




Raji Reddy Lachagari

# Financial Exclusion In India

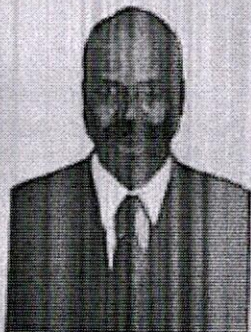
A Study On Rural Areas

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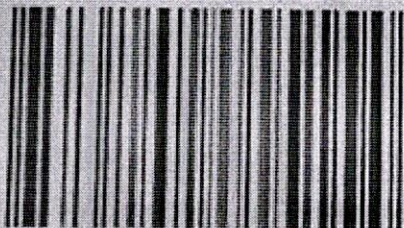


2017

This book focuses on financial exclusion as well as evaluates on who have access or away from financial institutions for credit in the case of farmers of rural areas. The book explores causes, consequences and how the magnitude of these financial exclusion exist. By focusing the policy options available to the farmers to avail credit the book helps them to be up lifted. The institutional sources being the cooperative banking system is consistently having lion share in financing agricultural sector. It deals with the the nexus between the financial development and economic development and the growth of agriculture sector in the context of credit. The problem of mounting Non Performing Assets is failure of banking system. The problem of mounting Non Performing Assets (NPA's) not only jeopardizes the interest of the defaulters but also the regular members, auditors and the cooperative banking institutions itself. This book discusses farmers socio-economic profile include age, place, social status, economic status, size, type of the family and This book will be a great help to the researchers and teachers of Commerce, Management and Social Sciences.



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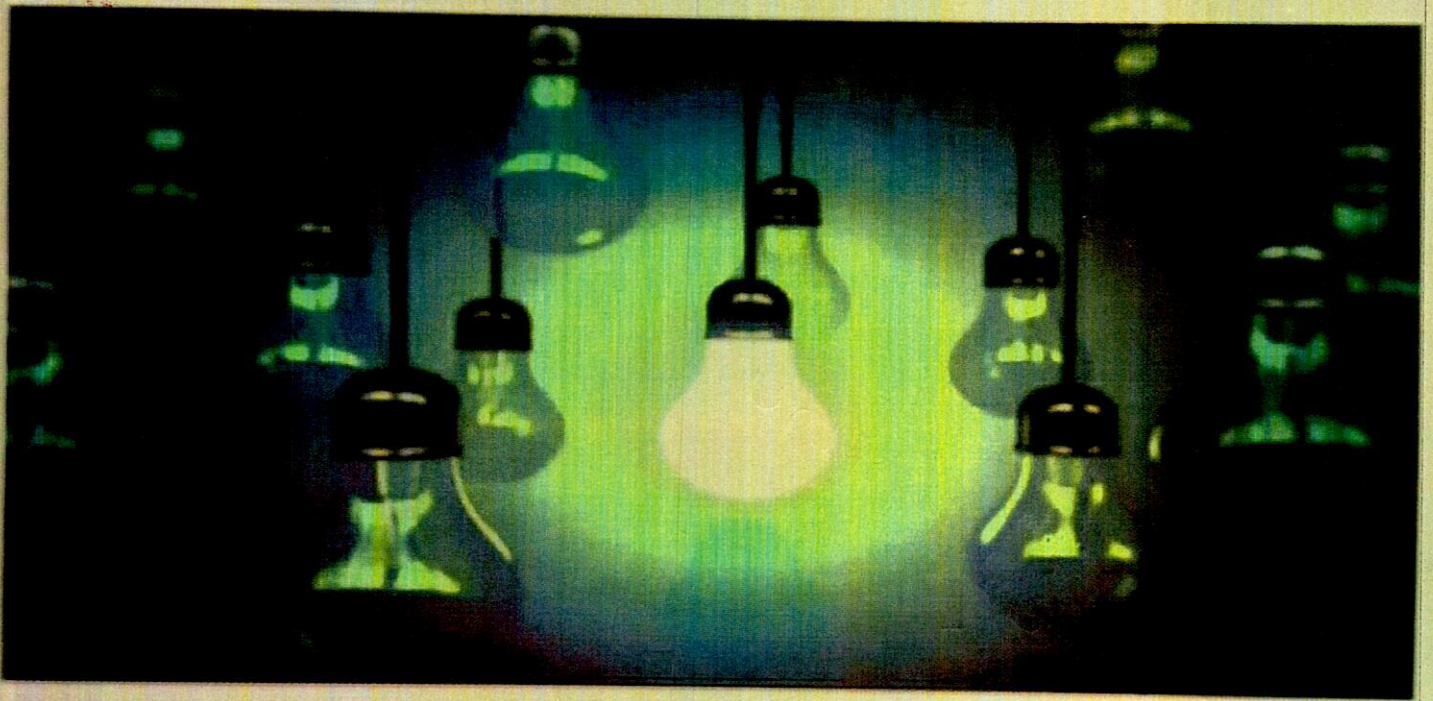


