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The impact of the Russia-Ukraine conflict on market volatility: stability of Islamic cryptocurrency

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Abstract

Purpose - This research investigates how the Russia-Ukraine conflict affects the volatility of cryptocurrencies, with a specific focus on the comparative stability of Islamic gold-backed cryptocurrencies versus conventional cryptocurrencies, such as Bitcoin.

Method - Utilizing the GARCH model, this study examines the risk factors and volatility transmission among cryptocurrencies (Bitcoin and Tether-gold), traditional financial markets (gold and stock markets), and their interrelationships during the conflict period. The study employs the daily closing prices of Bitcoin, Tether-gold, gold, the S&P 500, and the Dow Jones Islamic Market Index from February 7, 2020, to November 30, 2023.

Result - Bitcoin experienced significant volatility during the conflict, while the Tether-gold remained more stable. Islamic gold-backed cryptocurrencies have proven to be more stable than conventional ones during geopolitical crises.

Implication - The findings offer valuable insights for investors seeking safe-haven assets during periods of economic uncertainty. Gold-backed cryptocurrencies present a more stable investment option compared to conventional cryptocurrencies, especially for investors adhering to Shariah principles.

Originality - This research highlights the stability of Islamic gold-backed cryptocurrencies during geopolitical events, contributing to the understanding of safe-haven assets and offering practical implications for portfolio diversification and risk management.

Keywords: cryptocurrency; volatility; geopolitics; bitcoin; tether gold

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Introduction

The Russia-Ukraine conflict has caused significant disruptions to the global economy, leading to financial instability for both businesses and consumers (Karagiannopoulou et al., 2023; Pereira et al., 2022). The war has impacted financial markets, influencing stock returns (Boubaker et al., 2022; Boungou & Yatié, 2022), commodities markets (Appiah-Otoo, 2023a), and corporate decision-making (Tosun & Eshraghi, 2022). War exerts a significant influence on the cryptocurrency market (Appiah-Otoo, 2023b; Kayral et al., 2023; Khalfaoui et al., 2023; Le et al., 2023; Theiri et al., 2022). On the first day of the invasion, on February 24, 2022, the price of Bitcoin fell by 7.26% within 24 hours of the attack on Ukraine. This condition changed the investment behavior of many people, as those who previously took high risks due to the conflict have now shifted to playing the market with investments in safe havens (Kayral et al., 2023; Widjaja et al., 2023).

Moreover, there is compelling evidence that the transmission of volatility increases rapidly during periods of crisis (Adekoya & Oliyide, 2022; Akhtaruzzaman et al., 2021; Corbet et al., 2020; Karagiannopoulou et al., 2023). Given the current economic climate, investors must identify assets that function as safe havens or exhibit hedging behavior to diversify their portfolios. The objective of this diversification strategy is to reduce risk and strengthen portfolio resilience during times of market volatility or economic uncertainty. Understanding the dynamic interplay between asset classes and identifying those that exhibit countercyclical tendencies is paramount for investors seeking to preserve capital and navigate challenging economic landscapes (Conlon et al., 2020; Ji et al., 2020; Shehzad et al., 2021).

The ongoing discussion on whether cryptocurrencies can be classified as secure and reliable investment options persists. According to several analysts, cryptocurrencies, unlike gold, do not possess the necessary stability to be categorized as safe haven investments. High volatility and a lack of direct intervention in cryptocurrency prices are cited as reasons for this classification (Kayral et al., 2023; P.Wang et al., 2019). Bitcoin and ethereum,

for instance, do not serve as secure refuge for most of the foreign stock markets analyzed. Including them in a portfolio increases the potential for negative outcomes (Conlon et al., 2020). Furthermore, Sifat (2021) and Wang & Wang (2021) concluded that the volatility of cryptocurrencies remained unaffected by the COVID-19 pandemic.

Recent studies by Mokni et al. (2020) has demonstrated that Bitcoin can act as a hedge during periods of economic instability. Furthermore, Kalyvas et al. (2020) discovered that Bitcoin can serve as a safe haven across various currencies. Under specific market conditions, it can also serve as a hedge (Cheng & Yen, 2020). Moreover, incorporating Bitcoin into investing portfolios has been shown to yield substantial profits and enhance risk-adjusted results (Brière et al., 2015). Cryptocurrencies are more effective as hedging assets than equities and the U.S. dollar, as shown in several studies (Corbet et al., 2020; Dyhrberg, 2016; Ghorbel et al., 2022; Kayral et al., 2023; Widjaja et al., 2023). Conversely, gold is widely viewed as a secure refuge (Baur & McDermott, 2010; Kayral et al., 2023). Bitcoin, the leading digital cryptocurrency, is often referred to as digital gold (Disli et al., 2021; Koutmos et al., 2021). Cryptocurrencies have hedging and safe haven attributes comparable to gold (Antonakakis et al., 2019; Shahzad et al., 2019).

In addition, Salisu & Ogbonna (2022) examined the performance of cryptocurrencies during crises and discovered that news driven by fear had a substantial impact on increasing the volatility of cryptocurrencies, beyond levels observed before the pandemic. Conlon et al., (2020) substantiated the inherent volatility of bitcoin over this period. In contrast, Goodell & Goutte, (2021) determined that Bitcoin prices experienced an increase throughout the pandemic period, while Corbet et al., (2020) proposed that major cryptocurrencies served as a means of preserving value during this time. Interestingly, Islamic cryptocurrencies, which are often represented by gold-backed cryptocurrencies

Salisu & Ogbonna (2022) analyzed the performance of cryptocurrencies during crises and found that fear-driven news significantly heightened cryptocurrency volatility, surpassing pre-pandemic levels. Conlon et al.,

(2020) also confirmed Bitcoin's intrinsic volatility during this time. However, Goodell & Goutte, (2021) observed that Bitcoin prices increased throughout the pandemic, while Corbet et al., (2020) suggested that major cryptocurrencies acted as value-preserving assets during the period. Interestingly, Islamic cryptocurrencies, typically represented by gold-backed cryptocurrencies, have also been explored during such crises (Alshater et al., 2022; Bahloul et al., 2022; Emna & Anis, 2020; Lucero, 2020; Mnif et al., 2023; Wasiuzzaman et al., 2022), have been studied in the context of crises such as the COVID-19 pandemic and have been found to be resilient to crises such as COVID-19 shocks and the Federal Reserve Policy. The study also found that Islamic cryptocurrencies were not vulnerable to FOMC announcements, unlike traditional cryptocurrencies (Mnif & Jarboui, 2022). Ha & Nham, (2022), utilizing a time-varying parameter vector autoregression (TVP-VAR) model, found that the health disruptions caused by COVID-19 influenced the changing dynamics between crude oil, gold, stocks, and the cryptocurrency market.

