CAUSE AND EFFECT RELATIONSHIP
BETWEEN FUTURE CLOSING PRICE, TRADING VOLUME & OPEN INTEREST OF NIFTY STOCK INDEX FUTURE CONTRACTS

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Abstract

A rise in future closing price, trading volume and open interest indicates that the market is strong and in upward trend. While a fall in price and a rise in trading volume and open interest indicate that the market is weak and downward trend. When all three prices, trading volume and open interest are falling it indicates that the market is strengthening on the other hand, if price is rising but the trading volume and open interest are falling it said that the market is weakening. This paper makes an attempt to study the relationship between future closing prices, trading volume and open interest for Nifty Index near month, next to near month and far month contracts. Open interest is often used to know the trends and flow of money, the relationship between these three often indicates the changeof trend in the futures market. Granger causality test was adopted to assess the cause and effect relation between the variables. Thus the study provides the technicians utilize a three dimensional approach to futures market analysis.

Keywords: *Futures Closing Price, Trading Volume, Open Interest, Granger Causality, Nifty Index.*

Introduction

Futures are standardized contract between two parties to buy or sell an asset at a certain time in the future at a certain price. Open Interest is the total number of outstanding contracts that are held by market participants at the end of the day. Open interest applies primarily to the futures market. Open interest, or the total number of open contracts on a security, is often used to confirm trends and trend reversals for futures and options contracts. Open interest measures the flow of money into the futures market. For each seller of a futures contract there must be a buyer of that contract. Thus a seller and a buyer combine to create only one contract. Increasing open interest means that new money is flowing into the marketplace. The result will be that the present trend (up, down or sideways) will continue. Technical analysis can easily see that the volume represents a measure of intensity or pressure behind a price trend. The greater the volume, the more we can expect the existing trend to continue rather than reverse.

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Literature Review

(K.Srinivasana, 2010) Studied the conceptual framework of derivatives market in India and assessed the dynamic relationship between price volatility, trading volume and market depth for stock futures contracts for a period from Jan 2003 to Dec 2008 on NSE using ARCH and GARCH models. It further draws out stating that there is a significant positive relationship between return volatility, expected trading volume and expected open interest. Unexpected volume and open interest have a greater impact on volatility from the expected trading volume and open interest whereas the Market depth does not have any effect on volatility.

(Dr. B. Ramesh, 2011) Examined relation between the change in the prices of futures contracts of specific stocks and the change in Open Interest. The relationship or the absence of it suggests that change in open interest in futures contracts is just a phenomenon of the trading volume and it in no way has some directional information. Further the study concluded that open interest changes as and when the number of open positions increase or decrease in a given contract and it has no bearing over the direction of the market. Thus it was said that a change in open interest will not lead to a change in futures price in any direction.

(Gulati, 2012) Examined the relationship between closing price and open interest in Indian stock index futures market considering a sample of Indices BANKNIFTY, MINIFTY, CNXIT, NIFTY and NIFTYMIDCAP50 for a period 2009-10 & 2010-11 using statistical tool Granger Causality and concluded that one can use the information of open interest to predict future prices in the long run.

(Watanabe, 2001) This paper examined the relation between price volatility, trading volume and open interest for the Nikkei 225 stock index futures traded on the Osaka Securities Exchange (OSE). The conclusions drawn were a significant positive relation between volatility and unexpected volume and a significant negative relation between volatility and expected open interest. However, no relation between price volatility, volume and open interest is found for the period prior to 14 February 1994, when the regulation increased gradually. This result provides evidence that the relation between price volatility, volume and open interest may vary with the regulation.

(Chen, 2010)examined the relationships amongst volatility, total trading volume (TVOL) and total open interest (TOI) for three Taiwan stock index futures markets concluded that a significant in-sample relationships amongst the futures' daily volatilities, the lagged total volume and the lagged total open interest. Whether addition of lagged total volume and/or lagged total open interest helps the basic GARCH models predict future volatility depends upon the sample period examined for all three sets of futures.

(Eric, 2009) This paper investigated the relationship between daily returns and trading volume on Istanbul Stock Exchange National -30 index finds that the persistency of conditional volatility is high & very close to unity, implying that current information can be used to predict future volatility.

(Tarık Doğru, 2012)examined the relation between closing prices and trading volume of US Dollar (USD) futures contracts in the Turkish Derivatives Exchange (TURKDEX).The results indicated that there is no relation between prices and volume in the short run, there is a relation from volume to prices in the long run.

