

## Dynamic Correlations among Gold Returns, USD/IDR Returns, and the Jakarta Composite Index in Examining Gold's Safe Haven Role in Indonesia

Stevia Putri Septiani<sup>1</sup>, Mery Sukartini<sup>2</sup>, Desty Cristya Anisa<sup>3</sup>

<sup>1,2,3</sup>Management Study Program, Faculty of Economics and Business, Universitas Muhammadiyah Cirebon, Indonesia

Email: steviaputrisseptiani@gmail.com, destycristya.anisa@gmail.com , mery.sukartini@umc.ac.id

### Abstract:

*Increasing volatility in global financial markets caused by the COVID-19 pandemic, geopolitical conflicts, inflationary pressures, and changes in monetary policy has encouraged investors to seek assets capable of protecting portfolio value during periods of uncertainty. Gold is theoretically a potential safe haven, but evidence of its effectiveness remains mixed, particularly in emerging markets such as Indonesia. This study aims to analyze dynamic correlations among gold returns, Jakarta Composite Index (JCI) returns, and USD/IDR exchange rate returns and examine gold's safe haven role in Indonesia. A quantitative approach was employed using secondary monthly data on gold, JCI, and USD/IDR returns from January 2016 to December 2025. The analysis used Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH), preceded by stationarity tests, ARCH effect tests, and GARCH model estimation. The findings indicate that the relationships among gold, JCI, and USD/IDR returns are dynamic and vary with market conditions. The correlation between gold and JCI returns tends to be negative, whereas the correlation between gold and USD/IDR returns tends to be positive. Although the DCC parameters are not statistically significant, the DCC-GARCH model captures changes in correlations among the variables throughout the study period. These findings suggest that gold has potential as a safe haven during periods of heightened market volatility, although its effectiveness is not consistent throughout the observation period. The study implies that gold may be considered an instrument for diversification and risk mitigation in investment portfolio management in Indonesia.*

### Keywords:

*safe haven; gold; JCI; USD/IDR; DCC-GARCH; dynamic correlation.*

## I. Introduction

Global financial markets over the past decade have been characterized by increasing uncertainty arising from the COVID-19 pandemic, geopolitical conflicts, inflationary pressures, and shifts in global monetary policy. These conditions have generated high volatility across financial instruments, increasing investment risk and reducing the effectiveness of conventional portfolio diversification. During market stress, correlations among assets tend to increase, prompting investors to seek instruments capable of preserving investment value. Assets with safe haven characteristics therefore become increasingly important in investment risk mitigation strategies.

Gold is widely recognized as a store of value and is often used as a safe haven during economic turmoil and financial market instability. Unlike risky assets such as equities, gold is relatively independent of market pressures because it is not subject to default risk and has high intrinsic value. During 2016–2025, rupiah-denominated gold prices increased substantially, particularly following the COVID-19 pandemic and heightened geopolitical uncertainty. This increase reflects growing investor demand for gold as an instrument for protecting value during periods of elevated market volatility.

Meanwhile, Indonesia's capital market, represented by the Jakarta Composite Index (JCI), experienced substantial fluctuations during the study period. External shocks, including the COVID-19 pandemic, the Russia–Ukraine conflict, and the Federal Reserve's interest rate increases, placed pressure on the domestic stock market and increased investment risk. These conditions encouraged investors to diversify their portfolios by allocating funds to assets with low or negative correlations with the stock market. In this context, gold is considered an alternative investment that may provide protection during stock market declines.

In addition to stock market risk, Indonesian investors face exchange rate risk arising from USD/IDR fluctuations. During 2016–2025, the rupiah depreciated in several periods because of external pressures, including changes in United States monetary policy and increasing global economic uncertainty. Exchange rate depreciation affects not only international trade but also capital market performance and investment decisions. The relationships among gold, JCI, and USD/IDR returns therefore need to be analyzed simultaneously to provide a more comprehensive assessment of gold's effectiveness as a safe haven in Indonesia.

Although gold's safe haven role has been widely studied, previous findings remain inconsistent. Billah and Hartomo (2019) find that gold is negatively correlated with the stock market and can therefore serve as a safe haven. Conversely, Sugiyanto and Robiyanto (2022) conclude that gold functions primarily as a diversification instrument rather than a safe haven. Wulan et al. (2024) also show that gold's safe haven effectiveness emerges only under certain market conditions. These differences suggest that the relationships among gold, the stock market, and exchange rates are dynamic and require an analytical approach capable of capturing changes over time.

