AN ASSESSMENT OF SAFETY IN INVESTING COMMODITY DERIVATIVES OF BASE METALS TRADED IN MCX

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ABSTRACT

Commodity Derivative Market is one of the important and flourishing markets in India. It also supports the agricultural sector, the backbone of India. This market has become the most desirable investment option for both the small and large investors. Accumulation of wealth, predominantly through investments, has been the prime motive of every human life on the earth. Investments are considered to be safe and good when they are presumed to give maximum return with minimum risk. Though an investment in the commodity market is considered to be a little risky, there are some commodities that may be proved to be safe. Investments in commodity market have been less risky than that of the stock market. This study examined the volatility of prices of Six Base Metals during the study period from 1st June 2010 to 31st May 2011. As compared to other base metals, the commodity, Aluminium, has suffered less volatility. Therefore, investors who trade in Multi Commodity Exchange are advised to invest in this commodity. From the analysis of the volatility of the prices of Base metals, Aluminium, has been considered to be the safest metal to invest in.

Keywords: Commodity Derivatives, Base Metals, Investment Investors, Volatility

1. INTRODUCTION

A commodity may be defined as an article, a product or material that is bought and sold. It can be classified as every kind of movable property, except actionable claims, money and securities.[1]. Commodity derivatives, which were traditionally developed for risk management purposes, are now growing in popularity as an investment tool. Most of the trading in the commodity derivatives market is being done by people who have no need for the commodity itself. The commodity derivatives market is a direct way to invest in commodities rather than investing in the companies that trade in those commodities.[2]There are two basic types of participants in commodities markets–hedgers and speculators. Hedgers seek to minimize and manage price risk, while speculators take on risk in the hope of making a profit.

Every investor should diversify his portfolio with commodities, since there is low or even negative correlation between commodities and traditional stocks, thus lowering overall portfolio risk. Like any other market, in commodities market also speculators, who buy and sell on conviction about price movements, could be found.

Price volatility is a measure of fluctuations or deviations in the commodity prices. It is the measure of the uncertainty of the returns realized on an asset, investment, or on an exposure. Price volatility occurs due to the variations in the demand and supply of a given commodity, which in turn depends on a host of factors such as social, economical, political, and natural or man-made. It creates financial risks for users and suppliers of any given commodity, which affects their profitability.

2. TRADING ON BASE METALS - A REVIEW

Wen-Rong Jerry Ho, Yung-Chung Wang and Guan-Juan Liou (2010), in their paper entitled **"The interactive relationship among international gold indices, gold futures and the overall economy"** analysed the interactive relationship among the Amex gold BUGS index, the New York gold spot and the New York gold futures in the gold market, as well as the Commodity Research Bureau (CRB) futures price index, the Dow Jones industrial average, the OPEC crude oil spot, and the dollar index. The study found that only the AMEX gold index, the CRB futures index, the New York gold spot and the Dow-Jones industrial average move ahead of the New York gold futures. Furthermore, the relationship between the New York gold spot and the New York gold futures as well as the CRB futures index and the New York gold futures show bi-directional causality. The results of the study indicate that co-integration exists among gold futures, gold indices and the overall economy, meaning there is a long-term equilibrium relationship with gold futures.[3]

The paper entitled, (2004), **"Volatility and Commodity Price Dynamics"**, by **Robert s. Pindych**, analysed the role of volatility in short run commodity market dynamics, using daily and weekly data for crude oil, heating oil and gasoline and inventories, focusing on the behavior and role of volatility. The result of the study was indicates that the past value of the spot price affect past values of volatility, which in turn affects its current value.[4]

3. NEED OF THE STUDY

Commodity futures market gives either unlimited loss or unlimited profit, and therefore, investors should know the market condition in order to earn more returns. Hence, there arises a need to test the volatility in commodity prices in the commodity exchange in India. The present study is an attempt to analyse the volatility of commodities with the help of GARCH (1, 1) models.

4. OBJECTIVES OF THE STUDY

The present study is carried out with the following objectives:

1. to analyse the volatility of spot and futures prices of sample commodities.

2. to analyse the volatility structure of spot and future price of sample commodities.
3. to make suggestions to the investors.

5. RESEARCH HYPOTHESIS OF THE STUDY

The present study is an attempt to test whether the spot and futures prices of commodities are volatiled. Based on this, the following research hypothesis have been proposed:

There is a significant difference among the levels of volatility in spot and futures prices of commodities.

6. SCOPE OF THE STUDY

The present study has been carried out with the focus of studying the volatility in spot and futures prices of commodities in India with special reference to Multi Commodity Exchange Ltd.