(Floros, 2001)investigated the contemporaneous and dynamic relationships between trading volume, returns and volatility for Greek index futures(FTSE/ASE-20 and FTSE/ASE Mid 40) The conclusions drawn were for FTSE/ASE-20, price volatility does not significantly impact volume's volatility. Using GARCH methods, the results show a positive and significant effect, indicating that volume contributes significantly in explaining the GARCH effects. On the

other hand, both GARCH and GMM methods confirm that there is no evidence for positive relationship between trading volume and returns. For FTSE/ASE-20, the dynamic models show a bi-directional Granger causality (feedback) between volume and actual returns. However, for FTSE/ASE Mid 40, the results indicate that returns do notGranger cause volume and vice versa.

(Deo & K., 2011) The causal nexus between futures return, trading volume, open interest and volatility for S&P CNX Nifty futures, there exist a bi-directional causal relationship between futures market variables in the short-run and unidirectional causality running from trading volume and open interest with return and volatility bears the brunt of short-run adjustment to long-run equilibrium.

Objective

To study the cause and effect relationship between Future Closing Prices, Trading Volume and Open Interest for Nifty Stock Index Future Contracts.

Hypotheses

- H_{O1} : Future Closing Prices does not Granger Cause Trading Volume.
- H_{O2} : Future Closing Prices does not Granger Cause Open Interest.
- H_{O3} : Trading Volume does not Granger Cause Future Closing Prices.
- H_{O4} : Trading Volume does not Granger Cause Open Interest.
- H_{O5} : Open Interest does not Granger Cause Future Closing Prices.
- H_{O6} : Open Interest does not Granger Cause Trading Volume.

Research Methodology

This paper investigates the causal relationship between Future Closing prices, Trading Volume and Open Interest of Stock Index Futures Contracts on Nifty Futures Index in India using Granger Causality test. The data period considered in the analysis is from June 2000 to December 2015 for the near month, next to near month and far month contracts traded on Nifty 50 Index on NSE.

Data Sources

The study is based on secondary data i.e. Futures Future closing prices, Trading Volume and Open Interest of Nifty Stock Index Futures Contracts and has been collected from www.nseindia.com for a period of 15 years from June, 2000 to December, 2015. The Index is selected based on most actively traded Futures Index in terms of volume for all three contracts near month, next to near month and far month contracts.

Tools for Analysis

- **Descriptive Statistics**

The measure of performance i.e. mean is used to find the average value for the data set. The standard deviation is obtained for the given set of data to measure the variability and the the deviation from the central value i.e. mean average. Skewness measures the shape or pattern for the given observations. Kurtosis measures the normality and peakness of the data set.

- **Test of Unit Root**

Augmented Dicker Fuller test is used to test the stationary of the variables. A unit root test helps in determining whether the time series data variable is stationary. The time series data of futures closing prices, trading volume and open interest for all three contracts were found to be stationary at first difference.

- **Granger Causality Test**

The study used granger causality test to develop a two way relationship between variables. Granger (1969) proposed a time-series data based approach in order to determine causality. In the Granger-sense x is a cause of y if it is useful in forecasting y1. In this framework

"useful" means that x is able to increase the accuracy of the prediction of y with respect to a forecast, considering only past values of y.

According to Granger, X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. In other words, if past values of X statistically improve the prediction of Y, then we can conclude that X "Granger-causes" Y.

There are three different types of situation in which a Granger-causality test can be applied:

- In a simple Granger-causality test there are two variables and their lags.
- In a multivariate Granger-causality test more than two variables are included, because it is supposed that more than one variable can influence the results.
- Finally Granger-causality can also be tested in a VAR framework; in this case the multivariate model is extended in order to test for the simultaneity of all included variables.

The optimum lagged values are determined by using VAR Lag Length Criteria, the optimum lags as per SC criterion for near month contracts is 6 Lags, for next to near month is 3 Lags and for the far month contracts is 6 Lags.

Data Analysis & Interpretation

- **Descriptive Statistics**

Summary statistics of contract wise Future Closing Price, Trading Volume and Open Interest are provided in table 1, 2 and 3.

