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Are safe haven assets really safe during the 2008 global financial crisis and COVID-19 pandemic?

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ABSTRACT

This study evaluates the safe-haven role of twelve assets against the US stock market during the 2008 global financial crisis (GFC) and the COVID-19 pandemic. Our results show that silver and the Islamic stock index were safe havens during the 2008 GFC, and the Islamic stock index and Tether have been safe havens during COVID-19. We observe that the Islamic stock index and Tether have emerged as strong new safe havens. However, our supplementary analysis reveals that gold and Bitcoin still exhibit safe-haven behavior during severe market downturns. Overall, our findings suggest that safe-haven assets may vary over time.

1. Introduction

In general, investors seek to diversify or hedge their assets to protect their portfolios from normal risks. However, when global economic turmoil occurs, it adversely affects financial markets. Almost all sectors and assets are negatively affected by the economic crisis, hence, in such periods, diversification or hedging strategies often fail to protect investors' portfolios from plummeting. Therefore, in an extreme economic crisis, investors usually search for assets that have safe-haven properties. For example, during the 1987 stock market crash, investment shifted from risky to safe assets (Caballero & Krishnamurthy, 2008). Gold has long been used as a store of value and natural money. Therefore, it is considered an effective portfolio diversifier for stock markets in both developed and emerging countries during market turmoil (Conover, Jensen, Johnson, & Mercer, 2010; Wen & Cheng, 2018). There is substantial empirical evidence about the ability of gold to act as a hedge and a safe haven for equities during normal periods and periods of market turmoil, respectively (Areal, Oliveira, & Sampaio, 2015; Baur & Lucey, 2010; Beckmann, Berger, & Czudaj, 2015). In addition to gold, other assets, such as commodities and currencies, also provide shelter for equity markets during crisis periods (Grisse & Nitschka, 2015; Henriksen, 2018).

Before the 2008 global financial crisis (GFC), gold and some currencies (especially the US dollar and Swiss franc) are conventionally used as a hedge and safe-haven asset during financial crises (Beckmann et al., 2015; Grisse & Nitschka, 2015). However, the recent 2008 GFC and its recurrence in financial markets have further drawn investors' attention to different safe-haven assets (Bredin,

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Conlon, & Potì, 2015). Several studies have raised questions about the ability of gold and other assets to act as safe havens the post 2008 GFC because of their failure to provide protection at that time (Bekiros, Boubaker, Nguyen, & Uddin, 2017; Klein, 2017; Lucey & Li, 2015; Shahzad, Bouri, Roubaud, & Kristoufek, 2019). Moreover, financial markets and instruments have experienced unprecedented growth in both value and volume, increasing risk to the financial system (Baur & Lucey, 2010). Therefore, the need to discover effective safe-haven assets becomes crucial for investors, particularly those who are risk averse.

Bitcoin, introduced as the first cryptocurrency, has attracted considerable attention from both investors and academicians, as it has given investors some resilience in times of crisis, such as the debt crisis of 2010–2013 in Europe and the banking crisis of 2012–2013 in Cyprus (Luther & Salter, 2017). Bitcoin is fundamentally uncorrelated with financial assets (particularly equities) because of its independence from monetary regulation and its store of value characteristics (Baur, Hong, & Lee, 2018; Conlon & McGee, 2020). Even though several studies (Aysan, Demir, Gozgor, & Lau, 2018; Bouri, Molnár, Azzi, Roubaud, & Hagfors, 2017; Shahzad et al., 2019) favor using Bitcoin for its hedging and safe-haven ability, the opposite view is also expressed (Conlon, Corbet, & McGee, 2020; Conlon & McGee, 2020; Klein, Thu, & Walther, 2018; Smales, 2019). The conflicting findings on the safe-haven role of Bitcoin and scant research on other cryptocurrencies raise the issue of whether they are safe in times of crisis. Further investigation is required to gain a better understanding of the safe-haven characteristics of such assets.

The recent coronavirus (COVID-19) pandemic has created huge uncertainty in global business activities, leading to an unprecedented economic and financial crisis (Hasan, Mahi, Sarker, & Amin, 2021; Ji, Zhang, & Zhao, 2020; Rao, Goyal, Kumar, Hassan, & Shahimi, 2021; Zhang, Hu, & Ji, 2020). Particularly, COVID-19 has severely affected the US stock market, surpassing earlier effects caused by the 1929 crash, October 1987 crash, and 2008 GFC (Sharif, Aloui, & Yarovaya, 2020). The US stock market hits four circuit breakers in just two weeks, which is very unusual in its history (Ji et al., 2020). The recent oil price crisis has further deepened the stock market turmoil (Sharif et al., 2020). As a result, investors in the US, as well as the rest of the world, face increasing uncertainty. In times of such uncertainty, investors desperately seek safe haven to protect their assets and investments. However, conventional safe-haven assets such as gold, Bitcoin, commodities, and currencies may fail to provide such protection, as the COVID-19 crisis is something more critical than previous economic crises and has impacted almost all sectors and assets of the economy (Ji et al., 2020). Hence, COVID-19 has intensified the need for safe-haven assets to protect investors from the crisis.

