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INTRODUCTION

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NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

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RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

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- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.

- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

UNPUBLISHED DISSERTATIONS

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

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WEBSITES

- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

FUTURE CLOSING PRICE, TRADING VOLUME AND OPEN INTEREST: EVIDENCE FROM STOCK FUTURES & INDEX FUTURES OF NIFTY 50 ON NSE IN INDIA

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ABSTRACT

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. This paper makes an attempt to study the relationship between future closing prices, trading volume and open interest for Nifty Index and select 25 Stocks on Nifty 50 Index for near month contracts. Open interest is often used to know the trends and flow of money, the relationship between these three often indicates the change of trend in the futures market.

KEYWORDS

futures closing price, trading volume, open interest, granger causality, co-integration.

INTRODUCTION

Derivatives trading in India commenced in June 2000. NSE started operations in the derivatives segment on June 12, 2000. Initially, NSE introduced futures contracts on S&P CNX Nifty Index. However, the basket of instruments has widened considerably. Futures markets were designed to solve the problems that exist in forward markets. A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. But unlike forward contracts, the futures contracts are standardized and exchange traded. To facilitate liquidity in the futures contracts, the exchange specifies certain standard features of the contract. A futures contract may be offset prior to maturity by entering into an equal and opposite transaction. More than 99% of futures transactions are offset this way. The effective use of futures contract in hedging decisions has become focus and centre of debate on finding out an optimal hedge ratio and hedging effectiveness in empirical financial research. Financial media regularly reports daily trading activities to the stock markets. The information content of this data in terms of volatilities of price, trading volume and market depth has long attracted the attention of many researchers, policy makers and investors, to examine if there is any relationship between these variables and the types of relationship that exist between these variables. Trading volume offers useful information for practitioners and investors in investment decisions, as well as for researchers and policy makers in testing the theories of financial economics. The contemporaneous relation between price movements, trading volume and open interest on financial markets keeps attracting the attention of many financial economists (K. Srinivasana, 2010).

LITERATURE REVIEW

TarıkDoğru, ÜmitBulut International (2012),"The Price-Volume Relation in the Turkish Derivatives Exchange" the paper examined the relation between closing prices and trading volume of US Dollar (USD) futures contracts in the Turkish Derivatives Exchange (TURKDEX).The data set comprised of daily closing prices & volume from 2009 to 2011.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.

Christos Floros (2001) "The Relationship between Trading Volume, Returns and Volatility: Evidence from the Greek Futures Markets" this paper investigated the contemporaneous and dynamic relationships between trading volume, returns and volatility for Greek index futures(FTSE/ASE-20 and FTSE/ASE Mid 40) taking data of Daily closing prices and volume for FTSE/ASE-20 index Sept. 1997-August 2001. For FTSE/ASE Mid 40 index, the daily closing prices and trading volume Dec. 1999- August 2000 and used OLS, GARCH, Granger Causality, GMM models. The conclusions drawn were for FTSE/ASE-20, price volatility does not significantly impact volume's volatility, and also, we conclude that a contemporaneous relationship does not hold. 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.

Jonathan M. Karpoff (1987) "The Relation between Price Changes & Trading Volume: A Survey" this paper reviewed previous & current research on the relation between price changes & trading volume in financial markets and drawn various conclusions regarding each studies and a general conclusion drawn was that volume is positively related to the magnitude of the price change.

K. Srinivasana, (2010), "An Analysis of Price Volatility, Trading Volume and Market depth in Futures Market in India", this paper studied the conceptual framework of derivatives market in India and assessed the dynamic relationship between price volatility, trading volume and market depth for selected stock futures contracts and also to identify a suitable model to forecast volatility for stock futures contracts in India. The study was done for a period from Jan 2003 to Dec 2008 comprising of 25 stock futures contracts on NSE using ARCH and GARCH models. The study concluded that volatility is a part and parcel of capital market and have a major effect in derivatives market fluctuations and is due to the other key determining factors like inflow of foreign capital into the country, Exchange Rate, Balance of Payment and Interest Rates. 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.

Gulati Deepti (2012), "Relationship between Price and Open Interest in Indian Futures Market: An Empirical Study "this paper 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.

Toshiaki Watanabe (2001), "Price volatility, Trading Volume, and Market Depth: Evidence from the Japanese Stock Index Futures Market", 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) for a period of 24 August 1990, to 30 December 1997 using Descriptive statistics & ADF test. 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.

Stéphane M. Yen & Ming-Hsiang Chen (2010)"Open interest, Volume, and Volatility: Evidence from Taiwan Futures Markets "examine the relationships amongst volatility, total trading volume (TVOL) and total open interest (TOI) for three Taiwan stock index futures markets for a period July 21, 1998 to December 31, 2007 using GARCH and 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.

Jonathan M. Karpoff (1987) "The Relation between Price Changes & Trading Volume: A Survey" this paper reviewed previous & current research on the relation between price changes & trading volume in financial markets and drawn various conclusions regarding each studies and a general conclusion drawn was that volume is positively related to the magnitude of the price change.

RESEARCH METHODOLOGY

The analysis is conducted for Nifty 50 Index & 25 select stocks on NIFTY 50 Index traded on NSE India for a period from April 2005 to December 2015 considering the inclusions and exclusions from the Nifty 50 Index constituents during the study period, using various tools to achieve the objective. In order to help in comparative analysis the period of study is kept uniform from 1st April 2005 to 31st December 2015. The sample used in this study includes daily future close prices, trading volume & open interest as major components or determinants in futures market for Nifty Index & 25 select stocks traded on NSE (www.nseindia.com). Since most of the trading activity takes place in near month contracts, only near month contracts are examined. All the values are converted to natural logarithm, calculated as $R_t = LN(P_t / P_{t-1})$ where P_t and P_{t-1} are natural logarithms on day t and t-1 respectively to prevent non-stationarity, to achieve accurate results for the test incorporated.

