



A Study on Linkage Across Spot And Futures Markets of MCX Copper

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Abstract: *The study explores the linkage across copper spot and its corresponding futures prices traded on Multi Commodity Exchange (MCX). Owing to its extensive industrial usage, copper provides an appropriate setting to examine the role of derivatives in the price formation process. For this purpose, daily price data related to spot and its corresponding futures is collected from the portal of MCX for a seven-year period from 1 April 2017 to 31 March 2024. The analysis was carried out using time-series methods such as descriptive statistics, lag selection criteria, unit root tests (ADF and PP), and the Johansen co-integration test. The findings show that both price series follows a first-order integration process, and exhibit a stable equilibrium relationship over the long run, indicating a close connection between the spot and futures markets for copper traded on MCX.*

Key Words: *relationship, spot, future, copper, commodity derivatives, co-integration.*

1. INTRODUCTION:

Business activities are continually exposed to different forms of uncertainty that can influence financial performance and stability. These uncertainties arise not only from financial factors such as changes in interest rates, exchange rates, and asset prices, but also from market conditions linked to the core operations of a business. As a result, firms and investors remain vulnerable to potential losses, which increases the need for effective risk management practices. With the advancement of financial markets, several instruments have been developed to manage such risks, among which derivatives have gained significant importance. “A derivative can be defined as a financial instrument whose value depends on (or derives from) the values of other, more basic underlying variables” (Hull, 2015). “A derivative is simply a financial instrument (or even more simply, an agreement between two people) that has a value determined by the price of something else” (McDonald, 2003). In the commodity derivatives segment, metals play a vital role in price discovery and risk transfer, and copper holds a prominent position due to its extensive industrial applications in construction, electronics, infrastructure, and manufacturing. In India, copper is actively traded on the Multi Commodity Exchange (MCX), where both spot and futures prices reflect market expectations and current demand–supply conditions. Understanding the relationship between spot and futures prices is essential for analyzing how information is transmitted in the market and how the price discovery process takes place. Copper prices are influenced by global demand, currency movements, and macroeconomic factors, making it important to examine the long-run association between spot and futures prices. Therefore, this study focuses on analyzing the dynamic relationship between MCX copper spot and futures prices using time-series econometric techniques to identify the existence of a stable long-term linkage and the flow of information between the two markets.

This study is arranged into 5 main parts. The first part provides an introduction to commodity derivatives and sets the context for the study. The second section reviews relevant literature related to the topic. In the third section, the research methodology adopted for the study is explained in detail. The fourth section presents the analysis and discussion of results derived from the unit root tests (ADF and PP) and the Johansen co-integration test. Finally, the fifth section summarizes the overall findings and concludes the study.



2. LITERATURE REVIEW:

Name of Author(s)	Sample Size	Techniques Used	Key Findings
Garg et al. (2023)	Twelve agricultural commodities listed on NCDEX and NAM, such as castor, soybean, guar, coriander, chana, turmeric, wheat, mustard, barley, jeera, bajra, and moong	Granger Causality, VECM, Johansen Co-integration, and bivariate GARCH model	Results indicate that NCDEX spot and futures markets largely contribute to price discovery. Volatility was observed to spill over from NAM spot prices to NCDEX futures and spot prices in 9 of the 12 commodities studied.
Vijayakumara (2022)	2,286 observations of cardamom prices from MCX and the Spice Board of India	VECM, Granger Causality, and Co-integration tests	The e-auction market was found to lead both spot and futures markets. Prices discovered through the cardamom e-auction showed positive co-movement with spot prices whereas negative relationship with futures market prices.
Kaura and Rajput (2021)	Data on 13 commodities from MCX, including bullion and metals (7), energy (2), and agriculture (4)	Vector Autoregressive (VAR) Model	Price discovery was primarily observed in the futures market for energy, bullion, and metals, whereas this pattern was not evident for agricultural commodities.
Mamilla and Supriya (2020)	Comparative review of studies conducted before and after the 2008 global crisis	Literature Review	Earlier studies suggested that the Indian futures market lacked maturity and that spot markets drove price discovery. Later studies indicated that the futures market had developed and began influencing spot prices more strongly.
Raju and Shirodkar (2020)	Energy sector stocks available as Single Stock Futures (SSFs)	VECM, Common Factor Component Weights, and Granger Causality	Findings showed that Single Stock Futures tend to lead the spot market and significantly contribute to the price discovery process.
Inani (2018)	Ten agricultural commodities traded on NCDEX	Stationarity and Co-integration tests	The futures market was dominant in price discovery for 6 out of the 10 commodities analyzed.

