near future. Though the sacrifice is certain, the return expected tend to be uncertain. Hence, understanding the nature of investments and the uncertainty associated with the investment is inevitable. Most of the investors are concerned about the uncertainty of the returns on investment assets, caused by the variability in speculative market prices and the instability in the business performance. The study of volatility is important in the risk management. Understanding the nature and extent of volatility in a financial market provides the measure of risk exposure to the investors on their investments. Indian banking industry has come a long way from being a sluggish business institution to a highly productive and dynamic entity. This transformation has been largely brought about by the large impact of liberalisation and economic reforms that allowed banks to explore new business opportunities.

Banking sector is one among the core sectors responsible for the overall economic growth of the country. The increase in the working population and the growing disposable income raise the demand for banking and related financial services in India. Housing and personal finance are playing as key demand drivers in this sector. Both public and private sector banks in India render banking services to every part of the nation and are able to build confidence among people who live in rural areas too. The public sector banks in India play a crucial role in bringing the developments in the rural areas of the nation. They render their banking facilities not only to the urban people but also to the rural masses. There has been a tremendous growth in the performance of Indian public sector banks during the last few years. The demand has grown for both corporate and retail loans, more specifically services sector, real estate, consumer durables and agricultural and allied sectors which have led the growth in credit.

The public sector banks account for over 72.3 per cent of interest income in the Indian banking sector. An opportunity to grow many fold in the forth coming years have compelled the investors across the world to give focus on this sector and their sustained investments in this sectoral stocks have triggered the volatility in the price behavior of these stocks in Indian equity market. This attracts the attention of the researchers to study the nature and extent of volatility experienced by the banking sectoral stocks and returns delivered by them. Many researchers have conducted their research in this field both in India and abroad and among them, few studies are highlighted to have a deep insight about this research aspect. Madhusudan Karmakar (2005) has made an attempt to estimate the conditional volatility of the Indian Stock Market. He took an effort to capture the salient features of stock market volatility and evaluate the models in terms of out of sample forecast accuracy. His study found that there was a strong evidence of time varying volatility - a tendency of periods of high and low volatility to cluster, and a high persistence and predictability of volatility in Indian stock market. The study also conclude that various GARCH models provide good forecasts of volatility and are useful for portfolio allocation, performance measurement and options valuation. Puja Padhi (2006) have studied the volatility of individual stocks and of the aggregate indices, using ARCH model, GARCH model and ARCH in Mean model for daily data for the

time period from January1990 to November 2004. The analysis revealed the same trend of volatility in the case of aggregate indices and five different sectors such as electrical, machinery, mining, non-metallic and power plant sector. The GARCH (1,1) model performed well for all the five aggregate indices and individual stocks. Kashif Saleem (2007) has conducted a study to find the varying volatility and asymmetry of Karachi Stock Exchange. In his study, he has examined the time varying volatility by employing GARCH(1,1) and EGARCH model and found that in KSE-100 Index stocks, positive returns are associated with higher volatility than negative returns of equal magnitude. The study also found that past residuals have highly influenced the current volatility. Hojatallah and Ramanarayanan (2010) used the BSE 500 index of Mumbai stock exchange to evaluate the volatility of the Indian stock markets and its related stylized facts using ARCH models. The results suggest that the volatility in the Indian stock market exhibits the persistence of volatility and mean reverting behavior. Ahmed and Suliman (2011) used different univariate GARCH models to estimate volatility in the daily returns of the Khartotum Stock Exchange (KSE) over the period from January 2006 to November 2010. The empirical results show that the conditional variance process is highly persistent and provide evidence on the existence of risk premium for the KSE index return series which support the positive correlation hypothesis between volatility and the expected stock returns in Sudan. Kamran Pakizeh (2011) has conducted a research to examine the relationship between stock market return and volatility by applying out of sample methodology and ARCH (M) class models in the Tehran Stock Exchange (TSE) and International Stock Exchanges (ISE). The results of the study were inconsistent with portfolio theory implications in NASDAQ, ISE and TSE and found only negative relationship between unexpected volatility and monthly returns in most of the international exchanges. The author did not find any significant relationship between forecasted volatility and monthly returns. The results contradicted the asset pricing theories which explained a positive relationship between volatility and return. Emenike and Aleke (2012) examined the response of volatility to negative and positive news using daily closing prices of the Nigerian Stock Exchange (NSE). They find strong evidence supporting asymmetric effects in the NSE stock returns but with absence of leverage effect. A research was conducted by Wellington Garikai Bonga (2014) to investigate the stock market volatility of the Zimbabwe stock exchange (ZSE), by analyzing the data from the Mining Index and the Industrial Index. The author found that, in most cases, a higher average returns appear to be associated with a higher level of volatility. For testing the relationship between the stock returns and the unexpected volatility, the generalized autoregressive conditional heteroskedastic models (GARCH) has been used. A study was conducted by Karunanithy Banumathy and Ramachandran Azhagaiah (2015) to empirically investigate the volatility pattern of Indian stock market based on time series data which consisted of daily closing prices of S & P CNX Nifty index for 10 years from January 2003 to December 2012, by using both symmetric and asymmetric models of GARCH. Their study proved that models GARCH (1,1) and TGARCH (1,1) estimations were found to be most appropriate models to capture the symmetric and asymmetric volatility respectively. The foregoing survey of literature throws some interesting insights about the volatility and return in the Indian and global equity market.