TABLE 1: DESCRIPTION OF SAMPLE

INDEX & STOCKS	NIFTY 50		
	Company Name	**Industry**	**Symbol**
	ACC Ltd.	CEMENT & CEMENT PRODUCTS	ACC
	Ambuja Cements Ltd.	CEMENT & CEMENT PRODUCTS	AMBUJACEM
	Bank of Baroda	FINANCIAL SERVICES	BANKBARODA
	Bharat Heavy Electricals Ltd.	INDUSTRIAL MANUFACTURING	BHEL
	Bharat Petroleum Corporation Ltd.	ENERGY	BPCL
	Cipla Ltd.	PHARMA	CIPLA
	GAIL (India) Ltd.	ENERGY	GAIL
	HCL Technologies Ltd.	IT	HCLTECH
	Housing Development Finance Corporation Ltd.	FINANCIAL SERVICES	HDFC
	HDFC Bank Ltd.	FINANCIAL SERVICES	HDFCBANK
	Hero MotoCorp Ltd.	AUTOMOBILE	HEROMOTOCO
	Hindalco Industries Ltd.	METALS	HINDALCO
	Hindustan Unilever Ltd.	CONSUMER GOODS	HINDUNILVR
	ICICI Bank Ltd.	FINANCIAL SERVICES	ICICIBANK
	Infosys Ltd.	IT	INFY
	I T C Ltd.	CONSUMER GOODS	ITC
	Mahindra & Mahindra Ltd.	AUTOMOBILE	M&M
	Maruti Suzuki India Ltd.	AUTOMOBILE	MARUTI
	Oil & Natural Gas Corporation Ltd.	ENERGY	ONGC
	Reliance Industries Ltd.	ENERGY	RELIANCE
	State Bank of India	FINANCIAL SERVICES	SBIN
	Tata Motors Ltd.	AUTOMOBILE	TATAMOTORS
	Tata Power Co. Ltd.	ENERGY	TATAPOWER
	Tata Steel Ltd.	METALS	TATASTEEL
	Tata Consultancy Services Ltd.	IT	TCS
DATA VARIABLES	• FUTURES CLOSE PRICES • TRADING VOLUME • OPEN INTEREST		
PERIOD	APRIL, 2005 TO DECEMBER 2015		
TOOLS	• DESCRIPTIVE STATISTICS • UNIT ROOT TEST • GRANGER CAUSALITY • CO-INTEGRATION • VECTOR ERROR CORRECTION		

OBJECTIVE

To assess the relationship between Future Close Price, Trading Volume and Open Interest for select Stock Index Futures & Stock Futures in India.

HYPOTHESIS

H0: There is no significant relationship between future close price, trading volume and open interest.
H1: There is significant relationship between future close price, trading volume and open interest.

DATA ANALYSIS & INTERPRETATION

DESCRIPTIVE STATISTICS

To assess the relationship between future close price, trading volume and open interest we calculate daily log-returns of the NIFTY stock Index and the select 25 stocks based on its daily future close price, trading volume and open interest during 1st April 2005 to 31st Dec. 2015. To know the distribution pattern and also the

performance of the stocks descriptive analysis of future prices, volume and open interest is examined. The descriptive statistics of future close prices, trading volume and open interest is summarised in the below table 1.2 in terms of mean, standard deviation, Skewness, Kurtosis and Jarque Bera for Nifty 50 Index and select 25 stocks for the period from 1st Apr. 2005 to 31st Dec., 2015.

TABLE 2: DESCRIPTIVE STATISTICS OF LOG FUTURE CLOSE PRICE (LNFCL)

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs
ACC	0.000495	0.021327	-0.37702	8.171455	3037.38	0	2669
AMBUJACEM	-0.00027	0.045586	-33.6615	1509.123	2.53E+08	0	2669
BANKBARODA	-0.00013	0.040924	-23.1398	920.5788	93870142	0	2669
BHEL	-0.00058	0.042624	-22.3122	819.2022	74306883	0	2669
BPCL	0.000332	0.027364	-5.85755	157.921	2684320	0	2669
CIPLA	0.000342	0.026352	-17.3538	622.7336	42845723	0	2669
GAIL	0.000199	0.023739	-2.63006	54.03742	292754.5	0	2669
HCLTECH	0.000302	0.032135	-7.39226	165.5796	2963780	0	2669
HDFC	0.00021	0.038564	-25.8802	1068.587	1.27E+08	0	2669
HDFCBANK	0.000255	0.037103	-30.4198	1321.784	1.94E+08	0	2669
HEROMOTOCO	0.0006	0.019482	0.43559	8.927979	3992.366	0	2669
HINDALCO	-0.00104	0.053214	-29.6213	1271.6	1.79E+08	0	2669
HINDUNILVR	0.0007	0.018351	0.373241	7.438357	2252.663	0	2669
ICICIBANK	-0.00017	0.041191	-22.1308	863.7654	82614012	0	2669
INFY	-0.00026	0.030506	-13.4926	308.3661	10450990	0	2669
ITC	-0.00053	0.056071	-40.0418	1862.726	3.85E+08	0	2669
MAHINDRA	0.000343	0.03037	-8.73226	201.7414	4426443	0	2669
MARUTI	0.000887	0.021347	-0.12623	6.341993	1249.164	0	2669
ONGC	-0.00049	0.036324	-23.5156	920.9992	93963760	0	2669
RELIANCE	0.000217	0.02658	-8.12283	216.8377	5114523	0	2669
SBIN	-0.00041	0.050314	-35.114	1596.692	2.83E+08	0	2669
TATAMOTORS	-3.56E-05	0.042239	-22.8511	898.3168	89376019	0	2669
TATAPOWER	-0.00063	0.051452	-34.5541	1562.17	2.71E+08	0	2669
TATASTEEL	-0.00017	0.029492	-0.28732	6.2517	1212.589	0	2669
TCS	0.000195	0.028387	-11.5283	291.1232	9291074	0	2669
NIFTY50	0.000505	0.016255	-0.13364	11.26912	7612.185	0	2669

Source: Computed Value.

The following significant observations can be made from the Table 2:

The mean returns of the future close prices of the stocks namely ACC, BPCL, CIPLA, GAIL, HECLTECH, HDFC, HDFCBANK, HEROMOTOCORP, HINDULVR, MAHINDRA, MARUTI, RELIANCE, TCS & NIFTY INDEX are positive which implies the price series had increased and that of AMBUJACEM, BANKBARODA, BHEL, HINDALCO, ICICIBANK, INFOSYS, ITC, ONGC, SBI, TATAMOTORS, TATAPOWER & TATASTEEL are negative implies that the price series had decreased over the period from April 2005 to December 2015. The volatile nature of the stocks is evident from the statistics on standard deviation of daily future close price returns. The least volatile stock is HINDULVR with standard deviation of 0.018351 & NIFTY50 Index with 0.016255. The highest standard deviation is observed in the ITC with 0.056071 indicating the most highly volatile stock in terms of the future close prices. Negatively skewed implies that the return distribution of stock futures have a heavier tail of larger values and hence a higher probability of earning higher returns for all the stocks except for HEROMOTOCORP & HINDULVR having positive skewness which means there are higher chances of generating lower returns. Kurtosis value exceeds 3, showing a leptokurtic curve indicates that the unconditional return distributions are not normal. JB test confirms that the normality is rejected at p-value of almost 1% level of significance.

