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Investor Sentiment and Malaysian Government Bonds: A COVID-19 Case Study

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ABSTRACT

The COVID-19 pandemic has fundamentally altered investment strategies, particularly in bond markets. This study examines the global determinants of Malaysian government bond yields, comparing pre-pandemic and pandemic periods using daily data from January 2017 to May 2021. During the pandemic, Malaysian government bonds exhibited equity-like characteristics, diverging from their traditional safe-haven role, as evidenced by a positive relationship between bond yields and investor sentiment shocks. Gold prices emerged as the most influential factor, with their impact on bond yields becoming more pronounced during the pandemic, reaffirming gold's status as a safe-haven asset. The findings suggest that investors moved assets to gold during heightened risk periods before transitioning back to bonds. This highlights the need for investors to monitor gold prices and for policymakers to enhance bond market stability during crises to mitigate future economic uncertainties.

1. INTRODUCTION

Global financial crises such as the Asian Financial Crisis (AFC-1997/98), the Global Financial Crisis (GFC-2008/09), and the European Debt Crisis (2009) have significantly impacted world economies. These events disrupted macroeconomic variables, leading to decreased commodity prices, currency devaluations, and stock market collapses. For instance, during the Asian Financial Crisis in 1997, Thailand, Indonesia, and South Korea experienced severe stock market losses of 80%, 65%, and 65%, respectively (Jong & Sul, 2002). Similarly, in the US, the S&P 500 lost 56% of its value from its peak in October 2008 (Farmer, 2011). Such high volatility and uncertainty often lead to a flight to quality, where investors shift their preferences to safer assets.

The COVID-19 pandemic, caused by the coronavirus SARS-CoV-2, has had massive repercussions on lives and the global economy. Goodell (2020) highlights that this pandemic has caused unprecedented economic damage and will change the way of life for many people worldwide. This situation has spurred research on the impact of COVID-19 on financial assets, as seen in studies by Ashraf (2020) and Zhang et al. (2020).

During the COVID-19 pandemic, many investors recalibrated their strategies, seeking more profitable, sustainable, and crisis-proof investments. Investors became more risk-averse, looking for safer assets. Theoretically, during high uncertainty, investors move from riskier assets such as equities to less risky assets such as bonds (Durand et al., 2010). Government bonds, particularly sovereign bonds, are perceived as a safe investment due to their guaranteed returns by the government (Ben-Rephael, 2017). Highlighting the global financial market during 2007-2009, Mustafa et al. (2013) found a high negative correlation between Malaysian Government Bonds (MGS) and the Malaysian stock market, demonstrating the protective role of Malaysian government bonds during crises.

During unprecedented crises, governments play a crucial role in implementing effective policies to save lives and

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stabilise financial markets. To mitigate the effects of the pandemic, governments rely on sovereign bond issuance to fund economic activities. However, borrowing from the debt market during crises is constrained by sovereign default risk. An unstable financial market and ineffective government intervention can lead to a more severe debt crisis. Arellano et al. (2020) found that during the COVID-19 period, countries like Argentina, Ecuador, and Ethiopia defaulted on their government bonds, and many others saw increased sovereign bond spreads. Zaremba et al. (2021) found evidence that COVID-19 government responses, such as income support and economic stimuli, can stabilise sovereign bond markets.

The determinants of government bond yields reflect a complex interplay of domestic and global factors. Poghosyan (2014) highlights the influence of debt-to-GDP ratios, potential growth, and short-term deviations during crises, while Barrios et al. (2009) emphasize global risk perception and its interaction with fiscal vulnerabilities. Both studies underscore the heightened impact of international factors during financial crises, reinforcing the need to examine these dynamics, particularly during global events like the COVID-19 pandemic.

Malaysia's bond market has undergone substantial development, solidifying its position as the largest local currency bond market in ASEAN by 2015 (Choy et al., 2019). Over the years, the market experienced impressive growth, expanding from RM 0.42 trillion in 2010 to RM 1.3 trillion in 2019 (Bixmalaysia, 2019). This rapid expansion reflects its critical role in supporting the nation's economic stability and development. Given this significance, it is essential for policymakers to gain a deeper understanding of the factors influencing Malaysia's government bond yields, particularly the interplay with global determinants, both before and during the pandemic. Such insights are crucial for developing strategies to enhance market resilience in the face of global economic uncertainties.

This study addresses a notable gap in the existing literature by exploring the impact of global determinants on Malaysian government bond yields, particularly in the context of the COVID-19 pandemic. Although prior research has largely concentrated on domestic factors such as default risk, private sector savings, economic growth, interest rates, and inflation, there is a noticeable gap in understanding how global factors influence Malaysian bond yields, particularly during periods of crisis like the COVID-19 pandemic. The paper makes three key contributions to bridge this gap. First, it provides a comprehensive analysis of global determinants, including the VIX index (investor sentiment), USD/MYR exchange rates, crude oil prices, gold prices, and daily new COVID-19 cases, thereby enhancing the understanding of how these factors influence Malaysian bond yields. Second, it offers a comparative analysis of bond yield dynamics before and during the COVID-19 pandemic, highlighting significant changes in investor behaviour and market responses due to the crisis. Third, the research evaluates the flight-to-quality behaviour of investors, revealing that while Malaysian government bonds usually act as safe-haven assets, the pandemic led to increased selling pressure, with investors shifting towards gold and other stable bond markets. These contributions provide valuable insights for investors and policymakers, aiding in the formulation of strategies to navigate future financial crises.

2. LITERATURE REVIEW

The bond market is a crucial component of the capital market, playing a vital role in financial stability and economic growth. Malaysia's bond market has experienced remarkable growth, becoming the largest local currency bond market in ASEAN by 2015 (Choy et al., 2019). The market expanded from RM 0.42 trillion in 2010 to RM 1.3 trillion in 2019 (Bixmalaysia, 2019). This substantial growth began in the aftermath of the 1997 Asian financial crisis when Malaysia's financial institutions faced challenges in financing national development through traditional lending. The government responded by promoting the capital market as an alternative source of corporate financing (Che-Yahya et al., 2016). In the current global context, where governments increasingly rely on bond issuance to fund expenditures, particularly in the fight against COVID-19, understanding and managing government bonds has become even more critical. Effective management helps prevent potential debt crises and ensures economic stability (Arellano et al., 2020). This ongoing vigilance is essential for maintaining investor confidence and sustaining the economic momentum gained over the past decade.