Multiple studies suggest that Islamic stocks may not serve as reliable safe haven assets during periods of financial instability (Hassan et al., 2023). However, other research has shown that Islamic stocks have demonstrated resilience and have been a secure investment choice for G7 stock markets during the pandemic crisis. Moreover, empirical research has shown that Islamic financial assets, specifically sukuk, exhibit robustness throughout the pandemic. It is noteworthy that Islamic stock markets saw a lesser impact from the initial wave of the pandemic than traditional stock markets. However, they are more severely affected by the second wave (Hasan et al., 2022). The resilience of Islamic stock markets during times of crisis, as well as their performance relative to conventional stock markets, remains an ongoing subject of research and analysis (Alamgir & Cheng, 2023).

The Russia-Ukraine conflict is regarded as a highly unpredictable and rare event known as a black swan event. Therefore, it is worthwhile to examine how major financial markets responded to and bounced back from the crisis. This study seeks to enhance the scientific community's

understanding by analyzing the instability of cryptocurrencies amidst the economic crisis caused by the Russia-Ukraine conflict. In particular, the period of analysis spans from February 7, 2020, to November 30, 2023, capturing not only the onset and escalation of the Russia-Ukraine conflict, but also the broader economic conditions leading up to and following the invasion. Furthermore, it seeks to examine the correlation between cryptocurrencies and traditional financial markets, such as gold and stock markets, during this specific timeframe. This study aims to fill the gap in research on the transmission of volatility between Bitcoin and other financial assets. To achieve this, it uses Bitcoin (BTC) as a representative traditional cryptocurrency, Tether-gold (XAUT) as a cryptocurrency backed by gold, gold prices as a commodity, and categorizes the stock market into conventional stock markets represented by the S&P 500 and Islamic stock markets represented by the Dow Jones Islamic Market Index (DJIM) (Mnif & Jarboui, 2022; Yousaf & Yarovaya, 2022). By employing the GARCH approach, the analysis is expected to uncover the risk factors evident in the volatility of cryptocurrencies, which are thought to stem from investor sentiment regarding the Russia-Ukraine conflict.

Literature Review

Investor sentiment

Investor sentiment theory, a concept in behavioral finance, pertains to investors' outlook regarding future stock market activity and the formation of their beliefs (Baker & Wurgler, 2007; López-Cabarcos et al., 2020). Various authors have suggested diverse methodologies for quantifying investor sentiment, including the use of proxies such as trading behavior and portfolio dynamics of retail investors, as well as sentiment indices. According to this hypothesis, investor attitude has the potential to impact stock prices, leading to certain outcomes on portfolio performance and investment choices (Baker & Wurgler, 2007; Mehrani et al., 2016).

A bottom-up strategy is employed to assess investor sentiment by examining biases in individual investor psychology, including overconfidence,

representativeness, and conservatism. This methodology seeks to understand how these biases influence individual investors' reactions to historical returns or fundamentals, leading to either underreactions or overreactions. An alternative method is the top-down approach, which considers the genesis of investor sentiment to be external and concentrates on its observed consequences. This study shows the viability of measuring investor sentiment and emphasizes the substantial and consistent influence of sentiment waves on both individual firms and the broader stock market (Baker & Wurgler, 2007; López-Cabarcos et al., 2020; Mehrani et al., 2016; Ph & Rishad, 2020).

Empirical studies have demonstrated that investor attitudes have a significant impact on stock prices and investment returns, including those related to cryptocurrencies. Consequently, this has unavoidable consequences for the performance of one's investment portfolio and the choices made in investing. Research has also identified a link between the instability of stock markets and that of the cryptocurrency market, along with the influence of investor sentiment on returns, whether those returns are positive or negative. The presence of high-frequency data has enabled the development of investors' feelings and the identification of sentiment predictability as a systematic risk factor (Dincă et al., 2023; López-Cabarcos et al., 2020; Mehrani et al., 2016; Ph & Rishad, 2020).

Market Volatility

Financial market volatility reflects the degree of fluctuations in the value of an instrument within a specific period (Dyhrberg, 2016; Karagiannopoulou et al., 2023). This volatility introduces risks and uncertainties for market participants, leading to unstable investment interests and impacting the global financial market. In statistical science, volatility is interpreted as a change in fluctuations against the average financial time series of securities returns (Salisu & Ogbonna, 2022). Standard deviation is the simplest estimation tool for measuring volatility, providing uniform observation weights. However, this method has two limitations: it is symmetrical and

constant. High return volatility indicates significant fluctuations in securities' value, while low return volatility suggests a stable movement in securities' value (Karagiannopoulou et al., 2023; Umar & Gubareva, 2021).

Volatility in asset prices is regarded as one of the most perplexing phenomena in financial economics, presenting a considerable challenge for investors to fully grasp. A thorough review of the current literature on stock market volatility and return analysis underscores the importance of understanding the theoretical and practical significance of volatility when evaluating the positive development of the stock market. The study also emphasizes the significance of literature reviews as a basis for advancing knowledge, delivering guidance for planning and implementation, and providing a basis for determining impact (Bhowmik & Wang, 2020).

A study was carried out to explore the relationship between stock indices and cryptocurrencies during the Russia-Ukraine War. The aim was to understand the impact of the conflict on the connection between the U.S. and China stock markets, as well as the interdependence between cryptocurrencies and stock indices. The intricate and vehement battle between Russia and Ukraine, specifically during the 2022 invasion, has resulted in substantial market responses and compelled numerous Western authorities to respond promptly. This situation has also influenced the decisions of Western companies operating in Russia, thus affecting stock market volatility (Dincă et al., 2023).

