A Study On Spot-Futures Price Relationship: Evidence From Mcx Aluminium

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Abstract: Multi Commodity Exchange of India Ltd. (MCX) is the leading platform for commodity derivatives trading in India. Aluminium, with a great industrial demand in sectors such as construction and transportation, is actively traded on MCX. Analyzing the relationship between aluminium spot and related futures prices helps to understand how well futures prices reflect the underlying spot market. Thus, this study analyse the connection between the aluminium cash prices and related futures prices on MCX from 1st April, 2017 to 31st March, 2024. To achieve the objective, various techniques were applied including descriptive statistics, lag order selection criteria, unit root analysis, and the Johansen's co-integration. Findings from unit root analysis confirmed that the price series follow a first-order integration process, I(1) and the Johansen's co-integration analysis reveals a stable equilibrium link between the two aluminium price series in the long-term, suggesting that they move together over time despite short-term fluctuations.

Keywords: relationship, MCX, co-integration, aluminium, spot and related futures price.

I. INTRODUCTION

"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). "Derivatives are the financial instruments that are linked to a specific financial instrument, indicator, or commodity and through which specific risks can be traded in financial markets in their own right. The value of a financial derivative derives from the price of an underlying item, such as an asset or index. Unlike debt securities, no principal is advanced to be repaid, and no investment income accrues" (International Monetary Fund, 2001). Among these, commodity derivatives are widely used to speculate on future price movements. In India, the leading platform for commodity derivatives trading, offering transparency and liquidity is Multi Commodity Exchange of India Ltd. (MCX). Aluminium, with a great industrial demand in sectors such as construction and transportation, is actively traded on MCX. Analyzing the relationship between aluminium spot and related futures prices helps to understand how well futures prices reflect the underlying spot market. The prices of aluminium are highly influenced by global demand and domestic conditions, making it an ideal commodity to examine the long-run association between its spot and related futures prices.

II. REVIEW OF LITERATURE

Name of Author(s)	Sample Size	Techniques Used	Key Findings
Boora et al. (2025)	Ten NCDEX agricultural commodities	ADF Unit Root Test and Pearson Coefficient of Correlation	The study identified a strong positive association between spot and futures prices, showing close price integration in agricultural markets.
Ameur et al. (2021)	Six commodity index markets covering energy (natural gas, Brent crude), agriculture (wheat), and metals (gold, aluminum, copper).	Non-Linear Autoregressive Distributed Lag (NARDL) Model	Evidence suggested a two-way interaction between the markets, with futures markets playing an important role in price discovery.
Bohmann et al. (2019)	Six commodities: crude oil, natural gas, gold, silver, corn, and soybean.	New Information Leadership Measurement Techniques	Results revealed that options markets generally react faster than futures markets in majority of the selected commodities. A higher level of speculative trading, as opposed to hedging activity, plays a significant role in price discovery within commodity derivatives options markets.
Irfan and Hooda (2017)	Ten agricultural commodities traded on NCDEX.	Johansen's Co-integration Analysis, and the Granger Causality Analysis	Results discovered an equilibrium link between the two prices in the long term. Findings from Granger Causality analysis revealed a uni-directional lead–lag connection between the two markets.
Athma and Rao (2013)	MCX Comdex Index.	Moving Average Method, Cross-Correlation Function, and ADF Test	A meaningful linear relationship was observed between the two price series, where futures play a leading role in most instances.

(Source: Review of various studies)

Objective of the Study:
This study aims to analyse the relationship between spot and related futures prices of Aluminium traded on MCX.

III. RESEARCH METHODOLOGY
This study follows an analytical research design as it investigates the connection between aluminium cash prices & their corresponding futures prices through a time series approach. The sample comprises daily price observations of aluminium spot and related futures contracts from 1st April, 2017 to 31st March, 2024. For the collection of data, secondary sources (i.e., the official website of MCX) have been

used. To maintain accuracy and consistency, the data were organized and processed using statistical software. Various techniques were applied, including descriptive statistics, the schwarz criterion for lag order selection, unit root analysis for stationarity, and Johansen co-integration test (Johansen, 1988) to assess long-run relationships. These methods help in explaining the equilibrium linkage between the two price series.

IV. DATA ANALYSIS AND INTERPRETATION

Table 4.1: Descriptive Summary of Aluminium Spot and its Related Futures Contract Price

Particulars	Spot Price	Futures Price
Observations	1777	1777
Mean	175.5153	172.7604
Median	155.8500	156.4000
Maximum	324.1500	308.3500
Minimum	119.7000	120.0000
Standard Deviation	41.32261	39.31848
Skewness	0.646957	0.625082
Kurtosis	2.542995	2.487875
Jarque-Bera	139.4255	135.1395
Probability	0.000000	0.000000

(Source: EViews Data Analysis)

Table 4.1 presents the descriptive summary of aluminium spot and its related futures contract price for the period from 1 April 2017 to 31 March 2024. Both series consist of 1,777 observations, indicating a consistent dataset across the study period. The mean spot price (175.51) is slightly higher than the mean futures price (172.76), while the median values are very close, suggesting relative alignment between the two markets. The range between maximum and minimum prices reflects considerable price fluctuations over time. The standard deviation is marginally higher for spot prices, indicating comparatively greater volatility in the spot market. Positive skewness values show that both series are moderately right-skewed, and the significant Jarque–Bera statistics with zero probability imply that the price distributions deviate from normality.

