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Global Macroeconomic Drivers of Gold Prices: The Impact of Inflation, USD Exchange Rate, and Crude Oil Prices

Herman[1], Antony Wijaya[2], Afriza Amir[3], Nur Ahmadi Bi Rahmani[4]

Abstract:

This study aims to examine the influence of the inflation rate, the US dollar exchange rate, and global oil prices on world gold prices. Using a quantitative approach with secondary time-series data, the analysis was carried out through multiple linear regression to identify both partial and simultaneous effects of the selected macroeconomic variables. The findings indicate that the inflation rate does not have a significant impact on gold prices. In contrast, the US dollar exchange rate shows a positive and significant relationship with gold prices, suggesting that fluctuations in the value of the dollar play an important role in shaping global gold market movements. Meanwhile, global oil prices are found to have no significant partial effect on gold prices. Furthermore, when examined simultaneously, the three macroeconomic variables do not exhibit a collective influence on world gold prices. These results highlight the dominant role of currency dynamics compared to inflationary conditions and oil price fluctuations in determining gold price behavior during the observed period.

Keywords: *Inflation Rate, US Dollar Exchange Rate, World Oil Price, World Gold Price*

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1. Introduction

The recent near-record highs in world gold prices have been influenced by intensifying global economic uncertainty and geopolitical risks, including conflicts in Eastern Europe and the Middle East. As a well-established safe-haven asset, gold is strongly connected to monetary policy decisions, inflationary pressures, currency movements, and broad market risk sentiment. Understanding gold price dynamics is therefore essential for interpreting global macroeconomic conditions and investor behavior. Prior studies extensively explore gold's interactions with macroeconomic

[1]*PUI Fintech Innovation and Sustainable Economics, Universitas Prima Indonesia , Indonesia.*
[2]*PUI Fintech Innovation and Sustainable Economics, Universitas Prima Indonesia , Indonesia.*
[3]*PUI Fintech Innovation and Sustainable Economics, Universitas Prima Indonesia , Indonesia. afrizaamir@unprimdn.ac.id*
[4] *Universitas Islam Negeri Sumatera Utara*

variables. For instance, Chen et al. (2023), Zhang et al. (2025), and Wang et al. (2021) highlight how uncertainty shocks, exchange rate risks, and financial market instability shape gold's volatility and safe-haven properties. Research focusing on macroeconomic determinants shows that inflation, exchange rates, and oil prices play significant roles in influencing gold prices across different markets (Hena & Silalahi, 2022; Kesarditama et al., 2020; Li & Du, 2024; Luqman et al., 2023; Soekapdjo, 2021; Widijatmoko & Anggraeni, 2024; Yosephine et al., 2023). Exchange rate dynamics, particularly those involving the US dollar, have also been shown to affect gold returns through channels such as interest rate differentials and global risk sentiment (Herley et al., 2024; Lefatsa et al., 2025; Tanin et al., 2021; Rastogi et al., 2024). Meanwhile, the Indonesian gold market remains closely tied to global benchmark prices set in major trading hubs such as London, New York, and Hong Kong, with domestic fluctuations reflecting global market cycles and local macroeconomic conditions.

Inflation has long been theorized to affect commodity markets due to its impact on purchasing power, production efficiency, and investment behavior. Several studies affirm this relationship, suggesting that inflation plays a substantial role in driving gold prices (Hena & Silalahi, 2022; Kesarditama et al., 2020; Soekapdjo, 2021). However, there is also evidence that inflation does not consistently influence gold markets, with some research showing negligible or insignificant effects under certain economic conditions (Salim et al., 2021; Simanungkalit, 2020). This inconsistency demonstrates a clear research gap regarding the inflation–gold price nexus, especially in emerging market contexts. Similar discrepancies appear in the literature on exchange rates. While some studies conclude that US dollar movements significantly affect gold prices (Herley et al., 2024; Wang et al., 2021; Tanin et al., 2021), others find weak or non-existent relationships depending on the time period or market structure (Paidi & Sasono, 2022; Pratama & Sutrisna, 2022). Given the volatility of the rupiah and recent global monetary tightening, further empirical validation is needed. A comparable gap is also present in oil–gold price studies. Scholars such as Li and Du (2024), Luqman et al. (2023), and Truong et al. (2024) argue that oil prices, as a major driver of global economic activity, significantly contribute to gold price movements. Yet other research documents no meaningful influence, suggesting that gold sometimes behaves independently of energy market dynamics (Widijatmoko & Anggraeni, 2024; Yosephine et al., 2023).

