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   INTRODUCTION

   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

   ACKNOWLEDGMENTS

   REFERENCES

   APPENDIX/ANNEXURE

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

MARKET INTELLIGENCE - AN EMPIRICAL STUDY OF MARKET BEHAVIOR OF AGRICULTURAL COMMODITY

S. P. BHARDWAJ
PRINCIPAL SCIENTIST
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
NEW DELHI

ASHOK KUMAR
PRINCIPAL SCIENTIST
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
NEW DELHI

K. N. SINGH
PRINCIPAL SCIENTIST & HEAD FORECASTING & ECONOMETRIC TECHNIQUES
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
NEW DELHI

ABSTRACT
Market Intelligence (MI) is knowledge based management system which may be defined as a process primarily based on market information collected over period of time. An analysis based on past information helps to take decision about the future. Market integration and Price Transmission, the two important components of Market Intelligence are discussed in this study. The prevailing large difference between wholesale and retail price of Mustard oil in the important markets in the country indicated towards delayed or lack of information flow and not following the market efficiency criterion. The study of Vertical and horizontal Cointegration between wholesale and retail price of Mustard oil in the selected markets of Delhi, Kanpur and Kolkata was carried out. The two statistical tests i.e Trace test and Eigen value statistics indicated that there existed cointegrating vectors and cointegrating equations which confirms a long run relationship in the mustard oil markets under study. The value of error correction coefficient γ was observed to be relatively higher (the speed of price adjustment) in Delhi and followed by Kolkata and Kanpur markets. The value of long run multiplier suggest that the equilibrium between wholesale and retail price of Mustard oil in Delhi market takes minimum time of 1.13 months, Kolkata 1.57 months and Kanpur market takes 1.52 months to attain the equilibrium level between wholesale and retail prices.

KEYWORDS
Cointegration; Error Correction Coefficien; Market intelligence; Price transmission.

INTRODUCTION
Market information is needed by farmers in planning production and marketing, and is equally required by other market participants in arriving at optimal trading decisions. The dissemination of complete and accurate marketing information is the key to achieving both operational and pricing efficiency in the marketing system. There are several areas of agricultural marketing with which farmers need to be fully familiarized in order to improve price realization. Agricultural marketing is witnessing major changes owing to liberalization and globalization of markets. In this context agriculture has to be market driven, more cost effective, competitive, innovative and responsive to high tech and Information Technology (IT) applications.Market Intelligence (MI) is knowledge based management system which may be defined as a process primarily based on market information collected over period of time. An analysis based on past information helps to take decision about the future. MI synthesizes information from many diverse sources to form greater insights. MI requires sophisticated understanding of strategic trade goals and to widen trade opportunities.

