Gold and Cryptocurrency as Safe Haven Assets for Commodities, Stocks, and Bonds: Evidence from the Russia-Ukraine War

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Abstract. This research was conducted to determine whether gold and cryptocurrency (i.e., Bitcoin) can be used as safe haven assets for oil, wheat, stock index (SI), government bond (GB), Islamic stock (IS), and Islamic bond (IB) during the Russia-Ukraine war. We used panel quantile regression by utilizing extreme lower quantiles (i.e., 1%, 2.5%, 5%). It will only be recognized as a safe haven asset if it is negatively correlated with another asset during extreme adverse shocks. The data spans from 23 February 2021 – 25 July 2022 which covered the five largest economies in Europe and Asia (i.e., Germany, France, the UK, China, and Japan). The findings indicate that gold only acted as a safe haven asset for wheat, SI, and IS during the Russia-Ukraine war. Additionally, Bitcoin only serves as a safe haven asset for oil, wheat, SI, and GB during the Russia-Ukraine war.

Keywords. safe haven, gold, Bitcoin, panel quantile regression, Russia-Ukraine war.

1 Introduction

As a result of Ukraine’s decision to join NATO, Russia started a special military operation and invasion of Ukraine on 24 February 2022. This was the largest invasion and conflict in Europe since World War II [1] and has impacted many sectors, especially the economic sector. It will slow-down the global growth and increase inflation [2].

Russia and Ukraine contribute as the largest exporters of essential commodities (i.e., gas, oil, and wheat). This conflict has led to supply chain problems, rising commodity prices, and weakening global confidence and financial markets [3]. After the invasion, oil and gas prices reached the highest since 2008 [2]. However, this conflict resulted in a drastic decline in various investment instruments. STOXX Europe 600 index drops on the invasion date and days after the post-invasion date [4]. Volatility Index (VIX) has reached its highest level since 2020. It indicates that a high decline in the stock market has caused market worries during the Russia-Ukraine war [1]. Due to this uncertain situation, investors tend to invest in less risky or safe haven assets [5]. Safe haven assets are constantly negatively correlated or uncorrelated with other investment instruments in bear market conditions [6]. Gold, the most popular safe haven asset, negatively correlates with other assets during extreme market conditions [6]–[8]. It has characteristics of a counter-cyclical investment vehicle during black swan events such as the global financial crisis, the 2008 collapse of Lehman Brothers, the 9/11 attacks in 2001 [9], and the COVID-19 pandemic [10], [11]. Similar to gold, Bitcoin is considered digital gold with hedging ability during economic uncertainty and market downturns [12], [13]. Furthermore, its safe haven qualities may be superior to gold because of its independence from a nation’s politics and economy [14]. Bitcoin is a superior portfolio asset to gold for investors who are willing to take on greater risk [15].

Prior research into whether gold and bitcoin were safe haven assets during the turbulent COVID-19 times revealed that gold was a safe haven asset. In contrast, bitcoin was neither a safe haven asset nor a weak safe haven asset [11], [16], [17]. Other studies have suggested that Bitcoin could be used as a substitute instrument during the European sovereign debt crisis from 2010 to 2013 and the Cyprus banking crisis from 2012 to 2013 [18], [19]. Despite being more volatile than gold, Bitcoin exhibits short-term safe haven characteristics before and during the pandemic [20]. Furthermore, gold is essential in Islamic asset management [21], whereas Bitcoin’s role as a hedge and safe haven for Islamic investments remain unclear [17].

To the best of our knowledge, no prior research has tested whether gold and Bitcoin can be used as safe haven assets against oil, wheat, stock index (SI), government bond (GB), Islamic stock (IS), and Islamic bond (IB), all together, during Russia-Ukraine war. This research provides a comprehensive study by covering six financial assets. Furthermore, prior works usually conduct the

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study by utilizing time-series data, while we covered the five largest economies in Europe and Asia (i.e., Germany, France, the UK, China, and Japan) categorized as largest oil importer [22] and because these countries are related to NATO [23]–[25], which one of the main reasons of Russia-Ukraine war started.