3. OBJECTIVES

The study is conducted to study the relationship between spot and futures prices of MCX copper.

Need and Significance of the Study:

A close examination of the relationship between copper spot and futures prices is necessary to judge how well the commodity market operates in relation to the price formation and flow of information. Since copper prices are affected by international demand, currency fluctuations, and overall economic conditions, understanding this relationship becomes valuable for those who participate in the market. It helps traders, hedgers, and investors interpret price movements more clearly and adopt better risk management practices.

4. RESEARCH METHODOLOGY

- **Research Design:** Descriptive research design is used in this study as it describes the relationship between two important aspects i.e., prices of spot and its associated futures.



- **Sample:** The sample of the study is the daily spot and futures prices of copper traded on Multi Commodity Exchange (MCX).
- **Period:** The study is undertaken for a continuous seven-year timeframe commencing from 1st April, 2017 to 31st March, 2024.
- **Data Collection:** For achieving the objective of the study, daily data related to spot and its corresponding future prices of copper is collected from the secondary sources (i.e. official website of MCX).
- **Techniques:** In order to find out the relationship between spot and future market, various techniques are used such as Descriptive statistics, Schwarz criterion (for Lag Order Selection), Unit root test (Phillips-Perron test and the Augmented Dickey-Fuller test), Johansen cointegration test (Trace Test and Maximum Eigenvalue Test).

5. DATA ANALYSIS AND INTERPRETATION:

Table 1: Descriptive Statistics of MCX Copper Spot and Futures Price from 1st April, 2017 to 31st March, 2024

Particulars	Spot Price	Futures Price
Observations	1778	1778
Mean	575.0724	574.8026
Median	527.0750	529.0000
Maximum	880.3500	843.4000
Minimum	353.0000	356.6500
Standard Deviation	149.0227	146.1262
Skewness	0.132326	0.137259
Kurtosis	1.320640	1.321716
Jarque-Bera	214.1224	214.2487
Probability	0.000000	0.000000

Source: EViews Data Analysis

This table summarizes the key statistical characteristics of copper spot and futures prices over the period from 1 April 2017 to 31 March 2024. The closeness between the mean and median values for both price series suggests that prices remained relatively steady during this time. The highest and lowest values indicate the overall range within which prices moved, while the standard deviation points to moderate variability in price movements. The slightly positive skewness shows that the distribution has a mild tilt toward higher values. In addition, the low kurtosis value suggests a relatively flat distribution compared to a normal distribution. The Jarque–Bera test result, with a probability value of zero, indicates the data exhibit non-normal distributional characteristics.

Table 2: Lag Order Selection Criteria for Copper Spot and Futures price

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-17511.29	NA	1346848.	19.78903	19.79522	19.79132
1	-11425.69	12150.58	1396.055	12.91716	12.93573	12.92402
2	-11267.37	315.7475	1172.662	12.74279	12.77374	12.75422
3	-11238.03	58.44410	1139.564	12.71416	12.75749	12.73017
4	-11222.65	30.60556	1125.003	12.70130	12.75701*	12.72188*
5	-11216.88	11.45331	1122.765	12.69930	12.76740	12.72446
6	-11214.46	4.803906	1124.772	12.70109	12.78157	12.73082
7	-11205.14	18.48088	1118.032	12.69508	12.78794	12.72939
8	-11198.65	12.86098*	1114.888*	12.69226*	12.79750	12.73114

*indicates lag order selected by the criterion

Source: EViews Data Analysis

This table reports the results of lag length selection for copper spot and futures prices based on different statistical criteria. Several lag values are examined to identify how many past observations should be included in the model for better accuracy. The asterisks mark the lag length preferred by each method. Most of the criteria, including AIC, FPE, and LR, indicate that lag 8 is the most suitable choice. In contrast, SC and HQ suggest a shorter lag length of 4.



Considering the high number of observations (1778), the Schwarz Criterion (SC) is often preferred, as it imposes a stronger penalty on additional parameters. These results assist in deciding an appropriate lag structure for subsequent time-series analysis.