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# Dynamics of Price Discovery of Selected Agricultural Commodities in India

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## Abstract

*The purpose of the study is to investigate the relationship between Spot and Futures of selected commodities Guar Seed, Jeera, Soya bean and Turmeric. The study is used the tests like Augmented Dickey-Fuller (ADF) test, Phillips-Perron test, Kwiatkowski-Phillips-Schmidt-Shin test, Granger Causality test, Johansen co-integration test, Vector error correction Model (VECM) and diagnostic test, to seek the relationship between Guar Seed, Jeera, Soya bean and Turmeric Spot and futures for data between 1<sup>st</sup> March, 2014 to 31<sup>st</sup> March 2017. The results derived by the econometric tools reveal that the unit root test, Augmented Dickey Fuller test (ADF), Phillips-Perron (PP) Test, Kwiatkowski-Phillips-Schmidt-Shin test shows that the spot and futures prices were found to be stationary at first difference. The results of Granger causality test reveals that returns of spot price lead to the futures price and vice versa. Johansen's co-integration test and Vector Error Correction Model (VECM) proved that there is a relation between spot and futures prices of the selected commodities for the study period.*

**Key words:** Causal Relationship and Granger causality test

## Introduction:

The Indian agricultural production system has undergone profound changes over the few decades due to adoption of green revolution technologies coupled with price support policy of the Government of India. After independence, various policy initiatives undertaken by GOI for protecting agriculture sector affected the growth in agricultural commodities markets adversely. The Essential Commodities Act 1955 envisaged price and movement protection applicable to various agricultural commodities, particularly food grains such as paddy, wheat, coarse grains and pulses to protect the interests of producers as well as of consumers. During the process of economic liberalization, it was felt that there is a need to reorient policies and regulations in agricultural commodities. Act 1952 to bring fairness and efficiency in futures trading operations. The National Agriculture Policy announced in July 2000 envisaged external and domestic market reforms by putting in place a mechanism of futures trade/market and dismantling of

all control and regulations in agricultural commodity market. As a result, the Government of India issued notifications on April 1, 2003 and permitted futures trading (except options trading) for a wide range of agricultural commodities.

Futures contracts help in performing two important management functions, i.e. price discovery and price risk management for the specific commodity. Price discovery is the process of revealing information about future spot prices through the future markets. It is useful for producers as they get a fair idea about the prices likely to prevail at a future point of time and hence, can allocate their limited available resources among various competing commodities for optimizing their profits.

