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Original Research Paper

Management

A STUDY ON VOLATILITY OF COMMODITIES TRADED WITH SPECIAL REFERNCE TO MCX

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ABSTRACT Commodity market has a tremendous economic impact on the nation. Commodity trading can be risky because it can be affected by eventualities that are difficult to predict the volatility. It indicates the pricing behaviour of the commodity and it helps to estimate the price fluctuations. This study mainly focuses on price volatility of selected 7 commodities from each sector. The study analyses the market efficiency and relationship between future and spot prices. The data was collected from MCX for a period from 2012 to 2016. Correlation, ADF Unit Root test and GARCH were used to analyse the data. The study reveals that there exist relationship between spot and future price of copper and silver.

KEYWORDS : Commodity market, Market efficiency, GARCH model, Volatility.

I. Introduction

Commodity market has a tremendous economic impact on the nation. Commodities market represents another kind of organized market just like the stock market and the debt market. Commodity trading can be risky because it can be affected by eventualities that are difficult to predict. Price fluctuations occur because of demographic changes, unusual weather condition, natural disaster and man-made disaster that affect the supply and demand of commodities. However, commodities market, because of its unique nature leads to the benefits of a wide spectrum of people like investors, importers, exporters, producers, and corporate.

The commodity futures contract was adopted to ensure the convergence between the spot and future price of the commodity at the end of the settlement period. The commodity price as on future dates makes the commodity market more strong and vibrant. Currently, the various commodities across the country clock an annual turnover of Rs 1, 40,000 crores (Rs 1,400 billion). With the introduction of futures trading, the size of the commodities market grows many folds here on. The total turnover at MCX was Rs.4,53,820 crore in October 2016, which is a decrease of 13.17 percent over the total turnover of Rs.5,22,626 crore during September 2016. The contribution to the total turnover at MCX from Energy segment was at 35.93 percent followed by Bullion segment at 34.06 percent, metals segment with 27.52 percent and agricultural commodities had a share of 2.49 percent. The total turnover at NCDEX has decreased from Rs.49,415 crore in September 2016 to Rs. 9,706 crore in October 2016, a decline of 19.6 percent. Since June 2016, the entire turnover at NCDEX is contributed by the agricultural commodities segment only. The total turnover of agricultural commodities was the highest at NCDEX (Rs.39,706 crores) followed by MCX (Rs.11,307 crores) and NMCE (Rs.1,764 crores).

Objectives

- To analyze the relationship between spot and future price of the selected commodity
- To identify the price volatility of the selected commodity in the future trading

II. REVIEW OF LITERATURE

Stelios D. Bekiros and Cees G.H. Diks (2008) conducted a study on spot and future price relationship of crude oil. The research methodology used was empirical design. The data used was secondary data from West Texas Intermediate crude oil price for the period of two segments such as October 1991-1999 and November 1999-october 2007. The tools used were linear granger causality test, co-integration, GARCH, VAR, and VECM. The results showed that pairwise VECM modeling suggested strong bi-directional granger causality between spot and future price. This linear relationship of crude oil spot and future prices impacts the market efficiency.

Mr.Regi Franchis (2009) conducted a study on the impact of future trading on the spot price. The study was to analyse the degree of integration of future and spot prices of the pepper and to analyse the volatility of future and spot prices and price discovery, to identify the efficiency of commodity futures market and spot trading. The research methodology used was descriptive. The result indicates that future price and spot price are highly co-integrated and future prices are more volatile than spot prices of pepper.

Manuel Hernandez and Maximo Torero (2010) conducted a study on the dynamic relationship between spot and future price of agri commodities. The research design was empirical research. The data used was secondary data such as corn, wheat, and soybeans. The weekly spot prices are obtained from Food and Agriculture Organization of the United Nations (FAO) international commodity price database. The period of the study was from January 1994 to June 2009. The tool used was granger causality test. The result indicates that spot prices are discovered in futures markets. The change in future prices dominates the spot prices.