Russia-Ukraine War and Impact on Stock Market and Cryptocurrencies

The ramifications of the Russia-Ukraine War on stock markets have been the subject of substantial investigation and examination. Multiple studies have demonstrated that the conflict has caused significant reactions in stock market indices, especially over the duration of the conflict. The conflict negatively affects stock markets through monetary, financial, and political channels. A previous study examined how G20+ stock markets responded to the black swan event of the Russia-Ukraine conflict, highlighting the

interconnection between stock indices and cryptocurrencies during this geopolitical crisis (Choi, 2023; Ullah et al., 2023).

Anastasiou et al. (2021) explored the effect of crisis sentiment on the risk of cryptocurrency price crashes, finding a positive relationship between crisis sentiment and the risk profile of cryptocurrencies. This suggests that geopolitical events, such as the Russia-Ukraine conflict, may increase the likelihood of price crashes in cryptocurrencies. Similarly, Boungou & Yatié (2022) investigated the impact of the Russia-Ukraine conflict on cryptocurrency trading volume, revealing that the conflict negatively affected Bitcoin trading volume, particularly in the period following the invasion. Their study examined Bitcoin trading volume both before and after the invasion, highlighting the conflict's significant influence. Moreover, a thorough investigation carried out in prior studies demonstrated that gold functions as a robust refuge, but Bitcoin and Ethereum exhibit limited refuge characteristics when compared to traditional stock indexes (Będowska-Sójka & Kliber, 2021). Disli et al. (2021) conducted a study on gold and bitcoin in relation to Islamic equity indices. The findings indicate that neither gold nor Bitcoin exhibit safe-haven characteristics.

Additionally, the study assessed the resilience of Islamic financial markets during the COVID-19 pandemic. The findings revealed that the pandemic affected Islamic financial markets, including Islamic gold-backed cryptocurrencies and Islamic stock markets. However, these markets show greater resilience than conventional financial markets (Hasan et al., 2022). It is worth noting that there is a lack of research on investments based on Islamic faith. However, this study has garnered the attention of experts, especially amid a subprime crisis (Umar & Gubareva, 2021). The ethical and socially responsible aspects of this investment have garnered considerable interest from both conventional and faith-based investors (Umar et al., 2022).

The war has affected stock market indices, commodity markets, and the risk characteristics of cryptocurrencies. The relationship between stock indices and cryptocurrencies during this geopolitical event has been a focus of research, offering important insights for investors, policymakers, and

participants in financial markets. Gaining a comprehensive understanding of how geopolitical events influence stock market dynamics is crucial for making informed decisions and managing risk in the global financial environment.

Efficient Market Hypotesis on Russia-Ukraine Conflict

The Efficient Market Hypothesis (EMH) is a widely accepted theory in finance that suggests financial markets are efficient and fully reflect all available information in asset prices. According to this hypothesis, in a market that operates efficiently, it is not feasible to use previous information to forecast future prices. Consequently, investors face challenges in achieving abnormal returns (Gaio et al., 2022; Kakran et al., 2023). The relationship between the Russia-Ukraine war and the Efficient Market Hypothesis (EMH) can be seen in the possible impact of the war on market efficiency, as shown by disparities in stock prices, anomalous returns, and trading volume.

Several studies explored the impact of the Russia-Ukraine conflict on stock markets and commodity prices across different countries. Kamal et al. (2023) examines the impact of the Russia-Ukraine crisis on the Australian stock market by employing the event research approach. They discovered a substantial decrease in anomalous returns on the day of the event. Additionally, it was discovered that small and medium-sized enterprises experienced negative consequences both before and after the event. Sari et al. (2023) determined that the IDX demonstrates a degree of semi-strong form market efficiency, indicating that stock prices incorporate all publicly accessible information, such as news and events. Consequently, investors face challenges in achieving extraordinary returns by utilizing this information. Nevertheless, the study also reveals that the degree of market efficiency fluctuates based on specific events and sectors. Stock prices in the energy sector exhibited consistent and significant reactions during all three phases of the Russia-Ukraine war, as evidenced by notable fluctuations (Sari et al., 2023).

This indicates that the Russia-Ukraine war has the ability to affect market reactions, with the level of market efficiency varying by event and sector. Evidence from multiple studies suggests that the Efficient Market Hypothesis (EMH) is not supported in the context of the Russia-Ukraine conflict, showing that asset prices become more predictable during periods of instability and global financial crises (Gaio et al., 2022; Kakran et al., 2023). The relationship between the Russia-Ukraine War and the Efficient Market Hypothesis (EMH) is reflected in the war's potential effect on market efficiency, as evidenced by fluctuations in stock prices, abnormal returns, and trading volume.

Additionally, gold, traditionally seen as a safe haven asset, experienced significant fluctuations in its price return during the conflict. The rise in geopolitical tensions caused an increase in demand for gold, leading to price surges, as investors sought refuge from volatility in equity and cryptocurrency markets (Baur & McDermott, 2010). The behavior of gold prices during this period further illustrates how market efficiency can be compromised in times of crisis. Studies have shown that geopolitical uncertainty can drive significant changes in gold prices, making them more predictable during conflict periods (Adekoya & Oliyide, 2022). Investors were able to predict movements in gold prices based on the unfolding events, thus challenging the Efficient Market Hypothesis (EMH). The findings from multiple studies indicate that the market efficiency theory is disproven in the context of the Russia-Ukraine conflict. This shows that asset prices, including gold prices, can be predicted during times of instability and global financial crises, further undermining the notion of market efficiency (Duc Huynh et al., 2020; Shahzad et al., 2019; Yousaf & Yarovaya, 2022).

Research Methods

Data Source

This study aims to analyze the volatility of cryptocurrencies, particularly Bitcoin as a traditional cryptocurrency and Tether-gold (XAUT) as a gold-backed cryptocurrency, in relation to gold prices, as well as conventional and Islamic stock markets, during the Russia-Ukraine war. To accomplish this, the

daily closing prices for Bitcoin, Tether-gold, gold, the S&P 500, and the Dow Jones Islamic Market Index were examined from February 7, 2020, to November 30, 2023. A war dummy variable was introduced to indicate the start of the Russia-Ukraine conflict on February 24, 2022.

