

The Consequence of Volatility Index on Stock Market Returns

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ABSTRACT

Globally investors buy or sell in the stock market with greed and fear during the periods of uncertainty or high volatility. As a result, markets across the world and India have launched the Volatility Index (VIX) to measure volatility. Volatility also determines the Futures price, Open Interest, and Turnover which will be reflected in the underlying Spot price. Our study examines the various market indicators and their influence on the movement of the market. We provide direct evidence on how changes in selected indicators affect the value of the Market index. Our results show that VIX directly influences Futures price (positively) more than its indirect influence with Open Interest and Turnover but VIX indirectly with Open Interest, Futures and Turnover influences Spot prices (negatively) which is much less than its direct effect.

Keywords: Spot market index; Futures index; Open interest; Turnover; Volatility index-VIX

INTRODUCTION

An investor who invests in the stock market, in general, confers with the stock indexes for any changes in the overall market whereby they take appropriate investment decisions. The indexes are not only used to gage the investors' wealth but also the current position of the economy. In the market, use of futures have become popular among the investors to hedge against any hostile future price movements at the same time speculators are the other major beneficiaries of these contracts. Apparently, investors monitor the market with the trading volume as institutional investors' bulk and block trading can overwhelm the price movement indicated by these indices.

Globally investors buy or sell in the stock market with greed and fear during the periods of uncertainty or high volatility. Incidences like Lehman Brothers collapse in 2008, led investors to dump their stocks in panic which caused the global financial Crisis. This crisis made investors apprehension on determining the investment strategies based on the underlying and futures indices. Post-crisis investors focused on diversifying their investments with changing volatilities. As a result, markets across the world and India have launched the Volatility Index (VIX) to measure volatility. VIX is constructed to measure the market risk

and also considered as an investors fear gauge as it tracks the market reactions.

Volatility Index is computed based on the price of multiple options and derives an aggregate value of volatility. A high VIX value would hint that the market expects substantial changes in the market index, while a low VIX value expects only a minimal change thus negative correlation exists between the two. Our study will examine the various market indicators and their influence on the movement of the market. This study has implications for both academics and practitioners. We provide direct evidence on how changes in selected indicators affect the value of the Market index. We find that VIX has a significant (1%) positive influence on Open Interest and Turnover. Second, we find that VIX has a significant (1%) negative influence on Futures and Spot Prices. Third, we find Open Interest has a significant (1%) negative influence on Futures Price and Turnover has a significant (1%) positive influence on Futures price.

Finally, we find VIX and Open Interest have a significant (1% and 5%) negative influence on Spot prices (Nifty). Turnover and Futures prices have a significant (1%) positive influence on spot prices (Nifty). Overall it explains 99% of the variance in Spot prices (Nifty). The paper is organized as follows: The background

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of the study and the related papers are discussed in Section 2, Section 3 describes the data and methodology part of the study and formulates the study Hypothesis, Section 4 describes the study results, and in Section 5 we conclude.

BACKGROUND

According to the Efficient Market Hypothesis (EMH), it is impossible to beat the market as the share prices incorporate all pertinent information consistently. At the same time, there are dissension exists on EMH that market gurus have beaten the market and also the stock market crashes globally [1]. Academicians and market analysts found evidence for and against these traditional and modern theories of finance. The investors who are engulfed on the movement of stock indices for determining their strategies are clueless during the crisis [2]. The market index is considered as the touchstone of the market and is calculated using the price movement of the underlying stocks and volatility index measures the expected volatility. Informed investors take advantage of volatility implied by the options contracts [3]. as it provides investors expectation of uncertainty with respect to future price movements. Forecasting future volatility of a sensitivity index helps market participants to edge over market fortune whenever there is good news/bad news [4]. In India, VIX was launched on April 2008 (Futures on India VIX, Feb 2014). India VIX is a volatility index based on the real-time prices of Nifty-50 Index Option and reflects future expected stock market volatility over the next 30 days. The VIX is stated as “the investor fear gauge”, the higher the (VIX) index value, greater the risk and it is considered as a sensible forecast of uncertainty in the future [5-10]. In general, VIX increases with the bearish market and decreases with the bullish market due to the belief that bearish markets are riskier than bullish markets.

