

## Global and Local Determinants of Gold Prices: Insights from the US, India, and China

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**Abstract:-** The abstract should briefly summarize the main points of the paper, including the research question or objective, the methods used, and the major findings. It should be between 150 and 250 words.

**Keywords:** Bullion products, particularly gold, are highly valued precious metals traded in both physical and financial forms. Recognised as a safe haven asset, gold tends to retain or even appreciate in value during periods of economic uncertainty. The price of gold is influenced by numerous factors, including supply and demand, economic conditions, and investor sentiment. Among these, economic conditions play a crucial role, significantly impacting the demand for gold. This paper investigates the relationship between economic conditions and the price of gold in a cross-country context, utilising a panel data set from three countries over the period 2014-2023. The study's findings reveal a reciprocal interdependence between gold prices in the United States and India. These insights have profound implications for investors and policymakers. Investors should recognise that gold prices are likely to rise during periods of economic instability and inflation. Policymakers, on the other hand, should acknowledge gold's role in the financial system and implement measures to mitigate potential risks associated with its volatility.

**Keywords:** Commodity, Bullion, Cross Country, Gold.

### Introduction:

Investors buy bullion to protect their wealth during economic uncertainty. Bullion products, particularly gold, are considered safe investments that can hold value even when stocks and bonds fall. During economic prosperity, investors may sell bullion products in favor of assets with higher returns because they do not generate income, and their value may not keep pace with inflation (Kumar, 2018a). Economics and bullion product prices have been extensively studied, with some studies finding a positive correlation and others a negative or insignificant one (Kumar, 2018c). This study empirically examines economic conditions and bullion prices across countries. It will also examine supply and demand, investor sentiment, and exchange rates using a panel data set of bullion prices from India, China, and the US. By revealing the factors that affect bullion prices across countries, this study will help investors, traders, and policymakers make better bullion market decisions (Kumar, 2018d; Sahoo et al., 2024).

### Literature Review:

The literature review is a comprehensive synthesis of numerous studies that have examined the correlations between commodities like crude oil, gold, and silver and economic parameters. This thorough review provides a complete understanding of commodities market dynamics and material cost factors, laying a strong foundation for our study (Kumar, 2019a).

Early pandemic econometric analyses show that gold firms are more exposed to gold prices and less to market fluctuations than usual. Gold prices affect producers more than market conditions do explorers, reflecting their higher risk (Kumar, 2019b). Typically, investors can distinguish explorers, developers, and producers. The more severe market shocks that affect gold equities during crises reduce this discernment. The COVID-19 market shock hurt gold stocks regardless of price (Kumar, 2020).

Market exposure can outweigh fundamentals in severe shocks, causing gold share prices to plummet. Crisis-induced decoupling suggests discount rates temporarily overshadow fundamentals reflected in projected future cashflows due to uncertainty and risk aversion. A recoupling is expected, bringing gold share values back in line with future gold prices giving investors arbitrage opportunities (Kumar & Biswal, 2019).

Gold mining shares have been studied by Faff and Chan (1998), Twite (2002), Baur (2011, 2014), and Jensen et al. (2018). Baur et al. (2020) examine gold share performance during major economic and financial crises in Australia, Canada, the UK, and the US, but it does not address the COVID-19 pandemic or distinguish between gold companies.

The literature on gold's role as a currency hedge and haven includes studies by Capie et al. (2005), Reboredo, Baur, and Lucey (2010), Baur and McDermott (2010), and Tufano (1996, 1998). Conlon and Akhtaruzzaman et al. (2020), Cheema and Szulczuk (2020), McGee (2020), Ji et al. (2020), and Corbet et al. (2020) studied gold and gold stocks during the pandemic rather than generic safe-havens.

Previous research has identified many bullion price factors and suggested solutions to address price fluctuations. However, there is still a major price dependence gap between countries. Our study aims to bridge this gap and provide a deeper understanding of the relationship between bullion prices across countries and the price association with agro products (Kumar & Mishra, 2019a; 2019b). The potential benefits of these findings are significant, offering new perspectives and strategies to address price fluctuations in the bullion market (Kumar et al., 2019a; 2019b; Kumar, 2022).

**Methodology:**

Data Sources: The secondary data collected from the commodity exchange of respective countries. The data include two major bullion products that are traded locally and globally i.e. Gold of three major countries in production and consumption, i.e. India, China and USA. The study considers the daily return of all the bullion products of all three countries from 18 December 2014 to 31 March 2023.

*Research Hypothesis*

As per the study objective, the hypothesis formulated is as follows:

H1: The cross country bullion products are not correlated to each other.

H2: The cross country bullion products do not have any causal effect.