TABLE 3: DESCRIPTIVE STATISTICS OF LOG TRADING VOLUME (LNTV)

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs
ACC	-8.20E-06	0.535492	0.226724	8.528396	3421.744	0	2669
AMBUJACEM	-0.00016	0.555662	0.241716	8.605629	3520.498	0	2669
BANKBARODA	0.000558	0.560997	0.397996	10.88676	6987.725	0	2669
BHEL	4.94E-05	0.519867	0.368069	10.37367	6106.781	0	2669
BPCL	0.000275	0.562395	0.229893	8.914608	3913.864	0	2669
CIPLA	0.000275	0.521118	0.405335	7.178353	2014.63	0	2669
GAIL	0.000305	0.54108	0.349572	8.594088	3534.492	0	2669
HCLTECH	9.85E-05	0.567062	0.169887	8.619884	3525.142	0	2669
HDFC	0.00099	0.499458	0.159323	11.85359	8728.47	0	2669
HDFCBANK	0.000842	0.479826	0.247424	15.82275	18312.44	0	2669
HEROMOTOCO	0.000415	0.581379	0.207617	9.358389	4515.229	0	2669
HINDALCO	0.000325	0.48984	0.305205	10.15415	5733.287	0	2669
HINDUNILVR	0.000425	0.567436	0.442967	9.778887	5197.676	0	2669
ICICIBANK	0.000328	0.45513	0.071896	12.29443	9609.186	0	2669
INFY	-0.00016	0.491129	0.389083	9.248138	4408.829	0	2669
ITC	0.000315	0.514091	0.407017	10.00985	5538.248	0	2669
MAHINDRA	0.000132	0.507559	0.046215	11.701	8420.248	0	2669
MARUTI	0.000134	0.516561	0.331866	7.383649	2186.013	0	2669
ONGC	-9.69E-05	0.493238	-0.04483	8.16748	2970.473	0	2669
RELIANCE	6.62E-05	0.427935	0.109813	11.35279	7764.273	0	2669
SBIN	6.65E-05	0.459578	0.207083	13.627	12578.19	0	2669
TATAMOTORS	3.26E-05	0.451079	0.160761	10.67715	6565.966	0	2669
TATAPOWER	2.06E-05	0.547282	0.352504	8.468149	3380.477	0	2669
TATASTEEL	-0.00033	0.43702	0.216524	13.78314	12951.73	0	2669
TCS	1.89E-05	0.495936	0.117446	9.823744	5184.383	0	2669
NIFTY50	-4.57E-06	0.391216	0.191517	15.82388	18304.74	0	2669

Source: Computed Value.

The following significant observations can be made from the Table 3:

The mean of the trading volume series of the stocks have positive means except for stocks namely ACC, AMBIJACEM, INFOSYS, ONGC, TATASTEEL & NIFTY50 Index having negative mean indicating lower trading volume. The volatile nature of the stocks is evident from the statistics on standard deviation of daily trading volume. The highest standard deviation is observed in HEROMOTOCORP with 0.581379 standard deviation in its daily trading volume and the lowest volatile in trading volume in REIANCE WITH 0.427935 standard deviation and the least in NIFTY50 index with 0.391216 standard deviation. Negatively skewed implies that the return distribution of stock futures have a heavier tail of larger values and hence a higher probability of earning higher trading volume for ONGC stock and rest all the stocks having positive skewness indicating lower trading volume. Kurtosis value exceeds 3, showing a leptokurtic curve indicates that the unconditional return distributions are not normal. JB test confirms that the normality is rejected at p-value of almost 1% level of significance.

TABLE 4: DESCRIPTIVE STATISTICS OF LOG OPEN INTEREST (LNOI)

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs
ACC	-0.00081	0.350468	2.555326	15.75862	21007.4	0	2669
AMBUJACEM	5.72E-05	0.357414	2.779372	15.43037	20619.54	0	2669
BANKBARODA	0.000555	0.40432	3.102012	20.99252	40281.98	0	2669
BHEL	0.000476	0.363999	2.975188	16.25741	23483.39	0	2669
BPCL	0.000144	0.32788	2.491713	15.27158	19508.84	0	2669
CIPLA	-0.00067	0.354197	2.655858	16.04404	22059.44	0	2669
GAIL	-0.00057	0.272197	2.67606	17.17358	25526.26	0	2669
HCLTECH	0.0001	0.303415	2.799059	18.15802	29036.99	0	2669
HDFC	0.000527	0.298313	3.197138	18.96862	32904.73	0	2669
HDFCBANK	0.000755	0.316858	3.418695	20.7166	40104.8	0	2669
HEROMOTOCO	0.000223	0.319232	3.006789	17.93393	28823.58	0	2669
HINDALCO	0.001107	0.425079	2.987978	16.6811	24786.61	0	2669
HINDUNILVR	-0.00095	0.324284	3.092947	16.76979	25341.31	0	2669
ICICIBANK	0.000248	0.305722	3.214101	18.2706	30528.13	0	2669
INFY	0.000254	0.301363	2.974793	16.85261	25276.82	0	2669
ITC	0.000867	0.28579	3.103127	19.50013	34560.42	0	2669
MAHINDRA	-0.00023	0.330715	3.013795	18.82943	31905.98	0	2669
MARUTI	-0.00053	0.376441	2.842501	15.82001	21871.54	0	2669
ONGC	0.000108	0.280175	3.082985	20.70021	39069.35	0	2669
RELIANCE	-0.00054	0.365008	2.987704	16.96566	25660.78	0	2669
SBIN	0.000246	0.344187	2.900405	15.49684	21109.6	0	2669
TATAMOTORS	2.30E-05	0.356943	2.805331	14.92636	19318.85	0	2669
TATAPOWER	0.000257	0.324334	2.772501	17.41993	26543.38	0	2669
TATASTEEL	-0.00053	0.396282	2.734421	14.45466	17917.61	0	2669
TCS	-0.00012	0.303754	2.798602	15.68787	21386.55	0	2669
NIFTY50	-0.00029	0.218197	3.213629	17.49824	27969.84	0	2669

Source: Computed Value.

The following significant observations can be made from the Table 4:

The mean of the open interest series of the stocks have positive means except for stocks namely ACC, CIPLA, GAIL, HINDULVR, MAHINDRA, MARUTI, RELIANCE, TATASTEEL, TCS & NIFTY50 Index having negative mean indicating that the stocks had lower open interest. The volatile nature of the stocks is evident from the statistics on standard deviation of daily open interest series. The highest standard deviation is observed in HINDALCO with 0.425079 standard deviation in its daily open interest and the lowest volatile open interest in GAIL with 0.272197 standard deviation and the least in NIFTY50 index with 0.218197 standard deviation. All the stocks are having positive skewness. Kurtosis value exceeds 3, showing a leptokurtic curve indicates that the unconditional return distributions are not normal. JB test confirms that the normality is rejected at p-value of almost 1% level of significance.

