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UNCERTAINTY A FRIEND OR A FOE FOR GOLD RETURNS: A STUDY ON MALAYSIAN GOLD INSTRUMENTS

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ABSTRACT

This study explores the safe-haven properties of gold instruments offered in the Malaysian market against six different uncertainty measures namely the Chicago Board Options Exchange Volatility Index (VIX), Equity Market Volatility (EMV), Geopolitical Risk (GPR), Global Economic Policy Uncertainty (GEPU), Monetary Policy Uncertainty (MPU) and World Uncertainty Index (WUI). The three different types of gold instruments offered in the Malaysian market namely the Gold Exchange-Traded Fund (ETF), Gold Futures (FGLD) and Gold Bullion Coin (KIJANG EMAS) were examined in this study. The Autoregressive Distributed Lag (ARDL) model was employed to analyse the long run relationship between the variables. The Bounds test results indicated that the gold returns and uncertainty indexes are correlated in the long run, whilst the ARDL results indicated that five out of six uncertainty measures have significant impact on the returns of these gold instruments. One of the key findings of this study reveals a statistically significant positive relationship between EMV and the returns of specific gold instruments. Specifically, a 1% increase in the EMV index contributes to an increase of 3.56% in the returns of FGLD and 2.81% in the returns of KIJANG EMAS. This study expands the knowledge on the impact of uncertainty on Malaysian gold returns and identifies gold's safe-haven properties against uncertainty measures.

Keywords: Gold returns, Uncertainty measures, GOLDETF, FGLD, KIJANG EMAS

INTRODUCTION

Due to its safe-haven properties, gold have always been used by the investment community as a hedge in portfolio diversification especially during periods of extreme economic and political conditions (Bilgin et al., 2018) as when other asset class suffer from periods of extreme volatility, gold is viewed as a safe-haven (Bouoiyour et al., 2018). Besides that, Baur and McDermott (2010) noted that, gold is always considered as an important instrument for the central banks and governments since it serves as a reserve to uphold the value of their respective currencies. Studies have extensively examined the multifaceted roles of gold, with a notable focus on its hedging and safe-haven properties (Kayral et al., 2023; Cui et al., 2023; Chemkha et al., 2021; Akhtaruzzaman et al., 2021). Apart from that, the relationships between gold and other asset classes have been thoroughly examined by scholars, for instance, stocks (Ha, 2022; Salisu et al., 2021; He et al., 2020; Alkhazali & Zoubi, 2020), bonds (Yan et al., 2022; Jareno et al., 2022; Gao et al., 2023), exchange rates (Kumar et al., 2020; Syahri & Robiyanto, 2020; Sheikh et al., 2020), commodities (Naeem et al., 2022), and cryptocurrency (Mensi et al., 2023; Jia et al., 2023; Kim et al., 2020).

Literature has demonstrated that gold can serve as an important instrument for hedging against the volatility in other financial instruments. Wang et al. (2023), examines the hedging abilities of gold on crude oil market during the COVID-19 pandemic, finds evidence that gold maintained a good safe-haven ability for crude oil futures during pre-COVID-19 and post-COVID-19 period. Similarly, Widjaja et al. (2024) studies the ability of gold to act as safe-haven for stocks and bonds market both the conventional and Islamic market during COVID-19 and revealed that gold serves as a robust safe-haven asset for both conventional and Islamic market during periods of economic uncertainty.

Moreover, gold has demonstrated its attractiveness during periods of heightened economic and policies uncertainty. Various measures of uncertainties have been used in the past to analyse their association with gold. For instance, the economic policy uncertainty (EPU) has been employed in the study of Soni et al. (2023) to analyse its association with oil, stocks and gold. The authors concluded that gold played a vital safe-haven role during periods of high EPU. Hasan et al. (2023) explored the hedging properties of gold against five types of uncertainty measures namely, EPU, equity market uncertainty (EMU), the volatility index (VIX), crude oil volatility index (OVX) and gold volatility index (GVZ). They observed that gold returns tend to remain more stable during period of extreme shocks, leading them to conclude that gold is perceived as safe-haven asset in the face of uncertainty, particularly in the event of major shocks.

Inspired by the aforementioned studies, our research aims to understand the safe haven properties of gold by examining the long run cointegration of six uncertainty measures namely the Chicago Board Options Exchange (CBOE) Volatility Index (VIX), Equity Market Volatility (EMV), Geopolitical Risk (GPR), Global EPU (GEPU), Monetary Policy Uncertainty (MPU) and World Uncertainty Index (WUI) on three gold instruments returns that are offered in the Malaysian market namely the Gold Exchange-Traded Funds (ETF), Gold Futures (FGLD) and Gold Bullion Coin (KIJANG EMAS). This study seeks to answer the following key research questions:

1. Does a long-run relationship exists between gold returns and uncertainty?
2. Does uncertainty have a significant impact on gold returns?
3. Do different gold instruments exhibit a differential response to fluctuations in uncertainty?
4. Does gold exhibit safe-haven properties during periods of heightened uncertainty?

This study adds to the current body of literature in two ways. First, while previous studies offer insights into the sensitivity of gold returns to specific uncertainty measures, there remains a gap in understanding how broader economic and political uncertainty factors influences gold returns (Bilgin et al., 2018). Therefore, by incorporating six different types of uncertainty measures, this research intends to enrich the understanding on the determinants of Malaysian gold instruments returns and its safe-haven characteristics. Second, to the best knowledge of the authors, this is the first paper to investigate the long-run cointegration relationship between six different uncertainty indices and returns of Malaysian gold instruments. This article employs the Autoregressive Distributed Lag (ARDL) model proposed by Pesaran and Shin (1995) to analyse the long-run cointegration relationship between variables.

LITERATURE REVIEW

Numerous studies have been conducted on gold being a safe-haven instrument during periods of heightened uncertainty. Su et al. (2022) investigated whether gold performs better during periods of heightened world uncertainty levels as measured by WUI. By employing the quantile on quantile (QQ) approach, the authors found evidence that gold indeed performed better during economic or political chaos periods. The findings also support the idea of gold being utilised as a hedging tool during periods of heightened uncertainty. Kamal et al. (2022), examined the hedging and safe haven properties of gold, oil, equities and foreign exchange rates against the US EPU and GPR during the period of COVID-19 crisis. By employing OLS regression, quantile regression and quantile connectedness approach on pre and post COVID-19 data, the authors documented that gold is a safe-haven asset during periods of extreme stress conditions especially during higher level of US EPU shocks. However, the study also documented that overall gold lost its safe-haven features during the COVID-19 crisis. In contrast, Wu et al. (2019), examined the safe-haven and hedging properties of gold against EPU found that gold act as a weak hedge and weak safe-haven against EPU during the extreme bearish and bullish market conditions. However, the authors indicated that, gold can be considered for portfolio diversification during normal market condition.