Table 1. Variable

Variable	Formula	Source
Crypto Return	$R\_BTC = \frac{BTC_t - BTC_{t-1}}{BTC_{t-1}}$	Yahoo Finance and Coinmarketcap
	$R\_XAUT = \frac{XAUT_t - XAUT_{t-1}}{XAUT_{t-1}}$	
Gold Price Return	$R\_GOLDP = \frac{GOLDP_t - GOLDP_{t-1}}{GOLDP_{t-1}}$	Investing.com
S&P500 Return	$R\_S\&P500 = \frac{S\&P500_t - S\&P500_{t-1}}{S\&P500_{t-1}}$	Yahoo Finance
DJIM Return	$R\_DJIM = \frac{DJIM_t - DJIM_{t-1}}{DJIM_{t-1}}$	Yahoo Finance
War Dummy	Conflict 0 = Before 1 = After	

Volatility Estimation Utilizing the GARCH Model

The analytical framework employed in this research is the GARCH model initially formulated by Bollerslev (1986) as an extension of the ARCH model. The GARCH model incorporates lagged conditional variance terms in an autoregressive fashion to address the limitation observed in the ARCH model, which exhibits a semblance to a moving average specification (Asteriou & Hall, 2021). In the GARCH model, a conditional variant is maintained as autoregressive. In particular, the conditional residual variance (h_t) in the GARCH model is affected by both the residual from the prior period and the conditional residual variance from that same prior period.

This study adopts the GARCH (1,1) model as a basis for estimating the return volatility of cryptocurrencies (Bitcoin and Tether-gold). The mean equation return model is as follows:

$$R\_BTC_t = \alpha + \beta_1 GOLDP_t + \beta_2 S\&P500_t + \beta_3 DJIMI_t + u_t \quad (1)$$

$$R\_XAUT_t = \alpha + \beta_1 GOLDP_t + \beta_2 S\&P500_t + \beta_3 DJIMI_t + u_t \quad (2)$$

The residual (u_t) was assumed to be identically independently normally distributed (iid) with zero mean and a constant variance (σ^2). Meanwhile, the variance model used for cryptocurrency return volatility is as follows:

$$h_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 u_{t-1}^2 + \sum_{i=1}^{q} \delta_1 h_{t-i} + WAR\ DUMMY \quad (3)$$

Results and Discussion

Descriptif Statistic

The observation period began on February 7, 2020, and ended on December 13, 2023, with daily data (5 day week), resulting in 1004 observations. This is because Tether USD (XAUT) began the historical data on that date. Table 2 shows the descriptive statistics of the variables.

Table 2. Statistic Descriptive

	RBTC	RXAUT	BTC	XAUT
Mean	0,00237	0,000294	29247,73	1833,843
Median	0,000968	0,000370	27525,34	1831,314
Maximum	0,211097	0,079293	67566,83	2068,834
Minimum	-0,371695	-0,065480	4970,788	1466,927
Std. Dev.	0,041809	0,009473	14952,71	104,9963
Skewness	-0,643951	0,063156	0,418918	-0,290686
Kurtosis	12,33780	11,49095	2,330752	2,764714
	GOLD	S&P500	DJIM	WAR
Mean	1832,799	3976.337	7977,019	0.468127
Median	1830,200	4089.615	8088,400	0.000000
Maximum	2071,000	4796.560	9945,320	1.000000
Minimum	1477,300	2237.400	4339,230	0.000000
Std. Dev.	104,5993	514.2226	1114,020	0.499232
Skewness	-0,300751	-0.872137	-0,694460	0.127750
Kurtosis	2,842914	3.235261	3,156112	1.016320

Source: Data Processed (2023)

Throughout the observed period, the Bitcoin (BTC) market exhibited an upward trend, as evidenced by the average positive return of 0.0023. This bullish sentiment is further supported by the relative volatility in market activity during the observation period, captured by a return standard deviation of 0.0418. Furthermore, the Tether-gold (XAUT) market exhibited an upward trend similar to that of the Bitcoin market, as evidenced by the average positive return of 0.0002. The relatively volatile, characterized by a return standard deviation of 0.0418, instilled further confidence in the market and fueled bullish sentiment. Based on these results, it is evident that gold-backed (theter-gold) cryptocurrencies have lower volatility than conventional cryptocurrencies such as Bitcoin.

Gold prices, S&P500, and DJIM show high volatility at 104.5993, 414.2226, and 1114.020 standard deviations compared to the average value of 1831.799, 3976.337, and 7977.019, respectively. The dummy variable of war (Russia-Ukraine conflict) was assigned for 470 observations, which covered the period from February 24, 2022, to December 13, 2024, allowing for further analysis of its impact on market behavior. Figure 1 highlights that both Bitcoin and Tether-gold returns exhibit considerable volatility, with both assets displaying a strong comovement at the onset of the observation period. Nevertheless, the fluctuations in Tether-gold are typically lower than those of Bitcoin, as indicated by the broader range of the Bitcoin price graph.

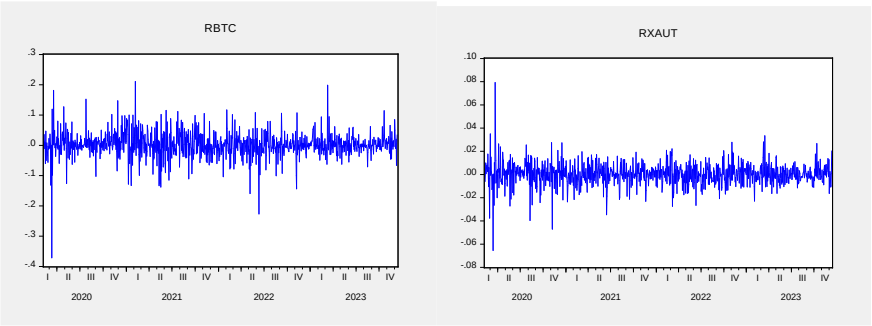

Figure 1. Return Fluctuation

Unit Root Test

The results of the breakpoint unit root tests are listed in Table 3. At the 1% significance level, the null hypothesis is rejected, indicating that none of the variables have unit roots with structural breakdowns.