Table 1
Descriptive Statistics for Future Closing Prices, Trading Volume and Open Interest
for Near Month Contract for Nifty Futures Index

	Future Closing Price	Trading Volume	Open Interest
Mean	3992.728	712976.9	16760737
Median	4219.525	717337.7	17745850
Maximum	9054.850	3612235.	44400050
Minimum	855.4000	51.87000	4000.000
Std. Dev.	2276.840	544246.7	10970143
Skewness	0.248784	0.473580	0.012561
Kurtosis	2.000863	2.958288	2.066439
Jarque-Bera	201.3081	145.2393	140.9275
Probability	0.000000	0.000000	0.000000

Source: Author Compilation

Table 2
Descriptive Statistics for Future Closing Prices, Trading Volume and Open Interest
for Next to Near Month Contract for Nifty Futures Index

	Future Closing Price	Trading Volume	Open Interest
Mean	4000.906	98957.68	3387023.
Median	4219.450	26632.17	1243700.
Maximum	9121.900	1401914.	38842500
Minimum	860.3000	0.000000	2800.000
Std. Dev.	2290.384	194497.3	5606447.
Skewness	0.258464	3.110538	2.724978
Kurtosis	2.007216	13.41809	10.81003
Jarque-Bera	202.4374	23791.28	14655.39
Probability	0.000000	0.000000	0.000000

Source: Author Compilation

Table 3
Descriptive Statistics for Future Closing Prices, Trading Volume and Open Interest
for Far Month Contract for Nifty Futures Index

	Future Closing Price	Trading Volume	Open Interest
Mean	4011.888	4162.400	230845.6
Median	4219.850	1832.870	99925.00
Maximum	9155.750	88640.48	3372000.
Minimum	865.1500	0.000000	0.000000
Std. Dev.	2301.981	6454.071	352349.8
Skewness	0.266260	3.725324	3.644641
Kurtosis	2.014144	26.22931	22.10263
Jarque-Bera	202.8662	96160.38	67548.98
Probability	0.000000	0.000000	0.000000

Source: Author Compilation
*Note: Future Closing Price (FCP), Trading Volume (TV) and Open Interest (OI).

The above table no. 1,2 and 3 represents the descriptive statistics for Nifty Futures Index for a period from June 2000 to December 2015.The future closing price as given by the mean is greater for far month contract than compared with the near month and next to near month contract. The mean value for trading volume is greater for near month contract indicating that more number of contacts in terms of turnover are traded as compared to the next to near and far month futures contract. The open interest mean value is also greater for near month future contract that indicates that there are more number of outstanding contracts.

The volatility as given by the standard deviation is higher for next to near month futures closing price as compared to near month and far month futures contract. The measure of skewness indicates that none of the variables are symmetric except for the open interest for near month contract. The kurtosis for all the variables lies below 3 for near month contract future closing prices, trading volume & open interest, next to near month contract future closing prices & far month contracts future closing prices which indicates platykurtic behavior of the data series.

The Jarque–Bera test is used to test the normality of the data series. The null hypothesis for the test is given as H0 all the data series are normally distributed. As it can be observed from the above tables it rejects the null hypothesis indicating that the data series are not normally distributed.

Unit Root Test

A Unit Root Test helps in determining whether the time series data is stationary. The Augmented Dickey Fuller (ADF) test is used to check is the data is stationary and as such has been used on future closing prices, trading volume and open interest for all three contracts of the Nifty Future Index. It found that all the variables have a unit root and the return series are stationary at first difference.

Granger Causality Test

The Granger Causality test tries to establish the presence of cause and effect relationship between future closing price, trading volume and open interest for all three futures contract. The contract wise results of the test are summarized in table 4, 5 and 6.

Table 4
Granger Causality Result for Near Month Future Contract

Pairwise Granger								Causality Tests
Date: 06/27/16								Time: 22:06
Sample: 1 3878
Lags: 6

Null Hypothesis:	Obs	F-Statistic	Prob.
TV does not Granger Cause FCP	3871	0.83136	0.5454
FCP does not Granger Cause TV		7.05515	*2.E-07
OI does not Granger Cause FCP	3871	1.18174	0.3128
FCP does not Granger Cause OI		2.87024	*0.0086
OI does not Granger Cause TV	3871	7.48281	*5.E-08
TV does not Granger Cause OI		2.89533	*0.0081

Source: Author Compilation,
Note: * denotes rejection of hypothesis at 5% level of significance

Table 4 represents the results from Granger Causality tests for near month contract on Nifty Future Index. For near month contract we reject null hypothesis [H01] that future closing price does not granger cause trading volume (p-value 2.E-07), we reject null hypothesis [H02] that future closing price does not granger cause open interest (p-value 0.0086) &null hypothesis [H06]open interest does not granger cause trading volume (p-value 5.E-08) and null hypothesis [H04]trading volume does not granger cause open interest (p-value 0.0081) indicating a bi-directional causality between open interest and trading volume.