2.1 Global Determinants of Bond Yields

Bond yield represents the return an investor earns on a bond. At issuance, the bond yield is equivalent to the coupon rate. The current yield, however, depends on the bond's price and its interest payments until maturity. Traditionally, bond yield determinants include domestic factors such as default risk, private sector savings, economic growth, interest rates, and inflation (Patje, 2014). Recent studies highlight the influence of international factors on bond yields. For instance, global market integration has led to spillovers from the US bond market and macroeconomic data affecting Asia-Pacific bond yields. This phenomenon, driven by foreign investments seeking higher yields in the region, sometimes disconnects local yields from their fundamental values (Spyros, 2013; Poghosyan, 2014; Chernov et al., 2019).

Barrios et al. (2009) found that global investor sentiment plays a crucial role in explaining bond yield differentials during crises, such as the 2008 financial crisis. Their research indicates that while domestic factors like liquidity and sovereign risk are important, global risk appetite and macroeconomic fundamentals significantly impact yield spreads. This underscores the importance of using indicators like the VIX index to gauge changes in domestic government bond yields. Additional drivers of government bond yields include credit default risk and currency movements (Afonso et al., 2015). Currency depreciation often signals fiscal stress, increasing credit risk. Hsing (2015) noted that fluctuations in emerging market exchange rates affect local bond yields through changes in sovereign credit risk, which are largely influenced by local factors. Debt markets and interest rate differentials also play a role in determining currency risk premiums.

Regarding Malaysian government bonds, Awaludin and Masih (2015) observed that rising US 10-year government bond yields prompt investors to sell Malaysian bonds and shift investments back to the US dollar, following the flight-to-quality theory. This behavior might also be driven by expectations that Bank Negara Malaysia would adjust its monetary policy to address global market changes. Mustafa et al. (2013) analyzed the Malaysian stock and bond markets from 2006 to 2011, finding evidence of a flight-to-quality movement from stocks to bonds, particularly government bonds, during

financial crises. Their study revealed a strong negative correlation between Malaysian government bonds (MGS) and the stock market, suggesting that investors turn to government bonds during global financial turmoil. The VIX index, which measures investment sentiment, can thus serve as an indicator for portfolio rebalancing from stocks to bonds.

Research from Malaysia's Central Bank (BNM) using variance decomposition methods further supports these findings. During the 2007-2009 global financial crisis, there were substantial co-movements between foreign government bond yields and Malaysian government bond yields. Regional and advanced markets contributed approximately 80% of changes in long-term MGS rates, and over two-thirds of short-term MGS rate variance, demonstrating the significant impact of global events on local bond yields. In the current global context, where governments increasingly rely on bond issuance to fund expenditures, particularly in the fight against COVID-19, understanding and managing government bonds has become even more critical. Effective management helps prevent potential debt crises and ensures economic stability (Arellano et al., 2020). This ongoing vigilance is essential for maintaining investor confidence and sustaining the economic momentum gained over the past decade.

2.2 COVID-19 and Financial Markets

There has been an upsurge in research into the impact of COVID-19 on the financial market. As the existing study is more on the stock market (Ashraf, 2020 and Zhang et al. 2020), there are opportunities for more research on COVID-19 impact to the bond market. As the government relies heavily on bond issuance of a sovereign bond to support its expenditure, the importance of government bond yield movement to policymakers is more apparent. Among studies on the bond market during COVID-19 period is by Zaremba (2021) where the study found that as covid case increases, the government bond spreads widen regardless of government policy and monetary response. An unstable financial market and ineffective government intervention will lead to a more expensive debt crisis. Arellano, et al. (2020) finds that during the COVID-19 period, there is a number of countries defaulting their government bonds such as Argentina, Ecuador and Ethiopia while many other countries have seen an increase in their sovereign bond spread. A wider bond spread represents a heightened risk sentiment in the bond market.

Furthermore, as sovereign default risk becomes an area of concern for investors, they may require a premium on investment, leading to higher yield and resulting in higher cost expenditure for the government (Andries et al. 2020). This can be more apparent to countries with very high COVID-19 cases and countries with a high credit default risk even before Covid hits. Looking at the investor perspective, the investor may rebalance its bond portfolio by buying a shorter tenure bond and selling a longer tenure bond to keep its investment liquid in anticipation for investor sentiment to improve. However, suppose bond investor expectations for monetary policy promote inflation. In that case, some investors will invest in longer-term treasury bonds if the yield is sufficiently high and meet their investment portfolio target (Zaremba. 2021), especially if there is a need to replace maturing bonds. In conclusion, Malaysia's government bond market has a certain level of global market integration. Therefore, any adverse global market sentiment will impact the domestic bond market despite local fundamentals remain unchanged.

2.3 Safe Haven Assets: Gold and Bonds

Gold and bonds have traditionally served as safe-haven assets during periods of market turmoil, though their effectiveness can vary under different conditions. Salisu et al. (2021) confirmed gold's strong safe-haven properties during the COVID-19 pandemic, outperforming other assets like stocks and precious metals, despite its higher effectiveness in pre-pandemic periods. Meanwhile, Zaremba et al. (2021) highlighted the role of government policies in stabilizing sovereign bond markets, showing that economic support measures significantly reduced bond market volatility during the pandemic. Together, these findings emphasize the complementary roles of gold and bonds as safe-haven assets and the importance of policy interventions in mitigating market uncertainty during crises.

3. DATA AND METHODOLOGY

3.1 Data

The Malaysia Government Securities (MGS), representing 57% of Malaysia's outstanding bonds (Bixmalaysia, 2019), are a critical indicator of the nation's bond market. MGS, backed by the government, serve as the risk-free interest rate benchmark and reflect sovereign creditworthiness. This study focuses on the 10-year MGS yield, widely regarded as representative of the Malaysian bond market (Awaludin & Masih, 2015; Choy et al., 2019).

