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REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

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APPENDIX/ANNEXURE

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MODELING AND MEASURING PRICE DISCOVERY IN COMMODITY MARKET

DR. SUYASH N. BHATT
ASSOCIATE PROFESSOR
PRIN. L. N. WELINGKAR INSTITUTE OF MANAGEMENT DEVELOPMENT & RESEARCH
MUMBAI

ABSTRACT

The study was carried out to understand the price discovery mechanism in commodities and assess the long-term trends in their prices. We took the commodity: wheat as an instance and considered factors affecting the prices in India. The data on area, yield, production, beginning stocks, imports, exports, and domestic consumption was collected for the period from 1970-71 to 2009-10 from USDA Production, Supply, and Distribution database. The data on CBOT daily prices have been extracted from MCX and the average annual price of wheat worked out and used for the analysis. Depending upon the suitability of the data the regression equations were fitted and forecasted individually and then the long-term forecasting was made by fitting a multiple regression model. The results of the multiple regression indicated that Demand, MSP, and CBOT were affecting the prices of domestic wheat significantly. One year lagged response model was also used to predict the short-term trends in prices of wheat. The predicted line is coinciding with the actual line and hence the model is good.

KEYWORDS
Price discovery, commodity market.

INTRODUCTION

Commodities are regarded as separate assets in the domain of all assets class. It is perceived that commodity markets are volatile. Therefore, the price volatility drives the demand for hedging the risk in the commodity market. Producers and consumers often seek ways of hedging risk and trading risk. In response to this need, derivative markets for commodity risks trading arose, and their use has become increasingly widespread. Instruments traded in these markets include financial instruments such as futures and forward contracts, options, swaps, and physical instruments like inventories. Future contracts are among the most important of these instruments, and provide significant information about cash and storage markets. A futures contract is also an agreement to deliver a specified quantity of commodity at a specified future date, at a price (the future price) to be paid at the time of delivery. Futures contracts are usually traded on organized exchanges and tend to be more liquid than the forward contract. Other than this, a futures contract differs from a forward contract only in that the futures contract is 'marked to market', which means that there is settlement and corresponding transfer of funds at the end of each trading day. Future market performs several economic functions that include hedging function, price discovery function, financing function, liquidity function and price stabilization.

Commodity futures trading existed in India since 1875. However the commodity futures have been in the state of hibernation for the past few decades owing to a lot of government restrictions. Significant developments took place in 2003-04 in terms of commodity futures market. The government issued a notification on April 1, 2003 withdrawing all previous notifications which prohibited futures trading in a large number of commodities in the country. This was followed by a notification in May 2003 revoking prohibition on non-transferable specific delivery forward contracts. The futures market was opened in anticipation of sound market institutions and market design. In order to set up proper markets, the Government of India (GOI) on recommendation of Forward Market Commission (FMC) granted recognition to National Multi Commodity Exchange, Ahmedabad (NMCE); Multi Commodity Exchange, Mumbai (MCX); National Commodity and Derivative Exchange, Mumbai (NCDEX) as nationwide multi commodity exchanges. Trading commenced at MCX in November 2003 and at NCDEX in December 2003. The FMC applied high standards to the market design. All the three exchanges were required to ensure anonymous order-matching. Prior to these exchanges trading typically took place in small groups who knew each other. But new exchanges offered electronic clearance scheme. The centralized nature of electronic system would overcome difficulties of fragmented and non-transparent price discovery. The FMC also drew upon the learning of equity markets in terms of favoring the demutualised governance structure for the new exchanges. Setting up futures markets was not simple owing to the fact that there is no properly developed spot market. The spot market is fragmented geographically spread across the country. NCDEX for example had to introduce a polling mechanism for spot prices from across mandis. Every commodity had a different set of mandis to be polled depending upon the proportion of spot market trade. The total volume of trade in the commodity future market rose from Rs. 34.84 lakh crore in 2006 to Rs. 36.54 crore in 2007. The volume growth in trade is primarily propelled by MCX and NCDEX. These exchanges also account for a large number of futures contract traded.

