

Is There Any Real Market Indicator to Predict Stock Index Returns? A SEM Approach

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Abstract The collapse of Lehman Brothers that led to global financial crisis had not left the Indian market too. During crisis many investors who determine their strategies in the underlying market based on the traditional indices and future prices movements were clueless about the plunge in the markets. The two benchmark stock indices, the Nifty and Sensex have ceased to reflect the 'true' performance of Indian stock markets today (Business Line, [2]). Thus investors tracking the market based on the popular indices alone as the market indicator will not suffice their hunger for building profitable trading strategies. Thus in the current scenario, to gauge any uncertainty in the market and to capture the underlining market movements in a systematic manner, the market volatility, liquidity, futures price should be closely monitored. Hence, this paper aimed at looking into the complex relationship between India VIX (Volatility Index), Index Futures, Open Interest (Liquidity) and NIFTY (Market) by applying Structural Equation Model (SEM) by which the impact of VIX, Nifty Futures and Open Interest on Nifty prices and their inter-relationships were studied to better understand the underlying market performance.

Keywords Volatility Index, Index Futures, Open Interest, Market Indicators, Structural Equation Modelling

1. Introduction

Investors in general are driven by greed and fear on any rational assessment of when to buy and sell in the stock market. Whenever investors are too gloomy or too cheerful, it often signals a turning point in the markets. Many investors, who had held their stocks through all the uncertainty up until then, watched markets plunge and dumped their stocks in a panic, after Lehman Brothers collapsed in 2008 globally (Bennett, [1]). This global effect has not left the Indian stock market too. The Nifty and Sensex have ceased to reflect the 'true' performance of Indian stock markets today (Business

Line, [2]). A stock market index is expected to provide a measure of the value of a group of stocks. But the two benchmark stock indices, the Sensex and Nifty, have been shown up as hopelessly inadequate in doing this. Even as the majority of stocks are in deep declines or languishing near their bear market lows, the two indices are still putting up a façade of relative resilience (Business Line, [2]). Thus investors tracking the market based on the popular indices alone as the market indicator will not suffice their hunger for building profitable trading strategies. But how to gauge any uncertainty in the market or which drives the market in general is muddy among the investing environment.

Black [3] suggested that the informed investors would try to take advantage of their views through the options market because of the leverage such instruments provided. Therefore clues from the options market may have implications for the performance characteristics of a security. One such clue is a volatility measure in options contract using the B-S model popularly known as Implied Volatility.

Implied volatility provides a method to measure investors' expectation of uncertainty regarding future price movements. That is, it measures what extent the returns of underlying asset fluctuates from the current date until expiration of the Options' contract and one such index is India VIX in the market. India VIX "new" barometer of investor fear – the NSE's Market Volatility Index – is claimed to have reached unprecedented levels and is now, in fact, causing stock market return. Moreover, India VIX is a forward-looking index of the expected return of the market or their stock portfolios.

An Index future is a futures contract on a stock or financial index which binds the parties to an agreed value for a specified future date. Investors use these contracts to protect themselves from the downside risk of the broader market. Alternatively, the portfolio managers use index futures to increase their exposure to movements in a particular index, basically to leverage their portfolios. In addition to the movement in the index futures price, the activity in the futures trading is measured by "Open Interest" in the

financial market. The level of outstanding positions in the derivatives segment is one of the parameters widely tracked by the market participants. The open interest indicates the intensity of trading i.e., a large open interest indicates more activity and liquidity. In fact, Open Interest is often used to confirm the trends and trend reversals and acts as a signal of the information content of a given price movement. However, all these market indicators may not provide investors with exact market movement / returns rather may provide information about future price movements. Therefore, this stock market phenomenon needs a thorough study on various market indicators and their relationships.

2. Review of Literature

The market participants and the financial media closely monitor the market volatility, liquidity, futures price and the market movement in a systematic manner.

