

## MARKET BEHAVIOUR AND PRICE DISCOVERY PROCESS OF SELECTED AGRICULTURAL COMMODITIES: AN ANALYSIS

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### **Abstract**

The study attempted the market behaviour and cointegration and causality relationship between spot and future prices of Cotton, Crude Palm Oil and Cardamom over the period of 3 years from 1<sup>st</sup> April 2016 to 29<sup>th</sup> March 2019. The daily closing prices and spot prices are obtained from MCX website. Trend movement and Descriptive Statistics used to analyse the market growth. The result indicates the average future price is greater than spot prices, it represents Contango. Johansen's Cointegration Test applied to examine the long run association between the series. The result showed towards long run equilibrium between the future and spot prices of cotton, crude palm oil and cardamom. Granger Causality Test used to analyse the bidirectional or unidirectional relationship between the variables. The result indicates that bidirectional causal relationship between future and spot prices of selected agricultural commodities. It can be suggested that the price discovery process is well performed by future prices and that forecasting the spot prices can be effective.

**Keywords:** Johansen's Cointegration, Causal Relationship, Price Discovery, Cotton, Crude Palm Oil and Cardamom.

### **Introduction:**

Commodity markets play a critical role in economies such as India where agricultural production accounts for a significant share of GDP. India being a dominated agricultural economy is one of the top producers of agricultural products, where farmers face yield risk as well as price risk. Farmers need protection from the volatility in prices of their crops. We face price volatility from the time of sowing through to the time of harvest. Simple contracts were designed to reduce the risk and fulfill the farmers' needs. The futures market for commodity exercises two essential economic roles of price discovery and price risk management. A futures commodity trading is beneficial to all sectors of the economy including farmers and consumers. It gives sellers (farmers / producers) advance demand

signals and assists purchasers (consumers) of agricultural commodities to finance commodities from one season to the next. Effective price discovery requires multiple players to participate directly in commodity markets: farmers / producers, intermediaries, wholesalers, consumers, investors and others. Most farmers / producers in India typically produce mainly for consumption, and thus generally do not participate in commodity markets. While commodity markets in India are typically dominated by traders and brokers speculating. Indeed, trading on futures markets is often prohibited because prices become too speculative (Nath and Lingareddy, 2008). Price discovery is also heavily dependent on physical market infrastructure as well as on cost processing, cost of storage, and cost of transportation, tax rates and other factors. In India, there is a network of regulated commodities markets nationwide, although the periodic rural markets are largely unregulated.

Commodity trading in agricultural commodities seeks to stabilize overall commodity prices. With the aid of future trade in agriculture, it is possible to ensure equal prices for farmers, prevent instabilities, generate an effective price discovery, etc. At the same time, bringing high instabilities in commodity prices will help some speculators. The market for agricultural commodity trading is helpful in discovering potential prices, depending on current trends. They are helpful in discovering prices, and thus can affect the farmers' pricing decisions. A better relation between the future market and the spot market will enable the commodity market to influence the agricultural sector at large. In India, agricultural prices are fixed or affected by MSP and the wholesale price that traders fixed. Both of these may contain errors as a mechanism of price oriented towards the market. A more refined commodity market can power market-oriented price determination in this context.

### **Commodity Profile:**

#### **Crude Palm Oil:**

Palm Oil is an edible vegetable oil extracted from the mesocarp (Reddish pulp) of the oil palm fruit, mainly the African oil palm *Elaeis guineensis* and, to a lesser degree, the American oil palm *Elaeis oleifera* and the *Attalea maripa* palm. Palm oil is naturally reddish in color, due to high levels of beta-carotene. It is not to be confused with palm kernel oil derived from the same fruit kernel, or coconut oil derived from the coconut palm kernel. The differences are in color (raw palm kernel oil lacks carotenoids and is not red), and in saturated fat content; palm mesocarp oil is saturated by 41%, while palm kernel oil and coconut oil are saturated by 81% and 86%, respectively. India's consumption trend is characterized not only by increasing overall consumption but also by changing consumption

patterns. Risk management approaches are important to stakeholders such as importers, refiners, retailers and stock holders of crude palm oil (CPO). Modern techniques and approaches offered on the MCX platform will boost efficiencies and strengthen competition through price risk management, including market-based risk management financial instruments such as 'CPO Futures.'