REVIEW OF LITERATURE
The spatial transmission of price shocks play, for example, a very important role in theories associated with exchange rate determination and market integration. Much of this literature has been concerned with the "law of one price" or, at an aggregate level, with "purchasing power parity. Dornbush (1987), Ardeni (1989), Baffes (1991), Gardner and Brooks (1994), Blauch (1997), Tkacz (2001), Baffes and Ajwad (2001), Goodwin and Piggot (2001), Jamaleh (2002), Brooks and Melyukina (2004). The literature analysing vertical price linkages has concentrated on evaluations of the links between farm, wholesale and retail prices. The vertical price relationships have featured prominently in recent studies as commodity markets have become more highly concentrated at each level and integrated across levels. Vertical price relationships are typically characterised by the magnitude, speed and nature of the adjustments through the supply chain to market shocks that are generated at different levels of the marketing process. Recent research has recognized more complex aspects of price transmission relationships and explored the extent to which price adjustments may be asymmetric. These studies typically distinguish between positive and negative price shocks. Peltzman (2000) argues that asymmetric price transmission is the rule, rather than the exception, and concludes that, since asymmetric price transmission is prevalent in the majority of producer and consumer markets, standard economic theory that does not account for this situation must be incorrect. Meyer and von Cramon-Taubadel (2004) observe that a possible implication of asymmetric price transmission is that consumers are not benefiting from a price reduction at the producers' level, or producers might not benefit from a price increase at the retail level. Thus, under asymmetric price transmission, the distribution of welfare effects across levels and among agents following shocks to a market will be altered relative to the case of symmetric price transmission. Ball and Mankiw (1994) note that in the presence of inflation and nominal input price shocks the use of menu costs by agents may lead to more resistance to lower prices than to increase them. Bailey and Brorsen (1989) also pointed out that asymmetries in price adjustments may be caused by asymmetries in the underlying costs of adjustments. Alternatively, retailers selling perishable goods might be reluctant to raise prices in line with an increase in farm-level prices given the risk that they will be left with unsold spoiled product. Heien (1980) argued that changing prices is more costly for products with a long shelf life as these costs include loss of goodwill. Blinder (1994) and Blinder et al. (1998) found that merchants often believed themselves to be disciplined by a fear of being "out of line" with their market competitors when costs rose; implying asymmetric responses to cost increases and decreases. Gardner (1975) pointed out that, in addition to other causes, farm-to-retail price asymmetries might be the result of government intervention to support producer prices. Kinnucan and Forker (1987) argued that government policies may lead to asymmetric price adjustments if agents believe that price movements in one direction may be more likely to trigger government intervention than movements in another direction: the government may be more likely to intervene if market shocks lower producer prices than if producer prices increase. The authors estimated price transmission for dairy products in the United States and showed that transmission elasticities for rising farm prices were larger than corresponding elasticities associated with falling farm prices, depending on the dairy product. Serra and Goodwin (2003) studied price transmission in the Spanish dairy sector and argued that scarcity of milk, to some extent created by the quota system,

may lead to a situation in which processors compete to increase both their access to milk quota and their retail market share, but may not pass the resulting farm level price increase fully to the retail level. Von Cramon-Taubadel and Loy (1996) use an ECM to study spatial asymmetric price transmission on world wheat markets. Scholnick (1996) also uses an ECM to test for asymmetric adjustment of interest rates, while Borensteinet *al.* (1997) employ an ECM specification where the error correction terms are not segmented. Von Cramon-Taubadel (1998) estimated price transmission in German pork markets using ECM. Balkeet *al.* (1998) and Frost and Bowden (1999) also employ variants of the asymmetric ECM. FAO (2003) provides a review of the application of time series techniques (co-integration, ECMs) in testing market integration and price transmission for a number of cash and food crop markets in developing countries. Capps and Sherwell (2005) analysed the behaviour of spatial tests of asymmetric price transmission according to the conventional Houck approach (so-called pre-cointegration method) and to the von Cramon-Taubadel and Loy ECM approach. Meyer and von Cramon-Taubadel (2004) argue that as the cointegration and the ECMs are based on the idea of a long run equilibrium, which disallows individual prices from drifting apart in long-term disequilibrium, it is only possible to consider asymmetry with respect to the speed of price transmission, not the magnitude. In addition, the presence of asymmetries may invalidate the standard tests, such as the Dickey and Fuller test of stationarity or the Johansen test for cointegration

IMPORTANCE OF STUDY

The MI provides diversified avenues to examine the market beaviour of agricultural commoditiesto facilitate all the stake holders. Market integration and Price Transmission, the two important components of Market Intelligence are chosen for discussion in this study. The issue of market integration has become an important area of empirical research in development economics. Many developing economies have been implementing structural adjustment and market reform programme/s. An important component of such programme/s is the liberalization of commodity markets. It has been argued that such liberalization is required for achieving allocative efficiency and long-term growth in agriculture. It has also been argued that freeing domestic and external trade in food grains from government intervention, while maintaining its role in price stabilization, yields positive welfare benefits. However, unless food markets are spatially integrated, producers and consumers will not realize the gains from liberalization: the correct price signals will not be transmitted through the marketing channels, farmers will not be able to specialize according to long-term comparative advantage and the gains from trade will not be realized. Spatial market integration refers to a situation in which the prices of a commodity in spatially separated markets move together and price signals and information are transmitted smoothly. Spatial market performance may be evaluated in terms of a relationship between the prices of spatially separated markets, and spatial price behavior in regional markets may be used as a measure of overall market performance. Price is the primary mechanism by which various levels of the market are linked. The extent of adjustment and speed with which shocks are transmitted among producer, wholesale, and retail market prices is an important factor reflecting the actions of market participants at different levels. The transmission of changes in the producer price to changes in the consumer price depends, however, greatly on the type of product. The products which are perishable in nature and undergo minimal processing such as vegetables, fruit, and fresh milk, are expected to have a relatively quick price transmission mechanism. Products that however undergo a certain level of processing and are not as perishable as fresh produce are expected to have a slower price transmission mechanism. This is particularly noticeable for commodities such as foodgrains and oils that can be stored relatively easily and are traded on the futures market, where processors can hedge against large price fluctuations. It is due to storability and hedging strategies that various time lags exist between changes in commodity prices and consumer prices.

