

Impact Analysis of Commodity Futures on Spot Prices, and Risk Management in Essential Commodities

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In any agriculture-dominated economy, like India, the farmers face not only yield risk but price risk as well. Commodity futures and derivatives have a crucial role to play in the price risk management process, especially in agriculture. Commodity derivatives and futures are instruments to achieve price discovery and price risk management. After withdrawal of prohibition on futures trading in 2003, the volume of futures trade increased exponentially in agricultural commodities till 2005-06 but the trade in Bullion and other metals over took it in 2006-07. Overall, non-agricultural commodities have been dominating the futures markets in India.

There was a significant upsurge in prices of some of the agri-commodities from the middle of 2006 to the first quarter of 2007, though the contribution of agricultural commodities, particularly 'food grains', in WPI inflation was small due to relatively low weight. This spurt in prices of essential commodities and increasing inflation was, according to one school of thought, caused by the excess speculation in commodity futures trade and had become an issue of concern for the government as well as people. In response to the public outcry against futures markets and their perceived role in causing inflationary trends in the prices of essential commodities, on January 23, 2007, the FMC, at the suggestion of the Gol, de-listed two commodities - urad and tur, both pulses from trading on futures exchanges out of concern about rising food prices which was perceived as caused by speculation in the futures markets. Later, on February 27, 2007, FMC limited the trading in wheat and rice futures to squaring off until the expiration of running contracts, for similar reasons. Hence it is felt imperative to study the working of futures markets in agro-commodities, particularly essential commodities with the specific objectives of knowing the impact of

commodity futures on spot price volatility, to understand the problems in physical delivery procedure and farmers and traders views on commodity futures trading. Two crops viz.; wheat and maize have been selected for the study. Wheat being the major staple food crop and futures for wheat has been banned. Maize is also a cereal crop for which futures trade is continuous. Secondary as well as primary data were used to fulfill the objectives of the study. Daily prices of Wheat from Bareilly, Shahjahanpur and Hardoi markets and for maize from Davangere and Bangalore markets were collected from January 2000 to December 2008. Futures prices and trading volume and open interest data were collected from the website of NCDEX.

For collection of primary data, largest producing states and districts, one for each commodity, were selected for Wheat (Hardoi in Uttar Pradesh) and Maize (Davangere in Karnataka). From the district selected four villages for wheat and three villages for maize, in consultation with district agriculture officer and mandi officials, were selected for the study from the largest producing taluka/block. About 15% of the total crop growing farmers were selected randomly from the list prepared for crop growers in each village. To fulfill the objectives of the study, annualized volatility in market prices of wheat and maize was analysed (seasonal as well as before and after futures trading) from the return series of mandi prices.

To know the impact of introduction of futures on the volatility of spot prices, a measure of volatility was so constructed and regress it on a proxy variable (to account for macro-economic factors) and a dummy variable (to account for the impact of futures trading). Monthly volatility measure has been constructed as standard deviation of daily spot returns. This volatility series was constructed for wheat at Bareilly and Sahjahanpur market and for maize at Davangere market.

To know the effect of futures trading activity on the volatility of commodity prices, the Granger causality test was conducted by running the regressions on the wheat and maize futures trading data collected from NCDEX. This test will help determine if there is a bi-directional impact flowing from one to other prices

and vice versa. Apart from prices, the test is also used for understanding the relationship between volumes and prices of wheat and maize.

The annualized volatility was observed to be higher for the pre futures period for wheat where it was upto 26% during 2003 in Shahjahanpur and 27% for the year 2001 at Bareilly. Volatility of Wheat before futures period was 49% at Shahjahanpur and Bareilly markets, which has declined to 31% and 33% during the post futures period, respectively. But at Hardoi market volatility in wheat prices was 15% in pre-futures period which has increased to 31% in the post futures period.

In case of maize, annualized volatility was observed to be increased in the post futures period at Davangere and Bangalore markets. This was mainly because of the higher day-to-day variation in arrival grades of maize in the APMC markets and prices in the market were not reported separately for different specified grades. Thus, the annualized volatility analysis gave the mixed results for the two selected commodities.