India VIX is a Volatility Index computed by NSE based on the order book of Nifty Options. These volatility indices are sometimes referred to as “the investor fear gauge”, higher the index, greater the fear (Whaley, [4]). It is also considered as a reasonable forecast of future realized volatility (Poon and Granger [5], Anderson et al., [6]). VIX signals market direction, the signal is loud and clear when the implied volatility is high (or, even better, when it spikes) (Cipollini and Manzini, [7]). Simon [8] describes how markets tend to view extreme values of the VIX as trading signals. If the VIX is very high, markets are pessimistic, which could lead to a subsequent rally in stock prices. On the other hand, if Implied Volatility is very low, the market may face a disappointment stemming from a downward move in prices. Fleming et al., [9] found that the VIX dominates historical volatility as a forecaster of future volatility. Blair et al., [10] agree, concluding that volatility forecasts provided by the VIX index are more accurate than forecasts based on intra-day returns. Blair et al. [10] also maintain that there is some incremental information in daily index returns when forecasting one day ahead, but the VIX index provides nearly all information relevant for forecasting. Dennis et al., [11] found that daily VIX changes are very significant in predicting future index return volatility.

Lockwood and Linn, [12] explained that derivatives market provides an additional channel by which information can be transmitted to the cash markets. Frequent arrival and rapid processing of information might lead to increased volatility in the underlying spot market. They also attribute increased volatility to highly speculative and levered participants. Kumar et. al. [13] argued that derivatives trading helps in price discovery, improve the overall market depth, enhance market efficiency, augment market liquidity, reduce asymmetric information and thereby reduce volatility of the cash market.

The index futures were introduced in the Indian stock markets in June 2000. However, the trading volumes in futures markets have substantially increased especially in the

case of National Stock Exchange (NSE). Presently the turnover in derivatives market is much higher than the turnover in underlying spot markets. The literature is huge on whether the introduction of futures leads to an increase or decrease in the spot market volatility. Harris [14] showed that after the introduction of index futures in the U.S. market, the spot price volatility of S&P 500 stocks rose relative to non-S&P 500 stocks, though the differences in volatilities are small in economic terms. The effect of the index futures trading on the underlying market volatility in Australia, Hong Kong, Japan, and UK have been examined by Lee and Ohk [15] and they found that the stock market volatility had increased significantly after the introduction of the stock index futures rendering it more efficiency, volatility of the shocks reflect the information which is transmitted and absorbed rapidly by the market. However, Australia and Hong Kong were observed to be exceptional cases, where stock market volatility did not increase. Chang et al. [16] reported for the Japanese market, that although spot volatility for Nikkei 225 stocks increased with the introduction of Nikkei 225 futures on the Osaka Securities Exchange, no such volatility effect was observed for non-Nikkei 225 stocks. The results of these studies indicate that futures trading increases spot market volatility, but that there is no volatility spillover to stocks against which futures are not traded. In sharp contrast, Bae et al. [17 & 18] observed the volatility spillover between the Korea Composite Stock Price Index (KOSPI) 200 stocks and non-KOSPI 200 stocks with the introduction of index futures trading in the Korean securities markets. Their findings reveals that information from the index derivatives markets also affects the return volatility of the non-index stock portfolio against which no futures or options are traded as well as that of the index stock portfolio. Thus, the introduction of derivatives trading promotes information transfer among stocks in the Korean Securities markets. Bologna and Cavallo [19] investigated the stock market volatility in the post derivative period for the Italian stock exchange. The study shows that introduction of index future, has actually reduced the stock price volatility and also found that in the post Index-future period the importance of ‘present news’ has gone up in comparison to the ‘old news’ in determining the stock price volatility. They also argued that the speculation in the futures market also leads to stabilization of the spot prices. Since futures are characterized by high degree informational efficiency, the effect of the stabilization permits to the spot market.

In the context of Indian Securities market, Thenmozhi [20] showed that the inception of futures trading has reduced the volatility of spot index returns due to increased information flow. However, according to Shenbagaraman [21], the introduction of derivative products did not have any significant impact on market volatility in India. Similarly, Bandivadekar and Ghosh [22] studied the impact of introduction of index futures on spot market volatility on both S&P CNX Nifty and BSE Sensex in India. The empirical analysis points towards a decline in spot market

volatility after the introduction of index futures due to increased impact of recent news and reduced effect of uncertainty originating from the old news.

