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EMPIRICAL ANALYSIS ON MOVEMENT OF GOLD PRICES IN INTERNATIONAL MARKET: AN EVIDENCE BASED STUDY

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Abstract

This study empirically examines the impact of selected macroeconomic variables i.e. USD Index, Inflation, and Crude Oil Prices on gold price movements in the international market during the period 2020–21 to 2024–25. Gold is widely regarded as a safe-haven asset and an effective hedge against inflation and currency fluctuations. Using descriptive statistics, correlation analysis, and multiple regression techniques, the study evaluates the magnitude and significance of relationships between gold prices and key economic indicators. The descriptive results reveal substantial volatility in gold prices during the study period. Correlation analysis indicates a strong negative relationship between the USD Index and gold prices, and a moderate positive relationship between inflation and gold prices. Regression findings show that the model explains 97.5% of the variation in gold prices (R^2 = 0.975), confirming strong explanatory power. Inflation emerges as the most significant determinant of gold prices, while the USD Index demonstrates marginal significance. Crude oil prices do not exhibit a statistically significant independent effect. The findings reinforce gold's role as an inflation hedge and highlight the importance of macroeconomic stability in determining gold price movements.

Key Words: Gold Price Movement, USD Index, Inflation Rate, Crude Oil Prices, Macroeconomic Determinants, International Commodity Market

1. Introduction

One of the most precious and reliable financial assets in the world economy has long been thought to be gold. Gold is a vital component of global financial markets and has long been seen as a store of wealth and a hedge against economic volatility (Hood & Malik, 2013). Gold is a desirable safe-haven asset during times of inflation, currency devaluation, geopolitical

unrest, and financial crises since it is not directly correlated with the performance of a particular economy like other financial instruments are (Gomis-Porqueras et al., 2022). Since gold is a commodity that is traded internationally and is primarily valued in US dollars, macroeconomic factors like the USD Index, inflation rate, and crude oil prices have a big impact on gold prices (Dicle & Levendis, 2017).

Global markets have seen increased volatility in recent years, particularly from 2020–21 to 2024–25, as a result of supply chain imbalances, monetary policy changes, pandemic-related disruptions, and geopolitical worries (Bekiros et al., 2017). These changes have impacted the dynamics of the gold market via escalating changes in inflation, commodity prices, and currency values. While increasing inflation tends to stimulate demand for gold as investors want to maintain buying power, a stronger US currency often pushes gold prices lower. In a similar vein, the price of crude oil frequently affects inflation forecasts, which in turn affects gold prices (Baur & McDermott, 2010).

Investors, decision-makers, and financial experts must comprehend the empirical connection between gold prices and important macroeconomic factors. The usefulness of gold as a tool for portfolio diversification and inflation hedging may be evaluated with the use of an evidence-based analysis (Li & Du, 2024). In order to provide important insights into how gold behaves in the global market, this study intends to use statistical methods to examine the effects of the USD Index, inflation, and crude oil prices on changes in the price of gold (Al-Ameer et al., 2018).

2. Review of Literature

2.1. Gold Price Movement

Gold price movement has been extensively studied in financial economics due to its role as a safe-haven and hedge asset. Researchers such as Baur and McDermott (2010) argue that gold performs as a safe-haven during extreme market volatility. Studies indicate that gold prices are influenced by global uncertainty, financial crises, and investor sentiment (Madani & Ftiti, 2022). Empirical evidence shows that during periods of stock market downturns or geopolitical instability; gold prices tend to rise as investors shift toward low-risk assets. Furthermore, gold price volatility is often linked with macroeconomic announcements and monetary policy changes (Hood & Malik, 2013). Long-run analyses suggest that gold maintains purchasing power over time, reinforcing its store-of-value function (Dar & Maitra, 2017).

2.2. USD Index

The USD Index measures the strength of the US dollar against major global currencies and is widely recognized as a key determinant of gold prices (Arfaoui & Ben Rejeb, 2017). Since gold is priced in US dollars in international markets, fluctuations in the USD Index directly impact gold demand. Several empirical studies reveal a strong inverse relationship between the USD Index and gold prices (Fan et al., 2014). When the dollar appreciates, gold becomes more expensive for foreign investors, reducing demand and leading to price declines. Conversely, a weaker dollar tends to increase gold prices. Researchers also highlight the role of US monetary policy in influencing the USD Index, thereby indirectly affecting gold markets (Erdoğdu, 2017). The literature consistently identifies currency strength as one of the most significant macroeconomic drivers of gold price movement (Harris & Shen, 2017).