MAIN OBJECTIVES OF THE STUDY

1. To examine the extent of market integration and
2. To estimate Error Correction Coefficients of price transmission.

HYPOTHESIS

The study based on following hypothesis:
1. T he time series price data used in the study has unit roots or non-stationary
2. The spatial markets are cointegrated in the long run
3. There exists asymmetry in price transmission from wholesale to retail trade.

DATA & METHODOLOGY

The time series data on Wholesale and Retail price of Mustard oil for the important markets of Delhi, Kolkata and Kanpur for the period of January 2001 to February 2012 has been analysed in this study.

THE STATIONARY TEST

The stationary of the data series is evaluated by Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests.

JOHANSEN'S COINTEGRATION TESTS

Cointegration of prices between two markets can be studied after establishing the order of integration for the price series. The prices are subjected pair wise to linear regression.

$$Y_t = \beta_1 + \beta_2 X_t + u_t \qquad \text{.................. (1)}$$

Where Y_t&X_t = price series &u_t = error term.

The residuals (u_t) of the equation (1) are subjected to DF or ADF test. The test statistic is compared to the critical values provided by Engle and Granger (1987). If the residuals are stationary, then the series are co integrated or otherwise. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. As explained below, the presence of a cointegrating relation forms the basis of the Vector Error Correction (VEC) specification. Vector Auto Regressive (VAR) based cointegrationtests using the methodology developed in Johansen (1991, 1995) has been used in this study.

Consider a VAR of order p:

$$y_t = A_1 y_{t-1} + - - + A_p\, y_{t-p} + Bx_t + \epsilon_t \qquad \text{.................. (2)}$$

Where y_t is a k-vector of non-stationary I(1) variables, x_t is a d-vector of deterministic variables, and ϵ_t is a vector of innovations. We may rewrite this VAR as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=0}^{p-1} \Gamma \Delta y_{t-1} + Bx_t + \epsilon_t \qquad \text{.................. (3)}$$

Where:

$$\Pi = \sum_{i=1}^{p} A_1 - I, \qquad \Gamma_1 = \sum_{j=i+1}^{p} A_j \qquad \text{.................. (4)}$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank r < k , then there exist k × r matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the VEC model. Johansen's method is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π .

NUMBER OF COINTEGRATING RELATIONS

The first test statistic (λtrace) tests whether the number of distinct cointegrating vectors is less than or equal to r. The second test statistic (λmax) tests the null that the number of cointegrating vectors is r against an r+1. Johansen and Jueselius (1990) provided the critical values of these statistics. The trace statistic tests the null hypothesis of 'r' cointegrating relations against the alternative of 'k' cointegrating relations, where 'k' is the number of endogenous variables, for $r = 0, 1, - - - k - 1$. The alternative of $'k'$ cointegrating relations corresponds to the case where none of the series has a unit root and a stationary VAR may be specified in terms of the levels of all of the series. The trace statistic for the null hypothesis of 'r' cointegrating relations is computed as:

$$\mathbf{LR}_{tr}(r|k) = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i) \binom{n}{k} \quad \text{.................. (5)}$$