UNIT ROOT TEST:

AUGMENTED DICKEY FULLER TEST

This study uses the standard Augmented Dickey-Fuller test (ADF) to test whether the assumed time series is I (1) which is a necessary condition for the further testing procedure. First, test for the unit roots in the cases when intercept is present in the regression, then when there is intercept and trend, and finally without intercept and trend. If not able to reject the null Hypothesis about the unit root run the ADF on the first differences of the original time series. In this step, we can reject the null Hypothesis about the unit root in order to be able to conclude that the original time series are I (1). The data used for are daily future close prices, trading volume and open interest and covers for a period from 1st April 2005 to 31st December 2015. All the daily values are converted to natural logarithm, calculated as R_t= LN (P_t / P_{t-1}) where P_t and P_{t-1} are natural logarithms on day t and t-1 respectively. The variables for the study after converting to natural logarithms the series are found to be stationary at levels and hence we reject the null concluding that the series has a unit root. Thus, the series are stationary since the null hypothesis is rejected that the data is non-stationary or has a unit root as represented in the table 5.

H_0- Has a unit root (i.e. the data is non-stationary)

H_1- Does not have a unit root (i.e. the data is stationary)

TABLE 5: ADF TEST RESULTS FOR FUTURE CLOSE PRICE, TRADING VOLUME & OPEN INTEREST

COMPANY /INDEX	FUTURE CLOSE PRICE			TRADING VOLUME			OPEN INTEREST		
	INTERCEPT	TREND & INTERCEPT	NONE	INTERCEPT	TREND & INTERCEPT	NONE	INTERCEPT	TREND & INTERCEPT	NONE
ACC	-49.44427*	-49.45073*	-49.42802*	-25.40015*	-25.39709*	-25.40495*	-20.22992*	-20.22561*	-20.23093*
AMBUJACEM	-53.17460*	-53.18925*	-53.18269*	-20.22263*	-20.21895*	-20.22614*	-18.44813*	-18.46334*	-18.44727*
BANKBARODA	-50.92400*	-50.94875*	-50.93301*	-25.32045*	-25.31574*	-25.32414*	-19.54850*	-19.59323*	-19.52876*
BHEL	-49.80415*	-49.82187*	-49.80461*	-21.03406*	-21.04092*	-21.03686*	-22.06313*	-22.05723*	-22.01805*
BPCL	-51.00927*	-51.00404*	-51.01144*	-26.22229*	-26.21742*	-26.22648*	-19.38395*	-19.38503*	-19.38089*
CIPLA	-50.54330*	-50.53977*	-50.54443*	-25.87468*	-25.86991*	-25.87913*	-11.92826*	-11.92129*	-11.93025*
GAIL	-53.82910*	-53.82450*	-53.83524*	-20.21917*	-20.21627*	-20.22238*	-17.94130*	-17.95523*	-17.94488*
HCLTECH	-51.26471*	-51.25646*	-51.26982*	-20.23175*	-20.22731*	-20.23552*	-17.67669*	-17.67196*	-17.67522*
HDFC	-51.65956*	-51.65341*	-51.66772*	-20.84416*	-20.86079*	-20.83095*	-19.08543*	-19.09197*	-19.05194*
HDFCBANK	-51.36043*	-51.35435*	-51.36765*	-21.26849*	-21.28470*	-21.25261*	-14.77491*	-14.77996*	-14.71983*
HEROMOTOCO	-50.38299*	-50.37687*	-50.34587*	-21.77134*	-21.77245*	-21.77331*	-20.55861*	-20.56055*	-20.55939*
HINDALCO	-51.39215*	-51.40389*	-51.38235*	-25.93010*	-20.96356*	-25.93315*	-19.67183*	-19.76123*	-14.85063*
HINDUNILVR	-51.67432*	-51.66463*	-51.60887*	-20.90741*	-20.90820*	-20.91112*	-21.61472*	-21.63116*	-21.60956*
ICICIBANK	-49.88977*	-49.91406*	-49.89833*	-21.83274*	-21.84288*	-21.83295*	-19.08163*	-19.08127*	-19.06223*
INFY	-52.20194*	-52.20519*	-52.20778*	-25.03938*	-25.03444*	-25.04377*	-18.98747*	-18.98362*	-18.98140*
ITC	-51.51800*	-51.53465*	-51.52308*	-21.38062*	-21.37958*	-21.38377*	-15.34213*	-15.39047*	-15.32804*
MAHINDRA	-48.91175*	-48.90294*	-48.91500*	-21.86845*	-21.86506*	-21.87179*	-19.75003*	-19.74644*	-19.75336*
MARUTI	-49.36379*	-49.35789*	-49.29166*	-20.03533*	-20.03608*	-20.03909*	-20.44012*	-20.43487*	-20.44387*
ONGC	-51.32418*	-51.31807*	-51.32469*	-22.17596*	-22.17266*	-22.18008*	-17.25163*	-17.24617*	-17.24861*
RELIANCE	-50.59414*	-50.59995*	-50.60032*	-21.15472*	-21.15890*	-21.15870*	-15.76358*	-15.76468*	-15.76676*
SBIN	-51.17824*	-51.22239*	-51.18442*	-25.36065*	-25.36008*	-25.36534*	-12.58881*	-12.63073*	-12.57239*
TATAMOTORS	-45.56743*	-48.55966*	-48.57650*	-19.84336*	-19.84069*	-19.84701*	-20.55966*	-20.55492*	-20.55666*
TATAPOWER	-52.42049*	-52.43148*	-52.42237*	-19.95400*	-19.95161*	-19.95764*	-17.37814*	-17.37764*	-17.36776*
TATASTEEL	-49.56544*	-49.56415*	-49.57308*	-21.96474*	-21.96053*	-21.96777*	-21.34337*	-21.36506*	-21.34762*
TCS	-51.33602*	-51.34425*	-51.34323*	-21.25762*	-21.25354*	-21.26159*	-20.07205*	-20.07661*	-20.07542*
NIFTY50	-50.78146*	-50.78380*	-50.74270*	-26.21663*	-26.22492*	-26.22160*	-20.62173*	-20.63365*	-20.62618*

*Source: Computed Value. Note: * denotes rejection of null hypothesis at 5% level of significance*

GRANGER CAUSALITY TEST

The procedure for testing statistical causality between future close prices, trading volume and open interest a direct "Granger-causality" test proposed by C. J. Granger in 1969 is used. Granger causality may have more to do with precedence, or prediction, than with causation in the usual sense. It suggests that while the past can cause/predict the future, the future cannot cause/predict the past. 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. To determine whether a cause and effect relationship exists between future close prices, trading volume and open interest the 8 lagged values have been used from the VAR Lag Order Selection Criteria. In case of Granger causality between the two variables, null hypothesis is rejected if the probability value is less than alpha (0.05).