It also provides food processors and consumers an idea about prices at which the specific commodity would be available at a future point of time. Although futures trading in a large number of agricultural commodities were re-introduced in India in the year 2003, government is always skeptical about its efficiency and likely



impact on the price movement of agricultural commodities. The influence of one market on the other and role of each market segment in price discovery is the central question in market microstructure design and has become an increasingly important research issue among academicians, regulators and practitioners alike as it provides an idea about the market efficiency, volatility, hedging effectiveness and arbitrage opportunities, if any. The essence of the price discovery function hinges on whether new information is reflected first in changes of future prices or changes of spot prices. Hence, there exists lead-lag relationship between spot and futures market by information dissemination. All the information available in the market place is immediately incorporated in the prices of assets in an efficient market. So, new information disseminating into the market should be reflected immediately in spot and futures prices simultaneously. This will lead to perfect positive contemporaneous co movement between the prices of those markets and there will be no systematic lagged response and therefore no arbitrage opportunity

#### Review of Literature

Kumar and Sunil (2004) examined the price discovery in six Indian commodity exchanges for five commodities. They used the daily futures and spot price and also engaged the ratio of standard deviations of spot and future rates for empirical testing of ability of futures markets to incorporate information efficiently. The study concluded that inability of future market to fully incorporate information and confirmed inefficiency of future market. However, the paper also concluded that the Indian agricultural commodities future markets are not yet mature and efficient.

Kushankur Dey, Debasish Maitra (2012) in their study on "Price Discovery in Indian Commodity Futures Market: An Empirical Exercise", found that there was a unidirectional causality from Futures to Spot prices in the pepper Futures market.

Jabir Ali, Kriti Bardhan Gupta (2011) observed the long-term relationship between Futures and Spot Prices for the selected Agricultural Commodities for the Maize, Chickpea, Black Lentil, Pepper, Castor Seed, Soybean and Sugar. The study found that there was also a short-term relationship between them and the Futures markets had ability to predict spot prices for Chickpea, Castor Seed, Soybean and Sugar. The study also concluded that there was a bi-directional relationship in the short run among the Maize, Black Lentil and Pepper.

R. Salvadi and P. Ramasundaram (2008) in their study entitled "Whether Commodity Futures Market in Agriculture is Efficient in Price Discovery? - An Economics Analysis" examined. The results showed the inefficiency of agricultural commodity futures market in terms of price discovery due to the non integration of futures and the spot market. The study also revealed that the implementation of Government driven policy measures to raise the commodity futures market as a vibrant segment for price risk management in Indian Agriculture sector.

Kumar, Singh and Pandey (2008), studied the hedging effectiveness of futures contract on a financial asset and commodities in Indian markets by applying different time series models and is found that there is presence of necessary co-integration between the spot and derivatives markets and also that both stock market and commodity derivatives markets in India provide a reasonably high level of hedging effectiveness.

Jabir and Kriti (2007), the study on analysis on the effectiveness of commodity futures market through regression analysis by taking both spot and future prices of commodities showed high level of volatility in both spot and futures prices of commodities. Positive coefficients for agricultural commodities in dissimilar equations supported the effectiveness of commodity market in hedging the price risk.



Raizada and Sahi (2006), studied the efficiency of Indian futures market and observed that the wheat futures market is even weak-form inefficient and fails to play the role of spot price discovery. Spot market has found to capture the market information faster and therefore expected to play the leading role. This inefficiency of the futures market may be attributed to the lack of necessary data to truly capture the actual lead-lag relationship between the spot and futures market. It is also suggested that the trading volume in commodity futures market, along with other factors, have a significant impact on country's inflationary pressure.

### Objective of the Study

- To test the stationary of the selected agricultural commodities in Spot and Futures Markets
- To examine directional effect among the selected commodities of Spot and Futures
- To examine the relationship between the selected commodities of Spot and Futures movement of NCDEX in India.

