International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 12 (2015) pp. 32213-32222

http://www.ripublication.com

Price Integration In The Indian Stock Market: S&P CNX Nifty And S&P CNX Nifty Future

P. Karthika* and Dr. P. Karthikeyan**

**Assistant Professor, Department of Management Studies,*
MPNMJ Engineering College, Chennimalai, Erode- 638112,
Tamil Nadu. Mobile: +919095021200,
E-mail: karthi.nathan21@gmail.com
***Assistant Professor (Sr. Grade), School of Management Studies,*
Kongu Engineering College, Perundurai, Erode-638 052, Tamil Nadu.
Mobile:+919843641321, E-mail: ptp_karthi@yahoo.co.in

ABSTRACT

One of the important functions of Futures market is Price discovery. Futures markets provide a mechanism through which information about current and futures Spot prices can be assimilated and disseminated to all participants in the economy. The ability of future markets to provide information about price is a central theme for the existence of these markets. The paper has examined whether the futures market is performing its primary role of price discovery. The main objective of the study is to examine whether any long run equilibrium relationship exists between spot market and future market and to identify the lead-lag relationship between these markets. The daily NSE closing prices of Nifty Spot Index and Nifty Index Futures of near month contracts from January 2013 to December 2013 have been taken for the study purpose. After obtaining the stationarity of the series by conducting Augmented Dickey Fuller Test, Granger's Co integration Test and Johansen Co integration Test have been conducted on the Nifty Spot and Nifty futures. The empirical results indicate that there exists long run equilibrium between these two markets. Further Granger's Causality Test results indicate that there exists lead –lag relationship between these Spot market and Future market. It also shows that there is much feedback from Futures market to Spot market in impounding information in its prices. Finally from overall empirical results we propose that Futures markets are more efficient in discovering the Future spot price.

Keywords: Augmented Dickey Fuller Test, Granger's Causality Test, lead – lag relationship

1. INTRODUCTION

One of the important functions of the futures market is price discovery and hedging. Futures market provides a mechanism through which information about current and future spot can be assimilated and disseminated to all participants in the economy. The futures trading in India started with the introduction of index futures on NSE and BSE in June 2000. The relationship between stock index spot and futures markets is still attracting the attention of academics, practitioners and regulators due to both the considerable volume of trading in these contracts and their role during periods of turbulence in financial markets. An important aspect of this relationship is the nature of the lead-lag relationship in the returns between equivalent assets traded in different markets or the predictive power of price movements in one market for those in the other market. Price discovery and risk transfer are considered to be two major contributions of futures market towards the organization of economic activity Granger, C. (1986).

Price discovery means whether price changes in futures markets lead price changes in cash markets more often than the reverse. If that is the case, there exists a lead-lag relationship between the two markets. The introduction of stock index futures cause an increase in volatility in the short run while there is no significant change in volatility in the long-run. Fama E & French K. (1987). This is because futures markets result in uninformed (irrational) speculators trading in both futures and cash markets, shocking prices in search of short-term gains. Antoniou, A. and Holmes, P. (1995) quote that increased market volatility may increase real interest rates and the cost of capital, leading to a reduction in the value of investments and loss of confidence in the market.

2. REVIEW OF LITERATURE

Pascal Alphonse (2000) studied the information linkage between the Nifty Index and Nifty Futures and its near-month index futures contract and the role (lead or lag) that the futures market plays using daily closing futures and cash prices. The study is concerned with the aggregation of information in the French Stock Index Cash and Futures Markets. The Results indicate that deviations from the equilibrium relationship linking cash and futures prices originate from information arrivals in the futures market and theta at least 95 % of their price discovery is achieved in this market. Arbitrage relationship (cost of carry pricing model) and co integration relationship between the spot and futures prices has been extensively used. Literature suggests inference concerning spot and future price dynamics should be based on "Error Correction Model" (ECM). It suggests that the spot and futures market should share a "Common Stochastic Trend Model" inspired from *Hasbrouck (1995).* Inference concerning error connection mechanism may be obtained from *Johansen (1988)* ECM Model. Inference concerning the common (unobserved) efficient price may be obtained from the vector moving average.