The independent variables include the VIX Index, USD/MYR exchange rate, Crude Brent Oil Price (USD per barrel), Gold Price (USD per ounce), and Daily New COVID-19 Cases. The VIX Index, sourced from the Chicago Board Options Exchange (CBOE), serves as a global risk sentiment proxy. The USD/MYR exchange rate data, indicative of currency market dynamics, is obtained from Bloomberg. Crude Brent Oil and Gold Price data, reflecting commodity market movements, are sourced from Investing.com. COVID-19 daily new case counts, representing pandemic-induced shocks, are retrieved from the World Health Organization (WHO) database.

The dataset comprises daily observations from January 2017 to May 2021, covering a period before and during the COVID-19 pandemic. Data preprocessing included ensuring uniform timeframes across variables, addressing missing values through linear interpolation, and converting prices to log levels where applicable for analysis. This comprehensive dataset provides a robust framework to investigate the global and local factors influencing MGS yields.

3.2 Empirical Methodology

To understand the long-term and short-term dynamics among variables before and during the COVID-19 periods, we employ a combination of time series cointegration, vector autoregression (VAR), impulse response, and variance decomposition techniques. These methods help identify significant global determinants of government bond yields and assess whether Malaysian investors adopt a flight-to-quality strategy during crises.

The VAR model, a multivariate framework, relates changes in one variable (e.g., MGS) to its own past values and the past values of other variables in the system. This approach allows each endogenous variable to be a function of all other

lagged variables. The use of VAR and cointegration methods is justified by their ability to model dynamic and long-term relationships in time series data, as established by Johansen (1991) for cointegration analysis and Lütkepohl & Reimers (1992) for integrating cointegration within the VAR framework.

Once the VAR model is established, we use the Impulse Response Function (IRF) to observe the dynamic behavior of each variable in response to a one-standard-deviation shock in another variable. Additionally, we use Variance Decomposition (VD) to determine the relative importance of each variable in explaining the movements of others over time.

Before applying the VAR model, a descriptive analysis of the sample is conducted, followed by stationarity testing using the Augmented Dickey-Fuller (ADF) test. Stationarity is a crucial prerequisite for time series analysis, as non-stationary data can lead to spurious regression results. The ADF test examines the presence of a unit root in the data by estimating the following regression equation, ensuring the suitability of the variables for further analysis. The ADF test involves estimating the following regression equation:

$$\Delta x_{it} = \mu_0 + \mu_1 t + (\rho - 1)x_{i,t-1} + \Sigma_{k=1}^{\rho} r_k \Delta x_{i,t-k} + e_t \quad (1)$$

Where μ_0 is the constant term, $\mu_1 t$ is a linear deterministic trend in the data, $(p-1)x_{i,t-1}$ represents the stochastic trend, and ϵt\epsilon_tϵt is the error term. This test helps us verify the stationarity of data, which is crucial for reliable cointegration and regression analysis.

The unit root test is essential for determining whether the data is stationary, which is a prerequisite for further analysis and cointegration testing. Stationary data is needed to confirm that the variables have a consistent mean and variance over time. If the data set is non-stationary, it implies that the variables may share a common trend, making cointegration analysis possible. Cointegration indicates a long-term equilibrium relationship between variables, which we examine using the Johansen (1991) cointegration test.

The Johansen cointegration test helps determine the number of cointegrating vectors and identifies causality between variables without specifying the direction. If the variables are cointegrated, it suggests the presence of a long-run relationship, meaning changes in one variable will have long-term effects on others.

To identify the number of cointegrating vectors, we use two test statistics: the Trace test and the Max Eigenvalue test. These tests are based on the following equations:

$$\lambda_{trace}(r) = -T\Sigma_{i=r+1}^{g} ln\,(1 - \hat{\lambda}_i) \quad (2)$$

$$\lambda_{max}(r, r+1) = -T\, ln\,(1 - \hat{\lambda}_{r+1}) \quad (3)$$

The results of the cointegration test will determine whether to accept or reject the null hypothesis of no cointegration. If the Trace statistic and Max Eigenvalues exceed the critical values, we reject the null hypothesis, indicating that cointegration exists among the variables. This result suggests that the coefficients of the independent variables are not zero, confirming a long-term equilibrium relationship.

Once cointegration is established, we decide between using the Vector Autoregression (VAR) method or the Vector Error Correction Model (VECM). If cointegration exists, VECM is typically employed to account for both short-term dynamics and long-term equilibrium. However, some studies, such as Naka and Tuffle (1997), argue that estimating VAR on cointegrated variables is more efficient for short-term analysis. Farreire et al. (2005) also support using VAR over VECM in short horizons due to the presence of a long-term equilibrium among non-stationary variables. Given that our study uses daily data over 17 months during the COVID-19 pandemic, we will use an unrestricted VAR system at level for this analysis.

The VAR model captures the long-run relationship of variables, as formulated by Johansen (1991). The model is represented as follows:

$$x_t = \Gamma_1 x_t + \cdots + \Gamma_p x_{t-p} + Az_t + \varepsilon_t \quad (4)$$

x_t is a vector of endogenous variables, and z_t is a vector of exogenous variables, as described above. In the meantime, Γ_p and A are coefficient matrices, with p denoting the lag length.For this study, the lag length is determined using different criteria: the Akaike Information Criterion (AIC) suggests a lag length of 2 for the pre-COVID period, the Hannan-Quinn (HQ) method indicates a lag length of 1 for the COVID period, and the Schwarz Criterion (SC) recommends a lag length of 2 for the full period. This study employs Cholesky ordering, which assumes that the first variable in the pre-specified order has an instantaneous influence on all other variables in the system. The Cholesky ordering used in this study is as follows: government bond yield (MGS), investor sentiment (VIX), currency exchange rate (USD/MYR), oil price (logoil), gold price (loggold), and Malaysia's new COVID-19 cases (MYcovid). This ordering takes into account the fact that the first variable has an immediate effect on the others, while subsequent variables influence those that follow them.

$$x_t = mgsp + vixp + usdmyrp + logoil + loggold + logmycovid \quad (5)$$

By structuring the variables in this manner, the analysis can accurately capture the dynamics and interactions between these critical factors, providing a clearer understanding of their impact on government bond yields during the specified periods.

