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**Working Paper**

## Examining US monetary spillover to Indonesian local currency government bonds in volatile periods

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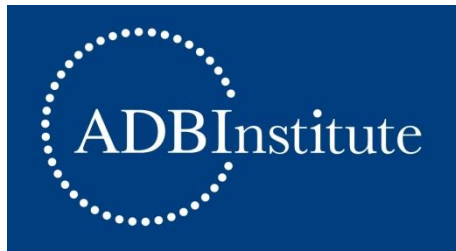
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**ADB Working Paper Series**

**EXAMINING US MONETARY SPILLOVER  
TO INDONESIAN LOCAL CURRENCY  
GOVERNMENT BONDS IN VOLATILE PERIODS**

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**Asian Development Bank Institute**

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**Abstract**

This study analyzes the magnitude of the US monetary policy spillover on the Indonesian local currency government bond yield, particularly when the Federal Reserve (Fed) implemented the quantitative easing (QE), tapering off, Fed fund rate (FFR) normalization, and quantitative tightening over the past decades. Understanding the global economic dynamics, such as changes in US monetary policy, can be a critical policy input to mitigate risks in the Indonesian economy, particularly in anticipating the monetary normalization policy amidst COVID-19 uncertainty. Changes in US monetary policy in the form of tapering off, increasing the FFR, and quantitative tightening as an external phenomenon that can affect the yield of Indonesian local currency government bonds.

Using the generalized autoregressive conditional heteroscedasticity method, this study found that changes in US monetary policy through the portfolio balance and confidence channels have a significant effect in increasing Indonesia's local currency government bond yield, particularly during the 2013 monetary policy normalization and 2020 pandemic QE period. In addition, Indonesia's local currency government bonds also experienced persistent volatility in the observed period, particularly during the 2008 global financial crisis, the 2013 tapering off, and the 2017–2019 quantitative tightening. Volatility occurred at different levels in each period, with the volatility during the pandemic QE being the lowest compared to the other periods. This lower volatility was mainly due to the combination of lower foreign ownership in the government bond market and a fiscal-monetary policy mix to recover the economy (including the debt monetization policy). From a fiscal perspective, an increase in government bond yield volatility leads to a higher cost of funds, which puts pressure on Indonesia's state expenditure. This reflects the risk that the debt, particularly government bonds, may eventually become too expensive to service and may shrink the fiscal space for funding national development initiatives.

**Keywords:** bond yield, federal fund rate, US monetary policy, tapering, quantitative tightening

**JEL Classification:** E50, E52, F40

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# 1. INTRODUCTION

## 1.1 Research Background

The increasingly integrated global financial market not only brings benefits, but it also carries risks. The integration of global financial markets opens the door wide for investors to diversify their portfolios in various countries. Such portfolio diversification globally expands investment opportunities and allows investors to invest more efficiently. Financial integration has increased the interdependence of assets between countries, including the government bond market (Heryán and Ziegelbauer 2016). This situation can facilitate governments in seeking financing from other countries by issuing government bonds.

This integration of financial markets can also be a problem when economic spillover from one country, especially developed countries, weakens the economies of other countries. This can also spread and weaken other countries on other continents that are not the initial country where the economic spillover occurred. Based on this phenomenon, this study examined the magnitude of US monetary policy as an external factor on Indonesian local currency government bond yield.

Global economic shocks have occurred several times in the past two decades, and they have had an adverse impact on the financial systems of emerging countries. One of the triggers for this global financial turmoil was the change in US monetary policy. Özcan (2021) emphasized that US monetary policy has been the most critical factor for the capital inflows and outflows of emerging countries due to its significant influence in shaping the risk perception of global investors. The notorious 2008 Global Financial Crisis arose from the collapse of the US (subprime) mortgage market, which paralyzed not only the US financial system but also spread to the financial systems of other advanced and emerging countries. To anticipate the impact of the crisis, the Federal Reserve (Fed) reduced its benchmark interest rate (i.e., the Fed Fund Rate [FFR]) to zero percent at the Federal Open Market Committee (FOMC), a condition called the zero lower bound that was carried out to encourage the economy and prevent a deeper recession.

After the FFR reached the zero lower bound, the Fed started using an unconventional monetary policy instrument, which included forward guidance and quantitative easing (QE) to stabilize the financial system and support post-crisis recovery and economic growth. QE was carried out by pursuing large scale asset purchases in mortgage-backed securities and long-term securities, which have a direct impact on increasing the Fed's balance sheet. Some studies have found that QE is a counter-cyclical policy that prevents the US and other developed countries from prolonged recession and deflation and has succeeded in helping restore market function after the global financial crisis (Fratzscher, Lo Duca, and Straub 2013; Chen et al. 2016)

However, the 2008 QE also had consequences in contributing to the capital inflows of emerging countries. Yang and Zhou (2017) found that QE was the main driver in increasing capital flows from the US to the rest of the world. Lim, Mohapatra, and Stocker (2014) and Park, Ramayand, and Shin (2016) found that capital inflows to developing countries during the QE period were more significant than before the global financial crisis. Turner (2013, 2014), in Guarin, Moreno, and Vargas (2014), suggested that lower long-term yields in the US and other developed countries have pushed investors into developing countries, supported by increased global liquidity (because of QE). The influx of capital flows affected exchange rate appreciation, economic growth,

and a surge in asset prices in developing countries (Moore et al. 2013; Fratzscher, Lo Duca, and Straub 2013).

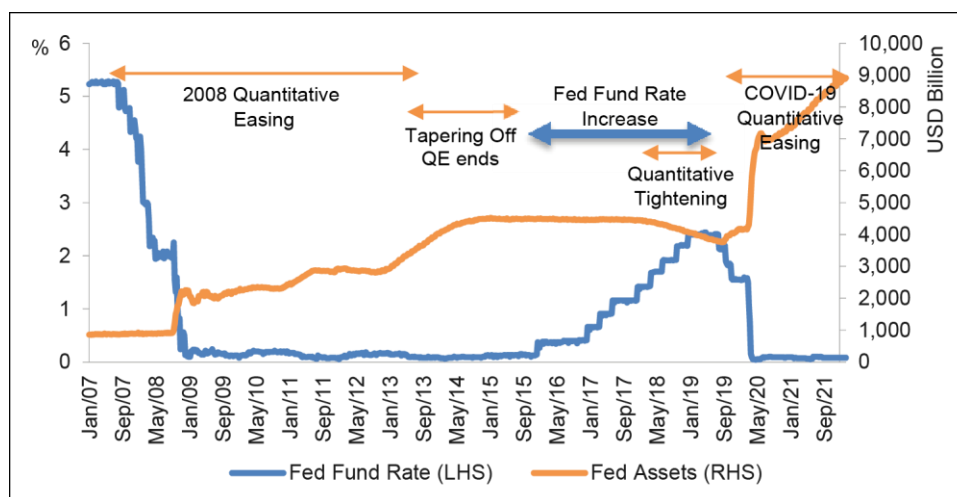
Concerns about the negative impact of US monetary policy on developing countries emerged when the Fed planned to reduce and stop its QE policy. After seeing progress in the economic recovery after the 2008 global financial crisis, the Fed began its “taper talk” in 2013 and announced its plan to stop its monetary stimulus (i.e., tapering off). This announcement created adverse consequences, called the “taper tantrum,” for emerging countries, in which their financial markets deteriorate, and this hit the “Fragile Five” countries (Indonesia, Brazil, South Africa, India, and Türkiye) hardest. According to Shin (2017), this taper tantrum caused exchange rate depreciation and massive capital outflows from emerging countries. After several delays, the Fed finally began to execute its tapering off policy in December 2013, reducing the pace of asset purchases by \$10 billion/month from \$85 billion/month to \$75 billion/month.

The Fed officially terminated the QE program at the FOMC meeting in October 2014. The Fed’s balance sheet at the end of the QE program in 2014 rose sharply to USD4.48 trillion from USD2.10 trillion when the first QE was announced in November 2008. After the termination of QE policy, on 28 January 2015 the Fed planned to increase the FFR in the next six months. However, the Fed delayed raising its interest rates several times because the US economic recovery was running below expectations. After several delays in increasing the FFR, the Fed finally increased the FFR by 25 bps to 0.5% on 16 December 2015. Since then, the Fed gradually increased its interest rate to 2.5% by December 2018.