Although it is too early, a few studies (Cheema, Faff, & Szulczyk, 2020; Conlon et al., 2020; Conlon & McGee, 2020; Ji et al., 2020) have already investigated the role of conventional financial assets as a safe haven during COVID-19. These studies, however, show conflicting views about the safe-haven role of those assets. Very few studies (Ashraf, Rizwan, & Ahmad, 2020; Hasan, Mahi, Hassan, & Bhuiyan, 2021; Yarovaya, Elsayed, & Hammoudeh, 2021) have analyzed Islamic financial assets, such as Islamic stock indices and Sukuk (Islamic bonds), during COVID-19. The findings show that only Sukuk acts as a strong hedge against conventional bonds, though Islamic stock indices provide resilience against the 2008 GFC (Azad, Azmat, Chazi, & Ahsan, 2018; Beck, Demirgüç-Kunt, & Merrouche, 2013; Farooq & Zaheer, 2015). Therefore, it appears that an asset's safe-haven role can alter from one crisis to another, increasing the need for regular assessment of the safe-haven role of different assets. Another critical point is that the traditional safe havens often fail to provide shelter to investors, particularly in recent crises (Cheema et al., 2020; Shahzad et al., 2019), which leads researchers and academicians to look for safe havens in other nonconventional assets.

To fill the gaps in the existing literature, we investigate conventional and potential safe-haven assets to confirm whether they had hedging and safe-haven properties for the US stock market during the 2008 GFC and COVID-19. Our results show that during the 2008 GFC, silver and the Islamic stock index were strong safe havens. But, during COVID-19, the Islamic stock index and Tether are strong safe havens. Interestingly, our findings suggest that the Islamic stock index and Tether emerge as new safe-haven assets, with the Islamic stock index providing a more consistent safe haven. However, our supplementary analysis reveals that traditional assets, such as gold and Bitcoin, are still strong safe havens in periods with an extreme market downturn.

Our study makes significant contributions to the existing literature in several ways. First, the novelty of our research is that we first compare and analyze the role of safe-haven assets for the US stock market during two recent major crises—the 2008 GFC and COVID-19—and reveal that traditional assets, such as gold, currency, Bitcoin, and Treasury bonds (T-bond), have lost their trustworthiness as a safe haven in times of crisis. However, our supplementary analysis reveals that gold and Bitcoin still provide a safe haven for US stocks in extreme market downturns (i.e., 1%, 2.5%, and 5% quantiles). Second, we provide evidence, supported by earlier studies (Ji et al., 2020; Li & Lucey, 2017; Shahzad et al., 2019), that an asset's safe-haven role tends to vary from one crisis to another. Finally, unlike previous studies, we consider twelve assets in our analysis, including conventional and nonconventional safe-haven assets, to offer investors an extended list of diversifiable and safe-haven instruments. Also, our findings suggest that the Islamic stock index and Tether are new instruments that can be used as safe havens.

The remainder of the study is as follows. Section 2 reviews previous studies that are relevant to our subject matter. The research model and associated materials to be employed are presented in Section 3. Section 4 presents the results and discusses them accordingly. Finally, Section 5 provides our concluding remarks.

2. Literature review

Historically, gold has been used as a potential hedge or diversifier against financial assets, such as stocks and foreign currency, because gold is a store of wealth and is empirically found to be uncorrelated or even inversely correlated with these assets (Bouri, Shahzad, Roubaud, Kristoufek, & Lucey, 2020; Reboredo, 2013). Baur and Lucey (2010) were the first to introduce the concept of a safe haven, which is different from a hedge and diversification. An asset is qualified as a hedge (safe haven) when it has zero or inverse correlation with another asset or portfolio on average (in times of financial crisis) (Baur & Lucey, 2010; Baur & McDermott, 2010). Baur and Lucey (2010) analyze the time-varying relationship between stock and bond returns in the US, UK, and German markets.

They reveal that in the short run gold is both a hedge and a safe haven for stocks.

Baur and McDermott (2010) built on the work of Baur and Lucey (2010), further confirming that gold meets the definition for being a safe haven for European and US equity investors in the short run. Using daily, weekly, and monthly data, they explore whether gold is a weak (strong) hedge or a safe haven for equities. They show that gold serves as both a hedge and a strong safe haven for developed markets, such as the US and Europe. However, it fails to provide both safe haven and hedging properties for Australia, Canada, and Japan and emerging economies such as BRIC countries. Baur and Glover (2012) and Reboredo (2013) obtain the same results but fear that the level of speculation in the asset might influence the safe-haven properties.

Hood and Malik (2013) evaluate various precious metals and the volatility index (VIX) as potential candidates to determine whether they have hedging and safe-haven properties against the US stock market. Their results indicate that only gold provides strong hedging and weak safe-haven benefits, while the VIX is a better hedge and safe haven than gold. Lucey and Li (2015) disagree and document that gold often fails to maintain its safe-haven status for the US stock market; instead, other precious metals—that is, silver, platinum, and palladium—more consistently provide a safe haven. Li and Lucey (2017) extend the previous literature by examining four precious metals—gold, silver, platinum, and palladium—against both stocks and bonds in eleven countries. They report that each precious metal serves as a safe haven but in different periods. They suggest that the choice of safe-haven assets may be influenced by countries' political, economic, and financial conditions. Recently, Dimitriou, Kenourgios, and Simos (2020) and Ji et al. (2020) find that gold acted as a safe haven during both the 2008 GFC and the COVID-19 crises. By contrast, Shahzad et al. (2019) and Cheema et al. (2020) report that investors may have lost their faith in gold, as it fails to protect investors' assets during a crisis.

