

Relationship Between Spot & Future Closing Prices With Reference To Stock & Index Futures Of Nifty 50 On NSE In India

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Abstract: This study investigates whether there exists a relationship between spot and future closing prices for stock and index futures of NIFTY 50 on NSE in India. For accomplishing this objective 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 are considered. The sample used in this study includes daily future close prices and spot closing prices 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 using econometric tools descriptive statistics, unit root test, granger causality and vector error correction. The analysis reveals there exists bidirectional relationship between spot and futures markets. The study also provides the evidence of long-run equilibrium relationship between the spot market price index and its futures price. It implies that either of these two historical prices will help to forecast the other

Keywords: futures closing price, spot closing price, granger causality, co-integration, vector error correction.

I. INTRODUCTION

Financial derivatives have grossed a central place in the financial markets worldwide. The activity in derivatives market has surpassed the growth in other spheres. The emergence and growth of Indian derivatives market since its inception in 2000 has been phenomenal. Within the given span of time, Indian Exchanges and Indian Derivative products feature in the Global rankings. Globally, derivative products on volatility indices are widely used by market participants as tools for risk management and to hedge against market volatility. (SEBI, Annual Report). The trading in derivatives has grown increasingly since inception on NSE. Derivatives market helps in various functions in the financial market in terms of price discovery, portfolio diversification and risk management. Hence trading in derivatives has made a major change in the spot market. The movements in spot market were mainly due to the speculation, hedging and arbitrage activities in the futures market. Hence, examining the cause and effect relationship between the spot and futures in the short run as well in the long run is necessary. Furthermore

which market reacts first is it the spot that reacts or future market in the dynamic financial market in India.

II. LITERATURE REVIEW

Dr. K. Srinivasan, Dr. Jain Mathew, Miss. Aditi Davidson (2012) this paper examined the repercussions on the underlying spot market volatility due to the introduction of futures market in India for the period from January 1, 1995 to December 31, 2011. The study concluded that the index futures are playing a very significant role in mitigating the volatility of the market and has contributed towards increased market efficiency and the spill over in the futures market lead to spot market, thereby making the spot market unstable.

Sahu Dhananjay, (2012), this paper examined the impact of equity derivatives trading on spot market volatility, particularly the effect of equity derivatives introduction on spot market volatility in Indian stock market by using daily returns of seventy three companies from April 01, 1998 to March 31, 2008 excluding holidays when there were no

transactions. The GARCH (1, 1) model that captures the heteroscedasticity in returns was applied to study market volatility. However, all the companies under study showed asymmetric response and, accordingly the GJR GARCH model that captured the asymmetric response has been applied by using CNX Nifty index return as the independent variable in order to remove the influence of market wide factors on equity returns. The results indicated that the coefficient of the dummy variable was significant and negative and thus it concluded that introduction of equity derivatives trading has reduced spot market volatility.

Kapil Choudhary, Sushil Bajaj, Intraday (2012), this study investigated whether spot and futures markets are playing an important role in the assimilation of information and price discovery in the Indian stock market. The study applied the Johansen's co-integration and Engle and Granger's residual based approach to determine the long-run equilibrium between the two markets. Besides this, Granger causality test and VECM (Vector Error Correction Model) were applied to determine the direction of causality and the leading market. The results of the study depicted that there is a bi-directional information flows or feedback between the spot and futures markets

Mall Manmohan (2011), this paper focused to study India's stock Index Futures market during 2000 to 2011. It also empirically tested the efficiency of Indian spot and index futures market, examined the time varying properties of Indian spot and index futures market volatility using GARCH, ADF, PP, VECM and Johansen's Co-integration test for the period starting from June 2000 to May 2011 having collected the closing prices of near month futures contract and the daily closing prices of S&P CNX NIFTY. The conclusions drawn were that the capital market efficiency test provides the evidence of weak form inefficiency of Indian spot market and the futures market is relatively efficient form the spot market. The relative efficiency of futures market was the result of introduction of index futures. High persistence of volatility in the futures market gave rise to unidirectional volatility spill over from index futures to spot market. It also concluded that there exists long run causality running from the index futures prices to the spot market prices.