**Results:**

In the quest to unveil the intricate dynamics of commodity relationships across nations—India, the United States, and China—the present study delves into a compendium of internationally traded gold return series. Yet, the primary endeavour lies in gauging the data's normalcy through the JB test, while also delving into the essence of the series via descriptive statistics, paving the way for the subsequent deployment of research methodologies. The outcomes of the JB test, delineated in Table 1, unveil the data series' conformity to normality, shedding profound insights into the gold market dynamics within the selected countries (Kumar et al., 2024).

**Table 1 Result of Bullion Products Test of Normality**

	GOLD_INDIA	GOLD_CHINA	GOLD_US
Mean	0.000172	0.000131	0.000112
Median	0.000172	0	0.000103
Maximum	0.013407	0.025803	0.023658
Minimum	-0.01683	-0.03806	-0.01715

Std. Dev.	0.002828	0.004033	0.00301
Skewness	0.055098	-0.61475	0.060349
Kurtosis	5.78045	14.89335	6.800953
Jarque-Bera	650.093	12002.97	1214.189
Probability	0	0	0
Sum	0.346674	0.26442	0.225445
Sum Sq. Dev.	0.016102	0.032761	0.018245
Observations	2015	2015	2015

The examination of commodity market performance is a pivotal aspect of the time series analysis, requiring a thorough understanding of data characteristics. Table 1 presents the data features for gold across China, India, and the USA, showcasing significant insights. Notably, the JB test results, with a 5% significance level, affirm that all data series are normally distributed, indicating a predictable pattern. This crucial finding enables the estimation of future pricing trends.

Additionally, Table 1 provides statistical insights, revealing some deviations from normalcy, indicating either positive or negative skewness. This suggests a left-tailed or platykurtic distribution, characterized by a high peak in graphical representation. The normal distribution's tail movement, discerned through skewness values (ideally 0), further confirms the data's normality.

The JB test's primary objective is to discern data properties, revealing that the data follow a random walk rather than a regular distribution. However, all data series exhibit variances within acceptable limits, allowing for further research alignment with the study's objectives. The stationary test results, as depicted in Table 2 (2.1 to 2.3), indicate that the gold data series for all three countries are statistically significant at a 0.05 p-value, affirming the constancy of mean, variance, and covariance over the study period (Kumar, 2018c).

In conclusion, the stationary nature of the gold data series across China, India, and the USA underscores their stability, supporting long-term implications and providing a foundation for generalized statements.

**Table 2 Result of a stationary test**

Table No.2.1 -Testing the presence of Unit root through ADF test and PP test(Level & Intercept)					
Gold Futures		ADF		PP	
	Test critical values	t-Statistic	Prob	t-Statistic	Prob

<b>GOLD_INDIA</b>		-28.61023	0.0000	-30.96244	0.0000
	1%	-3.962607		-3.962605	
	5%	-3.412042		-3.412041	
	10%	-3.127931		-3.127931	
<b>GOLD_INDIA</b> has unit root.					
<b>GOLD_CHINA</b>		-47.06521	0.0001	-47.02561	0.0001
	1%	-3.433398		-2.566111	
	5%	-2.862773		-1.940981	
	10%	-2.567473		-1.616594	
<b>GOLD_CHINA</b> has unit root.					
<b>GOLD_USA</b>		-21.77738	0.0000	-29.25574	0.0000
	1%	-3.433403		-3.433398	
	5%	-2.862775		-2.862773	
	10%	-2.567474		-2.567473	
<b>GOLD_USA</b> has unit root.					

**Table No.2.2 -Testing the presence of Unit root through ADF test and PP test(Trend & Intercept)**

Gold Futures		ADF		PP	
	Test critical values	t-Statistic	Probability	t-Statistic	Probability
<b>GOLD_INDIA</b>		-28.61023	0.0000	-30.96244	0.0000
	1%	-3.962607		-3.962605	
	5%	-3.412042		-3.412041	
	10%	-3.127931		-3.127931	
<b>GOLD_INDIA</b> has unit root.					
<b>GOLD_CHINA</b>		-47.05647	0.0000	-48.02536	0.0000
	1%	-3.962605		-3.962605	
	5%	-3.412041		-3.412041	

	10%	-3.127931		-3.127931	
<b>GOLD_CHINA</b> has unit root.					
<b>GOLD_USA</b>		-21.77765	0.0000	-29.24618	0.0000
	1%	-3.962611		-3.962605	
	5%	-3.412044		-3.412041	
	10%	-3.127933		-3.127931	
<b>GOLD_USA</b> has unit root.					