Warren Buffet, the world market guru states derivatives as the weapon of mass destruction especially in volatility conditions. Futures are marked as the speculators harbor for creating volatility in the underlying market [11]. The increased participation in futures contracts due to the benefit of leverage alarms the risk-bearing capacity of the investors not only in equity but also in commodities [12]. This increase in turnover or volume of trading in futures contracts since their introduction is much greater than the underlying cash markets turnover itself.

There is vast literature on surge or decline in volatility in the cash market, the introduction of futures trading has reduced the volatility of cash market with the increased flow of information [13,14] and no impact on the volatility [15]. Globally, on examining the volatility spillover in Korea Composite Price Index reveals (KOSPI) that the introduction of index futures promotes information transfer among the stocks in the Korean securities market [16]. In Italian Stock exchange, there is a reduction of stock price volatility after index futures and argues speculation in the futures led to the stabilization of cash market prices as futures possess a high degree of informational efficiency [17]. However, the effect of futures on the spot market volatility in Australia, Hong Kong, Japan, and the UK exhibits a significant increase in stock market volatility [18] and the volatility shock reflects the information transmission and

absorption by the market. The volatility of spot market index Nikkei 225 increased with the introduction of Nikkei 225 futures on the Japanese market [19]. It has destabilized the spot market in the UK market as the futures reduce the persistence of information and increased volatility [20].

Open Interest gives the market participants key information regarding the liquidity of a derivative contract, i.e., the large open interest means a large number of buyers and sellers making the reasonable spread between the bid and ask. Open interest is a non-price measure contains information about the future level of the underlying index or asset. Trading strategies built based on Open Interest generates increased returns or otherwise lowers the losses [21] For example, the relationship between the volume of Korean Stock Price Index derivative contracts and their Spot market volatility exhibits positive and negative influence between Open interest and Spot market volatility [22]. The combined effect of VIX, Spot market Index and Options Index on Open Interest show that spot had a major influence compared to the other two [23]. Volatility Index is a measure, of the amount by which an underlying Index is expected to fluctuate, in the near term and thus indicates the movement of Futures and spot price index. However, the impact of VIX, Open Interest, Index Futures, Turnover and their combined impact of the underlying spot market is necessary to understand the performance of the underlying benchmarking indices.

DATA AND METHODOLOGY

Data for the study were daily closing values of Volatility Index (VIX), Index Futures (Nifty Futures), Index Futures Open Interest, Index Futures Turnover and Nifty 50 from March 2009 to March 2011, taken from NSE website. The paper’s basic objective is to understand the effect of volatility index on future and spot market by studying the various market indicators and to find out how they influence the Futures and Spot prices of the Market (Nifty 50). Figure 1 the market indicators considered for the study were VIX (Volatility Index), Index Futures, Open Interest (Liquidity), Futures Turnover and Spot (Nifty). The underline theory says that there exists a complex relationship between the above-mentioned market indicators [24] and this differs from market to market. Structural Equation Modeling (SEM) technique is attempted to understand the multifold relation and how each of the four variables VIX, Index Futures, Futures Turnover and Open interest influences the Spot (Market) and also wanted to see the direct and indirect effect of them on the future and spot market. VIX is an index that measures the expectations of the volatility of the Nifty 50, in simple terms, it measures the market volatility and it is computed by the National Stock Exchange. Futures are the price of the Futures contract of Nifty 50 Index commonly called as Index futures, Open Interest refers to the total number of futures contracts that have not been settled, which Liquidity of the market. Futures Turnover is the total value of all the Index futures contracts traded. The spot is the price of Nifty Index which is a well diversified 50 stock index accounting for 22 sectors of the economy. The model is structured in such a way so as to analyze the Influence of VIX on Open Interest (Liquidity) because trading in the futures market is mostly determined by

volatility, VIX on Index Future because volatility is one of the underlying variables in determining the price of the future contracts, VIX on Futures turnover as volatility may determine the number of contracts traded and VIX on Nifty as VIX determines the fluctuations in the Market. Finally, the combined influence of VIX, Open Interest (Liquidity), Futures Turnover and Index Futures on Spot (Nifty) are ascertained.