Shiqing Xie, Jiajun Huang (2013), this paper examined an empirical analysis on the price discovery function of index futures in China for CSI 300 index period of the study from April 2010 to April 2012 using Vector Error Correction Model (VECM). The conclusions drawn were that solid cointegration relationship between the CSI 300 index and its index futures exists in the long run; when prices deviate from the long term equilibrium, the stock index reverses weakly, while the reversal of index futures is much stronger; the daily lead-lag relationship between the prices of the CSI 300 index and its index futures contracts is not significant in the short run; shocks from the spot market have a lasting impact upon the futures market, but not vice versa, due to the limited short-term adjustment ability of the spot market.

Goyal Niti (2012), this paper studied the estimation level of volatility prevailing in the Indian stock market, examined whether volatility is static or it has changed over time, the impact of derivatives trading on price discovery, analysed the impact of derivatives trading on stock market volatility of

indices and that of individual shares and has the introduction of derivatives been really successful in reducing the volatility in the stock market or change in volatility is due to some other macroeconomic factors? The study concluded that there was volatility in the Indian Stock Market, there was change in level of stock market volatility after introduction of derivatives, derivatives trading is not helpful in discovering the prices of equity shares, trading derivatives has impacted stock market volatility, derivatives introduction has not been successful in reducing the volatility.

III. 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 and spot closing prices 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.

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	<ul style="list-style-type: none"> FUTURES CLOSE PRICES SPOT CLOSING PRICES 		
PERIOD	APRIL 2005 TO DECEMBER 2015		
TOOLS	<ul style="list-style-type: none"> DESCRIPTIVE STATISTICS UNIT ROOT TEST GRANGER CAUSALITY CO-INTEGRATION VECTOR ERROR CORRECTION 		

Table 1: Description of Sample

OBJECTIVE

To examine the cause & effect relationship between Stock Index Futures & Stock Futures and Spot Index & Spot Futures in India.

HYPOTHESIS

H0- There is no significant relationship between Spot Close Price and Future Close Price

H1- There is no significant relationship between Future Close Price and Spot Close Price

IV. DESCRIPTIVE STATISTICS

To examine the cause and effect relationship between future close price and spot close price we calculate daily log-returns of the NIFTY Index and the select 25 stocks based on its daily future close price and spot close price during 1st April 2005 to 31st Dec.2015. To know the distribution pattern and also the performance of the stocks descriptive analysis of spot close price is examined. The descriptive statistics of spot close prices, is summarised in the below table 1.9 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.

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs
ACC	0.000495	0.021014	-0.35346	7.948804	2772.894	0	2669
AMBUJACEM	-0.00028	0.045406	-33.5038	1498.646	2.49E+08	0	2669
BANKBARODA	-7.70E-05	0.040686	-23.5047	938.7657	97406699	0	2669
BHEL	-0.00058	0.042624	-22.6509	835.1935	77071457	0	2669
BPCL	0.000327	0.027625	-6.12171	166.6597	2988596	0	2669
CIPLA	0.000349	0.026196	-17.0018	604.9623	40334996	0	2669
GAIL	0.000195	0.023552	-2.62723	54.5215	297598.5	0	2669
HCLTECH	0.000291	0.032185	-8.14585	185.2833	3716286	0	2669
HDFC	0.000207	0.038727	-25.3167	1036.782	1.19E+08	0	2669
HDFCBANK	0.000252	0.03718	-30.1994	1307.906	1.89E+08	0	2669
HEROMOTOCO	0.000605	0.020005	0.498345	9.347388	4580.662	0	2669
HINDALCO	-0.00104	0.053105	-29.6867	1274.177	1.80E+08	0	2669
HINDUNILVR	0.000689	0.018713	0.437624	7.204359	2046.371	0	2669
ICICIBANK	-0.00016	0.041202	-22.0019	856.0108	80951178	0	2669
INFY	-0.00027	0.031061	-13.123	296.5476	9637733	0	2669
ITC	-0.00053	0.0558	-39.7117	1840.265	3.75E+08	0	2669
MAHINDRA	0.000344	0.030417	-8.20243	190.9113	3947872	0	2669
MARUTI	0.000898	0.021448	-0.07396	5.98711	992.4896	0	2669
ONGC	-0.00047	0.036193	-24.2226	954.9631	1.01E+08	0	2669
RELIANCE	0.00023	0.026607	-8.11114	216.4365	5083923	0	2669
SBIN	-0.0004	0.050065	-35.539	1621.337	2.91E+08	0	2669
TATAMOTORS	-3.50E-05	0.042242	-22.5655	883.9484	86337445	0	2669
TATAPOWER	-0.00062	0.051322	-34.8822	1580.987	2.77E+08	0	2669
TATASTEEL	-0.00018	0.029114	-0.27824	6.386945	1307.207	0	2669
TCS	0.000217	0.028535	-11.2354	282.1195	8700533	0	2669
NIFTY50	0.000522	0.01536	-0.04439	12.23048	9447.621	0	2669