The volatility in wheat prices at Bareilly market was higher during pre-futures period. Monthly pattern shows higher volatility during harvesting months and in the October month. Post futures monthly volatility in wheat prices observed to be higher during pre-harvest and harvest months particularly in the year 2006. Monthly volatility in wheat prices at Shahjahanpur indicates that wheat prices in March and April months were fluctuating higher during pre-futures which have reduced during post futures but during post futures volatility in wheat prices in the lean months has increased compared to pre-futures period. Monthly volatility pattern in Maize prices at Davangere market suggests that during pre-futures period the volatility in maize prices was higher in pre-harvest and harvest months which also continued during post futures period. Also the volatility during lean months has increased marginally during the post- futures period.

Impact of Futures on Volatility

The preliminary analysis was conducted on the mandi by the descriptive analysis and unconditional volatility on the price data collected from Bareilly and Shahjahanpur for wheat and from Davangere for maize, the monthly SD of daily return series of this data was modeled as GARCH (1,1) to know the impact of futures introduction on the series. The purpose of this study is to empirically investigate the effect of introduction of futures trading on the market price volatility of wheat and maize. The main hypothesis that the volatility of the spot market has not changed after the introduction of futures is investigated along with others such as change in news transmission speed and change in persistence of volatility shocks.

The main finding of this investigation is that there has not been any significant change in the spot price volatility after the introduction of futures trading for both market prices in case of wheat and maize, implying thereby that there is no impact of introduction of futures trading in wheat and maize. However, the coefficient for the after futures ban in wheat period was found significant and negative in case of Bareilly, suggesting that the volatility there is marginal reduction in volatility after ban in futures.

To examine if the nature of volatility remains same after the introduction of futures in wheat and maize and after delisting of wheat futures, the sample is divided into pre-futures, post-futures and after futures ban and then run the GARCH process for each period. From the results of analysis indicated that there is no significant change in the nature of volatility in three sub-periods for wheat at Shahjahanpur and two sub-periods for maize at Davangere, suggesting that introduction of futures in wheat does have neither stabilizing nor destabilizing effect on wheat and maize, and therefore, did not contribute to the increase in the market efficiency of the spot markets.

But in case of Bareilly market the nature of volatility has changed after the introduction of futures trading. Thus, pre-futures the effect of information was

persistent over time, i.e. a shock to today's volatility due to some information that arrived in the market today, has an effect on tomorrow's volatility and the volatility for days to come. After futures contracts started trading the persistence has disappeared. Thus, any shock to volatility today has no effect on tomorrow's volatility or on volatility in the futures. This might suggest the increase in market efficiency after futures, since all information is incorporated into prices immediately.

In order to check the parameter stability in the regression models of pre-, post-futures and futures ban, assuming constant error variance, Chow test for structural change signifies that the regression coefficients statistically does not differ for three sub periods, thus suggesting that there is no any structural change in the nature of volatility in all three price series.

Impact of Trading Activity on Volatility

The results of the Granger causality test suggested that volume of wheat trade in futures had a significant causal impact on open interest and vice versa, both volume and open interest on futures had significant causal impact on spot price volatility and not vice versa, futures prices had significant causal impact on spot prices and vice versa. It is evident from the results of the Granger causality test for maize that futures prices had a significant causal impact on spot prices of maize and vice versa, volume had a significant causal impact on futures prices and vice versa, and volume had a significant causal impact on spot price volatility and not vice versa. Thus, volatility in futures prices does have a causal effect on the volatility in spot prices of wheat and maize. Further, the futures trading activity has a significant causal effect in spot prices of wheat and maize.

Performance of Commodity Futures

To understand the performance of commodity futures, ratio of standard deviation of futures to spot price and ratio of standard deviation of basis to spot was calculated. The results indicated that the futures and spot price variability is substantially different for Wheat and Maize. The results suggests that the futures

price variability is substantially less than the cash price variability in some of the contracts of wheat, indicating inefficient utilization of information if we assume cash markets are efficient. The month-wise analysis indicates that there may be the increased speculative activity in the delivery month in few contracts or prices not incorporation current information efficiently.

For maize futures, the ratios are either higher than 1.25 or lower than 0.75 for most of the contracts analysed indicating that the futures prices do not utilize information efficiently as their cash markets. The ratio turned out to be greater than 1.25 in the expiry/ delivery month contracts for more 50 per cent of the contracts indicating that futures price volatility was higher compared to the spot prices, and less than 0.75 for about one fifth of the contracts indicating increased speculative activity in the delivery month or prices not incorporation current information efficiently.