Sehgal, S., Rajput, N., & Dua, R. K. (2012) conducted a study on future trading and spot market volatility. The researchers analyzed the impact of futures on commodity price fluctuation and to understand the relationship between the spot and future price. The research design used was descriptive. The period of study was 2004-2014. The data used was secondary from MCX. The tools used natural logarithm return, Granger's causality test, GARCH, correlation, regression, and ADF. The author was concluded that conditional variance has a greater impact on the volatility of spot market return, the risk-return relationship between overnight and day trading induces volatility, and volatility spillovers from future to spot market are quite dominant.

Chauhan A, Singh S, & Arora A (2013) conducted a study on market efficiency and volatility spillovers in future and spot agricultural commodity market. The study was to analyze the impact of volatility in one series on the future volatility in other series. The research methodology used was empirical research. The data used in this study was Guar and Chana and it collected from NCDEX for the period of 1st April 2004 to 31st March 2012. The tools used in this study were ADF, KPSS, VECM, WALD, co-integration and GARCH. The author concluded that volatility lying in the commodity prices is a major concern for the participants (traders, speculators, and arbitrageurs), and volatility in the spot market of chana influences the volatility in the future movement of commodity price.

III. RESEARCH METHODOLOGY

Empirical research starts from specific concrete observations to create a model and subsequently, a theory. Daily closing prices from 2012:01 to 2016:12was collected from MCX- COMDEX index, Metal index contributes 40%, energy index contributes 40% and agri index contributes 20%.

IV. DATA ANALYSIS AND INTERPRETATION

1. CORRELATION

Table 01: correlation of spot and future price of selected commodities

Commodity	Correlation value	Inference
Cardamom	0.401025	Moderate correlation
Copper	0.942521	**High correlation**
Lead	0.441029	Moderate correlation
Crude oil	0.297786	Low correlation
Natural gas	-0.301741	Negative correlation
Gold	0.430262	Moderate correlation
Silver	0.753573	**High correlation**

The results infer that all the commodity except natural gas has a positive correlation among the spot and future price. Copper and silver have the correlation value greater than 0.70 which represents the highly positive correlation. The changes in spot price will influence the change in future price. Natural gas has the negative correlation which states that the spot and future price of natural gas have an inverse correlation. If the spot price increases then the future price will decrease (Vice versa).

2. ADF TEST

Table 02: ADF unit root test for selected commodity

Commodity	Price	P value (level)	t-stat (5% critical value)	Decision	P-value (1st difference)	t-stat (5% critical value)	Decision
Cardamom	**Future**	0.0126 < 0.05	-3.3599 < -2.8634	**Stationary**	**NA**		
	Spot	0.2875 >0.05	-2.5848 >-3.4163	**Non stationary**	0.000 < 0.05	-15.433 <-3.416	**Stationary**
Copper	**Future**	0.0461< 0.05	-3.443 < -3.4130	**Stationary**	**NA**		
	Spot	0.5593 > 0.05	-1.4484 > -2.8655	**Non stationary**	0.0000 < 0.05	-29.548 < -2.865	**Stationary**
Lead	**Future**	0.0644 > 0.05	-3.3136 > -3.4130	**Non stationary**	0.0000 < 0.05	-31.101 < -3.413	**Stationary**
	Spot	0.0000 < 0.05	-8.5943 < -3.4164	**Stationary**	**NA**		
Crude oil	**Future**	0.60270 > 0.05	-1.3098 > -2.8634	**Non stationary**	0.0000 < 0.05	-31.87 < -2.86	**Stationary**
	Spot	0.7455 > 0.05	-1.026 > -2.865	**Non stationary**	0.0000 < 0.05	-27.124 < -2.865	**Stationary**
Natural gas	**Future**	0.50 > 0.05	-2.16 > -3.41	**Non stationary**	0.0000 < 0.05	-42.11 < -3.41	**Stationary**
	Spot	0.594 > 0.05	-2.01 > -3.41	**Non stationary**	0.0000 < 0.05	-16.74 < -3.41	**Stationary**
Gold	**Future**	0.0138 < 0.05	-3.329 < -2.863	**Stationary**	**NA**		
	Spot	0.571 > 0.05	-1.424 > -2.865	**Non stationary**	0.0000 < 0.05	-25.95 < -2.865	**Stationary**
Silver	**Future**	0.4196 > 0.05	-1.72 > -2.863	**Non stationary**	0.0000 < 0.05	-27.277 < -2.863	**Stationary**
	Spot	0.49 > 0.05	-1.57 > -2.86	**Non stationary**	0.0000 < 0.05	-27.13 < -2.865	**Stationary**