Source: Computed Value

Table 2: Descriptive Statistics of Log Spot Close Price (LNSCL)

Table 2 represents the descriptive statistics of spot close return series for select 25 stocks and NIFTY50 Index. It shows positive mean returns for ACC, BPCL, CIPLA, GAIL, HDCLTECH, HDFC, HDFCBANK, HEROMOTOCORP, HINDULVR, MAHINDRA, MARUTI, RELIANCE, TCS & NIFTY50 Index indicating that the spot close prices performed superior whereas negative mean returns were

observed for AMBUJACEM, BANKBARODA, BHEL, HINDALCO, ICICIBANK, INFOSYS, ITC, ONGC, SBI, TATAMOTORS, TATAPOWER & TATASTEEL signifying lower performance. The standard deviation is high for ITC stock with 0.0558 & lowest for HINDULVR with 0.018713 followed by NIFTY50 as 0.01536. The skewness for all stocks is found to be negatively skewed except in case of HERO & HINDULVR stock. 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.

	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

Table 3: Descriptive Statistics of Log Future Close Price (LNFLC)

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

The mean returns of the future close prices of the stocks namely ACC, BPCL, CIPLA, GAIL, HCLTECH, 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.

V. UNIT ROOT TEST

AUGMENTED DICKEY FULLERTEST

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 and spot close prices 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 4.

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)

COMPANY	FUTURE CLOSE PRICE			SPOT CLOSE PRICE		
	INTERCEPT	TREND & INTERCEPT	NONE	INTERCEPT	TREND & INTERCEPT	NONE
ACC	-49.44427*	-49.45073*	49.42802*	-48.89827*	48.90490*	48.88198*
AMBUJACEM	-53.17460*	-53.18925*	53.18269*	-53.03973*	53.05376*	53.04769*
BANKBARODA	-50.92400*	-50.94875*	50.93301*	-50.78092*	50.80379*	50.79029*
BHEL	-49.80415*	-49.82187*	49.80461*	-49.69829*	49.71556*	49.69897*
BPCL	-51.00927*	-51.00404*	51.01144*	-51.10742*	51.10160*	51.11013*
CIPLA	50.54330*	-50.53977*	50.54443*	-50.33647*	50.33316*	50.33749*
GAIL	53.82910*	-53.82450*	53.83524*	-53.32427*	53.32001*	53.33054*
HCLTECH	51.26471*	-51.25646*	51.26982*	-50.66872*	50.66025*	50.67479*
HDFC	-51.65341*	-51.65341*	-51.65341*	-51.64434*	-51.64434*	-51.64434*

	51.65956*		51.66772*		51.63831*	51.65264*
HDFCBANK	51.36043*	-51.35435*	51.36765*	-51.19196*	51.18559*	51.19912*
HEROMOTOCO	50.38299*	-50.37687*	50.34587*	-32.88722*	32.88477*	32.82099*
HINDALCO	51.39215*	-51.40389*	51.38235*	-51.13204*	51.14356*	51.12202*
HINDUNILVR	51.67432*	-51.66463*	51.60887*	-51.70824*	51.69850*	51.64709*
ICICIBANK	49.88977*	-49.91406*	49.89833*	-49.44036*	49.46400*	49.44911*
INFY	52.20194*	-52.20519*	52.20778*	-52.20384*	52.20689*	52.20957*
ITC	51.51800*	-51.53465*	51.52308*	-51.27931*	51.29644*	51.28419*
MAHINDRA	48.91175*	-48.90294*	48.91500*	-48.71005*	48.70123*	48.71327*
MARUTI	49.36379*	-49.35789*	49.29166*	-49.05111*	49.04524*	48.97982*
ONGC	51.32418*	-51.31807*	51.32469*	-50.72645*	50.72007*	50.72765*
RELIANCE	50.59414*	-50.59995*	50.60032*	-50.09545*	50.10025*	50.10128*
SBIN	51.17824*	-51.22239*	51.18442*	-50.73245*	50.77628*	50.73895*
TATAMOTORS	45.56743*	-48.55966*	48.57650*	-48.10293*	48.09518*	48.11196*
TATAPOWER	52.42049*	-52.43148*	52.42237*	-52.29445*	52.30516*	52.29656*
TATASTEEL	49.56544*	-49.56415*	49.57308*	-48.06210*	48.06097*	48.06954*
TCS	51.33602*	-51.34425*	51.34323*	-51.29086*	51.29920*	51.29807*
NIFTY50	50.78146*	-50.78380*	50.74270*	-48.46953*	48.47072*	48.42591*

