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AN ANALYTICAL STUDY ON VOLATILITY OF VOLATILITY

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ABSTRACT

The purpose of this paper is to examine the volatility in the India VIX. For this purpose data for six calendar years from 2011 to 2016 is extracted from www.nseindia.com and analyzed year-wise, half-yearly and quarterly and tested the hypotheses whether the variance is significant among years, half-years and quarters. More fluctuations in the markets lead to more volatility and may give scope for good returns for the traders. In the research paper, the data was analyzed in terms of descriptive statistics and test of hypotheses were performed with the help of Z test and ANOVA. The study finds that there is no significant difference in the volatility among the six year period and also between the half years with in each year and among the quarters within each year. This study reveals that volatility has been consistent for the selected period of six years and within each year again it was uniform between the first and second six months and also among the quarters. This implies that there was no scope to make big returns on index basis due to volatility.

Keywords: Volatility Index, Investment Decisions, Fluctuations, Index Return

INTRODUCTION

The stock market volatility has radically increased in recent days and economies are currently passing through a tumultuous period has reflected in all financial markets and asset classes. The global economic slowdown created a lot of worries in the capital or equity and property market. Business organizations around the world have been affected by volatility in the stock and property markets. In India, fluctuations in the currency market can obstruct the stability in the equity market and hence stock market volatility shoots up. The study of volatility is therefore very important in an emerging market nation like India. Nifty volatility index is also called as India VIX which is treated as India's volatility Index and is taken as an important indicator of market expectations of near-term volatility.

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This volatility index was introduced during March 2008 and computed by NSE based on the order book of NIFTY Options namely the best bid-ask quotes of near and next-month NIFTY options contracts which will be traded on the F&O segment of NSE are used. India VIX reflects the perceptions of investors about the volatility of the market in the near term i.e. for the next 30 calendar days. Higher the values of India VIX, higher the expected volatility and vice-versa.

Stock markets fluctuates sharply volatility index tends to rise. Volatility index declines when the markets become less volatile. Hence the India VIX is sometimes also referred to as the '***fear index***' because when the volatility index increases, one will be afraid of entering the market as the markets can move steeply into any direction; upwards or downwards. Investors use it to gauge the market volatility and make their investment decisions

REVIEW OF LITERATURE

There are basically two major schools of thought on volatility. One school of thought argues that the introduction of futures trading increases the volatility in the spot market and thereby the market gets destabilized (Lockwood and Linn, 1990). On the other hand another school of thought argues that the introduction of futures actually reduces the volatility and thereby the market gets stabilized (Satya Swaroop Debasish, 2007). Further Kumar (2008) opines that derivative trading helps in price discovery, improve the overall market depth, enhance market efficiency, augment market liquidity, reduce asymmetric information and hence the degree of volatility of the cash market decreases. Thenmozhi (2002) says that the movements in future prices provide predictable information for the movements of the index. She also agrees that the volatility gets decreased due the introduction futures. Shenbagaraman (2003) has studied the impact of introduction of derivatives on the spot market volatility. The study explained that the increased volatility of the Indian stock market was due to that increase in the volatility of the US market. Nath (2003) has found in his study that volatility decreases due to introduction of derivatives. Vipul (2007) examined the change in volatility in Indian stock market especially after the introduction of derivatives. It was identified that there was reduction of underlying shares after the introduction of derivatives. Dhanaiah, Reddy and Prasad (2012) have studied the behavior of India volatility index. First the negative co-relation between

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changes in India VIX and market returns. Second the asymmetric nature of the changes in India VIX with respective market returns. Using OLS regression method on daily data, this study found an inverse relation between movements in India VIX and movements in the NIFTY. This study reveals the asymmetric nature of volatility index – market return relationship. Kumar (2012) studied the India VIX and its relationship with the Indian stock market returns. Result shows the negative association between the India VIX and stock market returns and the presence of leverage effect significantly around the middle of the joint distribution.

Thus there are two types of observations; one that volatility increases if futures and options are introduced and the other that the degree of volatility decreases or the stock market gets stabilized for the introduction of futures segment. However intelligent traders look at increasing volatility as trading opportunity to make profit. In fact since 1990, the average daily move of the VIX has been 5.72 times larger than the average daily move of S&P 500. Many see volatility of volatility as opportunity hence volatility has become a popular class of asset among traders and speculators.