Butterworth [23] studied the impact of futures trading on underlying stock index volatility in the FTSE, UK market and argued that introduction of the futures market leads to more complete market enhancing the information flow. Ryoo and Smith [24] argued that introduction of index futures trading have destabilized the spot market. They captured time varying nature of volatility phenomena in the data. The results implies futures trading increases the speed at which information is impounded into the spot market prices, otherwise reduces the persistence of information and increase the spot market volatility. The information implied from derivative prices are about the risk-neutral distribution of the underlying asset. Bhuyan and Chaudhury [25] asserts that apart from the derivative prices, non-price measures of activity in the derivatives market such as the open interest contain information about the future level of the underlying asset. The results suggest that the open-interest based trading strategies have the potential to generate enhanced trading returns or lower trading losses. Thereby, open interest based active trading strategies generate better returns compared to the passive benchmarks. Kim [26] examined the relationship between trading activities of the Korea Stock Price Index 200 derivative contracts and their underlying stock market volatility. He found positive relationship between stock market volatility and derivative volume while the relationship is negative between volatility and open interests. Robbani and Bhuyan [27] examined the effect of introduction of future & option on the DJIA on the volatility & trading volume of its underlying stocks. The result shows that level of volatility and trading volume increased after the introduction of futures& options on the index. Sabri [28] examined the impact of change in trade volume on volatility of stock prices as expressed by unified Arab Monetary fund stock price index. He reported increase in both trading volume & stock price volatility. He also found correlation between volume and price movement is higher in the stock markets of the oil Arab states compared to the non-oil Arab states. Naresh, et. al. [29] studied the effect of VIX and Options Index on Nifty Index and then saw the combined effect of these three on Open Interest in the Indian Options market. The results found that Nifty Index had a major influence on the Open Interest in the Derivatives market compared to the other two variables VIX and Options Index. Thus Investors should watch for information implicit not just in VIX, Option Index and Nifty prices but also in option market activity (Open Interest). Mutlu & Arik [30] investigated the interaction between Single Stock Futures and the Underlying securities found that Futures contribute to the price discovery in the underlying spot market. Aloulou and Boujelbene [31] studied the market indicators like higher liquidity, less transaction costs and the leverage effect for making trading decisions. The study found that use of leverage was largely compensated by the transaction costs and lack of liquidity. Kwark et al. [32] examined the

underlying stock price movements using the indicators such as implied volatility (of at-the-money call and put options) and futures price. The results found that these indicators as the significant predictors for both upward and downward jumps in the stock prices. Henceforth, the impact of VIX, Nifty Futures and Open Interest on Nifty prices and their inter-relationships were studied to better understand the underlying market performance.