Several studies, although few in number, have evaluated the safe-haven role of various foreign currencies. For instance, Kaul and Sapp (2006) first investigate currencies and document that the US dollar plays a safe-haven role during the period of "Y2K uncertainty" at the end of the 1990s. Ranaldo and Soderlind (2010) broaden the concept of a safe haven by considering market volatility and liquidity and show that the Japanese yen and Swiss franc serve as safe havens, whereas the euro does so to only a limited extent. Grisse and Nitschka (2015) unveil that when global risk increases, the Swiss franc shows safe-haven characteristics against several currencies, such as the Australian dollar, but not against the US dollar, the yen, and the British pound. They also document that the US dollar, the pound, and the yen are weaker hedges against global risk than the Swiss franc. In recent years, foreign exchange markets have become volatile, which is exacerbated by COVID-19. As a result, most currencies fail to play their safe-haven role (Ji et al., 2020). For instance, Cheema et al. (2020) find that the Swiss franc acted as a strong safe haven in both the GFC 2008 and COVID-19, whereas the US dollar did so only in the 2008 GFC.

Another strong candidate is cryptocurrency, due to its recent increase in popularity among investors, attributable to its potential ability to shield sovereign risk in global financial markets (Bouri et al., 2020). For these reasons, Bitcoin is often considered a panacea (Bouri et al., 2017; Luther & Salter, 2017). Since Bitcoin was introduced by Nakamoto (2008) as the first practical cryptocurrency, several studies have suggested that Bitcoin can play a strong safe haven in stock markets because it is weakly associated with equities (Bouri et al., 2017; Shahzad et al., 2019). Moreover, its prices trended upward during the debt crisis of 2010–2013 in Europe and the banking crisis of 2012–2013 in Cyprus (Luther & Salter, 2017). Bouri et al. (2017) report that Bitcoin can be a weak hedge, but it can provide strong diversification against global uncertainty for several assets. It can also serve as a strong safe haven against the weekly extreme down movement in Asian stocks. Urquhart and Zhang (2019) reveal comparable results with intraday data.

The safe-haven properties of Bitcoin, gold, and commodities against individual stocks as well as global stock indices are compared by Bouri et al. (2020). Their findings suggest that Bitcoin is the best potential safe haven, followed by gold and commodities, which is the opposite of Shahzad et al. (2019), who suggest that gold is an effective safe haven for all G7 stock markets, but Bitcoin is a safe haven only for the Canadian stock market. Other studies obtain different results on cryptocurrencies, particularly on Bitcoin. For example, Klein et al. (2018) and Smales (2019) claim that Bitcoin is unsuccessful as both a hedge and a safe haven for developed markets. Cheema et al. (2020), Conlon and McGee (2020), and Conlon et al. (2020) have comparable findings during COVID-19.

Islamic stock indices are another potential safe haven candidate and interest in them by investors (both Islamic and non-Islamic) has increased, attributable to their resiliency features, compared to conventional stock indices, particularly during stock market crises (Azmi, Ng, Dewandaru, & Nagayev, 2019). To date, only a few studies have focused on Islamic stock indices to assess their safe-haven properties, and even their findings are not persuasive. For instance, Hkiri, Hammoudeh, Aloui, and Yarovaya (2017) investigate nine regional Islamic stock indices to determine their safe-haven properties for conventional peers, based on the contagion and decoupling hypotheses. Their findings indicate that Islamic indices have both hedging and safe-haven properties. Azad et al. (2018) obtain comparable results in the international market context. In contrast, Cevik and Bugan (2018) find no proof of safe-haven characteristics in Islamic financial markets. Foglie and Panetta (2020) review articles in academic journals from 2009 to 2017 and find no strong support for the notion that in times of crisis the Islamic stock index acts as a safe haven.

However, a few attributes stand out from the above literature. First, the role an asset plays as a hedge and safe haven can fluctuate over time or be affected by the basic characteristics of the financial crisis; hence, the importance of an asset as a hedge and a safe haven is not constant. As a result, it is crucial to continually re-evaluate whether safe haven assets continue to have hedging and safe haven capabilities at various points during a crisis. Second, when examining assets' hedging and safe haven properties, recent studies (except Cheema et al., 2020) have focused mainly on the COVID-19 crisis. However, it is essential to analyze and compare the hedging and safe haven roles of assets between the COVID-19 pandemic and the 2008 GFC to comprehend the relative effect of each crisis on those assets. In doing so, we can also understand whether the effectiveness of these assets as a hedge and a safe haven varied in other crises. Third, recent studies also reveal that traditional assets, especially gold, foreign currency, T-bonds, and Bitcoin, have lost credibility as a safe haven, increasing the need to seek safe haven in other nontraditional assets. Thus, more potential assets should be evaluated to provide greater diversification and safe haven alternatives to investors. Finally, to chart the future path of safe havens in periods of market turbulence yet to come, it is necessary to conduct comprehensive research on a variety of hedging and a safe haven candidates

during various crises, such as the 2008 GFC and COVID-19, especially as the COVID-19 pandemic continues.