Most previous studies employ static correlation approaches or analyze relationships between two variables separately. Such approaches are limited in explaining changes in asset correlations under dynamically evolving market conditions. This study therefore uses Dynamic Conditional Correlation–Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH), which estimates dynamic correlations among financial variables and captures changes in volatility over time. DCC-GARCH is considered more suitable than conventional correlation approaches for identifying changes in the relationships among gold, JCI, and USD/IDR returns.

Beyond methodology, this study addresses gaps in research scope and observation period. Most previous studies focus separately on the relationship between gold and stock markets or between gold and exchange rates, while studies integrating all three variables into a single dynamic model for Indonesia remain relatively limited. Earlier studies also generally use observation periods preceding post-pandemic economic normalization and therefore do not capture Indonesian financial market dynamics through 2025. This study contributes by integrating gold, JCI, and USD/IDR returns in a DCC-GARCH analysis for 2016–2025.

Accordingly, this study aims to analyze dynamic correlations among gold, JCI, and USD/IDR returns and examine gold's safe haven role in Indonesia using DCC-GARCH. The

findings are expected to contribute to the financial management and capital market literature and provide a reference for investors and portfolio managers developing investment strategies that adapt to changing market conditions.

## II. Review of Literature

### 2.1 Portfolio Theory

Portfolio theory, proposed by Markowitz (1952), explains that investors can minimize investment risk through asset diversification within a portfolio. Diversification combines assets with low or negative correlations so that losses in one asset can be offset by gains in another. Under normal market conditions, diversification can reduce portfolio risk. During financial crises, however, correlations among assets often increase, reducing diversification benefits. Investors therefore require assets that preserve their value during market stress, namely assets with safe haven characteristics (Baur & Lucey, 2010).

### 2.2 Safe Haven

The safe haven concept was first introduced by Baur and Lucey (2010), who define a safe haven as an asset that is negatively correlated or uncorrelated with risky assets during market stress. Unlike a hedge, which protects investment value under normal market conditions, a safe haven provides protection during extreme market instability. Gold is among the most extensively studied safe haven assets because it functions as a store of value, is highly liquid, and is not exposed to default risk. According to Baur et al. (2021), gold remains an effective instrument for protecting value in the post-pandemic period. However, its safe haven effectiveness is not always consistent and is strongly influenced by economic conditions and country-specific characteristics (Dutta, 2022).

### 2.3 Gold Returns

Gold returns represent changes in gold prices from one period to the next, reflecting investors' investment gains or losses. As global economic uncertainty increases, demand for gold tends to rise, leading to price appreciation. This phenomenon is known as flight to quality: the movement of investment from risky assets toward assets perceived as safer (Ali et al., 2020).

Zhang et al. (2022) show that rising geopolitical risk and global economic uncertainty encourage investors to increase their gold holdings as a hedging instrument. Gold returns are therefore often used as an indicator when testing for a safe haven function within a country.

### 2.4 Jakarta Composite Index (JCI)

The Jakarta Composite Index (JCI) is the main indicator of Indonesian stock market performance. Its movements are influenced by macroeconomic factors including inflation, interest rates, economic growth, exchange rates, and global sentiment. During economic crises or market uncertainty, the JCI tends to decline as investor selling increases. According to Tandelilin (2017), equities are high-risk investment instruments because they are sensitive to changes in economic conditions and monetary policy. Investors therefore require alternative instruments that can reduce risk during periods of high stock market volatility.

## 2.5 USD/IDR Exchange Rate

An exchange rate is the price of one currency in terms of another. USD/IDR fluctuations substantially affect Indonesia's economic activity and capital market by influencing international capital flows, import costs, and corporate profitability. According to Miranda-Agrippino and Rey (2020), changes in United States monetary policy are a major driver of exchange rate movements in emerging economies through capital flows. Narayan et al. (2021) further state that global uncertainty increases exchange rate volatility, thereby raising investment risk in emerging markets.

## 2.6 Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH)

The Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) model was developed by Engle (2002) to analyze dynamic relationships among financial variables with time-varying volatility. Unlike static correlation, DCC-GARCH captures changes in asset correlations as market conditions evolve, making it more suitable for financial market research. The model consists of two stages: volatility estimation using GARCH and dynamic correlation estimation using Dynamic Conditional Correlation (DCC). According to Engle and Kelly (2022), DCC-GARCH is among the most widely used econometric approaches for analyzing volatility transmission and dynamic relationships among financial assets.

## 2.7 Previous Research

Studies of gold's safe haven role across countries have produced mixed findings. Baur et al. (2021) find that gold is an effective safe haven in the post-pandemic period because it preserves its value during market stress. Yousaf et al. (2022) also conclude that gold exhibits more consistent safe haven characteristics than digital assets such as cryptocurrencies.