STATEMENT OF PROBLEM

As is stated above, the NIFTY volatility also widely in 2008 fluctuating since its introduction. The fluctuations in the market is due to many factors introduction of futures and options, FIIs role in buy and sell operations, international market forces and so on. Does increase in volatility index a real opportunity? Due to options segment, when market is on decreasing trend also, the traders can play with an appropriate put option and convert the increasing volatility into a good return. Therefore the objective of the study is whether the volatility of volatility is significant.

SIGNIFICANCE OF RESEARCH

The utility of the study depends on the significance of volatility of volatility and can be stated as follows:

a) India VIX becomes a popular instrument in the Indian stock market.
b) Based on the success rate of India VIX as an instrument, the other instruments such as; Volatility Risk Premium (VRP), VIX Futures, VIX Options and VIX ETPs namely, VXX (short term volatility), XIV (Inverse short term volatility), VXZ (midterm volatility) and ZIV (Inverse

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midterm volatility) also become successful.

OBJECTIVES OF THE STUDY

The main objective of the study whether the India VIX generates a significant volatility to perceive an opportunity to make a good return.

RESEARCH METHODOLOGY

The research design to carry out the research work is stated as follows:

a) Data type and source

The research work is totally based on secondary data. The required data is collected form www.nseindia.com. India VIX data was gathered from the mentioned source.

b) Data collection and Period of the data

The required data was collected for the period of six years, starting from 2011 to 2016. India VIX data was collected on daily basis for the six years.

c) Data classification and tabulation

The collected data classified into different periods namely, quarters, six-months and year-wise and tabulated accordingly.

d) Research hypotheses

The following are the research hypotheses formulated:

i) There is no significant difference in the mean volatility among the quarters
ii) There is no significant difference in the mean volatility among the half years
iii) There is no significant difference in the mean volatility among the years

e) Statistical tools used

To analyze the data, the following mentioned statistical tools are used:

i) Arithmetic Mean
ii) Median
iii) Mode
iv) Standard deviation
v) Z Test of Means
vi) ANOVA – Two way

f) Limitations of the study

The limitation of the study is that data was taken for six years starting from 2011, though India VIX was introduced in 2008 because many of the Indian traders and investors are not fully aware of the India VIX as an instrument and moreover majority of the stock investors or traders are afraid of volatility. Further hardly 2-3% of Indian population only have the exposure of stock

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markets. Hence the data was collected for six years that is from 2011 to 2016.

RESULTS AND DISCUSSION

The findings of the study are as follows:

1) In table 1, India VIX features on yearly basis presented. In each year NSE worked for 244 to 251 days and based on the values the measures of central tendency were computed along with standard deviation. **(Refer Table 1)**

It is observed that the degree of volatility is not apparent in absolute terms. It is not even one percent

Similarly, half-yearly analysis for the six years is presented in tables 2, 3, 4, 5, 6 and 7. Along with the descriptive statistics, test of hypothesis is performed between the six month periods within each year to find whether there is significant difference in the mean of volatility. It is revealed that in all the selected years, between the six month-period within the year there is no significant difference in the mean volatility.

Quarter-wise analysis is depicted in tables 8 to 13 and in table 14, the data of means of volatility is arranged quarter-wise and year-wise to perform ANOVA two way. It is disclosed that the mean of volatility does not differ among the quarters and among the years too. **(Refer Table 2 to 14)**

IMPLICATIONS

The research work reveals that the India VIX is not taken as a source of an opportunity to make returns. Further the Indian traders treat the India VIX as a fear index. They perceive it as threat and a danger signal and hence they avoid when market is falling. Unless stock market becomes more and more sensitive to multiple external factors such as Govt policies in the country, wide and in-depth population exposure to the stock market after intensive awareness programs to encourage the public to have exposure in the equity market, global stock markets' movements, developed and dominating country economic policies etc, the India VIX and other instruments as mentioned above may not become a popular instruments to trade and invest in.