Zhao and Wang (2022) investigated the effects of both EPU and Monetary Policy Uncertainty (MPU) of US and China on the time-varying correlations between oil, gold and stock market. The authors employed the quantile regression approach and examined the heterogeneous impacts of uncertainty under different market correlation regimes. The study documented that gold can actually provide a better diversification option for stock market risk compared to crude oil during extreme levels of uncertainty henceforth showcasing its strong hedging characteristics. Purnawan and Puspitasari (2021) investigated the effects of US Monetary Policy Uncertainty (US MPU) on the dynamics of gold prices in Indonesia. By employing the ARDL-ECM approach, the results indicated that gold plays a significant role as both an inflation hedge and a safe-haven asset within the context of Indonesia. Besides that, the findings also indicated that the elevated levels of uncertainty surrounding the US monetary policy and global economic conditions have significantly contributed to a rise in gold prices within Indonesia.

Sikiru and Salisu (2022), assessed the hedging properties of gold, palladium, platinum and silver against uncertainty induced by infectious disease such as H1N1, the Ebola pandemic, H5N1, SARS outbreak and COVID-19. They employed the equity market volatility-infectious disease tracker (EMV-ID) developed by Baker et al. (2019) and tested it against all the four precious metals. The result indicated that the gold market remains the safest market among the precious metals especially during the COVID-19 pandemic. The result regarding hedging effectiveness indicated that among precious metals, gold stands out as the only one with hedging capabilities against health risks. Furthermore, it demonstrates unwavering safe-haven characteristics both on average and during turbulent periods especially during COVID-19 pandemic.

Jubinski and Lipton (2013) incorporated the CBOE VIX index to analyse the safe-haven features of commodities namely gold, silver and oil from 1990 to 2010. By employing the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model, it was evident that the return series of all three commodities were influenced by CBOE VIX. CBOE VIX on one hand has positive impact on gold and silver providing evidence to bolster the notion that investors view precious metals as safe-haven, acquired in anticipation of increased equity market volatility. On the other hand, oil reacted negatively towards the changes in CBOE VIX. Similarly, the study of Boscaljon and Clark (2013) investigated how investors in gold market reacts to market uncertainty as measured by the CBOE VIX index. The study examined the impact of CBOE VIX on SPDR Gold Shares (GLD) exchanged traded funds (ETF). The result of the study indicated that, during period of heightened uncertainty and when large increase is observed in CBOE VIX, an abnormal return in SPDR ETF is registered indicating that gold serves as a safe-haven and a great hedging tool during periods of uncertainty.

While a substantial body of research has examined the properties of gold as a hedge and safe-haven asset during periods of uncertainty, findings have been mixed, varying by methodology, type of uncertainty and market conditions. Earlier studies have mainly focused on developed markets, utilising diverse econometrics approaches such as OLS, quantile regression, and GARCH models to evaluate how gold reacts to uncertainty shocks. This article contributes to the existing literature both theoretically and empirically by focusing on gold instruments offered in the Malaysian market (emerging market). Theoretically, it extends the safe-haven and hedging literature by integrating six dimensions of uncertainty simultaneously. This offers a more holistic understanding of Malaysian gold's role during times of global economic and financial uncertainty. Empirically, this article adds value by employing the ARDL methodologies examining the long run cointegration relationship between gold and uncertainty in the context of emerging market.

Through this contribution, this article aims to offer new insights into the dynamic of gold's safe-haven properties and provide information to both investors and policymakers on the evolving role of gold in times of uncertainty especially in the Malaysian market.

DATA, ECONOMETRIC METHODOLOGY AND EMPIRICAL MODEL

Data

In this article, we consider the monthly return series of three gold instruments offered in the Malaysian market as the dependent variables. Firstly, the GoldETF over the period from January 2018 to December 2022 (60 observations). Secondly, the Gold Futures (FGLD) over the period from January 2014 to December 2022 (108 observations), and finally the 1 oz Gold Bullion Coin (KIJANG EMAS) over the period of January 2008 to December 2022 (180 observations). The price data for the gold series were obtained from the Bloomberg terminal. The monthly data for the uncertainty measures that were used in this study namely the CBOE-VIX, EMV, GPR, GEPU, MPU and WUI were obtained from policyuncertainty.com host by (Baker et al., 2016). The bilateral exchange rate which is the USD/MYR (hereinafter referred as EXR) and the Malaysian Government Bond 10-Y Yield (hereinafter referred as MTB) were used as the control variables. Both the data for EXR and MTB were extracted from the IMF database. All the variables are transformed to the natural logarithmic form in the empirical analysis. A summary of the operationalisation of the variables, descriptive statistics and correlation matrix are provided in Tables 1, 2 and 3, respectively.

TABLE 1
Table of operationalisation

Item	Definition	Operationalisation	Data source	Additional information
GoldETF	Exchange-traded funds that tracks the performance of gold prices.	Measure the returns on Gold ETF over time using monthly closing prices.	Bursa Malaysia, Bloomberg	Focus on the most commonly traded Gold ETF, Trade Plus Shariah Gold Tracker.
FGLD	Gold Futures Contract which allows investors to gain exposure to international gold price movements.	Track the returns on FGLD based on gold price movements on a monthly basis.	Bursa Malaysia, Bloomberg	Traded on Bursa Malaysia Derivatives counter.
Kijang Emas	A gold coin issued by Bank Negara Malaysia, a popular physical gold investment product in Malaysia.	Track returns on Kijang Emas coins time using monthly closing prices.	Bank Negara Malaysia	The Kijang Emas coin is sold by Bank Negara Malaysia through selected Maybank branch.
VIX	The CBOE Volatility Index, a measure of market volatility.	Measure the monthly closing value of the VIX, representing expected market volatility.	CBOE, Bloomberg, Yahoo Finance	Represents implied volatility from S&P 500 index options. Can be used as a market sentiment indicator.
WUI	World Uncertainty Index, a measure of global economic uncertainty.	Track the WUI index value, which quantifies global uncertainty based on media coverage and economic events.	Policy Uncertainty	The WUI uses news-based content analysis to capture global uncertainty and is available monthly.
MPU	Monetary Policy Uncertainty, the unpredictability in central bank policy decisions.	Measure MPU using the frequency of policy-related news articles, central bank statements or interest rate announcements.	Policy Uncertainty	MPU is often quantified using text analysis of central bank reports and media coverage of policy changes (e.g., interest rate decisions, reserve changes).

