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COMMODITY FUTURES AND PRICE DISCOVERY – A CASE OF COTTON IN INDIA

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Abstract

Commodity Futures and Derivatives have been well recognized in the context of price discovery and price risk management. The present study is an investigation into the agricultural commodity futures, taking cotton as a case. An econometric analysis was carried out to evaluate the efficiency of a sample set of markets in price discovery. The results show that the price discovery does not occur in the cotton futures. The major ills that retard the growth of futures markets are identified and discussed. The policy directives are evolved to make the futures and derivatives a more vibrant segment of the economy.

Introduction

Commodity Futures and Derivatives have been well recognized in the context of risk management and forward pricing for a long time(FMC,1952).However, till late 1980s, its use was limited to a few developed countries where it has emerged as a highly developed market. During 1990s, the economic liberalization in many countries has led to increasing withdrawal of the government's intervention from agricultural commodity sector, which has made agricultural prices depend on domestic and international market forces (UNCTAD, 1997 & 1998). As a result, the need for an effective price risk management mechanism for the protection of commodity sector from price volatility has been felt earnestly.

Changing economic environment, increasing commodity uses through value addition at different stages, increasing number of market participants, changing demand and supply position of agricultural commodities and growing international competition require wider role for futures markets in the agricultural economy(Wang,2003). Therefore, many countries have been establishing and promoting commodity futures market. In India also, where the futures market had been in a dormant stage for a long time, the interest in the futures markets has revived and efforts are being made to promote futures markets in the country for their wider role in the changing economic environment. At present, the futures and derivatives segment has been growing at an encouraging rate which is a good sign of development. The present study is an attempt to analyse the futures' market in its role of price discovery.

Futures and Price Discovery

Futures contracts perform two important functions of price discovery and price risk management with reference to the given commodity (Garbade,1982). It is useful to all segments of economy. It is useful to producer because he can get an idea of the price likely to prevail at a future point of time and therefore can compare between various competing commodities and decide on the best that suits him. It enables the consumer to get an idea of the price at which the commodity would be available at a future point of time. The futures trading is very useful to the exporters as it provides an advance indication of the price likely to prevail and thereby help the exporter in quoting a realistic price and secure export contract in a competitive market. Having entered

into an export contract, it enables him to hedge his risk by operating in the futures market.(FMC, 2000).

Hedging in Futures Market

Futures market attracts hedgers for risk management and encourages considerable external competition from those who possess market information and price judgment to trade in these commodities. While hedgers have long-term perspective of the market, the traders or arbitragers, prefer an immediate view of the market. However, all these users participate in buying and selling of commodities based on various domestic and global parameters such as price, demand and supply, climatic and market related information. This results in efficient price discovery, allowing a large number of buyers and sellers to trade on these exchanges(Jones,1994).

Hedging is the practice of off-setting the price risk inherent in any cash market position by taking an equal but opposite position in the futures market. This technique is very useful in case of any long-term requirements for which the prices have to be firmed to quote a sale price but to avoid buying the physical commodity immediately to prevent blocking of funds and incurring heavy holding costs (Tomek and Peterson, 2001).

The Process of Price Discovery

Futures prices increase or decrease largely because of myriad factors that influence buyers' and sellers' expectations about what a particular commodity will be worth at a given time in future. As new supply and demand developments occur and as more current information becomes available, these judgments are reassessed and the price of a particular futures contract may be bid upward or downward. This process of reassessment of price discovery is continuous. On any given day, the price of a July futures contract will reflect the consensus of buyers' and sellers' current opinions about what the value of the commodity will be when the contract expires in July. As new or more accurate information becomes available or as expectations change, the July futures price may increase or decrease. Competitive price discovery is a major economic function—and, indeed, a major economic benefit—of futures trading. Through this competition, all available information about the future value of a commodity is continuously translated into the language of price, providing a dynamic barometer of supply and demand. Price "transparency" assures that everyone has access to the same information at the same time (Hazell, 1990).