Basis and spot price risks are assessed by computing their standard deviation for each month and for every contract. In case of wheat futures at NCDEX, the ratios shows that there were very few contracts with less than 0.5 ratios and in most of the contracts the ratio was worked out to be more than 1.0 implying thereby that variation in basis was higher than the spot price variation leaving meager chance to hedgers to manage risk. Thus, futures contracts in wheat does not provide hedge opportunity. In case of maize, the ratios worked out were less than 0.5 for most of the cases indicating that the volatility in basis is less than the volatility in prices and these results suggests that the hedger find futures useful to manage business risk. Thus futures contracts of maize provide perfect hedge opportunity to minimize their risk through hedging activity.

The mandatory requirements for physical delivery and farmers' participation

- The participants giving delivery are required to be registered with sales tax
- The participants giving delivery are required to be registered with the respective local mandi and *mandi* tax paid receipt /certificate is required to

be handed over/transferred to the next buying member/client along with other settlement related documents like invoice/s.

- Requirement for opening of client account: proof of identity, proof of address, proof of bank account, proof of demat account, proof of sales tax registration, copy of PAN card (Mandatory), copy of latest income tax return and information about last three years income and investment. Farmers as a participant of commodity futures trading can't even open an account with the broker members as list of documents required for opening of accounts with brokers may not be available with farmers like PAN number, registration of sales tax, copy on income tax return, etc.

The response regarding delivery of commodities on or from commodity exchange designated warehouses revealed that no any wheat and maize trader and processor taken physical delivery as well as no one tendered for physical delivery. The reasons cited for not taking or making physical delivery were the problem of delivery location, problem of assaying in the district place, complex procedure of taking or tendering physical delivery, time consuming process of taking or making physical delivery, etc. Some of the traders in group discussion revealed the common problems they encounter with in physical delivery are:

- Delay in giving physical delivery- this even may take 15 to 20 days after the date of contract expiry. According to contract specifications and exchanged delivery guidelines, there is no compensation in case of such late deliveries, and the participants has to bear the loss, if any, to them in terms of difference on the price at contract expiry at which physical delivery was settled and the change in spot prices during those 15 to 20 days.
- Inferior quality of the delivered commodity- is another type of problem few of the traders face in the physical delivery and also not compensated for the lower quality in terms of charging discounted price. They further revealed that due to this reason we do not go for physical delivery of commodities instead prefers to settle in cash.

Farmers Awareness and Decision Making

From the observations of the study it can be inferred that, in case of wheat farmers only 2 farmers out of 241 total sampled farmers in Hardoi district of Uttar Pradesh have only heard about commodity futures. They do not know further about the commodity futures and its direct or indirect benefits they can derive. In case of maize, only 4 farmers out of 251 total selected farmers from Davangere district of Karnataka were aware about commodity futures.

While deciding on the area to be put to cultivation of different crops (crop selection and area allocation decision), all category of farmers consider previous years price of the crop in mind along with the factors like price of related crop and resource availability with them. The maize farmers in Davangere district considers previous year's price of the crop as a major factor to decide the area allocation at the time of sowing maize. The other factors farmers consider at the time of deciding on area allocation under different crops were price of the related crop, resource availability with them and labour availability. Since most of the farmers were not aware on direct and indirect use of commodity futures in their farming business, they do not consider futures price of harvest period contract at the time of making decision on area allocation to a particular crop during sowing of the crop.

Farmers Information Seeking Behaviour and Source of Price Information

As regards price information source, wheat farmers in the study area bank mainly upon traders (83% farmers reported sourcing price information from traders) followed by fellow farmers (43%), news paper (38%) and television/radio (37%). Very few farmers take price information from mandi, implying that for farmers in the study area traders were easily accessible and trusted source for getting information related to commodity prices. Major source for getting price information for maize farmers in Davangere district were traders in the market (57% of the total farmers responded seeking price information from traders),

followed by fellow farmers (36%), news papers (28%), and radio/television (26%).