(*Continued on next page*)

TABLE 1 (*Continued*)

Item	Definition	Operationalisation	Data source	Additional information
EMV	Equity Market Volatility, capturing the variability in equity market returns.	Calculate EMV using the standard deviation of daily/monthly returns on equity market indices, such as the S&P 500 or FTSE 100.	Policy Uncertainty	Can be calculated as the annualised standard deviation of daily/monthly returns over a set time period
GEPU	Global Economic Policy Uncertainty, indicating uncertainty regarding economic policies worldwide.	Track the GEPU index, derived from global news articles, focusing on uncertainty in economic policy.	Policy Uncertainty	Often based on text mining of news sources and data analysis related to political and economic policy uncertainty (e.g., fiscal policy, trade policy).
GPR	Global Political Risk, a measure of geopolitical risks affecting markets.	Measure GPR using the GPR index, which is based on political risk factors like political stability, conflict and policy uncertainty in regions worldwide.	Policy Uncertainty	Geopolitical risk can be assessed by examining factors like political events (e.g., elections), government stability and conflicts.
EXR	The bilateral exchange rate (MYR/USD), the value of Malaysia Ringgit (MYR) against the US Dollar (USD).	Measure the daily/monthly exchange rate for MYR/USD. Record the closing value each day/month.	Bank Negara Malaysia, Bloomberg	Key to understanding Malaysia's currency performance against the USD. Can impact imports, exports, and inflation in Malaysia.
MTB	Malaysia Treasury Bonds, government-issued debt securities.	Measure the yield of Malaysia Treasury Bonds, often focusing on yields 10-year maturities.	Bank Negara Malaysia, Bloomberg	MTB yields reflect investor confidence in Malaysia's fiscal health. Monitoring of bond yields can indicate macroeconomic trends like inflation expectations.

TABLE 2
Summary of descriptive statistics and description

Panel A: Summary of descriptive statistics and description of the GoldETF model for January 2018 to December 2022 (60 observations)

Variables	Unit	Measure	Mean	S. D.	Skewness	Kurtosis
GoldETF	Spot Price	Logarithmic Form	0.5923	3.679	0.411	3.281
VIX	Index	Logarithmic Form	3.027	0.332	0.478	2.747
WUI	Index	Logarithmic Form	10.113	0.414	–0.142	2.787
MPU	Index	Logarithmic Form	5.226	0.418	–0.093	2.767
EMV	Index	Logarithmic Form	3.075	0.310	0.841	4.193
GEPU	Index	Logarithmic Form	5.506	0.250	–0.256	2.750
GPR	Index	Logarithmic Form	4.562	0.315	1.295	5.474
EXR	USD/MYR	Logarithmic Form	1.430	0.038	0.805	4.449
MTB	Coupon rate	Logarithmic Form	1.258	0.157	–0.502	2.097

Panel B: Summary of descriptive statistics and description of the FGLD model for January 2014 to December 2022 (108 observations)

Variables	Unit	Measure	Mean	S. D.	Skewness	Kurtosis
FGLD	Futures price	Logarithmic form	0.486	4.449	–0.512	6.589
VIX	Index	Logarithmic form	2.860	0.347	0.649	3.001
WUI	Index	Logarithmic form	10.061	0.365	0.159	3.006
MPU	Index	Logarithmic form	5.031	0.464	0.171	2.376
EMV	Index	Logarithmic form	2.931	0.328	0.735	3.784
GEPU	Index	Logarithmic form	5.253	0.387	–0.150	1.984
GPR	Index	Logarithmic form	4.586	0.265	1.087	5.845
EXR	USD/MYR	Logarithmic form	1.397	0.088	–1.387	4.278
MTB	Coupon rate	Logarithmic form	1.310	0.134	–1.222	3.651

Panel C: Summary of descriptive statistics and description of the Kijang Emas for January 2008 to December 2022 (180 observations)

Variables	Unit	Measure	Mean	S. D.	Skewness	Kurtosis
Kijang Emas	Spot price	Logarithmic form	0.553	4.814	–0.109	4.239
VIX	Index	Logarithmic form	2.958	0.371	0.618	3.060
WUI	Index	Logarithmic form	9.954	0.368	0.365	2.796
MPU	Index	Logarithmic form	4.970	0.429	0.367	2.607
EMV	Index	Logarithmic form	2.974	0.332	1.039	4.818
GEPU	Index	Logarithmic form	5.091	0.388	0.349	2.145
GPR	Index	Logarithmic form	4.520	0.232	1.507	7.521
EXR	USD/MYR	Logarithmic form	1.306	0.136	–0.137	1.444
MTB	Coupon rate	Logarithmic form	1.325	0.121	–1.108	4.360

TABLE 3
Correlation matrix

Panel A: Correlation Matrix for GoldETF January 2018 to December 2022

Regressors	GoldETF	LVIX	LWUI	LMPU	LEMV	LGEPU	LGPR	LEXR	LMTB
GoldETF	1.000								
LVIX	0.102	1.000							
LWUI	0.157	–0.042	1.000						
LMPU	0.251	0.419	0.401	1.000					
LEMV	0.245	0.557	0.045	0.478	1.000				
LGEPU	0.237	0.455	0.351	0.745	0.443	1.000			
LGPR	0.077	0.049	0.169	0.176	–0.292	0.004	1.000		
LEXR	0.060	0.433	0.257	0.536	0.117	0.557	0.288	1.000	
LMBT	–0.079	–0.304	0.108	–0.077	–0.369	–0.350	0.582	0.189	1.000

Panel B: Correlation Matrix for FGLD January 2014 to December 2022

Regressors	FGLD	LVIX	LWUI	LMPU	LEMV	LGEPU	LGPR	LEXR	LMTB
FGLD	1.000								
LVIX	0.135	1.000							
LWUI	0.088	0.049	1.000						
LMPU	0.188	0.570	0.358	1.000					
LEMV	0.216	0.673	0.130	0.624	1.000				
LGEPU	0.082	0.522	0.362	0.748	0.559	1.000			
LGPR	–0.118	–0.044	0.091	0.001	–0.247	–0.086	1.000		
LEXR	0.033	0.307	0.295	0.583	0.310	0.688	0.071	1.000	
LMBT	–0.099	–0.410	–0.006	–0.236	–0.416	–0.468	0.490	–0.102	1.000

Panel C: Correlation Matrix for Kijang Emas January 2008 to December 2022

Regressors	Kijang Emas	LVIX	LWUI	LMPU	LEMV	LGEPU	LGPR	LEXR	LMTB
Kijang Emas	1.000								
LVIX	0.175	1.000							
LWUI	0.065	–0.147	1.000						
LMPU	0.171	0.329	0.339	1.000					
LEMV	0.158	0.722	–0.036	0.501	1.000				
LGEPU	0.055	0.174	0.463	0.679	0.362	1.000			
LGPR	–0.008	–0.163	0.135	0.017	–0.253	0.109	1.000		
LEXR	0.052	–0.047	0.372	0.387	0.070	0.670	0.308	1.000	
LMBT	–0.016	–0.159	–0.144	–0.230	–0.226	–0.488	0.326	–0.124	1.000

ECONOMETRIC METHODOLOGY AND EMPIRICAL MODEL

Unit Root Test

In order to employ the ARDL model, we need to ensure that the variables are stationary at level, I(0) or stationary at first difference I(1). It is essential to run the stationarity test in ARDL models to ensure model validity, avoid spurious regression, check for cointegration and select the appropriate differencing for non-stationary variables. This study employs the Augmented Dickey Fuller (ADF) and Phillips-Perron Test to test for the presence of unit root. Based on the ADF test, at level, the logarithmic values of GOLDETF, FGLD, KIJANG EMAS, CBOE-VIX, EMV, GEPU, MPU and WUI were found to be stationary whilst, GPR, EXR and MTB were found to be stationary at first difference. However, based on the PP test, only CBOE-VIX, WUI, MPU, EMV, GEPU and GPR were stationary at level, whilst GOLDETF, FGLD, KIJANG EMAS, EXR and MTB were found to be stationary at first difference. The mixed integration order of the variables based on ADF and PP test provides a strong justification for employing the ARDL model in this study. The ADF and PP results is provided in Table 4.