It was noted that findings of studies conducted by Madhusudan Karmakar (2005), Puja Padhi (2006) and Hojatallah and Ramanarayanan (2010) supported the fact that a higher average returns appear to be associated with a higher level of volatility and the results are in line with the asset pricing theories which explained a positive relationship between volatility and return. But, on contrary, the study conducted by Kamran Pakizeh (2011) was inconsistent with portfolio theory implications. The author did not find any significant relationship between forecasted volatility and monthly returns. This contradictory findings necessitates a revisit of this theme and hence, the author have attempted to find the relationship between volatility and return in the Indian context by taking the price behaviour of banking sectoral stocks - both private sector and public sector banks, which were more vibrant during the study period and the selected sectoral industry have contributed significantly to the growth story of the Indian economy.

Data and Methodology

The primary aim of this study is to find out the performance delivered by the banking sector stocks, relationship between volatility and return of the selected stocks and the extent of volatility experienced by the selected stocks during the study period. To achieve this objective, data has been collected for the period from January 2008 to June 2018, when the market has witnessed both the prolonged bear phase and bull phase. The reason for choosing this period is that, only during this period the Indian equity market has witnessed a drastic down fall due to global economic meltdown and recovered slowly and gradually to touch new highs. The price behavior data during the bear phase and the bull phase is available during this period and hence, choosing this period would be an ideal to choice to understand the nature and extend of volatility. The daily closing price of those banking stocks which are having data from January 2008 alone were taken for the study, inch the study focuses solely on the cash market segment, the price behavior of the selected stocks in cash market alone were taken for the analytical purpose and it does not

consider the price behavior of the respective stocks in the derivative segment. In order to obtain the accuracy and reliability, the data relating to the price behavior of the selected stocks were collected from website www.nseindia.com, an official website of National stock exchange. Price behavior of the public sector banks viz Andhra Bank, Allahabad Bank, Bank of India, Bank of Baroda, Bank of Maharashtra, Canara Bank, Central bank of India, Corporation Bank, Dena Bank, Indian Bank, Indian Overseas Bank, IDBI Bank, Oriental Bank of Commerce, Punjab National Bank, State Bank of India, Syndicate Bank, UCO Bank, Union Bank of India and Vijaya Bank and private banks viz Axis Bank, City Union Bank, DCB Bank, Dhanlaxmi Bank, Federal Bank, HDFC bank, ICICI Bank, Indus Ind Bank, Karnataka Bank, Karur Vysya Bank, Kotak Mahindra Bank, Lakshmi Villas Bank, South Indian Bank and Yes Bank were taken for analytical purposes.