## 2 Development of hypotheses

### 2.1 Gold as safe haven asset

Gold has traditionally been regarded as a safe haven investment [13], [26]–[29]. There is literature encouraging research into gold's ability to maintain its traditional role as a safe haven. For example, in high inflationary conditions caused by an increase in oil prices, investors will increase their demand for gold as an inflation hedge [30]. However, because gold's value is relatively stable, oil-exporting countries increase the proportion of gold in their external reserve portfolios as oil prices and revenues rise [31]. Using the DCC-GARCH model, concluded that gold is a safer haven asset than Bitcoin for global crude oil markets [32]. Furthermore, during extreme losses in equity markets, gold serves as a safe haven for domestic and foreign investors in more countries [33]. Gold is a safe haven and a hedge for SI, but not for GB [5].

Furthermore, we are testing gold as a safe haven asset for Islamic financial assets due to the rapid growth of IS markets. Most studies show that gold is a safe haven in extreme IS market conditions. Gold's value rises even during financial crises [21]. As a result, gold can play an essential role in managing Islamic assets. Gold hedges and diversifies Islamic equities on average but consistently across investment horizons. Moreover, gold-Islamic equity portfolios also provided short-term diversification and gold hedges IB risk in the short and medium term [34].

### 2.2 Cryptocurrency as safe haven asset

For various reasons, Bitcoin has been suggested as a potential safe haven for traditional assets, including its independence from monetary policy, its function as a store of value, and its low correlation with traditional assets. In recent years, there has been a consistent line of thought that Bitcoin is a safe haven immune to the volatility of commodities and stable currencies [18], [35], [36]. Furthermore, Bitcoin is an excellent hedge and safe haven when the commodity index is experiencing volatility, particularly in the period preceding the collapse [18]. The hedge capability of Bitcoin is similar to gold [35], [37]. Gold and Bitcoin are safe haven assets against oil price fluctuations [14]. Additionally, Bitcoin's role as a spillover transmitter for wheat volatility and a spillover receiver for oil and corn volatility could be a good long-term hedge against commodity volatility [38].

Furthermore, some research suggests that Bitcoin can be used as a safe haven or as a hedge against SI market risks [18], [39]. It can also be used as a hedge or safe haven against GB [40]. Bitcoin's co-movements with global and regional IS indices and IB markets are examined using a wavelet-based approach. The study discovered that high-frequency co-movement in opposite directions suggests diversifying into Bitcoin, the IS market, and IB may provide short-term hedging benefits [41]. It implies that Bitcoin can help hedge a portfolio. Moreover, Bitcoin-based hedging strategies can reduce portfolio risk while improving performance [42], [43].

## 3 Data and methodology

### 3.1 Data and sources

The aim of this research is to determine whether gold and Bitcoin as dependent variables can be safe haven assets for oil, wheat, stock index (SI), government bond (GB), Islamic stock (IS), Islamic bond (IB) as independent variables during the Russia-Ukraine war. The data used is daily for a 7-day period in US dollars spanning from February 23, 2021 to July 25, 2022, with a total of 2,590 observations. Linear inter-polations were used to fill in the gaps of variables with no 7-day frequency (i.e., gold, oil, wheat, SI, GB, IS, IB). We focused on five countries (Germany, France, the United Kingdom, China, and Japan) as the top five largest economies in Europe and Asia based on GDP [44]. As a result, SI, GB, and IS used national indices, whereas the remaining variables used global data. These countries are also NATO members and one of Russia's largest oil importers [45]. The entire data were extracted from Bloomberg terminal. To dig deeper, we divide the data into two periods and run the robustness test: (i) before the war (23 February 2021-23 February 2022); and (ii) during the war (24 February 2022–25 July 2022). We converted price data to return by computing as

$$\Delta P = P_t - P_{t-1}$$

where $P_t$ is price at time $t$ and $P_{t-1}$ is price at time $t-1$. Table 1 describes the summary statistics and unit root test results for each variable. Based on Levin-Lin-Chu unit root test results [46], the results revealed that the data are stationer at level.