After the FFR had been raised several times since December 2015, the Fed also started its balance sheet normalization program in October 2017 (known as the quantitative tightening policy) to gradually reduce the size of the Fed’s balance sheet (Engemann 2019). Quantitative tightening is a contractionary monetary policy that is carried out through the mechanism of not reinvesting in securities assets when the assets are mature (passive tightening). The Fed applies a maximum cap on the number of maturing securities in which it will not reinvest. If the value of the securities is above the maximum cap, the Fed will reinvest the securities. This quantitative tightening policy only lasted until Q3-2019. In the FOMC meeting in July 2019, the Fed announced the termination of the quantitative tightening policy in August 2019 due to global economic developments that occurred during that period. The quantitative tightening policy reduced the Fed’s assets of around USD698.63 billion from October 2017 (USD4.46 trillion) to August 2019 (USD3.76 trillion).

The dynamics of US monetary policy changed again in the early 2020s when the COVID-19 pandemic triggered a global health and financial crisis. To contain the economic turmoil sparked by COVID-19, the United States issued massive fiscal and monetary stimulus, one of the largest in the world. The fiscal stimulus that provided social assistance, as well as business support, reached more than USD 5 trillion, or about 25% of US GDP (Elgin and Yalaman 2021). On the monetary side, the Fed reimplemented its zero lower bound and QE policy on a much larger scale than for the 2008 global financial crisis. It only took two months for the Fed to increase the size of its balance sheet by \$2 trillion during the pandemic, while it took six years to reach the same number in 2008 (Figure 1).

**Figure 1: The Federal Reserve Benchmark Rate and Assets**



Source: Bloomberg.

This enormous fiscal and monetary stimulus, along with vaccination efforts, yielded positive results when the US economy began to recover while COVID-19 pandemic lingered. Several US economic indicators showed a progressive recovery, such as:

1. the US GDP has grown positively since Q1 2021;
2. manufacturing activity escaped its contraction zone since July 2020 and continued to expand (Manufacturing Purchasing Manager Index above the threshold of 50);
3. inflation rose beyond expectations and above the expected target of 2% since March 2021 to December 2021; moreover, inflation reached 7% (YoY) in December 2021, its highest since 1982; and
4. the unemployment rate during the pandemic period continued to decline, from its highest rate of 10.2% in April 2020 to 3.9% in December 2021. The quarterly averages for the unemployment rate in the 2021 taper talk were below the unemployment rate during the 2013 taper talk (Q2-2021: 5.9%, Q3-2021: 5.1%; Q1-2013: 7.7%, Q2-2013: 7.5%).

The rapid recovery of the US economy in the long aftermath of COVID-19 has led to speculation regarding future US monetary policy and, particularly, about the Fed’s plan to roll back its monetary stimulus and increase its FFR. The recent monthly FOMC meeting made several announcements regarding the Fed’s plan to normalize its monetary policy in the near future.

1. FOMC Meeting June 2021: The Fed signaled an acceleration of rate hikes in 2024.
2. FOMC Meeting July 2021: The Fed began discussions on announcing tapering off of QE at the end of 2021.
3. Jackson Hole Symposium August 2021: Fed Chairman, Jerome Powell, signaled that a very large tapering off would be announced in 2021, and the interest rate would be raised in 2023, noting that the planned rate hike would depend heavily on labor indicators.



4. FOMC Meeting September 2021: If the progress of economic recovery continues as expected, the Fed signaled that gradual tapering could commence in mid-November or mid-December.
5. FOMC Meeting November 2021: the FOMC decided to begin reducing the monthly pace of its net asset purchases by USD10 billion for Treasury securities and USD5 billion for agency mortgage-backed securities.
6. FOMC Meeting December 2021: Meeting participants assessed that the appropriate pace of balance sheet runoff would be faster than it was during the previous normalization episode. The FOMC decided to reduce the monthly pace of its net asset purchases by a larger amount compared to the November 2021 meeting, reducing Treasury securities by USD20 billion and agency mortgage-backed securities by USD10 billion.

Some analysts have different views regarding the potential impact of the post-pandemic US normalization policy on developing countries. Some have argued that the impact would be greater, while others have stated that the impact is likely to be less than that from the 2013 taper tantrum. Nomura Research classified ten emerging countries (“the Fragile 10”)—Brazil, Colombia, Chile, Peru, Hungary, Romania, Türkiye, South Africa, Indonesia, and the Philippines—that will be susceptible when the Fed implements its tapering policy. In August 2021, the IMF chief economist Gita Gopinath also warned that developing countries would face difficulties when the US resumes its tapering policy.

A potential rollback in monetary policy by the Fed could drive capital to a sudden stop and reversal as well as leading to an increase in the interest rates of developing countries. According to Engler, Piazza, and Sher (2021), each percentage point increase in the US interest rate tends to raise the average emerging country’s long-term interest rate by a third of a percentage point, or even more (two-thirds of a percentage point) for emerging countries with a lower credit rating. These increases in interest rates potentially decrease consumption and investment, which will diminish the momentum of economic recovery in the post-pandemic era.

Learning from experience, Indonesia should mitigate the risk of turmoil in the financial markets due to the tapering off and normalization of US monetary policy. In 2013, financial market turmoil emerged when the Fed entered the taper talk phase and began speaking about prospects for gradually unwinding its unconventional QE monetary policy. This shocked global financial markets, creating negative expectations for investors to invest in the financial markets of emerging countries (Sahay et al. 2014). During this taper talk period, Indonesia was one of the countries whose financial market was the most affected, as indicated by stock market, declines exchange rate pressures, reduced reserves, and a large increase in the bond spread (Eichengreen and Gupta 2014). During the ongoing post-pandemic economic recovery, Indonesia’s position has relied on external financing, particularly from government bond issuance. An economic spillover that drives hikes in the Indonesian government bond yield could pressure Indonesia’s annual budget. The higher the government bond yield, the higher the interest costs the government must pay.

Economic risks originating from external factors can be answered by examining the relationship between economic spillovers originating from influential developed countries, such as the United States. The ability to analyze the behavior of Indonesian government bond yields in a globally integrated financial system will thus be a critical input for policymakers. Robust analysis of the impact of global economic spillovers will help domestic policymakers to prepare for potential spillovers from external economic phenomenon and, in particular, in anticipating the changes in US monetary policy in

the form of tapering, FFR normalization, and quantitative tightening amidst the uneven economic recovery after the COVID-19 pandemic.

## **1.2 Research Scope**

This study sought to answer the following research questions: first, does US monetary policy have a significant spillover effect on the Indonesian local currency government bond yield? Second, of the 2008 QE period, monetary policy normalization in 2013, and the COVID-19 pandemic QE, which period has had the most significant impact on the volatility of Indonesian local currency government bond yields? Addressing these questions is essential, as several global economic events in the past few decades have created a spillover effect on the financial markets of emerging countries. Discovering the factors that drive the increases in a country's long-term yield is important for macroeconomic management, because a high long-term yield can burden a country's fiscal condition.

To answer the research questions, this study focused on the changes in US monetary policy from January 2005 to December 2021, a period that included various volatile economic events such as the 2008 global financial crisis, the monetary normalization policy (tapering, FFR increase, and quantitative tightening), and the COVID-19 pandemic. This study enriches the literature analyzing the impact of global economic spillovers and provides an empirical estimate of global economic spillover effects on the financial variables of emerging countries, particularly during the ongoing economic recovery from the COVID-19 pandemic. To estimate the effect of US monetary policy on the Indonesian government bond yield, this study used the generalized autoregressive conditional heteroscedasticity (GARCH) methodology to treat heteroscedasticity in high-frequency data and to measure the volatility in Indonesia's government bond yield from 2005 to 2021.

## **2. THEORETICAL BACKGROUND**

### **2.1 Financial Market Integration Theory**

Financial market integration is the process by which a country's financial markets become increasingly integrated with other countries or globally (Inter-American Development Bank, 2002). Financial integration can be achieved in two ways. The first way encompasses the formal efforts in integrating financial markets that arise from the agreement of two or more countries. Usually, these efforts occur from countries that have membership in a regional integration agreement. The integration of financial markets appear from these formal efforts in the form of eliminating restrictions, clarification of regulations, and taxes between member countries. The second way financial market integration can arise is without explicit agreement between countries (informal efforts). This happens, for example, when foreign banks enter a domestic market, through foreign participation in the domestic financial market, foreign securities trading, and direct loans to domestic companies on the international market. Eyraud, Singh, and Sutton (2017) mentioned that financial market integration is a process of two or more countries or regional financial markets becoming more interconnected. This can take the form of sharing information and practices between financial institutions, access to sources of corporate financing in international capital markets, foreign participation in domestic financial markets, or the unification of different countries' financial infrastructures.