TABLE 4
Augmented Dickey Fuller (ADF) and Phillips-Perron Test results

Variables	With constant		With constant and trend	
	I(0)	I(1)	I(0)	I(1)
Augmented Dickey-Fuller Test				
GoldETF	–8.5152 (0.0000***)	–9.0211 (0.0000***)	–8.4638 (0.0000***)	–8.9345 (0.0000***)
FGLD	–11.4398 (0.0000***)	–10.0748 (0.0000***)	–11.3919 (0.0000***)	–10.0192 (0.0000***)
Kijang Emas	–16.3065 (0.0000***)	–13.2852 (0.0000***)	–16.1029 (0.0000***)	–13.2445 (0.0000***)
VIX	–3.7280 (0.0060***)	–10.1624 (0.0000***)	–4.1133 (0.0102**)	–10.0667 (0.0000***)
WUI	–3.4865 (0.0118**)	–7.9950 (0.0000***)	–3.5349 (0.0448**)	–7.9628 (0.0000***)
MPU	–3.8558 (0.0041***)	–5.7970 (0.0000***)	–3.8100 (0.0228**)	–5.8004 (0.0000***)

(*Continued on next page*)

TABLE 4 (*Continued*)

Variables	With constant		With constant and trend	
	I(0)	I(1)	I(0)	I(1)
Augmented Dickey-Fuller Test				
GEPU	–3.2310 (0.0230**)	–10.6726 (0.0000***)	–3.2624 (0.0827*)	–10.6915 (0.0000***)
GPR	–2.9294 (0.0480**)	–9.3087 (0.0000***)	–3.1080 (0.1140)	–9.2221 (0.0000***)
EXR	–1.8712 (0.3434)	–6.9658 (0.0000***)	–2.3569 (0.3977)	–6.9085 (0.0000***)
MTB	–1.3164 (0.6164)	–9.0856 (0.0000***)	–1.1833 (0.9046)	–9.2752 (0.0000***)
Philips Perron Test				
GoldETF	–1.0367 (0.7345)	–8.5492 (0.0000***)	–2.0754 (0.5484)	–8.4914 (0.0000***)
FGLD	–1.2661 (0.6432)	–11.2812 (0.0000***)	–2.5208 (0.3177)	–11.2310 (0.0000***)
Kijang Emas	–0.7212 0.8375	–15.6700 (0.0000***)	–2.3045 0.4290	–15.6410 (0.0000***)
VIX	–3.6545 (0.0074***)	–12.4735 (0.0000***)	–4.1133 (0.0102**)	–12.3304 (0.0000***)
WUI	–3.3946 (0.0151**)	–11.4190 (0.0000***)	–3.3780 (0.0642*)	–11.4612 (0.0000***)
MPU	–3.8255 (0.0045***)	–10.8861 (0.0000***)	–3.7929 (0.0238**)	–10.9666 (0.0000***)
EMV	-4.5028 (0.0006***)	–10.7765 (0.0000***)	–4.4616 (0.0038***)	–10.6600 (0.0000***)
GEPU	–3.0495 (0.0361**)	–11.0530 (0.0000***)	–3.2624 (0.0827*)	–11.4507 (0.0000***)
GPR	–2.8696 (0.0551*)	–9.5702 (0.0000***)	–3.0682 0.1234	–9.4596 (0.0000***)
EXR	–1.9357 0.3141	–6.9355 (0.0000***)	–2.3569 0.3977	–6.8711 (0.0000***)
MBT	–1.1828 0.6763	–9.1765 (0.0000***)	–2.3569 0.3977	–6.8711 (0.0000***)

Note: *, **, ***, indicates the rejection of null hypothesis at 10%, 5%, and 1% significance level.

Autoregressive Distributed Lag (ARDL) Model

This study applied the ARDL methodology introduced by Pesaran and Shin (1995) to analyse the long-run cointegration relationship between the gold returns and uncertainty indexes. The ARDL model for this study is expressed as follows:

$$
\begin{aligned}
&GOLDETF\ RET_t \\
&\qquad = a \ + a_1 LVIX_{t-1} + a_2 LWUI_{t-1} + a_3 LMPU_{t-1} \\
&\qquad\quad + a_4 LEMV_{t-1} + a_5 LGEPU_{t-1} + a_6 LGPR_{t-1} \\
&\qquad\quad + a_7 LEXR_{t-1} + a_8 LMTB_{t-1} + e_t
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
&FGLD\ RET_t \\
&\qquad = a_0 + a_1 LVIX_{t-1} + a_2 LWUI_{t-1} + a_3 LMPU_{t-1} \\
&\qquad\quad + a_4 LEMV_{t-1} + a_5 LGEPU_{t-1} + a_6 LGPR_{t-1} \\
&\qquad\quad + a_7 LEXR_{t-1} + a_8 LMTB_{t-1} + e_t
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
&KIJANG\ EMAS\ RET_t \\
&\qquad = a_0 + a_1 LVIX_{t-1} + a_2 LWUI_{t-1} + a_3 LMPU_{t-1} \\
&\qquad\quad + a_4 LEMV_{t-1} + a_5 LGEPU_{t-1} + a_6 LGPR_{t-1} \\
&\qquad\quad + a_7 LEXR_{t-1} + a_8 LMTB_{t-1} + e_t
\end{aligned}
\tag{3}
$$

Where $GOLDETF\ RET_t$ = returns of gold exchange traded funds at time t; $FGLD\ RET_t$ = returns of gold futures at time t; $KIJANG\ EMAS\ RET_t$ = returns of Kijang Emas at time t; $LVIX_{t-1}$ = log CBOE-volatility index at time $t-1$; $LWUI_{t-1}$ = log world uncertainty index at time $t-1$; $LEMV_{t-1}$ = log equity market volatility index at time $t-1$; $LGEPU_{t-1}$ = log global economic policy uncertainty index at time $t-1$; $LGPR_{t-1}$ = log geopolitical risk index at time $t-1$; $LEXR_{t-1}$ = log USD/MYR exchange rate at time $t-1$; $LMTB_{t-1}$ = log Malaysian 10-Y treasury bill at time $t-1$; and e_t = error term at time t.

RESULTS AND DISCUSSION

ARDL Bounds Test

Table 5 reports the outcomes of the ARDL Bounds test for GOLDETF, FGLD and KIJANG EMAS. The main purpose of this ARDL Bounds test is to determine the existence of a long-run relationship between gold returns and uncertainty. The long-run relationship can only be verified provided the null hypotheses are rejected.