These conflicting findings reveal a clear research gap: despite extensive studies, the relationships between inflation, the US dollar exchange rate, oil prices, and gold prices remain inconsistent across time, regions, and methodological approaches. Particularly in Indonesia—an emerging economy highly exposed to global commodity cycles and currency pressures—empirical evidence for these relationships is still fragmented. Therefore, this study provides novelty by re-examining the simultaneous and partial effects of inflation, the US dollar exchange rate, and world oil prices on gold prices using recent data, focusing on a period marked by extreme global volatility. The inclusion of contemporary post-pandemic conditions, geopolitical uncertainty, and monetary tightening cycles offers updated empirical insights that expand the existing

literature and contribute to more accurate interpretations of gold price behavior in emerging markets.

2. Theoretical Foundations

Inflation is generally understood as a sustained increase in the overall price level within an economy, arising from imbalances between the flow of money and the flow of goods. When production, pricing, and monetary expansion become misaligned with income levels, inflationary pressures emerge and weaken the purchasing power of the currency. Prior research highlights that inflation can influence investment behavior, where individuals tend to move away from holding cash—which easily loses value during inflationary periods—toward safer assets such as gold (Hena & Silalahi, 2022; Kesarditama et al., 2020; Soekapdjo, 2021). As demand for gold increases under inflationary conditions, its price tends to rise, although some studies report inconsistent or insignificant effects depending on the economic cycle (Salim et al., 2021; Simanungkalit, 2020; Yosephine et al., 2023). Based on this theoretical and empirical foundation, the first hypothesis is formulated as follows:
H1: The inflation rate affects world gold prices.

Crude oil plays a critical role in global economic activity as one of the most essential energy sources. Global oil prices are commonly benchmarked against West Texas Intermediate (WTI) and Brent Crude, both widely used in international trade and production processes. Movements in crude oil prices significantly influence macroeconomic variables such as inflation, production costs, and commodity market dynamics (Li & Du, 2024; Luqman et al., 2023; Truong et al., 2024). At the same time, exchange rate fluctuations—particularly those involving the US dollar—are important determinants of investor decisions, as gold is denominated in USD in global commodity markets. When the US dollar depreciates, gold becomes cheaper in other currencies, increasing global demand and strengthening gold prices (Herley et al., 2024; Tanin et al., 2021; Wang et al., 2021). Conversely, during periods of dollar appreciation, gold prices often weaken. These interactions form the basis of the second hypothesis:
H2: The US dollar exchange rate affects world gold prices.

Gold itself serves as a financial standard in many countries and acts as a durable medium of exchange with universally recognized value. Its monetary role is supported by its stability and acceptance in global markets, typically in the form of bullion traded at prices listed in US dollars (Chen et al., 2023; Zhang et al., 2025). Gold price fluctuations are closely tied to market sentiment and macroeconomic shocks, including volatility in energy markets. Because crude oil is a key commodity in industrial production and global trade, its volatility can spill over into financial markets, influencing gold price dynamics. Rising oil prices may contribute to increased inflation expectations and heightened risk aversion, leading investors to shift to gold as a hedge (Li & Du, 2024; Luqman et al., 2023; Widijatmoko & Anggraeni, 2024). Conversely, when oil supply outpaces demand, resulting in lower prices, gold markets may not react strongly. Thus, the third hypothesis is proposed:

H3: World oil prices affect world gold prices.

From a broader macroeconomic perspective, the interaction among inflation, the US dollar exchange rate, and global oil prices may exert simultaneous influence on gold price movements. Higher money circulation during inflation reduces currency value and increases gold demand; a weakening dollar motivates investors to seek alternative stores of value, including gold; and rising oil prices heighten global uncertainty and inflationary pressures, which can also push gold prices upward (Hena & Silalahi, 2022; Herley et al., 2024; Li & Du, 2024). These interconnected effects suggest that the three variables may jointly shape gold price fluctuations more significantly than individually. This leads to the fourth hypothesis:
H4: Inflation rate, US dollar exchange rate, and world oil prices simultaneously affect world gold prices.

The frame of mind in this study synthesizes the theoretical relationships among the variables and guides the formulation of research hypotheses. It explains how inflation, the US dollar exchange rate, and world oil prices conceptually interact to influence gold prices based on previous empirical findings (Kesarditama et al., 2020; Li & Du, 2024; Wang et al., 2021). The conceptual framework illustrates these relationships as shown below.