Under efficient markets, new information is impounded simultaneously into cash and futures markets. In other words, financial market pricing theory states that market efficiency is a function of how fast and how much information is reflected in prices. The rate at which prices exhibit market information is the rate at which this information is disseminated to market participants. However, in reality, institutional factors such as liquidity, transaction costs, and other market restrictions may produce an empirical lead-lag relationship between price changes in the two markets. Futures markets given their inherent leverage, low transaction costs, and lack of short sale restrictions. Risk transfer and price discovery are two of the major contributions of future markets to the organization of economic activity. Risk transfer refers to hedgers using futures contracts to shift price risk to others. Price discovery refers to the use of future prices for pricing cash market transactions or price discovery means that futures price serves as market's expectations of subsequent spot price. In other words, price discovery is the process by which markets incorporate this information to arrive at equilibrium. In a static sense, price discovery implies the existence of equilibrium price and in a dynamic sense, the price discovery process describes how information is produced and transmitted across the markets. In addition, it also impounds information to all the market participants. Price discovery is a major function of commodity future market. Information on price discovery is essential since these markets are widely used by firms engaged in the production, marketing and processing of the commodities. The essence of the discovery function of future markets hinges on whether new information is reflected first in changed futures prices or in changed cash price. It is conventionally claimed that futures market tends to be the dominant points of price discovery than that spot market.

Several studies suggest that futures markets play a critical role in price discovery for the underlying spot market. This price discovery function implies prices in the futures and spot markets are systematically related in the short run and/or in the long run. In the co integration framework, the price discovery function implies the presence of an equilibrium relation binding the two prices together. If a departure from equilibrium occurs, prices in one or both markets should adjust to correct the disparity. There is a consensus on price discovery issue in any purely competitive market. In a purely competitive market, price discovery issue is more important for all economic agents like producers, wholesalers, and other agents. Because all agents are operating in the product market and also taking decisions for their products irrespective of buyers or sellers on the basis of market price behavior. Ultimately, better decision making leads to an optimal allocation of scarce resources.

The present study attempts to develop an econometric model for both long-term and short-term forecasting of wheat prices in India. The detailed methodology involved in developing the model and forecasting process can be understood in this paper. The short-term forecasting was studied by using lagged response model, where as the long-term forecasting was made with the help of a multivariate model.

LITERATURE REVIEW

The present section outlines both theoretical as well as empirical literature on Modeling and Measuring Price Discovery in Commodity Market in the International and Indian context. The review of the earlier studies here is attempted chronologically in order to get a comprehensive picture.

Booth, Martikeinan and Tse (1997) examined Modeling and Measuring Price Discovery in Commodity Market in the context of four Scandavian stock markets including Danish, Norwegian, Swedish, and Finnish stock markets for the period 2 May 1988 to 30 June 1994 by employing the multivariate model. Significant price and volatility exist but they are few in number.

Thomas and Karande (2001) analyzed price discovery in India's castor seed market, Ahmedabad and Bombay by using daily closing data on future and spot prices, which spans from May 1985 to December 1999. Although, they have employed G.S. model and seemingly unrelated regression approach, but the interpreted relationship between spot and future markets remained the same in both the estimation approaches. Besides estimating GS return equation separately for the respective months like March, June, September and December, the study ultimately estimated pooled data in merging four contracts. They found that out of four, three seasonal contracts in Bombay future prices lead the Ahmedabad future prices while the March contract in Ahmedabad future prices lead the former one. Despite having smaller volume, the Bombay dominants the future prices over the Ahemdabad prices for all contracts except the contracts maturing at the time of harvest. The reason is due to the fact that prices of caster seeds are largely driven by the export demand. Since the traders or exporters expose to the port in Bombay, the markets have a lead in getting information that drives prices in the June, September and December contracts. This study shows that markets that trade exactly the same asset, in the same time zone, do react differently to information and also small market may lead the large market.

Mooosa (2002) re-examined the Garbade and Silber (1983) model with the objectives of finding out if the crude oil future market perform the function of price discovery and risk transfer. The study uses the daily data of spot and one-month future prices of WTI crude oil covering from 2 January 1985 to July 1996. He found that sixty percent of the price discovery function is performed in future market. The result also showed a fairly elastic supply of arbitrage service. This study shows that Garbade and Silber model is more suitable for description of intraday behavior of spot and future prices.

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.

Zhong et al. (2004) investigated the hypotheses that the recently established Mexican stock index futures markets effectively served the price discovery function, and that the introduction of futures trading led to volatility in the underlying spot market using a total of 799 daily observations which covers the period 15 April 1999 to 24 July 2002. By using VECM and EGARCH models, the empirical evidence showed that the futures price index was a useful price discovery vehicle and future trading had also been a source of instability for the spot market.