The present study has covered the sample of three commodities which are traded in Multi Commodity Exchange. The study has covered a period of 12 months from 01.01.2011 to 31.12.2011.

This study is useful for the Advisory agents and the investors to manage the commodity price risk that prevails in the market. Moreover it is helpful for the investors to hedge their profits through the use of commodity exchange.

7. METHODOLOGY

7.1. Universe

All the commodities listed and traded in Multi Commodity Exchange (MCX) Limited, in the Indian commodity market is the universe of this study.

7.2. Sample Design

There are totally 32 commodities traded in multi commodity exchange in India. But only twenty commodities has been continuously traded during the study period, from 1st June 2010 to 31st May 2011. Among these twenty commodities, data of only sixteen commodities are available in the exchange. This study examined the volatility of prices of six Base Metals. The details of sample are given in **Table-01.**

TABLE – 01

LIST OF COMMODITIES TRADED IN MCX BETWEEN 01.06.2010 TO 31.05.2011

S.No	Name of the Commodity	Sales Turnover (In ₹)
1	Copper	3,047,997,858,000
2	Nickel	974,490,482,000
3	Zinc	782,411,362,000
4	Lead	740,878,968,000
5	Aluminium	194,579,794,000
6	Tin	1,412,000

Source: www.mcxindia.com

7.3. Type and Sources of data

The present study is purely based on published data. The required data for analysis have been collected from the following websites:

a) www.mcxindia.com

b) www.fmc.org.in
c) www.rbi.org.in

7.4. Period of the Study

Prices of daily commodity spot and futures under Multi Commodity Exchange Ltd (MCX) for 12 months period from 1st January 2011 to 31st December 2011 have been used for analyzing the volatility in commodity market in India.

7.5. STATISTICAL TOOLS USED FOR ANALYSIS

In order to analyse the volatility of both spot and futures prices in commodity market, the Generalized Autoregressive conditional Heteroskedascity (GARCH (1, 1)) have been used.

8. ANALYSIS AND RESULTS

In order to study the effect of Volatility for Commodity Spot and Futures Prices, the following analysis were made as detailed below

1. Analysis of Daily Returns of Spot and Futures Prices of Copper.
2. Analysis of Daily Returns of Spot and Futures Prices of Nickel.
3. Analysis of Daily Returns of Spot and Futures Prices of Zinc.
4. Analysis of Daily Returns of Spot and Futures Prices of Lead.
5. Analysis of Daily Returns of Spot and Futures Prices of Aluminium.
6. Analysis of Daily Returns of Spot and Futures Prices of Tin.

8.1. Analysis of Daily Returns of Spot and Futures Prices of COPPER from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Copper.

TABLE-02

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF COPPER FROM 01.06.2010 TO 31.05.2011

Copper Spot			**Copper Futures**		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.112110	0.031921	C	0.074966	0.047869
RESID(-1)^2	-0.019385	0.010701	RESID(-1)^2	0.015199	0.022024
GARCH(-1)	0.956864	0.018312	GARCH(-1)	0.931745	0.041082
Mean	0.088785		Mean	0.086284	
R-squared	-0.003678		R-squared	-0.004904	
Adjusted R-squared	-0.010347		Adjusted R-squared	-0.011581	
S.D dependent variable	1.466452		S.D dependent variable	1.234151	
Akaike Information	3.547622		Akaike Information	3.259119	

criterion		criterion	
Schwarz criterion	3.584303	Schwarz criterion	3.295800
Probability	0.0000	Probability	0.0000

Source: Computed from E-views

Table-02 exhibits the GARCH (1, 1) effect for spot and futures prices returns of Copper. The table indicates that the effect of the mean equation co-efficient of spot and futures are 0.088785 and 0.086284. The table also explains that the average daily percentage change was very low in the spot and futures price of copper returns.

The adjusted R-squared of both copper spot and futures prices were at (-0.010347) and (-0.011581) respectively. The R-squared of spot (-0.003678) and futures (-0.004904) value show that there is a linear relationship between the two because the value is less than 1. It shows that the series are stationary and also the persistence changes in volatility are gradually increasing throughout the study period.

The Akaike info criterion and Schwarz criterion test help find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. This indicates that the market is volatile.

The GARCH (1, 1) spot and future prices were significant at 5 percent level. Therefore, Copper spot prices were influenced by futures prices. In this study, the GARCH Model shows the time varying volatility in Copper spot and futures prices and those prices suffered low volatility. Hence, there is a significance difference among spot and futures prices of commodity during the study period. It can be clearly explains that there is significant volatility among the prices of commodities traded.