TABLE 5
ARDL Bounds Test for GOLDETF, FGLD and KIJANG EMAS

Critical value	Lower bound I(0)		Upper bound I(1)
1%	2.62		3.77
5%	2.11		3.15
10%	1.85		2.85
Model	**GOLDETF**	**FGLD**	**KIJANG EMAS**
F-statistics	21.7906***	11.0223***	16.2404***
k	8	8	8
Result	Cointegrated	Cointegrated	Cointegrated

Notes: *** indicates the rejection of the null hypothesis at 1% significance level. The optimal lag structure for GOLDETF is (4,4,4,4,4,4,4,4,3), FGLD is (4,1,0,4,1,4,0,1,2) and KIJANG EMAS is (4,1,0,2,1,2,0,0,0).

The ARDL Bounds test results in Table 5 shows that the F-statistics for GOLDETF, FGLD and KIJANG EMAS models exceeds the upper bound of the critical value at a 1% significance level. This leads to the rejection of the null hypothesis, concluding that the variables, i.e., gold returns and uncertainty indexes are cointegrated in the long run.

ARDL Cointegration and Long-Run Coefficient

The results of the long-run cointegration analysis are provided in Table 6.

TABLE 6
Long-run coefficient of ARDL approach results

Model	GOLDETF	FGLD	KIJANG EMAS
LVIX	–6.7809***	–2.2423**	–0.1076
LWUI	–0.3363	0.3422	0.7049
LMPU	0.5168	0.9006	1.8867***
LEMV	6.9225***	3.5586***	2.8135***
LGEPU	2.1469	–1.5474	–2.7418***
LGPR	2.6017**	0.4751	0.2591
LEXR	8.6282	4.7088	1.4942
LMTB	–5.8738***	–3.0785	–1.7479
Constant	–28.6599***	–8.2677	–10.5835

Notes: *** indicates the rejection of the null hypothesis at 1% significance level. The optimal lag structure for GOLDETF is (4,4,4,4,4,4,4,4,3), FGLD is (4,1,0,4,1,4,0,1,2) and KIJANG EMAS is (4,1,0,2,1,2,0,0,0).

Based on the results tabulated in Table 6, LVIX, LEMV and LGPR were found to have a significant impact on the returns of GOLDETF. Uncertainty arising from the VIX index has been found to negatively impact the long-term returns of GOLDETF. The ARDL analysis results indicates that heightened volatility as measured by VIX introduces significant risk factors that diminish the performance of GOLDETF over extended period. The increase in VIX reduces the attractiveness of GOLDETF which then indicates that GOLDETF is not a safe-haven investment during periods of high VIX. Our results differ from those of Jubinski and Lipton (2013) and Boscaljon and Clark (2013) who found that VIX has a positive impact on gold. Our results indicated that a 1% increase in VIX leads to a 6.78% drop in GOLDETF returns. On the other hand, uncertainty arising from EMV and GPR has been found to positively influence the long-term returns of GOLDETF. The ARDL analysis demonstrates that increased equity market volatility and geopolitical risk create conditions that enhances the overall performance of GOLDETF over extended periods. It is also evident that investors tend to gravitate towards GOLDETF as a reliable safe-haven asset during heightened periods of equity market volatility and geopolitical risk.

This finding aligns with the study of Kamal et al. (2022) and Sikiru and Salisu (2022) who documented that EMV and GPR has a positive impact on gold. It is expected that for every 1% increase in EMV leads to an increase in GOLDETF returns by 6.92% whilst for every 1% increase in GPR leads to an increase in GOLDETF returns by 2.60%.

As for FGLD, the uncertainty as measured by LVIX and LEMV were found to be having a significant impact on the returns of FGLD in the long run. Uncertainty captured by VIX has been found to negatively impact the long-term returns of FGLD which contradicts to the findings of Jubinski and Lipton (2013) and Boscaljon and Clark (2013). Similar to the impact on GOLDETF, the heightened uncertainty levels as measured by VIX index which is also known as the "fear gauge" leads to lower confidence among investors which then reduces the overall performance of FGLD over an extended period. An increase in VIX reduces the attractiveness of FGLD which in return indicates that FGLD isn't a safe-haven instrument during periods of high VIX. A 1% increase in VIX may result in FGLD shedding 2.24%. On the contrary, uncertainty arising from EMV has been found to positively influence the long-term returns of FGLD which is consistent with the findings of Kamal et al. (2022) and Sikiru and Salisu (2022). The ARDL analysis demonstrates that increased level of equity market volatility enhances the performance of FGLD. During periods of heightened equity market volatility, investors tend to gravitate towards gold as a safe-haven asset, further boosting the performance of FGLD. It is expected that for every 1% increase in EMV, the FGLD returns will increase by 3.56%. The ARDL results clearly shows that the FGLD serve as a hedge against equity market volatility.

For KIJANG EMAS, the uncertainty as measured by LMPU, LEMV and LGEPU were found to be having a significant impact on the returns of KIJANG EMAS in the long-run. The uncertainty measured by Global Economic Policy Uncertainty has been observed to have a detrimental effect on the long-run performance of KIJANG EMAS. The negative coefficient suggests that as uncertainty increases especially uncertainty that relates to changes in the global economic policies, the long-term returns of KIJANG EMAS tend to decrease, highlighting its sensitivity to global risk factors. The finding also suggests that an increase in GEPU reduces the attractiveness of KIJANG EMAS which in return indicates that this particular instrument is not a good choice of safe-haven asset during periods of heightened GEPU.

Our findings contradict to the findings of Qin et al. (2020) in which the authors found that gold can effectively hedge risks of GEPU. Based on our results, a 1% increase in GEPU may result in KIJANG EMAS to shed its value by 2.74%. Meanwhile, uncertainty arising from MPU and EMV has been found to positively influence the long-term returns of KIJANG EMAS. The result from the ARDL analysis indicates that increased monetary policy uncertainty and equity market volatility create conditions that enhances the overall performance of KIJANG EMAS over extended period. Investors tend to gravitate towards this instrument and regard is as safe-haven asset during periods of high MPU and EMV. A 1% increase in MPU and EMV boost the performance of KIJANG EMAS by 1.88% and 2.81%, respectively. The results also suggest that KIJANG EMAS serve as a hedge against equity market volatility and monetary policy uncertainty. Our overall findings align with the study of Zhao and Wang (2022), Purnawan and Puspitasari (2021), and Sikiru and Salisu (2022), in which the authors found that gold reacts positively to EMV and MPU.

Error Correction Term (ECT) and Diagnostic Checking

The results of the Error Correction Model (ECM) and diagnostic checks are detailed in Table 7. These diagnostic checks are crucial for validating the robustness and reliability of the results. The diagnostic check includes the Breusch-Godfrey Lagrange Multiplier (LM) test, Breusch-Pagan-Godfrey Heteroscedasticity Test, Ramsey RESET Test, Jarque Bera Test. CUSUM Test and CUSUMSQ Test. These diagnostic checks ensure that the model is correctly specified and that its assumptions hold, thereby providing confidence in the model's results and inferences.