### Data and Methodology

The present study is aimed towards analysing the dynamics of price discovery

### Unit Root Tests

#### Augmented Dickey-Fuller (ADF) Test

The standard DF test is carried out by estimating the following Equation after subtracting  $y_{t-1}$  from both sides of the equation:

$$\Delta y_t = a y_t - 1 + x_t \phi + \epsilon_t,$$

where  $a = \tau - 1$ . The null and alternative hypotheses may be written as,

$$H_0: a = 0$$

$$H_1: a < 0$$

#### The Phillips – Perron test

The Phillips – Perron test is carried out by estimating the following equation

$$\nabla y_t = \nabla y_{t-1} + u_t$$

Where  $y_t$  is the time series data under consideration.

The KPPS (1992) Test is based on the residuals ( $\epsilon_t$ ) from an ordinary least square regression of the variable of interest on the exogenous variable(s) as follows:

$$Y_t = X' t \beta + \epsilon_t \quad (2)$$

between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. The frequency of data is kept at daily level and time span of the study is between 1<sup>st</sup> March, 2014 to 31<sup>st</sup> March 2017. The results from daily data are more precise and are better able to capture the dynamics between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. Both the price series have been collected from the website of National Commodity and Derivative Exchange (NCDEX). In this study, the techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market.

### Following Econometric Models were Used for Analysis

- Unit root test,
- Granger causality test, and
- Johansen co-integration test
- Vector error correction Model (VECM)
- Diagnostic test



where  $Y_t$  is the variable of interest (endogenous variable(s)). The Lagrange Multiplier (LM) statistic used in the test as follows:  
 $TM = T^{-2} \sum_{t=1}^T S(t)^2 / f_0$   
 where  $T$  is the sample size,  $S(t)$  is the partial sum of residuals which is calculated as

$$S(t) = \sum_{i=1}^t S_i r_i$$

Here  $\hat{\epsilon}_t$  is the estimated residual from (3.1).  $f_0$  is an estimator of the residual spectrum at frequency zero. This statistic has to be compared with KPSS et al. (1992) critical values.

**Granger causality test**

The test was carried out to identify the directional effect of selected indices. To test for Granger causality, the following two equations were estimated.

$$Y_t = \sum_{i=1}^m \alpha_i Y_{t-i} + \sum_{i=1}^m \beta_i X_{t-i} + u_t$$

$$X_t = \sum_{i=1}^m \gamma_i Y_{t-i} + \sum_{i=1}^m \delta_i X_{t-i} + e_t$$

**Johansen cointegration test**

The condition for testing Johansen cointegration test for any time series data is that the data should be non stationary at their level i.e. the natural logarithm of time series data should be non stationary and the first difference in the data should be stationary. If the return indices of different markets are correlated, the value may rise or fall. On the other hand, if the time series data are co-integrated, then the series in the long run will come to equilibrium point.

**Empirical Results**

**Table 1: Out of Descriptive statistics of Selected commodities for the period from 01-04-2014 to 31-3-2017**

Statistical Measures	Guar Seed		Jeera		Soya Bean		Turmeric	
	Spot	Futures	Spot	Futures	Spot	Futures	Spot	Futures
Mean	4085.26	4106.58	15620.02	15216.59	3582.26	3625.06	7598.94	7746.79
Median	3800.00	3807.00	16417.93	15955.00	3482.00	3645.00	7591.65	7488.00
Maximum	6740.00	6265.00	19585.70	20380.00	4832.00	4863.00	9823.80	10706.00
Minimum	2982.70	3005.00	10246.90	10340.00	2855.00	2862.00	5708.70	5870.00
Std.Dev.	842.72	845.068	2606.40	2533.34	414.28	431.275	965.038	1047.77
Skweness	0.64614	0.74157	-0.72453	-0.36662	0.66096	0.41340	0.04889	0.6295
Kurtosis	2.20031	2.26958	2.24538	2.099386	2.9226	2.70820	2.60631	2.70657
Jarque-Bera	68.4189	80.9709	80.0765	40.4627	52.6040	23.0624	4.57333	46.4501
Probability	0.0000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10161	0.00000