Risk Management through Retaining Produce for future sale

The sales deferring behaviour of wheat farmers in Hardoi district revealed that one-fourth of the total farmers store their produce of wheat for taking benefit of higher prices. About 76% farmers of medium category were highest to store their produce for future sale followed by Semi-medium farmers (48%) and marginal and small farmers (10%). For storing the produce no any farmer availed credit or pledge loan. If benefits of warehousing receipt and pledge loan scheme be transferred through greater awareness among targeted farmers, more farmers can get benefit of higher prices in the lean season. In case on maize, about 45% farmers defer the sale of maize at the time of harvest to gain higher prices in the future point of time. Majority of large and medium farmers defer sale of maize for future period and store maize in their homes/godowns, while only a quarter of marginal and small farmers store maize for managing price risk and taking benefit of higher prices in the market during lean season.

The farmers stored their wheat for seven to eight months period after the harvest to take the maximum benefit of the increased market prices during the lean season. That means they sale their wheat in the months of November-December months. Maize farmers in Davangere deferred sales for about 3-6 months and store the produce. The farmers sold their produce at the time of high prevailing prices in the market after 3-4 months of storage.

Decision factors for deferring sales of wheat produce and storing it for sale in future point of time when prices in the market are high are previous years price of the crop during lean season and expectation of high price in future point of time through own analysis. It is obvious that with the negligible awareness about commodity futures, farmers does not consider futures price while deciding on deferring sale and storing wheat for sale in future. Prices of maize realized by farmers in the previous year and own analysis of expected price in the future

point of time were the major factors based on those farmers decided to defer sale and put the produce to store to minimize price risk and gain from higher prices.

Money requirement for meeting different obligations by farmers was the major factor that decides the time of sale of stored wheat by farmers in Hardoi followed by the prevailing high price in the market during lean season. Farmers under medium farm size group were the majority of farmers who stored wheat for sale in future and they decide to sale stored wheat when prices in the market were high during lean season. The time of sale of stored maize with the selected farmers in Davangere district of Karnataka was decided by the prevailing price in the market. More than 90% farmers who stored maize for future sale responded that they decide time of sale on the basis of prevailing high price in the market. About 70% responded the need of money for meeting different family obligations as a factor in deciding the time of sale of stored maize.

The farmers, who had stored wheat, gained Rs. 46.5 per quintal benefit in terms of higher price than the harvest period price. Semi-medium farmers got highest benefit of Rs. 64.5 per quintal followed by Medium (Rs. 49.5/qt.) and marginal & small farmers (Rs. 38/qt.). The risk management by maize farmers through deferring sales of maize produce and selling it after 3-5 months paid on an average Rs. 31 per quintal to the selected farmers as increased price realization compared to the prices in the harvest period. Since most of the wheat and maize farmers were not aware about the commodity futures trading and role of futures price as an indicative spot price for future date, they did not consider take use futures price indication at the time of sale of their produce in the market.

Farmers' inability to manage risk through Commodity Futures

The major factors that hinder the farmers to take active part in commodity futures and benefit directly through hedging were:

- most of the farmers were unaware on commodity futures concept and thus unable to benefit from this market instrument;
- the average total production of wheat and maize per farmers is well below the lot size on commodity futures and leaving home requirement aside,

- the marketable surplus with them did not qualify the lot size, hindering them to take part in commodity futures; the cash requirement to fulfill the margin requirement is about Rs 10,000 to 15,000 they have to deposit at the time of entry in the market, maintain mark-to-market margin and tender period & Delivery period margin which was 2-3 times higher than normal margin requirement is so high that they need finance;
- The delivery centres were also limited to few locations and that too far away from their locations leading increased cost of delivering commodities in physical to exchanges; The fear of non-compliance of commodity quality to the contract specifications at the time of assaying leading to major loss to farmers;

Perceptions of Wheat Traders and Processors

About 31 traders and 5 processors of wheat were selected for the study on their perceptions and use of commodity futures in their business. Ten traders from Bareilly and Shahjahanpur APMC markets and 11 traders from Hardoi market were selected for the study. Out of total 34 traders and processors trade on commodity futures, 15% trade on NCDEX exchange platform, 24% trade on MCX, and 62% trade on both the national level commodity exchanges. All the traders trade in wheat and other commodities in which these traders trade were Guar, Mentha oil, Pulses, Silver, Gold and Crude. Out of 25 maize traders and processors selected in davangere market who trade in commodity futures, 68% trade on NCDEX exchange platform and 32% trade both in NCDEX and MCX exchange platform. Maize traders in Davangere trade mainly in maize, paddy, and sunflower in mandi and in futures they trade mainly in Maize, Guar, Chilli, gold, silver, etc.