Table 5
Granger Causality Result for Next to Near Month Future Contract

Pairwise Granger								Causality Tests
Date: 06/27/16								Time: 22:23
Sample: 1 3878
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
TV does not Granger Cause FCP	3861	1.07318	0.3591
FCP does not Granger Cause TV		3.54306	*0.0140
OI does not Granger Cause FCP	3874	0.69502	0.5550
FCP does not Granger Cause OI		2.48153	0.0592
OI does not Granger Cause TV	3861	64.3103	*1.E-40
TV does not Granger Cause OI		7.61696	*4.E-05

Source: Author Compilation,
*Note: * denotes rejection of hypothesis at 5% level of significance*

Table 5 represents the results from Granger Causality tests for next to near month contract on Nifty Future Index. For next to near month contract we reject null hypothesis [H01] that future closing price does not granger cause trading volume (p-value 0.0140), we reject null hypothesis [H06]open interest does not granger cause trading volume(p-value 1.E-40) and we reject null hypothesis [H04]trading volume does not granger cause open interest (p-value 4.E-05) indicating a bi-directional causality between open interest and trading volume.

Table 6
Granger Causality Result for Far Month Future Contract

Pairwise Granger   Causality Tests
Date: 06/27/16   Time: 22:30
Sample: 1 3878
Lags: 6

Null Hypothesis:	Obs	F-Statistic	Prob.
TV does not Granger Cause FCP	3661	3.24783	*0.0035
FCP does not Granger Cause TV		1.80366	0.0944
OI does not Granger Cause FCP	3800	0.76526	0.5972
FCP does not Granger Cause OI		1.39703	0.2117
OI does not Granger Cause TV	3651	42.2531	*4.E-50
TV does not Granger Cause OI		14.8216	*8.E-17

Source: Author Compilation,
Note: * denotes rejection of hypothesis at 5% level of significance

Table 6 represents the results from Granger Causality tests for far month contract on Nifty Future Index. For far month contract we reject null hypothesis [H03] that trading volume does not granger cause future closing price (p-value 0.0035), we reject null hypothesis [H06]open interest does not granger cause trading volume (p-value 4.E-50) and we reject null hypothesis [H04]trading volume does not granger cause open interest (p-value 8.E-17) indicating a bi-directional causality between open interest and trading volume.

Conclusions

There are various reasons why traders pay attention to future price, trading volume and open interest. A rise in future closing price, trading volume and open interest indicates that the market is strong and in upward trend. While a fall in price and a rise in trading volume and open interest indicate that the market is weak and downward trend. This study concluded that the relationship between future closing prices, trading volume and open interest for three futures contracts traded on Nifty Stock Index Futures are having a causal relationship since the p-value is less than 0.05 for that rejects the null hypothesis.

Granger Causality test was used to find out the causal relationship future closing price, trading volume and open interest. The causality test showed that for near month futures contract futures closing price has an effect on trading volume and open interest showing a uni-directional causality whereas there is bi-directional causality between open interest and trading volume. For next to near month futures contract the futures closing price has an effect on trading volume and bi-directional causality between open interest and trading volume. For

far month futures contract trading volume has an effect on the futures closing price and once again bi-directional causality between open interest and trading volume. The findings suggest that the future closing prices can be used to predict the trading volume and open interest. Open interest information can help to predict the trading volume in futures contracts as the results showed a causal relation between open interest and trading volume for all three futures contracts on Nifty Stock Index Futures.

References

✠   Chen, S. M.-H. (2010). Open Interest, Volume and Volatility: Evidence from Taiwan Futures Markets. J Econ Finan, *34*, 113-141.

✠   Deo, M., & K., S. (2011). Determining The Information Content Of Futures Market Variables In India :A Time Series Approach. Delhi Business Review, Vol.12(Issue 1).

✠   Dr. B. Ramesh, G. A. (2011). Relationship between Futures Price and Open Interest in Stock and Index Futures in the Indian Stock markets: Empirical Analysis. International Conference on E-Business, Management and Economics, Vol.3.

✠   Eric, K. H. (2009). Stock Market Volatility and Trading Volume: An Eerging Market Experience. Journal of Derivatives.

✠   Floros, C. (2001). The Relationship between Trading Volume, Returns and Volatility: Evidence from The Greek Futures Markets.

✠   Gulati, D. (2012). Relationship between Price and Open Interest in Indian Futures Market: An Empirical Study. Pacific Business Review International, Vol.5 (Issue 1).

✠   K.Srinivasana. (2010). An Analysis of Price Volatility, Trading Volume and Market Depth in Futures Market in India.

✠   Tarık Doğru, Ü. B. (2012, April 8). The Price-Volume Relation in the Turkish Derivatives Exchange. Journal of Business and Social Science, Vol. 3.

✠   Watanabe, T. (2001). price Volatility, Trading Volume and Market Depth: Evidence from the Japanese Stock Index Futures market. Applied Financial Economics (Vol.11), 651-658.

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