Table 1: Descriptive statistics and correlation.

Particulars	Futures	TurnoVer	Open Interest	Market (Nifty)	VIX
Frequency	2063	2063	2063	2063	2063
Mean	6.48E+03	9.79E+05	2032499	6467.415	20.6399
Median	5.98E+03	9.35E+05	2017755	5960.9	18.55
Mode	4241.8	4.31E+04	1543405	5274.8	16.16
Std. Deviation	1.54E+03	3.73E+05	5974740	1531.531	7.34319
Skewness	0.236	0.973	0.436	0.247	1.688
Std. Error of Skewness	0.054	0.054	0.054	0.054	0.054

Kurtosis	-0.982	2.064	0.614	-0.99	2.06
Std. Error of Kurtosis	0.108	0.108	0.108	0.108	0.108
Variables	Futures	Turnover	Open interest	Market (Nifty)	VIX
Futures	1	-0.173**	-0.325**	0.999**	-0.692*
Turnover	-0.173**	1	0.186**	-0.166**	0.420*
Open Interest	-0.325**	0.186**	1	-0.326**	0.383*
Market (Nifty)	0.999**	-0.166**	-0.326**	1	-0.691*
VIX	-0.692**	0.420**	0.383**	-0.691**	1

**Significant at 1%, *Significant at 5%

The table contains information regarding descriptive statistics like mean, median, mode and standard deviation of the variables studied in the first part and the second part consists of the correlation matrix of the variables studied.

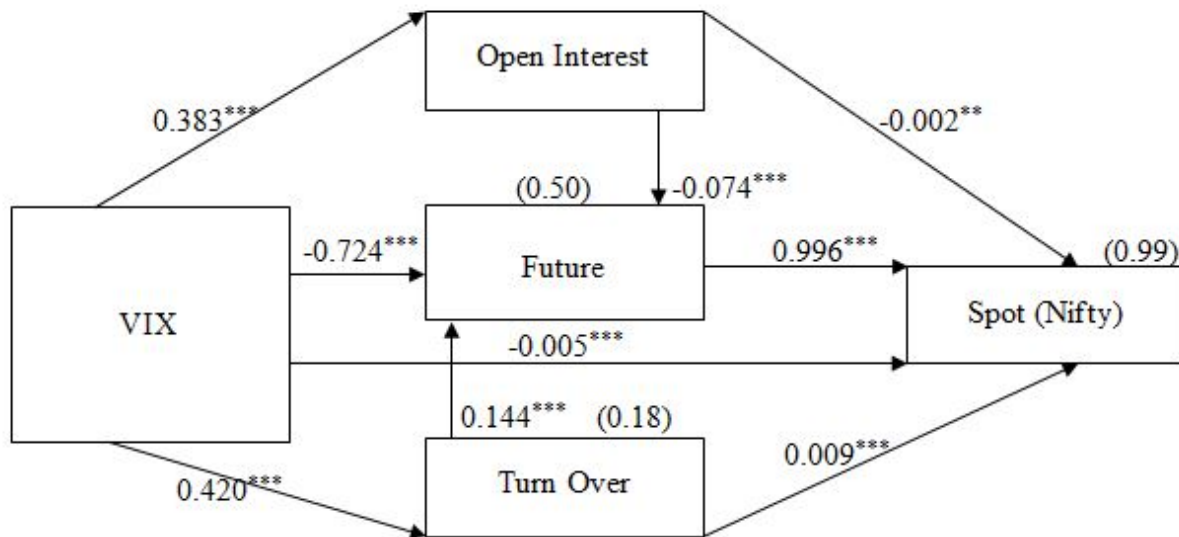


Figure 1: Complexity phenomenon.

RESULTS AND DISCUSSION

Graphs have been drawn to understand the trend and movement of the selected indicators with reference to VIX (Volatility) which is considered as an important Phenomenon to drive the market. Figure 2 is about the movement of VIX and Spot (Market) from which it can be seen that as VIX increases

Spot (market) decrease and this relationship is significant at 1% (Annexure Correlation Table).