**Cotton:**

The use of cotton for cloth is known to date in ancient times; in Mexico and the Indus Valley Civilization, fragments of cotton fabric dated from 5000 BC have been digged. The Indus cotton industry was well developed, and some methods used in cotton spinning and manufacturing continued to be utilized until India was industrialized. Cotton was widespread across India between 2000 and 1000 BC. Cotton fibre is one of the most common textile fibres, comprising about 35 per cent of the total textile fibre used in the world. The strength, absorption and capacity of cotton to be washed and dyed also makes it ideal for a large variety of textile items. Cotton seeds are crushed to make cotton cake that is used in livestock feed; and cotton seed oil that is the world's fifth-largest edible oil consumed. While the future is uncertain, new techniques and approaches offered on the MCX platform will boost efficiencies and strengthen profitability through price risk management, including market-based risk management financial instruments such as 'Cotton Futures'.

**Cardamom:**

Renowned for its taste and fragrance, cardamom is commonly used as seasoning. Green cardamom is commonly used in traditional Indian sweets and tea making in southern Asia; it is used in the preparation of 'gahwa' in Arabia — a powerful cardamom coffee used to welcome guests; it is an important ingredient in sweet food in northern Europe. Cardamom finds varied uses therapeutically, such as in the treatment of teeth and gum infections, digestive disorders, throat disorder, and skin problems. Small cardamom is cultivated in India, commercially on plantations, in the evergreen forests of the Western Ghats under the shade of tall forest trees at relatively high altitudes. India is a big cardamom producer and buyer who holds the second position in world production; Guatemala takes the top spot. Risk management techniques are critical on the market for key cardamom stakeholders, such as producers, exporters, marketers and processors. Modern techniques and approaches offered on the MCX platform, including market-based risk management financial instruments such as 'Cardamom Futures,' will boost efficiencies and strengthen competition through price risk management, despite an unpredictable future.

**Review of literature:**

1. **Interpal Singh (2015)** studied spot market volatility effect in Indian agricultural commodities from 2004 to 2014 for seven selected agricultural commodities obtained from the NCDEX website for a period of 10 years. The results showed advantages in dissemination information for the future market, contributing to price discovery and risk management.
2. **Moonis shakeel (2014)** attempted price discovery functions for three agricultural commodities traded on NCDEX, namely soybean, castor seed and chana, for the period 2009 to 2014. The vector error correction model result showed bidirectional causality between the castor seed, Chana, and soybean series. The study indicated that the selected agricultural commodities play a major role in the process of price discovery.
3. **Isha Chhajed (2013)** examine the market behaviour and price discovery functions in the Indian Commodity Market during the period 2009 to 2010. The researcher have been taken nine agricultural commodities that are traded on MCX, NCDEX, namely wheat, chana, soybean oil, jute, menthe oil, rubber, potato, crude palm oil, The outcome of the granger causality test showed bidirectional causality between spot and future prices.
4. **Sanjay Sehgal (2012)** evaluated price discovery in Indian commodity market from June 2003 to March 2011. The result of the granger causality test showed bidirectional causality between futures and spot of all agricultural commodities except turmeric which is not co-integrated and is not efficient in information.
5. **Mihir Dash (2010)** studied the market behavior and causality between variables between 2005 and 2007. The data were collected from NCDEX website. The findings showed Contango in terms of market behavior with average spot prices lower than future prices. The study indicated the mechanism for price discovery is very effective for most commodities. Even more causality has been used to forecast the commodities spot and future prices.

**Research methodology:**

The study used secondary data in nature. These data were obtained from MCX website. The author have been taken selected three agricultural commodities namely cardamom, cotton, and crude palm oil for the analysis.

**Period of the study:**

The data period of three years ranking from 1<sup>st</sup> April 2016 to 29<sup>th</sup> March 2019 have been collected for the study.

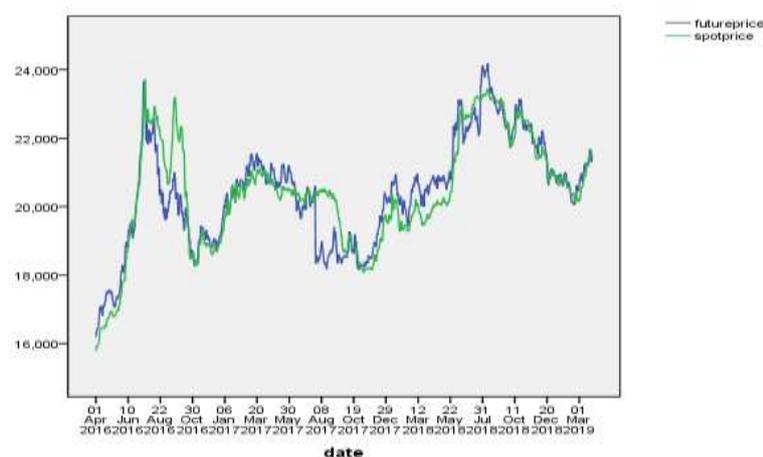
**Objectives of the study:**

1. To know the market behaviour of selected agricultural commodities.
2. To analyse the long run equilibrium relationship between spot and future prices of selected agricultural commodities.
3. To examine the causality between future and spot prices of selected agricultural commodities.

