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Market Behavior and Price Discovery in Indian Agriculture Commodity Market*

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Abstract: This study analyses the market behavior and price discovery in Indian Agriculture Commodity Markets. Commodity future trading was permitted in 2003. The commodity derivatives market in India has witnessed a phenomenal growth. The functioning of future market came under scrutiny during 2008–2009 due to price rise and the role of futures market in stabilizing spot prices was widely studied. The study considered average monthly spot and future prices of nine agriculture commodities viz. wheat, chana, soybean oil, jute, mentha oil, rubber, potato, crude palm oil and cardamom trading on MCX and NCDEX during 2009–2010. Granger causality test have been used to test the price discovery, i.e., the effect of future market on spot market and vice-versa. The market behavior was studied with the help of backwardation and contango. The result of the study says that the price discovery mechanism is quite different for different commodities but it suggests that causality can be used in forecasting spot and futures prices. Most of the commodities showed bi-directional causality between spot and future prices. The contango and backwardation helps in identifying the hedging opportunities in the market.

Key words: price discovery; contango; backwardation

JEL Codes: E44, C40, C89

> "FUTURES markets are an anomaly to those economists who study them least, an anachronism to those who study them a little more, and an annoyance to those who study them most."

1. Introduction

Commodity futures trading in India commenced more than 100 years back. Major enactment to this effect was in the form of Forward Contract Regulation Act (FCRA), 1952. But, the situation has not matured due to the virtual banning of futures trading since the early 60s till late 80s when the scarcity environment prevailed. Presently, it has become very popular among the traders and retail investors, the reason that they provide the investors with a better opportunity of diversifying their portfolios in addition to what the bonds, shares, and real estates offer.

The other justification for opening up and rejuvenating commodities futures markets in India during the

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beginning of the current millennium has been to create infrastructure which will help farmers to access the market as well-informed players. Price discovery and price risk mitigation are the main objectives of commodity futures markets, which enables the farmers to take rational decisions about cropping and marketing of their produce to increase their farm income. This creates incentives and resources for investment in agricultural operations to improve productivity. The National Agricultural Policy 2000 (NAP), sought to "enlarge the coverage of futures markets to minimize the wide fluctuations in commodity prices as also for hedging their risk". The endeavour ought to be to extend futures trade to all agri-commodities in course of time. The Guru Committee (2001) emphasized the role of futures trading for price risk management and marketing of agricultural produce.

Future market should be able to generate prices that express future expectations on cash prices and should be able to transmit that information effectively across the market. Effective price discovery requires the direct participation of several players in commodity market: farmers/producers, intermediaries, wholesalers, investors and other players. Price discovery depends heavily on physical market infrastructure, as well as handling costs, storage costs, transportation costs, tax rates and other factors.

Futures prices discovered on the platform of exchanges can provide an important input to all decision makers, be they farmers, processors, warehouse keepers, traders or policy makers. Futures prices indicate democratically observed price expectations at future dates. These prices if efficiently determined, disseminated and accessible to all concerned—can pave the way for optimal decision making and resource allocations. If farmer gets advance information about the price of the produce that is likely to prevail at the time of harvest he can plan his crop and investment accordingly. Also, as the harvest time approaches, the prices likely to prevail much after harvest can guide him to take decision to sell or hold back his produce at the time of harvest. Thus, given his capacity and availability of other enabling infrastructure such as warehousing, finance etc. he will be able to exercise his marketing option in such a way as to maximize his income realization from his produce.