### 3.2 Methodology

Quantile Regression for Panel Data (QREGPD) is a part of regression analysis, that was first proposed by Koenker.
and Bassett in 1978 [47]. QREGPD analysis enables us to estimate the relationship between dependent and independent variables widely by using different quantiles [48], [49]. This analysis is convinced to be more efficient than Ordinary Least Square (OLS) analysis and has less sensitive coefficient vector to outliers [50]. It is commonly used to identify the potential of gold and Bitcoin as safe haven assets [5], [51]. By applying QREGPD analysis in this study, the researchers expect a broader description of act of gold and Bitcoin as safe haven assets for oil, wheat, SI, GB, IS, and IB [52]. Based on prior research, this study used research model below [5], [53]:

\[ Q_{it}(\tau; x_{it}) = \alpha + \beta_1 \text{OIL}_it + \beta_2 \text{WHEAT}_it + \beta_3 \text{SI}_it + \beta_4 \text{GB}_it + \beta_5 \text{IS}_it + \beta_6 \text{IB}_it + \epsilon_t \]  

(1)

where \( Q_{it} \) represents quantile return of dependent variables: gold and Bitcoin on day \( t \) in represent countries \( i \), \( \alpha \) is constant of the model, \( X \) stands for independent variables, \( \beta \) represents coefficient of independent variables, \( \epsilon \) is composite error term, and \( \tau \) indicates quantile used in this research. The asset can be considered as safe haven during extreme conditions and market turbulence [54] and we used extremely low quantiles (i.e., 1%, 2.5%, and 5%).

4 Results and discussions

4.1 Quantile regression for panel data analysis

4.1.1 Results on gold

Table 2 proved the safe haven properties of gold against wheat, SI, and IS at 2.5%, 1%, and 5% quantiles, respectively. It confirmed prior works that gold can be a safe haven asset for agricultural commodities [55], conventional stock market [56], [57], and IS [21]. Surprisingly, gold is a strong safe haven for GB at all extreme quantiles (1%, 2.5%, and 5%). It proved a contradictory result to prior works [58]. On the other hand, gold was found to be as diversifier for oil and IB.

4.1.2 Results on cryptocurrency

As for Bitcoin’s role as a safe haven (see table 2.), it was proven that Bitcoin act as safe haven against oil, SI, and IB, at 1% and 2.5%; 2.5%; 2.5% and 5%, respectively. It is line with prior research that Bitcoin serves as safe haven for oil price movements [14], stock indices [13], and Islamic bonds. Meanwhile, Bitcoin act as diversifier for wheat, GB, and IS.

Table 2. Quantile Regression Result

<table>
<thead>
<tr>
<th>GOLD</th>
<th>Quantiles</th>
<th>0.01</th>
<th>0.025</th>
<th>0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL</td>
<td>0.1189***</td>
<td>0.1489***</td>
<td>0.1119***</td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td>0.0046***</td>
<td>-0.0018***</td>
<td>0.0288***</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>-0.0201***</td>
<td>0.0477***</td>
<td>0.0263***</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>-0.0012***</td>
<td>-0.0001***</td>
<td>-0.0002***</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>0.1051***</td>
<td>0.0390***</td>
<td>-0.0026***</td>
<td></td>
</tr>
<tr>
<td>IB</td>
<td>1.1014***</td>
<td>2.3829***</td>
<td>2.6552***</td>
<td></td>
</tr>
<tr>
<td>BITCOIN</td>
<td>Quantiles</td>
<td>0.01</td>
<td>0.025</td>
<td>0.05</td>
</tr>
<tr>
<td>OIL</td>
<td>-0.1211***</td>
<td>-0.1842***</td>
<td>0.1039***</td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td>0.2261***</td>
<td>0.2254***</td>
<td>0.1593***</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.2214***</td>
<td>-0.4401***</td>
<td>0.1498***</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>0.0062***</td>
<td>0.0042***</td>
<td>0.0053***</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>0.9215***</td>
<td>1.3947***</td>
<td>0.5035***</td>
<td></td>
</tr>
<tr>
<td>IB</td>
<td>8.2217***</td>
<td>-6.8783***</td>
<td>-7.8372***</td>
<td></td>
</tr>
</tbody>
</table>