Where λ_i is the *i*-th largest eigenvalue of the Π matrix. The maximum eigenvalue statistics which tests the null hypothesis of r cointegrating relations against the alternative of $r + 1$ cointegrating relations. This test statistic is computed as:

$$\mathbf{LR}_{max(r|r+1)} = -T \log(1 - \lambda_{r+1}) = LR_{tr}(r|k) - LR_{tr}(r + 1|k) \quad \text{.................. (6)}$$

for $r = 0, 1, \quad k - 1.$

GENERALIZED ERROR CORRECTION MODEL

This derivation of the error correction model starts with the assumption that both Y and X are integrated and demonstrates that the error correction model captures the equilibrium casual movements between these two co- integrated process. The starting point for the ECM is the Autoregressive Distributed Lag (ADL) model (Luke Keele and Suzanna De Boef 2004). The ADL model is often seen in the following bivariate form:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad \text{.................. (1)}$$

It generalizes to an ADL (p,q) where p refers to the number of lags of Y and q refers to the number of lags of X included in the model. Given that the ADL (1,1) has a lagged dependent variable on the right side, it should be consistently estimated by OLS and has a stationarity condition, that is Yt must be stationary (Davidson and MacKinnon 1993).

The information about error correction is readily available if a set of linear transformations are applied to the ADL model. Consider an ADL(1,1) model:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad \text{.................. (2)}$$

First, we take the first difference of Y to produce:

$$\Delta Y_t = \alpha_0 + (\alpha_1 - 1)Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad \text{.................. (3)}$$

Then add and subtract $\beta_0 X_{t-1}$ from the right hand side:

$$\Delta Y_t = \alpha_0 + (\alpha_1 - 1)Y_{t-1} + \beta_0 \Delta X_t + (\beta_0 + \beta_1)X_{t-1} + \varepsilon_t \quad \text{.................. (4)}$$

And next add and subtract $(\alpha_1 - 1)X_{t-1}$ from the right hand side and rewrite to produce the

GENERALIZED ERROR CORRECTION MODEL (GECM)

$$\Delta Y_t = \alpha_0 + \gamma(Y_{t-1} - X_{t-1}) + \lambda_1 \Delta X_t + \lambda_2 X_{t-1} + \varepsilon_t \quad \text{.................. (5)}$$

Where $\gamma = (\alpha_1 - 1)$, $\lambda_1 = \beta_0$ and $\lambda_2 = \beta_1 + \beta_0 + \alpha_1 - 1$

The GECM directly tells us how quickly the system reacts to any disequilibrium, as γ the coefficient on the lag of Y is the error correction rate. In other words, the term $(\alpha_1 - 1)$ can be interpreted as the speed at which Y adjusts to any discrepancy between Y and X in the previous period. The value of coefficient " γ "must be negative since it is just $(\alpha_1 - 1)$. The term $(Y_{t-1} - X_{t-1})$ is zero when X and Y are in equilibrium and measures the extent to which the long-run relationship is not satisfied. The short-run effects are represented by λ_1 and $\lambda_2 - \lambda_1 - \gamma$ in the GECM. We can derive the long run multiplier from the GECM, assume the equilibrium relationship is given by $y_t^* = k_1 x^*$, where again k_1 denotes the long run multiplier. The long-run effect of a change in X on Y is:

$$k_1 = -\frac{(\lambda_2 - \gamma)}{\gamma} \quad \text{.................. (6)}$$

Or by substitution:

$$k_1 = -\frac{(\lambda_2 - \gamma)}{\gamma} = -\frac{(\beta_1 + \beta_0 + \alpha - 1 - (\alpha_1 - 1))}{(\alpha_1 - 1)} = \frac{(\beta_1 + \beta_0)}{(1 - \alpha_1)} \quad \text{.................. (7)}$$