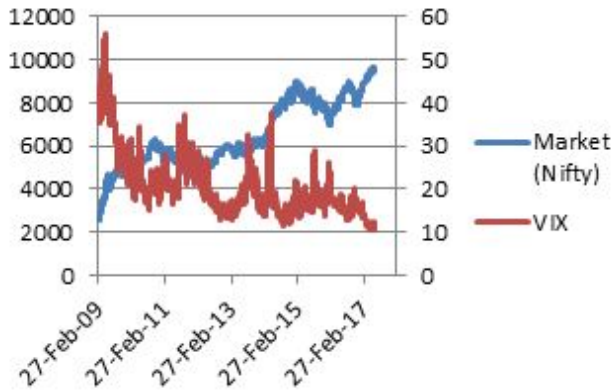


Figure 2: Movement of India VIX and Nifty (Market).

In Figure 3 (See Annexure) movement of VIX and Open Interest, which is the market liquidity, are plotted. It can be seen that they move more or less together and the relationship is positive and significant at 1% (See Annexure Table 1) as VIX increases Open Interest also increases and vice versa.

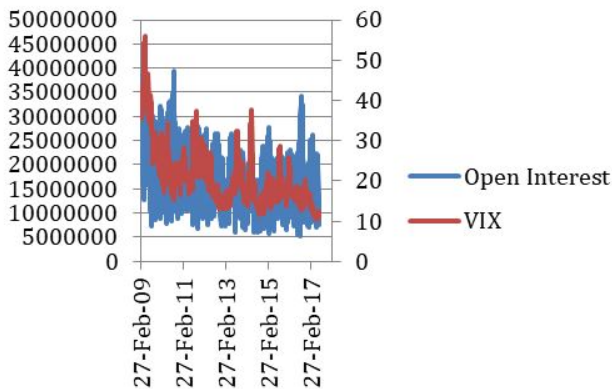


Figure 3: Movement of India VIX and open interest.

Figure 4 is about VIX and Turnover movement and here also the scenario is the same as VIX increase Turnover on Futures also increases and this relationship is also significant at 1% (Table 1).

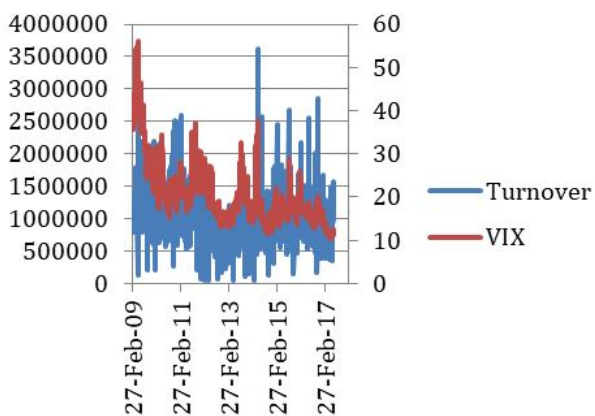


Figure 4: Movement of India VIX and futures turnover.

Figure 4 is about VIX and Turnover movement and here also the scenario is the same as VIX increase Turnover on Futures

also increases and this relationship is also significant at 1% (Table 1).

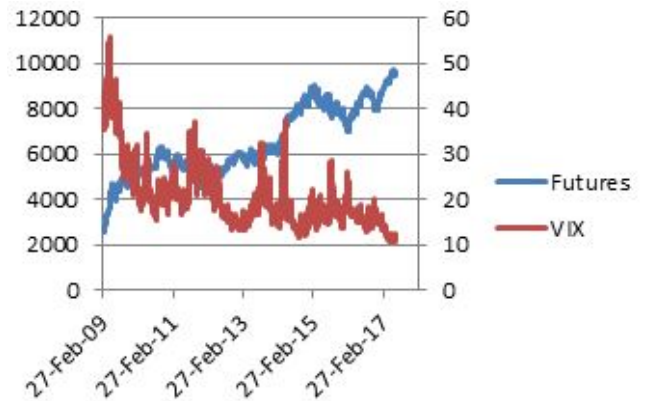


Figure 5: Movement of India VIX and Nifty futures.