Note: *** indicates significant at 1% level

4.2 Robustness analysis

Table 3 revealed the results of gold and Bitcoin as safe haven properties before Russia-Ukraine war in the period of 23 February 2021–23 February 2022. Gold serves as safe haven for oil and SI at 1% and 5%; and 2.5%, respectively. Similar to our main results, it confirmed that gold can be a safe haven for GB even before the Russia-Ukraine war at all extreme quantiles. In contrast, gold act as diversifier for wheat, IS, and IB. Bitcoin serve as safe haven for oil at 1% quantile. Surprisingly, it implies a safe haven property of Bitcoin against IB at all quantiles. Meanwhile, similar to the main results, Bitcoin was proven as diversifier for the remaining variables (i.e., wheat, GB, and IS) including SI before the war.

Table 4. Quantile Regression Result – During War.

<table>
<thead>
<tr>
<th>GOLD</th>
<th>Quantiles</th>
<th>0.01</th>
<th>0.025</th>
<th>0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL</td>
<td>0.132***</td>
<td>0.1420***</td>
<td>0.1507***</td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td>-0.0617***</td>
<td>-0.0777***</td>
<td>-0.0825***</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.0000***</td>
<td>-0.0431***</td>
<td>0.0175***</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>1.3500***</td>
<td>0.0042***</td>
<td>0.0055***</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>0.9215***</td>
<td>1.3947***</td>
<td>0.5035***</td>
<td></td>
</tr>
<tr>
<td>IB</td>
<td>8.2217***</td>
<td>-6.8783***</td>
<td>-7.8372***</td>
<td></td>
</tr>
</tbody>
</table>

Note: *** indicates significant at 1% level
4.3 Discussions

Over three distinct time periods, gold consistently acts as a safe haven asset for SI, according to the overall findings. Gold serves as a safe haven for wheat, SI, and IS in the face of extreme negative returns caused by the Russia-Ukraine war. The negative relationship between wheat and gold prices stems from the agricultural commodities market's volatile conditions, in which food prices are rising and supply is hampered by export imports that are hampered by China's lockdown and the Russia-Ukraine war [59]. Investors and business owners protect their assets by seeking out assets that are more stable and safer (i.e., gold). The stock market crash during the pandemic and the Russia-Ukraine war caused a negative relationship between stock index returns and gold price during stable and volatile states. Furthermore, the Federal Reserve's decision to raise interest rates added another layer of inflationary uncertainty, causing the stock index to continue to fluctuate up and down. As a result, portfolio investors are particularly interested in gold for investment diversification and hedging strategies. In both stable and volatile states, IS has a negative correlation with gold, indicating that Islamic market returns benefit from safe haven effects. Because of the stock market crash and significant economic slowdown, the low or negative correlation between the two markets suggests that gold can help diversify Islamic stock portfolios. Islamic investors can benefit from diversification by adding gold to their equity portfolios, especially during extreme market conditions. Furthermore, due to the different macroeconomic and timescale backgrounds, gold serves as a strong safe haven asset for the UK, which contradicts the previous result [58]. Bond yields are influenced by macroeconomic and oil price factors, resulting in an inverse relationship between bond yields and gold prices [60]. Bond yields are declining due to rising oil prices, limited oil supply due to war, and still-uncertain economic conditions. Furthermore, an increase in interest rates, which are inversely proportional to bond prices, has an impact on bond investor demand, as investors seek relatively safe and stable assets.