RESULTS AND DISCUSSION

The concept of market integration and price transmission has important implications of economic welfare for both producer (farmer) and consumer. Price transmission conveys unbiased information on prices to the producers and facilitates efficient allocation of resources. Incomplete price transmission arising either due to trade and other policies, or due to transaction costs such as poor transport and communication infrastructure, results in a reduction in the price information available to economic agents. The incomplete price transmission creates biased incentives to farmers, which in turns leads to suboptimal decision-making and affects agricultural productivity. The policy reforms are implemented through intervention in the price channel (e.g. tariffs), a lack of integration along the marketing chain prevents reforms from reaching to the stakeholders and finally leading to an inequality in the distribution of incomes. Therefore efficiency and equity of price transmission of agricultural and food products remained an item of major concern to producers, consumers and food industry. Changes in farm and wholesale prices are either not fully, or they are more than fully transmitted to consumer prices. In this study Mustard oil has been selected to examine the nature and extent of market integration (both vertical and horizontal) across the important wholesale and retail markets across the country. The main focus is on analyzing the degree of association between the commodity prices among state level wholesale markets/retail and the speed at which price in one market adjusts to a shock in price in another market. The study of Table-1 revealed that there has been wide variation in the wholesale as well as retail price across the different markets. The standard deviation in the mean price level of Mustard oil during the period of January 2001 to February 2012 remained more than Rs.500/qtls. The high order of standard deviation points to extent of high volatility in Mustard oil prices. Further the large difference between wholesale and retail price level points towards delayed or lack of information flow. The study of the Table-1 finally revealed that Mustard oil markets in the country are distorted and not following the market efficiency criterion. The market data of wholesale and retail price when tested for stationarity, was found to have unit root as given in Table-2. Dickey Fuller (DF), Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests were applied to the logged series data. The data series became stationary at one differencing and now ready for further econometric analysis.

JOHANSEN'S COINTEGRATION TEST (1988)

The result of Vertical Cointegration between wholesale and retail price of Mustard oil in the selected markets of Delhi,Kolkata and Kanpur was carried out and the results are given in Table-3. In case of trace statistics cointegration"r"denotes the number of cointegrating vectors. In this case, the number of cointegrating vectors can be at most one as there are only two series in each market. In all the cases trace statistics show that the null hypothesis of wholesale and retail prices are not cointegrated *(r=0)* against the alternative of one or more cointegrating vectors *(r>0)* is rejected. Next, the null hypothesis of $r < 1$ against the alternative of two or more cointegrating vectors cannot be rejected at 5 percent significance level. The presence of single cointegrating vector in all cases shows that there exists long run relationship between two prices. Similarly Eigen value statistics rejects the null hypothesis of equal to or less than one cointegrating equation against the alternative hypothesis of one equation. The two statistical tests confirm the relationship in long run between wholesale and retail price of Mustard oil in the selected markets. The result of Horizontal Cointegration between wholesale price of Mustard oil in the markets of Delhi, Kanpur and Kolkata was carried out and the results are given in Table-4. The two statistical tests i.e Trace test and Eigen value statistics revealed the fact that there existed three cointegrating vectors and cointegrating equations which confirms long run relationship among the Mustard oil markets.

GENERALIZED ERROR CORRECTION MODEL

The Granger representation theorem asserts that there is a close linkage between cointegration and error correction models. According to this theorem, if two or more time series are cointegrated they are bound to have an error correction representation. Similarly if two or more time series that are error correcting themselves are cointegrated in the long run (Engle and Granger 1987). The error correction model allows estimating both short term and long run effects of explanatory time series variables. The γ coefficient on the lag of Y is the error correction rate and can be interpreted as the speed at which *Y* adjusts to any discrepancy between *Y* and *X* in the previous period. The short-run and long adjustments between X and Y are represented by λ_1 and λ_2. The coefficient k_1 represents the long-run multiplier of *X* with respect to *Y* and any deviation from equilibrium point should induce change back to the equilibrium in the next period. The results of GECM model are given in Table-5. The long run relationship between retail and wholesale price of Mustard oil in the important markets of Delhi, Kolkata and Kanpur revealed that the value of error correction coefficient (γ) was found to be significant and negative in all the four markets, which satisfy the basic requirement of the GECM model. The value of error correction coefficient γ was observed to be significantly higher in Delhi (-0.350926) followed by Kolkata (-0.182601) and Kanpur (-0.158517). The short run adjustments between retail and wholesale price were examined with the help of λ_1 coefficient. The study of Table-5 revealed that any changes in wholesale price were immediately reflected significantly in retail price of Delhi (0.862239) and Kanpur (0.707733) markets. Whereas changes in wholesale price were reflected less significantly in short run in Kolkata (0.570579) markets. Similar trends were observed in long run price adjustments in wholesale and retail prices in all the four markets of Mustard oil. The value of long run multiplier k_1 suggest that the equilibrium between wholesale and retail price of Mustard oil in all the three markets takes different time period based on the values of short and long run price adjustment coefficients. The study of markets revealed that Delhi market takes minimum time (1.13 months), Kanpur (1.52 months), and Kolkata(1.57) to attain the equilibrium level between wholesale and retail prices.