An integrated global financial market allows investors to move funds from one country to another. Under the investment diversification rule of thumb of not putting all the eggs in one basket, investors move part of their portfolio to other investment instruments outside their own country. Levine (2001) has shown that financial integration helps strengthen the domestic financial sector, enabling more efficient capital allocation and greater investment and growth opportunities. Financial integration also has risks of aggravating financial contagion if a country experiences a crisis or changes its fiscal or monetary policies. Financial integration can encourage capital outflows from countries with weak financial institutions to developed countries with higher quality financial institutions.

Since the mid-1990s, there has been a significant increase in financial integration through increasing investment preferences for developing countries (Dua and Tuteja 2016). This increase in financial integration has resulted in a great deal of capital flow across the borders between countries, both developed and developing. This increase in financial integration is also driving global financial markets closer and increasing the presence of foreign financial institutions throughout the world. With rapid capital flows across the globe, financial crises such as the 1998 Asian financial crisis and the 2008 global financial crisis become inevitable. Developing countries with excessive capital flows are more vulnerable to financial disruption than developed countries.

## 2.2 Financial Contagion Theory

Dornbusch, Park, and Claessens (2000) defined financial contagion as the spread of market disruption from one country to another, which can be observed through joint movements in exchange rates, stock prices, bond spreads, and capital flows. Claessens and Forbes (2004), however, suggested that financial contagion refers to the economic vulnerability of one country to events that occur in other countries. When investors face liquidity needs in a particular asset or country, they tend to withdraw liquidity from other assets or other countries. The need for liquidity, reflected by changes in US benchmark rates, is one of the main avenues for transmission of financial turmoil in the financial assets of many countries. According to Claessens and Forbes (2004), contagion can occur in two categories: fundamental causes (common/global shock, trade link, and certain financial linkages) and investor behavior (liquidity problem, incentive problem, informational asymmetries, market coordination problem, and investor reassessment).

One example of a fundamental cause is the presence of a common or global shock. Changes in the US monetary policy can be categorized as a common shock. This happens because a shift in key economic indicators in developed countries (e.g., changes in interest rates), changes in commodity prices, or a decline in global economic growth, could trigger large capital outflows, recession, and crisis in emerging countries. A loose monetary policy in a developed country will, for example, be a push factor that increases foreign demand for an emerging country's financial assets (including government bonds)—and vice versa: when a developed country tightens its monetary policy, this reduces the foreign demand for an emerging country's financial assets (including government bonds).

Emerging country financial markets that depend on foreign financing are more vulnerable to changes in the interest rates of developed countries, as the interest rate shock drives capital outflow. Capital outflow in an emerging country can lead to an increase in borrowing costs, as well as increasing pressure on the emerging country's local currency depreciation, as foreign investors withdraw their investment for fear of increasing risk. In terms of trade, local currency depreciation could increase exports

due to a favorable price competitiveness, but there are also downside risks, such as increased inflationary pressure due to the increase in the price of imports.

Investor behavior can also contribute to financial contagion from one country. Claessens and Forbes (2004) have noted the occurrence of contagion based on investor behavior that focuses on liquidity problems, incentive problems and risk avoidance, and information asymmetry. In the case of liquidity problems, a financial crisis in one country can cause investors to sell securities in other markets to get cash to anticipate illiquid risks. The investor behavior factor also explains how contagion can be caused by information asymmetry: Investors often do not have a complete picture of the conditions in each country that can affect their portfolio returns.

With inadequate access to quality information, a financial crisis in one country can cause investors to believe that other countries face similar problems. As a result, investors then sell assets in other countries, especially those with conditions similar to the patient zero country that triggered the crisis. Kaminsky, Lyons, and Schmukler (2004) introduced the term “contagion trading strategy” to indicate the sale or purchase of a financial asset in one country when the financial markets of another country have increased or decreased. For example, the existence of a contagion phenomenon may suggest investors buy or sell financial assets (stocks or bonds) in a country based on observation of economic and financial indicators in other countries.

According to Lim, Mohapatra, and Stocker (2014) and Ebeke and Kyobe (2015), there are three channels for global economic phenomena to affect developing countries' financial assets (including government bonds). Those channels are liquidity, portfolio balance, and confidence channel. First, the liquidity channel is captured through the US 3-month T-bill (US3M) rate, which serves as the US short-term interest rate indicator. If this increases, it increases the opportunity cost of investing in developing financial markets and reduce global liquidity. The Fed monetary normalization policy is expected to increase the US3M rate. Capital outflows from developing countries and increased yields on developing country government bonds can thus occur if the global liquidity decreases.

Second, the portfolio balance channel is captured through the US 10-year treasury bond rate (US10Y). This indicator captures the transmission of Fed policies that can increase long-term yields, which affects portfolio rebalancing against risky assets, particularly sovereign bonds in developing countries. According to Bowman, Londono, and Sapriza (2014), the Fed's policies (e.g., changing interest rates) can trigger investors to transfer ownership in certain assets, including developing country financial assets.

Finally, confidence channel indicators are captured through the volatility index (VIX), which is an indicator to measure the uncertainty of a financial market and captures the market sentiment in investing in risky assets. An increase in VIX is an indication that the uncertainty in the global financial market is rising, which can trigger the sale of assets. VIX can increase because there are uncertainties that occur when developed countries roll back their monetary policy stimulus.

Bowman, Londono, and Sapriza (2014) have also identified other channels for how a global economic phenomenon can affect other countries, which they call signaling channels. Signaling channels occur when the market interprets announcements from the Fed as a signal of future policy changes, as well as the Fed's assessment of the condition of the US economy. Changes in US macroeconomic projections can also influence global financial projections, which affect the monetary policy decisions of other countries.

## 2.3 Previous Research

This study is related to and adds a new perspective on the literature about the impact of economic spillovers on asset prices in various countries. Yildirim (2016) examined the effect of global financial conditions in the Fragile Five (Brazil, India, Indonesia, South Africa, and Türkiye) and hypothesized that changes in US monetary policy are transmitted to developing countries by changing the risk-taking behavior of the private sector (banks and investors), thereby affecting capital flows to developing countries. In examining the impact of global economic spillovers on the financial assets of the Fragile Five, Yildirim used the structural vector auto regression model and found that:

1. Global financial risk significantly affects government bond yields, stock prices, credit default swap (CDS) spreads, and exchange rates in the Fragile Five countries.
2. The effect on financial assets is different in each country.
3. This difference is related to the macroeconomic fundamentals of each country.
4. Global financial shocks have a greater direct effect on government bonds and CDS markets than on exchange rates and stock markets.

Moore et al. (2013) also proved that QE has a significant impact on asset prices in developing countries. According to their study, knowing how the extent of the impact of QE on capital inflows in developing countries could help developing country policymakers to calibrate short-term interest rate policies. Using panel data, Moore et al. (2013) showed that a 10 bps decrease in the US Treasury Yields resulted in a 0.4% increase in foreign ownership in emerging country bond markets. The increase in foreign ownership was estimated to reduce the yield of developing country government bonds by 1.7 bps.

Mishra et al. (2014) analyzed financial market reactions to the Fed's tapering off announcements in 2013 and 2014 in 21 developing countries, including Indonesia. The results showed that these financial markets reacted significantly to the tapering off policy. They found that developing countries with deeper financial markets and tighter macroprudential policies before the tapering period experienced a lower financial condition decline.

Guarin, Moreno, and Vargas (2014) examined the relationship between benchmark interest rates of Colombia and the US during the period 2004–2013. To calculate the response of Colombian bond yields to an international economic phenomenon (changes in US monetary policy), they used a derivative GARCH (VARX-MGARCH) model as an analytical method divided into three sample periods (before, during, and after the global financial crisis). They found that the impact of US monetary policy on the Colombian government bond yield varied depending on the sample period. Changes in global volatility and monetary policy increased the bond yield and increased country risk perceptions.

Using the GJR-GARCH (1,1) model, Lin, Wang, and Gau (2008) examined the relationship of emerging country bond markets with the US. Their results indicated that there is a significant impact of US policy spillover on developing countries. Asia's emerging country bond markets are more strongly affected by the US than emerging countries in Latin America and Eastern Europe. Changes in global liquidity conditions significantly affected the sovereign bond yields of Chile, Mexico, Indonesia, Malaysia, the Philippines, and Poland. According to Lin, Wang, and Gau (2008), investors must anticipate increasing the US short-term interest rates by hedging and managing portfolio investment.