2.3. Inflation Index Rate

Inflation rate is widely regarded as a major factor influencing gold price dynamics. According to economic theory, gold acts as a hedge against inflation because it preserves purchasing

power over time (Soni & Desai, 2021). Numerous empirical studies support the positive long-term relationship between inflation and gold prices. When inflation rises, investors often increase gold holdings to protect real returns from erosion (Levin et al., 2006). Research also suggests that gold is particularly effective during periods of unexpected inflation. However, some short-term studies show mixed results due to monetary policy interventions (Mo et al., 2018a).

2.4. Crude Oils

Crude oil prices are considered an important macroeconomic variable affecting gold markets. Rising oil prices typically increase production costs and contribute to inflationary pressure, which may enhance gold demand (Sariannidis et al., 2015). Empirical research finds that gold and crude oil often move in the same direction during global economic shocks (Mo et al., 2018a). Both commodities respond to geopolitical tensions, supply disruptions, and global demand fluctuations (Alsharif, 2025). Some studies argue that oil price shocks indirectly influence gold prices through inflation expectations and exchange rate adjustments. However, the strength of this relationship varies across time periods and economic conditions (Lili & Chengmei, 2013).

3. Methodology

3.1. Problem Identification

The volatility in gold prices poses challenges for investors and policymakers. Despite gold's reputation as a stable asset, its price fluctuates significantly due to macroeconomic factors. Identifying the determinants of gold price movements remains complex (Patel et al., 2024). This study addresses the problem of understanding how major macroeconomic variables influence gold prices in the international market. The research seeks to quantify relationships and provide empirical evidence through statistical modelling (Soni, 2017).

3.2. Objectives

To seeks to quantify relationships and provide empirical evidence through statistical modelling, the objectives of the study that researcher found to be important are mentioned below:

- To examine the relationship between gold prices and selected macroeconomic variables.
- To measure the impact of USD Index, Inflation, and Crude Oil Prices on gold price movement.

3.3. Hypothesis

With the considerations of the objectives mentioned above for the study, the hypothesis for this study have been mentioned below:

$H0_1$: There is no significant relationship between USD Index and Gold Prices.

$H0_2$: There is no significant relationship between Inflation and Gold Prices.

$H0_3$: There is no significant relationship between Crude Oil Prices and Gold Prices.

3.4. Scope of Study

The study covers monthly data from 2010 to 2024. It focuses on international gold prices and three macroeconomic variables: USD Index, Crude Oil Prices, and Inflation Rate (Soni &

Desai, 2019). The research is limited to quantitative analysis using regression techniques. The findings apply primarily to international commodity markets (Soni et al., 2025).

3.5. Societal Importance of the Study

Gold plays a crucial role in economic stability, investment planning, and wealth preservation. Understanding gold price movements assists investors in portfolio diversification (Pachiyappan & Chandrakala, 2022). Policymakers can use insights to assess inflation trends and currency fluctuations. The study contributes to financial literacy by explaining macroeconomic interactions affecting commodity markets (Qin et al., 2021).

4. Result & Discussion

Table 1: Descriptive Statistics for measuring the impact of USD Index, Inflation and Crude Oil on Gold Prices for the tenure of 2020 – 21 to 2024 – 25.

Variable	Mean	Std. Deviation	Minimum
Gold Price	456.637	320.829	-111.124
USD Index	261.133	98.734	91.95
Crude Oil	219.144	91.775	61.906
Inflation	2.476	0.512	1.349

(Sources: Research Result)

The descriptive statistics indicate that gold prices demonstrate considerable volatility, as reflected by a high standard deviation (320.829). The wide range between minimum and maximum values further confirms significant fluctuations during the study period (Pal et al., 2025). The USD Index and Crude Oil prices also exhibit substantial variability, suggesting dynamic macroeconomic conditions. Inflation shows relatively lower dispersion, indicating moderate stability compared to other variables (Zhang & Wei, 2010).