<b>Table No.2.3 -Testing the presence of Unit root through ADF test and PP test(None)</b>					
<b>Gold Futures</b>		<b>ADF</b>		<b>PP</b>	
	<b>Test critical values</b>	<b>t-Statistic</b>	<b>Probability</b>	<b>t-Statistic</b>	<b>Probability</b>
<b>GOLD_INDIA</b>		-28.49962	0.0000	-31.06035	0.0000
	1%	-2.566111		-2.566111	
	5%	-1.940981		-1.940981	
	10%	-1.616594		-1.616594	
<b>GOLD_INDIA</b> has unit root.					
<b>GOLD_CHINA</b>		-47.02561	0.0001	-47.79833	0.0001
	1%	-2.566111		-2.566111	
	5%	-1.940981		-1.940981	
	10%	-1.616594		-1.616594	
<b>GOLD_CHINA</b> has unit root.					
<b>GOLD_USA</b>		-21.73011	0.0000	-29.28676	0.0000
	1%	-2.566112		-2.566111	
	5%	-1.940981		-1.940981	
	10%	-1.616593		-1.616594	
<b>GOLD_USA</b> has unit root.					

The research objective necessitates an initial analysis to verify the extent of the relationship between countries concerning bullion products, specifically focusing on gold. This evaluation is conducted through a correlation test, the results of which are presented in Table 3.

Table 3 illustrates the correlation coefficients between different countries regarding their bullion product prices, with a specific emphasis on gold. The analysis reveals the strength and direction of the relationships, providing valuable insights into the interconnectedness of these markets.

The correlation test aims to establish whether there exists a significant relationship between the prices of bullion products, particularly gold, across different countries. A positive correlation coefficient indicates a direct relationship, suggesting that as the price of gold increases in one country, it also tends to increase in others. Conversely, a negative

correlation coefficient implies an inverse relationship, indicating that as the price of gold rises in one country, it decreases in others.

Furthermore, the correlation test assesses the magnitude of the relationships, helping to determine the degree to which changes in the price of gold in one country affect prices in other countries. A high correlation coefficient suggests a strong relationship, indicating that changes in one country's gold price have a substantial impact on other countries' prices.

Overall, the correlation test provides valuable insights into the interconnected nature of bullion markets, particularly regarding gold, across different countries. Understanding these relationships is crucial for investors, traders, and policymakers, as it can help them make informed decisions regarding bullion trading and investment strategies.

**Table 3 – Result of cross country gold price Correlation**

	GOLD_INDIA	GOLD_CHINA	GOLD_US
GOLD_INDIA	1	<b>0.021023116286123</b>	<b>0.056098011282675</b>
GOLD_CHINA	<b>0.021023116286123</b>	1	-0.028120216215672
GOLD_US	<b>0.056098011282675</b>	<b>-0.028120216215672</b>	1

**Table 3.1:** Bullion Products Gold shows the weakest but highest relationship of all variables, 5.6%, with India and the USA.

Global economic conditions, currency exchange rates, and local demand and supply dynamics affect gold prices in India and the US. Consider these key points:

1. **Global Gold Prices:** Gold's price is primarily determined by international trade. These include global economic conditions, geopolitical events, inflation, interest rates, and market sentiment. Changes in these factors can affect gold prices worldwide.
2. **Currency Exchange Rates:** The Indian Rupee (INR) and US Dollar (USD) exchange rates significantly impact the local gold price in India. If the USD strengthens against the INR, Indian gold buyers may pay more for USD-converted gold. Conversely, a weaker USD/INR can lower Indian gold prices.
3. **The Indian government imposes import duties and taxes on gold imports, which can impact local prices.** Lower import duties may make gold cheaper in India, while higher duties may increase it.
4. **Demand and Supply:** Gold demand in India, particularly for cultural events like weddings and festivals, can increase prices locally. Even if international prices remain stable, gold prices in India may rise during high demand. Local factors like jewelry making, investment demand, and recycling can also affect Indian supply and demand.
5. **International Factors:** Economic stability, geopolitical tensions, and central bank policies can affect gold prices globally. These global factors indirectly affect gold prices in India and the US.
6. **Arbitrage Opportunities:** Many traders and investors capitalize on market price differences. Arbitrage opportunities may arise if gold prices in India are significantly higher or lower than in the US, causing price adjustments in one or both markets.

The price of gold in India and the US is affected by many global and local factors. Local factors like currency exchange rates, taxes, and cultural demand patterns, along with international influences, affect gold prices in each country. Thus, global and regional factors must be considered when comparing gold prices in India and the US.

Gold prices in India and China, like elsewhere, are affected by global and local factors. Both countries are major gold consumers, but several factors can affect the price of gold in India and China:

1. **The international price of gold is influenced by global factors such as supply and demand, geopolitical events, economic indicators, and investor sentiment.** These factors affect gold prices worldwide and in India and China.
2. **Exchange Rates:** Exchange rates significantly impact gold prices across countries. Since gold is priced in dollars, a more robust local currency can lower local gold prices. Conversely, a weaker currency can boost gold prices.