Table 3. ADF-Test

Variables	level		1st Different	
	t-statistic	prob.	t-statistic	prob.
BTC	-1.609768	0.4772	-32.25255	0.0000
XAUT	-2.799024	0.0587	-30.61045	0.0000
GOLD	-3.228564	0.0187	-32.33811	0.0000
S&P500	-1.273107	0.6439	-35.55387	0.0000
DJIM	-1.431370	0.5680	-34.66998	0.0000

Source: Data Processed (2023)

Table 4. Bitcoin, GARCH (1,1) Test Result

	Coefficient	Std. Error	Prob.
Mean Equation			
C	0.001343	0.001106	0.2247
GOLD	0.110772	0.097901	0.2579
S&P500	1.235380	0.062413	0.0000
DJIM	0.028963	0.080645	0.7195
Variance Equation			
γ_0	0.001343	2.97E-05	0.0000
ARCH(γ_1)	0.073102	0.014319	0.0000
GARCH(δ_1)	0.852131	0.024528	0.0000
WAR	0.852131	0.024528	0.0001

Source: Data Processed (2023)

GARCH (1,1) Volatility Modelling

Table 3 shows the regression results of the GARCH (1,1) model for cryptocurrency return volatility.

Siauwijaya & Sanjung (2022) utilized the GARCH methodology to investigate the influence of Bitcoin and Ethereum returns on gold, stock markets, and the dollar index. The analysis concluded that gold price has no substantial impact on Bitcoin returns. Furthermore, several studies have examined the responsiveness of Bitcoin returns to fluctuations in gold price returns and discovered a negative correlation between gold prices and Bitcoin returns (Jia et al., 2023). According to previous research, gold price may not have a significant effect on Bitcoin or ethereum for several reasons. Bitcoin and cryptocurrencies generally have their own unique market dynamics that may not be directly influenced by gold prices.

The relationship between gold and cryptocurrencies is still not fully understood, and the correlation between their prices may not be as strong as some researchers initially thought (Shariati & Sjölander, 2022; Wijaya & Ulpah, 2022). Cryptocurrencies such as Bitcoin and Ethereum have higher volatility compared to traditional assets such as gold. This high volatility may overshadow the impact of gold prices on cryptocurrency returns, making it difficult to observe a significant relationship between the two assets (Wijaya & Ulpah, 2022). The returns of cryptocurrencies are affected by multiple factors, including market sentiment, legislative advancements, and global economic circumstances. These factors may have a stronger impact on cryptocurrency prices than gold prices, and gold is given greater priority as a safe haven asset (Conlon et al., 2020; Duc Huynh et al., 2020; Wijaya & Ulpah, 2022).

The statistical model reveals that the effect of the S&P 500 on Bitcoin returns is not statistically significant at the one percent significance level. In contrast, the Dow Jones Islamic Market Index (DJIM) shows a different and opposing result. Research has shown that during periods of increased uncertainty, such as the COVID-19 pandemic, the performance of the S&P 500 has a significant impact on Bitcoin returns. The S&P 500 is a composite index that includes 500 prominent corporations in the United States, commonly regarded as a barometer of the nation's overall economic well-being. Fluctuations in the S&P 500 can have a substantial impact on investors'

general outlook and trust. In the event of robust performance of the US stock market, investors may display a greater propensity to pursue high-risk assets, such as Bitcoin, in order to attain elevated profits. Conversely, when the S&P 500 declines, investors may seek value preservation assets such as Bitcoin (Bouri et al., 2022).

The influence of the S&P 500 on Bitcoin can be attributed to increased correlation during periods of heightened uncertainty, transmission effects between the stock market and Bitcoin, and a fundamental shift in the relationship between these two assets. During the COVID-19 pandemic, S&P 500 returns significantly affected Bitcoin returns, indicating a strong correlation between the two during market turbulence. Additionally, studies have shown spillover effects between the stock market and Bitcoin, where fluctuations in the S&P 500 influence investor sentiment toward Bitcoin, causing changes in its returns. This implies that in times of market stress, investors may perceive Bitcoin as a safe-haven asset, leading to a positive correlation between them. Research further indicates that sentiment in one market can spill over into the other, reflecting a nontrivial connection between the stock market and Bitcoin (Nguyen, 2022).

Previous research found that Bitcoin is not affected by the Islamic market, such as the Dow Jones Islamic Market Index (DJIM), for several reasons. First, studies have demonstrated that precious metals exert a favorable influence on Islamic stocks, particularly in times of economic turmoil (Ashraf et al., 2023). Bitcoin, as a novel and distinct investment option, may not exhibit the same correlation with precious metals as Islamic stock. Second, research has shown that Bitcoin's downside lagged volatility has positive effects on returns across the Islamic market, particularly for emerging markets (Jusoh et al., 2023). This suggests that Bitcoin may have a different relationship with the Islamic market compared to traditional assets like stocks and precious metals. Third, some studies have found that cryptocurrencies, including Bitcoin, are not considered halal in Islam due to their potential negative impact on the economy and government budget (Ashraf et al., 2023; Yunita, 2022). This may limit the adoption of Bitcoin in the Islamic market and

reduce its sensitivity to changes in the Dow Jones Islamic Market. The unique features and behavior of Bitcoin, as well as its potential non-halal status in Islam, may contribute to its limited sensitivity to the Islamic market, such as the Dow Jones Islamic Market.

Table 5. Tether-gold, GARCH (1,1) Test Result

	Coefficient	Std. Error	Prob.
Mean Equation			
C	0.000154	0.000187	0.4087
GOLD	0.490510	0.018299	0.0000
S&P500	0.086818	0.017261	0.0000
DJIM	-0.006366	0.014293	0.6561
Variance Equation			
γ_0	4.66E-06	1.25E-06	0.0002
ARCH(γ_1)	0.250609	0.032279	0.0000
GARCH(δ_1)	0.723052	0.032591	0.0000
WAR	-1.46E-06	9.34E-07	0.1185

Source: Data Processed (2023)

The second mean equation demonstrates that gold prices have a significant impact on Tether gold returns at the 1% significance level. This study revealed that gold-backed cryptocurrencies are influenced by gold prices due to their inherent connection to the value of gold. These digital coins or tokens are issued with their value directly linked to physical assets, such as gold, providing them with extra stability compared to other cryptocurrencies (Trichilli & Boujelbéne, 2022). The value of gold-backed cryptocurrencies is influenced by the price movements of gold, making them less volatile than traditional cryptocurrencies and allowing them to serve as reliable value stores for investors (Wasiuzzaman et al., 2022). As gold prices rise, the value of gold-backed cryptocurrencies typically follows suit, reflecting the stability and strength of the underlying asset.