H_{01}- *Trading Volume does not granger cause Future Close Price*

H_{02}- *Future Close Price does not granger cause Trading Volume*

H_{03}- *Open Interest does not granger cause Future Close Price*

H_{04}- *Future Close Price does not granger cause Open Interest*

H_{05}- *Open Interest does not granger cause Trading Volume*

H_{06}- *Trading Volume does not granger cause Open Interest*

To select the lags VAR Lag Order Selection Criteria is used so that causality test is run using optimum lags of 8 for all stocks.

TABLE 6: GRANGER CAUSALITY TEST RESULTS

COMPANY	LAGS	LNTV -> LNFCL	LNFCL -> LNTV	LNOI -> LNFCL	LNFCL -> LNOI	LNOI -> LNTV	LNTV -> LNOI
ACC	8	0.87600 (0.5359)	0.96229 (0.4637)	1.27730 (0.2506)	1.193396 (0.2984)	**4.88061 (5.E-06)***	**2.25588 (0.0212)***
AMBUJACEM	8	0.50221 (0.8554)	1.07044 (0.3808)	0.23488 (0.9845)	**1.96753 (0.0467)***	**7.32736 (1.E-09)***	**2.76505 (0.0048)***
BANKBARODA	8	**2.40102 (0.0140)***	1.31690 (0.2300)	1.43122 (0.1781)	**2.69714 (0.0059)***	**5.30968 (1E-06)***	**3.13318 (0.0016)***
BHEL	8	0.27694 (0.9736)	0.41900 (0.9102)	0.92935 (0.4907)	1.60358 (0.1185)	**5.66984 (4.E-07)***	**14.3556 (1.E-20)***
BPCL	8	1.07640 (0.3765)	**2.01943 (0.0406)***	**2.49853 (0.0106)***	1.47506 (0.1609)	**2.10634 (0.0321)***	**2.05129 (0.0373)***
CIPLA	8	**1.97148 (0.0462)***	1.47851 (0.1596)	1.83609 (0.0060)	**2.35204 (0.0161)***	**4.75999 (8.E-06)***	0.79238 (0.6094)
GAIL	8	0.97848 (0.4507)	0.39780 (0.9223)	0.35387 (0.9444)	0.31639 (0.9602)	**3.18222 (0.0013)***	**2.94172 (0.0028)***
HCLTECH	8	0.62998 (0.7532)	0.39574 (0.9234)	**2.12824 (0.0302)***	**2.22376 (0.0232)***	**6.26226 (5.E-08)***	0.76542 (0.6334)
HDFC	8	0.63315 (0.7505)	1.37799 (0.2009)	1.02976 (0.4109)	**2.38206 (0.0148)***	**7.11389 (2.E-09)***	**3.29489 (0.0009)***
HDFCBANK	8	0.81879 (0.5859)	0.91320 (0.5042)	0.48059 (0.8707)	0.45578 (0.8874)	**8.86705 (5.E-12)***	**7.72059 (3.E-10)***
HEROMOTOCO	8	1.85624 (0.0626)	0.80576 (0.5975)	0.76149 (0.6370)	**2.93736 (0.0029)***	**2.81814 (0.0041)***	**4.45168 (2.E-05)***
HINDALCO	8	1.17936 (0.3074)	1.02161 (0.4171)	**3.63050 (0.0003)***	1.45610 (0.1682)	**6.47234 (2.E-08)***	**1.99115 (0.0438)***
HINDUNILVR	8	1.66319 (0.1023)	1.45719 (0.1678)	0.66046 (0.7268)	0.47284 (0.8760)	**4.17845 (6.E-05)***	**6.62238 (1.E-08)***
ICICIBANK	8	0.77736 (0.6228)	0.35577 (0.9435)	**2.57175 (0.0085)***	1.20922 (0.2892)	**4.95258 (4.E-06)***	**2.51326 (0.0101)***
INFY	8	1.43499 (0.1766)	0.48501 (0.8676)	**2.74565 (0.0051)***	**1.97641 (0.0456)***	**8.32323 (3.E-11)***	**1.68752 (0.0963)**
ITC	8	1.67823 (0.0986)	0.83769 (0.5692)	1.12320 (0.3439)	**4.36115 (3.E-05)***	**2.78304 (0.0046)***	1.24084 (0.2707)
MAHINDRA	8	0.59680 (0.7813)	0.60468 (0.7747)	**3.35103 (0.0008)***	0.97113 (0.4566)	**3.11027 (0.0017)***	**2.43893 (0.0126)***
MARUTI	8	1.12695 (0.3414)	0.36833 (0.9376)	1.31380 (0.2316)	1.43540 (0.1764)	**3.30797 (0.0009)***	**6.21823 (5.E-08)***
ONGC	8	1.38749 (0.1967)	0.56186 (0.8098)	**3.92663 (0.0001)***	0.82005 (0.5848)	**5.89598 (2.E-07)***	1.51142 (0.1478)
RELIANCE	8	0.23528 (0.9844)	0.64271 (0.7422)	0.54408 (0.8239)	0.85111 (0.5575)	**8.47813 (2.E-11)***	**3.55988 (0.0004)***
SBIN	8	1.18914 (0.3014)	0.84973 (0.5587)	0.41133 (0.9147)	**2.42117 (0.0132)***	**10.2656 (3.E-14)***	**2.64491 (0.0069)***
TATAMOTORS	8	0.88336 (0.5296)	1.05992 (0.3885)	0.20330 (0.9904)	0.59096 (0.7861)	**5.21307 (2.E-06)***	**3.02438 (0.0022)***
TATAPOWER	8	0.45691 (0.8867)	1.09727 (0.3618)	0.38908 (0.9270)	1.14243 (0.3311)	**2.90871 (0.0031)***	**2.45096 (0.0121)***
TATASTEEL	8	0.69792 (0.6937)	1.28310 (0.2475)	**3.30496 (0.0009)***	0.43100 (0.9031)	**8.61865 (1.E-11)***	**2.09519 (0.0331)***
TCS	8	1.44022 (0.1745)	0.94181 (0.4804)	0.51530 (0.8458)	1.09507 (0.3633)	12.6793 (5.E-18)	1.54028 (0.1380)
NIFTY50	8	0.63561 (0.7484)	**7.69739 (3.E-10)***	1.57242 (0.1278)	1.03338 (0.4082)	13.0698 (1.E-18	**2.16599 (0.0272)***

*Source: Computed Value. Note: * denotes rejection of null hypothesis at 5% level of significance*

Table 6 represents the results from Granger Causality test for select 25 stocks and NIFTY50 Index. We reject the null hypothesis that there exists bidirectional causality for all the stocks from Open Interest to Trading Volume and Trading Volume to Open Interest except in case of HCLTECH, INFOSYS & ITC there exist a unidirectional causality from Open Interest to Trading Volume and for Nifty50 from Trading Volume to Open Interest. There is no causality for TCS stock from Trading Volume to Open Interest. There exists a unidirectional causality from Open Interest to Future Close Price except for ACC, HDFCBANK, HINDULVR, RELIANCE, TATAMOTORS, TATAPOWER, and TCS & NIFTY50. Bi-directional causality is being observed from Open Interest to Future Close Price for HCLTECH & INFOSYS. There exists no causality from Trading Volume to Future Close Price except for BANKBARODA from trading volume to future close price and for CIPLA & BPCL from Future Close Price to Trading Volume. Overall it can be concluded that there are high chances of predicting Open Interest from Trading Volume or vice-versa due to significant results from the causality test for almost all the stocks is evident.