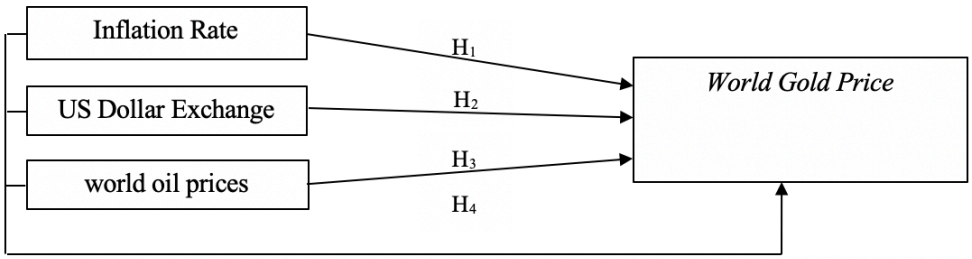

Figure 1. Conceptual Framework

3. Methodology

This study employs a quantitative research approach with a descriptive–explanatory research design, aimed at examining the influence of inflation rate, US dollar exchange rate, and world oil prices on world gold prices. The population in this research consists of monthly data for all variables during the period January 2021 to December 2023, totaling 36 observations. The sampling technique utilized is non-probability sampling with a purposive sampling method, in which samples are selected based on specific criteria. Monthly end-period data for each variable are used as samples because they are considered more stable and less affected by short-term market volatility or panic reactions, thereby providing a more accurate representation of actual market conditions.

The units of analysis in this study consist of: (1) the inflation rate obtained from the official publications of Bank Indonesia (www.bi.go.id), using end-of-month inflation

data for the period January 2021–December 2023; (2) the US dollar exchange rate (USD/IDR) derived from historical monthly data available at https://id.investing.com/currencies/usd-idr-historical-data, using the monthly closing selling rate; (3) world oil prices obtained from idtradingeconomics.com, using end-of-month prices for the same observation period; and (4) world gold prices per gram, converted into rupiah based on world gold market data obtained from idtradingeconomics.com.

The data collection method applied in this study is documentation, which involves gathering secondary data from official and credible sources. The analytical technique employed is multiple linear regression analysis using SPSS. Before conducting the regression test, a series of classical assumption tests are performed, including normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test, to ensure that the regression model meets the criteria of the Best Linear Unbiased Estimator (BLUE). After the model is declared valid, hypothesis testing is conducted using the t-test to examine the partial effect of each independent variable and the F-test to analyze their simultaneous influence on world gold prices. The coefficient of determination (R^2) is also used to measure the model's explanatory power. Through these procedures, the study aims to obtain comprehensive and reliable findings regarding the determinants of world gold prices during the observation period.

4. Empirical Findings/Results

Descriptive Statistics

Descriptive statistics variable inflation rate with a total of 36 observations have an average of 3.1506 with a minimum value of 1.33 in June 2021 and a maximum value of 5.95 in September 2022 and a standard deviation of 1.53442. Descriptive statistics of US Dollar exchange rate variables with a total of 36 observations have an average of 14493.6944 with a minimum value of 1440 in March 2021 and a maximum value of 15880 in September 2023 and a standard deviation of 2295.47610. Descriptive statistics of world oil price variables with a total of 36 observations has an average of 78.4406 with a minimum value of 25.08 in January 2021 and a maximum value of 111.91 in May 2022 and a standard deviation of 15.22358. Descriptive statistics of World Gold price variables with a total of 36 observations have an average of 1850.7222 with a minimum value of 1640 in October 2022 and a maximum value of 2071 in December 2023 and a standard deviation of 107.85006.

Normality Test

A normality test is a statistical procedure used to determine if a dataset was drawn from a normally distributed population, which is crucial for many statistical analyses like t-tests and ANOVA. The purpose offnormality testing is to determine whether or not the distribution of data in a data group or variable is normal. The Kolmogorov-Smirnov test normal P-P plot are two methods for determining if residuals are normally distributed.

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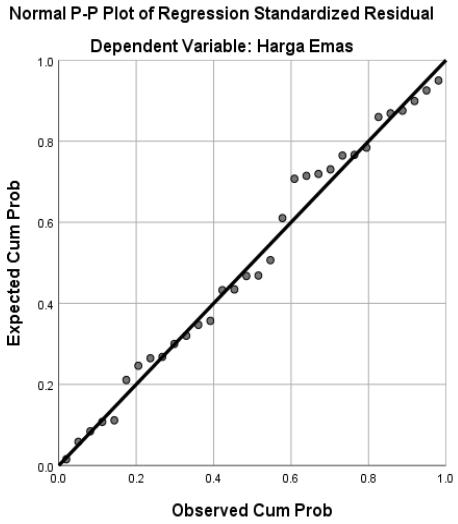

Figure 2. Normal Probability Plot
Source: Data processed (2025)

Figure 3. Normal Probability Plot can be concluded that the data is normally distributed, as seen from the data scattered close to the diagonal line and the data scattered mostly around the diagonal line.