3. GARCH(1,1) MODEL

Conditions need to be satisfied

- There should be arch effect in the data
- There should be no serial correlation

Table 03: Inference of garch model conditions

Commodity	Series	ARCH – LM test (p value)	Durbin Watson statistics (p value)	Decision
Cardamom	**At Future price**	0.0294 <0.05 Arch effect is significant	2.630669 No serial correlation	Proceed with GARCH(1,1) model
	At Spot price	0.0000 <0.005 Arch effect is significant	2.319324 No serial correlation	Proceed with garch(1,1) model
Copper	**At Future price**	0.0000 < 0.05 Arch effect is significant	2.081149 No serial correlation	Proceed with GARCH(1,1) model
	At Spot price	0.0000 < 0.05 Arch effect is significant	2.490501 No serial correlation	Proceed with GARCH(1,1) model
Lead	**At Future price**	0.0000 < 0.05 ARCH effect is significant	2.009709 No serial correlation	Proceed with GARCH(1,1) model
	At spot price	0.9661 No arch effect	1.537333 No serial correlation	**NA**
Crude oil	**At Future price**	0.0000 < 0.05 ARCH effect is significant	2.020101 No serial correlation	Proceed with GARCH(1,1) model
	At spot price	0.0000 < 0.05 Arch effect is significant	2.166654 No serial correlation	Proceed with GARCH(1,1) model
Natural gas	**At Future price**	0.0002 < 0.05 ARCH effect is significant	2.161436 No serial correlation	Proceed with Garch(1,1) model
	At spot price	0.0000 < 0.05 Arch effect is significant	2.725134 No serial correlation	Proceed with GARCH(1,1) model
Gold	**At Future price**	0.007 > 0.05 No ARCH effect	2.006753 No serial correlation	Proceed with Garch(1,1)
	At spot price	0.000 < 0.05 ARCH effect is significant	2.022209 No serial correlation	Proceed with Garch (1,1) model
Silver	**At Future price**	0.0911 > 0.05 No ARCH effect	2.002763 No serial correlation	Proceed with garch(1,1)

	At spot price	0.0000 < 0.05 Arch effect is significant	2.142320 No serial correlation	Proceed with GARCH(1,1) model

Table 04: volatility measure of selected commodity using garch model

Commodity	Price	ARCH coefficient (alpha)	GARCH coefficient (beta)	Volatility (alpha +beta)
Cardamom	Future	0.053947	-1.004309	-0.950362
	Spot	1.272769	-0.290189	**0.98258**
Copper	Future	0.111308	-0.076035	0.035273
	Spot	0.213222	0.082332	0.295554
Lead	Future	0.041273	-0.737228	-0.695955
	Spot	**NA**		
Crude oil	Future	0.072384	-0.997191	-0.924807
	Spot	1.277703	-0.333350	**0.944353**
Natural gas	Future	0.025876	-0.663845	-0.637969
	Spot	**NA**		
Gold	Future	0.447672	-0.006968	0.440704
	Spot	1.482907	-0.752965	**0.729942**
Silver	Future	0.648678	-0.124003	0.524675
	Spot	1.214846	-0.286548	**0.928298**

P value of arch lm test should be less than 0.05 then, there is an arch effect is significant. Durbin-Watson statistics value should be closer to 2 which means there is no serial correlation in the data. Volatility is measured using coefficients of ARCH and GARCH term. The sum of arch and garch coefficient should be closer to 1.

Conclusion

This study has investigated the volatility of commodities market through the use of time series methodologies. The markets for all actively traded commodities included in the study are efficient in the long run. However, short run inefficiencies and pricing biases exist, which can be attributed to volatility to a minimum extent and slow adjustment to long run equilibrium. It was observed that the degree to which commodity spot prices have a relationship with the future market with a view to measure the efficiency. The results indicate that relationship exists between the future and spot prices of copper and silver. There is a clear linking of futures prices and spot prices of commodities traded on the exchanges, thereby leaving arbitrage opportunities, because of which actual hedgers find these exchanges useful for managing their commodity price risks.

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