The study by Zapata, Fortenbery and Armstrong (2005) examined the relationship between 11 future prices traded in New York and the World cash prices for exported sugar by considering the observation from January 1990 to January 1995. They found that the future market for sugar leads the cash market in price discovery. However, they also found unidirectional causality from future price to spot but not vice versa. The finding of co integration between futures and cash prices suggests that sugar future contract is a useful vehicle for reducing overall market price risk faced by cash market participants selling at the world price. Further it was found through impulse response function that a one unit shock in the future price innovation generates a quick (one month) and positive response in futures and cash prices, but not vice versa.

Fu and Qing (2006) examined modeling and measuring price discovery process in Chinese spot-futures markets through Johansen co integration, VECM and bivariate EGARCH model. The empirical results indicated that the models provided evidence to support the long-term equilibrium relationships and significant bidirectional information flows between spot and futures markets in China, with futures being dominant. Although innovations in one market could predict the futures volatility in another market, the volatility spillovers from futures to spot were more significant than the other way round. Gupta and Belwinder (2006) examined the price discovery mechanism in the NSE spot and future market. The study uses the daily closing values of index future SandP CNX Nifty, from June 2002 to February 2005. By using the techniques like Johansen and VECM, it was empirically found that there was bilateral causality between the Nifty index and futures. Besides, it was also found that there exists stronger casual relation from Nifty futures to Nifty index as compared to the vice-versa. This might be the reason due to the lower cost of transactory in the future market and future market provides flexibility to investors i.e., investors enable to speculate on the price movement of the underlying asset without the financial burden of owning asset themselves.

Praveen and Sudhakara (2006) attempted to study a comparison of price discovery between stock market and the commodity future market. They have taken Nifty future traded on National Stock Exchange (NSE) and gold future on Multi Commodity of India (MCX). The result empirically showed that the one month Nifty future did not have any influence on the spot Nifty, but influenced by future Nifty itself. The casual relationship test in the commodity market showed that gold future price influenced the spot gold price, but not the contrary. So this implies that information is first disseminated in the future market and then later reflected in the spot market. Their study on spot prices of gold during the period of April 2002 to June 2005 showed that the Indian gold prices volatility is relatively higher than global market and Indian stock market has declined during their study period. It was found that the stock market has well developed spot market due to its presence of national wide stock exchange, which provides the stock market a perfect platform for price discovery while the spot commodity market is far away from this platform because spot gold is not confined to one place.

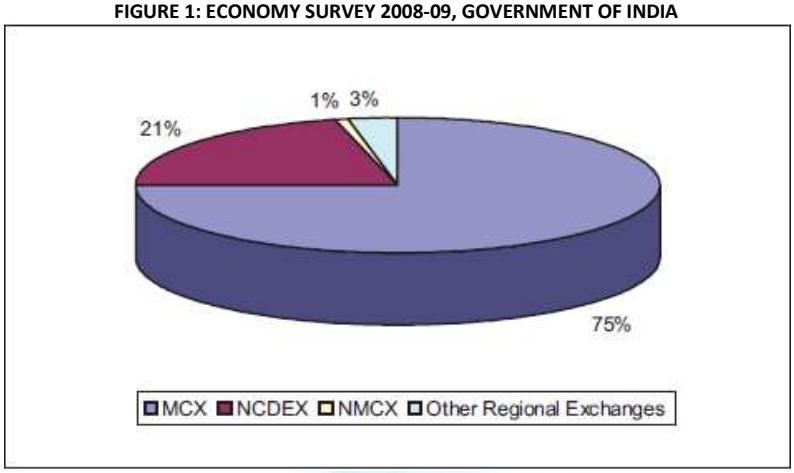
Given the above background, it is apparent that mostly research on modeling and measuring the price discovery role of futures markets and their possible volatility implications for the spot market generally focused on the US and a few other developed markets. This paper examines the case for India that has recently established the commodity futures trading. At least two main features distinguish our analysis in this paper i.e., the futures market effectively serves the price discovery function, and that the introduction of futures trading has resulted volatility in the underlying spot market.

METHODOLOGY AND DATA

The preface of new information results in modeling and measuring price discovery for short intervals of time between futures and spot market due to communication cost. Both increased availability and lower cost of information account together for faster assimilation of information in the futures market than a spot market. However, the price linkage between futures market and spot market would be examined by using co integration analysis that has several advantages. First, co integration analysis reveals the extent to which two markets have moved together towards long run equilibrium. Secondly, it allows for divergence of respective markets from long-run equilibrium in the short run.