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

Table 4: ADF Test Results for Future Close Price & Spot Close Price

GRANGER CAUSALITY TEST

The procedure for testing statistical causality between future close prices and spot close prices 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.

H_0 : Spot Close Price does not granger cause Future Close Price

H_{01} : Future Close Price does not granger cause Spot Close Price

COMPANY	LAGS	LNACL -> LNACL	LNACL -> LNACL
ACC	7	1.91156 (0.0638)	2.14629 (0.0361)*
AMBUJACEM	7	0.71746 (0.6573)	0.51418 (0.8245)
BANKBARODA	3	0.04576 (0.9870)	2.27094 (0.0784)
BHEL	8	0.39637 (0.9231)	2.25243 (0.0214)*
BPCL	7	2.02020 (0.0491)*	2.89409 (0.0052)*
CIPLA	8	0.61831 (0.7632)	2.04400 (0.0380)*

GAIL	8	1.34921 (0.2143)	2.02504 (0.0400)*
HCLTECH	7	3.03596 (0.0035)*	0.94464 (0.4705)
HDFC	7	0.96561 (0.4546)	0.86443 (0.5339)
HDFCBANK	6	0.50583 (0.8044)	0.93952 (0.4653)
HEROMOTOCO	7	1.14032 (0.3346)	2.08086 (0.0424)*
HINDALCO	7	1.45562 (0.1786)	1.13607 (0.3372)
HINDUNILVR	8	2.04364 (0.0381)*	2.90439 (0.0032)*
ICICIBANK	7	0.63679 (0.7258)	0.32267 (0.9441)
INFY	7	0.92503 (0.4857)	0.98560 (0.4397)
ITC	5	0.66073 (0.6533)	0.28123 (0.9236)
MAHINDRA	8	1.43996 (0.1746)	1.16155 (0.3187)
MARUTI	8	2.10917 (0.0318)*	1.73602 (0.0853)
ONGC	8	0.52971 (0.8349)	0.41292 (0.9138)
RELIANCE	8	0.54803 (0.8208)	0.46205 (0.8833)
SBIN	7	1.37511 (0.2113)	0.74493 (0.6338)
TATAMOTORS	7	0.48140 (0.8487)	1.01644 (0.4173)
TATAPOWER	7	0.33248 (0.9394)	0.71093 (0.6628)
TATASTEEL	8	1.73528 (0.0855)	1.21700 (0.2846)
TCS	8	1.38038 (0.1999)	0.59523 (0.7826)
NIFTY50	7	1.59808 (0.1312)	1.05738 (0.3886)

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

Table 5: Granger Causality Test Results

Table 5 represents the results of Granger Causality test wherein it is witnessed that there exist a bi-directional causality from spot to future close price returns for BPCL & HINDULVR stocks. There exist unidirectional causality from futures to spot for ACC, BHEL, CIPLA, GAIL & HEROMOTOCORP whereas from spot to futures is observed in HCLTECH & MARUTI. No causality was found between spot and futures for AMBUJACEM, HDFC, HDFCBANK, HINDALCO, ICICIBANK, INFOSYS, ITC, MAHINDRA, ONGC, RELIANCE, SBI, TATAMOTORS, TATASTEEL, TCS & NIFTY50 indicates that spot is not causing the future so also the future is not causing the spot for the study period.