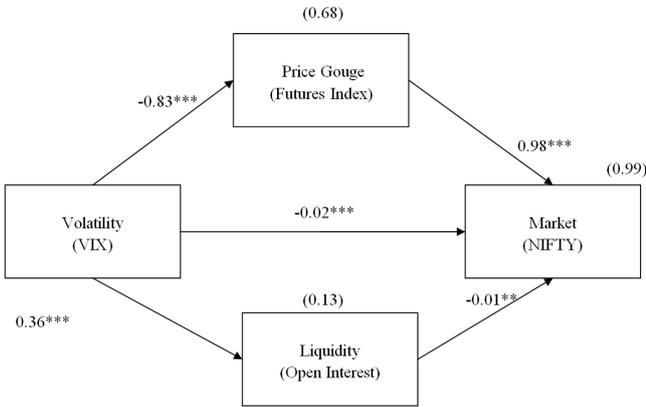
3. Research Methodology

This paper aimed at looking into the various market indicators such as India VIX (Volatility Index), Index Futures, Open Interest (Liquidity), NIFTY (Market) and their complex relationship by applying Structural Equation Model (SEM). SEM model was applied for the data because we wanted to study the multifold relation and causal effect of three variables VIX, Future Index and Open interest on the Market and also wanted to see the direct and indirect effect of them on the market. To measure volatility in the markets, the VIX computed by the National Stock Exchange is used. VIX is an index which measures expectations of volatility, of the Nifty Index. Index Futures are the Futures contract on an Index in the Futures market, Open Interest refers to the total number of futures contracts that have not been settlement. Nifty is a well diversified 50 stock index accounting for 22 sectors of the economy. The objective is to look into the effect of India VIX on Liquidity (Open interest) because the active trading in the futures market is determined by the volatility factor, VIX on Index Future because volatility is one of the underlying variables in determining the price of the future contracts and VIX on Nifty as VIX determines the fluctuations in the Market. Lastly the effect of VIX, Liquidity and Index Future on Nifty as these three are said to be the key variables for determining the market movement namely the index. Data for the study were daily closing values of VIX, Open Interest, Index Futures and Nifty from March 2009 to February 2013, taken from NSE website. Descriptive statistics and correlation analysis for the data are included in the annexure.

4. Findings and Discussions

The trend line has been drawn to show the movements of the selected indicators. Figure II depicts the movement of VIX and Open Interest; it is clear that as the value of VIX increases open interest also increases simultaneously and vice versa. In the Figure III, one can observe clearly that when the value of VIX is high the price of the Futures Index is low whereas when the value of the VIX is high the price of the Futures Index is low whereas when the value of VIX falls i.e., the volatility decreases the Futures Index price soars in an increasing trend. In Figure IV the movement of VIX value is extremely opposite to the price movement in Nifty Index. In this figure as the volatility decreases the value of Nifty

Index increases. The Figure V gives the combined effect of movement of VIX, NIFTY Index, Futures Index and Open Interest where the movements of NIFTY Index and the Futures Index are moving in tandem and the Open Interest moves in opposite direction to the movement of prices in Nifty and Futures Index. Even though the value of the VIX moves equally with the Open Interest, it is not clearly reflected in this figure as the value of VIX is very low in number.