Conversely, a decrease in gold prices can impact the value of gold-backed cryptocurrencies, highlighting their direct dependence on gold prices.

Therefore, the value of gold-backed cryptocurrencies is closely tied to their performance, making them an attractive investment option for individuals seeking exposure to the precious metal market through digital assets (Trichilli & Boujelbéne, 2022; Yousaf & Yarovaya, 2022). Gold-backed assets, such as gold ETFs and gold-backed cryptocurrencies, offered diversification and safe-haven qualities during the COVID-19 pandemic, demonstrating co-movement with gold bullion, gold futures, and the gold volatility index (Madhavan & Sreejith, 2022). Nevertheless, gold-backed stablecoins were less volatile than Bitcoin during the COVID-19 pandemic but did not show the same persistence to the shock as gold, their underlying asset (Jalan et al., 2021).

Research has shown that there are spillover effects between the stock market and Bitcoin, with changes in the S&P 500 affecting investor sentiment towards Bitcoin, leading to changes in Bitcoin returns (Ahmed et al., 2023; Irfan et al., 2023). Since gold-backed cryptocurrencies are connected to Bitcoin, they may also be influenced by fluctuations in the S&P 500. The S&P 500 is frequently viewed as a barometer of the U.S. economy's health, and significant rises or falls in the index can affect overall investor sentiment and confidence. If the US stock market strengthens, investors may be more inclined to seek risk assets, including Bitcoin and gold-backed cryptocurrencies, to achieve higher returns. Conversely, when the S&P 500 declines, investors may seek value preservation assets, such as bitcoin and gold-backed cryptocurrencies. Research has identified asymmetric connections between the S&P 500, crude oil, gold, and Bitcoin (Irfan et al., 2023). This implies that the relationship between the S&P 500 and gold-backed cryptocurrencies may not be symmetrical, with fluctuations in the S&P 500 impacting gold-backed cryptocurrencies in varying ways, depending on market conditions.

In the Islamic financial market, research findings suggest that the relationship between Islamic market stocks and gold-backed cryptocurrencies is minimal and insignificant. The results from Ali et al. (2022), using the DCCs model, show a weak and negative correlation

between the halal chain and Islamic gold-backed cryptocurrencies, as well as DJIM returns, under both bullish and bearish market conditions. Furthermore, the findings suggest that during bearish market regimes, the correlations between the halal chain and Islamic gold-backed cryptocurrencies, and between the halal chain and DJIM, display temporal variability. Furthermore, the average correlation across all variables was determined to be negative during this bearish regime. Additionally, there is no significant correlation between Islamic asset classes and cryptocurrencies, nor between Islamic socially responsible investments (SRI) and cryptocurrencies. Both investment categories showed a dynamic correlation during the COVID-19 crisis, but this correlation weakens when estimations account for global market risk and investor sentiment (Anwer, 2023). Islamic cryptocurrencies, with the exception of Hello Gold, did not exhibit significant reactions to FOMC announcements during the COVID-19 pandemic, whereas the Bitcoin and Ethereum markets experienced short-lived bubbles during this period (Emna & Anis, 2020; Mnif & Jarboui, 2022).

Based on the variance equation section in Tables 4 and 5, the GARCH (1,1) volatility model can be written as follows:

$$\text{BTC}: h_t = 0.001343 + 0.073102\, u_{t-1}^2 + 0.852131\, h_{t-1} - 0.852131\ \text{Dummy} \quad (4)$$

$$\text{XAUT}: h_t = 0.000005 + 0.250609\, u_{t-1}^2 + 0.723052\, h_{t-1} - 0.000002\ \text{Dummy} \quad (5)$$

The coefficient ($\gamma 1$) in the ARCH model reflects the influence of volatility information from the preceding period, while the ($\delta 1$) coefficient in the GARCH model assesses the impact of the conditional variance from the previous period (Irwaningtyas et al., 2023). Both the ARCH and GARCH coefficients are statistically significant at the 1% level. This indicates that significant changes in stock returns are likely to be followed by additional large changes, and the same pattern holds for smaller fluctuations as well. This observation suggests a pattern of volatility clustering in the market, wherein the anticipated magnitude of disturbance terms may be higher (indicating higher volatility) during riskier periods compared to other periods characterized by lower risk (lower volatility).

A significant finding in this study is that the return volatility of gold-backed cryptocurrency is not influenced by Russia-Ukraine war conditions. Meanwhile, traditional cryptocurrencies, on the contrary, exhibit a different trend where the WAR dummy significantly affects the volatility of cryptocurrency returns at the 99 percent confidence level. These findings are consistent with Wasiuzzaman et al. (2022), who reported that gold-backed cryptocurrencies experienced a rise in volatility during the COVID-19 crisis and bear market, although this increase was not significant. Gold-backed stablecoins were less volatile than Bitcoin during the pandemic but did not demonstrate the same level of resilience to the shock as gold, their underlying aset (Jalan et al., 2021). Gold-backed assets, such as gold ETFs and gold-backed cryptocurrency, offered diversification and served as a secure investment option during the COVID-19 epidemic. They exhibited simultaneous movement with gold bullions, gold futures, and the gold volatility index (Madhavan & Sreejith, 2022).

A key finding in this study is that the return volatility of gold-backed cryptocurrencies is not affected by the conditions of the Russia-Ukraine war. Gold-backed stablecoins were less volatile than Bitcoin during the COVID-19 pandemic but did not show the same persistence to the shock as gold, their underlying asset. Gold-backed assets, such as gold ETFs and gold-backed cryptocurrencies, offered diversification and served as a secure investment option during the COVID-19 pandemic. They moved simultaneously with gold bullions, gold futures, and the gold volatility index.