Analytical Part of the Study

Return is the difference between today's price and yesterday's price. It is the key factor that motivates the investor to invest money in the equity market. Normally return is the profit earned as a result of changes in share prices. For the purpose of analysis, the daily closing price of the shares were converted into continuously compounded rate of return and it is calculated as a log of the first difference of daily closing price by using the following formula. $R_t = (\log P_t - \log P_{t-1}) \times 100$. Where R_t is the logarithmic daily return on the selected stock for time T, P_t is the closing price of the selected stock at time T and P_{t-1} is the corresponding price in the period at time T-1. Arithmetic mean of daily returns of the stock is calculated to know the average return of the stock. Descriptive statistics like Average, Standard deviation, Skewness and Kurtosis are used in the study to understand the distributional properties of the selected stocks. The financial time series data used in any study must be stationary in nature. Hence, to test the stationary of the selected financial time series, the Augmented Dickey Fuller (ADF) test and Phillips-Perron (PP) test were employed in this study. Before applying the GARCH family models to estimate the volatility, it is necessary to identify whether substantial evidence of heteroskedasticity exists or not and this determines necessity of the application of GARCH estimation methods. In order to test for the presence of ARCH effects in the selected return series, Lag range Multiplier Test method was applied. And finally, as it has been proved by Puja Padhi (2006), Kashif Saleem (2007) and Karunanithy Banumathy and Ramachandran Azhagaiah (2015), the most preferred model, GARCH (1,1) model was employed to understand the nature and extent of volatility of the stocks selected for the study. For a stationary GARCH model the volatility mean reverts to its long run level, at rate given by the sum of ARCH and GARCH coefficients, which is generally close to one for a financial time series. The average number of time period for the volatility to revert to its long run level is measured by half life of volatility shock and is calculated by the formula $L_{half} = (\ln (1/2)) / (\ln (\alpha + \beta))$, where α and β are the calculated ARCH and GARCH coefficients. The widely used econometric software, E-Views 7.1 version was used for the calculations made in this study.

Results and Discussions

Descriptive statistics of all the 33 selected banking stocks (19 public sector bank stocks and 14 private sector stocks) are summarized in Table 1. The arithmetic average of the return (mean return) of all the stocks are positive, indicating that the price have increased substantially during the study period. Positive returns delivered by all the banking stocks have confirmed the fact that the Indian banking sector have performed extremely well during the selected period. Among these stocks, Axis bank (0.001355) has delivered highest return followed by Yes Bank (0.001297), Kotak Mahindra Bank (0.001148), HDFC Bank (0.000994), ICICI Bank (0.000779), Karnataka Bank (0.000769) Federal Bank (0.000692) and Karur Vysya Bank (0.000654) in the private sector banks category. In the case of public sector banks, State Bank of India (0.000699) delivered a good returns followed by Punjab National Bank (0.000641), Union Bank (0.000578), Bank of Baroda (0.000569), Allahabad Bank (0.000553) Dena Bank (0.000499), Canara Bank (0.000467) and Bank of Maharashtra (0.000443). The descriptive statistics also shows that majority of the stocks are negatively skewed and this indicates that the high probability of earning returns greater than the average returns. The kurtosis values of all the stocks are greater than 3, which imply that the selected financial time series are fat tailed and did not follow a normal distribution. This state of feature is further confirmed by the Jarque-Bera test statistics values of the selected stocks. The Jarque-Bera values are significant at 1 per cent level and this rejects the assumption of normality in the selected financial time series. In order to test the whether the selected financial time series data are stationary in nature, Augmented Dickey Fuller Test (ADF Test) and Philips Perron Test (PP Test) have undertaken and the results are displayed in Table 2. The calculated values for all the selected banking sector stocks for both the tests (ADF and PP Test) are greater than the test critical values **(**both signs should be ignored, Test critical values at 5 per cent level is -2.862279 for Intercept ; at 5 per cent level is -3.411264 for Trend and Intercept; at 5 per cent level is -1.940927 for None, p values for all the above observations are < 0.05**)** and hence, it is confirmed that all the selected series are stationary in nature, which is basic condition to estimate the volatility by applying the auto regressive conditional heteroskedasticity model. Before applying the GARCH family models to specify the volatility, it is