8.2. Analysis of Daily Returns of Spot and Futures Prices of NICKEL from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Nickel.

TABLE-03

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF NICKEL FROM 01.06.2010 TO 31.05.2011

Nickel Spot			**Nickel Futures**		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.414172	0.198053	C	0.310126	0.183105
RESID(-1)^2	-0.021822	0.011702	RESID(-1)^2	0.009944	0.022972
GARCH(-1)	0.865375	0.070817	GARCH(-1)	0.847560	0.086455
Mean	0.013498		Mean	0.02578	
R-squared	-0.000063		R-squared	-0.000277	
Adjusted R-squared	-0.006664		Adjusted R-squared	-0.006880	
S.D dependent variable	1.709152		S.D dependent variable	1.551352	
Akaike Information criterion	3.876603		Akaike Information criterion	3.687382	
Schwarz criterion	3.913109		Schwarz criterion	3.723888	
Probability	0.0000		Probability	0.0000	

Source: Computed from E-views

From **Table-03** it can be noted that the GARCH (1, 1) effect for spot and futures prices returns of Nickel. The table specifies that the effect of the mean equation co-efficient of spot and futures was 0.013498 and 0.02578. The table also reveals that the average daily percentage change to be very low in the spot and futures price of Nickel returns.

The adjusted R-squared of both nickel spot and futures prices were at (-0.006664) and (-0.006880) respectively. The R-squared of spot (-0.000063) and future (-0.000277) value show that there is a linear relationship between the two because the value is less than 1. This indicates that yesterday's prices have very less influence over today's prices. It show that the series are stationary and also the persistence changes in volatility are gradually declining and the changes in the price shows downward trend.

The Akaike info criterion and Schwarz criterion test help find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. This indicates that the market is volatile.

The GARCH (1, 1) spot and future prices were significant at 5 percent level. The Nickel spot prices were influenced by futures prices. Hence there is a significance difference among spot and futures prices of commodity. It can be clearly understood that there is significant volatility among the prices of commodities traded.

8.3. Analysis of Daily Returns of Spot and Futures Prices of ZINC from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Zinc.

TABLE-04

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF ZINC FROM 01.06.2010 TO 31.05.2011

Zinc Spot			Zinc Futures		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.213795	0.087982	C	0.185066	0.082403
RESID(-1)^2	-0.001582	0.010535	RESID(-1)^2	0.031680	0.015830
GARCH(-1)	0.915955	0.034540	GARCH(-1)	0.883120	0.039653
Mean	0.045107		Mean	0.044779	
R-squared	-0.000709		R-squared	-0.000816	
Adjusted R-squared	-0.007292		Adjusted R-squared	-0.007401	
S.D dependent variable	1.697259		S.D dependent variable	1.569937	
Akaike Information criterion	3.855553		Akaike Information criterion	3.703461	
Schwarz criterion	3.891972		Schwarz criterion	3.739880	
Probability	0.0000		Probability	0.0000	

Source: Computed from E-views

Table-04 it can be illustrated that the GARCH (1, 1) effect for spot and futures prices returns of Zinc. The table specifies that the effect of the mean equation co-efficient of spot and futures was 0.045107 and 0.044779. The result reveals the average daily percentage change to be very low in the spot and futures price of Zinc returns.

The adjusted R-squared of both zinc spot and futures prices were at (-0.007292) and (-0.007401) respectively. The R-squared of spot (-0.000709) and future (-0.000816) value show that there is a linear relationship between the two because the value is less than 1. This indicates that the 'yesterday's price has less influenced over 'today's price. It shows that the series are stationary and also the changes in volatility are gradually declining.

The Akaike info criterion and Schwarz criterion test help find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. This means that the market is volatile.

The GARCH (1, 1) spot and future prices were significant at 5 percent level. The zinc spot prices were influenced by futures prices. Hence there is a significance difference among spot and futures prices of commodity. It can be clearly explains that there is significant volatility among the prices of commodities traded.

8.4. Analysis of Daily Returns of Spot and Futures Prices of LEAD from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Lead.