Bitcoin is an independent asset, which means it is not dependent on the conditions of any country and will rise as uncertain conditions emerge. Bitcoin consistently serves as a safe haven asset for oil by separating the entire sample. Oil price movements are influenced by the economic and political conditions of the largest oil exporting and importing countries, in addition to supply-demand factors. The more extreme or uncertain the conditions in those countries, the more volatile the oil price movements. In addition to oil, our findings indicate that Bitcoin can be a safe haven asset for SI and IB. Prior research indicated that SI suffered the greatest losses with Bitcoin at various times [61]. We discover that the impact of macroeconomic changes on SI is influenced, with SI decreasing as uncertain situations emerge. As far as we know, no prior research on Bitcoin as a safe haven asset for IB has been conducted. Economic uncertainty will have no effect on IB returns, but it will be influenced by the movements of other bonds [62]. These other bonds will be influenced by interest rates and economic growth, which will have an indirect impact on IB. In aggregate, IB is a more liquid, stable, and difficult to manipulate asset, which contrasts with Bitcoin's characteristics, which favor higher liquidity but higher volatility. In these uncertain times, we recommend Bitcoin as a safe haven asset and portfolio diversifier, particularly in a bear market.

Our robustness tests show that Bitcoin served as a strong safe haven asset for IB prior to the outbreak of the war. As previously stated, Bitcoin is a highly liquid and volatile asset, as opposed to IB, which is more stable but is indirectly influenced by economic growth. This implies that the nature of Bitcoin and IB has a negative correlation, making Bitcoin suitable for a safe haven asset in extreme bear market conditions prior to the occurrence of uncertain conditions. During the war, gold served as a strong safe haven asset for wheat, with Russia and Ukraine producing 25% of global production. Wheat prices have risen sharply due to restrictions on Russian export and import activities, as well as wheat production constraints in Ukraine. When there is uncertainty about the price movements of major commodities in various countries, investors buy gold as an asset that tends to be stable and rise during extreme or uncertain conditions. This study shows that gold has a negative correlation with wheat and can be used as a safe haven asset during the uncertain conditions of the Russia-Ukraine war and an extreme bear market. Furthermore, during wartime, Bitcoin served as a strong safe haven asset for conventional assets (i.e., SI and GB). This is consistent with the state of the conventional asset market in the five largest economies, which has weakened because of Russia's influence in Ukraine, particularly since the imposition of international economic sanctions on Russia by the United States, the European Union, and other countries. Because of the nature of Bitcoin, which is independent of a country's economic and political conditions, it can be used as a strong safe haven asset for conventional assets.

5 Conclusion

Russia’s invasion to Ukraine has impacted to social conditions in Russia and Ukraine that interfere economic activities, limited social and economic mobilities, supply chain problems that affected by international economic sanctions which causing higher commodities prices globally, and investors’ fear to invest has made indexes price decreased. Given that market fluctuations are still unpredictable, policymakers and global investors must base their decisions on the market's price. Therefore, this research provides decision-making recommendations for
gold and Bitcoin investors all over the world, including Indonesia, regarding how to invest during bear market.

To avoid a higher loss in an extreme negative return, we recommend that stock investors invest in gold, which consistently acts as a safe haven asset in bear markets. Furthermore, we recommend that oil investors use Bitcoin as a safe haven asset during extreme and uncertain negative conditions. During the Russia-Ukraine conflict, gold and Bitcoin will help to mitigate asset return fluctuations. Furthermore, investors can benefit from the "buying short" or "selling long" strategy. Last but not least, when looking for safe haven assets, investors must consider gold and Bitcoin when deciding on more profitable portfolio policies. This research applied for Indonesia investors as well for the decision-making during market downturn because they need to watch closely regarding global condition. This study identified the act of safe haven assets for 5 months following Russia's invasion of Ukraine, which displayed a relatively long period of extreme low conditions. We propose further research to determine whether gold and Bitcoin can be safe haven assets with shorter time horizons and detailed extreme lower quantiles. The act of safe havens may indicate more accurate and detailed over a shorter period of time.

References


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