Table 1. One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		32
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	96.14668228
Most Extreme Differences	Absolute	.123
	Positive	.064
	Negative	-.123
Test Statistic		.123
Asymp. Sig. (2-tailed)		.200[c,d]

Source: Data processed (2025)

Table 3. shows that the significant value is 0.200>0.05, indicating that the data in this study is distributed.

Multicollinearity Test
Multicollinearity is tested using methods like the Variance Inflation Factor (VIF), correlation matrices, and scatter plot matrices .Multicollinearity is a condition where there is a strong correlation or relationship between two or more variables. The following is the SPSS output below:

Table 2. Multicollinearity Test

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	446.368	627.711		.711	.483		
	Inflation rate	-17.119	15.105	-.246	-1.133	.267	.641	1.560
	US dollar exchange rate	.097	.043	.471	2.280	.030	.704	1.420
	World Oil prices	.339	1.765	.035	.192	.849	.889	1.124

Source: Data processed (2025)

Table 2 shows that the tolerance value for the independent variable >0.1 while the VIF value for the independent variable < 10. Thus, in multicollinearity test, there is no correlation between variable inflation rate, US dollar exchange rate, and oil price.

Heteroscedasticity Test

Heteroscedasticity tests are used to check if the variance of the residuals in a regression model is constant across all levels of the independent variables. The purpose of the heteroscedasticity test is to determine whether the variance of the residuals in the regression model varies from one observation to the next.

Table 3. Gletjer Test

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-479.685	300.831		-1.595	.122
	Inflation rate	5.880	7.239	.168	.812	.424
	US dollar exchange rate	.039	.020	.377	1.904	.067
	Oil prices	-.466	.846	-.097	-.551	.586

Source: Data processed (2025)

Table 3. above shows significant value > 0.05 means that there is no heteroscedasticity problem in this study.

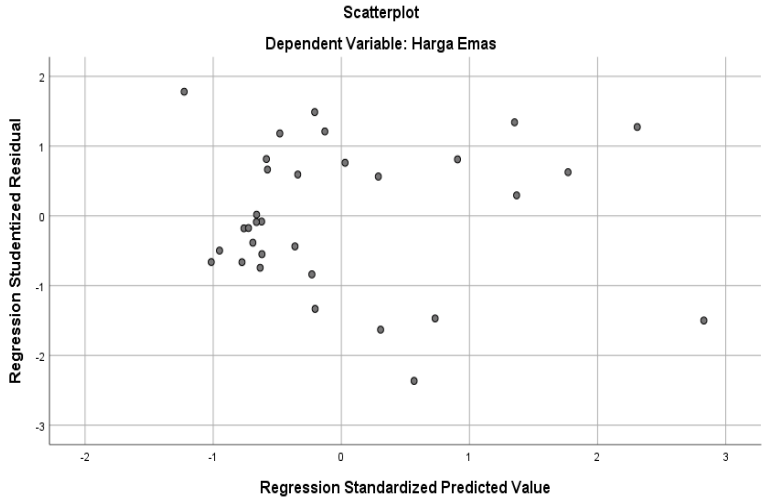

Figure 4. Scatterplot
Source: Data processed (2025)

The scatterplot graph in Figure 4 indicates that there is nooheteroscedasticity in the regressionnmodel used in this investigation because the data is dispersed in an ambiguous pattern both above and below 0 on the Y-axis and is not grouped in one location.

Autocorrelation Test
An autocorrelation test checks for correlation between a time series and a lagged version of itself, which is useful for identifying trends, seasonality, and other patterns in data. Common tests include the Durbin-Watson test (for regression residuals), One non-parametric method for measuring a single variable in ordinal data is the autocorrelation test with the Run Test. Table 6 displays the autocorrelation test's findings. as follows:

Table 4. Durbin Watson

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.397[a]	.157	.067	101.166	.756

Source: Data processed (2025)

Based on the criteria of D-W numbers between -2 to +2 means there is no autocorrelation. From this study obtained 0.756 (between -2 to +2) so it is concluded that there is no autocorrelation in this study.