3. Data and methodology

3.1. Data and sample

In this study, we investigate the safe haven and hedging roles of twelve assets chosen from six different asset classes during two major market downturns, the 2008 GFC and the COVID-19 pandemic. We select traditional as well as potential safe haven assets denominated in US dollars. The six asset classes selected are precious metals, which comprises gold (USD per troy ounce) and silver (USD per troy ounce); bonds, proxied by the ten-year US Treasury bond (T-bonds) and the Dow Jones Sukuk index (Sukuk); foreign currency, represented by Swiss franc and US dollar indices¹; commodities, using the S&P GSCI (Goldman Sachs Commodity Index) and West Texas Intermediate (WTI) crude oil price, and the Dow Jones Islamic Index US (IMUS) to proxy for the Islamic stock index; and cryptocurrencies, including Bitcoin, Ethereum, and Tether. The hedging and safe haven capabilities of these assets are tested against the S&P 500 index (a benchmark index of the US stock market).² We use the daily closing/spot prices of these selected assets. The sample period, except for Sukuk and cryptocurrencies, is from January 2, 2002 to August 18, 2020. For Sukuk and cryptocurrencies, the sample period is as follows: September 30, 2010, to August 18, 2020, for Sukuk; July 19, 2010, to August 18, 2020, for Bitcoin; August 7, 2015, to August 18, 2020, for Ethereum; and February 25, 2015, to August 18, 2020, for Tether.³ To capture the 2008 GFC crisis, we select twenty trading days (September 12 to October 10, 2008) as suggested in previous studies (e.g., Baur & McDermott, 2010; Low, Yao, & Faff, 2016), because the stock market crisis was deepened by the GFC during that period. To capture the COVID-19 pandemic, we select the period from January 20 to August 18, 2020, as the first COVID-19 case was reported in the United States on January 20, 2020.⁴ Data on gold, silver, T-bonds, the US dollar index, S&P GSCI, WTI crude oil price, and IMUS are collected from www.investing.com, and the data on Bitcoin, Ethereum, and Tether are collected from www.coinmarketcap.com. The rest of the data, that is, S&P 500 index, Sukuk, and Swiss franc are amassed from DataStream (a division of Thomson-Reuters). We use the daily returns of these assets in natural logarithm in conducting our analysis.

3.2. Methodology

This study uses safe haven assets as the dependent variable and the S&P 500 index as an independent variable. To analyze the safe haven and hedge properties of selected assets against stock market returns, we estimate the following regression models, as suggested by Baur and McDermott (2010).

$$R_{i,t} = \alpha + b_t r_{stock,t} + \varepsilon_t \quad (1)$$

$$b_t = c_0 + c_1 D(GFC, 2008) + c_2 D(COVID - 19) \quad (2)$$

$$\sigma_t^2 = \omega + (\alpha + \gamma I_{t-1}) \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (3)$$

where Eq. (1) models the relationship between US stock returns and returns on safe haven assets. The parameters to be estimated are α and b_t . ε_t is the disturbance term. The parameter b_t is modeled as a dynamic process given by Eq. (2). *GFC* refers to a dummy variable, which takes a value of one for the twenty trading days of the 2008 GFC, and zero otherwise. *COVID-19* is also a dummy variable, which takes a value of one when the trading day is during the COVID-19 period and zero otherwise. Eq. (3) presents the GJR-GARCH (1,1) model (proposed by Glosten, Jagannathan, & Runkle, 1993), which is used to capture the asymmetric effects when stock returns have high volatility in response to bad news and low volatility in response to good news. The GJR-GARCH (1,1) model is suggested, based on the minimum Akaike information criterion (AIC) and Schwarz information criterion (SIC). Finally, Eqs. (1), (2), and (3) are jointly estimated with maximum likelihood criteria.

The parameters of Eqs. (1), (2), and (3) are interpreted as follows. The assets co-move with the stock market provided that all the parameters (c_0 , c_1 , and c_2) are positive, implying that the assets do not satisfy the hedge and safe haven criteria. Parameter c_0 estimates the hedging characteristics of all assets on average. If the parameter c_0 is negative and is statistically significant (insignificant), it implies a strong (weak) hedge on average during the sample period. Similarly, parameters c_1 and c_2 capture the safe haven characteristics during the 2008 GFC and COVID-19, respectively, in the US stock market. If the parameters c_1 and c_2 are negative and statistically significant (insignificant), it indicates a strong (weak) safe haven in the 2008 GFC and COVID-19 pandemic, respectively.

We follow the second approach to test the safe haven and hedge characteristics during extreme stock market turmoil, which is also used by Baur and Lucey (2010), Baur and McDermott (2010), and Li and Lucey (2017).

$$b_t = c_0 + c_1 D(r_{stock} q_5) + c_2 D(r_{stock} q_{2.5}) + c_3 D(r_{stock} q_1) \quad (4)$$

¹ The US dollar index represents the value of the US dollar relative to a basket of foreign currencies. The Swiss franc is defined accordingly.

² It includes 500 leading companies and covers approximately 80% of the available market capitalization of US stock market. For details, see <https://www.spglobal.com/spdji/en/indices/equity/sp-500/#overview/>.

³ The starting date of the sample period of these assets is determined by the availability of data.

⁴ <https://www.nejm.org/doi/full/10.1056/NEJMoa2001191/>.

The parameter b_t is modeled as a dynamic process in Eq. (4). The dummy variables are represented by $D(\dots)$, capturing extreme stock market turbulence, defined as follows (Li & Lucey, 2017).

$$D(r_{stock} q_x) = \begin{cases} 1 & \text{if } r_{stock,i} < (r_{stock} q_x) \\ 0 & \text{if } r_{stock,i} \geq (r_{stock} q_x) \end{cases}$$

The threshold is given by the 5%, 2.5%, and 1% quantiles of the return distribution over the full sample period. As in the prior equations, the terms of Eq. (4) are interpreted as follows. The assets are strongly (weakly) hedged if the parameter c_0 is negative and significant (insignificant) on the normal term. Similarly, if the parameters (c_0 , c_1 , c_2 , and c_3) are negative and statistically significant (insignificant), it indicates a strong (weak) safe haven in times of extreme stock market downturns. This approach is jointly estimated through Eqs. (1), (3), and (4) with maximum likelihood criteria. Finally, in our study, we consider four error distributions, that is, Student's t distribution, skewed Student's t distribution, generalized error distribution (GED), and Gaussian distribution, to fit the model and capture the fat tails in the return distribution. We estimate these four error distributions based on the maximum likelihood criteria.