COINTEGRATION

H₀: there is no co-integration between Future Close Price & Spot Close Price

H₁: there is co-integration between Future Close Price & Spot Close Price

STOCK	NO.OF CE(S)	EIGENVALUE	TRACE STATISTIC	PROBABILITY
ACC	NONE	0.049589	138.5750	0.0001*
	AT MOST 1	0.001510	3.997541	0.0456*
AMBUJACEM	NONE	0.056096	173.3701	0.0001*
	AT MOST 1	0.007760	20.61387	0.0000*
BANKBARODA	NONE	0.048216	134.0132	0.0001*

BHEL	AT MOST 1	0.001229	3.255016	0.0712
	NONE	0.060916	167.7986	0.0001*
BPCL	AT MOST 1	0.000566	1.497355	0.2211
	NONE	0.075849	210.4941	0.0001*
CIPLA	AT MOST 1	0.000672	1.778567	0.1823
	NONE	0.063727	176.1511	0.0001*
GAIL	AT MOST 1	0.000724	1.916928	0.1662
	NONE	0.045385	130.3821	0.0001*
HCLTECH	AT MOST 1	0.002824	7.483884	0.0062*
	NONE	0.066850	185.9320	0.0001*
HDFC	AT MOST 1	0.001079	2.857813	0.0909
	NONE	0.068227	191.8367	0.0001*
HDFCBANK	AT MOST 1	0.001833	4.853971	0.0276*
	NONE	0.046008	129.8842	0.0001*
HEROMOTOCO	AT MOST 1	0.001985	5.257821	0.0218*
	NONE	0.061570	168.8129	0.0001*
HINDALCO	AT MOST 1	0.000252	0.666425	0.4143
	NONE	0.051596	167.8520	0.0001*
HINDULVR	AT MOST 1	0.010407	27.68205	0.0000*
	NONE	0.068383	187.4304	0.0001*
ICICIBANK	AT MOST 1	1.59E-06	0.004204	0.9470
	NONE	0.047472	135.1798	0.0001*
INFOSYS	AT MOST 1	0.002450	6.489613	0.0108*
	NONE	0.047302	134.1244	0.0001*
ITC	AT MOST 1	0.002229	5.905144	0.0151*
	NONE	0.077393	231.1271	0.0001*
M&M	AT MOST 1	0.006774	17.98619	0.0000*
	NONE	0.044750	124.7318	0.0001*
MARUTI	AT MOST 1	0.001356	3.591730	0.0581
	NONE	0.066764	187.2785	0.0001*
ONGC	AT MOST 1	0.001679	4.447678	0.0349*
	NONE	0.050252	138.6104	0.0001*
RELIANCE	AT MOST 1	0.000826	2.187188	0.1392
	NONE	0.057926	161.5341	0.0001*
SBIN	AT MOST 1	0.001376	3.643175	0.0563
	NONE	0.048992	136.2750	0.0001*
TATAMOTORS	AT MOST 1	0.001269	3.359951	0.0668
	NONE	0.040291	110.8295	0.0001*
TATAPOWER	AT MOST 1	0.000760	2.011177	0.1561
	NONE	0.049731	136.4213	0.0001*
TATASTEEL	AT MOST 1	0.000547	1.447487	0.2289
	NONE	0.052245	146.2656	0.0001*
TCS	AT MOST 1	0.001618	4.284046	0.0385*
	NONE	0.065401	179.2513	0.0001*
NIFTY50	AT MOST 1	0.000107	0.282574	0.5950
	NONE	0.049519	135.6209	0.0001*
	AT MOST 1	0.000584	1.543138	0.2142

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

Table 6: Johansen Co-integration Results

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 one co-integrating vector at the 5% level of significance. This indicates that the future close price and spot close price is 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 2 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.

	C(1) LNF CL (-1)	C(2) D LNF CL (-1)	C(3) D LNF CL (-2)	C(4) D LNSCL (-1)	C(5) D LNSCL (-2)	C(6) C
ACC	-1.06405	0.054286	-0.06243	-0.68117	-0.25671	2.85E-05
	-4.56783	0.302587	-0.56562	-3.77518	-2.30433	0.059816
	0*	0.7622	0.5717	0.0002*	0.0213*	0.9523
AMBUJACEM	1.085462	-1.66052	-0.70006	0.983805	0.3632	5.41E-05
	2.243769	-4.4762	-3.19113	2.611804	1.636261	0.05291