Effect onf Russia-Ukraine War on Cryptocurrency Return Volatility

This study also found that the Russia-Ukraine war coefficient has a significant effect, which means that the Russia-Ukraine war caused shocks to the cryptomarket. Interestingly, in the case of Bitcoin, a positive influence was observed, wherein periods of conflict were associated with an increase in volatility. However, this phenomenon did not occur with Tether-gold, which exhibited the opposite effect. This implies that gold-backed cryptocurrencies have an advantage during crises and can serve as potential safe haven assets

(Trichilli & Boujelbéne, 2022; Wasiuzzaman et al., 2022; Yousaf & Yarovaya, 2022).

Figure 2 illustrates the volatility of Bitcoin returns throughout the study period. The effects of the COVID-19 pandemic began to manifest in cryptocurrency markets in early 2020. The negative response in the cryptomarket during this time is likely linked to the World Health Organization's (WHO) announcement of the novel coronavirus 2019 (2019-nCoV) case at the end of December 2019. Furthermore, the volatility of Bitcoin also increased following the Russia-Ukraine war, with the initial attack occurring on February 24, 2022. This is evident in Figure 2, which illustrates upward movement at the beginning of the second quarter. The stock market responded to the Russia-Ukraine war case as a negative signal, giving rise to negative investor sentiments, which was indicated by high Bitcoin return volatility. This could be due to investors' concerns about companies' performance during the Russia-Ukraine war. They would look for companies whose performance was less affected by the conflict. The onset of war can lead to irrational market reactions, including mass stock sell-offs, panic, and heightened uncertainty, all of which can negatively affect the stock market (Appiah-Otoo, 2023b; Irwaningtyas et al., 2023; Karagiannopoulou et al., 2023; Mgadmi, 2023; Mgadmi et al., 2023).

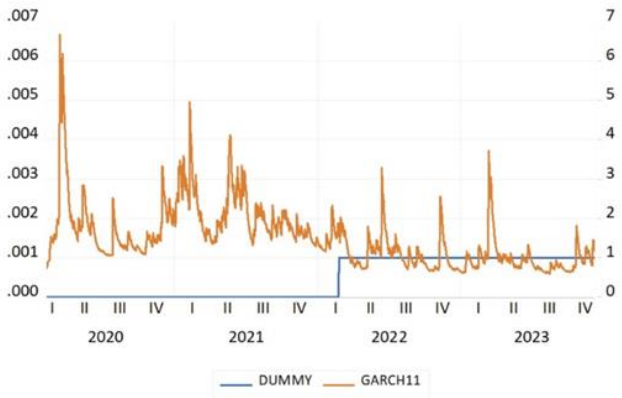

Figure 2. Bitcoin Conditional Variance and Dummy War

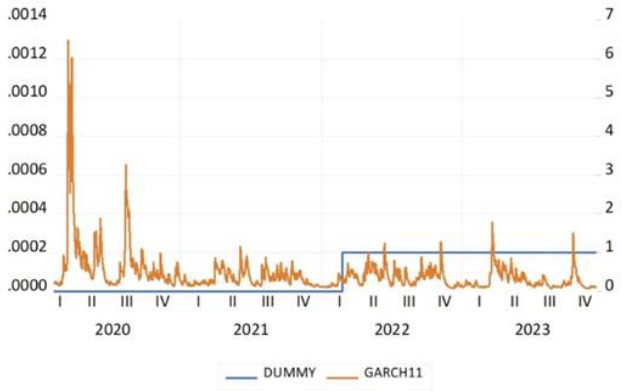

Figure 3. Tether-gold Conditional Variance and Dummy War

Nevertheless, this contrasts with gold-backed cryptocurrencies, represented by Tether-gold. Although the onset of the pandemic similarly saw a sharp increase in return volatility, a subsequent spike in volatility occurred during the Russia-Ukraine War. However, this rise in volatility did not reach the same levels as those observed during the pandemic. However, the ensuing fluctuations were relatively low. Gold-backed cryptocurrencies experienced increased volatility during crises and bear markets, but this increase was insignificant (Wasiuzzaman et al., 2022). This emphasizes that Tether-gold is more stable than Bitcoin during periods of uncertainty. In times of crises or uncertainty, such as pandemics or wars, investors should prioritize liquid and stable assets like US Treasuries, the Swiss Franc, and Tether over gold, as gold proved ineffective in protecting wealth during the COVID-19 pandemic (Cheema et al., 2022). Gold-backed assets, such as gold ETFs and gold-backed cryptocurrencies, offered diversification and safe-haven benefits during periods of uncertainty like the COVID-19 pandemic, exhibiting co-movement with gold bullion, gold futures, and the gold volatility inde (Madhavan & Sreejith, 2022).

Based on the research results presented in the "Results" subsection, the observation period extended from February 7, 2020, to December 13, 2023, comprising 1004 observations. The statistical analysis revealed that both Bitcoin and Tether-gold exhibited an upward trend, although Bitcoin's volatility was higher compared to Tether-gold. Gold, the S&P 500, and DJIM also demonstrated significant volatility. The ADF test results indicated that these variables did not possess unit roots, suggesting short-term stability in the data. The GARCH (11) model revealed that gold prices had a significant effect on Tether-gold returns but not on Bitcoin. The S&P 500 had a significant impact on both Bitcoin and Tether-gold returns, while the DJIM did not exhibit any significant influence. The Russia-Ukraine war had a significant effect on Bitcoin's volatility but not on Tether-gold, reaffirming Tether-gold's role as a more stable asset during times of crisis.

Islamic cryptocurrencies, such as Tether-gold, which are backed by physical gold, exhibit higher stability than conventional cryptocurrencies like Bitcoin. The primary reason for this stability is the direct linkage of Tether-gold's value to gold, a commodity known for its low volatility and status as a safe haven asset. During crises, investors tend to seek assets that can preserve their value, and gold has historically fulfilled this role (Baur & McDermott, 2010). Research indicates that gold can hedge against inflation and market fluctuations, making it an ideal base for stablecoins. Gold not only maintains value but also shows a negative or low correlation with other assets, meaning that when other markets decline, gold tends to retain or increase its value (Shahzad et al., 2019). This provides an additional advantage for Tether-golds under volatile market conditions.