The variables considered in the scope of the study are examined in the table 1 reveals that the average values of variables are found to be Spot prices of Guar Seed (4085.26), and Futures prices of Guar Seed (4106.58), standard deviation values are found as Spot prices of Guar Seed (842.72), and Futures prices of Guar Seed (845.068), Spot prices of

Jeera (15620.02), and Futures prices of Jeera (15216.59), standard deviation values are found as Spot prices of Jeera (2606.40), and Futures prices of Jeera (2533.34), Spot prices of Soya Bean (3582.26), and Futures prices of Soya Bean (3625.06), standard deviation values are found as Spot prices of Soya bean (414.28), and Futures prices of Soya Bean





(431.27) and Spot prices of Turmeric (7591.65), and Futures prices of Turmeric (7488.00), standard deviation values are found as Spot prices of Turmeric (965.04), and Futures prices of Turmeric (1047.77). When average values of the variables are considered in terms of the data very close to normal distribution as the median values of variables are very close to average values.

Regarding whether series are distributed normally or not, skewness, kurtosis and Jarque-Bera statistics were considered. If kurtosis value of relevant variables is bigger than three, it indicates that series is sharp, if it is smaller than three, it indicates that series is oblate. In consideration of skewness values, if skewness value is equal to zero, it indicates that series has normal distribution, if the skewness value is bigger than zero; it means that series is skew in the positive direction, if skewness value is smaller than zero; it indicates that series is skew in the negative direction.

Following values were found: skewness value of Spot price of Guard Seed (0.64614), kurtosis value (2.2003), Jarque-Bera value (68.4189) and skewness value of price of Guard Seed futures (0.74157), kurtosis value (2.2696), Jarque-Bera value (80.9709). Skewness value of Spot price of Jeera (-0.7245), kurtosis value

(2.2454), Jarque-Bera value (80.076) and skewness value of price of Jeera futures (-0.3666), kurtosis value (2.09939), Jarque-Bera value (40.463). Skewness value of Spot price of Soya Bean (0.66096), kurtosis value (2.9226), Jarque-Bera value (52.604) and skewness value of price of Soya Bean futures (0.413400), kurtosis value (2.7082), Jarque-Bera value (23.0624). Skewness value of Spot price of Turmeric (0.04889), kurtosis value (2.6063), Jarque-Bera value (4.5733) and skewness value of price of Turmeric futures (0.6295), kurtosis value (2.7066), Jarque-Bera value (46.4501). It has been found that Spot and Future price of selected commodities are oblate and except Jeera other three commodities are in the positive direction.

Tables 2 presents the results of the unit root test of augmented Dickey Fuller Test, Phillips-Perron (P-P) Test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The variables of Spot and Futures Price of selected five Commodities non-stationary at their level and stationary at first differencing I(1). The results indicate that the null hypothesis of a unit root cannot be accepted for the given variable as none of the ADF value, PP value and KPSS test is smaller than the critical t-value at 5% level of significance.

**Table 2: Unit Root Test Results of selected Commodities Gaur Seed, Jeera, Soya bean and Turmeric at NCDEX**

Series		ADF unit root test - statistic		Phillips-Perron test		KPSS	
		With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88
Daily spot closing price of Gaur Seed	At level	-1.84523	Not Stationary	-1.6612	Not Stationary	2.45267	Not Stationary
	At 1 <sup>st</sup>	-25.751 (0.000)	Stationary	-26.080	Stationary	0.071782	Stationary
Daily Future closing price of Gaur Seed	At level	-1.85668	Not Stationary	-1.8692	Not Stationary	2.33761	Not Stationary
	At 1 <sup>st</sup>	-26.237	Stationary	-26.251	Stationary	0.074496	Stationary
Daily spot	At	-1.92021	Not	-1.9140	Not	2.20063	Not