necessary to confirm whether ARCH effect exists or not in the financial time series selected for the analysis. For this purpose, the lag range multiplier test was conducted and the results obtained are mentioned in Table 3. The calculated F statistics values for all the return series of selected stocks are greater than the observed R square values and P values are significant at 1 per cent level. This indicates that the ARCH effect exists in the series selected for the study and which demands the application of GARCH family models to understand the presence of volatility and its extent. To estimate the level of volatility experienced by the selected stocks, GARCH (1,1) model was applied and the results obtained are shown in Table 4. The calculated values of all the parameters (ω, α and β) for the selected stocks are positive, which is necessary condition to declare that the selected model is well defined to understand the level of volatility. All the coefficient values of lagged squared residuals (α) and lagged conditional variance (β) are positive and significant at five percent level indicating that the past volatility of stock return is significantly influencing the current volatility. The sum of both ARCH and GARCH coefficients (α + β) for all the selected stocks of banking sector is closer to one (1) which implies that the shocks to the conditional variance are highly persistent and indicates that the banking sector stocks were having high volatility during the study period and the volatility persistence were lasting for many days. The average number of time period for the volatility to revert to its long run level is measured by half life of volatility shock and the values calculated so is used to understand the volatility persistence of the selected stocks. It is found that among the stocks selected for the study Kotak Mahindra Bank (47.30794), YES Bank (43.77953), ICICI Bank (40.39943), Axis Bank (38.61141), HDFC Bank (32.89190), Punjab National Bank (28.86547), Indus Ind Bank (25.18588), State Bank of India (24.59592), Karnataka Bank (24.64088), Bank of Baroda (20.90717), Canara Bank (20.77180) and IDBI Bank (20.43051) are the more volatile stocks. Any shocks to these stocks take longer time to die out and these stocks take longer period to revert to its long run average price level. Andhra Bank (7.597366), UCO Bank (8.330759), Syndicate Bank (8.504680), Corporation Bank (9.491834), Vijaya Bank (9.63612), Central Bank of India (10.03289), Allahabad Bank (10.18958), Bank of India (11.77286), Dena Bank (11.93752) and Indian Bank (12.08749) are the less volatile banking stocks among the stocks selected for the study. Any shocks, either positive or negative, did not lasted for longer time period in these stocks and the any shocks to the price behavior of these stocks take shorter period to reach its long run average price level.

Table 1: Descriptive statistics for banking sector stocks

S. No	Name of the Stock	Mean Return	Standard deviation	Skewness	Kurtosis	Jarque Bera	*p* value
1	Andhra Bank	0.000257	0.026987	-0.190545	7.467674	2182.336	0.0000
2	Allahabad Bank	0.000553	0.027784	-0.006431	6.994521	2238.367	0.0000
3	Bank of India	0.000387	0.031572	0.057634	6.227853	1240.410	0.0000
4	Bank of Baroda	0.000569	0.043761	-0.004466	8.685079	4151.799	0.0000
5	Bank of Maharashtra	0.000443	0.029883	0.003298	6.118453	3923.811	0.0000
6	Canara Bank	0.000467	0.028319	-0.035476	6.026684	1293.247	0.0000
7	Central Bank of India	0.000398	0.029834	-0.037331	6.874443	2178.766	0.0000
8	Corporation Bank	0.000534	0.039943	-0.058257	5.992854	1986.844	0.0000
9	Dena Bank	0.000499	0.0312276	0.057234	6.80093	2154.874	0.0000
10.	Indian Bank	0.000423	0.028537	0.049377	6.84365	3870.823	0.0000
11.	Indian Overseas Bank	0.000218	0.028064	-0.103967	7.03699	2106.479	0.0000
12	IDBI Bank	0.000361	0.033423	0.090975	8.581362	4107.319	0.0000
13	Orient Bank of Commerce	0.000196	0.030682	-0.204598	8.187769	3462.115	0.0000
14	Punjab National Bank	0.000641	0.027603	-0.143984	7.737469	2781.032	0.0000
15	State Bank of India	0.000699	0.026083	-0.057083	6.715734	1668.716	0.0000
16	Syndicate Bank	0.000493	0.028639	-0.174158	7.807225	3270.591	0.0000
17	UCO Bank	0.000387	0.037491	-0.027664	6.739971	2949.923	0.0000
18	Union Bank	0.000578	0.028975	-0.020173	5.668540	1815.4636	0.0000
19	Vijaya Bank	0.000495	0.031073	-0.031148	6.937534	2094.885	0.0000
20	Axis Bank	0.001355	0.028842	0.551894	8.655308	4264.927	0.0000
21	City Union Bank	0.000526	0.027241	0.433621	7.954382	3980.375	0.0000
22	DCB Bank	0.000411	0.019993	-0.500265	8.065821	4006.825	0.0000
23	Dhanlaxmi Bank	0.000599	0.021884	-0.584374	9.005462	4195.073	0.0000
24	Federal Bank	0.000692	0.026696	-0.342934	11.12910	8549.239	0.0000
25	HDFC Bank	0.000994	0.020978	0.249334	15.14806	18989.23	0.0000
26	ICICI Bank	0.000779	0.029853	-0.067215	8.513975	3791.041	0.0000