Table 4.2: Optimal Lag Length Determination

Lag Length	LogL	LR Statistic	FPE	AIC	SC	HQ
0	-13760.26	NA	19606.35	15.55936	15.56556	15.56165
1	-8125.171	11251.06	33.69010	9.192958	9.211539	9.199823
2	-8033.993	181.8418	30.52791	9.094395	9.125363	9.105837
3	-7978.623	110.3022	28.80541	9.036317	**9.079672***	9.052335
4	-7971.235	14.69964	28.69531	9.032488	9.088229	9.053082
5	-7957.542	27.21580	28.38256	9.021529	9.089657	9.046700
6	-7945.098	24.70467	28.11291	9.011982	9.092498	9.041730*
7	-7938.055	13.96805	28.01634	9.008541	9.101444	9.042865
8	-7932.356	11.28728*	27.96260*	9.006621*	9.111911	9.045522

(Source: EViews Data Analysis)

Table 4.2 shows the lag length selection results for aluminium spot and its related futures prices using several statistical criteria like LogL, LR, FPE, AIC, SC, and HQ for lags from 0 to 8. Since the dataset contains 1,777 observations, the Schwarz Criterion (SC) is given importance because it applies a stronger penalty for adding extra lags. The lowest SC value is observed at lag 3, indicating it as the most appropriate lag length. Therefore, three lag terms are considered sufficient to maintain a balance between model accuracy and simplicity.

Unit Root Test

Null hypothesis (H_o) of spot price series states that the series contains a unit root and is therefore non-stationary. Similarly, the Null Hypothesis (H_o) of futures price series assumes the presence of a unit root, implying non-stationarity. These hypotheses were examined at the 5 percent level of significance.

Table 4.3: Unit Root Test for Aluminium Spot and its Related Futures Price

Variables	Unit Root Test	ADF		PP	
		Level	1st Difference	Level	1st Difference
Spot Price	Test Statistics	-1.983013	-50.91792	-2.121047	-50.98298
	P value	0.6097	0.0000	0.5331	0.0000
Futures Price	Test Statistics	-2.118379	-41.50700	-2.048806	-41.56858
	P value	0.5346	0.0000	0.5735	0.0000

(Source: EViews Data Analysis)

Table 4.3 reports the results of unit root test for aluminium spot and its related futures prices. At the level form, the test statistics for both price series are higher than the 5% critical value (–3.412342) and the p-values are insignificant, indicating that the null hypothesis is accepted i.e., series contains a unit root. After taking first difference, test statistics become highly significant ($p < 0.05$), which leads to the rejection of the null hypothesis. This confirms that both series are stationary. Hence, the price series follow a first-order integration process, I(1).

Johansen Co-integration Test

The Null hypothesis (H_o) assumes no long-run relationship exists between aluminium spot and its related futures price series. To test this hypothesis, Johansen Co-integration test was applied at 5% significance level.

Table 4.4: Johansen's Co-integration Analysis

No. of CE (s)	Eigen Value	Trace			Max-Eigen value		
		Trace Statistics	Critical Value	P value	Max-Eigen Statistics	Critical Value	P value
None*	0.065852	122.5278	15.49471	0.0000	120.7781	14.26460	0.0000
Atmost 1	0.000986	1.749698	3.841465	0.1859	1.749698	3.841465	0.1859

(Source: EViews Data Analysis)

Table 4.4 presents the result of Johansen co-integration test for aluminium spot and its related futures prices. For the hypothesis of no co-integration (None), both the statistics are much higher than their respective critical values, with p-values of 0.0000, implying, rejection of the null hypothesis of no co-integration. However, for the hypothesis of at most one co-integrating equation, the test statistics are lower than the critical values and the p-values are insignificant. Therefore, the null hypothesis cannot be rejected at this stage. These results indicate the presence of one co-integrating relationship between spot and its related futures prices. It suggests that a stable equilibrium link is maintained between the two prices in the long-term and they tend to move together over time despite short-run fluctuations.

V. CONCLUSION

The study analyse the connection between the aluminium cash prices and related futures prices on MCX (for the time span 1st April, 2017-31st March, 2024) using secondary data. To achieve the research objective, various statistical tools, including descriptive analysis, lag order selection criteria, unit root analysis, and Johansen's co-integration (Johansen, 1988), were applied. Findings from unit root analysis confirmed that the price series follow a first-order integration process, I(1). and the Johansen's co-integration analysis reveals a stable equilibrium link between the two aluminium price series in the long-term, suggesting that they move together over time despite short-term fluctuations. However, the study is limited to a single metal i.e. aluminium and a specific time period of 7 years, which may restrict broader generalization. It also based solely on secondary data and does not incorporate external macroeconomic factors that may affect the price movements. Future research may expand the scope by analysing multiple commodities, longer time periods, and using advanced econometric techniques to better understand short-term dynamics and overall market behaviour.

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