Whether Futures Markets are Efficient in Price Discovery?

Farmers normally seek to lock in a value on their crop and were willing to pay a price for certainty. They give up the chance of very high prices in return for protection against abysmally low prices. This practice of removing risk from farm business is called hedging. As a rule of thumb, about half of the participants in the futures markets are hedgers who come to market to remove or reduce their risk. For the market to function, however, it cannot consist of only hedgers seeking to lay off risk. There must be someone who comes to market in order to take on risk. They are the "speculators." Speculators come to market to take risk, and to make money doing it. Some speculators, against all odds, have become phenomenally wealthy by trading futures. Interestingly, even the wealthiest speculators often report having gone broke one or more times in their career because speculation offers the promise of astounding riches with little apparent effort, or the threat of devastating losses despite even the best efforts. But our interest in the present

study is to examine how far these futures markets are helpful to farmers who would like to hedge their produce as a means of price risk management. However such type of hedging will be successful only if these futures markets are efficient in price discovery (Sudhir **et al**, 2004).

Objectives

In the present study, an attempt has been made to empirically verify whether these futures markets are efficient in their role of price discovery, taking Cotton as a case. The following are the specific objectives of the study;

i) To assess the efficiency of futures market in its role of providing hedge against price risk in agricultural commodities with specific reference to cotton in India

ii) To carry out an econometric analysis of price discovery and price behaviour of spot and futures market.

iii) To identify the bottlenecks in agricultural commodities trading and possible policy solutions for improving the futures markets in India, taking cotton as a case.

Period of Study and Sources of Data

The present study was carried out from February 2005 to January 2007 and the data regarding futures and spot prices of medium staple cotton and long staple cotton were collected from official websites of the commodity exchanges (MCX and NCDEX).

Methodology

The present study has utilized Ordinary Least Square (OLS) method for estimating regression equations. The problem of serial correlation has been diagnosed and the iterative Cochrane-Orcutt procedure has been used for making necessary adjustments in coefficient estimates. The study has used Wald chi-square procedure for parametric restriction on coefficients to test market efficiency and unbiasedness of futures prices. Bartlett's homogeneity of variance test has been used for testing the integration between spot and futures markets.

Expectations Theory Hypothesis

The price discovery is the process of determining the price of a commodity, based on supply and demand factors. The expectations theory hypothesises that the current futures price is a consensus forecast of the value of spot price at a future point of time. For example, today's 90 day cotton futures rate is a market forecast of the spot rate that will prevail in the spot market after 90 days. The futures market for a commodity is said to be efficient when the n-period futures rate ($FP_{t,n}$) is equal to the futures spot rate (SP_{t+n}) The efficient market ensures that the average difference between today's futures rate (with *n* day maturity) and the subsequent spot rate *n* days later was zero. The difference, if any, represents both the futures rates forecasting error and the opportunity for gain (or loss) from open positions in the market. The efficiency of the futures market is usually examined by testing the unbiasedness of futures rate as a predictor of spot rate that will prevail in the future.

Hypothesis I

The hypothesis postulated in the present study is that the futures markets are efficient in the sense that **the price discovery occurs in futures market.**

Tools of Analysis

The above hypothesis can be tested by the following set of regression equations with parametric restrictions on its coefficients:

$$DISCP_{t+1} = \mu + \lambda\ FUSP_t + \varepsilon_{t+1} \quad (1)$$

$$DISCP_{t+1} = (SP_{t+1} - SP_t) \quad (2)$$

$$FUSP_t = (FP't - SP't), \quad (3)$$

where SP_t and SP_{t+1} are the logarithm of the spot rate at time *t* and *t+1* respectively. PF_t

is the logarithm of the futures rate established at time t for period $t+1$, and ε_{t+1} is an error term. In this form, the unbiasedness hypothesis implies that $\mu = 0$ and $\lambda = 1$. Such a restriction is consistent with the model of a competitive market with no transaction costs, risk-neutral speculators and market expectations which are rational. For that model, the expectation of premium or discount in the futures market is as follows:

$$E_t [DISCP_{t+1}] = FUSP_t \qquad (4)$$

Where E_t is the mathematical expectation operator conditional upon some information set. The test relation (1) and the joint null hypothesis of rational expectations and no risk premium implicit in (2) can be related by decomposing the actual change in the spot rate into two orthogonal components.