27	Indus Ind Bank	0.000535	0.031660	0.024773	7.172698	2236.956	0.0000
28	Karnataka Bank	0.000769	0.036659	0.019778	7.943692	3301.784	0.0000
29	Karur Vysya Bank	0.000654	0.029856	0.023865	6.683922	3906.348	0.0000
30	Kotak Mahindra Bank	0.001148	0.028332	-0.061136	9.315722	4926.952	0.0000
31	Lakshmi Villas bank	0.000602	0.025823	-0.066749	9.019432	3995.273	0.0000
32	South Indian Bank	0.000496	0.039646	0.429641	7.892642	4118.472	0.0000
33	Yes Bank	0.001297	0.027763	-0.564428	8.168432	4623.072	0.0000

Table 2: Tests for unit root problem - banking sector stocks

S. No	Name of the Stock	Augmented Dickey Fuller Test			Phillips Perron Test		
		Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None
1	Andhra Bank	-50.37577	-50.40268	-50.37991	-50.32673	-50.31760	-50.34327
2	Allahabad Bank	-50.14720	-50.22120	-50.13619	-50.01153	-50.09439	-50.01919
3	Bank of India	-51.31160	-51.34542	-51.32947	-51.28752	-51.20198	-51.23824
4	Bank of Baroda	-50.93655	-50.84574	-50.75476	-50.69840	-50.69322	-50.82911
5	Bank of Maharashtra	-52.59933	-51.61239	-51.98043	-51.29329	-51.09933	-51.47832.
6	Canara Bank	-51.76975	-51.89615	-51.90878	-51.87972	-51.82211	-51.89902
7	Central Bank of India	-49.67324	-49.05533	-49.58322	-49.22433	-49.55923	-49.30054
8	Corporation Bank	-51.85393	-51.55483	-51.09954	-51.40932	-51.84433	-51.04439
9	Dena Bank	-53.86433	-53.86554	-53.86623	-53.17522	-53.86513	-53.20564
10	Indian Bank	-52.25651	-52.95543	-52.44533	-52.38133	-52.53932	-52.21965
11	Indian Overseas Bank	-49.66973	-49.74330	-49.67588	-49.47127	-49.52761	-49.47859
12	IDBI Bank	-51.38121	-51.42898	-51.38247	-51.36721	-51.36717	-51.36879
13	Orient Bank of Commerce	-50.64663	-50.68716	-50.65321	-50..55584	-50.59551	-50.59551
14	Punjab National Bank	-52.82325	-52.85693	-52.80617	-52.77146	-52.80280	-52.75414
15	State Bank of India	-50.48469	-50.50585	-50.45179	-50.28683	-50.31002	-50.25342
16	Syndicate Bank	-50.78681	-50.80662	-50.78397	-50.74310	-50.76759	-50.74297
17	UCO Bank	-52.8433	-52.94776	-52.2944	-52.46633	-52.67293	-52.63352
18	Union Bank	-51.30910	-51.34646	-51.29922	-51.15589	-51.19015	-51.14956
19	Vijaya Bank	-51.84405	-51.63382	-51.47382	-51.93776	-51.93346	-51.83222
20	Axis Bank	-53.78654	-53.82526	-53.68071	-53.75942	-53.80016	-53.65586
21	City Union Bank	-54.83663	-54.84222	-54.33637	-54.22674	-54.32672	-54.17739
22	DCB Bank	-48.64373	-48.33833	-48.76373	-48.34733	-48.63576	-48.73246
23	Dhanlaxmi Bank	-53.34273	-53.43734	-53.34091	-53.73554	-53.55442	-53.75632
24	Federal Bank	-41.41675	-41.44713	-41.34706	-51.23075	-51.25144	-51.17679
25	HDFC Bank	-41.56603	-41.56997	-41.43066	-41.26349	-41.25389	-41.26711