CO-INTEGRATION

With the previous results of unit root tests, we have two I (1) variables. We can test whether there is a long-run relationship between Future close prices, trading volume and open interest. Co-integration test can be used to examine stable long-run relations between two or more variables. Co-integration means that one or more combination of the variables is stationary even though each variable is not. If we can reject the null hypothesis about the unit root, we can conclude that the variables are co-integrated of the orders CI (1). If there exists co-integration between variables, we can test short-run dynamics between two series within the framework of an error correction model.

To investigate the existence of a long-term relationship between real and financial variables, we explore existence of any significant long-run relationships among the variables in our model. If the real and financial variables are co-integrated with one another, then this will provide statistical evidence for the existence of a long-run relationship. Though, a set of economic series are not stationary, there may exist some linear combination of the variables which exhibit a dynamic equilibrium in the long run (Engle and Granger 1987).

Since the series of all the variables are integrated of same order, the Johansens's Co-integration test is used to examine the long run relationship and the results are summarised in the table 7.

H_0- there is no co-integration between Future Close Price, Trading Volume & Open Interest
H_1- there is co-integration between Future Close Price, Trading Volume & Open Interest

TABLE 7: JOHANSEN CO-INTEGRATION RESULTS

STOCK	NO.OF CE(S)	EIGENVALUE	TRACE STATISTIC	PROBABILITY
ACC	NONE	0.075218	270.2254	0.0001*
	AT MOST 1	0.021390	61.90758	0.0000*
	AT MOST 2	0.001615	4.305711	0.0380*
AMBUJACEM	NONE	0.093350	333.8491	0.0001*
	AT MOST 1	0.019674	72.78044	0.0000*
	AT MOST 2	0.007422	19.84588	0.0000*
BANKBARODA	NONE	0.061583	191.9182	0.0001*
	AT MOST 1	0.007150	22.59255	0.0036*
	AT MOST 2	0.001304	3.475609	0.0623
BHEL	NONE	0.043583	180.1766	0.0001*
	AT MOST 1	0.022257	61.46569	0.0000*
	AT MOST 2	0.000564	1.504216	0.2200
BPCL	NONE	0.073203	250.5278	0.0001*
	AT MOST 1	0.017101	48.00825	0.0000*
	AT MOST 2	0.000771	2.055812	0.1516
CIPLA	NONE	0.087576	304.6935	0.0001*
	AT MOST 1	0.021406	60.53549	0.0000*
	AT MOST 2	0.001085	2.891380	0.0891
GAIL	NONE	0.110843	363.6489	0.0001*
	AT MOST 1	0.016165	50.67891	0.0000*
	AT MOST 2	0.002723	7.264793	0.0070*
HCLTECH	NONE	0.080714	295.0346	0.0001*
	AT MOST 1	0.025150	70.83714	0.0000*
	AT MOST 2	0.001118	2.979565	0.0843
HDFC	NONE	0.050774	169.4764	0.0001*
	AT MOST 1	0.009677	30.66045	0.0001*
	AT MOST 2	0.001783	4.754302	0.0292*
HDFCBANK	NONE	0.116181	342.6026	0.0001*
	AT MOST 1	0.003111	13.59150	0.0948
	AT MOST 2	0.001984	5.291357	0.0214*
HEROMOTOCO	NONE	0.111727	406.8214	0.0001*
	AT MOST 1	0.033330	91.20161	0.0000*
	AT MOST 2	0.000336	0.896278	0.3438
HINDALCO	NONE	0.056257	282.7167	0.0001*
	AT MOST 1	0.035974	128.4684	0.0001*
	AT MOST 2	0.011520	30.86704	0.0000*
HINDULVR	NONE	0.097707	404.8178	0.0001*
	AT MOST 1	0.047955	130.9168	0.0001*
	AT MOST 2	5.77E-08	0.000154	0.9917
ICICIBANK	NONE	0.025149	103.9706	0.0000*
	AT MOST 1	0.010718	36.11634	0.0000*
	AT MOST 2	0.002778	7.410052	0.0065*
INFOSYS	NONE	0.117687	394.1586	0.0001*
	AT MOST 1	0.020173	60.60482	0.0000*
	AT MOST 2	0.002367	6.313846	0.0120*
ITC	NONE	0.108459	378.2975	0.0001*
	AT MOST 1	0.020385	72.46049	0.0000*
	AT MOST 2	0.006583	17.59405	0.0000*
M&M	NONE	0.100254	338.1273	0.0001*
	AT MOST 1	0.019675	56.69403	0.0000*
	AT MOST 2	0.001410	3.757834	0.0526
MARUTI	NONE	0.120288	461.8534	0.0001*
	AT MOST 1	0.042533	120.4327	0.0001*
	AT MOST 2	0.001742	4.643651	0.0312*
ONGC	NONE	0.073979	237.8241	0.0001*
	AT MOST 1	0.011445	33.07228	0.0001*
	AT MOST 2	0.000903	2.406589	0.1208
RELIANCE	NONE	0.031077	145.2358	0.0001*
	AT MOST 1	0.021298	61.13175	0.0000*
	AT MOST 2	0.001419	3.781998	0.0518
SBIN	NONE	0.055732	185.5875	0.0001*
	AT MOST 1	0.010814	32.81904	0.0001*
	AT MOST 2	0.001445	3.852466	0.0497*
TATAMOTORS	NONE	0.079052	256.2489	0.0001*
	AT MOST 1	0.012623	36.86329	0.0000*
	AT MOST 2	0.001133	3.021238	0.0822
TATAPOWER	NONE	0.042181	146.2759	0.0001*
	AT MOST 1	0.011220	31.46558	0.0001*
	AT MOST 2	0.000528	1.405941	0.2357
TATASTEEL	NONE	0.057867	273.1844	0.0001*
	AT MOST 1	0.040346	114.3876	0.0001*
	AT MOST 2	0.001754	4.677142	0.0306*
TCS	NONE	0.100684	365.0457	0.0001*
	AT MOST 1	0.030291	82.33842	0.0000*
	AT MOST 2	0.000148	0.394928	0.5297
NIFTY50	NONE	0.078680	270.9873	0.0001*
	AT MOST 1	0.018962	52.67701	0.0000*
	AT MOST 2	0.000630	1.678458	0.1951

