



## **A STUDY ON THE STOCK MARKET EFFICIENCY AND INTERRELATIONSHIP BETWEEN SPOT AND FUTURES COMMODITY PRICES IN INDIA**

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### **ABSTRACT**

*In India we find a contrasting view of the market efficiency and interrelationship of spot and futures commodity prices. Also, the issues of whether the operation of futures market increases spot market volatility and create a macro economic impact like inflation, market distortion or mispricing is still unresolved. In this paper, we analyses the researches in Indian commodity markets and other countries to address these issues. In our initial investigation for Indian researches, we find that inferences may be contrasting due to the time periods of data used for analysis, selection of the commodity or market exchange and the influence of the limiting nature of research techniques.*

### **Introduction**

Market efficiency is a necessary condition for forecasting future prices of traded assets. In commodity markets, many researchers have examined different aspects of market efficiency using various time series techniques. In an emerging market context, the growth of commodity future market would depend on the efficiency of the future market . Various researches have been conducted globally to examine the efficiency of commodity derivative markets particularly futures contracts like Canarella and Pollard (1987), Baura (1987), Chan et al (1997), Dickinson

and Muragu (1994), Min et al. (1999) for Korea and Taiwan market which establish the weak form of efficiency.

Oellermann and Farris (1989) investigated the direct impact of futures trading on the live cattle spot market and find that introduction of futures trading improved spot market efficiency, but also increased short-run spot price risk. Kaminsky and Kumar (1990) show that for certain commodities expected excess returns to futures speculation are non-zero, particularly for forecast horizons for more than three months.

Researches on Indian commodity markets show contrasting results. Thiripalraju et al, (1997) shows that Indian commodity markets are efficient in terms of price formation, price discovery and inter market feedback. Singh (2004) argue that for market efficiency is mixed and varies across the commodities. Sahi and Raizada (2006) have concluded that the price discovery was poor, and, the higher volumes in futures markets had a significant causal impact on inflation. Bose (2008) find that both futures and spot prices contribute to price discovery and the futures market can provide information for current spot prices and thus help to reduce volatility in the spot prices of the relevant commodities and provide for effective hedging of price risk. But, Eswaran and Ramasundaram (2008) indicated that the futures and spot markets are not integrated. Singh, Shunmugam and Garg (2009) realized the genuine shortcomings accruing due to lack of detailed investigation of seasonality, overlapping data and un spaced observations in examining the efficiency and spill over.

Goyari and Jena (2010) show that the Indian commodity markets are not weak form efficient signifying that there is systemic way to exploit trading opportunities and acquire excess profits. Kaur and Rao (2010), Chakrabarty and Sarkar (2010) find that the commodity spot market indices and, the future market indices are cointegrated with each other. So if the information regarding any one of the index is available, hedging can be done on other commodity indices. However, Dinkar and Nagpal(2011), Ali and Gupta (2011) find the market to be partially efficient. Agnihotri and Sharma (2012) argue that market quality need not be compromised with contract separation. It is inferred that the issue of co-integration and market efficiency is still unresolved.

I will try to find interesting to explore the reasons for these varying results of these researches and possible explanation of the methodological implications. For this purpose, we split the issue of market efficiency into three components – (a) Price discovery and Volatility Spillover, (b) Interrelationship between futures and spot markets and (c) Macro economic impact of futures commodity markets. I use the published research paper on commodity markets with a focus on Indian markets.

### **Price Discovery and Volatility Spillover is of interest to traders**

The issue of Price Discovery and Volatility Spillover is of interest to traders, investors, financial economists and analysts. Although futures and spot markets react to the same information, the major question is which market reacts first and from which market volatility spillover to other market. Various researches have been conducted on the price discovery and volatility spillover in the Indian as well as international context. Table 1 shows a gist of these researches focusing the research technique used, issues examined and the implications.

**Table 1 – Researches on Price discovery and Volatility**

<b>Author</b>	<b>Issue Examined</b>	<b>Technique</b>	<b>Implications</b>
Stein (1987)	Conditional Model	Developing a model where prices are determined by interaction of hedgers and informed speculators	Opening a futures market improves risk sharing and reduces price volatility
Bessembinder and Seguin (1993)	Open interest and spot market volatility	Co-integration	Spot volatility is positively related to unexpected volume and negatively related to expected open interest
Kanas (2000)	Spillover effects across countries	Co-integration	Strength of the volatility spillovers increased after major events
Thomas and Karande (2001)	Price discovery function of futures	Garbade and Silber (1983) price dynamics	Markets react differently to