Golaka. C. Nath and Sunil Varma (2003) in their study have taken Daily stock market data from Jan 1994 to Nov 2002. Stock market indices of India (NSE NIFTY), Singapore (STI) and (TAIEX) is been examined for their study purpose. Dynamic

linkage is examined using *Granger's Causality Concept (1969, 1988)*. ADF is used to test the stationarity of the series. ECM was used since data series ware non stationary. Johansen Methodology is been used to overcome the many deficiencies brought forward by a number of researchers The research has been done on the 3 important capital markets in Asian region and during the period from 1994 to 2002.

The literatures suggest that existence of significance interactions between the various equity markets, the empirical results shows that generally returns in these markets are not interrelated and there is no long run equilibrium. Therefore the results suggests that international investors can achieve long term gains by investing in the stock market as the market under study have been generally independent.

Dimitris F. Keniurgois (2004) examined the relationship between price movements of FTSE/ASE 20, 3 months index and the underlying cash market in Athens Stock Exchange. FTSE/ASE 20 futures market, as the first organized Greek derivatives market established in Aug 1999. Co integration tests are used and an Error Correction Model is developed in order to examine the relationship between price movements of FTSE/ASE 20, 3 months index and underlying cash market in Athens Stock Exchange. The results show the presence of a bi directional causality between Stock index spot and futures market, indicating that the newly established ADEX can provide futures contracts that serve as a focal point of information assimilation and fulfil their price discovery. The Co integration and ECM is used to examine the co movements between the series.

Ash Narayan Sah and Anil Kumar (2006) studied whether the derivatives trading are performing its primary role of price discovery. The main objectives of the study were to know to know whether there exists feedback mechanism between NIFTY spot and NIFTY futures. Daily NSE data pertaining to stock index futures taken from JUNE 12th 2000 to Mar 31st 2005. *Hans R, Stoll and Whaley (1990)*, examined intraday price changes from S&P 500 and MM stock index and futures contracts for serial correlation via-ARMA (p, q) process The Co integration approach and an ECM using the ENGLE-GRANGER methodology is applied to capture both the long run and short run dynamics of spot and futures prices.

Testing of stationary of series is performed by using augmented Dickey Fuller Test. Results indicate that there exists a long run relationship between NIFTY spot and futures price. Presence of co integration between NIFTY spot and futures indicates market is not efficient. One can combine information of NIFTY spot and futures prices to predict futures NIFTY spot price. ECM leads to the conclusion that there exists feedback between NIFTY spot and NIFTY futures. Results also show spot market leads the futures market and price discovery takes place in both the markets.

3. METHODOLOGY

3.1. Problem statement

It is well known that prices of related securities like prices in spot and futures markets cannot diverge without bound because they are linked by an arbitrage relationship. The link between this arbitrage relationship (and the associated cost of carry model) may diverse due to short term disequilibrium. Therefore the existence of a long run co

integration relationship between the spot and futures prices is the problem to be studied with the Granger's Co integration test and Error Correction Model.

3.2. Research Objectives

- To study the futures trading in India is performing its primary role of price discovery
- To find out there are any long term equilibrium exists between futures and spot prices along with short term equilibrium dynamics.
- To reveal there is any lead- lag relationship exists between spot and futures market.

3.3. Data Collection

The data employed in this study comprises of 244 daily observations on the NIFTY stock index and stock index Futures contracts (01-01-2013 to 26-12-2013). Closing prices of spot and future indices are obtained from the official website NSE India (www.nseindia.com). NIFTY futures contracts have a maximum of 3-month trading cycle - the near month (one), the next month (two) and the far month (three). We have confined the analysis to the near contract because of high trading volume and greater liquidity in the F & O market and the preliminary research showed that there was not very much difference between the closing prices of the nearest and second contract. Daily data are preferred in this study is confined to one years which is helpful to get the better results.

3.4. Statistical Software Packages Used

The software used for this study is E views. This software has been used to conduct the Augmented Dickey Fuller Unit root Test, Johansen Co integration Test and Granger's Causality Test

3.5.Statistical Models Applied

- Augmented Dickey Fuller test to test the stationary of the series.
- Granger's co integration approach and Johansen co integration test for co integration between the series.
- Granger's Causality test.