Following the results from the unrestricted VAR, this research employs variance decomposition functions. These functions are typically used with Cholesky ordering to manage contemporaneous correlation, as suggested by Sims (1980), which requires a predetermined causal order of variables. At the short-run horizon, variance decomposition reveals how much of one variable's forecast error variance can be attributed to other variables (Campbell, 1991). This method summarizes the short-run responses of the variables to shocks in the dependent variables (Lutkepohl & Reimers, 1992).

In this study, the first variable in the Cholesky ordering is government bond yield (MGS), followed by investor sentiment (VIX), the USD/MYR exchange rate, oil price (logoil), gold price (loggold), and Malaysia’s new COVID-19 cases (MYcovid). This order allows us to assess the impact of the pandemic on government bond yields and determine if bonds remain the preferred asset during a crisis. VIX captures global investor sentiment and the heightened risk environment during the COVID-19 pandemic.

The USD/MYR exchange rate is crucial as it represents the Ringgit's movement against the US Dollar. A rise in USD/MYR

indicates Ringgit depreciation, which can drive foreign investors away from Ringgit-denominated assets. Studies by Afonso et al. (2015) and Muharam (2013) highlight that currency movements significantly impact local currency government bond yields. Choy et al. (2019) also found a significant relationship between the Ringgit and Malaysian Government Bonds (MGS).

Next in the order are oil and gold prices. Crude Brent oil price is used as an indicator, as employed by Kang et al. (2014). Malaysia's status as an oil exporter makes it vulnerable to oil price changes. Woertz (2008) noted that Islamic corporate bond investors are sensitive to oil price fluctuations. Gold price, a global determinant, is included due to its role as a safe-haven asset (Baur & Lucey, 2010). Ciner et al. (2013) found a positive relationship between gold prices and bond markets in the US and UK, consistent with this study's use of gold price per ounce in USD.

To evaluate the local COVID-19 situation's influence on government bond yields, we include daily new COVID-19 cases in the analysis. An increase in daily cases may indicate future higher cases if the government does not control outbreaks effectively. Conversely, a decrease in daily cases can reflect successful government interventions. Analyzing daily cases helps determine if spikes affect investor sentiment and bond yields as a safe-haven asset or quality investment.

Beyond variance decomposition, the Impulse Response Function (IRF) captures dynamic responses of variables to shocks within the system. This study uses generalized IRF, which accounts for historical correlation patterns and is unaffected by variable ordering.

(5) Finally, to better understand the correlations between variables, we employ the Granger Causality test (Granger, 1969). This test determines if one variable can predict another, clarifying the direction of influence. The Granger causality analysis supports the findings from impulse response and variance decomposition, offering a comprehensive view of the relationships between variables.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1 Test of Stationary & Cointegration

This section presents the empirical results for the VAR from the period before COVID-19 and during COVID-19 Pandemic. The unit root component of the data series is critical for cointegration and regression analysis since it examines the data's stationary property. The results of the unit root test using Augmented Dickey-Fuller (ADF) are shown in Table 1. The result shows that all the data is stationary at first differenced for pre-COVID-19 and during COVID-19 periods.

Table 1. Unit Root Test

ADF Test	**PRE-COVID-19**		**COVID-19**	
	LEVEL	**FIRST**	**LEVEL**	**FIRST**
MGS	I(0)	I(1)	I(0)	I(1)
VIX	I(1)	I(1)	I(0)	I(1)
USDMYR	I(0)	I(1)	I(0)	I(1)
LOGOIL	I(0)	I(1)	I(0)	I(1)
LOGGOLD	I(0)	I(1)	I(0)	I(1)
LOGMYCOVID-19	NA	NA	I(0)	I(1)

Note: I(0) result shows that the sample have unit root, non-stationary and I(1) proves that the sample data is stationary.

Prior to performing the cointegration test, it is necessary to establish the lag based on a set of predetermined criteria. The Akaike Information Criterion (AIC), the Schwarz Information Criterion (SC), and the Hannan-Quinn Information Criterion (HQC) are the three most commonly used criteria to determine the lag (HQ). We chose to use the SC criterion for both periods based on the optimal lag length criteria results in Table 2. The selected lag is 1 for both the pre-COVID-19 and during COVID-19 eras.

Table 2. Optimal Lag Length

	PRE-COVID-19		COVID-19	
	AIC	SC	AIC	SC
0	-3.14900	-3.10748	2.295097	2.367934
1	-19.92303	-19.67395*	-13.83134	-13.32148*
2	-20.05862*	-19.60197	-13.86978	-12.92289
3	-20.02556	-19.36134	-13.90202*	-12.51811
4	-19.98694	-19.11514	-13.86061	-12.03967
5	-19.95520	-18.87584	-13.78524	-11.52728
6	-19.91385	-18.62692	-13.73934	-11.04436
7	-19.86732	-18.37283	-13.67500	-10.54299
8	-19.85702	-18.15496	-13.66169	-10.09265

Note: * indicates the optimal lag length selected based on the criterion at the $p < 0.05$ significance level.

Following the selection of optimal lag length information, this study then performs the Johansen cointegration test to unravel the long run dynamics between MGS10Y and the selected independent variables such as VIX index, oil price, gold price, and Malaysian COVID-19 cases. According to Table 3, the Johansen Trace statistic and maximum Eigen statistic for all variables suggest below 5% significance level. Hence, the null hypothesis of no cointegration can be rejected, implying that the hypothesis of at least one cointegration exists between the variables. This result supports the hypothesis of a stable long-run relationship between the variables for both periods, pre-covid or during covid. Furthermore, the test also finds that there are 2 cointegration equations for models during COVID-19 period.