To examine the co integrating and error correction dynamics, this study used two futures indices and corresponding underlying spot indices of Multi-Commodity Exchange (MCX), Mumbai. The four indices are MCXCOMDEX and MCXMETAL. The study has used natural logarithm for the transformation of daily data as well as to minimize the heteroscedasity in the value of the level series. The period of study is from June 2005 to December 2009 after adjusting for dates and missing observations caused by holidays, the total observations for index are 1047 and 1049. The market share is a main source of the motivation for considering MCX rather than NCDEX in the analysis. The Indian commodity exchanges market share in terms of total turnover (End-December, 2009) is shown below.

FIGURE 1: ECONOMY SURVEY 2008-09, GOVERNMENT OF INDIA



Co integrating methodology fundamentally proceeds with non-stationary nature of level series and minimizes the discrepancy that arises from the deviation of long-run equilibrium. The arrived deviations from long-run equilibrium are not only guided by the stochastic process and random shocks in the system but also by other forces like arbitrage process. As a result, the process of arbitrage possesses dominant power in the commodity future market to minimize the very likelihood of the short run disequilibrium. Moreover, it is theoretically claimed that if futures and spot price are co integrated, then it implies presence of causality at least in one direction. On the other hand, if some level series are integrated of the same order, it does not mean that both level series are co integrated. Co integration implies linear combinations of both the level series canceling the stochastic trend, thereby producing a stationary series. The error correction model takes into account the lag terms in the technical equation that invites the short run adjustment towards the long run. This is the advantage of the error correction model in evaluating price discovery. The presence of error correction dynamics in a particular system confirms the price discovery process that enables the market to converge towards equilibrium. In addition, the model shows not only the degree of disequilibrium from one period that is corrected in the next, but also the relative magnitude of adjustment that occurs in both markets in achieving equilibrium.

Moreover, co integration analysis delivers the message saying how two markets (such as futures and spot commodity markets) reveal pricing information that are identified through the price difference between the respective markets. The implication of co integration is that both the commodities in two separate markets respond disproportionately to the pricing information in the short run, but they converge to equilibrium in the long run under the condition that both markets are well innovative and efficient. In other words, the root cause of disproportionate response to the market information is that a particular market is not dynamic in terms of accessing the new flow of information and adopting better technology. Therefore, there is a consensus that price change in one market (futures or spot commodity market) generating price change in the other market (spot or commodity futures) with a view to bring a long run equilibrium relation is :

$F_t = \alpha + \beta S_t + \acute{\epsilon}_t$ (1)

Equation (1) can be expressed as in the residual form as:

$F_t - \alpha - \beta S_t = \acute{\epsilon}_t$ (2)

Where F_t and S_t are futures and spot price of some commodities in the respective markets at time t. Both α and β are intercept and coefficient terms, where as $\acute{\epsilon}_t$ is estimated white noise disturbance term. The main advantage of co integration is that each series can be represented by an error correction model which includes last period's equilibrium error with adding intercept term as well as lagged values of first difference of each variable. Therefore, casual relationship can be gauged by examining the statistical significance and relative magnitude of the error correction coefficient and coefficient on lagged variable. Hence, the error correction model is:

$$\Delta F_t = \delta_f + \alpha_f \hat{\varepsilon}_{t-1} + \beta_f \Delta F_{t-1} + \gamma_f \Delta S_{t-1} + \varepsilon_{f,t} \qquad (3)$$

$$\Delta S_t = \delta_s + \alpha_s \hat{\varepsilon}_{t-1} + \beta_f \Delta S_{t-1} + \gamma_f \Delta F_{t-1} + \varepsilon_{s,t} \qquad (4)$$

In the above two equations, the first part is the equilibrium error which measures how the dependent variable in one equation adjusts to the previous period's deviation that arises from long run equilibrium. The remaining part of the equation is lagged first difference which represents the short run effect of previous period's change in price on current period's deviation. The coefficients of the equilibrium error, α_f and α_s, are the speed of adjustment coefficients in future and spot commodity markets that claim significant implication in an error correction model. At least one coefficient must be non zero for the model to be an error correction model (ECM). The coefficient acts as an evidence of direction of casual relation and reveals the speed at which discrepancy from equilibrium is corrected or minimized. If α_f is statistically insignificant, the current periods change in future prices does not respond to last period's deviation from long run equilibrium. If both α_f and β_f are statistically insignificant; the spot price does not Granger cause futures price. The justification of estimating ECM is to know which sample markets play a crucial role in the price discovery process.

