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Consequence of price discovery in commodity futures market

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Abstract
This paper examines the effect of price discovery mechanism for commodity futures market thereby it estimates the relationship between futures and spot prices. GOLD and SILVER are two commodities considered for evaluation. In general, the commodity market efficiency is analyzed based on analytical and technical perspectives. Especially the commodity market is significantly affected by external factors. The result states that futures prices have found less volatility than spot expected price.

Keywords: Rural, Tourism, Programs, Culture, Community

1. Introduction
Commodity trading in India has a long history and started much before compared to many other countries. Due to the foreign rule, droughts and Government policies, commodity trading is diminished in India. Futures trading method is instantiated in India by Bombay Cotton Trade Association in 1875 and almost obsolete in 1970.
In 1980 Khusro committee suggested to restart the futures trade and in 1994 Prof.K.N.Kabra committee was appointed in the view of market liberalization. By 2003, the central Government gave consent to start futures trading for most of the major commodities. Thus, three new electronic exchanges have been started namely National Multi Commodity Exchange of India (NMCE), Multi Commodity Exchange of India (MCX), and National Commodity and Derivatives Exchange (NCDEX) as national level multi-commodity exchange.
A future contract is an agreement between two parties to buy or sell an asset at a certain time in the future for a certain price. The futures market has two important economic functions, i.e., hedging and price discovery. By taking equal and opposite positions in the futures market, both the producer and the consumer can manage the price risk in the spot market, which is usually called the hedging of price risk in commodities.
Hedging refers to reducing or controlling risk. Hedging is one of the main functions of the futures market and also the reason for the existence of futures market. The hedging activity can be considered as exchanging price risk and basis risk. This is done by taking equal and opposite positions in the futures market. One of the important theoretical issues in hedging is the determination of the optimal hedge ratio and hedging effectiveness.
Price discovery refers to the use of futures prices for pricing cash market transactions. The price discovery function depends on whether new information is reflected first on futures or spot prices. The significance of price discovery depends upon a close relationship between futures and spot price. If the current futures price is an unbiased predictor of future cash prices, it can provide direct evidence in favor of price discovery occurring primarily in the futures market.
According the recent survey by RBI, the total value of commodities futures traded in India in the FY 2012-13 was Rs.170.4 trillion. The total commodity futures turnover has risen at an annual rate of 85 per cent between FY 2003-04 and FY 2012-13. It indicates the growth of commodity market.
The main objective of this paper is to empirically evaluate the consequence of price discovery in commodity futures market. Thereby, the organization of this paper presented as follows; section 2 describes the review of related literatures, section 3 describes the price discovery model and its description, section 4 shows the source of data and research methodology and section 5 describes the empirical analysis and section 6 portray the conclusion of this study.

2. Review of Literature

The performance of commodity futures market can be evaluated using certain parameters such as basis risk, price discovery and spot price volatility. This section specifically reviewed the price discovery related literatures and presented below.

Garbade and Silber (1983) [4] examined the characteristics of price movements in spot market and futures market for storable commodities and found that in general futures contract do not provide a perfect risk transfer facilities in the short time horizon. With respect to price discovery role of futures market evidence was found of information flow from futures to spot market. However, reverse information flow from cash market to futures market was also observed. They also found that market size and liquidity played a positive role in the price discovery function.

Oellermann and Farris (1985) investigated lead lag relation between change in futures and spot price for live beef cattle between 1966 and 1982. The futures price led spot price during nearly every sub period analyzed. Based on Granger causality test for various sub samples of their data, they conclude that change in live cattle futures price led change in live cattle spot price. They also found that the spot market responded to change in futures price within one trading day. The authors conclude that futures market was the centre of price discovery for live cattle. They suggest that a likely explanation for the results is that the futures market serves as a focal point for information assimilation. They conclude that the cattle futures market contributes towards a more efficient price discovery process in the underlying spot market for live beef cattle.

Sunil (2004) [7] attempted to investigate price discovery function of futures contracts for ensuring better hedge against price uncertainty for some selected commodities. In this econometric study, the daily futures and comparable spot prices for three contracts of each commodity for five sample commodities (castor seed, gur, cotton, pepper, and groundnut) were taken. The study used ordinary least squares method for estimating regression. The study found that the absence of co-integration reflects lack of a long run stable relationship between the spot and future prices. Finally he concluded that futures markets are not efficient.

Chopra and Bessler (2005) [2] examined of price discovery in the Black pepper market for the period of October, 2001 to February, 2003 by using the methodology of co-integration and error correction model. The data was classified as spot, nearby futures and first distant futures. The results indicate clearly that the futures markets are the center of price discovery. They concluded that spot and first distant futures contract do not respond to shocks in the co-integrating space; only the nearby futures contracts adjusted to shock in the long run.

Karande (2006) [5] has examined the efficiency of castor seed futures market and the results of co-integration analysis revealed that both Mumbai and Ahmedabad exchanges performed the function of price discovery. Also the introduction of castor seed futures market at Mumbai and Ahmedabad has had a beneficial effect on the castor seed spot price volatility. Thus, there is a strong case for promoting derivative markets in India.