TABLE-05

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF LEAD FROM 01.06.2010 TO 31.05.2011

Lead Spot			**Lead Futures**		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.597239	0.340988	C	0.523184	0.838996
RESID(-1)^2	0.001534	0.019900	RESID(-1)^2	-0.000793	0.02149
GARCH(-1)	0.820750	0.101370	GARCH(-1)	0.790528	0.335240
Mean	0.096577		Mean	0.092578	
R-squared	-0.002663		R-squared	-0.003360	
Adjusted R-squared	-0.009259		Adjusted R-squared	-0.009961	
S.D dependent variable	1.874546		S.D dependent variable	1.599680	
Akaike Information criterion	4.097721		Akaike Information criterion	3.787939	
Schwarz criterion	4.134139		Schwarz criterion	3.824358	
Probability	0.0000		Probability	0.0184	

Source: Computed from E-views

Table-05 portrays the results of basic GARCH (1, 1). The table indicates that the effect of the mean equation co-efficient of spot and futures was 0.096577 and 0.092578. The table also explicates that the average daily percentage change to be low in the spot and futures price of Lead returns.

The adjusted R-squared of both lead spot and futures prices were at (-0.009259) and (-0.009961) respectively. The R-squared of spot (-0.002663) and future (-0.003360) value show that there is a linear relationship between the two because the value is less than 1. It shows that the series are stationary and also the changes in volatility are gradually increasing. This means that the 'yesterday's price have less influence over 'today's price.

The Akaike info criterion and Schwarz criterion test helps to find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. It indicates that the market is volatile.

The GARCH value is more significant than the ARCH. It is also significant to the constant co-efficient value. The GARCH (1, 1) spot and future prices were significant at 5 percent level. The lead spot prices were influenced by futures prices. In this study, the GARCH Model proves that the time varying volatility in Lead spot and futures prices and those prices suffered with low volatility. Hence there is significance difference among spot and futures prices of commodity during the study period. It is clearly understood that there is significant volatility among the prices of commodities traded.

8.5. Analysis of Daily Returns of Spot and Futures Prices of ALUMINIUM from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Aluminium.

TABLE-06

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF ALUMINIUM FROM 01.06.2010 TO 31.05.2011

Aluminium Spot			Aluminium Futures		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.127595	0.052825	C	0.504883	0.356535
RESID(-1)^2	-0.012401	0.016029	RESID(-1)^2	0.082632	0.059804
GARCH(-1)	0.908538	0.042200	GARCH(-1)	0.415549	0.363224
Mean	0.07474		Mean	0.075099	
R-squared	-0.004098		R-squared	-0.005658	
Adjusted R-squared	-0.010703		Adjusted R-squared	-0.012274	
S.D dependent variable	1.169509		S.D dependent variable	1.000049	
Akaike Information criterion	3.130000		Akaike Information criterion	2.851664	
Schwarz criterion	3.166418		Schwarz criterion	2.888082	
Probability	0.0000		Probability	0.2526	

Source: Computed from E-views

Table-06 shows results of basic GARCH (1, 1). The study reveals that the effect of the mean equation co-efficient of spot and futures was 0.07474 and 0.075099. The table also explains that the average daily percentage change to be very low in the spot and futures price of Aluminium returns.

The adjusted R-squared of both Aluminium spot and futures prices were at (-0.010703) and (-0.012274) respectively. The R-squared of spot (-0.004098) and future (-0.005658) value show that there is a linear relationship between the two because the value is less than 1. It shows that the series are stationary and also there is a gradual increase in changes in volatility and shows upward trend. It indicates that the 'yesterday's price have very less influence over 'today's price.

The Akaike info criterion and Schwarz criterion test help find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. It indicates that the market is volatile.

The GARCH value is more significant than the ARCH. It is also significant to the constant co-efficient value. The GARCH (1, 1) spot prices were significant at 5 percent level but futures prices were not significant at 5 percent level. The Aluminium spot prices were influenced by futures prices but futures price experienced higher volatility than spot prices. In this study, the GARCH Model shows the time varying volatility in Aluminium spot and futures prices and those prices suffered low volatility. Hence there is no significance difference among the levels of volatility in spot and futures prices of commodity during the study period.

8.6. Analysis of Daily Returns of Spot and Futures Prices of TIN from (01.06.2010 to 31.05.2011) using GARCH (1, 1) Effect

This analysis is done to ascertain the volatility of Tin.