Dahlhaus and Vasishtha (2020) assessed the US spillover effects on emerging countries by examining the role of US monetary policy news as an external shock on emerging country capital flows. They found that the magnitude of the effect of US monetary policy news varied among emerging countries, depending on the emerging country's financial inflows before the taper talk period. Emerging countries that had more significant financial inflow before 2013 also had greater capital outflow during the taper talk period from May 2013 to August 2013.

### 3. METHODOLOGY

According to Forbes and Rigobon (2002), there are four approaches to measure the global financial transmission, namely cross-market correlation coefficients, ARCH and GARCH models, cointegration techniques, and direct estimation of specific transmission mechanisms. Time series data in the financial sector generally show periods of high volatility followed by periods of relative calm, indicating that the assumption of a constant variance of error cannot be achieved (Enders 2004). The non-constant variance of error is referred to as a heteroscedastic condition.

If there is a change in volatility over time, the dataset has violated the assumption of homoscedasticity. If this happens, the condition of the best linear unbiased estimates in the ordinary least squares (OLS) model will not be achieved. The presence of heteroscedasticity is one of the factors causing inefficient parameter estimation, and heteroscedasticity results in difficulties in measuring the actual standard deviation, which results in a standard deviation that is either too wide or too narrow.

Heteroscedastic conditions arise because there are outliers in the data (Gujarati 2012). Before deciding on a model to capture the US spillover to Indonesia's local currency government yield, this study checked whether any heteroscedasticity issue might arise using the White test. After testing, heteroscedasticity was found in Indonesia's local currency government bond yield data from January 2005 to December 2021, because there are various phenomena, ranging from the global financial crisis, the 2008 QE, the 2013 taper tantrum, the 2017–2019 quantitative tightening, to the COVID-19 pandemic, which created several outliers in government bond yield data during the observed period.

Forbes and Rigobon (2002) have stated that heteroscedasticity results in biased test results when using the correlation coefficient approach. The time series data for government bond yields are very volatile, which violates the assumption of constant error variance, making the OLS model problematic, so GARCH can be used to overcome the heteroscedasticity and to regress the study data. The GARCH model has also become a model that has been widely applied in the analysis of time series data and financial sector data, and it is especially useful in analyzing the volatility of an asset (Engle 2001). Ghani and Rahim (2019) have also mentioned that the GARCH model is one of the most reliable models for predicting volatility and it effectively fits a variety of data series, particularly time series data. Thus, this study used the GARCH method to treat heteroscedasticity issues found in the government bond yield data and measure the magnitude of US monetary policy spillover on Indonesian local currency government bond yields in different periods.

### 3.1 Research Variables

This study examined the transmission channels, particularly on liquidity, portfolio balance and confidence channel as stated by Lim, Mohapatra, and Stocker (2014) as well as Ebeke and Kyobe (2015), to measure the impact of US monetary policy on Indonesian local currency government bond yields. The GARCH model is divided into two equations: the mean equation and the variance equation. The mean equation is used to determine the significant effect of external influences—in this case, US monetary policy—on Indonesian local currency government bond yields. The mean model equation in this study is written as:

*Mean Equation:*

$$ID10Y_t = \alpha_0 + \alpha_1 \cdot US3M_{t-1} + \alpha_2 \cdot US10Y_{t-1} + \alpha_3 VIX_{t-1} + \alpha_4 IDEQT_{t-1} + \alpha_5 IDCDS_{t-1} + \varepsilon$$

Information:

ID10Y = Indonesian Local Currency Government Bond 10-year Yield

US3M = US 3 Month T-bill

US10Y = US Government Bond 10-year Yield

VIX = Volatility Index

IDEQT = Indonesia Stock Exchange Index

IDCDS = Indonesia 5-Year Credit Default Swap

The dependent variable in this study is represented by ID10Y, which is the benchmark Indonesian local currency government bond yield. Independent variables in the research model are the US3M, US10Y, and the VIX to capture the spillover from US monetary policy, with the Indonesia Stock Exchange Index (IDEQT) and Indonesia 5-year CDS (IDCDS) as the control variables.

The US3M is the variable that captures the effect of US monetary policy through liquidity channel, while the US10Y captures the effect through the portfolio balance channel. Guarin, Moreno, and Vargas (2014) used the US treasury bond yield as an indicator to reflect the US monetary policy stance. The VIX data are used to capture global economic spillover through the confidence channel (Ebeke and Kyobe 2015) and to capture global risk volatility (Moore et al. 2013). The confidence channel is an important risk factor that can influence foreign investors' appetite to invest in a developing country bond market.

This study also included the IDEQT and IDCDS as control variables to capture domestic effects. According to Lin, Wang, and Gau (2008), domestic risk has an essential role in the bond market yields of developing countries. The IDEQT variable is used to check whether the domestic stock market has a "flight to quality" effect in Indonesia's bond market. Longstaff, Mithal, and Neiss (2003) showed that equity markets have leading information in the bond market. The IDCDS, meanwhile, represents the domestic credit risk, which can affect the bond market. Some studies have found that the CDS market has a leading effect on the sovereign bond market (Coudert and Gex 2010 and Chan-Lau and Kim 2004). Shim and Zhu (2010) also found that CDS trading had a significant spillover effect on the bond market during the crisis period.

The variance equation was used to determine bond yield volatility from persistence parameters. The persistence parameter was obtained from the sum of the lagged conditional variance and lagged squared residual ( $\beta_1 + \beta_2$ ) of the GARCH model (Brooks 2008).

Variance Equation:

$$H_t = \beta_0 + \beta_1 h_{t-1} + \beta_2 \varepsilon_{t-1}^2 \quad (3.2)$$

Information:

$H_t$  = *bond yield conditional variance* on t period

$h_{t-1}$  = *conditional variance* on t-1 to capture *GARCH effects*

$\varepsilon_{t-1}^2$  = *squared residual* on t-1 to capture *ARCH effects*

As noted in Choudhry (1995), if the sum of  $\beta_1 + \beta_2$  approaches 1, economic volatility will persist (persistent), and the shock will decrease very slowly. The value of a large variance equation (close to 1) implies that a large positive or negative return will result in forecasting future variances to be high over a long period (Brooks 2008). Thus, if the persistence parameter approaches the value of 1 or more, the financial asset experiences continuous volatility.

## 3.2 Data

The impact of US monetary policy after FFR normalization was analyzed using daily data from January 2005 to December 2021, which included various volatile economic events outlined above. To determine differences in the impact of US monetary policy in various periods, the study period was further divided into several sub-periods (before the 2008 QE, during the 2008 QE, Fed monetary policy normalization, and 2020 pandemic QE) as follows:

1. Before the 2008 QE (1 January 2005–24 November 2008): the US monetary policy before the Fed announcement of QE and entered the zero lower bound;
2. The 2008 QE (25 November 2008–21 May 2013): the US monetary policy between QE and before the taper talk;
3. The Fed's monetary normalization policy (22 May 2013–30 August 2019): US monetary policy from the tapering off until the Fed gradually increased the FFR, which is further broken down into three sub-periods: the tapering off period (22 May 2013–15 December 2015), the FFR increase (16 December 2015–30 July 2019), and quantitative tightening (2 October 2017–30 August 2019);
4. The 2020 pandemic QE (16 March 2020–31 December 2021): US monetary policy when the COVID-19 pandemic drove the Fed to lower its FFR and reinstate the QE policy.

This study begins with the normalization period when the Fed introduced the possibility of a tapering policy to the public (taper talk) in May 2013. Sahay et al. (2014) emphasized that the taper talk phase significantly affected the asset prices and capital flows of emerging countries. Eichengreen and Gupta (2014) also found that the taper talk phase had a significant adverse effect on the exchange rate, reserves, and stock market of emerging countries. Data in this study were obtained from financial data sources such as Bloomberg Terminal and CEIC Database. In addition, data were also taken from the Bank Indonesia, the Ministry of Finance, and the Fed. Time-series data



analysis using the GARCH method was calculated using E-Views 10 to answer the research hypothesis.

### 3.3 Hypothesis

To answer the research questions, this research has the following hypothesis:

H<sub>0</sub>: There is no effect of US monetary policy on Indonesian local currency government bond yields.

H<sub>1</sub>: There is an effect of US monetary policy on Indonesian local currency government bond yields.

The significance level to prove the hypothesis used in this study was  $\alpha = 0.05$  or 5%. H<sub>0</sub> is rejected if the coefficients of  $\alpha_1$  (US3M),  $\alpha_2$  (US10Y), and  $\alpha_3$  (VIX) in the research model that represents US monetary policy through the liquidity, portfolio balance, and confidence channel (respectively) show a significance value of less than or equal to 5%. Meanwhile, H<sub>0</sub> is not rejected if the coefficient  $\alpha_1$ ,  $\alpha_2$ , and  $\alpha_3$  shows a significance value of more than 5% for the impact on ID10Y.