Multiple Linear Regression Analysis

Multiple linear regression analysis is a regression model that includes several independent variables or predictors. The following are the results of the multiple linear regression study:

Table 5. Multiple Linear Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	446.368	627.711		.711	.483
	Inflation rate	-17.119	15.105	-.246	-1.133	.267
	US dollar exchange rate	.097	.043	.471	2.280	.030
	Oil prices	.339	1.765	.035	.192	.849

Source: Data processed (2025)

World Gold price = 446,368-17,119 Inflation Rate + 0.097 US Dollar Exchange Rate + 0.339 Oil Price

Explanation of multiple linear regression above is the constant value of 446.368 which shows variable inflation rate, US dollar exchange rate, oil prices are considered constant against World gold prices. The value of the unit regression inflation figure of 17.119 (negative) states that every increase of 1, the world gold price will decrease by 17.119 units.The value of the US dollar exchange rate regression unit of 0.097 (positive) states that every increase of 1, the world gold price will increase by 0.097 units.The oil price regression unit value of 0.339 (positive) states that every increase of 1, the world gold price will increase by 0.339 units.

Coefficient of Determination

The coefficient of determination,is a statistical measure that indicates the proportion of variance in a dependent variable that is predictable from an independent variable or set of independent variables

Table 6. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.397[a]	.157	.067	101.166	.756

Source: Data processed (2025)

Table 6 the results of the coefficient of determination can be seen from the value of Adjusted R Square of 0.067 that the world price of gold which can be explained by the variation of inflation rate, the US dollar exchange rate, the price of oil bags by 6.7% while the remaining 93.3% (100% - 6.7%) is explained by other variables that are not studied in this study.

Partial Test

Partial test can refer to several different concepts depending on the field, including a method for testing parts of a larger system like a valve (partial stroke testing), a technique in statistics and calculus (partial F-test, second partial derivative test), or a term used in legal and software contexts for testing only parts of a model.

Table 7. Partial Test

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	446.368	627.711		.711	.483
	Inflation rate	-17.119	15.105	-.246	-1.133	.267
	US dollar exchange rate	.097	.043	.471	2.280	.030
	Oil prices	.339	1.765	.035	.192	.849

Source: Data processed (2025)

From the above SPSS output that obtained the value of t count > t table (1.133 < 2.048) and sig. 0.267 > 0.05, means H1 rejected that inflation rate partially do not affect the world gold price. From the SPSS output above that obtained the value of t count > t table (2.288 > 2.048) and GIS. 0.030 < 0.05, means H2 is accepted that the US Dollar exchange rate has a positive effect on World gold prices. From the above SPSS output that obtained the value of t count > t table (0.192 < 2.048) and sig. 0.849 > 0.05, means h3 rejected that the world oil price partially does not affect the world gold price.

Simultaneous Test

A "simultaneous test" can refer to several different concepts, most commonly testing multiple users performing the same action at the same time in software engineering, or using the F-test to determine if multiple independent variables have a significant effect on a dependent variable in statistics. It can also refer to testing multiple hypotheses at once in statistics, or performing tests on multiple observations simultaneously.

Table 8. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53469.155	3	17823.052	1.741	.181[b]
	Residual	286569.720	28	10234.633		
	Total	340038.875	31			

a. Dependent Variable: World Gold price

b. Predictors: (Constant), Oil Price, US Dollar Exchange Rate, Inflation Rate

Source: Data processed (2025)

Table 8. seen from the value of F count > F table (1.741 < 2.95) and GIS.0.181 > 0.05, means that H4 is rejected by the hypothesis of inflation, US Dollar exchange rate, world oil prices simultaneously have no effect on World gold prices.

5. Discussion

Influence of Inflation Rate on World Gold Prices

The findings of this study indicate that the inflation rate does not have a significant effect on world gold prices. This result aligns with previous studies showing that inflation does not always play a dominant role in determining gold price movements, especially in conditions where inflation remains relatively stable or within a controlled range. Several studies emphasize that gold often functions as an inflation hedge only during periods of high or unexpected inflation (e.g., Bouri et al., 2020; Shahbaz et al., 2019). When inflation stays moderate, as noted in recent macroeconomic observations, its impact on gold becomes limited because production costs, interest rates, and investor expectations remain relatively stable (Arfaoui & Ben Rejeb, 2017). Inflation itself reflects a continuous increase in general price levels, leading to a decline in money's purchasing power. However, controlled inflation—especially single-digit inflation—rarely disrupts economic stability or investor behavior. As noted by Narayan et al. (2021), steady inflation does not significantly influence commodity price volatility because it does not alter underlying fundamentals. This explains why the inflation rate during the observation period did not significantly shift gold prices. Investors tend to view gold as a protection tool only during turbulent economic conditions, not in periods of mild inflation. Consequently, the movement of the gold price index remains primarily influenced by more dynamic global factors rather than domestic inflationary trends.

