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STUDY IN COPPER PRICE LINKAGE BETWEEN INTERNATIONAL AND INDIAN COMMODITY MARKET

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ABSTRACT

The study is to analysis the price behavior pattern of copper in different markets both national and international. The paper places the co movement of prices of copper in LME, MCX and COMEX to assess the impact of international prices on Indian market and give emphasis on price discovery and volatility spillover. The prices of copper from 1st January 2007 to 31st March 2017 are considered to assess disseminate of information among the various stock exchanges. The discussion mentions the impact of global financial crisis of September 2008 and the role it played behind creating volatility in metal market as well as equity market. The paper is a predominantly conceptual study based on the literature review. The logical consequence behind the volatility created due to global demand and supply and the simultaneous domestic production and consumption of copper has been studied. The paper finds the price discovery across the market and helps the producer and consumer to get price signal due to cross market linkage. The study also examines the impact of cross market linkage of commodity market on Indian equity market. As the investors are involved between the markets, it leads the other market to react and move unidirectionally.

Keywords: Copper, Price Discovery, Volatility

INTRODUCTION

Commodity derivative is one of the most important hedging tools existing in the derivative market. It is applicable to both agricultural as well as non-agricultural commodity. It alleviates the risk of the manufacturers or producers and the consumers involved in these trading activities. Agricultural commodity includes wheat, rice, soya bean, etc., and non-agricultural commodity includes metals, i.e. both ferrous as well as non-ferrous metals.

Metals are the key intermediate input in industrial production and construction. There are various forms of metal, ranging from base metals to precious metals, that help in industrial production and play a pivotal role in the economic development of a country. Base metals are further divided into two categories, namely, ferrous and non-ferrous metals. Ferrous metals are rich in iron and possess magnetic properties. They also have low resistance to corrosion. Non-ferrous metal category includes metals like aluminum, nickel, copper, zinc, tin etc.

India is heavily dependent on other countries for the import of its crude petroleum and other components like gold and silver (12% of the total imports), machinery (10%), electronic goods (7%), pearls, and precious and non-precious stones (5%). India's main import partners are China (10%), U.A.E. (8%), S.A. (7%), Switzerland (7%) and the U.S. (5%). Furthermore, India's industrial growth and the latest technological development challenges make it dependent to a large extent on the import of primarily non-ferrous metals.

Metal market is a place where a number of buyers and sellers interact and trade in both ferrous and non-ferrous metals. Indian metal market is a very volatile market operating under the regulatory framework of Securities Exchange Regulation Board of India (SEBI).

The whole metal market depends upon the demand and supply in the international market. The largest international market is LME (London Metal Exchange), followed by COMEX, a division of New York Mercantile Exchange, which in the year 1994

started its metal trading, CME (Chicago Metal Exchange), SHFE (Shanghai Future Exchange), and MCX (Multi Commodity Exchange).

It has been observed that information transmission contributes majorly in the metal market. Information transmission effect leads to price discovery and volatility spillover. Price Discovery means transfer of price information across the markets. The price signal provides direction to producer and consumer and brings desired transparency into commodities market networking. It is the indicator of price efficiency and helps one market react faster than the other market. Another instrument of information transmission is volatility spillover, which determines the flow of information from one market to another reducing the risk and disseminating the information among the market participants.

COPPER

This paper focused on the production and consumption of a non-ferrous commodity, i.e. copper and how its prices are affected in Indian metal market. Although macro- and micro-economic factors majorly impact the prices of copper, the dissemination of information from international market has also forced the Indian metal market prices to move in unidirectional or bidirectional manner. Like two faces of a coin, copper prices can be analyzed by calculating the demand and supply side.

Demand side of copper

Copper is very useful and popular metal. Its various uses are as follows:

1.Electrical industry as wires, cables etc. 2. Wrought copper & alloys 3. Building and construction 4. Transport 5. Coinage 6. Ordnance & other uses 7. Industrial and engineering applications 8. Copper compounds 9. Refrigeration & Air Conditioning (Government of India, 2015-16)

Supply side of copper

As per the assessment of US Geological Survey, production mines and reserves of copper are in Australia, China and Peru. The table given below shows the data for the years 2015 and 2016, where it is shown that Chile is not only the highest producer of copper in the world, but also holds the largest copper reserve weighing 2,10,000 million tons.

Table 1: Shows the data of copper production and reserves for the years 2015 and 2016

	Mine production		Reserves7
	2015	**2016**	
United States	1,380	1,410	35,000
Australia	971	970	89,000
Canada	697	720	11,000
Chile	5,760	5,500	210,000
China	1,710	1,740	28,000
Congo (Kinshasa)	1,020	910	20,000
Mexico	594	620	46,000
Peru	1,700	2,300	81,000
Russia	732	710	30,000
Zambia	712	740	20,000
Other countries	3,800	3,800	150,000
World total (rounded)	**19,100**	**19,400**	**720,000**

Source: from USGS

LITERATURE REVIEW

Various studies have been undertaken on base metal to find the volatility spillover and price discovery by GARCH and ARCH model.