## 4. RESEARCH ANALYSIS

### 4.1 Regression Results

Based on the GARCH estimation results (Table 1), the liquidity channel (US3M), portfolio balance (US10Y), and confidence channel (VIX) affect the ID10Y in different ways. Overall, an increase in the US10Y and VIX increase ID10Y. The US monetary spillover through the portfolio balance and confidence channel affected ID10Y throughout the observation period. In contrast, spillover from the liquidity channel only had a significant impact on ID10Y during the period prior to QE. In addition, the portfolio balance channel magnitude experienced a substantial decline in the 2008 QE period. Spillover through the confidence channel consistently had a significant 1% effect on the ID10Y in the entire observation period.

Domestic control variables also affected the ID10Y to some extent. An increase in the IDEQT decreases the ID10Y. Meanwhile, IDCDS has a positive coefficient and significantly affected the ID10Y during global financial crisis (before 2008 QE) and during the taper tantrum (2013 monetary policy normalization). The studies by Chan-Lau and Kim (2004) and Hull, Predescu, and White (2004) found that higher sovereign CDS spreads (when investors perceive that credit quality declines) lead to an increase in local currency sovereign bond yields, and vice versa. However, the IDCDS does not significantly impact ID10Y in the QE 2008 period and showed only a small significance during the 2020 pandemic QE.

**Table 1: Regression Results**

Mean Equation	US Monetary Policy Normalization					2020 Pandemic QE
	Before QE	2008 QE	Tapering Off	Fed Fund Rate Increase	Quantitative Tightening	
C	-0.00258	-0.00729***	0.00427	-0.00414**	0.00161	-0.00322*
US3M	0.46458***	-0.19984	-1.00947	0.09443	0.03530	-0.00496
US10Y	0.16703***	0.05840*	0.27894***	0.33681***	0.34562***	0.21375***
VIX	0.01859***	0.00943***	0.00671***	0.00843***	0.00826***	0.00313***
IDEQT	-0.00021***	-0.00023***	-0.00012**	-0.00007*	-0.00003	-0.00003
IDCDS	0.00113***	-0.00009	0.00281***	0.00128**	0.00246**	0.00078*

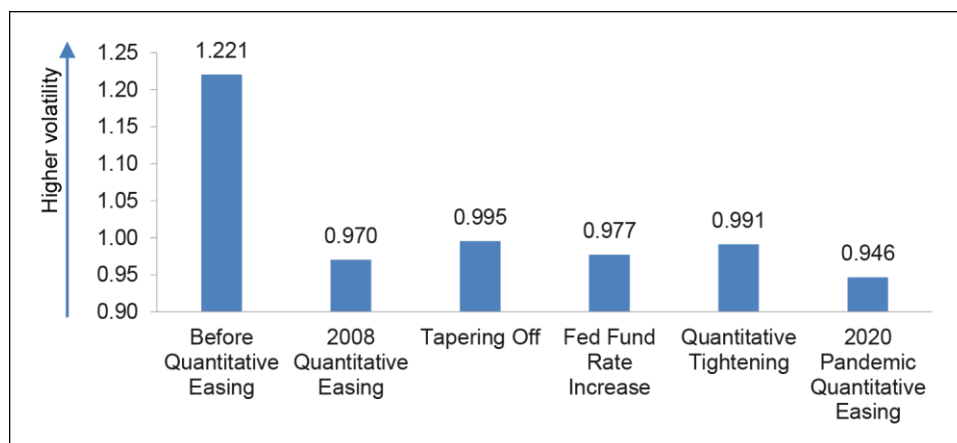
  

Variance Equation	US Monetary Policy Normalization					2020 Pandemic QE
	Before QE	2008 QE	Tapering Off	Fed Fund Rate Increase	Quantitative Tightening	
C	0.00042***	0.00031***	0.00018***	0.00009***	0.00005***	0.00013***
$\alpha$	0.53527***	0.17861***	0.12751***	0.06137***	0.03098***	0.22853***
$\beta$	0.68555***	0.79153***	0.86789***	0.91552***	0.95997***	0.71793***

QE = quantitative easing; \*\*\* significant at 1%, \*\* significant at 5%, \* significant at 10%.

Source: Author's calculation.

**Figure 2: Volatility of the Indonesian Local Currency 10-Year Government Bond Yield**



Source: Author's calculation.

**4.1.1 Before QE**

Based on the GARCH model estimation results in the pre-QE period, the US3M, the US10Y, and VIX have positive coefficients with a significance level of 1% for their effect on the ID10Y. An increase in the US3M, US10Y, and VIX by 1% is estimated to increase the ID10Y by 0.46%, 0.17%, and 0.02%, respectively. This means that the regression results prove  $H_0$  is rejected. During this period, US monetary spillover through liquidity, portfolio balance, and the confidence channel influenced the ID10Y. The influence of VIX in this period was the strongest compared to the other periods. At the height of the 2008 crisis, the ID10Y increased by 1,093 bps, spiked to 20.95% on 27 October 2008 (the highest level during the global financial crisis) from 10.01% in January 2008. There were no extraordinary monetary or fiscal policies from the US or Indonesia that anticipated the global financial crisis before it happened. In this period, the persistence parameter of the variance equation showed a value above 1 (1.22), the highest volatility compared to other periods.

#### 4.1.2 During QE

Based on the estimated results of the GARCH mean equation in the QE period, the US monetary spillover affected the ID10Y through the confidence channel. The coefficient sign of the VIX against ID10Y was positive, with a significance level of 1% ( $H_0$  is rejected). An increase in the VIX by 1% is estimated to positively affected the ID10Y rise by 0.009%. On the other hand, US monetary policy transmission through the portfolio balance channel (US10Y) had smaller significance on ID10Y ( $H_0$  rejected at 10%) and the liquidity channel had no significance on ID10Y ( $H_0$  is not rejected) in this period. Volatility in this period decreased compared to the global financial crisis period, reaching 0.97.

#### 4.1.3 Fed Monetary Policy Normalization Period

Based on the GARCH estimation results during the Fed monetary policy normalization period (tapering off, FFR increase, and quantitative tightening), the portfolio balance (US10Y) and confidence channel (VIX) significantly affected the ID10Y at 1% significance ( $H_0$  is rejected), but at different magnitudes. The US monetary policy transmission through the portfolio balance channel (US10Y) in this period had a stronger influence on the ID10Y compared to other periods. The magnitude of the impact of the portfolio balance channel was the highest during quantitative tightening, followed by the FFR increase and tapering off periods. An increase in the US10Y by 1% during tapering off, FFR increase, and quantitative tightening, is estimated to increase the ID10Y by 0.28%, 0.34%, and 0.35% respectively.

After the announcement of the QE policy termination, the liquidity of the global financial markets thinned, which increased the US10Y. If the spread between Indonesian and the US government bond yields shrinks, there is a possibility of a sudden reversal of capital flows in Indonesia, because investors perceive that the Indonesian bond market does not provide adequate returns amidst its risk profile. In May 2013, S&P downgraded Indonesia's Sovereign Credit Rating to a BB+ stable outlook due to the weakened external sector.

Perceptions of risk that disrupt the investor confidence also became an additional catalyst for the spillover transmission through the confidence channel. The VIX during the period of monetary policy normalization had an effect of larger magnitude on the ID10Y compared to the 2020 pandemic QE. In the monetary normalization period, volatility increased from the 2008 QE period and was higher than the 2020 pandemic QE. The volatility in the monetary normalization period was persistent, with the highest point during the tapering off period (0.995), followed by quantitative tightening (0.991). This is in line with the study of Ghosh and Sagggar (2016), which found that increased volatility peaked in developing markets during the tapering off period. The Fed's announcement regarding the tapering off in May 2013 (taper talk) made the market react and became a source of volatility for the bond markets of developing countries. Yildirim (2016) also emphasized that global financial spillover effects triggered by the US monetary policy—characterized by positive changes in the VIX—lead to market risk sentiment deterioration. When market sentiment deteriorates, stock prices fall, local currency depreciates, and the government bond yields increase.