Testing the Hypothesis I

Testing the unbiasedness hypothesis involves estimating a regression equation (1) with coefficient restrictions and determining whether the coefficient estimates of $\mu = 0$ and $\lambda = 1$ are significantly different from zero and one respectively and this can be tested by Wald chi-square test statistics. The study has utilized the OLS method to estimate the equation for daily futures prices of medium staple and long staple cotton for multiple contracts. The coefficient estimates of the equation are corrected for serial correlation by using iterative Cochrane -Orcutt procedure and the autoregressive parameter (ρ) estimates are reported. The daily prices of multiple contracts have been used for estimation. To test the unbiasedness and whether futures prices are the optimal forecaster of the futures spot prices, the restriction $\mu = 0$ and $\lambda=1$ has been tested by estimating equation (1) by OLS and by using Wald chi-square test of the joint hypothesis that $\mu = 0$ and $\lambda = 1$.

Empirical Results

The test results based on the estimates of the equation (1) are presented in Table1. It could be inferred from **Table- 1** that the joint null hypothesis that $\mu = 0$ and $\lambda = 1$ is rejected in all sample cases. The significant Wald chi-square test statistics indicate that futures markets are not efficient in predicting the futures spot prices.

The main reason for such inefficiency in futures market is due to the fact that the commodity exchanges have very thin trading volumes and infrequent trading. In spite of a developed spot market for cotton, the futures markets do not attract traders. As a result, the futures markets are much useful to only speculators rather than the farmers who would like to hedge their produce.

A perfect hedge guarantees that the profit or loss on the futures contracts fully offset the loss or profit on the physical transactions in the spot market. The results testify the fact that the futures contracts are not perfect hedge against variations in spot prices. Any disparity between the futures price for a specific maturity contract and the spot prices in physical market on the day of the maturity of futures contract, exposes the participants to basis risk. The users of futures markets face this risk because the specific physical commodity they wish to hedge does not have the same price development as that of the standardised futures contract.

There may be many imperfections in the cotton futures market which would make spot prices deviate from the corresponding futures prices. Firstly, thin volume, infrequent trading and meager portion of physical delivery of the commodity traded are the major reasons why futures market does not have the same development as the corresponding spot market. Secondly, in cases where government intervenes

to manipulate the market by affecting supply (like monopoly procurement in cotton), the relation between futures prices and spot market prices may get distorted. Thirdly, in most cases, futures exchanges are not located in the area where well developed spot market exists. Finally, most of the agricultural products are produced in unorganised sector involving lakhs of smallholdings and there are many intermediaries between farmer and wholesaler/exporter. This makes the supply and price development in spot market unpredictable.

Hypothesis II

There exists equal variances in the spot and future prices of cotton in India.

Testing the Hypothesis II (The Test of Equality of Variances)

The uniform and interdependent behaviour of the two markets has been verified by testing the equality of variances of futures and spot market price changes using Bartlett's statistic. According to the test, the null hypothesis of equal variances is rejected, if the test statistic exceeds the critical value from a χ^2 distribution with (n -1) degrees of freedom. The price and returns behaviour in futures and spot markets may differ. However, both the markets would be better integrated if the market is matured. Higher price volatility in the spot market would make the futures market more active as it provides hedge against the risk and provide better opportunity for speculators for booking profit. The results of Bartlett's homogeneity of variance test are reported in Table 2.