The study was carried out to assess the long-term trends in the prices of wheat and factors affecting the wheat prices in India. The investigation calls for data on different variables which affect the prices of wheat in Indian markets. The data on area, yield, production, beginning stocks, imports, exports, and domestic consumption was collected for the period from 1970-71 to 2005-06 from USDA Production, Supply, and Distribution database. The total consumption data includes both the quantity consumed for the purposes of food and feed. The per capita food consumption was taken into account while estimating the total quantity of wheat consumed for food purpose. However, the yearly data on average prices of wheat for India was available only for the period from 1979-80 to 2005-06 and hence the previous prices were interpolated and included in the analysis. The data on CBOT daily prices have been extracted from MCX Meta stock software and the average annual price of wheat worked out and used for the analysis.

SELECTION OF MODEL

In the beginning, all the selected variables were included in the model, but due to interrelationship among the independent variables few variables have been clubbed and used for the analysis. The variables included in the model are: total supply, total demand, minimum support price, CBOT prices and area under wheat cultivation for the whole study period. The total demand includes consumption for food and feed and export, whereas total supply includes imports, total production, and stocks held by both government and private agencies.

To assess the trends in different variables which affect the price of wheat, different forms of equations were used, depending upon their suitability. The equations used are as below:

y=a+bt-ct2+dt3+ut - For trends in Prices---------- (1)

y=a+bt+ut - For Supply---------- (2)

y=a+bt+ut - For Demand---------- (3)
y=a+bt-ct2+dt3-et4+ut - For MSP--------- (4)
y=a+bt-ct2+dt3+ut - For Area- --------- (5)
Where,
y = Price, supply, demand, MSP and area for respective equations
a= Intercept
bt, ct2, dt3, et4 = Coefficients
ut= Stochastic term
Results and Discussion
The coefficients, standard errors of the corresponding coefficients, coefficient of determination, and significance of the model are presented in Table 1. The predicted variables from the above equations were used to forecast the prices of wheat by using a multivariate model of the following type:
logY= log(a)+(b1)logX1+(b2)logX2+(b3)logX3+(b4)logX4+(b5)logX5+ui-------- (6)
Where,
Y = Price of wheat
b1, b2, b3, b4, b5 = Coefficients
X1, X2, X3, X4, X5 = Independent variables
ui = Stochastic term
The regression coefficients, standard errors of coefficients, coefficient of multiple determination, and significance of the model can be seen from Table 2. It could be seen from Table 2 that the multiple regression model developed for forecasting the wheat prices was found to be highly significant for the factors like demand, MSP, and CBOT prices. The total effect explained by these variables together was found to be 89%, which seems to be highly significant for price forecasting validated by regression analysis. Model explanatory power is 89% which is good enough to address fundamental factors like demand, MSP, and CBOT prices and rest 11% is explained by other exogenous variables, which we have not included in the model due to lack of data and inability of quantifying some of the variables like climatic factors. The other fundamental factors like area and total supply have negative and non-significant effect. For forecasting the prices of wheat for the years 2007, 2008, 2009, and 2010, the forecasted values of independent variables affecting the prices were taken into account and the predicted and actual trends in the prices of wheat can be seen in Figure 1.
logY= log(a)+(b1)logX1+(b2)logX2+(b3)logX3+(b4)logX4+(b5)logX5+ui-------- (6)
Where,
Y = Price of wheat
b1, b2, b3, b4, b5 = Coefficients
X1, X2, X3, X4, X5 = Independent variables
ui = Stochastic term
The regression coefficients, standard errors of coefficients, coefficient of multiple determination, and significance of the model can be seen from Table 2. It could be seen from Table 2 that the multiple regression model developed for forecasting the wheat prices was found to be highly significant for the factors like demand, MSP, and CBOT prices. The total effect explained by these variables together was found to be 89%, which seems to be highly significant for price forecasting validated by regression analysis. Model explanatory power is 89% which is good enough to address fundamental factors like demand, MSP, and CBOT prices and rest 11% is explained by other exogenous variables, which we have not included in the model due to lack of data and inability of quantifying some of the variables like climatic factors. The other fundamental factors like area and total supply have negative and non-significant effect.