#### 4.1.4 Pandemic QE (Tapering Off and FFR Normalization)

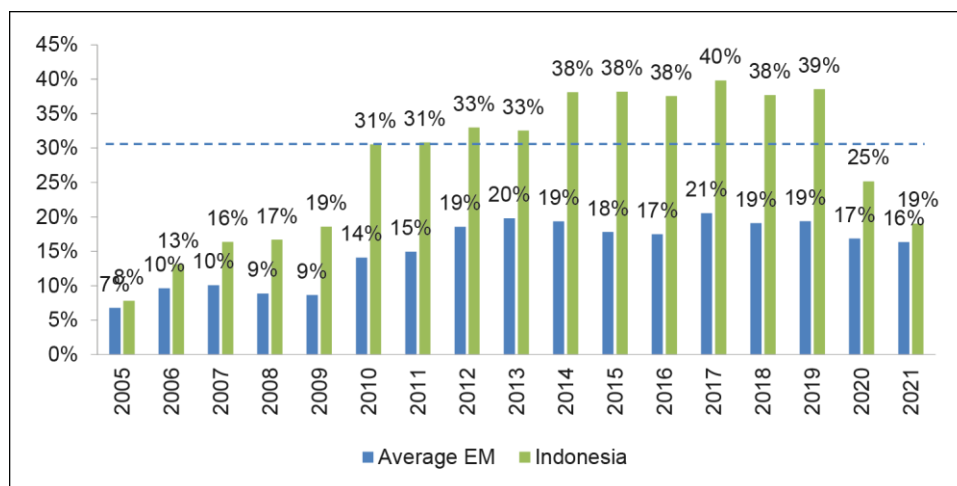
During the pandemic, spillover transmission occurred from the portfolio balance channel (US10Y) and confidence channel (VIX). An increase in the US10Y and VIX will have an impact on an increase in the ID10Y with a significance level of 1% ( $H_0$  is rejected). The coefficient of US10Y on ID10Y in this period reached 0.21, which is

larger than the pre-QE and 2008 QE periods but lower than the 2013–2019 normalization period. An increase in the US10Y and VIX by 1% is estimated to increase the ID10Y by 0.21% and 0.003%, respectively. Volatility in this period decreased compared to the monetary normalization period. The volatility during the pandemic period was the lowest of the entire research period, reaching 0.946. Although the COVID-19 pandemic weakened the global financial sector, the ID10Y during this period did not increase as much as during the 2008 crisis or tapering periods. During the pandemic, the ID10Y only increased by 134 bps on 24 March 2020, rising to 8.37% (the highest level during the pandemic period) from 7.03% in January 2020.

The pandemic period was less volatile because of several government and central bank interventions, especially the debt monetization policy, which allowed Bank Indonesia to buy government bonds in the primary market. With this policy, the Indonesian government securities market was not dependent on foreign investors. In addition, the banking industry also tended to place their excess liquidity in the Indonesian government bond market to maintain their profitability because of weak demand for bank credit during the pandemic.

The low volatility of the ID10Y in the pandemic era can also be explained by the reduced dependence on foreign investors. Since before the pandemic era, Indonesia was one of the developing countries with the highest participation of nonresidents in local currency bond markets (Figure 3). A higher participation of nonresidents in local currency bond markets has two sides. On one hand, it enhances bond market liquidity and increases financial resources with lower funding costs. On the other hand, higher nonresident ownership increases risk exposure to sudden capital outflows, which eventually could create disorderly market conditions if it happened alongside major global economic events (e.g., the global financial crisis or tapering off). Ebeke and Lu (2014) showed that high foreign investor ownership in developing country government bonds has a relationship to high volatility. Further research from Ebeke and Kyobe (2015) also found that the high participation of foreign investors in the domestic bond market (especially when reaching the 30% limit) could strengthen the impact of global economic events on that market.

**Figure 3: Foreign Ownership in Local Currency Government Bond Markets**



Sources: Arslanap and Tsuda (2014), International Monetary Fund, CEIC.

During the 2013 taper tantrum and early pandemic 2020, the level of foreign ownership for Indonesia's government bonds exceeded the 30% limit (May 2013: 34%; March 2020: 37%). This high level of foreign ownership left Indonesia vulnerable to disruptions in the global economy. There was a capital outflow from the Indonesian government bond market of IDR 87.95 trillion in 2020 and IDR82.57 trillion in 2021. Meanwhile, banks and the central bank could fill the demand in the Indonesian government bond market to replace foreign investors. The share of foreign ownership thus fell drastically from 38% in January 2020 to 19% in December 2021. Government bond ownership by banks increased to 34% in December 2021 from 23% in January 2020, while ownership by central bank rose to 17% from 8% in the same period.

The government also increased retail bond issuance to finance the state budget during the pandemic, issuing IDR 77 trillion in 2020 (53% YOY) and IDR 97 trillion in 2021 (26% YOY, a record high in the history of retail bond issuance). This effort increased retail investor ownership in the government bond market from 3% in January 2020 to 5% in December 2021. The reduced share of foreign ownership and increased participation of domestic investors (banks, central banks, and retail) ensured that the volatility of the Indonesian government bond market was not as high as in other periods.

## 4.2 Analysis

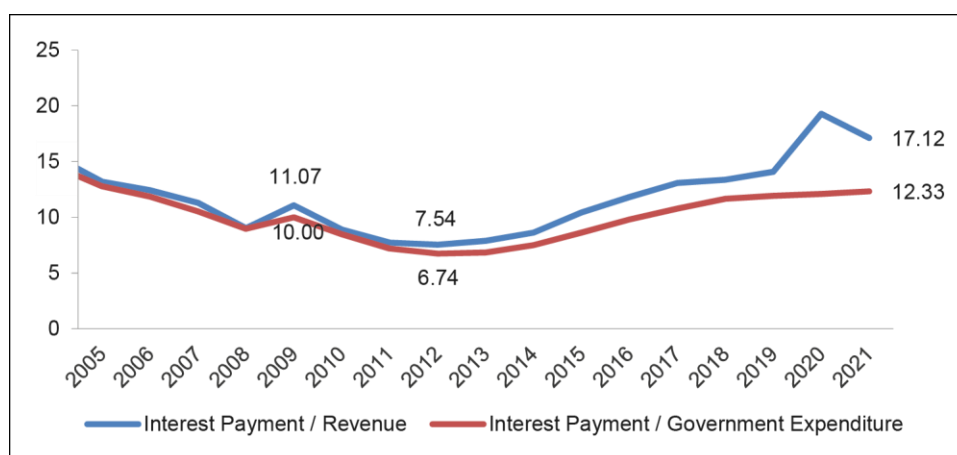
From a balance of payment perspective, a global financial spillover that occurs when the Fed initiates its tapering policy and increases its benchmark interest rate directly affects the reduction of portfolio investment in the balance of payments. Global financial spillover can also spread to the monetary sector through exchange rate depreciation, for which the central bank needs to conduct monetary interventions that can reduce foreign exchange reserves. For foreign investors who buy local currency bonds, the depreciation of the exchange rate will reduce their real returns, resulting in the potential for foreign capital inflows in the Indonesian government securities market to dry up, which creates difficulties for the government to attract foreign financing. QE tapering and an increase in the FFR can also put additional pressure on the central banks of developing countries to conduct tighter domestic monetary policy and raise the benchmark interest rate if necessary.

However, unlike the 2013 taper tantrum episode, there was limited space for domestic monetary tightening (e.g., interest rate hikes) during the COVID-19 pandemic, as demand remained weak. Raising domestic interest rates needs to be calculated carefully amidst the normalization of Fed policy when the domestic economy is still not fully recovered from the pandemic scarring effect. Raising interest rates makes domestic borrowing costlier, and tighter monetary policy during economic stress potentially harms the trajectory of economic recovery. Thus, to manage capital flight and to maintain stability in the foreign exchange, the central bank needs to utilize another policy instrument as the first line of defense, such as robust reserves, as the tool to intervene in the foreign exchange market. The normalization of the Fed's policy after the COVID-19 recovery needs to be monitored, because it could increase the volatility of Indonesia's bond market.

From the fiscal side, funding government spending from bond issuance certainly has risks, especially bringing further consequences in the form of the risk of interest expenses and default (in extreme situations). An increase in government bond yield volatility leads to a higher cost of funds, which puts pressure on Indonesia's state spending, particularly when the government requires substantial financing to fund its development program after COVID-19. Indonesia's interest payment ratio to revenues

and expenditures, which captures the relative proportion of debt interest expense, has shown an increasing trend in the last ten years. The interest payment to revenue ratio continued to increase from 7.54% (2012) to 17.12% in 2021, whereas the interest payment ratio to expenditure increased from 6.74% to 12.33% in the same period. When the government bond yield volatility increases, it would likely push the interest payment ratio even further, creating an additional burden for the state budget structure.