Significant at 1% *** and at 5% **

Figure 1. COMPLEXITY PHENOMENON

Table 1. Model Fit

Chi	df	Sig	RMSEA	NFI	CFI	RFI	AIC
0.000	1	0.998	0.000	1.000	1.000	1.000	26.000*

*Default model and Lowest of the three models

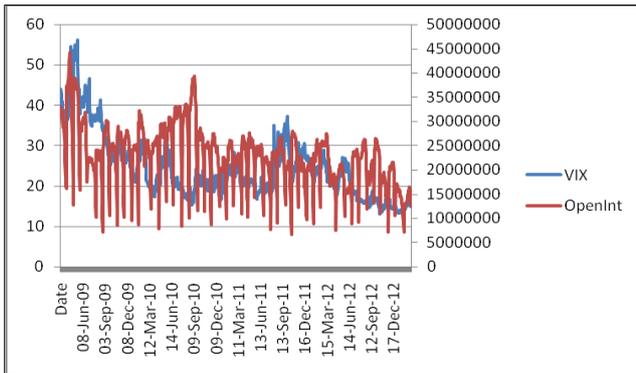


Figure 2. Movement of Vix and Open Interest

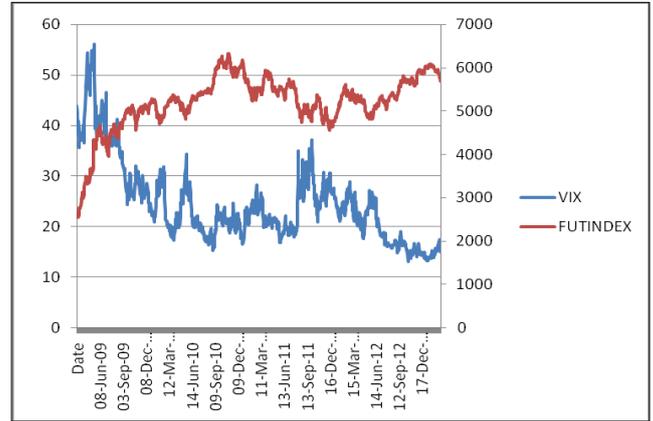


Figure 3. Price Movement of Vix And Nifty Index

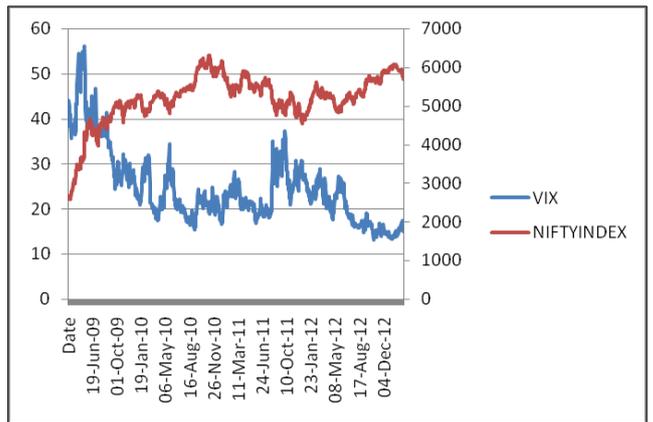


Figure 4. Price Movement of Vix And Nifty Index

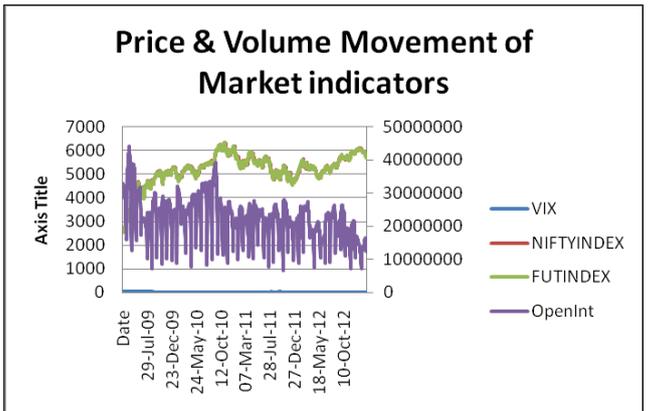


Figure 5. Movement of Key Market Indicators

The χ^2 value and its significance will explain the Model fit for the data. The χ^2 value is very close to 0, for a degree of freedom of 1 it is highly insignificant indicating that the model fits the data very well (Naresh et al. [29]). Root mean square error of approximation (RMSEA) is the next Goodness of fit indices, which should be less than .05 (Hair et al [33], Thiagarajan & Shanthi [34]) and the value for the model is 0.000 from which it can be concluded that the model exactly fits the data. The others Goodness of Fit indices to be looked into are Comparative fit index (CFI), Normed fit index (NFI), and Relative fit index (RFI) whose values should be >0.90 (Hooper et al, [35], Hair et al, [33], Shanthi & Thiagarajan [36]) and the values for the model are 1.000, 1.000 and 1.000 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 (Akaike, [37], Diamantopoulos and Siguaw, [38]) and it is the least for the above model. All the fit indices from the above Table I clearly signal that the model fits the data well.

From the model and analysis it can be said that VIX has a negative influence on Future Index (-0.83) and on Nifty (-0.02) and the influence is significant at less than 1%. The influence can be quantified by 1 SD unit increase of VIX will lead to a decrease in 0.83 SD unit of Future Index and the explained variance is 68%. On the same lines 1 SD unit increase of VIX will lead to a decrease in 0.02 SD unit of Nifty.

VIX is a substitute of the market sentiment, higher the India VIX values, higher the expected volatility giving a signal to sell future index and the underlying index leading to fall in prices and when VIX decreases future index and the underlying asset price index rise thereby giving a buy signal to the investors thus having a negative influence. VIX has a positive influence (0.36) on Liquidity (Open Interest) and is also significant at less than 1% from which it can be said that 1 SD unit increase of VIX will lead to an increase of 0.36 SD unit and the explained variance is 13%. Higher the VIX indicates higher the fear, hence the market participants will buy futures contract to hedge themselves against risk thereby increase in the Open Interest and vice versa. Looking at the variables holistically Future Index has a significant (less than 1%) positive effect (0.98) on Nifty whereas Liquidity, like Open Interest, has a significant (less than 5%) negative effect (-0.01) on Nifty. 1 SD unit increase of Future Index will lead to an increase of 0.98 SD unit of nifty but 1 SD unit increase of Open Interest will lead to a decrease of -0.01SD unit of nifty. VIX, Future Index and Open Interest together explain 99% of the change in Nifty, amongst them Future Index seems to play a major role.