Table 3. Johansen Cointegration Test

	PRE-COVID-19		COVID-19	
	TRACE	MAX	TRACE	MAX
	PROB	PROB	PROB	PROB
R=0	0.0031*	0.0050*	0.0027*	0.0461*
R≤1	0.1761	0.3541	0.0391*	0.2549

R≤2	0.3218	0.2778	0.1104	0.1652
R≤3	0.6446	0.6052	0.3714	0.6105
R≤4	0.5442	0.5442	0.3286	0.3123
R≤5	NA	NA	0.3975	0.3975

Note: * Indicates the sample have at least one cointegration between the variables

4.2 Impulse Response

To examine the relative strength of each independent variable in influencing the MGS10Y in the short run, we need to estimate the VAR Model. Since the individual coefficient estimations in VAR do not have straightforward interpretation, this study extends the analysis by employing Impulse Response Function (IRF). IRF typically maps the path of the impact of the selected independent variables such as VIX index, oil price, gold price, and Malaysian COVID-19 cases during the periods of analysis as illustrated below:

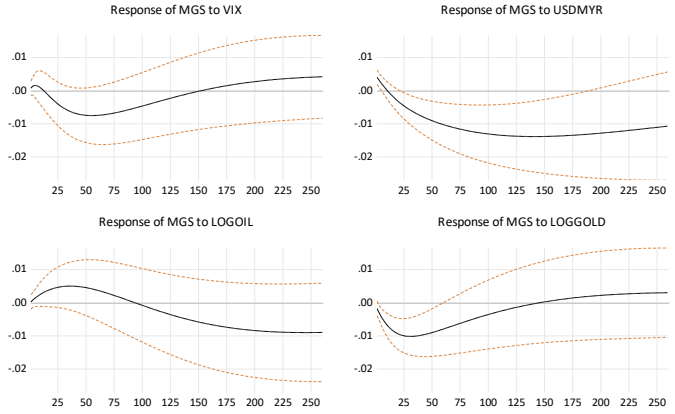

Fig. 1. Impulse Response Pre-COVID-19

Note: The impulse response functions depict the effect of a one-standard-deviation shock to each independent variable (VIX, USD/MYR, LOGOIL, and LOGGOLD) on the Malaysian Government Securities (MGS) yield over 250 days. The solid line represents the estimated response, while the dashed lines indicate the 95% confidence intervals

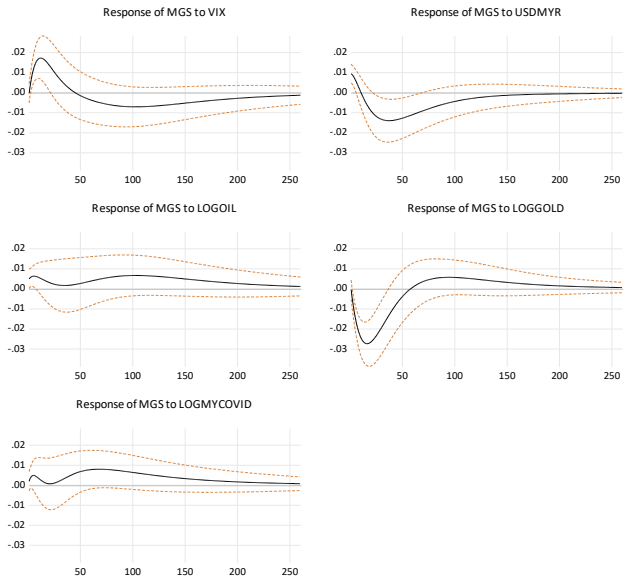

Fig. 2. Impulse Response During COVID-19

Several observations can be made based on the Impulse Response (IRF) results in Figures 1 and 2. During the pre-COVID-19 period, the first figure shows a significant negative relationship between MGS yields and shocks in investor sentiment as measured by the VIX. This relationship is not observed during the COVID-19 period, where MGS yield shows a significant positive relationship with shocks in investor sentiment (VIX). These findings seem to support the flight-to-quality theory, where investors shift their money to safe assets like bonds during a crisis from riskier assets such as equities, resulting in a negative correlation between bond yields and VIX during the pre-COVID-19 period. However, the findings during the COVID-19 period show otherwise, where investors react in the opposite manner. In this regard, investors sell government bonds when investor risk heightens, such as during the crisis period. This result is another form of flight-to-quality behaviour but on a country level, where investors sell riskier government bonds during crises to move to safer and more stable bond markets. It is thus plausible that during such extreme cases of adverse investor sentiment, as seen during the COVID-19 period, we can observe selling pressure on government bonds as global investors do not recognise Malaysia's government bonds as safe-haven assets (Khalid & Ahmad, 2021) and move to other safer bond markets like the US.

In the case of a shock in currency, our findings reveal a significant negative relationship between the Malaysian currency and government bond yield in the long run. This finding is consistent with some studies on sovereign bond yield determinants, such as by Choy et al. (2019), which show a significant role of local currency movements on local currency sovereign bonds. However, during the COVID-19 pandemic, the shock in currency (implying depreciation of the Malaysian Ringgit against the US Dollar) impacts local bond yield and becomes not statistically significant. We can therefore infer that investors react less to changes in currency during the COVID-19 pandemic, which is probably due to efficient monetary policy by the central bank to control currency fluctuation in Malaysia and the quantitative easing happening in the US. As Malaysia is a net exporter of oil and the government relies on income from its oil sector, a positive shock in oil price can improve Malaysia's fiscal income, lower its credit default possibilities, and ultimately improve the government bond yield. These results lend support to the theory of sovereign credit default, where weakness in government fiscal health could lead to an event of default, resulting in investors exiting and selling their investments, pressuring the value lower. However, during the COVID-19 period, the impact of shock in oil price has almost no significant changes in government bond yield. According to Narayan (2020), changes in oil prices have a significant relationship with global COVID-19 daily cases and COVID-19-related news. Despite oil prices falling dramatically in the early stages of COVID-19, the price has recovered to the pre-pandemic level, thanks to a successful vaccine rollout programme.

A vital highlight from this analysis is the impact of gold price shocks on Malaysia's government bond yield. The IRF result presented in Figure 1 shows that gold price movements have a significant negative relationship with government bond yield in the short run, both pre- and during the COVID-19 period. A negative relationship implies that investors will purchase more bonds when gold prices rise, resulting in a lower bond yield. Furthermore, the relationship between bonds and gold became more significant during the COVID-19 period

compared to before COVID-19. This is consistent with findings by Salisu et al. (2021), who found that the gold market remained effective as a safe-haven asset globally during and before the COVID-19 era in the US. Considering that bonds are also deemed safe-haven assets, it is expected that both bonds and gold will rise in value during a crisis. In other words, as gold goes up, investors will buy more bonds, leading to a lower bond yield.