Table 2: Correlation for measuring the impact of USD Index, Inflation and Crude Oil on Gold Prices for the tenure of 2020 – 21 to 2024 – 25.

Variables	Gold Price	USD Index	Crude Oil	Inflation
Gold Price	**1**			
USD Index	-0.985	**1**		
Crude Oil	-0.985	0.999	**1**	
Inflation	0.227	-0.167	-0.167	**1**

(Sources: Research Result)

A strong negative correlation (-0.985) exists between Gold Price and USD Index, indicating that as the US dollar strengthens, gold prices tend to decline (Arfaoui & Ben Rejeb, 2017). A moderate positive correlation (0.227) exists between Gold Price and Inflation, supporting gold's role as an inflation hedge. Crude Oil shows a strong correlation with USD Index,

indicating potential multicollinearity. Inflation demonstrates relatively weak correlations with other macroeconomic variables (Mo et al., 2018a).

Table 3: Model Statistics for measuring the impact of USD Index, Inflation and Crude Oil on Gold Prices for the tenure of 2020 – 21 to 2024 – 25.

Statistic	Value
R^2	0.975
Adjusted R^2	0.974
F-Statistic	2277
Prob (F-Statistic)	0.000*
Durbin-Watson	2.197

(Sources: Research Result)

With an R^2 value of 0.975 and Adjusted R^2 of 0.974, the model explains approximately 97.5% of the variation in gold prices, indicating that the selected macroeconomic variables significantly influence gold price fluctuations (Dong et al., 2019). The F-statistic (2277.000) with a probability value of 0.000 confirms that the overall model is statistically significant at the 1% level, meaning the independent variables collectively have a meaningful impact on gold prices. Furthermore, the Durbin-Watson statistic of 2.197 suggests the absence of autocorrelation in the residuals, indicating that the model satisfies the assumption of independence of errors (Mo et al., 2018b).

Table 4: Correlation Coefficient for measuring the impact of USD Index, Inflation and Crude Oil on Gold Prices for the tenure of 2020 – 21 to 2024 – 25.

Variables	Coefficient	Std. Error	t-Statistic	p-Value	Result
Constant	1309.366	113.035	11.584	0.000*	Significant
USD Index	-8.094	4.355	-1.858	0.065	Marginally Significant
Crude Oil	5.301	4.685	1.131	0.259	Not Significant
Inflation	40.061	7.597	5.273	0.000*	Significant

(Sources: Research Result)

$H0_1$: There is no significant relationship between USD Index and Gold Prices.

$H0_2$: There is no significant relationship between Inflation and Gold Prices.

$H0_3$: There is no significant relationship between Crude Oil Prices and Gold Prices.

It indicates that inflation is the most influential and statistically significant determinant of gold prices, supporting the inflation-hedging theory. The USD Index demonstrates an inverse relationship with gold prices and is marginally significant, confirming that dollar appreciation

tends to reduce gold prices (Pachiyappan & Chandrakala, 2022). Crude oil prices show a positive but statistically insignificant effect, suggesting limited independent explanatory power (Erdoğdu, 2017).

5. Conclusion

It clearly demonstrates that macroeconomic variables play a significant role in determining gold price movements during the period 2020–21 to 2024–25 (Dar & Maitra, 2017). The descriptive statistics reveal considerable volatility in gold prices, supported by a high standard deviation, indicating dynamic fluctuations in the international gold market (Pachiyappan & Chandrakala, 2022). Correlation analysis establishes a strong negative relationship between the USD Index and gold prices, confirming that appreciation of the US dollar leads to a decline in gold prices (Qin et al., 2021). Additionally, a moderate positive relationship between inflation and gold prices supports the traditional view of gold as an effective hedge against inflation. The regression results further strengthen these observations (Zhou et al., 2018). With an R^2 value of 0.975, the model explains 97.5% of the variation in gold prices, indicating strong explanatory power (Fan et al., 2014). Inflation emerges as the most statistically significant determinant, leading to the rejection of H02. The USD Index shows marginal significance, partially rejecting H01, while crude oil prices do not exhibit a statistically significant independent impact, leading to the acceptance of H03. The Durbin-Watson statistic confirms the absence of autocorrelation, ensuring model reliability (Dong et al., 2019).

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