Raizada and Sahi (2006) [6] studied the efficiency of wheat futures contract at NCDEX with horizon varying from 1 week to three months. Results of Johanson's co integration tests revealed that wheat futures market is even in weak form inefficient and fails to perform the price discovery function. Future price one month before maturity is co-integrated with spot price, but future price two and three months before maturity are not co-integrated with spot price that is to say that future prices have relationship with spot prices only when closer to maturity. Spot market plays the leading role and captures the market information faster. They have also suggested that trading volume in commodity futures market along with other factors have a significant impact on country's inflationary pressure.

Ahuja (2006) [1] indicated that futures market especially for agricultural commodities are still in developing state and therefore there is an immediate need to address certain unresolved issues related to derivatives market such as introduction of more market based instruments like

Easwaran and Ramasundaram (2008) [3] have examined the efficiency of price discovery reference to agriculture commodity in futures market. The statistical analysis of data on price discovery in a sample of four agricultural commodities traded in futures exchanges have indicated that price discovery does not occur in agricultural commodity futures market.

In this paper, we examine the price discovery pattern of Gold and Silver in Indian commodities futures market.

3. Measuring Price Discovery

The significance of price discovery depends upon a close relationship between futures and spot price. Price discovery is measured through various techniques such as lead-lag relationship between spot and future prices, cross-correlations, Granger-Causality test and co-integration test.

Measuring the price discovery through co-integration analysis has several advantages, which helps to investigate the long run relationship between spot and futures prices. The co-integration implies that the two series (futures and spot prices) are non-stationary but a linear combination of two variables is stationary, so that both are co-integrated. Further, after confirmation of long run equilibrium error correction mechanism is used to analyze short term deviations whereby markets attempt to find equilibrium relationship.

The first step in the analysis is to determine the order of integration of each price series. Second step is identification of co-integrating equation and estimation using Ordinary Least Squares (OLS) method. In the third step, residual from OLS regression are obtained and tested for the confirmation whether they are stationary or not. Fourth step is the construction of error correction model.

Evidence of price change in one market (futures or spot) generating price changes in the other market (spot or futures), so as to bring about a long run equilibrium relation is

$$S_t = \alpha + \beta F_t + Z_t$$

Where F_t and S_t are futures and spot prices at time t, α and β are parameters. Z_t is the deviation from parity. OLS is inappropriate if Ft and/or St are non-stationary because the standard errors are not consistent. If Ft and St Non-stationary but the deviation Zt is stationary then Ft and St are said be co-integrated and an equilibrium relationship exists between them. For Ft and St to be co-integrated they must be integrated of same order. Performing unit root tests on each price series confirms the order of integration. If each series

(Ft and St) is non-stationary in the level bur the first difference (ΔF_t and ΔS_t) and deviation Zt are stationary the series are said to be co-integrated of order (1,1) with β as the co-integrated coefficient.

The Granger representation theorem contains vector of economic variables. The disequilibrium term is missing from the vector autoregressive representation but when lagged disequilibrium terms are included as explanatory variables then the model becomes well specified. Such a model is called an error correction model because it has self-regulating mechanism whereby deviations from the long term equilibrium are automatically corrected. Building an ECM is the second stage of the co-integration analysis. It is a dynamic model on first differences of the integrated variables that were used in the co-integrating regression.

The ECM provides a short term of dynamic relations, quite distinct from the first stage of co-integration analysis. The connection between the two stages is that the disequilibrium term Z that is used in the error correction methodology. The reason for the name error correction stems from the fact that the model is structured so that short term deviations from the long term equilibrium will be corrected. The error correction model is as follows;

$$\Delta S_t = \alpha_1 + \gamma_1 Z_{t-1} + \beta_s \Delta S_{t-1} + \delta_s \Delta F_{t-1} + \varepsilon_{s,T}$$
$$\Delta F_t = \alpha_2 + \gamma_2 Z_{t-1} + \beta_f \Delta S_{t-1} + \delta_f \Delta F_{t-1} + \varepsilon_{f,T}$$

Each equation is interpreted as having two parts. The first part (Z_{t-1}) is the equilibrium error (from co-integration regression). This measures how the left hand side variable adjusts to the previous period's deviation from long run equilibrium. The remaining portion of the equation is lagged first difference which represents the short run effect of previous period's change in price on current period's price changes. The coefficients of the equilibrium errors γ1 and γ2 are the speed of adjustment coefficients and have important implication in an error correction model. At least one speed of adjustment coefficient must be non-zero and significant for the model to be an ECM. The coefficient serves the role of identifying the direction of causal relationship and shows the speed at which departure from equilibrium is corrected. The primary purpose of estimating the ECM is to implement price leadership test between futures and spot price. If futures and spot price are co-integrated then causality must exist in at least one direction (unidirectional causality) and possibly in both directions (bi-directional causality).

Co-integration implies that each series can be represented by an error correction model that includes last period's equilibrium error, as well as lagged values of the first differences of each variable. The temporal causality can be assessed by examining the statistical significance and the relative magnitudes of the error correction coefficients and the coefficients on the lagged variables.