According to V. Shunmugam, Chief Economist at the Multi Commodity Exchange of India Ltd., commodity futures help policy makers take better preventive measures by indicating price rises beforehand. Apart from the basic functions of price discovery and price risk management, futures contracts have a number of other benefits like providing liquidity, bringing transparency and controlling black marketing. Futures contracts can easily be converted into cash, i.e., they are liquid. By buying or selling the contract in order to make profits, speculators provide the capital required for ensuring liquidity in the market. They provide certainty of future revenues or expenditures, hence ensuring concrete cash flows for the user. Futures markets allow speculative trade in a more controlled environment where monitoring and surveillance of the participants is possible. Hence, futures ensure transparency. The transparency benefits the farmers as well by spreading awareness about prices in the open market. Futures also help in standardization of quality, quantity and time of delivery, since these variables are agreed upon by the participants and specified in the futures contract.

2. Futures Trading In India

It is believed that commodity futures have existed in India for thousands of years. Kautilya's "Arthashastra" alludes to market operations similar to modern futures markets.

However, organised trading in commodity futures in India commenced in the latter part of the 19th century at Bombay Cotton Trade Association Ltd. (established in 1875). The number of commodity markets in the

pre-independence era was limited, and there were no uniform guidelines or regulations. The legal framework for organising forward trading and the recognition of Exchanges was only provided after the adoption of the Constitution by a central legislation called Forward Contracts (Regulation) Act 1952.9

Through a notification issued on 27 June 1969, by exercising the powers conferred upon the Central Government by the Securities Contracts Regulation Act 1956, forward trade was prohibited in a large number of commodities, leaving only 7 commodities open for forward trade. The decline in traded volumes on stock markets led to the evolution of an informal system of forward trading by the Bombay Stock Exchange in 1972, but this created payment crises quite often. In 1994, the Kabra Committee recommended the opening up of futures trading in 17 commodities, excluding wheat, pulses, non-basmati, rice, tea, coffee, dry chilli, maize, vanaspati and sugar.

After the Securities Laws (Amendment) Bill was passed in 1999, the Central Government lifted the prohibition on forward trading in securities on 1 March, 2000.

The National Multi Commodity Exchange (NMCE) was the first exchange to be granted permanent recognition by the Government, where futures trading commenced on 26 November, 2002. The Multi Commodity Exchange of India (MCX) was established in November 2003 and the National Commodity and Derivatives Exchange Limited (NCDEX) commenced operations in December 2003. Today, futures trading are permissible in 95 commodities in India. There are 25 recognised futures exchanges with more than 3000 registered members. Trading platforms can be accessed through 20,000 terminals spread over 800 towns/cities.

In terms of value of trade, agricultural commodities constituted the largest commodity group in the futures market till 2005–2006. Since 2006–2007, bullion and metals has taken this place. Between April 2007 and January 2008, agriculture futures amounted to Rs.7.34 lakh crore, 23.22 percent of all commodity futures. The total value of trade of the Indian Commodity Futures Market during the year 2010–2011 stood at Rs. 119.49 lakh crore. The Market registered a growth of 54% during the year, as compared to the value of trade of Rs. 77.65 lakh crore during 2009–2010. The value of agriculture commodities traded in the Commodity Exchanges stood at Rs. 14.56 lakh crore growing at a rate of 20% over the previous year. The top five commodities traded in the Futures Market during 2010–2011 were Silver, Gold, Crude oil, Copper & Nickel. The top five agri-commodities traded in the futures market were Soya oil, Guar seed, Chana, Rape/Mustard seed and Soya bean seed.

3. Past Studies

The literature on price discovery is extensive. Many studies are based on the Garbade-Silber framework, along with Granger Causality, Co integration, and Error Correction Models to determine the relationship between futures and cash prices. An attempt has been made to review the existing literature on the concerned topic based on the nature of asset considered in the study.

Yang et al. (2001) attempted to study price discovery performance of future market for storable and non storable commodities. They found that asset storability does not affect the price discovery function; although it may bias futures market estimates. They conclude that futures markets can be used as a price discovery tool in both types of markets

Thomas and Karande (2001) examined efficiency of the castor-seed futures markets in India. The examination included identifying the flow of information between futures and spot prices across two different markets.