Knowledge of Traders on Commodity Futures

Out of the total traders and processors trade on commodity futures, responded that all know about commodity futures, only 44% were aware about the benefits of commodity futures, 38% know about the role of commodity futures in their

business, only 12% know on how to participate in commodity futures, only 1 trader knows hedging and physical delivery procedure and contract specifications, and only 12% were aware about margin and cost of hedging.

Almost all the maize traders and processors in Davangere responded that they know about commodity futures and their benefits to them and the economy. About 96% traders and processors responded that they know the role of commodity futures trading in their business and about 85% know about the procedure of participating in commodity futures trading. About 93% traders and processors were aware about hedging mechanism on commodity futures but only 33% know about the physical delivery procedure of commodities on exchange platform and only 30% were aware about margin system and cost of hedging. Seventy per cent of the traders were aware on contract specifications of commodities traded on exchange platform.

Most of the wheat traders and processors responded that their position in commodity futures was mainly based on advice from broker operator and specialists' opinion. Only one trader responded that his decision to take position in commodity futures was based only on own analysis of supply and demand condition of the commodity they trade in. A quarter of maize traders and processors taken position in commodity futures based on own analysis of demand and supply condition of the commodity. About two-third traders take position based on advice either from broker operator or specialist opinion.

Impact of futures on Trade

On the question of impact of commodity futures with Wheat traders in Hardoi, Bareilly and Shahjahanpur markets of Uttar Pradesh, most of them responded that there was no any effect of introduction of commodity futures on their turnover, cost of trade, profit earning out of their business and price risk management. A quarter of wheat traders responded that the price risk after ban of futures trading in wheat has increased. On the other hand, most of the maize traders and processors responded that turnover of their trade had increased after the introduction of futures trading in maize, 85% responded that the cost of trade

had reduced, 81% responded that profit have increased and 96% traders and processors had responded that their price risk have reduced after introduction of commodity futures in maize.

Perception regarding commodity futures

The perception of most of the wheat traders and processors was positive on commodity futures trading as about 50% traders responded that the futures trading is an instrument of better price discovery, price risk management and futures prices help in better bargaining. But still half of the traders and processors selected does not know much about these aspects or were negative on these aspects of commodity futures requiring thorough understanding of the concepts and process. Thus, thorough training of this important segment of stakeholders of commodity futures is required.

On the perception of maize traders and processors, more than 70% responded that the commodity futures is an instrument of better price discovery, price risk management, it disseminates real time price information and thus help in better bargaining at the time of buying/ selling of commodities. Commodity futures is transparent and trusted trading platform was responded positive by more than 90% traders.

The response regarding delivery of commodities on or from commodity exchange designated warehouses revealed that no any trader processor taken physical delivery as well as no one tendered for physical delivery. The reasons cited for not taking or making physical delivery were the problem of delivery location, problem of assaying in the district place, complex procedure of taking or making physical delivery, time consuming process of taking or making physical delivery, etc.

Recommendations:

- Exchanges and clearing houses should ensure the timely delivery of the commodity and in case of delay in the delivery, buyers should be compensated upto the date of delivery instead of paying a pert from the

- penalty amount charged from seller on the basis of E+5, in case of loss to the buyer participant.
- Exchanges and clearing houses should also ensure delivery of commodity satisfying the quality as per the contract specifications else compensate through charging discounted price commensurate with the difference in quality instead of exact entry price.
 - Since awareness regarding commodity futures among farming community as well as among traders and processors is very limited. Thorough training on project basis for farmers and traders on the use and role of commodity futures prices is required. This will boost up the direct and indirect use of commodity futures in farming as well as trading business and risk minimization.
 - Since most the farmers in the country are small and marginal and semi-medium farmers having minimum marketable surplus, intermediary organizations may be promoted who would assume the role of aggregator and hedge the farmers stock on futures on behalf of farmers. These organizations should be given thorough training on all aspects of commodity futures and agricultural marketing and should have legal status for taking positions on behalf of farmers in commodity futures.
 - Introduction of smaller trading lots in all the major food grains items may ensure mass participation by the farmers leading to in the increased stability in the futures as well as in physical market. With the introduction of small trading lots the participation of genuine participants and farmers as hedgers can be increased in futures trading which would lead to better price discovery.