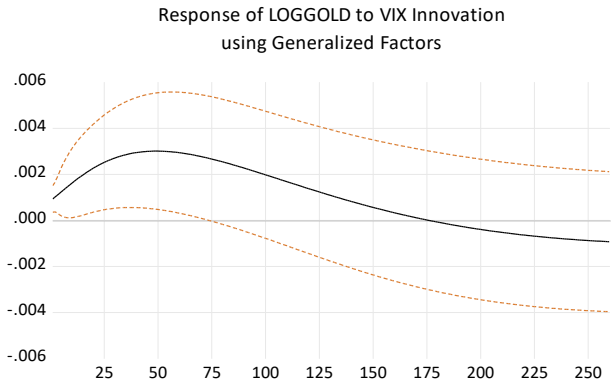

Fig. 3. Gold Price and VIX Index IRF Pre COVID-19

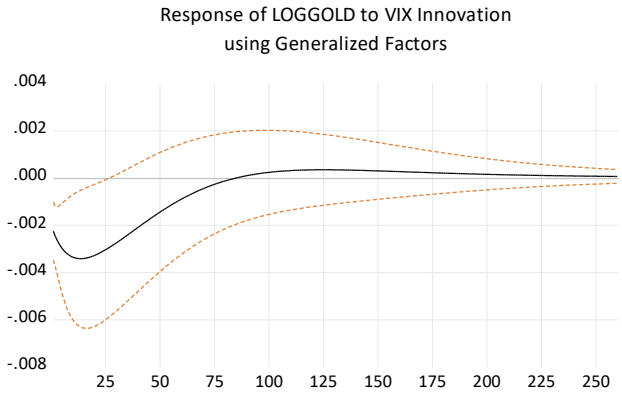

Fig. 4. Gold Price and VIX Index IRF During COVID-19

Fig. 5. Gold Price and VIX Index during COVID-19 Period

The result in Figure 3 shows that during the pre-COVID-19 period, the VIX index had a positive relationship with gold prices. As investor sentiment worsened, indicated by an increase in the VIX, gold prices rose. This is consistent with the expected behaviour of gold as a safe-haven asset during times of market uncertainty, where increased demand drives up prices. This relationship aligns with the flight-to-quality theory, which suggests that investors shift to safer assets like gold during periods of high market volatility and risk. However, during the COVID-19 period, this study finds that gold prices exhibited a significant negative relationship with investor sentiment in the short run, as illustrated in Figure 4. This implies that as investor sentiment worsened, leading to a rise in the VIX, gold prices initially fell. This reaction suggests that during the COVID-19 crisis, investors prioritised liquidity and possibly sold gold to cover losses or meet margin calls in other asset classes.

Figure 5 supports this finding, showing that a spike in investor sentiment in March 2020 resulted in a drop in gold prices, followed by a subsequent rise as investor sentiment improved. These observations contradict the traditional flight-to-quality theory. However, as the initial panic subsided, gold prices began to recover, reflecting its enduring role as a safe-haven asset. Figure 5 further supports this analysis by showing the actual movements of gold prices and the VIX index during the COVID-19 period, where an initial spike in the VIX coincided with a drop in gold prices, followed by a recovery as market conditions stabilised. Similar behaviour was noted during the 2008 financial crisis, where the relationship between gold and the VIX turned negative, as highlighted by Yu-Xin et al. (2021). They explained that extreme adverse investor sentiment led to a liquidity preference over returns. To further analyze the extent to which gold price movements in the short run are influenced by investor sentiment, we employed the Variance Decomposition function, which provides additional insights into this dynamic.

4.3 Variance Decomposition

Table 4. Variance Decomposition Pre COVID-19 (MGS)

Period	S.E.	MGS	VIX	USDMYR	LOGOIL	LOGGOLD
1	0.025086	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.034749	99.90081	0.016666	0.010995	0.011689	0.059836
3	0.041738	99.68657	0.043386	0.036967	0.037296	0.195775
4	0.047318	99.37207	0.070989	0.078251	0.075209	0.403483
5	0.051996	98.96916	0.093946	0.135043	0.123942	0.677914
6	0.056039	98.48742	0.109541	0.207417	0.182128	1.013494
7	0.059609	97.93473	0.117153	0.295332	0.248508	1.404279
8	0.062813	97.31769	0.117663	0.398639	0.321918	1.844090
9	0.065727	96.64203	0.112963	0.517093	0.401282	2.326634
10	0.068408	95.91286	0.105566	0.650362	0.485598	2.845610

Table 5. Variance Decomposition Pre COVID-19 (GOLD)

Period	S.E.	MGS	VIX	USDMYR	LOGOIL	LOGGOLD
1	0.006590	0.471271	2.044507	0.615382	0.404434	96.46441
2	0.009226	0.620885	2.268208	0.599799	0.574386	95.93672
3	0.011194	0.788520	2.508662	0.581956	0.772900	95.34796
4	0.012813	0.971873	2.765595	0.562168	0.997275	94.70309
5	0.014208	1.168755	3.038587	0.540769	1.244804	94.00709
6	0.015445	1.377111	3.327080	0.518099	1.512800	93.26491
7	0.016565	1.595023	3.630400	0.494504	1.798631	92.48144
8	0.017592	1.820715	3.947772	0.470329	2.099740	91.66144
9	0.018545	2.052556	4.278334	0.445917	2.413669	90.80952
10	0.019436	2.289058	4.621157	0.421603	2.738070	89.93011

Table 6. Variance Decomposition during COVID-19 (MGS)

Period	S.E.	MGS	VIX	USDMYR	LOGOIL	LOGGOLD	LOGMYCOVID
1	0.043115	100.0000	0.000000	0.000000	0.000000	0.000000	0.00000
2	0.058754	98.96759	0.39439	0.003419	0.207792	0.336247	0.09056
3	0.069858	96.78131	1.233073	0.005172	0.624244	1.109906	0.24629
4	0.078812	93.71183	2.406453	0.004362	1.174326	2.281844	0.42118
5	0.086548	90.03551	3.796691	0.004752	1.789627	3.788481	0.58493
6	0.093520	86.00262	5.294314	0.012718	2.414622	5.554790	0.72094
7	0.099976	81.81988	6.808068	0.035436	3.008821	7.504890	0.82290
8	0.106050	77.64540	8.268645	0.079606	3.545972	9.569107	0.89126
9	0.111821	73.59159	9.628127	0.150715	4.011677	11.68769	0.93020
10	0.117333	69.73226	10.85704	0.252747	4.400507	13.81198	0.94545

In the short-run horizon, the variance decomposition shows how much of one variable's forecast error may affect other variables. This test will be used to sum up the variables' short-run responses to dependent variables (Lutkepohl & Reimers, 1992).