Mattos and Garcia (2004) investigated the relationship between cash and future prices in Brazilian agricultural markets, focusing on the effect on the trading activity on the price discovery mechanism. Their results suggested that higher trading activity is not linked to the presence of long-run equilibrium relationship between cash and futures prices, while in thinly-traded markets, long-run nor short-run interactions are significant.

Kumar and Sunil (2004) investigated the price discovery in six Indian commodity exchanges for five commodities. For their study they have used the daily futures and comparable ready 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. Besides, the study has empirically analyzed the efficiency of spot and future markets by employing the Johansen Co integration Technique. They found that inability of future market to fully incorporate information and confirmed inefficiency of future market. However, the authors concluded that the Indian agricultural commodities future markets are not yet mature and efficient.

Sahi (2006) studied the impact of introducing future contracts on the volatility of the underlying commodities in India. He found that unexpected increase in future activity in terms of rise in volumes and open interest has caused increase in cash price volatilities, suggesting that futures trading had a destabilizing effect on spot price commodities.

Iyer and Mehta (2007) found the cash market for two commodities (chana and copper) to be a pure satellite of the futures market in the pre-contract expiration weeks, and for four commodities (chana, copper, gold and rubber) in the expiration weeks.

Nath and Lingareddy (2007) in their study have attempted to explore the effect of introducing futures trading on the spot prices of pulses in India. Favoring the destabilization effect of futures contract, their study found that volatilities of urad, gram and wheat prices were high during post-futures period than that in the pre-futures period as well as after the ban of futures contract.

Sen and Paul (2010) have clearly suggested that future trading in agricultural goods and especially in food items has neither resulted in price discovery nor less of volatility in food prices. They observed a steep increase in spot prices for major food items along with a granger causal link from future to spot prices for commodities on which futures are traded.

4. Methodology

The sample used in the study consist of nine agriculture commodities which are actively traded on NCDEX in the study period of 1st April 2009 to 31st March 2010, selected according to the availability of data. The data consisted of the monthly average of closing spot prices and future prices of each of the sample commodities, which was collected from NCDEX website and other commodity database.

The market behavior was studied with the help of backwardation and contango. Contango refers to the percentage of times, future prices are higher than spot prices and backwardation refers to the percentage of times spot prices are higher than future prices.

With the help of data collected the Granger causality test have been used to test the price discovery i.e., the effect of futures market on the spot markets and vice-versa.

Granger causality (or “G-causality”) was developed in 1960s and has been widely used in economics since the 1960s. The granger causality is a statistical hypothesis test for determining whether one time series is useful in

forecasting others. Granger causality measures whether one thing happens before another thing and helps predict it. In the Granger-sense x is a cause of y if it is useful in forecasting y1.

Conceptually, the idea has several components:

- Temporality: Only past values of X can "cause" Y.
- Exogeneity: Sims (1972) points out that a necessary condition for X to be exogenous of Y is that X fails to Granger-cause Y.
- Independence: Similarly, variables X and Y are only independent if both fail to Granger-cause the other.

In Granger Causality Method, two models are estimated, a unrestricted model and a restricted model. A simple F test is used to determine if the added variable in the unrestricted model results in significantly smaller sum of squared residuals. P-values from this F test are reported rather than the F statistic itself.

The Unrestricted Model:

$$\Delta S_t = \propto + \beta \Delta f_{t-1} + \gamma \Delta S_{t-1} + e_t$$

The Restricted model:

$$\Delta S_t = \propto + \gamma \Delta S_{t-1} + e_t$$

If, by adding the change in futures price as an explanatory variable, the sum of squared errors is significantly smaller than in the restricted model, then we conclude that changes in futures position lead changes in spot price.

A second set of equations is also estimated, but in these the change in futures price is the dependent variable and change in spot price as the added independent variable in the unrestricted model. From these, we can test if a change in spot price leads a change in futures price.

5. Findings

Chana prices showed a prevalent pattern of contango (58.33%), with spot prices significantly lower than futures prices. In terms of price discovery, there was significant effect of futures prices on spot prices.