TABLE 7
Error Correction Term (ECT) and diagnostic checking

Model	GOLDETF	FGLD	KIJANG EMAS
ECT (–1)	–3.0468***	–1.9651***	–1.9097***
LM (2)	2.7780	0.4012	0.6944
B-P-G	0.8652	1.03125	1.4001
RESET (1)	0.4308	1.1762	0.7582
JARQUE BERA	0.3742	0.6086	0.9064
CUSUM	S	S	S
CUSUMSQ	S	S	S

Notes: The lag length for LM test is 2 whilst the lag length for the RESET test is 1. The letter 'S' denotes 'Stable'.

Generally, the ECT represents the speed at which the adjustment process occurs to restore equilibrium when a disturbance affects the long-run equilibrium relationship. In this article, the ECT figures are found to be negative and statistically significant at the 1% level. The interpretation of the ECT results is as follows:

GOLDETF will be corrected based on 103.0468% per period and it will take 1/3.0468 = 0.3282 months for the model to move back into long-run relationship.

FGLD will be corrected based on 101.9651% per period and it will take 1/1.9651 = 0.5088 months for the model to move back into long-run relationship.

KIJANG EMAS will be corrected based on 101.9097% per period and it will take 1/1.9097 = 0.5236 months for the model to move back into long-run relationship.

The LM test results suggest that all the models are free from serial correlation problems. Additionally, the B-P-G test results indicate neither model suffer from heteroscedasticity. Furthermore, the RESET test results show that the models are free from specification errors. The Jarque Bera test indicated that the residuals of the ARDL models are normally distributed (See Figures 1, 2 and 3). Lastly, the Cumulative Sum of Recursive Residual (CUSUM) and Cumulative Sum of Squares of Recursive Residual (CUSUMSQ) test results indicate all the models are stable, as the statistics fall within the 5% significance level (see Figures 4, 5 and 6).

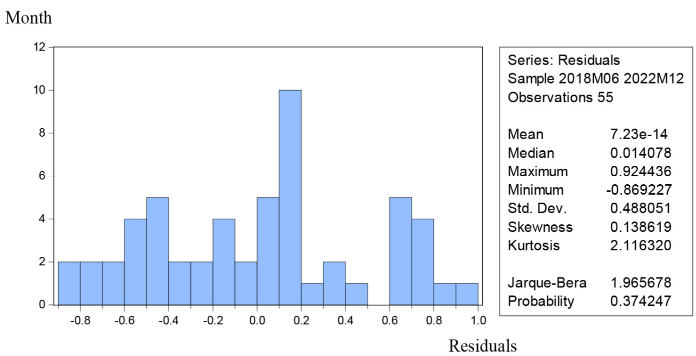


FIGURE 1: Normality Test and Jarque Bera Test for GOLDETF

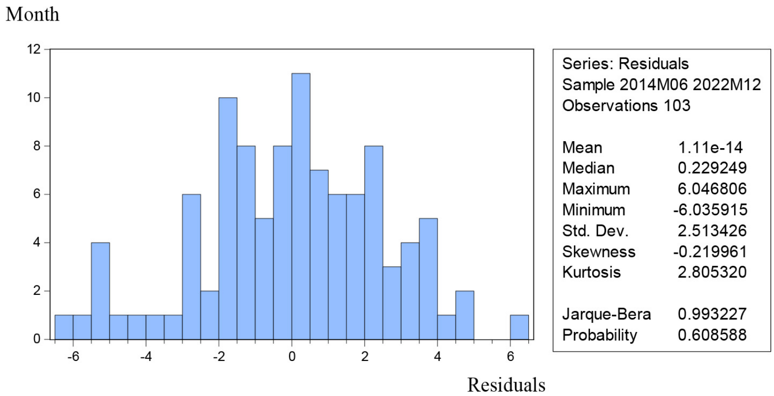


FIGURE 2: Normality Test and Jarque Bera Test for FGLD

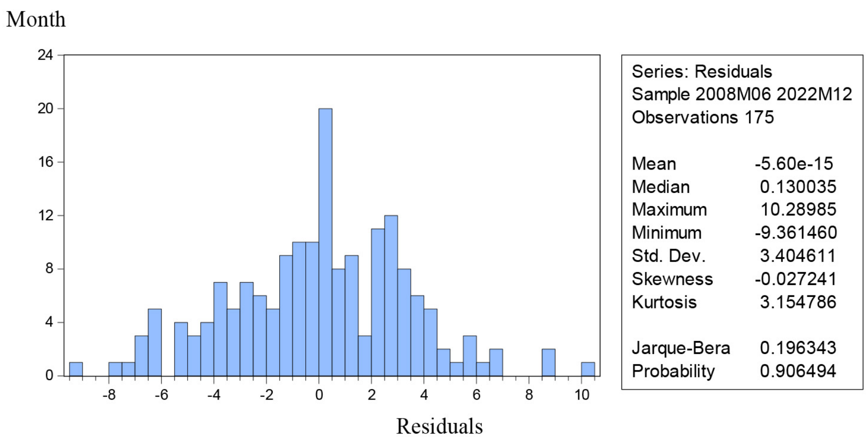
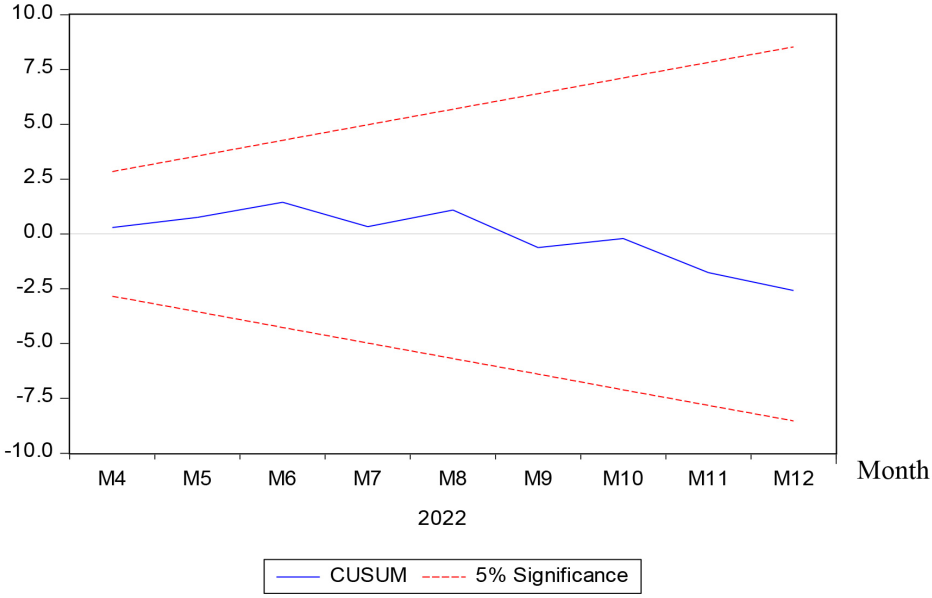