Table 7. Variance Decomposition during COVID-19 (GOLD)

Period	S.E.	MGS	VIX	USDMYR	LOGOIL	LOGGOLD	LOGMYCOVID
1	0.011138	0.007147	4.062221	0.899518	0.112723	94.91839	0.000000
2	0.015496	0.021039	4.649704	0.639238	0.059779	94.60776	0.022482
3	0.018690	0.039941	5.238008	0.462365	0.054702	94.14060	0.064385
4	0.021270	0.062585	5.821365	0.357396	0.090376	93.55143	0.116851
5	0.023452	0.087948	6.395454	0.313981	0.160395	92.86877	0.173450
6	0.025349	0.115208	6.957109	0.322946	0.259083	92.11597	0.229682
7	0.027028	0.143715	7.504078	0.376254	0.381458	91.31195	0.282541
8	0.028533	0.172960	8.034810	0.466917	0.523180	90.47198	0.330156
9	0.029894	0.202544	8.548298	0.588890	0.680487	89.60828	0.371497
10	0.031134	0.232161	9.043938	0.736967	0.850131	88.73066	0.406148

Based on the Variance Decomposition (VD) above, during the pre-COVID-19 era, the gold price had the most significant impact on bond yield after its own variables, at 2.85% after 10 days. When observing the gold price VD, investor sentiment plays the most significant role after its own variables, at 4.62% after the 10th period, followed by the oil price and bond yield. Meanwhile, according to results during the COVID-19 period, we can observe that gold plays a more prominent role in changes in MGS yield, at 13.81% compared to 4.62% during the pre-COVID-19 period. This result also shows that investor sentiment plays a more significant role, increasing from 0.11% before COVID-19 to 10.86% at the 10th period. Furthermore, looking at gold VD analysis, we notice investor sentiment plays a more significant role after its own variables, at 9.04% at the 10th period, which is 6.19% higher than before the COVID-19 period.

The VD result for MGS in Table 4.4 shows that prior to the COVID-19 period, the biggest mover for MGS bond yield is gold, followed by currency movement and oil price. However, during the COVID-19 period, the gold price and investor sentiment play a bigger role in changes in MGS bond yield in the first 10 days and are less affected by currency movement. This result further substantiates our impulse response findings on the significant relationship between global investor sentiment and gold price on bond yield. As per the analysis during the COVID-19 period, although changes in the government bond yield can be explained by investor sentiment as per Table 4.6, changes in the gold price play a more significant role in government bond yield compared to investor sentiment. However, when focusing on the gold price VD in Table 4.7, the biggest mover to its changes in price is VIX. This result can be interpreted as a movement in investments where investors will move their assets to gold before moving to the bond market during heightened investor risk.

Furthermore, due to the flight to quality in the bond market during the COVID-19 era, there is an opportunity for local investors in the Malaysian bond market to profit by tracking the gold price rather than investor sentiment. When foreign investors depart the domestic market, local investors have a chance to enter the bond market at a lower cost. Since gold and bonds are both safe-haven investments, investors can benefit from capital protection as well as appreciation during a crisis. Finally, this research also finds that a shock in daily new COVID-19 cases in Malaysia does not significantly impact bond yield. While the daily new case count is critical because a continuous increase can lead to a higher number of infections, hence leading to a Movement Control Order enforced by the Malaysian government, our analysis reveals no substantial link between the daily new cases and bond yield. It is probably preferable to look at other factors such as the VIX index and gold price to determine government bond yields.

Table 8. Key summary from IF and VD

Variable	Pre-COVID-19 Impact	During COVID-19 Impact
VIX	Significant negative relationship with MGS yields, supporting flight-to-quality behavior.	Significant positive relationship with MGS yields, reflecting investor sell-offs of Malaysian bonds.
USD/MYR	Significant negative relationship with MGS yields.	No significant relationship observed.
Oil Price	Positive relationship with MGS yields due to improved fiscal health from higher oil revenues.	No significant relationship observed.
Gold Price	Significant negative relationship with MGS yields, consistent with gold as a safe-haven asset.	Stronger negative relationship compared to pre-COVID-19.
Daily COVID-19 Cases	Not applicable (COVID-19 did not exist pre-pandemic).	No significant relationship with MGS yields.

The analysis shows that before COVID-19, MGS yields were negatively influenced by investor sentiment (VIX) and currency, positively by oil prices, and negatively by gold prices, aligning with the flight-to-quality theory. During COVID-19, VIX had a positive impact on MGS yields, reflecting bond selloffs, while currency and oil became insignificant. Gold prices became more influential as a safe-haven asset during the pandemic, consistent with Salisu et al. (2021), who highlighted gold's resilience in crises. Meanwhile, COVID-19 cases had no significant impact, with global factors like VIX and gold prices playing a larger role.