Islamic cryptocurrencies backed by gold also comply with Shariah principles, which emphasize investment in real assets and reject excessive speculation. This makes them attractive to investors seeking Shariah-compliant investments, as well as those looking for lower-risk assets with more controlled volatility (Alshater et al., 2022). Previous research has demonstrated that gold-backed stablecoins exhibit lower volatility compared to conventional cryptocurrencies. Jalan et al. (2021) found that gold-backed

stablecoins were less volatile during the COVID-19 pandemic than Bitcoin and did not exhibit the same shock persistence as physical gold. Another study by Wasiuzzaman et al. (2022) confirmed that gold-backed stablecoins provide diversification and safe-haven properties during periods of uncertainty, such as the COVID-19 pandemic. Research by Madhavan & Sreejith (2022) found that gold-backed assets, including gold ETFs and gold-backed stablecoins, provided diversification and safe-haven benefits during the COVID-19 pandemic. Their research showed that these assets co-moved with physical gold, gold futures, and the gold volatility index, reinforcing their role in mitigating portfolio risk.

The importance of this research stems from its timely analysis of the Russia-Ukraine conflict's impact on financial market volatility, with a specific focus on cryptocurrencies. This conflict has created substantial economic uncertainty, affecting global financial stability. Understanding how various asset classes, including conventional and Islamic cryptocurrencies, react to geopolitical events is essential for investors, policymakers, and financial analysts. This study offers valuable insights into the performance of these assets during extreme conditions, emphasizing the relative stability of gold-backed cryptocurrencies compared to their conventional counterparts (Baur & McDermott, 2010; Shahzad et al., 2019).

This study introduces a novel perspective by specifically focusing on the comparative analysis between conventional cryptocurrencies, such as Bitcoin, and Islamic cryptocurrencies backed by gold, such as Tether-gold, during a significant geopolitical crisis. Previous research has separately investigated the safe-haven characteristics of gold and cryptocurrencies. However, this study uniquely combines these elements to analyze their interaction during the Russia-Ukraine conflict. Furthermore, the use of the GARCH model to analyze the volatility transmission between these asset classes provides a robust methodological framework that enhances the understanding of their behavior under stress conditions (Jalan et al., 2021; Wasiuzzaman et al., 2022).

This study makes several key contributions to the existing literature on financial market volatility and investment strategies.

- Empirical Evidence on Stability: This study empirically demonstrates that Islamic cryptocurrencies backed by gold exhibit greater stability than conventional cryptocurrencies like Bitcoin during periods of geopolitical uncertainty. This finding supports the argument that gold-backed assets are preferable during crises because of their intrinsic value stability (Baur & McDermott, 2010).
- Enhanced Understanding of Safe-Haven Assets: By analyzing the performance of Tether-gold and Bitcoin, this research provides a deeper understanding of the dynamics between different types of cryptocurrencies and their potential as safe-haven assets. This contribution is particularly relevant for investors seeking to diversify their portfolios and mitigate risk during volatile periods (Shahzad et al.2019).
- Implications for Shariah-Compliant Investing: This study highlights the advantages of Islamic cryptocurrencies, which adhere to Shariah principles, offering an attractive investment alternative for Muslim investors. This adds to the growing body of knowledge on Islamic finance and its application in contemporary financial markets (Alshater et al., 2022).
- Policy Recommendations: These findings offer valuable insights for policymakers and regulatory bodies to develop strategies to enhance market stability and protect investors during geopolitical crises. The demonstrated stability of gold-backed cryptocurrencies suggests potential avenues for regulatory support and promotion of these assets (Madhavan & Sreejith, 2022).

In summary, this study provides significant empirical evidence and theoretical insights into the stability of gold-backed Islamic cryptocurrencies during geopolitical crises. This adds novel contributions to the literature on safe-haven assets and offers practical implications for investors and

policymakers aiming to navigate the complexities of financial markets during periods of heightened uncertainty (Alshater et al., 2022; Baur & McDermott, 2010; Jalan et al., 2021; Madhavan & Sreejith, 2022; Shahzad et al., 2019; Wasiuzzaman et al., 2022).

Conclusion

This study conclusively demonstrates the significant impact of the Russia-Ukraine conflict on the volatility of both cryptocurrency and traditional financial markets. Notably, Bitcoin, a conventional cryptocurrency, exhibited a substantial volatility increase during the conflict period. In contrast, gold-backed cryptocurrencies, such as Tether-gold, displayed a higher degree of stability, underscoring their potential as safe haven assets during crises. Additionally, Islamic cryptocurrencies backed by gold were found to outperform conventional cryptocurrencies such as Bitcoin in terms of maintaining value and reducing volatility during periods of economic uncertainty.

This research is significant as it provides insights into how major geopolitical events, such as the Russia-Ukraine conflict, impact the volatility of both cryptocurrencies and traditional financial markets. By utilizing the GARCH model, this study uncovers the intricate dynamics between different asset classes during periods of economic uncertainty. These findings are invaluable for investors and policymakers seeking to comprehend the risks and opportunities present in the market during times of crisis. Furthermore, this study offers a comprehensive understanding of the advantages of Islamic gold-backed cryptocurrencies over conventional ones.

Based on these findings, this study recommends that investors diversify their portfolios by including gold-backed assets, which have shown greater stability during geopolitical uncertainties. Specifically, for investors in markets adhering to Shariah principles, Islamic gold-backed cryptocurrencies should be considered a more stable investment option than conventional cryptocurrencies. Continuous monitoring of global geopolitical events is essential for investors and policymakers because of their significant impact

on market volatility. Additionally, financial authorities should develop policies that consider the effects of geopolitical events on cryptocurrency markets to protect investors and maintain market stability.

Future research should investigate the long-term impacts of geopolitical conflicts on global financial and cryptocurrency markets to understand sustained volatility patterns. Comparative studies of the effects of other geopolitical events, such as trade wars or regional financial crises, on market volatility can help identify both the common and unique characteristics of each event. Furthermore, the role of other asset classes, such as commodities and government bonds, as safe haven assets during geopolitical uncertainties should be investigated. Additionally, the influence of global monetary policies, such as interest rate decisions by the Federal Reserve, on the volatility of cryptocurrencies and financial markets during geopolitical conflicts warrants further examination. Finally, in-depth studies on the stability and advantages of Islamic gold-backed cryptocurrencies compared to conventional cryptocurrencies under various market conditions and geopolitical events would be beneficial.

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