SCOPE FOR FUTURE RESEARCH

The following areas are suggested for future research:

a) A comparative study between NIFTY 50 stock volatility and India VIX
b) A comparative study of volatility indices among BRICS nations

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c) India VIX vis-à-vis large-cap, mid-cap and small-cap return: 2010-16

d) An analytical study on volatility indices: developed nations vis-à-vis BRICS nations

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LIST OF TABLES:

TABLE 1 NIFTY VOLATILITY INDEX - FEATURES - YEAR-WISE						
	2011	**2012**	**2013**	**2014**	**2015**	**2016**
N	247	251	250	244	248	247
SUM	93.92	-34.71	30.92	36.16	35.98	40.27
MAX	23.15	17.95	26.42	17.94	64.36	33.24
MIN	-21.62	-11.51	-13.73	-33.92	-16.84	-9.9
AVG	0.38	-0.14	0.12	0.15	0.15	0.163
MED	0.2	-0.35	0	-0.33	-0.10	-0.62
MODE	-0.22	-2.29	-1.75	-2.21	0.68	-2.95
STDEV	5.95	4.50	4.86	5.36	6.41	5.02

Source: https://www.nseindia.com/products/content/equities/indices/historical_vix.htm

TABLE 2 HALF-YEARLY 2011			**TABLE 3 HALF-YEARLY 2012**		
	JAN-JUNE	JULY-DEC		JAN-JUNE	JULY-DEC
AVG	0.20	0.56	AVG	-0.15	-0.12
MEDIAN	-0.03	0.48	MEDIAN	-0.50	-0.30
MODE	3.02	1.85	MODE	-2.29	-0.37
STDEV	4.80	6.94	STDEV	5.02	3.91
N	124	123	N	127	124
z-Test: Two Sample for Means			**z-Test: Two Sample for Means**		
2011			**2012**		
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0.199032	0.5629268	Mean	-0.15465	-0.12153
Known Variance	4.8	6.94	Known Variance	5.02	3.91
Observations	1	1	Observations	1	1
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
z	-0.1062042		z	-0.01108	
P(Z<=z) one-tail	0.45771016		P(Z<=z) one-tail	0.495579	
z Critical one-tail	1.64485363		z Critical one-tail	1.644854	
P(Z<=z) two-tail	0.91542032		P(Z<=z) two-tail	0.991157	
z Critical two-tail	1.95996398		z Critical two-tail	1.959964	
H0 IS ACCEPTED			**H0 IS ACEPTED**		

https://www.nseindia.com/products/content/equities/indices/historical_vix.htm

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TABLE 4 HALF-YEARLY 2013			TABLE 5 HALF-YEARLY 2014		
	JAN-JUNE	**JULY-DEC**		**JAN-JUNE**	**JULY-DEC**
AVG	0.24	0.01	AVG	0.33	-0.04
MEDIAN	0.00	-0.10	MEDIAN	0.04	-0.43
MODE	-0.30	3.59	MODE	2.30	-1.17
STDEV	4.14	5.50	STDEV	6.12	4.46
N	125	125	N	123	121
z-Test: Two Sample for Means			**z-Test: Two Sample for Means**		
2013			**2014**		
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0.2388	0.00856	Mean	0.333008	-0.03967
Known Variance	4.14	5.5	Known Variance	6.12	4.46
Observations	1	1	Observations	1	1
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
z	0.074155		z	0.114575	
P(Z<=z) one-tail	0.470443		P(Z<=z) one-tail	0.454391	
z Critical one-tail	1.644854		z Critical one-tail	1.644854	
P(Z<=z) two-tail	0.940887		P(Z<=z) two-tail	0.908782	
z Critical two-tail	1.959964		z Critical two-tail	1.959964	
H0 IS ACCEPTED			**H0 IS ACCEPTED**		