Unit Root Test

Table 3: Unit Root Test based on Augmented Dickey Fuller and Phillip Perron Model for Copper Spot and Futures Price

Variables	Unit Root Test	ADF		PP	
		Level I(0)	1 st Difference I(1)	Level I(0)	1 st Difference I(1)
Spot Price	Test Statistics	-1.935592	-45.27658	-1.997203	-45.25407
	P value	0.6352	0.0000	0.6019	0.0000
Futures Price	Test Statistics	-2.019342	-41.23806	-2.025455	-41.22857
	P value	0.5898	0.0000	0.5864	0.0000
Inference		Non-Stationary	Stationary	Non-Stationary	Stationary

Source: EViews Data Analysis

Critical value at 5% Significance level = -3.412341

This table exhibits the outcomes of unit root tests applied to copper spot and futures prices to examine their stationarity. In their level form, the test statistics for both series exceed the critical value of -3.412341, and the associated p-values are relatively high. This indicates the presence of unit root, showing that both prices are non-stationary and exhibit a trend over time.

However, after applying the first difference, the test statistics become strongly significant and the p-values drop to 0.0000 in both ADF and PP tests. This demonstrates that the series achieve stationarity after differencing once. Hence, both variables are classified as integrated of order one, I(1). This finding is important as it supports the application of co-integration tests and other time-series modeling methods in further analysis.

Johansen Co-integration Test

Table 4: Results of Johansen Co-integration Test for Copper Spot and Futures price Unrestricted Cointegration Rank Test

No. of CE (s)	Eigen Value	Trace			Max-Eigen value		
		Trace Statistics	Critical Value (0.05)	P value	Max-Eigen Statistics	Critical Value (0.05)	P value
None*	0.048808	89.80323	15.49471	0.0000	88.71932	14.26460	0.0000
Atmost 1	0.000611	1.083913	3.841465	0.2978	1.083913	3.841465	0.2978

Source: EViews Data Analysis

This matrix display the findings of Johansen co-integration test conducted to identify the long-term relationship between copper spot and futures prices. For the hypothesis of “none,” both the statistics are substantially more than their respective critical values, with p-values of 0.0000. This leads to the rejection of the null hypothesis of no co-integration, confirming the existence of at least one co-integrating relationship between the two series. In contrast, for the hypothesis of “at most 1,” the test statistics are below the critical values and the p-values are not significant. As a result, this null hypothesis cannot be rejected. It can therefore be concluded that there is exactly one co-integrating equation linking copper spot and futures prices, indicating that the two series share a long-run equilibrium relationship despite short-term variations.

6. CONCLUSION

Financial markets play an important role in reducing risk and helping participants understand how prices are formed, largely through the use of derivative instruments. In this setting, commodity derivatives have become especially relevant for metals that are traded extensively and are influenced by changes in the global economy. Copper is one such metal that attracts considerable attention due to its wide range of industrial uses and its strong trading activity on the Multi



Commodity Exchange (MCX). Because of these characteristics, copper provides a suitable basis for examining how spot and futures prices are related to each other. To address the research objectives, daily observations of spot and its corresponding futures price of copper were obtained from secondary sources (from the official MCX website), for a seven-year timeframe commencing from 1st April, 2017 to 31st March, 2024. To analyze the behavior of the data, various time-series techniques were employed, such as descriptive statistics, lag length selection, unit root tests using ADF and PP methods, and the Johansen co-integration test. The findings from these methods revealed that both price series follows a first-order integration process, and exhibit a stable equilibrium relationship over the long run, indicating a close linkage between MCX copper spot and futures prices.

LIMITATIONS OF THE STUDY: The scope of this study is limited to copper prices traded on MCX and does not include other commodities or trading platforms. The analysis is based on secondary data covering the period from 2017 to 2024, which may not fully capture earlier market patterns. In addition, External factors such as global political events, policy changes, and sudden economic shocks were not examined separately in the analysis.

RECOMMENDATIONS OF THE STUDY: Further studies may broaden the scope by including more commodities or by comparing results across different exchanges. Extending the time period of analysis could help in understanding price behavior over a longer horizon. The findings of this study can also be useful for traders, investors, and hedgers in making better use of futures markets for managing price uncertainty.

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