Factors influencing the movement of copper price on London Metal Exchange by Gamgee Fong (2010).

The study assessed the three factors: copper stock level, aluminum price and exchange rate. Cointegration vector model is used to calculate not only the positive impact of stock level and aluminum price on copper price, but also the negative impact of the real effective exchange rate on the same. He examined the aluminum price which is the substitute of copper and assessed the price effect of this substitute on copper price.

International linkages of Indian commodity of future markets, Rameshkumar and Ajay Pandey (2011).

This paper examined the unidirectional and bidirectional cross market linkage of highly tradable and less tradable commodity prices. The model used to analyze the prices is GARCH and BEKK and tested the market comovement of two agricultural commodities, that is, soya bean and corn, with two precious metal, i.e. gold and silver and three ferrous metal, namely, aluminum, copper and zinc.

A study of price of Base metal trades in India, Pankaj Sinha and Kritika Mathure (2013)

It describes the price behavior pattern of India stock and its effect on volatility spillover of Indian equity market. The paper substantiates on the introduction of option contract as a derivative tool to reduce the risk in metal market. Global financial crisis is the factor which influenced the Indian market and led to price discovery and increased the volatility in Indian market in 2008. To assess the influence of commodity market in equity market the prices of five base metals, i.e. aluminum, copper, tin, lead and nickel's spot and future prices were considered from November 2007 to January 2013. The paper shows the price behavior pattern of future and spot contracts of five metals traded in MCX.

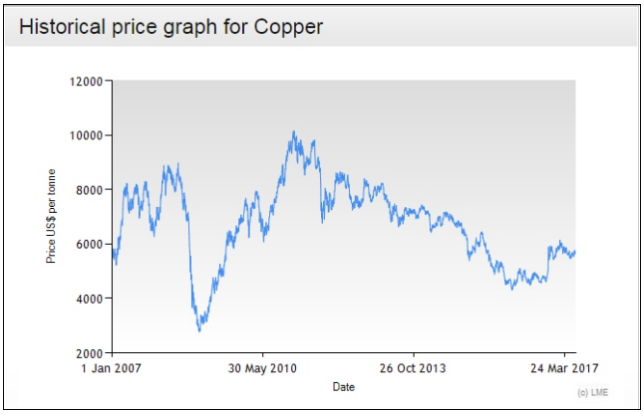
The results found that the price volatility of metal affects the price volatility of equity market. Furthermore, the paper found that while copper occupied high daily mean returns, lead possessed the lowest. It also found that return of the spot price is highly dependent on the future prices of the contract. The paper also focused on the global crisis which started in 2008 and has greatly impacted the Indian metal market.

FINDING AND DISCUSSION

Prices of copper in different market

London Metal Exchange

Figure 1: Price flow from 2007-2017



Source: from LME http://www.lme.com/metals/non-ferrous/copper/#tab2

Presently the production of copper in US has increased to 1.14 million and its value is $6.8 billion. Recent cash buyer price of copper is $5788.50 per metric ton. The graph in figure 1 shows the direction of price flow from 2007 to 2017, presenting a huge dip in the price in 2008 due to global down twist. The main reason behind this twist was global financial crisis and raised stock level of inventories all over the world, especially in China. China is one of the biggest consumer as well as producer of metals, and hence plays a very vital role in the metal market. So, the demand of copper in 2008 was not only affected by excessive reserves of copper in the world market, but also due to weak global economy.

COMEX

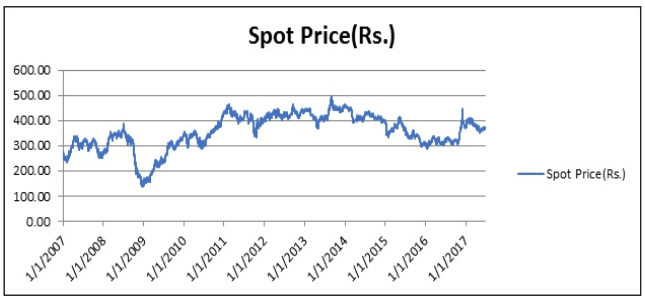
Figure 2: Price of Copper Trading in COMEX market from 2008

Source: from NASDAQ http://www.nasdaq.com/markets/copper.aspx?timeframe=10y

Figure 2 shows the price of copper trading in COMEX market from the year 2008, contemplating the flow of price behavior in unidirectional manner similar to that in LME. It is found that the pattern of price movement is lowest in 2008 and hovering in 2011. So, it implies that cross market linkage affects the price behavior as well as creates volatility in the market.

Multi Commodity Exchange

Figure 3: Spot Prices of Copper from 2007-2017 in MCX



Sources: - Graph drawn by author based on data derived from NSE https://www.mcxindia.com/market-data/spot-market-price

In figure 3 the graph shows the spot prices of copper from 2007 to 2017, where it is reflecting the price of copper in MCX following a path similar to that of LME. The current price is Rs 373.55 per one kg and the average change in price is (-9.26). Again, cross market linkage subsistence on the price of copper traded in MCX can be easily identified in the graph.