**Figure 4: Interest Payment Ratio to Revenue and Expenditure**



Source: Indonesia Ministry of Finance, CEIC.

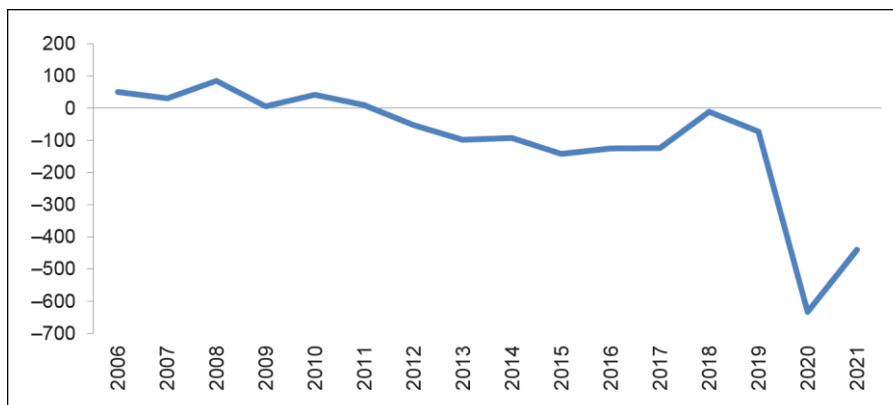
A higher cost of funds also can reduce the fiscal space and disrupt financing sustainability, as reflected in the primary balance deficit. Defined as the difference between the fiscal balance (revenue minus expenditure) excluding interest payments, Indonesia has had years of primary balance deficit, partly because state revenues were not optimal, particularly the low tax ratio, while the expenditure continued to increase to finance national development programs. The OECD (2021) mentioned that the primary balance is a critical indicator to measure a government's financing sustainability in the short-term. If a surplus primary balance occurs, there are sufficient funds from tax revenue to pay the debt principal and interest. If the primary balance is negative, the government does not have sufficient tax revenue to pay the debt principal and interest. In other words, some of the debt principal and interest are paid by adding new debt—by issuing government bond for instance.

Similar to the ratio of interest payments to revenue and expenditure, the primary balance of the Indonesian State Budget in the last ten years has continued to be in the deficit zone, with the largest deficit occurring during the 2020–2021 pandemic period. The primary balance surplus before 2012 occurred partly because, Indonesia's fiscal structure at that time was supported by a commodity boom. With the end of the commodity boom, Indonesia's primary balance became a deficit.

In a state revenue structure that is far from optimal, with a low tax ratio (9.11% in 2021), Indonesia is still reliant on the financing component to address its spending needs. An increase in government bond yield volatility that results in a widening of the primary balance deficit might reduce the fiscal space available to fund national development initiatives. In addition, if the volatility of government bond yields persists, the primary balance deficit will spiral, and the interest and principal burden of the debt will erode fiscal sustainability in the long term. As the bond yield has increased, the government must pay more to borrow, which reflect the risk that their debts may eventually become too expensive to service. Both effects on the balance of payment

and fiscal side can eventually propagate to Indonesia's real sector, hampering the country's post-pandemic economic recovery. Debt management during stable and volatile conditions needs to be carried out with caution.

**Figure 5: Indonesia: Fiscal Primary Balance**



Source: Indonesia Ministry of Finance, CEIC.

Amidst the looming threat of global financial turmoil, particularly based on changes in the US and global monetary stance, Indonesia should balance its monetary and fiscal policy mix to strengthen the stability of the financial sector and macroeconomic fundamentals, as this will be the foundation for medium-term economic growth. Indonesian financial policy authorities must take active steps to protect the Indonesian economy from the contagious impact of external economic events. Fratzscher, Lo Duca, and Straub (2013) and Sahay et al. (2014) found that countries with more active monetary policies and more robust macroeconomic fundamentals were less exposed to the unconventional US monetary policies. Prachi et al. (2014) and Ahmed, Coulibaly, and Zlate (2017) also emphasized the importance of domestic macroeconomic fundamentals. They found that developing countries with better macroeconomic fundamentals (e.g., stronger fiscal balance, current account balance, lower inflation, and higher reserves) experienced slight disruptions in various financial variables (exchange rates and government bond yields) during tapering off. Mishra et al. (2014) found that developing countries with deeper financial markets and tighter macroprudential policies before the tapering period (stress period) experienced lower financial conditions.

Sahay et al. (2014) emphasized that emerging countries that respond quickly and decisively in dealing with current account deficits, inflation, economic growth, and foreign exchange reserve issues generally fare better when facing a disruptive global economic event. Özcan (2021) has also stated that the impact of the Fed's pandemic tapering off depends on country-specific risks, such as private external debt, inflation, and emerging countries' policy response to COVID-19.

This paper has shown that volatility during the pandemic was lower compared to other major periods, such as the 2013 tapering off and monetary normalization. During the pandemic, several of Indonesia's economic indicators were better than in 2013, including low inflation, larger foreign exchange reserves, trade surplus, and current account surplus (Table 2). While the fiscal deficit in 2021 and 2020 widened because of the pandemic, ID10Y volatility was lower compared to 2013, when there was a smaller fiscal deficit.

In terms of external trade, Indonesia has enjoyed a trade surplus for 20 consecutive months, from May 2020 to December 2021. Robust trade performance also drives the current account into surplus territory, the first surplus since 2011. Indonesia's current account in 2021 was recorded at US\$3.3 billion or 0.3% of GDP. While Indonesia relied on external debt to finance its various programs during the pandemic, it has been able to maintain its external debt. Indonesia's external debt to GDP rose to 39.35% in 2020 from 36.07% in 2019 as the necessary instrument to face the COVID-19 pandemic, but its external debt to GDP in 2021 decreased to 34.99%, which is lower than the external debt before the pandemic in 2019. Indonesia also recorded the highest ever foreign reserve in September 2021, which reached USD146.9 billion (USD144.9 billion at the end of 2021).

However, there is also views that financial market size, rather than macroeconomic fundamentals, is the main factor that explains the US spillover effect on emerging countries. Eichengreen and Gupta (2014) suggested that macroeconomic fundamentals (budget deficit, public debt, foreign reserves, and GDP growth rate) are not related to dampening the Fed tapering effect on emerging countries; rather, a larger financial market size in the emerging country (e.g., larger portfolio liability, equity market, M2, reserve) is more vulnerable to Fed shocks such as the 2013 taper tantrum. Eichengreen and Gupta (2014) argued that a large and liquid financial market enables investors to seek portfolio rebalancing opportunities by selling their portfolio assets from the emerging country with a sizable financial market. They showed that the widening of the current account deficit prior to the 2013 taper tantrum was associated with emerging country deterioration during the taper tantrum. In Indonesia's case, the current account deficit prior 2013 widened to  $-2.8\%/GDP$  (2012) from  $0.2\%/GDP$  (2011).

However, Indonesia's financial market size, shown by larger portfolio liability stock, equity market capitalization, bond market, ratio of M2 to GDP, and ratio of reserve to GDP (Table 2), was larger during the Fed taper announcement in 2021 than in the 2013 taper tantrum, but the volatility was much lower. Furthermore, Indonesia narrowed its current account deficit prior 2021, from  $-2.7\%/GDP$  in 2019 to  $-0.4\%/GDP$  in 2020. From these polarized views on macroeconomic fundamentals or financial market size, there is one indicator highlighted by each study: the current account balance. Smaller current account deficits tend to reduce the global economic spillover in emerging countries. In the case of Indonesia, the current account deficits during the pandemic were much lower, even experiencing a surplus, compared to the 2013 taper period.

To reduce external volatility, policymakers should also encourage the development of the Indonesian bond market and diversify investors in that market. Basri (2017) emphasized that domestic financing sources, including increasing domestic savings, are needed to overcome dependence on external financing sources, which can increase risks for Indonesia. Investor base diversification is also necessary considering that the debt monetization policy will expire at the end of 2022 and Bank Indonesia has given a signal that it will sell its owned government bonds through reverse repurchase arrangements in 2023.

Basri (2017) also recommends various actions that can be taken to anticipate the normalization of FFRs. First, Indonesia can implement the Tobin tax (including the reverse Tobin tax) policy to minimize the negative impact of future short-term capital inflows. However, the Tobin tax needs to be carried out very carefully, because it can reduce capital inflows when Indonesia still needs external financing. Second, capital inflows originating from foreign direct investment must be channeled to export-oriented



sectors to minimize the risk of currency mismatch and pressure on Indonesia's balance of payments.