closing price of Jeera	level		Stationary		Stationary		Stationary
	At 1 <sup>st</sup>	-12.6010	Stationary	-25.731	Stationary	0.20915	Stationary
Daily Future closing price of Jeera	At level	-1.8233	Not Stationary	-1.8259	Not Stationary	1.96220	Not Stationary
	At 1 <sup>st</sup>	-26.6242	Stationary	-26.624	Stationary	0.08265	Stationary
Daily spot closing price of Soya bean	At level	-1.7623	Not Stationary	-1.7465	Not Stationary	0.06596	Not Stationary
	At 1 <sup>st</sup>	-26.8374	Stationary	-26.837	Stationary	0.07450	Stationary
Daily Future closing price of Soya bean	At level	-1.8216	Not Stationary	-1.9093	Not Stationary	0.71949	Not Stationary
	At 1 <sup>st</sup>	-17.8566	Stationary	-23.084	Stationary	0.095801	Stationary
Daily spot closing price of Turmeric	At level	-1.4243	Not Stationary	-1.6204	Not Stationary	0.082061	Not Stationary
	At 1 <sup>st</sup>	-21.3031	Stationary	-21.795	Stationary	0.29279	Stationary
Daily Future closing price of Turmeric	At level	-1.96248	Not Stationary	-2.1088	Not Stationary	0.58529	Not Stationary
	At 1 <sup>st</sup>	-23.5276	stationary	-23.528	stationary	0.15906	Stationary

### Granger Causality Test

Table 3 shows the results of Pairwise granger causality test between Spot and Futures price of four selected commodities i.e., Guar Seed, Jeera, Soya bean and Turmeric. It is revealed from the test that the F-value of Guar Seed is 16.7546 and the probability value is 8.E-08 (0.08 per cent), which suggests that spot returns granger causes the futures returns at 5 per cent level of significance. The F-value of Jeera Spot is 8.50127 and the probability value is 0.0002 per cent, which also suggests that spot returns granger causes the spot price at 5 per cent level of significance. The F-value of Soya bean 9.22211 and the probability value is 0.0001 per

cent, which suggests that spot returns granger causes the futures price at 5 per cent level of significance and the F-value of Turmeric is 4.74626 and the probability value is 0.0090 per cent, which further suggests that spot returns granger causes the Spot price at 5 per cent level of significance. It is also observed that F-statistics value is 1.54623 (Jeera) and 2.71052 (Soya bean) its probability values are 0.2138 and 0.0672 respectively, which indicate that the futures price do not cause the spot price. Therefore spot price leads future price and vice versa.

Table 3: showing the Granger causality test results of selected commodities

Null Hypothesis:	F-Statistic	Prob.	Decision
Future Price of Gaur Seed not Granger Cause Spot Price of Gaur Seed	16.7546	8.E-08	Causality
Spot Price of Gaur Seed not Granger Cause Future Price of Gaur Seed	3.48427	0.0312	Causality



Future Price of Jeera not Granger Cause Spot Price of Jeera	1.54623	0.2138	No Causality
Spot Price of Jeera not Granger Cause Future Price of Jeera	8.50127	0.0002	Causality
Future Price of Soya Bean not Granger Cause Spot Price of Soya Bean	9.22211	0.0001	Causality
Spot Price of Soya Bean not Granger Cause Future Price of Soya Bean	2.71052	0.0672	No Causality
Future Price of Turmeric not Granger Cause Spot Price of Turmeric	0.09565	0.9088	No Causality
Spot Price of Turmeric not Granger Cause Future Price of Turmeric	4.74626	0.0090	Causality

Source: Computed of Data

Table 4 presents the results of Johansen's (1991) maximum likelihood co-integration test results which examines whether the Spot and Futures price of selected commodities are co-integrated. The result shows that first null hypothesis is 'none' which means that there is no co-integration equation among the variables. The value of the trace-statistics is more than critical value we can reject null hypothesis. Here the value of trace statistics of Guar Seed (40.1551), Jeera (22.0177), Soya Bean (27.4024), Turmeric (15.3402) and critical value at 5 per cent is 15.4947. Thus the trace statistics of the selected commodities are more than the critical value that means we can reject the null hypothesis. Here the probability value is very small that is less than