	0.0249*	0*	0.0014*	0.0091*	0.1019	0.9578
BANKBARODA	0.088536	-0.62739	-0.22467	-0.0288	-0.1111	1.60E-05
	0.211452	-1.93522	-1.16031	-0.08817	-0.57061	0.017421
	0.8326	0.0531*	0.246	0.9297	0.5683	0.9861
BHEL	-0.08157	-0.26729	-0.09651	-0.3637	-0.22224	6.03E-06
	-0.17709	-0.75674	-0.46371	-1.03273	-1.07244	0.006285
	0.8595	0.4493	0.6429	0.3018	0.2836	0.995
BPCL	-0.95534	0.019178	0.098869	-0.6756	-0.41478	3.49E-05
	-3.2871	0.086275	0.740379	-3.04981	-3.12483	0.056866
	0.001*	0.9313	0.4591	0.0023*	0.0018*	0.9547
CIPLA	-0.97781	0.114521	0.058378	-0.75754	-0.39906	3.18E-05
	-2.59069	0.39971	0.350912	-2.63438	-2.39143	0.053591
	0.0096*	0.6894	0.7257	0.0085*	0.0169*	0.9573
GAIL	-0.12142	-0.75202	-0.36928	0.06773	0.009082	3.23E-05
	-0.55397	-4.47104	-3.57275	0.39547	0.086548	0.060111
	0.5796	0*	0.0004*	0.6925	0.931	0.9521
HCLTECH	-1.21413	-0.08533	-0.09829	-0.54003	-0.21472	9.45E-06
	-3.99119	-0.36871	-0.72456	-2.34542	-1.58496	0.012961
	0.0001*	0.7124	0.4688	0.0191*	0.1131	0.9897
HDFC	-0.14234	-0.67221	-0.19102	0.019917	-0.14216	3.53E-05
	-0.2539	-1.58509	-0.76597	0.046843	-0.56959	0.04043
	0.7996	0.1131	0.4438	0.9626	0.569	0.9678
HDFCBANK	0.079437	-0.88717	-0.39177	0.23329	0.055773	1.05E-05
	0.156036	-2.30488	-1.76737	0.605254	0.251452	0.012586
	0.876	0.0213*	0.0773	0.5451	0.8015	0.99
HEROMOTOCO	0.572622	-1.08862	-0.53412	0.500009	0.22756	2.44E-05
	4.044371	-9.80837	-7.45515	4.362621	3.15004	0.054954
	0.0001*	0*	0*	0*	0.0017*	0.9562
HINDALCO	-1.79636	0.441034	0.080947	-1.10248	-0.40079	4.13E-06
	-2.35142	0.770268	0.24732	-1.92408	-1.22237	0.00345
	0.0188*	0.4412	0.8047	0.0545	0.2217	0.9972
HINDULVR	-0.20736	-0.64863	-0.3319	-0.01589	0.003136	2.60E-05
	-0.98263	-3.99703	-3.39474	-0.09854	0.03244	0.062974
	0.3259	0.0001*	0.0007*	0.9215	0.9741	0.9498
ICICIBANK	-0.78251	-0.25594	-0.06704	-0.3727	-0.25743	1.28E-05
	-1.79936	-0.76615	-0.33482	-1.1199	-1.28831	0.013797
	0.0721	0.4437	0.7378	0.2629	0.1977	0.989
INFOSYS	1.856668	-2.37324	-1.17131	1.709242	0.851672	-3.05E-06
	3.656638	-6.10658	-5.11143	4.40844	3.741565	-0.00441
	0.0003*	0*	0*	0*	0.0002*	0.9965
ITC	-2.02594	0.598906	0.355924	-1.24985	-0.68267	1.80E-05
	-2.83536	1.088138	1.082868	-2.26606	-2.06944	0.014222
	0.0046*	0.2766	0.279	0.0235*	0.0386*	0.9887
M&M	-1.65834	0.429311	0.081386	-1.03886	-0.36912	2.10E-05
	-4.68824	1.608924	0.541775	-3.91799	-2.46924	0.030938
	0*	0.1078	0.588	0.0001*	0.0136*	0.9753
MARUTI	-0.79969	-0.20779	-0.14531	-0.41169	-0.15085	3.96E-05
	-3.0809	-1.05885	-1.27565	-2.10142	-1.32667	0.082496