The Bartlett's test statistic is insignificant in both the exchanges, signifying that these two futures markets are not at all aligned with their respective spot markets. An essential condition for a vibrant futures market in any commodity is the presence of active participation of many trading members and frequent trading and proximity of developed spot market. This proximity and interdependence make risk management more efficient and accessible to various participants. A highly volatile spot market boosts trading activity in futures and a resultant increase in the volume of activity which would eventually reduce futures price volatility. But here, as far as the cotton futures are concerned, the price volatility in spot markets did not have any impact on the market conditions in futures markets and hence it shows that the futures market and spot markets are not integrated.

Conclusion

The commodity derivatives have a crucial role to play in the price risk management process, especially in any agriculture dominated economy. The present study is an investigation into the agricultural commodity futures, taking cotton as a case. An econometric analysis has been carried out to evaluate the efficiency of a sample set of markets in price discovery. The results obtained from a statistical analysis of the data on price discovery in a sample of four contracts traded in futures exchanges show that the futures market in both medium and long staple cotton are not efficient and it implies that the cotton futures exchanges failed to provide an efficient hedge against the risk emerging from volatile prices of cotton. The difference between the futures prices and the futures spot prices is an indication of inefficiency arising from the underdeveloped nature of the market. The exchange specific problems like low volume and market depth, lack of participation of trading members and irregular trading activities along with state intervention in the commodity markets are major ills retarding the growth of futures market. The following are the policy directives for improving the futures and derivatives market in India, with specific reference to agricultural commodities.

Future Policy Directives

- The Policy should facilitate the creation of a new institutional design exclusively (Like

SEBI in the case of Stock Exchanges)for governing, monitoring and regulating the futures and derivatives markets in agricultural commodities.

- Ø Policy should aim to reduce the margin money in commodities where there is less price volatility to increase market depth.
- Ø Institutional creation of a new service sector with Public-Private Partnership to deal with the standardisation and grading of agricultural produce.
- Ø Policy directives should ensure certain percentage of contract linked to compulsory physical delivery and off take to avoid too much of speculation.
- Ø Shifting the focus of the present system of production oriented extension to market oriented extension in agriculture to create awareness on Futures & Derivatives among farmers.
- Ø Enhancing the Capacity Building of Farmers' Organisations through NGOS' intervention.
- Ø Quality linked "On-Line Pricing" with provisions for enforcement of appropriate sanctions against defaulters in commodity trading.

A review of the nature of institutional and policy level constraints facing this segment calls for more focused and pragmatic approach from government, the regulator and exchanges for making the agricultural futures and derivatives markets a vibrant segment for risk management which can play an important role, especially in an agriculture dominated economy of India.

Table -1
Restricted Least Squares Regression Output

Commodity	Contract	μ	λ	Wald	D-W	Adj R^2	ρ_1	ρ_2
Medium staple cotton	March 2006	-0.22 (-2.37)	0.51 (85.15)	152.07 (0.00)	1.48	0.94	1.07 (9.24)	-0.31 (-2.42)
Medium staple cotton	Nov. 2006	-0.24 (-0.12)*	0.76 (32.14)	8.52 (0.001)	1.67	0.92	1.22 (11.28)	-0.29 (-2.70)
Long staple cotton	April 2006	0.09 (0.95)	0.68 (14.36)	25.57 (0.002)	1.59	0.95	1.09 (35.67)	-0.32 (-1.58)
Long staple cotton	Nov. 2006	0.16 (2.89)*	0.81 (17.69)	116.49 (0.003)	1.70	0.91	1.19 (24.31)	-0.33 (-1.84)

The values in parenthesis are f-statistics. Wald is the Wald Chi-square test statistic with the corresponding *p*-values in parenthesis.

Table- 2
Bartlett's Homogeneity Variance Test

Commodity	Variance		Bartlett's statistic
	Futures returns	Spot returns	
Cotton (NCDEX)	0.004	0.017	0.032
Cotton (MCX)	0.008	0.012	0.045

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