4. Analysis of results

4.1. Summary statistics and unit-root tests

Table 1 lists the key descriptive statistics of the daily return series of assets considered in this study. We divide our data into three periods to estimate the descriptive statistics: the full sample, the 2008 GFC, and COVID-19. The results for the mean, standard deviation, and Sharpe ratio vary substantially over the three periods. Unlike T-bonds, the US dollar, Swiss francs, and Tether, all the assets have positive mean returns during the full sample period. Bitcoin obtains the highest mean returns, and T-bonds yield the lowest mean returns. Surprisingly, Sukuk has the highest Sharpe ratio, as its standard deviation is the lowest of all, and the Swiss franc has the lowest Sharpe ratio. During the 2008 GFC period, only gold, T-bonds, and US dollars have positive Sharpe ratios, and the dollar has the highest Sharpe ratio. During the COVID-19 period, all the assets have positive Sharpe ratios except T-bonds, GSCI, WTI oil price, US dollars, and Swiss francs.

The commodity indices (GSCI and WTI) and Swiss francs have sharply negative ratios during both crises. Unlike cryptocurrencies, all the assets have higher volatility during the crisis periods than the full sample period. However, most of the assets used in this study are negatively skewed and have high kurtosis values, suggesting the normality of the return series with fat tails. However, the Jarque-Bera statistic shows that the return series for the full sample and COVID-19 periods are not normal, whereas those for the 2008 GFC period are normal.

The return series stationarity is tested with the augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979) and Phillips-Perron (PP) test (Phillips & Perron, 1988). Although there are several tests for stationarity, we have used ADF and PP tests, as they have some benefits over other tests, particularly in capturing the residuals' autocorrelation issues (Hasan, Hassan, Karim, & Rashid, 2021). The results are reported in Table 2 and confirm the return series' stationarity for all the assets in all the sample periods.

4.2. Correlation matrix

The correlation matrix between the assets considered in this study is reported in Table 3. All the assets except the Islamic stock index (IMUS) have a very low or negative correlation with the S&P 500, indicating that they are less likely to go in the same direction as the S&P 500 index; instead, they are likely to move in the opposite direction. Thus, these assets have the potential to provide hedge or safe-haven benefits for the US stock market.

4.3. Regression analysis

We estimate the model considering four error distributions as mentioned in Section 3.2. In most cases, a Student's t distribution is estimated based on the maximum likelihood criteria, although the GED is also estimated in other cases. The Student's t distribution and GED both capture the fat-tail behavior (Bouri et al., 2017; Bouri, Lucey, & Roubaud, 2019), indicating that our model has a good fit.

To determine the results of safe-haven assets during the 2008 GFC and COVID-19 periods, we jointly estimate Eqs. (1), (2), and (3). The empirical results of the analysis are reported in Table 4, except for cryptocurrencies during the 2008 GFC period.⁵ Our results show that gold and the US dollar are strong hedges against the US stock market, whereas Sukuk and Ethereum are weak hedges. Our results further indicate that silver and the Islamic stock index are strong safe havens against the US stock market during the 2008 GFC period, but gold and T-bonds are weak safe havens. Conversely, during the COVID-19 period, the Islamic stock index and Tether are strong safe havens, whereas Sukuk and Swiss francs are weak safe havens. Surprisingly, Bitcoin, GSCI, and crude oil prices perform as neither a hedge nor a safe haven for the US stock market. Among our selected assets, only the Islamic stock index has consistent safe-haven properties, as it serves as a strong safe haven in both crises.

⁵ The study period of cryptocurrencies and Sukuk starts after the 2008 GFC crisis, which are also mentioned in Section 3.1. Thus, for cryptocurrencies and Sukuk, we estimate Eqs. (1), (2), and (3) without the GFC dummy.

Table 1
Descriptive statistics.