FIGURE 3: Normality Test and Jarque Bera Test for Kijang Emas



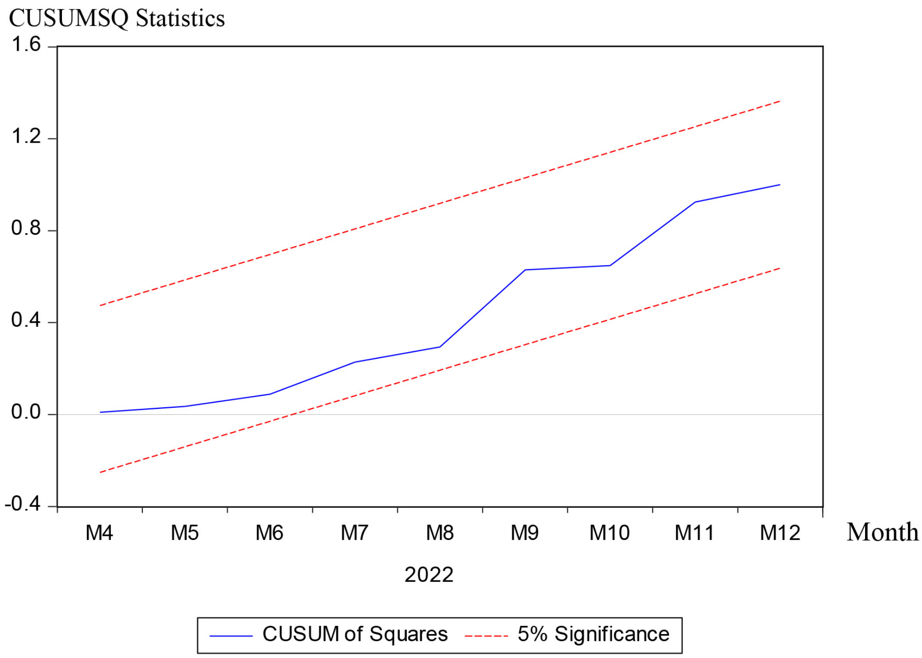
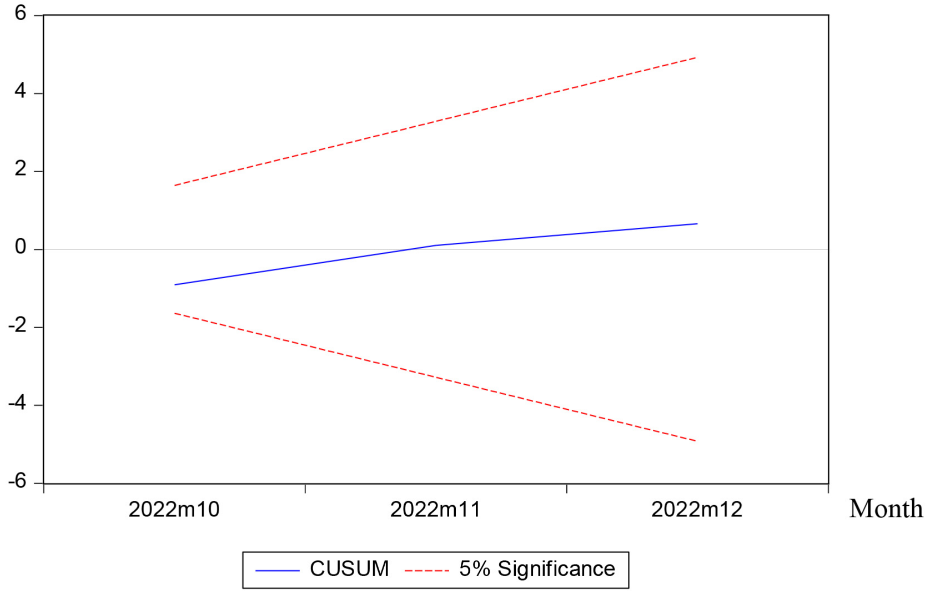


