

Gold in Transition: Analyzing the Lead-Lag
Relationship **between** *Indian Commodity*
Spot and Futures Prices in the Post-COVID
Period

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- This research paper investigates the lead-lag relationships between gold spot and futures prices in India post-COVID-19 economic context. The pandemic has altered the role of gold as an asset class from the traditional role of an inflation hedge and a haven in times of market volatility

- This study considers advanced analytical tools, such as the Johansen co-integration test and a Vector Autoregression (VAR) model. Through it, interactions between these markets under determinants such as the demand for gold, regulatory changes, and cultural significance in India are studied.

LITERATURE REVIEW

The COVID-19 pandemic has catalyzed significant transformations in the global financial landscape, affecting gold as an asset class. Traditionally considered a hedge against inflation and a haven during market downturns, gold has had a resurgence in demand stemming from its intrinsic stability with economic uncertainty (Gomis-Porqueras et al., 2020; Badalov & Barabanov, 2020). The paper will try to synthesize important findings on the change in gold investment dynamics through the pandemic, including factors affecting demand, changes in market behavior, and their implications on the investors.

The Gold Asset Haven

Gold possesses some in-built characteristics that make it an investment item of choice in times of crisis. Studies show that gold is a hedge against inflation and currency devaluation, which explains why it was always in demand during economic turmoil (Gomis-Porqueras et al., 2020). Once the government's restrictions to control the pandemic began to form, the financial markets became highly volatile, and investors made a beeline for gold. Research proved that negative news and events related to the pandemic's development appeared to have a more substantial impact on the downside of market fluctuations than positive news surrounding this event. This demonstrates gold's reinforcing function as a stabilizer asset (Djouadi et al., 2024; Khan et al., 2024).

Indian Demand for Gold

For Indians, gold is a rich cultural product, serving as the primary saving vehicle for most families. The period of COVID-19 has only showcased the two-sided character of the precious metal: it is both a sacred cultural relic and a safe investment (Gaikwad, 2022). Gold usage during traditional festivals like Diwali should have boisterously risen; new legislative changes, including VAT on bullion purchases, particularly have accelerated the interest in gold investments (Jain, 2023).

Such macroeconomic factors as GDP growth rate, inflation rate, and currency fluctuation significantly affect Indian gold prices (Khatri & Chhikara, 2024; M. & Nagendra, 2023).

- **Role of Regulatory Changes**
- Regulation factors, including removal of import taxes and duties, and increased availability, lead to an increase in consumption because individuals now consume the item in larger quantities than usual. The challenges this offers include changing global price directions and the local economies, hence making it very complicated. What is needed here is interaction between the regulatory setting that guides investment in the Gold Market and the dynamism in the marketplace place.

The Relation of Spot and Future Market Trends Has Been Shifting End

This paper has redefined further how the pandemic has influenced the interactions between the gold spot and its futures market. Traditionally, the lead for price discovery would fall in the future market; however, because of the complexity generated by this crisis, things were different here too

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- Through recent research, a bi-causality of existence has been revealed to be between the precious metal that is gold and the excellent stock index like the S&P 500: it was the pandemic that caused the significant influences on each, which made movements of the excellent index to make heavy ripples through the gold price.

- However, in this new system, the flexibility of its application in current financial markets is reflected in the evolution of gold-backed cryptocurrencies, which are further avenues to diversify against the volatility of digital assets. Innovations of this nature require investors to reassess old assumptions of market behavior, particularly those related to the volatile connection between spot and futures prices in a post-COVID world (Ahmed, 2022; Kumar & Dhiman)

Research Gap

While ample literature exists about lead-lag relationships in many financial markets, the Indian case between the spot and the futures price of gold is an uncaptured element. Earlier literature addressed the lead-lag dynamics within various commodities and assets, while the gold market, particularly post-COVID-19, had much less exploration. A great volatility era and change in market behavior have entered after the post-pandemic phase, which can further modify the time relationship between historical spots and futures prices. To fill that gap, the present research probes into the lead-lag association between India's post-COVID post-spot and post-futures gold prices to enrich knowledge about this pivotal commodity and advance to a more vibrant understanding.

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AIM OF STUDY

The primary objective of the study is to examine both long-run and short-run relationships between the spot and futures prices of gold. Further, it examines the lead-lag relationship between these pricing mechanisms. This will establish interactions and relationships between spot and futures prices in the study and thus enhance the body of knowledge regarding the behavior of the gold market in India, specifically in the post-COVID context.

OBJECTIVES OF THE STUDY

1. To examine the long-run and short-run relationships between spot and futures prices of gold.
2. To investigate the lead-lag relationship between spot and futures prices of gold.

RESEARCH QUESTIONS

What is the nature of the long-run and short-run relationships between spot and futures prices of gold in the Indian market?