TABLE-07

RESULTS OF GARCH (1, 1) EFFECT IN DAILY RETURNS OF SPOT AND FUTURES PRICES OF TIN FROM 01.06.2010 TO 31.05.2011

Tin Spot			Tin Futures		
Variable	**Co-efficient**	**Standard Error**	**Variable**	**Co-efficient**	**Standard Error**
C	0.642635	0.229207	C	0.206929	0.056828
RESID(-1)^2	0.053045	0.037819	RESID(-1)^2	0.045458	0.011779
GARCH(-1)	0.709862	0.103608	GARCH(-1)	0.804270	0.045547
Mean	0.130976		Mean	0.13932	
R-squared	-0.004291		R-squared	-0.013155	
Adjusted R-squared	-0.010898		Adjusted R-squared	0.019821	
S.D dependent variable	2.002660		S.D dependent variable	1.216676	
Akaike Information criterion	3.930039		Akaike Information criterion	3.190440	
Schwarz criterion	3.966454		Schwarz criterion	3.226858	
Probability	0.0000		Probability	0.0000	

Sources: Computed from E-views

Table-07 illustrates the results of GARCH (1, 1) effect for spot and futures prices returns of Tin. The table indicates that the effect of the mean equation co-efficient of spot and futures was 0.067546 and 0.06413. The table also explicates that the average daily percentage change to be very low in the spot and futures price of tin returns.

The adjusted R-squared of both tin spot and futures prices were at (-0.010898) and (-0.019821) respectively. The R-squared of spot (-0.004291) and future (-0.013155) value show that there is a linear relationship between the two because the value is less than 1. It shows that the series are stationary and also the changes in volatility are gradually declining. The above value clearly indicates that the 'yesterday's price have very less influence over 'today's price.

The Akaike info criterion and Schwarz criterion test help find out price relationship between one day and another day. In the present study, the value of Akaike info criterion is less than the Schwarz criterion value. It indicates that the market is volatile.

The GARCH (1, 1) spot and future prices were significant at 5 percent level. The tin spot prices were influenced by futures prices. In this study, the GARCH Model shows the time varying volatility in Tin spot and futures prices and those prices suffered low volatility. Hence there is significant difference among the levels of volatility in spot and futures prices of commodity during the study period. It clearly explains that there is significant volatility among the prices of commodities traded.

8.7. Summary of Daily returns of Spot and Futures Prices of Sample Commodities using GARCH (1, 1) Model

TABLE-08

S. No	Name of the Commodity	GARCH (1, 1) Model	
		GARCH Effect	
		Spot	Futures
1	Copper	S	S
2	Nickel	S	S
3	Zinc	S	S
4	Lead	S	S
5	Aluminium	S	NS
6	Tin	S	S

Source: Computed from Table-02 to 07

Note:
S-Significant @ 5% level
NS- Non – Significant @ 5% level

The summary of GARCH (1, 1) Effect for daily returns of spot and futures prices of sample commodities from 01.06.2010 to 31.05.2011 are shown in the **Table-08**. The overall analysis noted that the GARCH (1, 1) Effect that daily returns of spot and futures prices of commodities experienced volatility except the commodity Aluminium. It means that the prices have not experienced the significant volatility.

9. TESTING OF HYPOTHESIS

It is interesting to note from the analysis that daily returns of the commodities spot and futures GARCH effect during the study period.

The overall results of GARCH (1, 1) Model indicate that the sample commodity prices of spot carried volatility during the study period except the commodity Aluminium futures. It is clearly understood from the analysis that the daily returns of commodity spot and futures prices were volatile and spot prices of sample commodities influenced futures prices. Hence the research hypothesis, "**There is significant difference among the levels of volatility in spot and futures prices of commodities**" is proved.

10. FINDINGS, SUGGESTIONS AND CONCLUSION

10.1. Findings

The study has revealed the following important findings.

According to the results of GARCH (1, 1) Model, the spot and futures prices of all sample commodities have experienced the GARCH effect except the commodity Aluminium.

The prices of commodity Aluminium has gradually increased during the study period.

The prices of the commodities such as Zinc, Lead have highly fluctuated during the study period.

The spot prices of sample commodities suffered more risk than the future prices during the study period.

The spot prices recorded higher volatility than future prices of sample commodities during the study period.

10.2. Suggestions

The investors should try to make more investment in commodity market since the fluctuation is normal.

The exchanges, brokers and other authorities of commodity futures market should create awareness among the investors, explaining that there is only normal fluctuation and volatility in the spot and future price of the commodity market.

It is suggested that the risk avoiders may invest in Aluminium and that the speculators may invest in Lead and Zinc.

As compared to other sample commodities, The commodity Aluminium has suffered less volatility. Therefore, investors who trade in Multi Commodity Exchange are advised to invest in this commodity.

10.3. Conclusion

The commodity market is an emerging market in the recent period and it has reached a stage wherein investors have realized the need to hedge and manage their risks on the exchange platform. The study proves statistically that prices of spot market have higher volatility than the futures market prices. The result of the study signifies that there is volatility among the prices of spot and futures in commodity market. The commodity market has got a normal volatility and is safe for investment. Aluminium is the safest metal to invest in.

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