	markets	model.	information in the price discovery
Naik and Jain (2002)	Price discovery and risk management	Co-integration	Significant Co integration relationship (a strong long run relation)
Kumar and Sunil (2004)	Price discovery function of futures markets and information efficiency (India)	Johansen Co integration	Futures market unable to fully incorporate information
Aviral Chopra and Blesser (2005)	Price discovery in the spot market	Co-integration, error correction models	Spot and first distant futures contracts behavior show market inefficiency
Slade and Thille (2006)	Levels and volatilities of the spot prices	Descriptive measures	Positive relationship between increased trading and price instability.
Sahi (2006)	Trading impact of futures markets	Granger Causality	No change in volatility
Kiran and Mukhopadhyay (2007)	Volatility spillover from the US to India	GARCH on intra-day	Established, Simple ARMA-GARCH model outperforms MGARCH model.
Biswal (2009)	Price discovery function of futures contracts	Co-integration and Error correction dynamics	Futures and spot markets in are co-integrated and sharing a long-run relationship
Debasish and Kushankur (2011)	Volatility and its spillover effects	GARCH, EGARCH, CGARCH, MGARCH, Diagonal VEC, BEKK	Bi-directional spill over captured under GARCH and unidirectional spill over found under EGARCH
Bhatt (2012)	Price discovery mechanism in commodities and assess the long-term trends in their prices.	Lagged response model	Model robust to capture trends
Shiyun Li(2015)	Volatility Spillovers in the CSI300 Futures and Spot Markets	VAR-BEKK-bivariate GARCH Model	Effectively reducing the volatility of the stock market

It can be seen from the existing literatures on Price Discovery and Volatility Spillover, that even though spot and futures markets react to the same information, the major question is which market reacts first. The data available on commodity exchanges – MCX, NCDEX, ICX differ significantly with respect to the time frequency, price-volume, high low statistics. On some exchanges the data is not continuous which raises questions on the applicability of an appropriate times series method. We also raise questions on use of econometric techniques. The results of price discovery and spillovers would be different in different circumstances. They may possibly explain the confusion between the researchers.

### **Relationship between spot and futures markets**

I further explore the relationship between spot and futures markets used to test the notion of efficiency under a distinct framework. The selected list of researches on these aspects is given in Table 2.

**Table 2 – Researches on Spot and Future Markets Relationship**

<b>Author</b>	<b>Issue Examined</b>	<b>Technique</b>	<b>Implications</b>
Chan (1992)	Cash-futures price relationships	Co-integration, lead lag regression	Trading intensity affected lead lag relation-no convincing evidence
Baharumshah and Habibullah (1994)	Long-run relationship among prices in six different markets of Malaysia	Co-integration	Markets in Malaysia were highly integrated
Thornton and Herrero (1997)	Stable long-run co-movement exists between world commodity prices and UK retail prices	Co-integration, Granger Causality	No casualty found
Silvapulle and Moosa (2000)	Price volume relationship in futures market	Non-linear causality test. Bivariate VAR	Linear causality from volume to price
Maynard et al. (2001)	Performance of the thinly traded futures contracts traded on	Short-run analysis using Sims' two-sided distributed lag model	Only one variety in the spot market co-integrated with one of

	Minneapolis Grain Exchange.		the futures contracts.
Sahadevan (2002)	Relationship between returns, trading volume, market depth, and volatility.	Co-integration	Lack of efficient and modern infrastructure facilities, existence of the gray market and lack of participation in the futures markets
Chen and Firth (2004)	Relationship between return and trading volume of commodity futures in China.	Co-integration	No contemporaneous correlation exists between return and trading volume.
Singh et al. (2005)	Mechanism of movement of spot and future prices	Co-integration	Futures contract behave in an expected manner and a mechanism for long-run equilibrium exists
Reddy (2006)	Causality and speed of adjustment to deviations in long run equilibrium	Co-integration, Granger causality, VECM	No single country is completely exogenous and many countries GSP prices are interlinked to some extent
Hadsell (2006)	Relationship between trading volume and price volatility	Threshold ARCH	Traders react asymmetrically to new information
Lokare (2007)	Cash-futures price relationships	Co-integration, Casualty	Evidence of co-integration and operational efficiency, though at a slower rate
Roy and Kumar (2007)	Lead-lag relationship between spot and futures prices and hedging effectiveness	Johansen Co-integration, Garbade-Silber (1983) model	Partial evidence
Sandhya (2008)	Impact of futures trading on market integration	Co-integration	Partial evidence
Agnihotri (2009)	Relationship of future and spot price	Standard deviation, regression and correlation	Partial evidence
Bhardwaj and Vasisht (2009)	Integration of futures and spot market	Co-integration, Granger Causality the	Price discovery in each contract is