TABLE 1: TRENDS IN SELECTED VARIABLES THAT AFFECT THE PRICES OF WHEAT (1970-71 TO 2008-09)

Sr.no	Variable	Intercept	T	T^2	T^2	T^4	R^2	F
1	Price (Y)	4045.49	207.36** (85.81)	-20.34* (5.34)	0.51** (0.095)	-	0.87	76.22
2	Supply (X1)	26297.68	1692.76** (113.64)	-	-	-	0.86	221.85
3	Demand (X2)	19937.1	1595.35** (54.91)	-	-	-	0.96	844.01
4	MSP (X3)	3129.76	592.18** (81.27)	-60.23* (7.07)	1.61** (0.18)	-0.006* (0.06)	0.92	92.3
5	Area (Xs)	16630.5	634.56** (634.56)	-16.50NS* (-16.50)	0.18NS* (0.18)	-	0.91	110.89

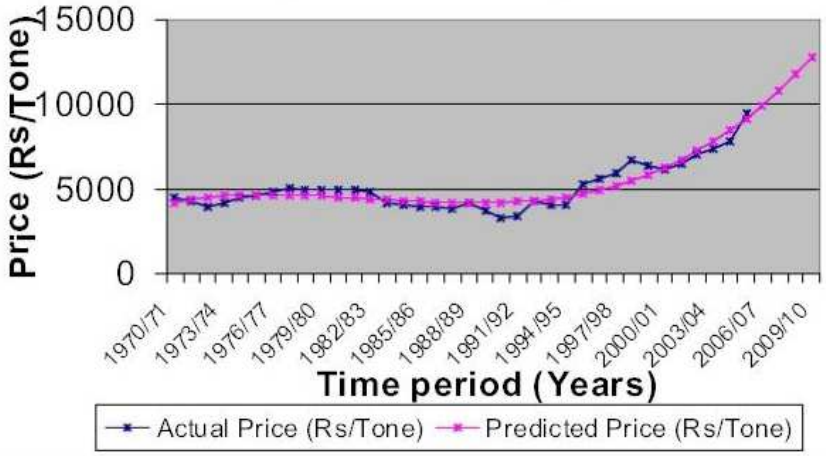
** Significant at 1 per cent level NS Non-significant
Note: Figures in the parentheses indicate the standard errors of the corresponding coefficients.

TABLE 2: FACTORS RESPONSIBLE FOR VOLATILITY IN THE PRICES OF WHEAT IN INDIA (1970-71 TO 2008-09) (N=36)

Sr.no	Independent variable	Coefficient
1	Total Supply in '000 tones (X_1)	-0.001NS (1.12)
2	Total Demand in '000 tones (X_2)	0.28 * (0.12)
3	Minimum Support price in Rs. Per tones (X_3)	0.98** (0.07)
4	CBOT Price in $ per tones (X_4)	0.19** (0.09)
5	Area in '000 Ha (X_5)	-0.20NS (0.38)
	Intercept	**-0.82**
	R^2	**0.89**
	F' Value	**49.95**

** Significant at 1 per cent level * Significant at 5 per cent level
NS Non-significant

FIGURE 2: FIGURES IN THE PARENTHESES INDICATE THE STANDARD ERRORS OF THE CORRESPONDING COEFFICIENTS



LAGGED RESPONSE MODEL

Similarly, by using the available short-term data on Delhi spot prices and CBOT wheat price, the lagged response model of the following type was used by using the daily time series data for the period from September 2004 to December 2006 and August 1973 to August 2007 respectively for Delhi spot prices and CBOT. The results were significant at first lag with high r2 value of 99 per cent and low Mean Sum of square for error was found to be 120 and 135.5, respectively, which is low, and best fit to address the forecasting ability of the model. The results of actual and predicted prices for Delhi spot price and CBOT respectively can be seen from Figures 4 and 5. The following type of the model was used for forecasting wheat prices:

Pt=f(pt-1) (7)