The table below presents the actual status report of copper production in India and the data was extracted from Indian Bureau of Mines, Nagpur. According to the current status, on an average the demand of copper in India is 3Lakhs tons per year. The main copper ore deposits in India are in Madhya Pradesh, Jharkhand and Rajasthan. India receives major supply from Mexico, Canada, Zimbabwe and Japan.

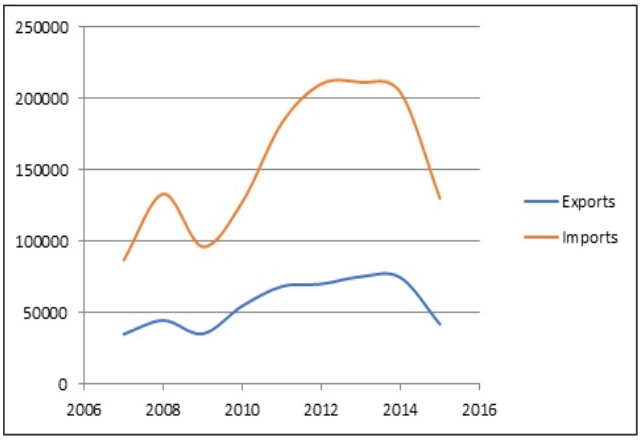
Table 2: Copper Production in India

(Value in Rs '000)

Year	Feb-17		Jan-17		April2016- Feb 2017		April 2015- Feb 2017	
Units	Qty	Value	Qty	Value	Qty	Value	Qty	Value
Copper Ore t	331192	0	370142	0	3483895	0	3540406	0
Copper Conc. t	11415	563372	13338	677973	121636	5680648	128912	5593789

Source: Indian Bureau of Mines, Nagpur

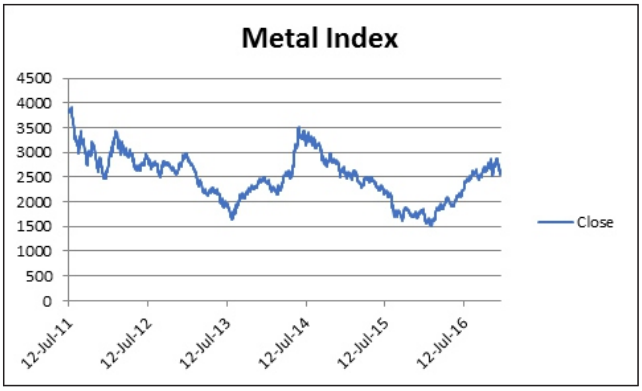
Figure 4: Fuel and Mineral Products' Import and Export data from 2006-2015



Sources: Graph created by author based on data derived from WTO http://stat.wto.org/StatisticalProgram/WSDBViewData.aspx?Language=E

Figure 4, drawn from data extracted from World Trade Organization, describes the import and export of fuel and mineral parts from year 2006 to 2016. Copper is the sub parts of fuel and mineral. The downward curve from the year 2008 to 2009, caused by global financial crisis, implies the linkage of export and import data with the exchange market. The upward growth in the economy started in the year 2010 and remained up to 2014, and then there are diminishing curve lines up to 2015. This indicates that the overall world production and consumption of copper hampers and directly influences our domestic market.

Figure 5: Metal Index data from 2011-2016



Sources: Graph drawn by author based on data collected fromNSE https://www.nseindia.com/products/content/equities/indices/historical_index_data.htm

Figure 5 shows the Metal Index data from 2011 to 2016. The graph shows the behavior of Index is flow in unidirectional manner like that of MCX, COMEX and LME. So, cross market linkage in commodity market has its influence on equity market as well.

CONCLUSION

Metal is the backbone of Indian economy and copper contributes a major part in the gross domestic product of India. The demand and supply side of copper market in India is the factor behind the fluctuation on metal price. The paper highlights that the sectors, like electrical wiring, transportation, refrigeration, and air conditioning, which give rise to the demand of copper, constitute our daily requirements, and that countries like Chile are major producers of copper. On an average, the production of copper in India is 3 Lakhs tons per year, which is stable and led to more fluctuation in the prices of copper. India depends on other countries for fulfilling its domestic needs. This is evident from the gap between the export and import of fuel and mineral parts.

Next factor is the information transmission which disseminates information from one market to other. We

can find this by following the trend movement of three exchanges and its simultaneous effect on Indian Equity market. So, transfer of price information between the exchanges help the trader to get the price signal. Global financial crisis, which affected the market across the world, showed the same variation in prices of commodity in all the exchanges, implying volatility spillover. Then it is fruitful to say that Indian market depends upon the international market, as our country imports huge amounts of copper to fulfill the domestic consumption. This also means that since investor involvement between the markets is very high, the Indian market is bound to react as per the International market. The average price change is (-9.26) which shows the volatility of copper prices in MCX. So, by considering the above facts it can be concluded that international markets like LME and COMEX, which are the largest metal trading markets, have helped the Indian market like MCX towards price discovery and volatility spillovers, and also influenced the Indian equity market

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