**Hypothesis of the study:**

$H_{01}$ : There is no long run equilibrium between future and spot prices of selected agricultural commodities.

$H_{02}$ : There is no causal relationship between future and spot price of selected agricultural commodities.

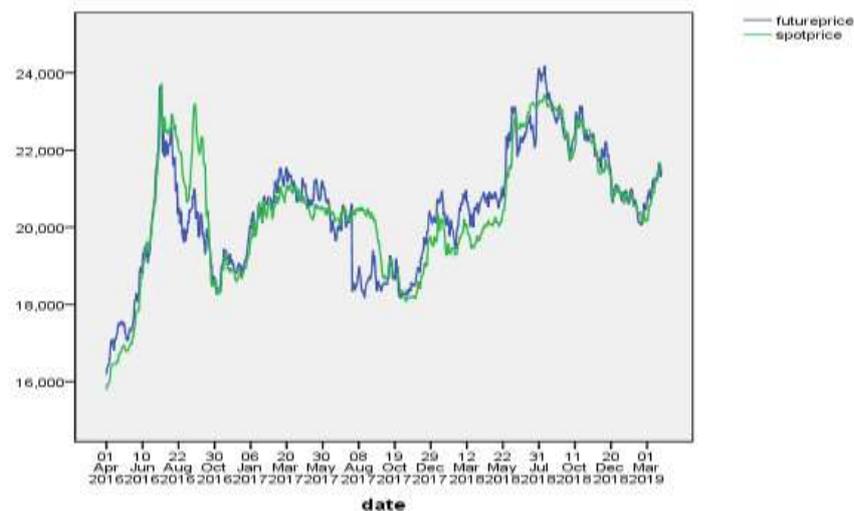
**Data Analysis and Interpretation:****Table No 1: Trend movement of Cotton future and spot prices**

The above table shows trend movement of cotton future and spot prices. There was an upward trend in cotton prices of 2018 and slightly downward trend in March 2019.

**Table No 2: Descriptive Statistics of Cotton future and spot prices**

	Cotton	
	Future	Spot
Mean	20419.47	20402.09
Maximum	24180.00	23720.00
Minimum	16190.00	15790.00
Standard Deviation	1553.12	1622.54
Skewness	-0.07	-0.25
Kurtosis	2.706	2.917
Contango/Backwardation	Contango	

The above tables shows growth and descriptive statistics of cotton future and spot prices. The average cotton future prices is greater than spot prices it represents Contango. The analysis of Skewness cotton future and spot prices revealed that is asymmetrical and negatively skewed. The kurtosis shows that the series is less peaked and the data is platykurtic.

**Table No 3: Trend movement of Crude Palm Oil future and spot prices**

The above table shows trend movement of crude palm oil future and spot prices. There was an upward trend in crude palm oil prices of 2018 and slightly downward trend in March 2019.

**Table No 4: Descriptive Statistics of Crude Palm Oil future and spot prices**

	Crude Palm Oil	
	Future	Spot
Mean	559.73	556.32
Maximum	671.10	668.00
Minimum	468.50	479.80
Standard Deviation	44.03	45.98
Skewness	0.47	0.44
Kurtosis	2.58	2.54
Contango/Backwardation	Contango	

The above tables shows growth and descriptive statistics of crude palm oil future and spot prices. The average crude palm oil future prices is greater than spot prices it represents Contango. The analysis of Skewness crude palm oil future and spot prices revealed that is asymmetrical and positively skewed. The kurtosis shows that the series is less peaked and the data is platykurtic

**Table No 5: Trend movement of Cardamom future and spot prices**

The above table shows trend movement of cardamom future and spot prices. There was a downward trend in cardamom prices of 2018 and upward trend in March 2019.

**Table No 6: Descriptive Statistics of Cardamom future and spot prices**

	Cardamom	
	Future	Spot
Mean	1180.70	1179.21
Maximum	1679.70	1663.50
Minimum	667.40	730.00
Standard Deviation	228.51	219.47
Skewness	0.14	0.02
Kurtosis	1.96	2.21
Contango/Backwardation	Contango	

The above tables shows growth and descriptive statistics of cardamom future and spot prices. The average cardamom future prices is greater than spot prices it represents Contango. The analysis of Skewness cardamom future and spot prices revealed that is asymmetrical and positively skewed. The kurtosis shows that the series is less peaked and the data is platykurtic.