In this study, Johansen co-integration Approach and Granger's co integration is applied to capture both the long run and the short run dynamics of stock returns. Before doing co-integration analysis, it is necessary to test whether the time series are stationary at levels by running Augmented Dickey fuller (ADF) test on the series. Because most time series are non-stationary in levels, and the original data need to be transformed to obtain stationary series. And then the granger causality test is done to test the causal relationship between stock returns.

4. RESULTS AND DISCUSSION

4.1. ADF unit root test results for stationary of the series

Table No: 1. ADF Unit Root Test Results for Stationary of the Series

H_0 = Unit root: Non Stationary H_1 = No Unit root: Stationary			**At Levels**		
Series	**Constraints**	**Test Statistics**	**at 1%**	**at 5%**	**at 10%**
Nifty Future Prices (At lag 0)	Intercept	-2.12037**	-3.457173	-2.873240	-2.573080
	Trend and Intercept	-2.346003**	-3.996271	-3.428426	-3.137619
	None	0.108972**	-2.57451	-1.942136	-1.61583
Nifty Spot Prices (At lag 0)	Intercept	-2.06375**	-3.45717	-2.87324	-2.57308
	Trend and Intercept	-2.309003**	-3.996271	-3.428426	-3.137619
	None	0.234157**	-2.574513	-1.942136	-1.615828
(** indicates acceptance of null hypothesis)					

Source: Historical data collected form www.nse-india.com

The ADF test has been conducted on both the nifty spot and nifty futures time series at their levels. The results show that the null hypothesis is accepted since ADF calculated values for nifty spot and nifty futures are greater than the critical values at all the levels. There exists unit root in the series. Therefore the both the series are Non Stationary.

At First Order Difference

H_0 = Unit root: Non Stationary

H_1= No Unit root: Stationary

Table No: 2. The ADF test statistics after first order difference

Series	**Constraints**	**Test Statistics**	**Durbin Watson Test**	**at 1%**	**at 5%**	**at 10%**
Nifty Spot Prices (At lag 0)	Intercept	-14.21251	1.983863	-3.457286	-2.873289	-2.573106
	Trend and Intercept	-14.21306	1.984383	-3.996431	-3.428503	-3.137665
	None	-14.23819	1.983918	-2.574553	-1.942142	-1.615825
Nifty Future Prices (At lag 0)	Intercept	-14.4192	1.987845	-3.457286	-2.87329	-2.57311
	Trend and Intercept	-14.4236	1.988169	-3.996431	-3.4285	-3.13767
	None	-14.4478	1.987879	-2.574553	-1.94214	-1.61583

Source: Historical data collected form www.nse-india.com

From the above table shows the results regarding the ADF test statistics after transforming the series into first order difference. These calculated values are less than the Mac Kinnon Critical values at all the levels. This shows that the null hypotheses of Unit root is rejected at all the levels. Therefore the both the series are Stationary. Further, Durbin Watson test has been done to find out the auto correlation in the series. The calculated values for spot prices and futures prices are **1.983918 and 1.987879** at none respectively which is not significantly different from the values at Intercept and Trend & Intercept. These values are close or greater than threshold value of 2. These show that the series are Stationary at their first order difference.

4.2. Residual Based Granger's Co Integration Test

After obtaining the stationarity of the series at their first order difference, next residual based Granger's co integration test has been conducted at their levels to know the long run relationship between the Nifty spot prices and Nifty Futures prices. The residuals are obtained by following the granger's Ordinary Least Square method.

Table No: 3. Regression Coefficient

Residuals for Spot $e_{t=} S_t - \alpha - \beta F_t$ **Residuals for futures** $e_{t=} F_t - \alpha - \beta S_t$	**Regression coefficients**	**Future prices**	**Spot Prices**
	α	-137.5567	219.6873
	β	1.029699	0.956689

Source: Historical data collected form www.nse-india.com

In the above equations α and β are the regression coefficients which are obtained by regressing the nifty index prices against the nifty futures prices. The regression coefficient β is positive for both the series which gives some idea that they are positively co integrated. But this relationship has been further studied by following ADF test.