3. Local Demand: India and China are major gold consumers worldwide, driven by cultural and economic factors. Both countries' High demand can raise prices, especially during festivals and weddings, when gold purchases rise.
4. Government Policies: Controls on gold imports, taxes, and restrictions can affect local gold prices, and changes in import duties can affect gold jewelry prices.
5. Import/Export: Gold trade between India and China impacts local prices. If one country exports much gold to another, supply, demand, and price can change.
6. Jewelry Trends: Variable consumer preferences impact gold jewelry demand and prices. For instance, fashion trends can affect gold jewelry purchases.
7. Investor Behavior: Gold investment demand, such as buying gold bars and coins, can affect prices. Economic uncertainty drives investors to buy gold as a haven.
8. Monetary Policies: Central bank policies in both countries can affect gold prices. Central banks buying or selling gold for reserve management can affect the local gold market.

Despite similarities, these factors affect gold prices in India and China differently due to country-specific conditions and policies. As major players in the global gold market, their interactions can affect prices elsewhere, complicating their relationship. Traders and investors closely monitor these factors to make informed gold market decisions.

The price of gold in China and the US, like any two countries, can vary depending on many factors. Consider these key points:

1. The price of gold is determined by international supply and demand dynamics in the global market. Political events, economic conditions, inflation, and central bank policies can affect gold prices worldwide.
2. The exchange rate between the Chinese Yuan (CNY) and the US Dollar (USD) can significantly affect gold prices in different countries. As the CNY weakens against the USD, Chinese gold prices may rise to compensate. When the CNY strengthens, Chinese gold prices may fall.
3. Gold Import/Export: China is a major gold consumer and imports significantly from other countries, including the United States. Changes in import/export regulations, tariffs, or trade policies can affect Chinese gold prices.
4. Local Demand: Cultural, economic, and investment factors impact gold demand in each country. Traditional Chinese culture values gold jewelry, which can affect gold demand in China.
5. Financial Markets: The performance of financial markets in both countries may also be a factor. Gold prices may rise during economic uncertainty or market volatility as investors seek safety.
6. Government policies on gold ownership, trading, and taxation can affect the price of gold. For instance, gold import and export regulations can affect China's gold supply and price.
7. Global Factors: External factors like the global economy, interest rates, and geopolitics can affect gold prices in China and the US.

The relationship between Chinese and US gold prices is complex and influenced by many global and local factors. Due to their interconnection in the worldwide gold market, their prices tend to move in the same direction, but various factors can cause temporary price differences (Sahoo *et al.*, 2024). Traders, investors, and policymakers track these factors to make good decisions.

**Table-4 Pairwise Granger Causality Tests**

Pairwise Granger Causality Tests

Sample: 1 2105

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GOLD_CHINA does not Granger Cause GOLD_INDIA	2013	1.52254	0.2184
GOLD_INDIA does not Granger Cause GOLD_CHINA		0.00760	0.9924
GOLD_US does not Granger Cause GOLD_INDIA	2013	<b>5.16030</b>	<b>0.0058</b>
GOLD_INDIA does not Granger Cause GOLD_US		<b>7.28803</b>	<b>0.0007</b>
GOLD_US does not Granger Cause GOLD_CHINA	2013	1.52313	0.2183

While correlation analysis reveals the degree of association between variables, it cannot elucidate causal relationships—specifically, which variable influences another more strongly. Thus, the aim is to discern the major cause-and-effect relationships among variables. To determine these relationships, the Granger causality test, outlined in Table 4, must be employed.

The Granger causality test, detailed in Table 4, aims to pinpoint cause-and-effect links. In analyzing the price dynamics among nations for bullion products like gold, this study considers lag 2. The results indicate that the US lags behind India in terms of price movements as discussed by various researchers (Kumar, 2022; Kumar *et al.*, 2024).

### Conclusion:

This study aimed to validate the price correlation between gold bullion products across three nations—India, China, and the United States—to understand shifting trends and assist practitioners, traders, policymakers, and others in devising profitable strategies. The findings reveal interdependence between US and Indian gold prices, suggesting a reciprocal relationship. This research on price associations is valuable for predicting pricing trends and making informed decisions on import/export and trading strategies in domestic and foreign markets (Kumar *et al.*, 2019a; 2019b).

### Limitations

The study is limited to the price association of gold bullion products among three nations based on production and consumption. Other factors, such as regional legislation and taxation, could influence practitioner decisions, potentially impacting the study's outcomes (Kumar, 2018a; 2018d).

### Future Study

Future research should expand to include more countries and commodities, utilize larger datasets, incorporate macroeconomic variables, and delve into practitioner psychology. This holistic approach will enable a more comprehensive evaluation of reality and lead to generalized conclusions (Kumar, 2019a; 2020).

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