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TABLE 6 HALF-YEARLY 2015			TABLE 7 HALF-YEARLY 2016		
	JAN-JUNE	**JULY-DEC**		**JAN-JUNE**	**JULY-DEC**
AVG	0.21	0.08	AVG	0.24	0.09
MEDIAN	-0.09	-0.24	MEDIAN	-0.36	-1.04
MODE	-2.14	0.93	MODE	-0.79	-1.38
STDEV	4.91	7.63	STDEV	4.74	5.30
N	123	125	N	123	124
z-Test: Two Sample for Means			**z-Test: Two Sample for Means**		
2015			**2016**		
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0.207398	0.08376	Mean	0.238618	0.088065
Known Variance	4.91	7.63	Known Variance	4.74	5.3
Observations	1	1	Observations	1	1
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
z	0.034914		z	0.047514	
P(Z<=z) one-tail	0.486074		P(Z<=z) one-tail	0.481052	
z Critical one-tail	1.644854		z Critical one-tail	1.644854	
P(Z<=z) two-tail	0.972148		P(Z<=z) two-tail	0.962103	
z Critical two-tail	1.959964		z Critical two-tail	1.959964	
H0 IS ACCEPTED			**H0 IS ACCEPTED**		

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TABLE 8 QUARTER-WISE					TABLE 9 QUARTER-WISE				
2011	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC	2012	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC
AVG	0.614839	-0.21677	1.224127	-0.13133	AVG	-0.17891	-0.13	-0.18619	-0.05475
MEDIAN	0.915	-0.395	0.48	0.465	MEDIAN	0	-0.66	-0.18	-0.8
MODE	3.02	3.41	#N/A	#N/A	MODE	1.29	-5.18	-0.37	#N/A
STDEV	5.399699	4.114255	8.160572	5.349484	STDEV	5.066911	5.010773	3.984721	3.86675
N	62	62	63	60	N	64	63	63	61
TABLE 10 QUARTER-WISE					TABLE 11 QUARTER-WISE				
2013	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC	2014	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC
AVG	0.107581	0.367937	0.820476	-0.81645	AVG	0.685714	-0.03733	-0.42206	0.37569
MEDIAN	-0.345	0.61	0.36	-1.055	MEDIAN	0.04	0.07	-0.61	-0.035
MODE	-0.3	0	3.59	-1.16	MODE	-2.21	-0.42	-1.17	2.36
STDEV	3.999455	4.310714	6.396538	4.314346	STDEV	4.992981	7.147809	3.598235	5.23726
N	62	63	63	60	N	63	60	63	58
TABLE 12 QUARTER-WISE					TABLE 13 QUARTER-WISE				
2015	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC	2016	JAN-MAR	APR-JUNE	JULY-SEP	OCT-DEC
AVG	0.075968	0.340984	0.617188	-0.4759	AVG	0.468197	0.012742	0.222742	-0.04661
MEDIAN	-0.355	0.07	-0.335	0.19	MEDIAN	-0.52	-0.025	-0.675	-1.45
MODE	2.55	0.68	2.76	0.93	MODE	#N/A	-3.74	-1.47	-2.36
STDEV	5.529466	4.23219	9.840331	4.248838	STDEV	6.089195	5.719396	5.577818	5.047609
N	62	61	64	61	N	61	62	62	62

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TABLE 14 AVERAGES: YEAR & QUARTER-WISE						
QUARTERS	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
1	0.614839	-0.17891	0.107581	0.685714	0.075968	0.468197
2	-0.21677	-0.13	0.367937	-0.03733	0.340984	0.012742
3	1.224127	-0.18619	0.820476	-0.42206	0.617188	0.222742
4	-0.13133	-0.05475	-0.81645	0.37569	-0.4759	-0.04661
ANOVA: **Two-Factor Without Replication**						
SUMMARY	*Count*	*Sum*	*Average*	*Variance*		
Row 1	6	1.773389	0.295565	0.118528		
Row 2	6	0.337563	0.05626	0.05962		
Row 3	6	2.276283	0.379381	0.390285		
Row 4	6	-1.14935	-0.19156	0.167293		
Column 1	4	1.490866	0.372717	0.461693		
Column 2	4	-0.54985	-0.13746	0.003663		
Column 3	4	0.479544	0.119886	0.476411		
Column 4	4	0.602014	0.150504	0.233423		
Column 5	4	0.55824	0.13956	0.217178		
Column 6	4	0.657071	0.164268	0.054407		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1.190059	3	0.396686	1.88882	0.174854	3.287382
Columns	0.528364	5	0.105673	0.503161	0.76938	2.901295
Error	3.150269	15	0.210018			
Total	4.868692	23				
BOTH NULL HYPOTHESES ARE ACCEPTED						

https://www.nseindia.com/products/content/equities/indices/historical_vix.htm