Table No: 4. ADF test statistics for residuals

ADF TESTS		**TEST STATISTICS**	**DURBIN WATSON**	**AT 1%**	**AT 5%**	**AT 10%**
Spot prices &Future Prices	None Lag 0	-3.44685*	2.176035	-2.57451	-2.57451	-2.57451
(* indicates rejection of null hypothesis)						

Source: Historical data collected form www.nse-india.com

The above table shows the results regarding the ADF test statistics obtained for residuals obtained from the Granger's Co integration Test.The ADF Test has been conducted to check the unit root in the series. The ADF test statistics calculated for

residual is -3.44685. The calculated value is less than the Mac Kinnon Critical values at all the levels (1%, 5%, and 10%). This shows that the null hypotheses of Unit root is rejected at all the levels. Therefore the series are Stationary which shows that the series are co integrated.

4.3. Johansen Co-Integration Test

Further Johansen Co integration test has been conducted on the price series which is preferred by many economists. This test is very much suitable for the multivariate system and moreover this overcomes the limitations of the Granger's co integration test.

For Both Spot and Future Prices

H_0: r = 0 : No co integration
H_1: r = 1 : Co integration

Table No: 5. Johansen Co Integration between the Nifty spot prices and Nifty futures prices

TESTS	NULL HYPOTHESIS	EIGEN VALUES	TRACE STATISTICS	AT 5%
Lag 0	**r = 0**	0.054264	18.07033*	15.49471
Lag 1	**r = 0**	0.043099	16.321*	15.49471
Lag 2	**r = 0**	0.056328	18.50986*	15.49471
r indicates no co integration equations		(* indicates rejection of null hypothesis)		

Source: Historical data collected form www.nse-india.com

The Johansen Co Integration test has been conducted at various lags to check the influence of past value of one series against another series. The test results reveal that the calculated trace statistics is greater than the critical values at all the lags compared to its critical values. The null hypothesis is rejected at 5% level. That means there are more than 1 co integration equations exist. This shows that there is long run equilibrium relationship between Nifty spot prices and Nifty future prices.

4.4. Granger's Causality Test

Since long run relationship exists between Nifty spot prices and nifty futures prices, there will be causal relationship between these series. That means there is lead-lag relationship exists between them. This should be examined to know which market lead and which market lag in impounding the information in its prices. This relationship is examined by conducting Grangers Causality test.

H_0 = Futures does not cause Spot market
H_1 = Futures causes Spot market

Table No: 8 Granger's Causality Test for Nifty future price

TESTS	F- STATISTICS (FUTERES)	P VALUES	F- STATISTICS (FUTERES)	P VALUES
Lag 2	1.49834*	0.2256	0.68815**	0.5035
Lag 5	0.77903*	0.5657	0.49013*	0.7835
Lag 12	0.83061*	0.6188	0.72427*	0.7268
(*rejection of null hypothesis)			(** acceptance of null hypothesis)	

Source: Historical data collected form www.nse-india.com

The above table shows the results that the calculated F values of Future are significantly greater from the P values at all the lags (2, 5, 12). That means the null hypothesis is rejected and the alternative hypothesis is accepted.That shows that there is causality from futures to spot market in impounding the information in its prices. This tells that, any changes in futures prices causes change in Spot prices. The prices changes in futures prices precede the changes in the Spot prices.

The calculated F value of spot is greater from P values at lag 2. Moreover the calculated F values of spot are significantly lower than the P value at 5 and 12 lags which show that the null hypothesis is accepted at 5 and 12 lags. That shows that there is no much causality from Spot market to Futures market in impounding the information in its prices. This tells that, any changes in Spot prices do not cause much change in Future prices.

Therefore the Grangers Causality Test results show that the Future markets are leading the spot market in impounding future expectations about the future spot price. There is only unidirectional causality from futures market to Spot market, which helps to conclude that the Futures markets are more efficient in discovering the future Spot prices.