			unidirectional
Ghosh (2010)	Role of thin commodity futures markets in physical market price	VAR Granger Causality Unrelated regression	Little evidence that futures price serves as reference price
Vasisht and Bhardwaj (2010)	Volatility of agricultural prices	Johansen Cointegration tests, Granger causality	Co-integration evidence found but unidirectional causality from futures to spot markets
Bhardwaj and Vasisht (2010)	Bivariate relationship between spot and future market	Granger causality.	Evidence found
Srinivasan (2011)	Performance of various hedge ratios	OLS ,VECM, M-GARCH with error correction model	Dynamic M-GARCH model hedging strategy performs best in reducing the conditional variance of the hedged portfolio.
Kumar and Pandey (2011)	Relationship between volatility and trading activity including trading volume and open interest	GARCH, Granger Causality, variance decomposition, IRF	Only overnight volatility drives the trading volume but not open interest.
Srinivasan (2012)	Price discovery process and volatility spillovers	Johansen Cointegration, VECM, Bivariate EGARCH	Flow of information from spot to futures commodity markets
Haq and Rao(2014)	Commodity market efficiency	Johansen Co-integration and VECM	Efficiency in long run and inefficient in short run
Vivek Kumar(2015)	market efficiency	Vector Error Correction Model (VECM)	impulse response

The flow of information from futures to spot is obvious and is an auto process, yet we find instances of backwardation and co tango violated over fairly large time periods. We also blame the large Foreign Institutional Investors (FII) acting as fly by night operators both in the commodity and securities markets. I generalize by saying that the Indian commodity market is

inefficient in semi strong form but sometimes for selected data groups typically show efficiency in short runs.

### Impacts on Commodity Market

Researchers have extensively used a variety of integration and vector type models to investigate the impact of commodity trading on various macroeconomic measures particularly inflation. The series of futures prices conveys information to the market. If the information disseminated to the market is inefficient, the price arbitrage can have a devastating impact. An important concern to the policy makers is the impact of the market behavior on the macro economic variables. India, in the last decade has witnessed serious demand-supply gaps as well as price distortions in markets, which have raised important concerns like rising prices. Table 3 shows the summary of the researches mainly carried out on Indian commodity markets.

**Table 3 - Researches on economic Impacts of Commodity Markets**

<b>Author</b>	<b>Issue Examined</b>	<b>Technique</b>	<b>Implications</b>
Becker and Finnerty (2000)	Commodities can be used as inflation hedge	GARCH	Inclusion of long commodity futures contracts in portfolios improved the risk and return performance of stock and bond portfolio
Jensen, Mercer and Johnson (2002)	Diversification benefit of adding commodity futures to a traditional portfolio	Co-integration	Commodity future sustainability enhances portfolio performance
Pandey (2005)	Price behavior of selected commodities in neighboring countries of Asia on its Indian equivalents.	GARCH	Commodity future sustainability enhances portfolio performance
Pandey (2005)	Price behavior of selected commodities in neighboring countries of Asia on	GARCH	Partial Evidence



	its Indian equivalents.		
Aggarwal and Ladda (2007)	Inter linkages between macroeconomics and agro commodity prices	Co-integration model and OLS model.	Macroeconomic influences are minimal or remain obvious to the changes in agricultural prices and yield.
Kumar, Singh and Pandey (2008)	Hedging effectiveness of futures	OLS, VAR and VECM, MGARCH	Futures are effective
Bose (2009)	Role of futures trading on inflation	Co-integration	No conclusive proof regarding the role of futures market in India or in the US.
Nayak (2010)	Sources of agricultural commodity price fluctuations and their macroeconomic implication for developing countries	Co-integration	Future market price is not stable and not efficient from macroeconomic point of view.
Varadi (2012)	Evidence of speculation in Indian commodity markets.	Co-integration	Recent price surge in commodity markets has stipulated the intensity of various factors, which lead to the price volatility.
Agarwal, Jain and Thomas (2014)	Efficiency and Risk management	Co-integration	High settlement cost, poor warehousing
A.singh & K.singh	Commodity market during business cycle	Regression, Standard Deviation	less correlation include in stock and commodity market

In developing countries like India, commodity markets haven direct implications on the functioning of the economy since a large chunk of the household demand is represented by commodity consumption. The idea behind allowing the commodity futures to trade on the changes is to possible reduce the uncertainty of spot prices and an auto mechanism for the government authorities and regulators to fix the minimum support prices to farmers as applicable to many agro commodities .

In Table 3 We find a large use of the granger casualty and integration models to explain the macroeconomics particularly the inflation measured by Whole Sale Price Index (WPI). Most of the researches indicate that introduction of futures trading has produced inflationary effects. We give two arguments to explain this phenomenon. India has moved from a controlled economy to a somewhat open system.

## Conclusion

The importance of futures markets in restoring equilibrium and efficiency is unquestionable as evidenced from the research in various developed countries. However, in India we find a host of market distortions that confuse the researchers to generalize their findings. The operational control of market regulators and government policies are highly dynamic and unpredictable which may lead to the unclear market regulation that possibly explains the contrasting natures of the research inferences.

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