How do spot and futures prices of gold interact in terms of lead-lag relationships, particularly in the post-COVID context?

METHODOLOGY

The time-series data for this research was obtained from the official website of the National Stock Exchange (NSE, www.nse.com). The spot price of gold was obtained by using the daily closing price of 1 gram of gold in the spot market, while the futures market data were obtained by using the closing prices of the next month's futures contracts for 1 gram of gold. The data spans from June 2021 to December 2023, where all observations of bullion futures are considered since gold is a bullion.

- To study the lead-lag relationship between futures and spot prices in logarithmic terms, we applied several analytical techniques. We first used the Johansen cointegration test to determine the presence of long-run relationships among the variables. We used the VAR model after that to capture the dynamic interrelations and short-term relationships among the spot and futures prices.

To further explore these causal linkages, we ran a Granger causality test, which would determine if one variable's past values helped forecast other variables' future values.

1. **Johansen Co-integration test:-**

2. Cointegration is said to be the long-term equilibrium relationship between spot prices and futures prices, yet both series are individually not stationary. Though these two non-stationary time series may diverge temporarily, they are supposed to evolve systematically in the long run. The presence of cointegration between prices of spot and futures can be said to imply the fact that although both series individually are not stationary, the linear combination of them is said to be stationary, but their difference should be close to zero. If the series are not cointegrated, that implies no long-run relationship between them. In such a case, speculators may be able to make a profit in the futures market if the cointegration relationship between the futures and spot markets becomes weak

Johnson cointegration test

Statistic	Mean	Std. Dev	Skewness	Kurtosis	Observation
LGOLDSP	8.5807	0.0927	0.2241	-1.3842	631
LGOLDFP	8.5727	0.0942	0.4755	-1.0935	631

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- For comparison and simplification of the analysis, we have taken the log of the data series. The data reported in this study are daily data from Jun 7, 2021, to Dec 29, 2023. Summary statistics for the data are shown in Table 1. We note that the mean of the futures price is less than the mean of the spot prices (logged values). Both the indices reflect positive skewness. The distribution of the series is not equal to 3, so neither data series is a normal distribution.

Null Hypothesis	Lags	Z statistic	
D(LGOLDFP) does not Granger cause D(LGOLDSP)	1	0.5703**	
D(LGOLDSP) does not Granger cause D(LGOLDFP)	1	2.1369	

- Therefore, a Granger Causality test has been performed. The results of the Granger causality Wald tests indicate a significant directional relationship between log spot prices and log future prices that points to one-way causality from the former to the latter. Table 5 shows the result of the Granger causality test on whether log spot prices Granger-cause log future prices had a chi-squared statistic of 5.5703 with a p-value of 0.018, which was statistically significant at the 0.05 level. This means that past log spot prices have relevant predictive information about log future prices. The reverse test of whether log future prices Granger-cause log spot prices had a chi-squared statistic of 2.1369 and a p-value of 0.144, indicating no significant predictive relationship.

Findings & Conclusion

- These findings would indicate that market participants would react to changes in the spot price because expectations are being formed about future prices. Therefore, spot prices are highly relevant in forecasting future market movements. Furthermore, the absence of Granger causality from log futures prices to log spot prices leads to an interesting market efficiency issue, which, about integration, reflects a non-full incorporation between the two markets that eventually gives rise to inefficiencies. All Granger causality tests highlight the causal role of spot prices in forming expectations of future prices, thus always showing a directional flow of information from the spot market to the futures market.

Conclusion

- This study analyzes lead-lag relationships between gold spot and futures prices, particularly in the post-COVID scenario in India. The one-way Granger causality has come out as significant from the log spot price to the log future prices, implying that past movement of the spot price tends to forecast future price expectations. That captures the impact of the spot price over market participants' expectation or their decision related to a future price. The study further shows that although spot prices largely determine futures prices, the converse is not that past futures prices considerably determine present spot prices.

- The absence of a long-run cointegration relationship between the two pricing mechanisms indicates that there might not be full integration of the futures market into the spot market, raising serious questions on market efficiency and the existence of inefficiency in price formation. A lesson learned is that much information regarding spot price movements can be monitored to help forecast future price directions. It helps in enhancing existing knowledge regarding the dynamics of Indian prices for gold by allowing it to have some insight in assisting

- further traders, investors, and policymakers to navigate or take appropriate decisions regarding this kind of complexity in post-pandemic environment market conditions. Further studies might be performed on trading strategies as well as implications on such results for market behavior. Further detailed analysis of the economic indicators and geopolitical happenings of outside will further shed light on the relationship between spot and futures prices. Further detailed analysis of the economic indicators and geopolitical happenings of outside will further shed light on the relationship between spot and futures prices.

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