26	ICICI Bank	-50.63826	-50.43341	-50.39244	-50.21288	-50.23486	-50.16867
27	Indus Ind Bank	-52.75562	-52.55914	-52.54258	-52.55291	-52.54379	-52.46637
28	Karnataka Bank	-42.76342	-42.55457	-42.42676	-42.67392	-42.67132	-42.56123
29	Karur Vysya Bank	-47.75376	-47.45623	-47.38556	-47.77323	-47.36345	-47.37043
30	Kotak Mahindra Bank	-51.97232	-51.99589	-51.85343	-51.89184	-51.90881	-51.80323
31	Lakshmi Villas bank	-54.21383	-54.73342	-54.45632	-54.54842	-54.73541	-54.18712
32	South Indian Bank	-49.64233	-49.57347	-49.15343	-49.34262	-49.33933	-49.45762
33	Yes Bank	-53.34734	-53.63733	-53.35262	-53.47374	-53.37342	-53.45329

(Test critical values @ 5% level is -2.862279 for Intercept ; @5% level is -3.411264 for Trend and Intercept; @5%level is -1.940927 for None, p values for all the above observations are < 0.05**)**.

Table 3: Testing the heteroskedasticity effect in the return series of banking sector stocks

S. No	Name of the Stocks	*F*-statistic	Prob.F	Obs*R-squared	Prob.chi-square
1	Andhra Bank	241.5109	0.0000	223.9559	0.0000
2	Allahabad Bank	371.8399	0.0000	324.3879	0.0000
3	Bank of India	163.6147	0.0000	156.4122	0.0000
4	Bank of Baroda	758.6779	0.0000	679.4155	0.0000
5	Bank of Maharashtra	315.7543	0.0000	310.5433	0.0000
6	Canara Bank	61.1076	0.0000	59.7199	0.0000
7	Central Bank of India	169.0954	0.0000	152.0446	0.0000

8	Corporation Bank	154.5739	0.0000	142.7642	0.0000
9	Dena Bank	572.6712	0.0000	549.6713	0.0000
10	Indian Bank	476.4732	0.0000	461.3428	0.0000
11	Indian Overseas Bank	298.5768	0.0000	272.3672	0.0000
12	IDBI Bank	450.1675	0.0000	393.0171	0.0000
13	Orient Bank of Commerce	329.7458	0.0000	298.0505	0.0000
14	Punjab National Bank	223.3194	0.0000	208.3572	0.0000
15	State Bank of India	276.1539	0.0000	253.5957	0.0000
16	Syndicate Bank	247.4551	0.0000	229.2012	0.0000
17	UCO Bank	198.2342	0.0000	189.6732	0.0000
18	Union Bank	164.0865	0.0000	155.8882	0.0000
19	Vijaya Bank	495.7613	0.0000	465.7632	0.0000
20	Axis Bank	74.71002	0.0000	72.98810	0.0000
21	City Union Bank	649.6333	0.0000	614.4345	0.0000
22	DCB Bank	382.6743	0.0000	359.3423	0.0000
23	Dhanlaxmi Bank	517.7434	0.0000	499.3473	0.0000
24	Federal Bank	416.2065	0.0000	366.8972	0.0000
25	HDFC Bank	522.6406	0.0000	447.1105	0.0000
26	ICICI Bank	214.2299	0.0000	200.4282	0.0000
27	Indus Ind Bank	261.4384	0.0000	241.1396	0.0000
28	Karnataka Bank	301.7446	0.0000	289.7343	0.0000
29	Karur Vysya Bank	377.7487	0.0000	360.3213	0.0000
30	Kotak Mahindra Bank	231.5080	0.0000	215.4630	0.0000
31	Lakshmi Villas bank	297.3243	0.0000	280.4376	0.0000
32	South Indian Bank	391.4329	0.0000	373.3428	0.0000
33	Yes Bank	483.9834	0.0000	472.5818	0.0000