*Source: Computed Value. Note: * denotes rejection of hypothesis at 5% level of significance*

Johansen Co-integration test is used to examine the long run relationship. It is well known that Johansen Co-integration is very sensitive to the choice of lag length. So first a VAR model is fitted to the time series data in order to find an appropriate lag structure. The AIC, SC, LR are used to select the number of lags required in co-integration test. The co-integration test indicates there exist two co-integrating vector at the 5% level of significance. This indicates that the future close price, trading volume & open interest are co-integrated in long run. The trace test indicates the existence of two co-integrating equation at 5 % level of significance. Maximum Eigen Value test makes the confirmation of this result. Thus the 3 variables of the study have a long run equilibrium relationship between them. But in short run there may be deviations from this equilibrium & we have to verify whether such equilibrium converges to long run equilibrium or not. Thus VECM can be used to generate the short run dynamics.

TABLE 8: VECTOR ERROR CORRECTION RESULTS

STOCKS	C(1): LNF CL (-1)	C(2): D LNF CL (-1)	C(3): D LN F CL (-2)	C(4): D LNTV (-1)	C(5): D LNTV (-2)	C(6): D LNOI (-1)	C(7): D LNOI (-2)	C(8): C
ACC	**0.002658**	**-0.62906**	**-0.3218**	**0.006118**	**0.002735**	-0.00155	0.000571	6.07E-06
	3.440242	**-33.9726**	**-17.3793**	**3.490901**	**2.754907**	-1.45337	0.538897	0.012762
	0.0006*	**0***	**0***	**0.0005***	**0.0059***	0.1462	0.59	0.9898
AMBUJACEM	-0.00044	**-0.69247**	**-0.34314**	0.004604	0.001846	-0.001	-0.00068	5.92E-06
	-1.27605	**-37.7906**	**-18.7285**	1.290793	0.904584	-0.44547	-0.30468	0.005794
	0.2021	**0***	**0***	0.1969	0.3658	0.656	0.7606	0.9954
BANKBARODA	**0.004484**	**-0.65598**	**-0.33077**	0.004457	-0.00037	-0.0004	0.000248	2.36E-05
	2.04573	**-35.512**	**-18.0025**	1.396495	-0.20397	-0.20092	0.139012	0.025799
	0.0409*	**0***	**0***	0.1627	0.8384	0.8408	0.8895	0.9794
BHEL	7.18E-05	**-0.62972**	**-0.31946**	0.00182	0.000421	-0.00375	-0.0004	-4.53E-06
	0.318537	**-34.1693**	**-17.3511**	0.530931	0.206798	-1.58102	-0.18832	-0.00474
	0.7501	**0***	**0***	0.5955	0.8362	0.114	0.8506	0.9962
BPCL	**0.014252**	**-0.67264**	**-0.32215**	**0.007435**	**0.004279**	0.000728	0.000542	-1.45E-06
	2.811966	**-35.5764**	**-17.2147**	**3.463649**	**3.49451**	0.506506	0.377275	-0.00238
	0.005*	**0***	**0***	**0.0005***	**0.0005***	0.6125	0.706	0.9981
CIPLA	-0.0035	**-0.63762**	**-0.33415**	-0.00068	-0.00156	-0.00123	-0.00203	1.02E-07
	-0.89417	**-34.387**	**-18.1661**	-0.33325	-1.28355	-0.92893	-1.55264	0.000172
	0.3713	**0***	**0***	0.739	0.1994	0.353	0.1206	0.9999
GAIL	-0.00134	**-0.69064**	**-0.36236**	0.000343	0.000935	-0.00123	-0.00039	1.73E-05
	-0.38855	**-37.8432**	**-19.9158**	0.18025	0.851148	-0.79463	-0.25819	0.032352
	0.6976	**0***	**0***	0.857	0.3948	0.4269	0.7963	0.9742
HCLTECH	**0.002115**	**-0.63669**	**-0.31494**	**0.005013**	0.00256	-0.00094	0.00019	-9.45E-07
	2.057605	**-34.4533**	**-17.0485**	**2.009456**	1.78903	-0.49874	0.10134	-0.0013
	0.0397*	**0***	**0***	**0.0446***	0.0737	0.618	0.9193	0.999
HDFC	-0.00273	**-0.65138**	**-0.33231**	0.003294	0.001549	-0.00171	-0.00082	8.96E-06
	-1.19883	**-35.4113**	**-18.1162**	0.941303	0.784692	-0.70994	-0.35654	0.010301
	0.2307	**0***	**0***	0.3466	0.4327	0.4778	0.7215	0.9918
HDFCBANK	-0.00259	**-0.65408**	**-0.33508**	0.004961	0.00266	-0.00041	-0.001	7.83E-06
	-0.85683	**-35.4942**	**-18.2606**	1.436606	1.356414	-0.16362	-0.46447	0.0094
	0.3916	**0***	**0***	0.1509	0.1751	0.87	0.6423	0.9925
HEROMOTOCO	**-0.00575**	**-0.60711**	**-0.31487**	**-0.00376**	**-0.00233**	-0.00134	-0.0005	-1.58E-06
	-2.3204	**-32.8494**	**-17.0753**	**-2.58025**	**-2.75772**	-1.14204	-0.45455	-0.00357
	0.0204*	**0***	**0***	**0.0099***	**0.0059***	0.2535	0.6495	0.9972
HINDALCO	-4.18E-06	**-0.66018**	**-0.32067**	0.002581	0.0016	-0.00127	**-0.00904**	-6.45E-07
	-0.00172	**-35.9405**	**-17.5135**	0.556841	0.60102	-0.58653	**-4.16754**	-0.00054
	0.9986	**0***	**0***	0.5777	0.5479	0.5576	**0***	0.9996
HINDULVR	-0.00055	**-0.67036**	**-0.32897**	0.0101103	0.000755	-1.18E-05	0.001049	9.05E-06
	-0.14986	**-36.1912**	**-17.8232**	0.794556	0.934784	-0.01029	1.033595	0.022016
	0.8809	**0***	**0***	0.4269	0.35	0.9918	0.3014	0.9824
ICICIBANK	0.00012	**-0.63226**	**-0.32252**	0.000741	-0.00193	-0.00136	-0.00029	-2.69E-06
	0.173932	**-34.382**	**-17.5596**	0.185081	-0.85489	-0.57997	-0.12282	-0.00292
	0.8619	**0***	**0***	0.8532	0.3927	0.562	0.9023	0.9977
INFOSYS	**-0.01253**	**-0.65364**	**-0.31809**	**0.010924**	**0.005264**	**-0.00482**	**-0.00566**	2.85E-06
	-4.8493	**-35.6049**	**-17.3737**	**4.397443**	**3.544409**	**-2.62085**	**-3.14749**	0.004156
	0*	**0***	**0***	**0***	**0.0004***	**0.0088***	**0.0017***	0.9967
ITC	**-0.01178**	**-0.64854**	**-0.32945**	**0.01458**	0.003729	0.000301	-0.0065	-1.60E-06
	-3.25495	**-34.9913**	**-17.8353**	**3.061387**	1.365329	0.079093	-1.83586	-0.00127
	0.0011*	**0***	**0***	**0.0022***	0.1723	0.937	0.0665	0.999
M&M	**0.002459**	**-0.62246**	**-0.29082**	**0.006472**	0.002075	-0.00267	-0.00233	1.32E-05
	2.224465	**-33.4385**	**-15.6483**	**2.502801**	1.401838	-1.67957	-1.46504	0.019397
	0.0262*	**0***	**0***	**0.0124***	0.1611	0.0932	0.143	0.9845
MARUTI	0.00269	**-0.62579**	**-0.29418**	0.002818	0.000674	0.001009	0.000614	2.23E-05
	1.280695	**-33.386**	**-15.7149**	1.582966	0.652351	0.949262	0.617015	0.046539
	0.2004	**0***	**0***	0.1135	0.5142	0.3426	0.5373	0.9629
ONGC	0.000575	**-0.65264**	**-0.31693**	0.003263	-0.00089	0.001007	-0.00196	-5.35E-06
	0.608965	**-35.3002**	**-17.1865**	0.996747	-0.47699	0.417769	-0.84684	-0.00655
	0.5426	**0***	**0***	0.319	0.6334	0.6761	0.3972	0.9948
RELIANCE	-0.00086	**-0.62362**	**-0.29176**	-0.00159	0.000135	-0.00094	0.00084	8.27E-06
	-0.65772	**-33.5782**	**-15.7002**	-0.57912	0.085915	-0.71409	0.649733	0.01369
	0.5108	**0***	**0***	0.5626	0.9315	0.4752	0.5159	0.9891
SBIN	-0.00434	**-0.64904**	**-0.32302**	-0.00854	-0.00361	-0.00091	0.001518	9.41E-06
	-1.84307	**-35.247**	**-17.554**	-1.71105	-1.2901	-0.35875	0.592559	0.008322
	0.0654	**0***	**0***	0.0872	0.1971	0.7198	0.5535	0.9934
TATAMOTORS	0.002117	**-0.60248**	**-0.29974**	**0.010001**	**0.004803**	0.001472	0.000398	1.71E-05
	1.831746	**-32.4752**	**-16.1814**	**2.445949**	**2.060553**	0.718645	0.193345	0.018017
	0.0671	**0***	**0***	**0.0145***	**0.0394***	0.4724	0.8467	0.9856
TATAPOWER	0.000567	**-0.67181**	**-0.32956**	0.005176	0.000482	0.000487	-0.00167	1.96E-05
	1.063393	**-36.4686**	**-17.9123**	1.29886	0.20577	0.169155	-0.59321	0.01689
	0.2877	**0***	**0***	0.1941	0.837	0.8657	0.5531	0.9865
TATASTEEL	0.002752	**-0.6507**	**-0.32088**	0.004721	0.002259	-0.00235	-0.00136	2.70E-05
	1.184817	**-35.2087**	**-17.4196**	1.596251	1.352405	-1.85366	-1.06931	0.041422
	0.2362	**0***	**0***	0.1106	0.1764	0.0639	0.285	0.967
TCS	-3.20E-06	**-0.633**	**-0.31846**	0.001744	-8.78E-05	-0.00117	-0.00147	1.96E-06
	-0.03951	**-34.3437**	**-17.287**	0.716598	-0.06184	-0.70322	-0.87843	0.003043
	0.9685	**0***	**0***	0.4737	0.9507	0.482	0.3798	0.9976
NIFTY50	**0.014997**	**-0.65103**	**-0.32431**	**-0.0049**	**-0.00294**	-0.00015	2.37E-05	5.43E-06
	2.494774	**-34.2151**	**-17.3006**	**-2.51055**	**-2.72736**	-0.1104	0.017811	0.014833
	0.0127*	**0***	**0***	**0.0121***	**0.0064***	0.9121	0.9858	0.9882