Variable	Full sample period						2008 GFC period				COVID-19 period			
	Mean	Std. Dev.	Sharpe Ratio	Skewness	Kurtosis	Jarque-Bera	Mean	Std. Dev.	Sharp Ratio	Jarque-Bera	Mean	Std. Dev.	Sharp Ratio	Jarque-Bera
S&P 500	0.0222	1.2218	0.0182	-0.4449	16.099	34,898.22*	-1.6537	3.9565	-0.4180	0.3979	0.0118	2.6736	0.0044	201.10*
Gold	0.0407	1.4204	0.0287	-0.123	16.995	39,667.33*	0.5893	3.4006	0.1733	1.1053	0.1564	1.5200	0.1029	40.10*
Silver	0.0376	2.084	0.0180	-0.7522	9.799	9817.35*	-0.0893	6.0796	-0.0147	0.8809	0.2839	3.1580	0.0899	60.75*
T-bond	-0.042	2.4864	-0.0169	-0.0019	38.697	257,983.40*	0.2027	4.1773	0.0485	0.8759	-0.6592	8.4608	-0.0779	210.49*
Sukuk	0.0179	0.1249	0.1431	-1.9523	25.1127	54,161.19*	-	-	-	-	0.0333	0.2566	0.1297	605.62*
GSCI	0.015	1.4544	0.0103	-0.3785	7.907	4991.32*	-1.2363	3.8208	-0.3236	0.5046	-0.1154	2.5956	-0.0445	314.04*
WTI	0.0147	2.6489	0.0055	-0.4668	28.716	134,061.50*	-1.3202	6.5355	-0.2020	0.4706	-0.2047	8.1014	-0.0253	248.44*
Dollar	-0.0047	0.4941	-0.0095	0.0301	4.709	591.83*	0.2672	1.1359	0.2352	0.0064	-0.0330	0.5238	-0.0630	54.12*
Franc	-0.0123	0.6798	-0.0181	-0.8384	41.389	298,937.60*	-0.0457	1.0367	-0.0441	1.3953	-0.0451	0.5049	-0.0893	31.20*
IMUS	0.0273	1.1992	0.0228	-0.3082	15.727	32,872.24*	-1.6254	3.2698	-0.4971	0.4262	0.0625	2.6497	0.0236	210.61*
Bitcoin	0.4444	7.6706	0.0579	2.483	70.6910	505,013.50*	-	-	-	-	0.1928	5.7212	0.0337	9268.80*
Ethereum	0.3834	8.4166	0.0556	-2.966	60.1862	180,698.20*	-	-	-	-	0.5977	6.8983	0.0867	5025.11*
Tether	-0.0134	1.6628	-0.0081	-11.1662	341.68	6,859,201.0*	-	-	-	-	0.0000	0.7988	0.0000	2383.27*

Notes: The table presents the results of summary statistics, including the Jarque-Bera test, of the return series of assets. The sample period is from January 2, 2002, to August 18, 2020. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The Sharpe ratio is estimated as dividing the mean returns of an asset by its standard deviation of returns (Bouri et al., 2020).

Table 2
Unit-root tests.

Variable	Full sample period		2008 GFC period		COVID-19 period	
	ADF	PP	ADF	PP	ADF	PP
S&P 500	-79.468*	-79.468*	-4.590*	-12.551*	-18.300*	-18.099*
Gold	-56.918*	-86.100*	-4.630*	-4.650*	-12.153*	-12.153*
Silver	-73.048*	-73.039*	-5.332*	-5.347*	-6.805*	-11.694*
T-bond	-25.270*	-75.273*	-4.936*	-4.938*	-13.897*	-15.511*
Sukuk	-21.776*	-43.324*	-	-	-4.316*	-7.859*
GSCI	-70.936*	-70.931*	-4.702*	-5.360*	-12.304*	-12.320*
WTI	-52.927*	-68.811*	-5.007*	-9.977*	-9.823*	-10.927*
Dollar	-69.589*	-69.590*	-4.727*	-4.727*	-9.253*	-9.304*
Franc	-70.905*	-70.946*	-1.752***	-4.473**	-10.562*	-10.473*
IMUS	-54.071*	-77.195*	-4.946*	-10.643*	-18.756*	-18.235*
Bitcoin	-27.187*	-54.419*	-	-	-15.486*	-15.188*
Ethereum	-40.844*	-40.206*	-	-	-14.988*	-14.694*
Tether	-23.636*	-34.984*	-	-	-11.178*	-52.042*

Notes: The table reports the unit-root test results (ADF and PP tests) of the return series of assets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results of an extreme downturn in the market (i.e., 1%, 2.5%, and 5% quantiles) are documented in Table 5. The estimated results show that the coefficients (c_0) for gold, silver, Sukuk, US dollars, and Tether are negative but insignificant. This result means that these assets are weak hedges against the US stock market, and none of the assets are strong hedges. Considering the condition of extreme market turmoil (in the same quantiles), our results provide evidence that gold, the Islamic stock index, and Bitcoin have strong safe-haven properties under different quantiles. In contrast, silver, T-bonds, US dollar, and Ethereum are weak safe havens. Our findings also reveal that GSCI, crude oil, and Swiss francs are neither hedges nor safe havens. Therefore, in times of extreme market downturns, the traditional assets gold and Bitcoin still play a safe-haven role in the US stock market context, and the Islamic stock index, as a potential asset, can be newly added to the list of strong safe havens.

4.4. Discussion

At the outset, our results can be summarized as follows. Our first and principal analysis reveals that, among the selected assets, only gold and the US dollar are strong hedges for the US stock market. Only silver and the Islamic stock index provide a strong safe haven during the 2008 GFC. During COVID-19, the Islamic stock index and Tether provide a strong safe haven. Surprisingly, the Islamic stock index is the only asset that provides a shield during both crises, whereas silver loses its safe-haven status during COVID-19, even though it provides a safe haven in the 2008 GFC. The traditional assets fail to offer protection during the recent crisis (COVID-19), whereas the potential assets (Islamic stock index and Tether) effectively offer a safe haven, which is partially supported by studies such as Ashraf et al. (2020), Conlon et al. (2020), Goodell and Goutte (2021), and Hasan, Hassan, Karim, and Rashid (2021).