Where, Pt = Price of current year

f(pt-1)= Price of previous year

FIGURE 3: WHEAT PRICE FORECASTING MODEL FOR DELHI MARKET

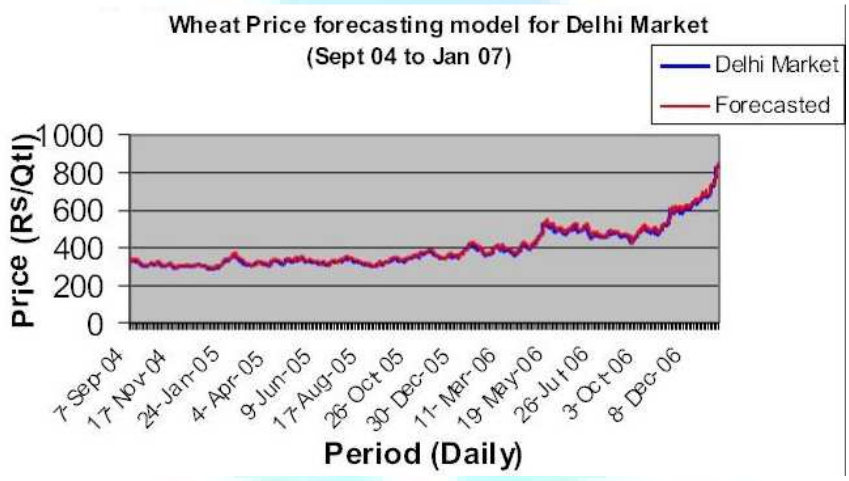
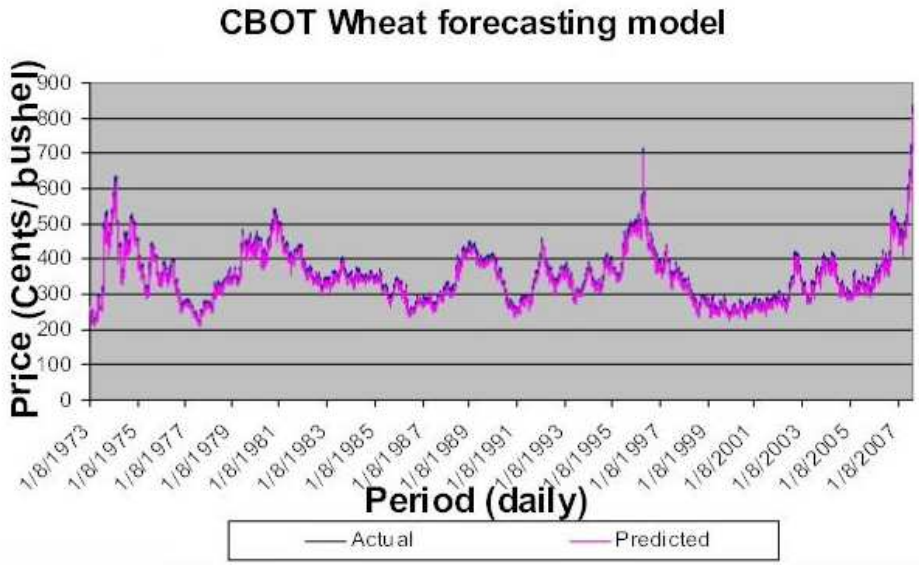


FIGURE 4: WHEAT FORECASTING MODEL



ANALYSIS AND FINDINGS

We deployed a Multivariate Price Forecasting Model for Wheat with Area, Supply, Demand, Minimum Support Price (MSP), and Global Wheat Prices as variables. Forecast models, both the structural model as well as lagged time series model, predicted the prices fairly efficiently. Forecasts for the year 2006-07, 2007- 08, 2008-09 and 2009-10 were Rs 9,964, Rs 10,820, Rs 11,752 and Rs 12,764 per ton, respectively. This assumes an average yearly increase in acreage and MSP of 3 percent and 4 to 6 percent, respectively (as predicted by the model). However, if there is a less than desired increase in acreage/level of MSP, then there could

be shortfall in supply which would have to be met with imports from abroad. The above forecast models are amenable to fine-tuning the predicted prices by incorporation of new and additional information as and when they become available.

CONCLUSIONS

The process of price discovery is crucial for all participants in commodity markets. The present paper re-examines the work of team to measure price discovery for wheat markets with finite elasticity of arbitrage services. Instead of explicitly modeling convenience yields to take account of backwardation/contango structures, this paper argues that wheat's are investment as well as consumption assets and therefore should be co integrated with a unit co integrating vector. Our price discovery measure depends on the relative volumes traded in the spot and future markets.

Applied to data for four wheat commodity, our model shows that

i) all the commodities are co integrated with a unit co integrating vector suggesting that they are investment as well as consumption assets and

ii) Both the spot price and the future price are equally important for the price discovery process, suggesting that futures trading in commodity are not as predominant in terms of volumes traded as for other equity markets.

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