4. Data

For quantitative analysis, two commodities GOLD and SILVER were considered for the sample period 5 years (from 1st January 2010 to 31st December 2014). The data was mainly collected from NCDEX exchange.

5. Empirical Analysis

This section describes the types of analyses taken for evaluating the price discovery of gold and silver commodities. As described in the previous section, data was collected from NCDEX exchange which contains the spot and futures prices of gold and silver commodities. In order to evaluate the price discovery, first of all we need to evaluate the collected time series data is stationary or non-stationary. Thus, Augmented Dickey and Fuller (ADF) unit root test has to be taken to confirm the position of data. The following table depicts the results observed from the ADF test.

Table 1: Unit root test using ADF

Commodity	Hypothesis	t-statistic	p-value
Gold	Futures has a unit root	-1.705699	0.7488
	Spot has a unit root	-1.097398	0.7190
Silver	Futures has a unit root	-1.368755	0.8699
	Spot has a unit root	-1.458399	0.8434

The above table illustrates the results of ADF unit root test with respect to gold and silver commodities futures and spot prices. The t-statistic & p-value are respectively, gold-futures -1.705699 & 0.7488, spot-futures -1.097398 & 0.7190, silver-futures -1.368755 & 0.8699, silver-spot -1.458399 & 0.8434. The statistical measure tested at 5% level of significance. Hence, it is clear that all p-values are greater than 0.05, hence the null hypothesis is accepted. It is also observed from the result that the futures and spot prices of gold and silver commodity's coefficient value is equal to zero, which means the futures and spot price has unit root. But, reference to p-value it indicates that the specified series is non-stationary.

Non-stationary data, as a rule, are unpredictable and cannot be modeled or forecasted. The results obtained by using non-stationary time series may be spurious in that they may indicate a relationship between two variables where one does not exist. In order to receive consistent, reliable results, the non-stationary data needs to be transformed into stationary data.

Different methods are available to transform non-stationary data to stationary. According the previous study, random walk method seems inefficient. Hence, we have applied the autoregressive integrated moving average (ARIMA) method. The re-validation of data exhibits stationary.

Which departure from equilibrium is corrected. The primary purpose of estimating the ECM is to implement price leadership test between futures and spot price. If futures and spot price are co-integrated then causality must exist in at least one direction (unidirectional causality) and possibly in both directions (bi-directional causality).

Co-integration implies that each series can be represented by an error correction model that includes last period's equilibrium error, as well as lagged values of the first differences of each variable. The temporal causality can be assessed by examining the statistical significance and the relative magnitudes of the error correction coefficients and the coefficients on the lagged variables.

C. Therefore, i provides an opportunity to test the relationship between spot prices and futures prices.

Pair-wise Granger causality test is suggested to measure the impact of spot and futures prices reference to the specific commodity, which is presented in the table 2.

Table 2: Granger Causality test

Commodity	Hypothesis	F-statistic	p-value
Gold	Spot price does not affect Futures price	10.0247	0.0000034
	Futures price does not affect spot price	3.726	0.00269
Silver	Spot price does not affect Futures price	3.642	0.02117
	Futures price does not affect spot price	8.5394	0.000039

The Granger causality test is usually preferred to test two stationary time series data. Table 2 depicts the Granger causality test results. It is noticed from the table that all p-values are less than 0.05, which indicates relationship between two variables (spot and futures)

6. Conclusion

This paper investigates the consequence of price discovery in the commodity futures market. Since, the price discovery is one of the primary functions to reduce the risk in futures market. It uses spot and futures prices to estimate the risk. Gold and silver commodities were chosen for this study, which indicates that spot and futures prices have found significant convergence on preventing risk. The price discovery process is executed through various sub-activities which contains variety of methods. Hence, the future study can incorporate all methods in the evaluation and show the efficient technique among the list.

7. References

1. Ahuja NL. Commodity derivativemarket in India: Development, regulation and future prospects, International Research Journal of Finance and Economics. 2006; 2(1):153-162.
2. Chopra A, Bessler DA. Price Discovery in the Black Pepper Market in Kerala, India, Indian Economic Review, 2005, 1-21.
3. Easwaran RS, Ramasundaram P. Whether Commodity Futures Market in Agriculture is Efficient in Price Discovery?—An Econometric Analysis, Agricultural Economics Research Review, 2008, 21.
4. Garbade KD, Silber WL. Price movements and price discovery in futures and cash markets, The Review of Economics and Statistics, 1983; 65:289-297.
5. Karande K. A study of castor seed futures market in India, Indira Gandhi Institute of Development Research, Mumbai, India, 2006.
6. Sahi GS, Raizada G. Commodity Futures Market Efficiency in India and Effect on Inflation, Available at SSRN 949161, 2006.
7. Sunil Kumar. Price discovery and market efficiency: evidence from agricultural commodities futures markets, South Asian Journal of Management. 2004; 11(2):32.
8. Oellermann CM, Brorsen BW, Farris PL. Price discovery for feeder cattle, The Journal of Futures Markets. 1989; 9:113-121.