Influence of US Dollar Exchange Rate on World Gold Prices

The results show that the US dollar exchange rate has a positive and significant effect on world gold prices. This finding is consistent with numerous empirical studies indicating a strong linkage between currency fluctuations and gold price movements (e.g., Reboredo, 2013; Jain & Biswal, 2020). Gold is globally traded in US dollars, making the currency's value an important determinant of global gold pricing. When the US dollar weakens, gold becomes cheaper for investors holding other currencies, thereby increasing demand (Sari et al., 2020). Higher demand leads to upward movements in gold prices, as seen in various periods of dollar depreciation.

Several studies highlight that investors often shift their portfolios from weakening currencies toward safer assets such as gold (Hoang et al., 2019; Baur & Smales, 2020). This behavior generally strengthens gold's position as a "safe haven", especially when the dollar experiences downward pressure. The positive effect observed in this study reinforces the idea that exchange rate volatility influences global investment flows and commodity pricing. As stated by Ghosh et al. (2016), exchange rate movements are among the most consistent predictors of gold price changes. Therefore, the strengthening or weakening of the US dollar remains one of the key determinants of world gold price dynamics.

Influence of World Oil Prices on World Gold Prices

The findings indicate that world oil prices do not have a significant effect on world gold prices. This result aligns with several empirical studies showing that the

relationship between oil and gold prices is not always linear or significant, especially during periods of supply–demand imbalance in the global oil market (e.g., Bouri et al., 2017; Mensi et al., 2020). Oil oversupply, reduced global energy demand, and economic slowdowns—such as those observed in China and other emerging economies—often weaken the usual transmission mechanism between oil and gold (Ji et al., 2020). When oil prices fluctuate due to sector-specific issues rather than broader macroeconomic shocks, their impact on gold becomes minimal.

Oil is a crucial commodity influencing production costs and macroeconomic stability. Rising oil prices typically benefit oil-exporting nations and investment in the energy sector (Mensi et al., 2015). However, this dynamic does not necessarily affect gold prices directly because gold markets respond more to financial uncertainty, geopolitical risk, and currency movements rather than oil market fundamentals. Previous research also shows that in certain periods, gold and oil do not exhibit strong comovements because investors perceive them as serving different purposes—gold as a safe-haven asset, and oil as a production-based commodity (Filis et al., 2011).

This explains why fluctuations in world oil prices during the study period did not significantly influence gold prices. External factors—such as currency instability, global risk sentiment, and investor speculation—remain more dominant drivers in the world gold market.

6. Conclusions

The results of this study indicate that the inflation rate does not have a significant effect on world gold prices. This suggests that during periods of stable or controlled inflation, gold prices tend to be influenced more by global financial conditions rather than domestic price movements. In contrast, the US dollar exchange rate demonstrates a positive and significant effect on world gold prices, reaffirming the strong linkage between currency fluctuations and the valuation of gold as a global commodity. A weakening dollar generally increases investor demand for gold, thereby raising its price. Meanwhile, world oil prices are found to have no significant effect on world gold prices, indicating that the dynamics of the oil market—often shaped by sectoral supply and demand conditions—do not consistently translate into movements in gold prices. When examined simultaneously, the three variables do not collectively influence world gold prices, implying that gold price movements during the observed period were driven more by other global macro-financial factors beyond the scope of this study.

Future studies are encouraged to incorporate additional independent variables that may influence gold price movements, such as interest rates, geopolitical risk, global stock market volatility, or monetary policy indicators. Including a broader set of variables may provide a more comprehensive understanding of the determinants of gold prices. Researchers may also consider extending the research period to capture longer-term trends and structural changes in global financial markets. Longer time series data can help produce results that better reflect actual market conditions.

Moreover, the use of alternative econometric models—such as vector error correction models, ARDL, or nonlinear approaches—may offer deeper insights into both short-term and long-term relationships between variables. These models could help reveal asymmetric effects or dynamic interactions not captured by standard regression analysis. For investors and practitioners, it is advisable to consider a wider range of economic and financial indicators when making investment decisions, as gold prices are influenced by multiple global factors beyond those examined in this study.

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