Table 4: Volatility estimation by using GARCH (1,1) model - banking sector stocks

Name of the stock	ω	α	β	α + β	SIC	AIC	Log Likelihood	Mean Reversion
Andhra Bank	6.72E-05	0.160839	0.751964	0.912803	4.50232	4.51016	6956.391	7.597366
Allahabad Bank	5.11E-05	0.121438	0.812799	0.934237	4.45813	4.46596	6888.278	10.18958
Bank of India	6.25E-05	0.132528	0.810295	0.942823	4.17675	4.18458	6454.538	11.77286
Bank of Baroda	1.97E-05	0.083857	0.883533	0.967390	4.43060	4.43843	6845.852	20.90717
Bank of Maharashtra	3.02E-05	0.108717	0.829984	0.938701	4.23167	4.24250	6543.820	10.95742
Canara Bank	3.16E-05	0.093245	0.873936	0.967181	4.31399	4.32182	6666.085	20.77180
Central Bank of India	5.32E-05	0.171382	0.761863	0.933245	4.49232	4.51016	6956.391	10.03289
Corporation Bank	4.95E-05	0.119738	0.809839	0.929577	4.39812	4.451043	6978.326	9.491834
Dena Bank	4.01E-06	0.128563	0.815026	0.943589	4.62045	4.68263	6483.742	11.93752
Indian Bank	4.17E-05	0.118437	0.825832	0.944269	4.83424	4.89962	6295.062	12.08749
Indian Overseas Bank	3.81E-05	0.092899	0.859974	0.952873	4.37431	4.38754	6693.139	14.35871
IDBI Bank	3.79E-05	0.113431	0.853211	0.966642	4.11256	4.20298	6491.134	20.43051
Orient Bank of Commerce	5.06E-05	0.118717	0.829919	0.948636	4.19477	4.21893	6443.120	13.14519
Punjab National Bank	1.61E-05	0.097619	0.878654	0.976273	4.55586	4.56372	7145.939	28.86547
State Bank of India	1.63E-05	0.071109	0.901103	0.972212	4.77471	4.79932	7296.340	24.59592
Syndicate Bank	6.99E-05	0.102380	0.819351	0.921731	4.26716	4.31945	6593.362	8.504680
UCO Bank	5.99E-05	0.110241	0.809923	0.920164	4.49151	4.54065	6602.492	8.330759
Union Bank	5.53E-05	0.129914	0.810198	0.940112	4.31187	4.39006	6598.281	11.22392
Vijaya Bank	6.11E-05	0.110047	0.820547	0.930594	4.29711	4.34018	6113.936	9.63612
Axis Bank	1.28E-05	0.081003	0.901205	0.982208	4.29126	4.397512	6759.693	38.61141
City Union Bank	4.37E-05	0.121639	0.819933	0.941572	4.69224	4.79132	6735.172	11.51322
DCB Bank	3.68E-05	0.091479	0.864175	0.955654	4.36351	4.37724	6439.489	15.28124
Dhanlaxmi Bank	5.17E-05	0.139417	0.818719	0.958136	4.18975	4.20983	6364.320	16.20807