Moving to Figure 5 (See Annexure) Movement of VIX and Futures Price here the pattern is similar to the Spot price when VIX increases Future price decrease and this relationship is also significant at 1% (Table 1). From the above discussions, it can be said that the positive effect of VIX on Market Liquidity and Turnover is comparatively less than the negative effect of VIX on the spot and future prices.

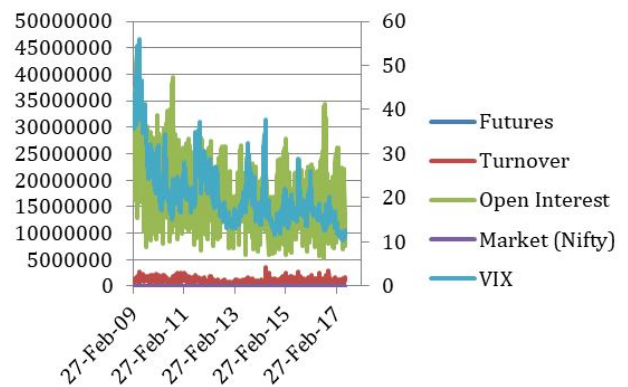


Figure 6: Movement of key market indicators.

Figure 6 is a combined pictorial depiction of VIX, Liquidity, Turnover, Spot and Futures Prices. In the graph VIX, Liquidity, and Turnover are more clearly visible than Spot and Futures Prices which are low in values.

Interpreting the Model, the χ^2 value is insignificant at 5% indicating that the data fit the model well and the findings are relevant. Root Mean Square Error Approximation (RMSEA) is one of the goodness of fit index which should be less than .05 [25-27] and the value for the model is 0.020 from which it can be concluded that the model exactly fits the data. The others Goodness of Fit indices to be considered are Comparative fit index (CFI), Normed fit index (NFI), and Relative fit index (RFI) whose values should be >0.90 [27] and the values for the model are 1.000, 1.000 and 0.999 from which it can be concluded that the model fits the data very well. Akaike Information Criterion (AIC) should be least for the default model [28,29] and it is the least for the above model with a

value of 39.864. All the above-discussed fit indices and results from Table 2 in Annexure clearly authenticate the model fits.

Table 2: Model fit.

Chi	df	Sig.	RMSEA	NFI	CFI	RFI	AIC
1.864	1	0.172	0.02	1	1	0.999	39.864*

The table consists of the model fit information from which one can assess the utility of the model

Interpreting the influence of various market indicators on Futures and Spot prices reveals that VIX has a significant (1%) positive influence on (0.383) Open Interest and (0.420) on Turnover. This can be inferred as 1 SD unit increase in VIX will lead to an increase in 0.383 SD units in Open Interest or market liquidity with an explained variance of 15% and 0.420 SD units increase in Turnover with an explained variance of 18%. VIX has a significant (1%) negative influence on (-0.724) Futures and (-0.005) on Spot Prices. If VIX increases by 1 SD unit Futures price will decrease by 0.724 SD units and spot price by 0.005 SD units. The interesting finding is Open interest or market liquidity has a significant (1%) negative influence on (-0.074) Futures price, more liquidity in the market lower are the futures price and vice versa, where Turnover has a significant (1%) positive influence on (0.144) Futures price, more turnover in the market higher are the prices and vice versa. 1 SD unit increase of Open Interest and Turnover will result in an 0.074 SD units decrease and 0.144 SD units increase of Futures price. VIX, Open Interest, and Turnover together explain 50% of the variance in Futures Price (Equation 1). Finally, VIX and Open Interest have a significant (1% and 5%) negative influence of (-0.005) and (-0.002) on Spot prices. Whereas Turnover and Futures, Prices have a significant (1%) positive influence (0.009) and (0.996) on Spot prices. 1 SD unit increase VIX, Open Interest, Futures Price and Turnover will lead to a decrease in spot price by 0.005 SD units and 0.002 SD units and an increase by 0.009 SD units and 0.996 SD units in the Spot price. All of them together explain 99% of the variance in Spot Prices (Equation 2).