Conversely, Das et al. (2023) show that investors tend to hold cash during extremely severe global liquidity crises, reducing gold's safe haven effectiveness. In Indonesia, Billah and Hartomo (2019) report that gold is negatively correlated with the stock market and can therefore function as a safe haven. However, Sugiyanto and Robiyanto (2022) find that gold is more appropriately classified as a diversification instrument. Wulan et al. (2024) also show that gold's safe haven role appears only under certain market conditions. These differences indicate that the relationships among gold, the stock market, and exchange rates are dynamic, requiring an econometric approach capable of capturing changes in correlations over time.

## 2.8 Research Gap

The theoretical review and previous research reveal several gaps. First, most earlier studies analyze the relationship between gold and stock markets or between gold and exchange rates separately. Second, many studies employ static correlation approaches that do not capture changes in asset relationships under dynamic market conditions. Third, research integrating gold, JCI, and USD/IDR returns into a single DCC-GARCH model for Indonesia with observations through 2025 remains relatively limited. This study therefore aims to provide empirical evidence of the dynamic relationships among these three variables and examine gold's safe haven effectiveness in Indonesia using Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH).

### III. Research Methods

This study employs a quantitative approach with an explanatory research design to analyze dynamic relationships among gold returns, Jakarta Composite Index (JCI) returns, and USD/IDR exchange rate returns and examine gold's safe haven role in Indonesia. A quantitative approach was selected because it enables objective measurement of relationships among variables through statistical and econometric analysis.

#### 3.1 Data Types and Sources

ADLI's legacy includes sustained public investment in agriculture exceeding Comprehensive Africa Agriculture Development Programme (CAADP) targets in certain period. This study uses secondary monthly data on gold prices, the Jakarta Composite Index (JCI), and the USD/IDR exchange rate from January 2016 to December 2025, yielding 120 observations. Gold price data were obtained from Goldprice.org, JCI data from Yahoo Finance, and USD/IDR exchange rate data from Bank Indonesia. All data were converted into returns using logarithmic changes to meet the assumptions of time series analysis.

### IV. Result and Discussion

#### 4.1 Descriptive Statistics

Descriptive statistical analysis provides an overview of the characteristics of gold, JCI, and USD/IDR returns from January 2016 to December 2025. The descriptive statistics include the mean, maximum, minimum, and standard deviation as an indicator of data dispersion.

**Table 1.** Descriptive Statistics

| Variable        | Mean   | Maximum | Minimum | Std. Deviation |
|-----------------|--------|---------|---------|----------------|
| Gold Returns    | 0.0102 | 0.1285  | -0.0947 | 0.0394         |
| JCI Returns     | 0.0048 | 0.1026  | -0.1681 | 0.0456         |
| USD/IDR Returns | 0.0031 | 0.0873  | -0.0738 | 0.0287         |

*Source: Data processed using EViews 12.*

Table 1 shows that gold returns have a positive mean over the study period, indicating that gold prices tend to increase over the long term. JCI returns also have a positive mean, although their volatility is higher than that of gold returns. Meanwhile, USD/IDR returns show relatively lower fluctuations than the other two variables. The higher standard deviation of JCI returns indicates that the Indonesian stock market experienced larger price changes than gold and exchange rates. These findings suggest that gold has relatively more stable volatility and may therefore serve as a diversification instrument during stock market stress.

#### 4.2 Stationarity Tests

Before estimating the DCC-GARCH model, all variables were tested using the Augmented Dickey–Fuller (ADF) test to ensure that the data met the stationarity assumption.

**Table 2.** Stationarity Test Results (ADF)

| Variable        | ADF Statistic | Probability | Assessment |
|-----------------|---------------|-------------|------------|
| Gold Returns    | -9.234        | 0.0000      | Stationary |
| JCI Returns     | -10.184       | 0.0000      | Stationary |
| USD/IDR Returns | -8.917        | 0.0000      | Stationary |

*Source: EViews 12 output.*

Before estimating the DCC-GARCH model, all variables were tested using the Augmented Dickey–Fuller (ADF) test to ensure that the data met the stationarity assumption.

### 4.3 ARCH Effect Tests

ARCH testing was conducted to establish the presence of conditional heteroskedasticity, a primary requirement for using GARCH models.

**Table 3. ARCH-LM Test Results**

| Variable        | Obs*R <sup>2</sup> | Probability | Conclusion           |
|-----------------|--------------------|-------------|----------------------|
| Gold Returns    | 14.281             | 0.0017      | ARCH effects present |
| JCI Returns     | 18.644             | 0.0004      | ARCH effects present |
| USD/IDR Returns | 12.518             | 0.0036      | ARCH effects present |

*Source: EViews 12 output.*

The probability values for all variables are below the 5% significance level, indicating the presence of ARCH effects. These results demonstrate time-varying volatility (volatility clustering), making DCC-GARCH an appropriate approach for this study.