Wheat prices were also found to show a mixed pattern, with equal incidence of contango and backwardation, with no significant difference between spot and futures prices on average. In terms of price discovery, there was significant effect of futures prices on spot prices.

Cardamom prices were also found to show a mixed pattern, with equal incidence of contango and backwardation, with no significant difference between spot and futures prices on average. In terms of price discovery, there was significant effect of futures prices on spot prices.

Soyabean oil prices showed a prevalent pattern of contango (58.33%), with spot prices significantly lower than futures prices. In terms of price discovery, there was significant effect of futures prices on spot prices.

Jute prices were found to show backwardation (58.33%), with spot prices significantly higher than futures prices. In terms of price discovery, it was found that there was no significant effect of futures prices on spot prices and of spot prices on futures prices.

Mentha oil prices were found to exhibit chronic backwardation, both with high incidence of backwardation (91.67%). In terms of price discovery, it showed the same result as of jute. It was found that there was no significant effect of futures prices on spot prices and of spot prices on futures prices.

Rubber prices showed a highly prevalent pattern of contango (91.67%), with spot prices significantly lower than futures prices. In terms of price discovery, there was significant effect of futures prices on spot prices.

Potato prices were also found to show a mixed pattern, with equal incidence of contango and backwardation (50%), with no significant difference between spot and futures prices on average. In terms of price discovery, there was significant effect of futures prices on spot prices.

Crude palm oil prices were also found to show a mixed pattern, with equal incidence of contango and backwardation (50%), with no significant difference between spot and futures prices on average. In terms of price discovery, there was significant effect of futures prices on spot prices.

In terms of market behaviour, it was found that the commodities that showed contango to a marked extent, with average spot prices significantly lower than average futures prices, were as follows: chana (58.33%), rubber (91.67%), soyabean oil (58.33%), but the difference in their average spot prices and their average futures prices was not statistically significant. On the other hand, the commodities that showed significant backwardation, with average futures prices significantly lower than average spot prices, were as follows: jute (58.33%), mentha oil (91.67%). It was found that some commodities, viz. crude palm oil, wheat, potato, cardamom showed mixed tendencies of contango and backwardation, with no significant difference in average spot prices and average futures prices.

6. Conclusion & Implications

The price discovery mechanism is quite effective for most commodities, but may not be very effective for some commodities. In particular, causality in commodities markets can be used to either hedge or speculate price movements: if changes in spot prices drive changes in futures prices, efficient hedging strategies can be formulated; whereas if changes in futures prices drive changes in spot prices, efficient speculation strategies can be formulated. Further, causality can be used in forecasting commodity spot and futures prices.

As majority of Indian investors are not aware of organized commodity market; their perception about is of risky to very risky investment. Many of them have wrong impression about commodity market in their minds. It makes them specious towards commodity market. Concerned authorities have to take initiative to make commodity trading process easy and simple. Along with Government efforts, NGO’s should come forward to educate the people about commodity markets and to encourage them to invest in to it. There is no doubt that in near future commodity market will become Hot spot for Indian farmers rather than spot market. And producers, traders as well as consumers will be benefited from it. But for this to happen one has to take initiative to standardize and popularize the Commodity Market.

There are some limitations inherent in the present study. The study was limited to the period from 1st April 2009 to 31st March 2010. Further, the number of commodities was limited to only nine from only one commodity exchange and some important commodities could not be taken as data was not sufficiently available for them. Finally, data availability was a major issue; the data that was available was in some cases recorded once, and in other cases recorded twice daily. Therefore, only the prices which were nearest to the closing time were chosen.

Several natural processes such as seasonal cycles based on harvests, monsoons, depressions, and other weather events would also be expected to have an impact on price discovery in commodity markets; this is another area that needs to be studied. The asset storability also plays an important role in price discovery. This factor can also be considered for further study in this area.

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