Federal Bank	5.47E-05	0.163229	0.781121	0.944350	4.515904	4.548242	7169.836	12.10559
HDFC Bank	1.44E-05	0.129848	0.849299	0.979147	5.021974	5.110502	7761.348	32.89190
ICICI Bank	1.22E-05	0.062995	0.919994	0.982989	4.534733	4.592681	7073.231	40.39943
Indus Ind Bank	6.51E-05	0.072911	0.899943	0.985228	4.288716	4.316644	6581.897	25.18588
Karnataka Bank	1.56E-05	0.072359	0.899903	0.972262	4.65171	4.684312	7156.233	24.64088
Karur Vysya Bank	3.79E-05	0.091999	0.861975	0.953974	4.36736	4.38111	6703.261	14.71061
Kotak Mahindra Bank	1.31E-05	0.070342	0.915113	0.982455	4.457612	4.51547	6937.183	47.30794
Lakshmi Villas bank	3.54E-05	0.091789	0.861064	0.952853	4.39472	4.47427	6583.143	14.35247
South Indian Bank	3.61E-05	0.116779	0.850929	0.967708	4.23687	4.29471	6271.749	21.11651
Yes Bank	6.34-05	0.072179	0.912113	0.984292	4.340116	4.357603	6513.592	43.77953

*All the values are significant at 5 per cent level

Findings and the Concluding Remarks

The descriptive statistics of the selected banking sector stocks shows that the average daily mean return values of all the stocks selected for the study are positive and indicating that the stock prices have increased substantially during the study period. Positive returns delivered by all the banking stocks during the study period have confirmed that the Indian banking sector was vibrant in their performance and have contributed substantially to the development of the Indian economy. It is interesting to note that the private sector bank stocks have delivered comparatively higher returns than the public sector banking stocks during the study period. The application of GARCH (1,1) model has explained the level of volatility that experienced by the banking sector stocks during the study period. The calculated sum of both ARCH and GARCH coefficients ($\alpha + \beta$) for all the selected stocks is closer to one (1) which indicates that the Indian banking sector stocks are vulnerable to any stocks and most of them are highly volatile in nature. Stocks belonging to the private sector banks have shown more volatility than the public sector stocks. The calculated mean reversion values of most of the private sector banking stocks shows that they are more volatile in nature and the price behavior of these stocks take much longer time to reach its long run average price level. It is also interesting to note that there is a positive relationship between volatility and return exists in the stocks selected for the study. Stocks which are shown more volatility have delivered considerably good returns when compare with the stocks that are attributed with less volatility. High volatile stocks like Axis bank YES bank, Kotak Mahindra Bank and HDFC bank have delivered higher returns than the stocks that have attributed with the low level of volatility.

This study attempted to study the volatility and return of the Indian equity market by considering the price behavior of the banking sectoral stocks of National stock Exchange. Those stocks which are having price behavior records for the whole selected study period alone were taken into consideration. The daily closing price of the selected stocks were considered for the study and GARCH (1,1) model was applied to understand the volatility. The study found that the selected banking sectors stocks were delivered the positive returns and private sector stocks have delivered higher returns than the public sector stocks. The selected stocks have experienced more volatility during the study period and again it is the private sector stocks that have exposed more to the volatility than the public sector stocks. The finding of this study is in line with the findings of the previous studies which are supporting the fact that the volatility and return are positively related. The overall conclusion of this study supports the findings of the Kashif Saleem (2007), Ahmed and Suliman (2011) and Wellington Garikai Bonga (2014). Studies of this kind of nature, more specifically, studies considering the specific sector stocks could be more useful to the investors who choose the sector specific investments in their investment decision. It is important to note that this study suffers from the limitation of non-calculating the price behavior of the selected stocks for the short term period. If intra day price behavior of the stocks could have used, then the findings of the study might have differed from the findings of the present one. Any researcher who wishes to conduct further study in this area to know the immediate impact of any event specific or any sector specific should use the intra day price behavior of the stocks with one hour time gap and which may present the findings with some more accuracy.

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