CONCLUSION

The high order of standard deviation points towards extent of high volatility in Mustard oil prices. The large difference between wholesale and retail price level indicated towards delayed or lack of information flow. The study thus revealed that Mustard oil markets in the country are distorted and not following the market efficiency criterion. The market data of wholesale and retail price when tested for stationarity was found to have unit root. However the data series became stationary at one differencing. The study of Vertical and horizontal Cointegration between wholesale and retail price in the selected markets was carried out. The two statistical tests i.e Trace test and Eigen value statistics revealed that there existed cointegrating vectors and cointegrating equations which confirms long run relationship in the markets under study. The value of error correction coefficient γ was observed to be significantly higher in Delhi and Kanpur markets as compared to Kolkata markets. The value of long run multiplier suggest that the equilibrium between wholesale and retail price revealed that Delhi market takes minimum time (1.13 months), Kanpur (1.52 months), and Kolkata(1.57) to attain the equilibrium level between wholesale and retail prices.

SCOPE FOR FURTHER WORK

This study provides ample evidence of market inefficiency prevails in commodity trading further research work can be undertaken to reduce such inefficiencies through policy interventions.

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TABLES

TABLE - 1: MONTHLY WHOLESALE AND RETAIL PRICE OF MUSTARD OIL JANUARY 2001 TO FEBRUARY 2012

Statistics	Markets (Price Rs./ Qtls)					
	Delhi		Kanpur		Kolkata	
	Retail Price	Wholesale Price	Retail Price	Wholesale Price	Retail Price	Wholesale Price
Mean	5422.739	5051.119	5370.075	4916.993	5812.373	5392.313
Std. Dev.	1130.367	946.8086	1266.532	1072.848	1054.161	988.156
Skewness	-0.240954	-0.56183	-0.010215	0.036914	-0.757963	-0.499798
Kurtosis	2.22274	2.515335	1.947744	2.516934	2.474403	2.014645
Jarque-Bera	4.669715	8.361117	6.18443	1.333319	14.37309	10.99981
Probability	0.096824	0.01529	0.045401	0.513421	0.000757	0.004087
Observations	134	134	134	134	134	134