Table 9. Granger Causality Test

Pre-COVID-19	F-Statistic	COVID-19	F-Statistic
DVIX Granger Cause DLOGOIL	19.4060	DVIX does not Granger Cause DMGS	11.5267
DVIX Granger Cause DUSD_MYR	24.3561	DVIX does not Granger Cause DLOGGOLD	7.82034
DLOGGOLD Granger Cause DMGS	15.0215	DVIX does not Granger Cause DUSDMYR	7.11391
DLOGGOLD Granger Cause DUSD_MYR	28.4851	DUSDMYR does not Granger Cause DVIX	9.49459
		DLOGGOLD does not Granger Cause DMGS	7.41980
		DLOGGOLD does not Granger Cause DUSDMYR	14.7322

Finally, our analysis attempts to assess pairwise causality in the Granger sense for the variables of interest. Table 8 shows the direction of causality among MGS, VIX, currency, oil price, gold price, and Malaysia's daily new COVID-19 cases, separated into pre-COVID-19 and during COVID-19 periods. Based on Table 9, the pre-COVID-19 results show significant relationships between investor sentiment and currency, and between investor sentiment and oil. Additionally, gold price has a causal impact on currency. During the COVID-19 period, we observe more significant causal relationships among variables. VIX has a significant causal relationship with bond yield and gold price, and a two-way relationship with currency. Similarly, gold price has a significant causal impact on bond yield and currency.

Table 10. Granger Causality Test

Pre-COVID-19	F-Statistic	COVID-19	F-Statistic
DVIX Granger Cause DLOGOIL	19.4060	DVIX does not Granger Cause DMGS	11.5267
DVIX Granger Cause DUSD_MYR	24.3561	DVIX does not Granger Cause DLOGGOLD	7.82034
DLOGGOLD Granger Cause DMGS	15.0215	DVIX does not Granger Cause DUSDMYR	7.11391
DLOGGOLD Granger Cause DUSD_MYR	28.4851	DUSDMYR does not Granger Cause DVIX	9.49459
		DLOGGOLD does not Granger Cause DMGS	7.41980
		DLOGGOLD does not Granger Cause DUSDMYR	14.7322

The Granger causality analysis demonstrates that gold significantly impacts changes in bond yields and currencies both before and during the COVID-19 period. This result is consistent with our impulse response study and supports the conclusion of Salisu et al. (2021) that gold continues to be an effective safe-haven asset during times of crisis. Additionally, the flight-to-quality theory could explain the phenomenon where investor sentiment (VIX) has a significant causal relationship with bond yields, gold, and currency. This implies that investors adjust their investments in gold and bonds, which in turn affects the currency, depending on the impact on sovereign credit risk.

5. CONCLUSION

This study makes significant contributions to the understanding of global determinants influencing Malaysian government bond yields, particularly in the context of the

COVID-19 pandemic. By utilising daily data from January 2017 to May 2021, the research contrasts the pre-COVID-19 and pandemic periods, providing a comprehensive analysis of how investor behaviour and market dynamics have evolved. The findings reveal critical insights into the equity-like characteristics of Malaysian government bonds during the pandemic, the dominant influence of gold prices on bond yields, and the varied impact of currency movements across different periods. These contributions are pivotal for policymakers and investors, offering practical guidance to navigate future economic uncertainties and optimise investment strategies in times of crisis.

First, our research reveals that during the pandemic, Malaysian government bonds exhibited equity-like characteristics, diverging from their traditional role as safe-haven assets. This finding is evidenced by the positive relationship between bond yields and investor sentiment shocks during COVID-19, indicating that investors were selling their bonds in response to heightened risk. In contrast, the pre-COVID-19 period showed a significant negative relationship between MGS yields and shocks in investor sentiment, aligning with traditional flight-to-quality behaviour. According to Chiang et al. (2015), investors typically react to protect their investments by moving to safe-haven assets such as bonds during financial crises. However, during the COVID-19 period, the opposite reaction was observed, suggesting that global investors did not view Malaysian government bonds as safe-haven assets during the pandemic, possibly due to high foreign investor ownership (Bixmalaysia, 2019).

Second, the study identifies gold prices as the most influential factor affecting bond yields, reaffirming gold's status as a safe-haven asset. As seen in Ciner et al. (2013), the gold price has a negative relationship with bond prices, as both are preferred by investors to protect their investments during crises. This relationship became even more pronounced during the COVID-19 period compared to the pre-COVID-19 period. The significant role of gold prices in influencing bond yields is consistent with findings by Salisu et al. (2021), who concluded that gold continues to be an effective safe-haven asset during times of crisis. Khalid & Ahmad (2021) observed similar equity-like behaviour in the bond markets of ASEAN-5 countries, indicating that global investors might seek higher yields but do not consider these bonds as safe havens. Moreover, despite investor sentiment significantly impacting gold prices, the Malaysian bond market was more influenced by gold prices than by global investor sentiment. This suggests that investors initially moved assets to gold before transitioning back to bonds during heightened risk periods, providing local investors an opportunity to enter the bond market at a cheaper cost when foreign investors exited.

Third, the analysis shows that currency movements played a substantial role, though their impact varied between the pre-COVID-19 and pandemic periods. During the COVID-19 crisis, the depreciation of the Malaysian Ringgit against the US Dollar did not significantly impact local bond yields in the short term, indicating that investors reacted less to currency changes during the pandemic. However, pre-COVID-19 results showed a significant negative relationship between currency movements and government bond yields in the long run, aligning with several studies on sovereign bond yield determinants, such as Afonso et al. (2015). This suggests that while currency depreciation can signal fiscal stress and increase credit risk, its short-term impact during the pandemic was muted.

Unlike advanced markets such as the US, where government bonds maintained their safe-haven status during the pandemic, Malaysian government bonds exhibited equity-like behavior, aligning with patterns observed in other ASEAN-5 countries (Khalid & Ahmad, 2021). These findings highlight the need for policymakers to implement strategies that enhance bond market resilience and reinforce investor confidence during crises, such as promoting local investor participation and ensuring effective communication of fiscal stability.

This study is limited by the exclusion of global factors, such as US Federal Reserve policies, which play a significant role in shaping global bond market dynamics, as well as regional disparities within Malaysia, where variations in economic development, infrastructure, and investment behaviors across different states could influence the demand for and performance of government bonds.

Additionally, future research could explore the co-movement of government bond yields across ASEAN-5 countries and compare them with advanced economies like the US to better understand the flight-to-quality behavior of bond investors during the COVID-19 period. Such studies could also examine the role of emerging safe-haven assets in these markets to provide deeper insights into investor preferences during crises.

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