### 4.4 DCC-GARCH Model Estimation

DCC-GARCH estimation was conducted to examine dynamic correlations among gold, JCI, and USD/IDR returns.

**Table 4. DCC-GARCH Parameter Estimation Results**

| Parameter    | Coefficient | Probability | Assessment      |
|--------------|-------------|-------------|-----------------|
| DCC $\alpha$ | 0.031       | 0.284       | Not Significant |
| DCC $\beta$  | 0.957       | 0.000       | Significant     |

*Source: EViews 12 output*

The estimation results indicate that parameter  $\alpha$  is not significant, whereas parameter  $\beta$  is high and significant. This suggests persistent correlations among the variables, with changes in correlations influenced more by previous conditions than by short-term shocks. Although parameter  $\alpha$  is not significant, the DCC-GARCH model still captures the dynamics of relationships among the variables throughout the observation period.

### 4.5 Dynamic Correlation Analysis

The estimation results show that the correlation between gold and JCI returns tends to be negative during most of the study period. Conversely, the correlation between gold and USD/IDR returns tends to be positive. These correlations vary with market conditions, particularly during heightened volatility arising from the COVID-19 pandemic and global economic uncertainty.

The negative correlation between gold and the JCI indicates that gold prices tend to rise when the stock market declines. Conversely, the positive relationship between gold and USD/IDR indicates that an appreciation of the United States dollar against the rupiah is generally accompanied by an increase in rupiah-denominated gold prices. This pattern suggests that gold can preserve its value during periods of stress in Indonesian financial markets.

#### 4.6 Dynamic Correlation Analysis

The findings show that relationships among gold, JCI, and USD/IDR returns are dynamic and vary as market conditions evolve. The negative correlation between gold and JCI returns supports the safe haven theory proposed by Baur and Lucey (2010), which states that an asset can be classified as a safe haven if it is negatively correlated or uncorrelated with risky assets during market stress. Gold can therefore protect against declines in portfolio value during periods of high stock market volatility.

These findings align with Billah and Hartomo (2019) and Baur et al. (2021), who report that gold can preserve its value during financial crises. The results also support Yousaf et al. (2022), who show that gold remains among the most stable safe haven instruments compared with alternative assets.

However, this study finds that not all DCC parameters are statistically significant. This indicates that gold's safe haven effectiveness is not permanent but depends on economic conditions and market volatility. The finding is consistent with Sugiyanto and Robiyanto (2022) and Wulan et al. (2024), who argue that gold functions as a safe haven only in certain periods, while serving primarily as a diversification instrument under normal market conditions.

Practically, the findings suggest that investors should consider gold within portfolio diversification and risk management strategies, particularly when Indonesia's capital market faces heightened uncertainty arising from global economic factors. Academically, this study strengthens empirical evidence that Dynamic Conditional Correlation–Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) captures changes in asset relationships that static correlation analysis cannot explain, making it more relevant to contemporary financial market research.

### V. Conclusions

This study aims to analyze dynamic correlations among gold returns, Jakarta Composite Index (JCI) returns, and USD/IDR exchange rate returns and examine gold's safe haven role in Indonesia using Dynamic Conditional Correlation–Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH). The analysis indicates that relationships among gold, JCI, and USD/IDR returns are dynamic and vary with financial market conditions. The correlation between gold and JCI returns tends to be negative, whereas the correlation between gold and USD/IDR returns tends to be positive. These findings suggest that gold can provide protection against investment risk during periods of heightened market volatility.

DCC-GARCH estimation shows that the model captures changes in correlations among the variables throughout the observation period, although not all Dynamic Conditional Correlation (DCC) parameters are statistically significant. This indicates that gold's safe haven effectiveness is not permanent but depends on economic uncertainty and financial market dynamics. Gold is therefore more appropriately viewed as an instrument with safe haven potential during certain periods, particularly during severe market turmoil.

Practically, the findings suggest that investors should consider gold as part of portfolio diversification and investment risk management strategies, especially during heightened global economic uncertainty. Future studies could incorporate additional macroeconomic variables, including inflation, interest rates, global oil prices, and the global volatility index (VIX), and use

daily or weekly data to analyze the dynamics of relationships among the variables in greater detail. Alternative econometric models, such as BEKK-GARCH, Copula-GARCH, or Markov Switching GARCH, could also be considered to provide a more comprehensive understanding of safe haven asset behavior in Indonesian financial markets.

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