FIGURE 4: CUSUM and CUSUMSQ For GOLDETF



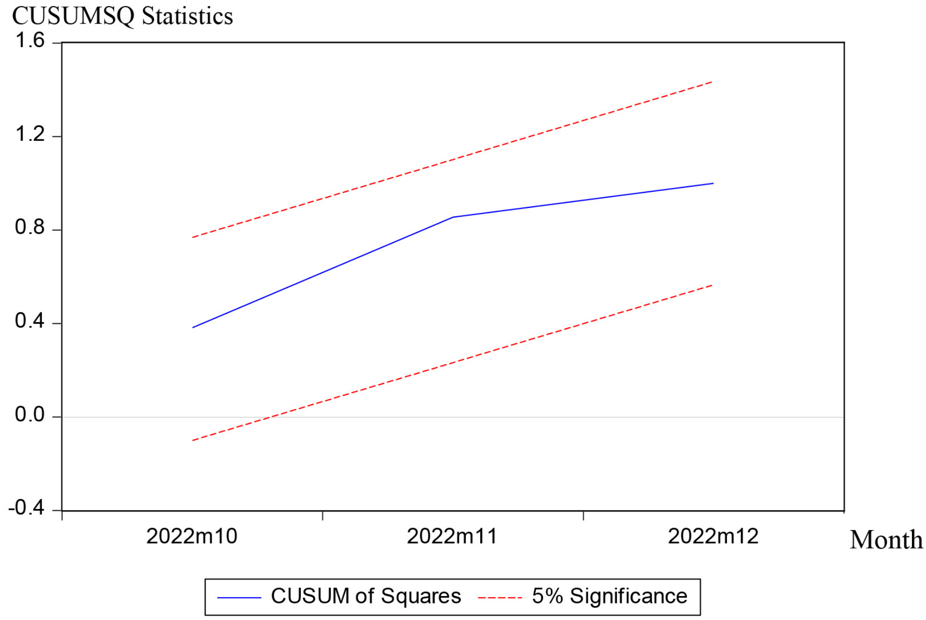


FIGURE 5: CUSUM and CUSUMSQ for FGLD

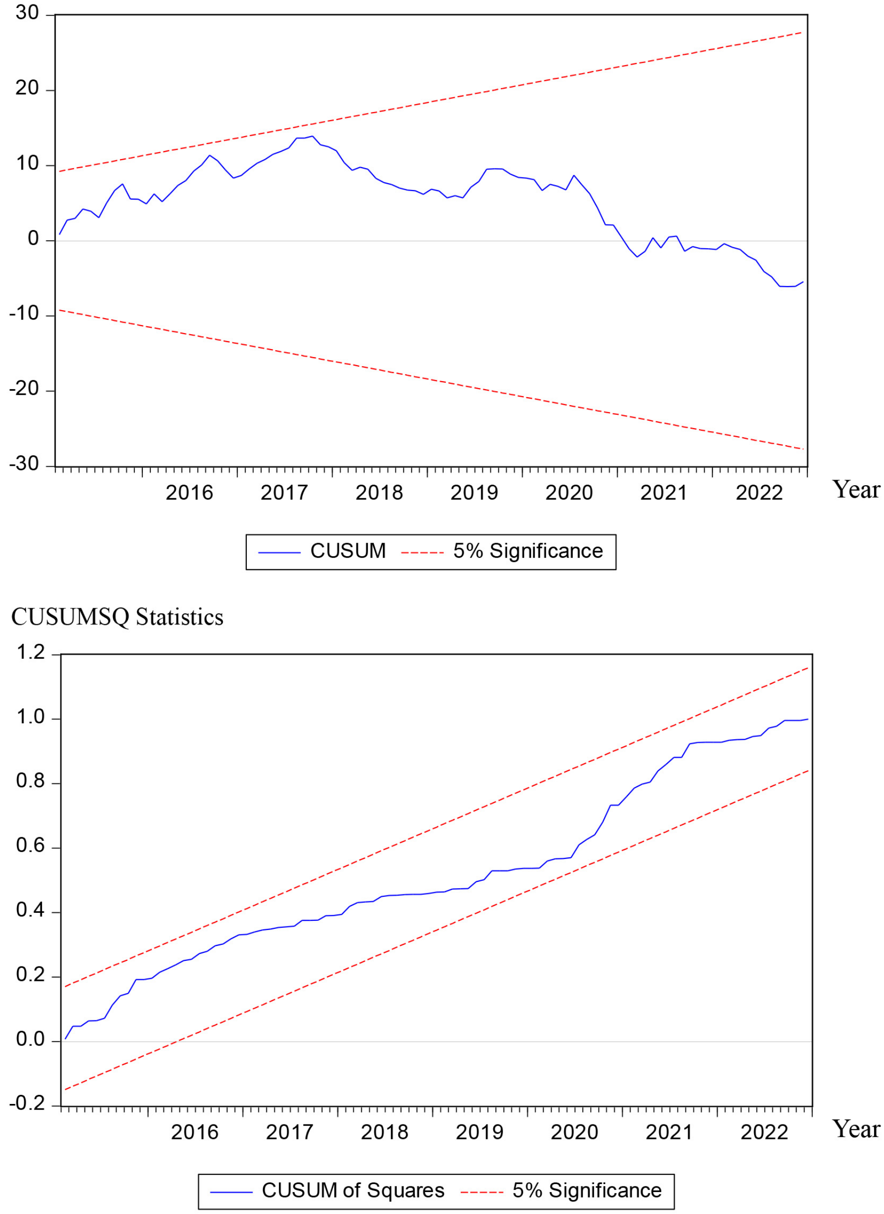


FIGURE 6: CUSUM and CUSUMSQ for KIJANG EMAS

Additionally, the BDS test (see Table 8) was applied to the residuals of the ARDL models of GOLDETF, FGLD and KIJANG EMAS to evaluate the adequacy of the model specification, especially in capturing nonlinear dependencies. As for GOLDETF, the BDS test produced the *p*-values below the 0.05 significance level across embedding dimensions 2 to 5, which leads to the rejection of the null hypothesis that the residuals are independently and identically distributed (IID). The results indicates that the ARDL model for GOLDETF is mis specified, as it fails to fully capture the underlying dynamics of the series especially potential nonlinear structure. Due to this, the ARDL model of GOLDETF should be rejected or revised, potentially in favour of a nonlinear modelling approach. On the other hand, the residuals from the ARDL models for FGLD and KIJANG EMAS yielded p-values consistently above 0.05 indicating no significant evidence of nonlinearity. Henceforth, the ARDL models for FGLD and KIJANG EMAS are considered well specified and appropriate.

TABLE 8
BDS test results

Model	2	3	4	5	6
GOLDETF	0.005	0.0153	0.0035	0.0480	0.2161
FGLD	0.7636	0.0526	0.0557	0.3316	0.4707
KIJANG EMAS	0.9137	0.5795	0.4031	0.2505	0.1130

Note: The distance value of the test is 0.7. For the details of the BDS test, please see Broock et al. (1996)

CONCLUSION

In this study, we analysed the relationship of six uncertainty index (i.e., VIX, WUI, MPU, EMV, GEPU and GPR) on the returns of three gold instrument (GOLDETF, FGLD, KIJANG EMAS) traded in the Malaysian market. Our primary objective is to identify the safe-haven properties of gold against uncertainty measures. This present study employed a novel econometric approach known as the ARDL model to identify the potential long-run cointegrating relationship between these variables. The result of this study provides a comprehensive answer to the four key research questions:

1. Does a long-run relationship exists between gold returns and uncertainty?
2. Does uncertainty have a significant impact on gold return?
3. Do different gold instrument exhibits a differential response to fluctuations in uncertainty?
4. Does gold exhibit safe-haven properties during period of heightened uncertainty?

First, the cointegration test confirms the existence of a long run relationship between gold returns and uncertainty, indicating that gold prices adjust over time to persistent changes in the level of uncertainty. Second, the ARDL regression results confirms that uncertainty as measured by EMV has a statistically significant positive impact on the returns of FGLD and KIJANG EMAS reinforcing the view that gold appreciates during uncertainty periods and acts as a hedge against risk. Third, the analysis of different gold instrument, i.e., futures (FGLD) and physical gold (KIJANG EMAS) reveal differential response to EMV shocks. FGLD shows a higher return of 3.56%, compared to a 2.81% increase for KIJANG EMAS. This suggest that derivatives-based gold reacts more strongly to uncertainty, likely due to greater liquidity and ease of access, whereas physical gold show a more moderate but still positive response. Finally, our empirical analysis finds evidence that gold function as a reliable safe-haven asset during turbulent times, though the strength of this role can vary depending on the form of gold instrument and the nature of uncertainty. One similarity that we found through our empirical analysis is that, all the three gold instruments including GOLDETF responds positively to the changes in EMV. Henceforth, we can draw a conclusion that gold is considered as a safe-haven in times of high-level equity market volatility. Based on the empirical result, we can conclude that EMV is indeed a 'friend' to gold returns rather than a 'foe'. It is important to note that the ARDL model for GOLDETF failed the BDS test for residual independence, indicating potential model misspecification due to unaccounted nonlinear dynamics. Henceforth, the findings related to GOLDETF should be interpreted with caution, and we must reject the validity of this model's result in its current form. The results obtained from this study provide valuable insights into portfolio diversification and risk management practices. For investors, particularly during periods of heightened uncertainty, gold especially in derivative form such as FGLD proves to be an effective hedge against market volatility which supports the inclusion of gold assets in diversified portfolio.

On the other hand, for policymakers, the study highlights the importance of financial market instruments like gold in absorbing uncertainty shocks. This study contributes to the growing body of literature on the safe-haven role of gold by providing context-specific insights from the Malaysian gold market. By incorporating both physical and derivatives gold instrument and evaluating them against multiple forms of uncertainty, the study extends existing theories on gold's hedging and safe-haven properties. Despite its contributions, this study has several limitations. First, the short time series, especially for GOLDETF, may weaken the analysis of long-run dynamics. Second, the ARDL model assumes linear relationship, which may not fully capture the complexity of financial markets which is evident in the BDS test failure for GOLDETF. Future studies should consider exploring non-linear models such as NARDL to better capture asymmetries and hidden patterns. Additionally, future studies on the determinant of gold returns can also explore additional measures of uncertainty such as Twitter-based uncertainty, financial stress indicator and trade policy uncertainty. At present, equity market volatility can be considered a potential driver of gold returns.

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