Source- Estimated

TABLE - 2: UNIT ROOT TEST OF LOGGED PRICE SERIES OF MUSTARD OIL

Price/Markets	Unit Root Tests	On Levels		On First Difference	
	With Intercept and Trend	Unit Root Statistics	critical value at 1% level	Unit Root Statistics	critical value at 1% level
Retail Price Delhi	Dickey Fuller (DF)	-2.26013	-3.5404	-11.25022	-3.5428
	Augmented Dickey Fuller (ADF)	-2.592997	-4.028496	-11.32905	-4.029595
	Phillips Perron(PP)	-2.558076	-4.028496	-12.6032	-4.029041
Wholesale Price Delhi	Dickey Fuller (DF)	-1.835999	-3.5404	-9.941109	-3.5428
	Augmented Dickey Fuller (ADF)	-2.278138	-4.028496	-10.64086	-4.029595
	Phillips Perron(PP)	-2.094828	-4.028496	-11.61281	-4.029041
Retail Price Kolkata	Dickey Fuller (DF)	-1.540729	-3.5428	-10.00793	-3.5428
	Augmented Dickey Fuller (ADF)	-1.985295	-4.029595	-10.17136	-4.029595
	Phillips Perron(PP)	-2.156472	-4.028496	-9.733247	-4.029041
Wholesale Price Kolkata	Dickey Fuller (DF)	-2.10714	-3.5404	-11.01775	-3.5416
	Augmented Dickey Fuller (ADF)	-2.29383	-4.028496	-9.796479	-4.029595
	Phillips Perron(PP)	-2.339021	-4.028496	-11.35423	-4.029041
Retail Price Kanpur	Dickey Fuller (DF)	-2.076298	-3.5404	-10.98774	-3.5416
	Augmented Dickey Fuller (ADF)	-2.211315	-4.028496	-11.07652	-4.029041
	Phillips Perron(PP)	-2.434399	-4.028496	-11.07305	-4.029041
Wholesale Price Kanpur	Dickey Fuller (DF)	-1.386737	-3.5428	-10.37202	-3.5428
	Augmented Dickey Fuller (ADF)	-1.62494	-4.029595	-10.7492	-4.029595
	Phillips Perron(PP)	-2.126824	-4.028496	-10.36874	-4.029041

Source- Estimated

TABLE - 3: VERTICAL COINTEGRATION TEST RESULTS BETWEEN WHOLESALE AND RETAIL PRICE

Wholesale & Retail Price	Null Hypothesis No. of CE(s)	Alternative Hypothesis	Eigen value	Trace Statistics	0.05 level Critical Value	Eigen value	Max-Eigen Statistics	0.05 level Critical Value
Delhi Markets	None *	r = 0	0.286989	64.16307	25.87211	0.286989	43.29701	19.38704
	At most 1	r ≥ 1	0.150423	20.86607	12.51798	0.150423	20.86607	12.51798
Kolkata Markets	None *	r =0	0.256247	63.32524	25.87211	0.256247	37.894	19.38704
	At most 1	r ≥ 1	0.180189	25.43124	12.51798	0.180189	25.43124	12.51798
Kanpur Markets	None *	r= 0	0.280695	61.56773	25.87211	0.280695	42.17207	19.38704
	At most 1	r ≥ 1	0.140607	19.39566	12.51798	0.140607	19.39566	12.51798

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level, Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level.

Source- Estimated

TABLE - 4: HORIZONTAL COINTEGRATION TEST RESULTS BETWEEN WHOLESALE PRICES SERIES OF MUATARD OIL: DELHI, KANPUR AND KOLKATA MARKETS

	Trace Statistics Test			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.391844	117.235	42.91525	0
At most 1 *	0.230906	53.5775	25.87211	0
At most 2 *	0.144469	19.97215	12.51798	0.0024
	Eigen Value Test			
None *	0.391844	63.6575	25.82321	0
At most 1 *	0.230906	33.60535	19.38704	0.0002
At most 2 *	0.144469	19.97215	12.51798	0.0024

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Source- Estimated

TABLE - 5: RESULTS OF GENERALIZED ERROR CORRECTION BIVARIATE MODEL

Dependent Variable: Retail Price Mustard Oil Delhi Market				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
α_0	0.001008	0.002488	0.40536	0.6859
γ	-0.350926	0.06846	-5.12598	0
λ_1	0.862239	0.058211	14.81231	0
λ_2	0.046723	0.058382	0.800301	0.425
K_1 (Months)	1.13			
Dependent Variable: Retail Price Mustard Oil Kolkata Market				
α_0	0.001755	0.002101	0.835056	0.4052
γ	-0.182601	0.048298	-3.780686	0.0002
λ_1	0.570579	0.055015	10.37125	0
λ_2	0.104951	0.057763	1.816911	0.0716
K_1 (Months)	1.57			
Dependent Variable: Retail Price Mustard Oil Kanpur Market				
α_0	0.001978	0.002439	0.810847	0.419
γ	-0.158517	0.051166	-3.098102	0.0024
λ_1	0.707733	0.05852	12.09393	0
λ_2	0.081944	0.058611	1.398116	0.1645
K_1 (Months)	1.52			

Source- Estimated

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