**Table 2: Indonesia: Selected Economic and Financial Market Indicators**

	December 2013	December 2021
Inflation (YOY)	8.38%	1.87%
Fiscal Deficit/GDP	-2.3% (2012: -1.9%; 2011: -1.1%)	-4.6% (2020: -6.5%; 2019: -2.2%)
Bank Indonesia Benchmark Interest Rate	7.5%	3.5%
Nominal Effective Exchange Rate	74.63 (-17.52% YTD)	71.79 (+2.73% YTD)
Trade Balance (YTD cumulative)	-USD4.07 billion	USD35.34 billion
Current Account Deficit/GDP	-3.2% (2012: -2.8%/GDP; 2011: 0.2%/GDP)	0.3% (2019: -2.7%/GDP; 2020: -0.4%/GDP)
External Debt/GDP	29.13% (2012:27.4%; 2011: 25.2%)	34.99% (2020: 39.3%; 2019:36.1%)
S&P Credit Rating	Non-Investment Grade BB+ (Stable Outlook)	Investment Grade BBB (Negative Outlook)
Portfolio Liability Stock (Equity and Debt) *	USD161.97 billion	USD259.38 billion (2020)
Equity Market Capitalization (IDR Trillion)	IDR4,219.02 trillion	IDR8,252.41 trillion
Equity Market Capitalization (% GDP)	44.20% GDP	48.30% GDP
Government Bond Market (% GDP)	14.61% GDP	26.38% GDP
M2/GDP	39.08%	46.38%
Reserve/GDP	10.89%	12.22%
Foreign Reserve	USD99.4 billion equivalent to financing 5.6 months of imports or 5.4 months of imports and servicing government external debt (2012: USD112.8 billion; 2011: USD110.1 billion)	USD144.9 billion equivalent to financing 8.0 months of imports or 7.8 months of imports and servicing of government external debt (2020: USD135.9 billion; 2019: USD 129.2 billion)

\*Lane, Philip R. and Gian Maria Milesi-Ferretti, External Wealth of Nations database (September 2021 update).

Source: Ministry of Finance, Bank Indonesia, CEIC, and Bloomberg.

Another thing that needs to be addressed is that Indonesia's external sector during the pandemic period has benefited from high commodity prices because of the commodity supercycle phenomenon, which is not sustainable. The commodity supercycle has been driving Indonesia's trade performance, but these high commodity prices will eventually end. Indonesia's exports are supported by non-oil and gas export growth, driven by rising prices for Indonesia's leading commodities, such as crude palm oil (2020: 27.95% YTD, 2021: 32.59% YTD) and coal (2020: +18.91% YTD, 2021: +110.68% YTD). The end of the commodity supercycle could lower the prices of Indonesia's leading commodities, which in turn will weaken Indonesia's external sector. Economic reforms, particularly in strengthening the manufacturing sector and digital economy connected to the global value chain, need to be carried out so Indonesia's external sector does not depend on commodity price fluctuations. By reforming the manufacture sector and digital economy, Indonesia can ensure an alternative source of economic growth when the high commodity price period ends.

The Indonesian Government also needs to maintain investor confidence, because the confidence channel (VIX) had a significant effect on the ID10Y in the entire study period. Thus, another essential thing that should be addressed by Indonesian fiscal and monetary policy authority is policy coordination and communication. This also includes transparent communication from the Central Bank of Indonesia and the Ministry of Finance to maintain investors' expectation during the domestic tapering

when ending the debt monetization policy. The International Monetary Fund (2021) emphasized that transparent and clear guidance on fiscal and monetary policy communication can improve confidence in external debt sustainability and help reduce the spillover effect to the domestic financial sector. The Indonesian fiscal and monetary policy authorities within the Financial System Stability Committee framework should provide clear explanations to investors, the media, and the public regarding the latest global and domestic financial situation as well as Indonesia's expected policy response. Excellent communication can provide confidence for investors and the public, in general, to prevent massive capital outflows from Indonesia in the short term.

## 5. CONCLUSION

Domestic and foreign investors respond to domestic and global factors, such as low US interest rates, that encourage capital inflows into developing countries. According to Ghosh et al. (2014), foreign investors are more sensitive to global conditions than domestic investors. With a drastic change in the FFR and increasing global economic uncertainty, foreign investors will react when a global economic phenomenon occurs. Measuring the effect of monetary policy on financial markets is important for financial authorities in formulating policies and managing risk effectively. This study has shown that US monetary policy positively affected the ID10Y, particularly from the confidence channel (VIX), throughout the entire study period, with the highest magnitude occurred before 2008 QE.

Higher magnitude in VIX during before 2008 QE was driven by a sudden shock from the global financial Crisis without any supporting fiscal or monetary policy in the US and Indonesia. The VIX effect on the ID10Y during the 2020 pandemic QE was the smallest among the other study periods. The impact of US monetary policy through the portfolio balance channel (US10Y) occurred significantly during the pre-QE 2008, monetary policy normalization, and 2020 pandemic QE periods. The most significant impact of the US10Y (portfolio balance channel) on the ID10Y occurred in the US monetary policy normalization period, particularly during quantitative tightening followed by the FFR increase and tapering off, when an increase in US10Y by 1% affected the ID10Y by 0.35, 0.34, and 0.28, respectively.

This study also found that volatility in Indonesia's government bond market occurred at different levels in each period. The period that experienced the highest and most persistent volatility occurred in the pre-QE 2008 period, followed by tapering off, quantitative tightening, and FFR increase during the 2013 monetary policy normalization. Meanwhile, the volatility during the pandemic QE was the lowest of the study periods. Active unconventional macroprudential policy in Indonesia through its debt monetization policy that was supported by counter-cyclical fiscal policy with robust trade performance and lower foreign ownership in the government bond market might explain why the VIX effect and volatility of the ID10Y were lowest in the 2020 pandemic QE period. The fiscal-monetary policy mix helped to maintain investor confidence during the turmoil of COVID-19.

From the fiscal side, an increase in government bond yield volatility leads to a higher cost of funds. This condition puts pressure on Indonesia's state spending, particularly when the government requires substantial financing to fund its development program after COVID-19. As the bond yield increased, the government had to pay more to borrow. This reflects the risk that the debts may eventually become too expensive to service and shrinks the fiscal space to fund the national development programs.

The magnitude of the effect of the US economy on Indonesia during the 2013 monetary policy normalization indicates that the financial policy authorities in Indonesia must prepare appropriately to deal with the risks and threats of global economic policy dynamics, including the Fed's monetary tightening during pandemic recovery. Anticipatory policies are needed to mitigate the effects of the changing US monetary policy stance, and the pandemic is still not over yet. This study suggests three things that are critical to overcome the impact of the Fed's monetary policy normalization.

First, reducing the exposure of foreign investors to government bonds and diversifying the exposure of domestic investors is expected to reduce the impact of disruptive global economic event spillover, such as changes in US monetary policy, on Indonesia's government bond market. Historically, Indonesia has had a high level of foreign ownership in the last ten years, which even reached above 40% in 2017. During the pandemic, Indonesia's government bond market investor base has been supported by banks and the central bank. After the debt monetization policy ends, the government bond market should strengthen its investor base through insurance, pension fund, and retail investors.

Second, the transition of the fiscal-monetary policy mix to a normal stance must be delivered smoothly. Indonesia plans to end its higher-than-normal fiscal deficit and debt monetization policy at the end of 2022. Lingering global risk (e.g., global monetary tightening, global inflation) while the country still needs to recover from the pandemic is a challenge when ending the extraordinary policy that has been implemented since the beginning of the pandemic. Indonesia needs to maintain a robust and sustainable current account balance that, combined with other solid economic variables (such as a high foreign reserve), may help minimize ID10Y volatility when a major global economic event occurs. It would be a challenge to maintain the current account balance in the long run, because during the pandemic, Indonesia's trade balance was supported by high commodity prices. Strategic economic reforms that can minimize Indonesia's dependence on commodity prices and unleash the untapped potential of Indonesia's manufacturing and digital economy will help create a sustainable current account balance.

Finally, investor confidence should be maintained through clear policy guidance from the fiscal and monetary sides. The research results in this paper can still be further developed to determine the impact of the monetary stance of other major developed countries on Indonesian financial instrument variables, particularly in assessing the magnitude of the effects on the Indonesian State Budget structure. Further research could also revisit the study of Eichengreen and Gupta (2014) by examining whether macroeconomic fundamentals or a sizeable financial market is the driver of capital flow to Indonesia and the primary factor that makes Indonesia more vulnerable to external spillover.

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