	0.0021*	0.2898	0.2022	0.0357*	0.1847	0.9343
ONGC	-0.25008	-0.63382	-0.31338	-0.01734	-0.00505	1.58E-06
	-0.64674	-2.12992	-1.75563	-0.0582	-0.02821	0.00192
	0.5179	0.0333*	0.0793	0.9536	0.9775	0.9985
RELIANCE	2.544755	-2.6471	-1.1586	2.046858	0.880003	7.01E-06
	5.162687	-6.92898	-5.06112	5.303133	3.819922	0.011613
	0*	0*	0*	0*	0.0001*	0.9907
SBIN	-1.62161	-0.00574	-0.09994	-0.63917	-0.22379	3.61E-05
	-2.11537	-0.0098	-0.29337	-1.09115	-0.65531	0.031846
	0.0345*	0.9922	0.7693	0.2753	0.5123	0.9746
TATAMOTORS	-0.41321	-0.36246	-0.05256	-0.23633	-0.24953	3.28E-05
	-0.9866	-1.1271	-0.27957	-0.7367	-1.33048	0.034357
	0.3239	0.2598	0.7798	0.4614	0.1835	0.9726
TATAPOWER	-0.92318	-0.05562	0.070614	-0.61497	-0.39959	2.45E-05
	-1.78633	-0.13989	0.300413	-1.54579	-1.69803	0.021054
	0.0742	0.8888	0.7639	0.1223	0.0896	0.9832
TATASTEEL	-0.50291	-0.53312	-0.21351	-0.10864	-0.11351	4.11E-05
	-1.47815	-2.03046	-1.35304	-0.41402	-0.7155	0.062706
	0.1395	0.0424*	0.1762	0.6789	0.4744	0.95
TCS	-0.7699	-0.27832	-0.30863	-0.35159	-0.00987	-1.21E-05
	-1.72471	-0.82219	-1.57065	-1.03918	-0.05027	-0.01877
	0.0847	0.411	0.1164	0.2988	0.9599	0.985
NIFTY50	-2.21808	0.921352	0.616827	-1.57277	-0.95665	-2.05E-06
	-5.89006	3.204017	3.747055	-5.39175	-5.65961	-0.00563
	0*	0.0014*	0.0002*	0*	0*	0.9955

Source: Computed Value

Table 7: Vector Error Correction Results

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(6) 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. 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 whereas the positive and significant co-integrating term indicates that the errors are getting exploded.

VI. CONCLUSIONS

The main arguments in favour of futures market leads spot market are mainly due to the advantages provided by the futures market includes higher liquidity, lower transaction costs, lower margins, ease leverage positions, rapid execution and greater flexibility for short positions. Such advantages attract larger informed traders and make the futures market to react first when market-wide information or major stock-specific information arrives. Thus, the future prices lead the spot market prices. On the other hand, the low cost contingent strategies and high degree of leverage benefits in futures market attracts larger speculative traders from a spot market to a more regulated futures market segments. Hence, this ultimately reduces informational asymmetries of the spot

market through reducing the amount of noise trading and helps in price discovery, improve the overall market depth, enhance market efficiency and increase market liquidity. This makes spot market to react first when market-wide information or major stock-specific information arrives. Hence, spot market leads the futures market.

Besides, there exists a bidirectional relationship between the futures and spot markets through price discovery process. This may be mainly due to future markets attracts larger informed traders to enjoy the advantages of higher liquidity, lower transaction costs, lower margins and greater flexibility for short positions. Hence, these advantages make futures markets to lead the spot markets around macroeconomic or major stock-specific information releases. Consequently, the spot markets will lead the futures market under the circumstances that these advantages of futures markets attracts larger speculative traders from a spot market and reduces informational asymmetries of the spot market through reducing the amount of noise trading and helps in price discovery, improve the overall market depth, enhance market efficiency and increase market liquidity. This makes spot market to react fast when market-wide information or major stock specific information arrives. Thus, both the spot and futures markets are said to be informational efficient and reacts more quickly to each other.

Johansen's Cointegration technique followed by the Vector Error Correction Model (VECM) was employed to examine the long run relationship between Stock futures and Stock Index Futures. The empirical analysis was conducted for the daily data series from April, 2005 to December 2015. The analysis reveals the bidirectional relationship between spot and futures markets. The study also provides the evidence of

long-run equilibrium relationship between the spot market price index and its futures price. It implies that either of these two historical prices will help to forecast the other, which is the evidence for disapproving market efficiency hypothesis between these two markets.

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