Bitcoin, one of the striking assets for investors, does not perform well as a safe haven during COVID-19, which tallies with the findings of recent studies, such as Goodell and Goutte (2021), Conlon et al. (2020), and Conlon and McGee (2020). However, our supplementary analysis with three threshold quantiles reveals that traditional assets, such as gold and Bitcoin, are strong safe havens during severe market downturns. Overall, the results suggest that safe-haven assets can change over time, suggesting that safe-haven properties are time-varying, which is consistent with the findings of Li and Lucey (2017), Shahzad et al. (2019), and Ji et al. (2020).

Gold has a very long history as a store of value and money. Accordingly, it is empirically proven to be a safe-haven asset, but, unexpectedly, our study finds that gold fails to act as a safe haven in times of crisis, especially during the COVID-19 period. One possible reason is that, from September 5, 2011, to December 1, 2015, the price of gold fell about 45% (Cheema et al., 2020); therefore, investors have lost confidence in gold, creating uncertainty among investors that is exacerbated by COVID-19. In the first two months of COVID-19, sales of jewelry (including gold) in the US dropped 82%.⁶ Nonetheless, in our supplementary threshold analysis, gold still acts as a safe-haven asset during severe market downturns. However, these findings are consistent in part with those of Baur and McDermott (2016), Ji et al. (2020), Cheema et al. (2020), and Hassan, Hasan, and Rashid (2021), among others. For the same reason, silver also fails to act as a safe haven during COVID-19. Moreover, the price of silver fell rapidly in March 2020 due to the sudden outbreak of COVID-19, which might be an additional reason for this result (Rajput et al., 2021).

Oil prices plummeted in early 2020, due to the oil price war between Russia and Saudi Arabia. Oil prices fell further because of the COVID-19 pandemic, as oil demand was substantially reduced by the lockdown measures initiated to prevent the spread of COVID-19 (Hasan, Mahi, Hassan, & Bhuiyan, 2021). Demand for commodities drops significantly when people are forced to stay at home. Besides, these assets are not generally considered strong safe havens (Hassan, Djajadikerta, Choudhury, & Kamran, 2021; Ji et al., 2020). All these aspects work against the ability of GSCI and oil to act as a safe haven for the US stock market.

US T-bonds are typically considered the safest investment. Moreover, bonds are assumed to be less affected by business cycles than stocks (Yarovaya et al., 2021). However, in our analysis, even though US T-bonds appear to be a weak safe haven during the 2008 GFC,

⁶ <https://www.edahngolan.com/this-is-how-covid-19-impacted-jewelry-sales/>.

Table 3

Correlation matrix.

Variable	S&P 500	Gold	Silver	T-Bond	Sukuk	GSCI	WTI	Dollar	Franc	IMUS	Bitcoin	Ethereum	Tether
S&P 500	1												
Gold	-0.1121	1											
Silver	-0.0291	0.7421	1										
T-bond	0.3265	-0.1431	-0.0810	1									
Sukuk	0.0243	0.0228	0.0226	0.0012	1								
GSCI	-0.0184	0.2859	0.2455	-0.0206	0.0041	1							
WTI	-0.0417	0.2019	0.1773	-0.0177	-0.0062	0.8893	1						
Dollar	0.1175	-0.5010	-0.3680	0.3156	-0.0118	-0.1461	-0.1146	1					
Franc	0.1445	-0.4347	-0.2966	0.2248	0.0143	-0.1196	-0.0999	0.7577	1				
IMUS	0.9468	-0.0961	-0.0136	0.3416	0.0161	0.0333	0.0035	0.1310	0.1366	1			
Bitcoin	-0.0152	-0.0316	-0.0310	-0.0211	0.0037	0.0023	0.0003	0.0326	0.0111	-0.0206	1		
Ethereum	0.0291	-0.0066	-0.0288	0.0411	0.0160	-0.0040	-0.0041	0.0415	0.0218	0.0178	0.0578	1	
Tether	-0.0110	0.0206	-0.0045	-0.0050	0.0074	-0.0456	-0.0647	-0.0047	0.0068	-0.0092	-0.0016	-0.1401	1

Note: The table reports the correlation matrix between the safe-haven assets and the US benchmark stock index.

Table 4
Estimation results for the candidates as hedge and safe-haven assets.

S&P 500 index			
Variable	Hedge (c_0)	GFC dummy (c_1)	COVID-19 dummy (c_2)
Gold	-0.0372*	-0.0473	0.0355
Silver	0.0411**	-0.2994**	0.2037*
T-bond	0.6398*	-0.0900	1.3152*
Sukuk	-0.0003	-	-0.0072
GSCI	0.3357*	0.0761	0.1910*
WTI	0.4992*	0.1435	0.4228*
Dollar	-0.0255*	0.0596**	0.0177
Franc	0.0304*	0.0148	-0.0102
IMUS	0.9936*	-0.1736*	-0.0104***
Bitcoin	0.0303	-	1.3505*
Ethereum	-0.0256	-	0.5725*
Tether	0.0021	-	-0.1071*

Notes: The table reports the roles of all selected assets as a hedge and safe haven against the S&P 500 index during two stressful periods, i.e., the 2008 GFC and COVID-19 pandemic. The 2008 GFC and COVID-19 periods are from September 12 to October 10, 2008 (20 trading days) and January 20 to August 18, 2020, respectively. A significantly negative coefficient (c_0) indicates a strong hedge and an insignificantly negative coefficient (c_0) implies a weak hedge. The decision criteria for safe-haven properties during GFC (c_1) and COVID-19 (c_2) are like the coefficient (c_0) of the hedge. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5
Estimation results for all the selected assets as a safe haven during extreme market downturn.