$$\text{Futures} = [-0.074 \text{ (SD of Futures)} (\text{Open Interest/SD of Open Interest}) - 0.724 \text{ (SD of Futures)} (\text{VIX/SD of VIX}) + 0.144 \text{ (SD of Futures)} (\text{Future Turnover/SD of Future Turnover}) + e] \quad (\text{Eq. 1})$$

$$\text{Spot (Nifty)} = -0.002 \text{ (SD of Spot)} (\text{Open Interest/SD of Open Interest}) - 0.005 \text{ (SD of Spot)} (\text{VIX/SD of VIX}) + 0.996 \text{ (SD of Spot)} (\text{Future Price/SD of Future Price}) + 0.009 \text{ (SD of Spot)} (\text{Future Turnover/SD of Future Turnover}) + e \quad (\text{Eq. 2})$$

Table 3: Standardized indirect effects.

Variables	VIX	Turnover	Open interest	Futures
Turnover	0	0	0	0
Open Interest	0	0	0	0

Futures	0.032	0	0	0
Spot (Nifty)	-0.686	0.144	-0.074	0

The indirect effect of the market indicators on Futures and Spot Prices are in Table 3. VIX has an Indirect Effect on Futures price by 0.032 SD units and it is significant (1%) but the interesting finding is Volatility has direct negative effect on Futures price but a Positive indirect effect on Futures price. From this, it can be concluded that Open Interest (liquidity) and Turnover play a significant mediating role on the Futures Price. VIX has an indirect effect of -0.686 SD units on Spot Price and it is also significant (1%). From this, we can conclude that the direct effect of Volatility (VIX) on Spot price is much less than its indirect effect. Even on the Spot price, Open Interest (Liquidity) and Turnover plays a significant mediating effect with Futures price. The indirect effect of Open Interest, which is -0.074 SD units, on spot is more than its direct effect and the scenario is same for Turnover as well where its Indirect effect on Spot (0.144 SD units) is more than its Direct effect. From this, we opine that Future price plays a strong mediating role in determining the Spot price.

Trading does not occur in emptiness, for which indicators and reports show what other market participants are doing can be a valuable addition to the trading system. Investors enter into futures contract voluminously, during high volatility to hedge against their exposure to risk which leads to an increase in Liquidity and this leads to a decrease in Futures Prices which in turn plays a major role in affecting the Spot Market Index. Thus Futures market (derivatives market) plays a key role in pushing/pulling the Nifty 50 returns (underlying spot market) whereby the level of VIX, Open Interest and Turnover provides the information to the investors to safeguard themselves against the future risk whereby one can act as a risk-averse investor. Thus, Volatility measures the pace at which market moves higher or lower, and how wildly it swings i.e., “rate and magnitude of changes in prices” in the near future. Since VIX is an estimate of future volatility it directly influences the Futures price and indirectly the spot market (Nifty) i.e., the futures, in turn, affect the spot prices [30,31]. Meanwhile, Nifty Index is used for a variety of purposes such as benchmarking portfolios, index-based derivatives and index funds, the indicators which influenced the movement of Nifty 50 Index are considered to be a useful tool for capturing uncertainty in the market prices. Therefore volatility (VIX), futures price movements (Futures Index), liquidity (Open Interest) and Turnover (Futures Trade) are the key indicators of the derivatives market which should be taken into consideration by the market participants while making their buy or sell decision in the underlying spot market. To conclude VIX directly influences futures price (positively) more than its indirect influence with Open Interest and Turnover but VIX indirectly with Open Interest, Futures and Turnover influences spot prices (negatively) which is much less than its direct effect. It has been traditionally believed that it is Volatility (VIX) that plays a major role in price determination and by tracking volatility one can easily understand the price behavior. But this has been proved wrong from the findings of this paper it is just not VIX but the combination of other

market factors that play a role in price determination of Derivatives. Globally exchanges have started to offer derivatives on VIX as it gives investors a means to hedge against risk and diversify their portfolio. In such a scenario, VIX may help investors to effectively manage risk and diversify a portfolio. The findings of this study can throw some light on making appropriate trade strategies from which investors can decide on their timing of entering or exiting the market. The study can be extended by using intra-day movements of price, volatility, and volume whereby the traders could benefit more with the information.

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