Source: Computed Value.

It is observed that in the short run dynamics results from the error correction co-integrating term C(1) indicates the long run relationship and C(2) to C(7) indicates the short run relationship among the variables. It is being reflected that there exist a short run relationship among the variables for the majority of stocks for two co-integrating term that is C (2) [DLNFCL (-1)] & C (3) [DLNFCL (-2)]. In all these cases where the co-integrating term is negative and significant it is indicated that the errors are going back to the equilibrium and the error is getting corrected by 62% for C(2) and in range of 29% to 36% for C(3) co-integrating term for all the stocks. But in cases of stocks like ACC(0.002658), BANKBARODA(0.004484), BPCL(0.014252), HCLTECH(0.002115), MAHINDRA(0.002459) & NIFTY(0.014997) co-integrating term C(1) [LNFCL(-1)] indicating the long run relationship is positive and significant concluding that the error is getting exploded more and not impending back to equilibrium. Furthermore the co-integrating term C (1) [LNFCL (-1)] the error is being corrected in HERO (-0.005757), INFOSYS (-0.01253) & ITC (-0.01178). The co-integrating term C (4) [DLNTV (-1)] & C (5) [DLNTV (-2)] the error is bought to equilibrium in HERO & NIFTY. The co-integrating term C (6) [DLNOI (-1)] is bought to equilibrium only in INFOSYS (-0.00482) & C (7) [DLNOI (-2)] is being corrected in HINDALCO (-0.0094) & INFOSYS (-0.00566).

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. Overall it can be concluded that there are high chances of predicting Open Interest from Trading Volume or vice-versa due to significant results from the causality test for almost all the stocks is evident. The Johansens's Co-integration test was used to examine the long run relationship and it was found that the variables of the study that is future closing price, trading volume and open interest have a long run equilibrium relationship between them. But in short run there may be deviations from this equilibrium and to verify whether such equilibrium converges to long run equilibrium or not. Thus VECM can be used to generate the short run dynamics. It was being reflected that there exist a short run relationship among the variables for the majority of stocks.

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