S&P 500 index				
Variable	hedge (c_0)	1% quantile (c_1)	2.5% quantile (c_2)	5% quantile (c_3)
Gold	-0.0365	-0.0112	0.0381	-0.1504*
Silver	-0.0917	0.1660***	0.2164**	-0.0521
T-bond	0.5662*	0.0933	-0.0226	0.2891*
Sukuk	-0.0264	0.0260	0.0259	0.0262
GSCI	0.1079	0.2594*	0.2521*	0.2030**
WTI	0.2453	0.3043**	0.2556	0.1995
Dollar	-0.0275	0.0076	-0.0134	0.0278
Franc	0.0168	0.0154	0.0022	0.0210
IMUS	0.9866*	0.0110	-0.0015	-0.0394**
Bitcoin	0.6342*	-0.6342*	-0.4661**	-0.0235
Ethereum	0.3115*	-0.0945	-0.2498	0.4916*
Tether	-0.1305	0.1163	0.1291	0.2870**

Notes: The table reports the estimated results for the role of the assets as a hedge and safe haven during the extreme downturn market. A significantly (insignificantly) negative coefficient (c_0) indicates a strong (weak) hedge on average, whereas significantly (insignificantly) negative coefficients (c_1 , c_2 , and c_3) indicate strong (weak) safe havens during an extreme market downturn (i.e., 1%, 2.5%, and 5% quantiles). *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

they do not appear to be a safe haven to any degree during the COVID-19 period. The COVID-19 pandemic created unprecedented havoc in the world economy and affects almost all sectors and assets, but the US economy has been hit even harder. Accordingly, T-bonds are also affected. Hence, they cannot hedge the US stock market during COVID-19. By contrast, Sukuk offer somewhat more consistent protection than T-bonds, as it can act as a hedge and a safe haven, though weak, during the entire period and under COVID-19, respectively. The possible reason for the slightly better performance of Sukuk is its conservative nature in the investment process.

Foreign currencies, such as the US dollar and the Swiss franc, fail to provide a hedge for the US stock market during both crises, as international trading activities generally drop during financial crises, and so does activity on foreign exchange markets. International trade is severely affected by the lockdown measures due to COVID-19, creating uncertainty in the foreign exchange market (Ji et al., 2020).

A substantial body of previous literature has documented that Islamic markets are more stable, safer, and less volatile than their conventional counterparts. Even during the 2008 GFC, the banning of subprime mortgage securities and derivatives at Islamic entities enabled Islamic markets to demonstrate their greater ability to play a role as a safe haven compared to their conventional counterparts (e.g., Akhtar & Jahromi, 2017; Arouri, Ameer, Jawadi, Jawadi, & Louhichi, 2013). Our findings present evidence that Islamic stock markets are less influenced by the financial crisis and provide strong protection for the US stock market during both crises. Furthermore, Islamic markets are ruled by sharia law, which prohibits interest, gambling, and extremely risky transactions, such as speculation, short selling, and arbitration (Abdul Aziz & Gintzburger, 2009). These restrictions make Islamic markets less likely than conventional markets to be influenced by a financial crisis.

Unexpectedly, we do not find safe-haven properties in Bitcoin during either of the crises. However, our secondary analysis finds evidence of strong safe-haven properties for it against extreme market downturns. Interestingly, among the other cryptocurrencies,

Tether shows strong safe-haven properties during COVID-19, but Ethereum is only a weak hedge during our sample period. Because cryptocurrencies escape monetary regulation, they are essentially uncorrelated to other financial assets, especially equities, enabling them to act as a safe haven. Moreover, Tether is considered a stable coin because of its performance.

5. Conclusions

In times of crisis, the most important issue for investors is the safety of their investments if the market suffers turbulence; hence, their safe-haven properties are critical. However, crises such as the 2008 GFC and COVID-19 hit the economy and financial markets so hard that it was difficult to find safe-haven assets, which increases demand for safe-haven assets. Moreover, safe-haven assets are time varying, so it is vital to evaluate their role further. Therefore, our study considers two recent major crises, the 2008 GFC and COVID-19, to test the safe-haven properties of a set of traditional and potential assets in the US market. We selected twelve assets over the period January 2, 2002, to August 18, 2020, and study them with the methods suggested by Baur and McDermott (2010).

Our empirical findings reveal that, during the 2008 GFC, only silver and the Islamic stock index perform as strong safe havens for the US stock market, but during COVID-19, the Islamic stock index and Tether perform as strong safe havens. Surprisingly, only the Islamic stock index provides a consistent safe haven. However, among the selected assets, only gold and the US dollar are strong hedges during the full sample period. Traditional assets, except silver, fail to protect the US stock market in times of crisis, whereas nontraditional assets, such as the Islamic stock index and Tether, provide strong protection. Nonetheless, our supplementary analysis reveals that traditional assets, such as gold and Bitcoin, still demonstrate strong safe-haven behavior during extreme market downturns. Overall, our findings suggest that safe-haven assets might change over time. Our findings can benefit both investors and fund managers to formulate effective investment strategies for protecting their investments in times of market turbulence.

The limitation of this study is that we focus only on the US market, though it is the world's largest market. To provide a more comprehensive scenario regarding the degree and direction of safe-haven properties, future researchers should incorporate more assets and stock markets in their studies.

Credit author statement

All authors equally contributed to the paper.

Availability of data and materials

The data sources are given in the data and methodology section. The datasets can be provided upon reasonable request.

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The authors declare that they have no competing interests.

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