0.05 so the study rejects the null hypothesis of 'none' ( $H_0: r=0$ ). The second null hypothesis is 'atmost 1'. It means that there is one co-integration model. Here the trace statistics of Guar Seed (3.25839), Soya Bean (3.41286), Turmeric (2.44941) and the critical value is 3.84147 which is more than the trace value which means that the study reject the null hypothesis and that there exists one co-integration model. Again the p-value is 0.000 which is less than 0.05 which indicates the rejected the null hypothesis of both 'none' and 'atmost 1'. Thus the selected commodities of the study have long run equilibrium relationship between them.

Table 4: showing the Johnsen cointegration test result (lags interval: 2)

Co-integration between	Hypothesized No. of CE(s)	Eigen Value	Trace Test			Maximum Eigen Value test		
			Test Sta.	P. Value**	Critical value at 5%	Test Sta.	P. Value**	Critical value at 5%
Daily Spot closing and Daily future closing of Gaur Seed	$H_0: r=0$ (None)	0.058951	40.1551	0.0001	15.4947	42.8967	0.0001	14.2646
	$H_1: r \leq 1$ At Most 1	0.004605	3.25839	0.0000	3.84147	3.25839	0.0000	3.84147
Daily Spot closing and Daily future closing of Jeera	$H_0: r=0$ (None)	0.024410	22.0177	0.0001	15.4947	17.6698	0.0001	14.2646
	$H_1: r \leq 1$ At Most 1	0.006063	4.38011	0.0000	3.84147	4.34801	0.0000	3.84147
Daily Spot closing and Daily future closing of Soya Bean	$H_0: r=0$ (None)	0.032995	27.4024	0.0001	15.4947	23.9895	0.0001	14.2646
	$H_1: r \leq 1$ At Most 1	0.04762	3.41286	0.0000	3.84147	3.41286	0.0000	3.84147
Daily Spot	$H_0: r=0$ (None)	0.019284	15.3402	0.0001	15.4947	12.8908	0.0001	14.2646



Data: Computed of Data

Table 9: Diagnostic Testing of VECM model for Turmeric

Wald Test			
Test Statistic	Value	Df	Probability
F-Statistic	22.43034	(1658)	0.0000
Chi-Square	22.43034	1	0.0000
Residual Diagnostics : Breusch-Godfrey Serial Correlation LM Test			
F-Statistic	2.452596	Prob.F(2987)	0.0869
Obs*R-squared	4.928160	Prob.Chi-Square(2)	0.0851
Heteroskedasticity F Test- Breusch-Pagan-Godfrey			
F-Statistic	0.582061	Prob.F(3,459)	0.7448
Obs*R-squared	3.510911	Prob.Chi-Square(3)	0.7425
Scaled explained SS	148.3694	Prob.Chi-Square	0.0000

Data: Computed of Data

### CONCLUSIONS:

The future markets of agricultural commodity depends on the transparency and efficiency of its functioning in terms of price risk management, price discovery, flexible contract specification, controlling unfair speculation, commodity delivery system, coverage, infrastructural support, etc. Empirically the study examines the market which reacts first in agricultural commodity markets in India by assessing the relationship between the spot and future prices of Guar Seed, Jeera, Soya bean and Turmeric traded in NCDEX. The techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-

integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market. The frequency of data is kept at daily level and time span of the study is between 1<sup>st</sup> March, 2014 to 31<sup>st</sup> March 2017. The unit root test clarified that the selected commodities Spot price and Futures prices are stationary at the first differences. Johansen's co-integration test and Vector Error Correction Model (VECM) showed that there is a relation between Spot and Futures prices of the commodities in the long run period. The results of Granger causality test concluded that prices of spot market lead to the prices of futures market and vice versa.

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