Nifty = -0.01(SD of Nifty) (Open Interest/SD of Open Interest) - 0.02(SD of Nifty) (VIX/SD of VIX) + 0.98(SD of Nifty) (Future Index/SD of Future Index) + e

The above equation on Nifty is explained by VIX, Future Index and Open Interest to the extent of 99% and indicates the indirect effect of VIX on Nifty as well. The indirect effect of volatility (VIX) on market (Nifty) through price gouge

(Future Index) as a mediating variable is -0.813, whereas the indirect effect is only -0.004 through liquidity (open interest). Thus, the result indicates that the indirect effect of VIX on Nifty through Future index is much stronger than the direct effect (-0.02). Future index is the strongest mediating variable in comparison with open interest on Market. Therefore the volatility (VIX), futures price movements (Futures Index) and the liquidity (Open Interest) to a small extent are the key indicators of the derivatives market which should be taken in to consideration by the market participants while making their buy or sell decision in the underlying spot market. This shows that the Futures market (derivatives market) pushes / pulls the Nifty returns (underlying spot market) whereby the level of VIX and Open Interest provides the information to the investors to safeguard themselves against the future risk and act as a risk averse investors.

Trading does not occur in a vacuum. Indicators and reports that show, what other market participants are doing can be a valuable addition to the trading system. An increase in the value of VIX leads to a decrease in the prices of Futures and Spot market Index. At the same time an increase in VIX increases the level of Open Interest and an increase in open interest means, Investors are entering into futures contract voluminously during high volatility to hedge against their exposure to risk. The increase in Open Interest i.e., high liquidity also led to reduction in the price of the Nifty index. Thus VIX which is a volatility measure signals the market participants who are straying about the market movements. Since Nifty Index is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds, the indicators which influenced the movement of Nifty Index were considered to be useful tool for capturing uncertainty in the market prices. VIX being a volatility measure seems to have important and different implications for return expectations for all alternative investment strategies.

5. Conclusions

Given, the rising interest in identifying the effect of volatility trading on the underlying stock market, this paper suggests that it is not sufficient to track the market based on the traditional and popular indices alone, as volatility is playing a significant role in driving the underlying stock prices. The implications of this paper will be useful for investors in the underlying spot market to make appropriate trading strategies and to decide when to enter and exit a trade, as well as ensuring to get the best possible price. Thus, VIX along with Future index can be considered as a fear gauge for the underlying stock market. The quality of information dissemination from these key market indicators gives confidence to the traders in their buy or sell decisions and also helps the investors to be risk averse. The study can be further extended to intra-day movements of price, volatility and volume whereby the traders could benefit with the information flow enormously.

Annexure

Descriptive Statistics	VIX	Index Futures	Open Interest	Nifty Index
Mean	24.00	5,206.00	22,934,514.00	5,196.00
Median	22.00	5,266.00	23,254,600.00	5,259.00
Mode	22.00	5,063.00	25,389,200.00	5,275.00
Standard Deviation	8.00	641.00	6,219,524.00	635.00
Kurtosis	2.00	3.00	0.00	4.00
Skewness	1.00	-1.00	0.00	-1.00
Range	43.00	3,785.00	37,466,750.00	3,739.00
Minimum	13.00	2,548.00	6,737,350.00	2,573.00
Maximum	56.00	6,333.00	44,204,100.00	6,312.00
Jarque-Bera	423.87	850.57	10.06	869.15
Correlation				
	VIX	Nifty Index	Index Futures	Open Interest
VIX	1			
Nifty Index	-0.82937	1		
Index Futures	-0.8264	0.994546	1	
Open Interest	0.357965	-0.30307	-0.29586	1

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