5. CONCLUSION

The empirical results of the study show that a long run equilibrium relationship exists between Nifty Spot and Nifty futures. This long run relationship between these two markets is evidenced by the Granger's Co integration Test and Johansen co integration Test. These tests show positive results towards co integration between Nifty Spot Prices and Nifty Futures prices. Further the results of Granger's Causality test indicate that there is lead - lag relationship between Futures market and Spot market. This shows that there is feedback mechanism between Futures market and Spot markets. But the results significantly show that there is more of unidirectional causal effect and feedback from Future market to Spot market in impounding the information in its prices. The occurrence of changes in the futures prices precede the changes in the Spot prices.This indicates that Futures market is leading the spot market in discovering the prices for future's Spot prices. So finally we can conclude that the Future market is efficient in discovering the Future Spot price compared to Spot market

REFERENCES

[1] Granger, C. (1986). "Developments in the Study of Cointegrated Variables," Oxford Bulletin of Economics and Statistics 48, 213-227.

[2] Fama, E. and K. French. (1987). "Commodity Futures Prices: Some Evidence on Forecast Power, Premiums and the Theory of Storage," The Journal of Business 60, 55-73.

[3] Antoniou, A. and Holmes, P. (1995),"Futures Trading, Information and Spot Price Volatility: Evidence for the FTSE-100 Stock Index Futures Contract Using GARCH", Journal of Banking and Finance, 19(1), 117-129

[4] Pascal Alphonse, 2000, "Efficient Price Discovery in Stock Index Cash and Futures market", ANNALES D'ÉCONOMIE ET DE STATISTIQUE. – N° 60 – 2000

[5] Golaka C Nath & Sunil Verma(2003), "Study of Common Stochastic Trend and Co-Integration in the Emerging Markets A Case Study of India, Singapore and Taiwan", from http://www.nse-india.com/content/research/Paper72.pdf

[6] Dimitris F. Keniurgois (2004), "Price Discovery in the Athens Derivatives Exchange: Evidence for the FTSE/ASE-20 Futures Market",Economic and Business Review, Vol. 6, No 3, 2004, pp. 229-243

[7] Ash Narayan Sah and A Anil Kumar (2006), "Price discovery in cash and futures market: the case of S & P Nifty and Nifty futures". The ICFAI Journal of Applied finance, Vol -12, No. 4, pp 55 -63

[8] Hans R., Stoll and Robert E. Whaley (1990), "The dynamics of stock Index and Stock index Future Return", Journal of Financial and Quantitative Analysis", Vol: 25

[9] Bera, A. and C. Jarque. (1980). "Efficient Tests for Normality, Heteroskedasticity, and Serial Independence of Regression Residuals," Economic Letters 6, 255-259.

[10] Karthika P and Karthikeyan P,2011, "A Study on Comparative Analysis of Risk and Return with reference to Selected stocks of BSE Sensex index, India", The International Journal's Research Journal of Social science & Management ISSN : 2251-1571Volume 1, No 4

[11] Karthika P and Karthikeyan P, June'2013, "Option investment strategy and their benefits-An Analysis", International Journal of Management Focus, ISSN: 2250-2971, Volume: III, Issue - 2, P.No:43

[12] Karthikeyan, P., and T. Mohanasundaram. "FII Flows and Indian Equity Market Performance", *Asian Journal of Managerial Science* 1.1 (2012): 12-22.

[13] Mohanasundaram, T., and P. Karthikeyan. "Association and Information Causality among World Stock Markets: Evidence from India, Japan and US,

"*International Information Institute (Tokyo). Information* 17.12 (B) (2014): 6399.

[15] Mohanasundaram, T., and P. Karthikeyan. "Impact of Institutional Investments and Macro-Economic Variables in the Indian Equity Market", *International Research Journal of Finance and Economics* 94 (2012): 69-78.

[16] Mohanasundaram, T., P. Karthikeyan, and V. Krishnamoorthy. "Macroeconomic Dynamics of Foreign Institutional Investments In India." *International Journal of Management Research and Reviews* 5.1 (2015): 39.

[17] Soniya K, G. Mohanraj K, and. Karthikeyan P, 2103 "A Study on Financial Derivatives (Future & Options) with Special Reference to ICICI & SBI ", international Journal of Commerce & Business Studies Volume 1, Issue 2, pp. 11-21.

[18] Zellner, A. (1962). "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests of Aggregation Bias", Journal of the American Statistical Association 57, 500-509.