### Johansen's Cointegration Test:

Model two likelihood ratio test Johansen and Juselius (1990) are widely used to determine the number of cointegrating vectors. These are the trace test and the Maximum Eigen value test.

$$J_{trace} = -T \sum_{i=r+1}^n \ln (1 - \hat{\lambda}_i)$$

$$J_{max} = -T \ln (1 - \hat{\lambda}_{r+1})$$

Where  $\hat{\lambda}_1 \dots \dots \hat{\lambda}_r$  are the r largest squared canonical correlations between the residuals obtained by regressing  $\Delta y_t$  and  $\Delta y_{t-1}$  on  $\Delta y_{t-1}, \Delta y_{t-2} \dots \dots \Delta y_{t-k-1}$  and I respectively.

**Table No. 7: Johansen's Cointegration Test of Future and Spot Prices of Selected Agricultural Commodities:**

Commodities	No. of Cointegration Equation	Trace Statistics ( $\lambda_{trace}$ )	Maximum Eigen Value ( $\lambda_{max}$ )	5% Critical Value for Trace Statistics	5% Critical Value for Max. Eigen Statistics	P Value
<b>Cotton</b>	None	27.622	19.195	15.495	14.265	0.000
	Atmost 1	8.427	8.427	3.841	3.841	
<b>Crude Palm Oil</b>	None	45.104	40.766	15.495	14.265	0.000
	Atmost 1	4.338	4.338	3.841	3.841	
<b>Cardamom</b>	None	37.861	35.729	15.495	14.265	0.000
	Atmost 1	2.133	2.133	3.841	3.841	

Trace test and Max-eigenvalue test indicates 2 cointegrating eqn (s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level.

The above table revealed the Johansen's Cointegration test, Trace Statistics and Maximum Eigen value used to interpret whether the null hypothesis (None  $r = 0$ ) rejected at 5% significant level and alternative hypothesis (At most 1  $r = 1$ ) were accepted. The rejected null hypothesis showed of two Cointegration equation for cotton and crude palm oil, one Cointegration equation for cardamom it indicates towards the long run equilibrium relationship.

#### **Granger Causality Test:**

Granger Causality test showed the future and spot prices to analyze the unidirectional or bidirectional causality relationship between the series. The results of granger causality test are represented in the table below:

**Table No. 8: Granger Causality Test of Future and Spot prices of Selected Agricultural Commodities**

Commodities	Null Hypothesis	F Statistic	P. Value
Cotton	Spot price does not granger cause Future price	0.58863	0.0432
	Future price does not granger cause Spot price	68.8151	3.E-28
Crude Palm Oil	Spot price does not granger cause Future price	4.24205	0.0147
	Future price does not granger cause Spot price	81.8090	6.E-33
Cardamom	Spot price does not granger cause Future price	0.54033	0.0328
	Future price does not granger cause Spot price	52.7723	3.E-22

From the above table showed granger causality test between the variables. The results revealed that there is a bidirectional relationship between spot and future prices for cotton, crude palm oil and cardamom. It can be concluded that future prices as well as spot prices can be used to forecast spot prices for the selected commodities.

### **Conclusion:**

India is primarily an agrarian economy, and ranks second in the world's agricultural growth. Although keeping up with the increasing population, the rising agricultural production over the past few decades has faced significant marketing challenges as well as supply, storage and distribution. With highly fragmented markets and volatile commodity prices, assuring the Indian farmer of a 'fair' and 'remunerative' price is a challenge. With these in mind, a number of reforms have been introduced by the Government. In all this, the enhancement of existing spot-and-derivative trade institutions has become critical as commodity markets affect the lives of millions of stakeholders in the complex and broad commodity ecosystem in the world. Commodity derivative markets are expected to play two main roles, one being price discovery and another transfer of risk. The market for agricultural commodity trading is helpful in discovering future prices, depending on current trends. They are helpful in discovering prices, and thus can affect the farmers' pricing decisions. This study examined the market behaviour and price discovery process of selected agricultural commodities namely cotton, crude palm oil and cardamom. The daily data of future and spot prices are collected from MCX website for the period of 3 years from 2016 to 2019. The author used trend movement and descriptive statistics for analyse the market

growth. Johansen's Cointegration test results revealed the long run equilibrium between the series of cotton, crude palm oil and cardamom. And the granger causality test results showed bidirectional causal relationship between the variables of selected agricultural commodities. The study concluded that the process of price discovery is being carried out by the future prices in cotton, crude palm oil and cardamom and it may be useful to forecast the spot prices.

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