

Journal of Central Banking Theory and Practice, 2026, 2, pp. 233-253
Received: 8 July 2025; accepted: 27 January 2026

UDC: 336.76:004.738.5
DOI: 10.2478/jcbtp-2026-0019

Mico Apostolov^{*}, **Simone Domenico Scagnelli**^{**},
Lorenzo Vasile^{***}

^{*} Goce Delcev University,
Stip, N. Macedonia;
University of Turin, Torino,
Italy

E-mail:
mico.apostolov@ugd.edu.mk;
mico.apostolov@unito.it

^{**} Edith Cowan University,
Joondalup, Australia

E-mail:
s.scagnelli@ecu.edu.au

^{***} University of Turin, Torino,
Italy

E-mail:
lorenzo.vasile@unito.it

Diversification for Stock Markets: Commodities or Crypto

Abstract: The question that an asset could serve as a good store of value has been brought up a number of times, especially due to major market shocks. Despite the long-held belief that gold serves as a safe haven, a growing body of contemporary literature perpetually assesses this notion. Whether cryptocurrencies, namely Bitcoin as the most well-known of them, as an asset, can serve as a safe haven or hedge gains traction in research. This study investigates the relationship of gold and Bitcoin to S&P 500 stock index and the possibility that these might serve as a safe haven in respect to stock indexes. The results show that, when analysed the safe haven properties of either gold or Bitcoin, there is evidence that Bitcoin has negative and statistically significant relationship with the stock market making it good proponent for safe haven. On the other hand, gold has non-positive correlation with the stock market, which adds to the basic readings that it is good hedge asset.

Keywords: stock market, Gold, Bitcoin, S&P500, hedge, safe haven, diversification

JEL Code: F21, F37, G15, M21, O31

1. Introduction

The context and importance, that is, the role of hedge/safe haven assets is conditioned on the premise that financial markets are inherently volatile, with periods of significant instability often triggered by different events. During such times, investors seek refuge in assets that can preserve value and mitigate losses. These assets, known as safe haven assets, are crucial for portfolio diversification

and risk management. Traditionally, gold has been regarded as the quintessential safe-haven asset due to its historical stability and intrinsic value (Baur & McDermott, 2010). However, the advent of digital currencies, particularly Bitcoin, has introduced a new potential safe haven asset, prompting a re-evaluation of traditional investment strategies (Bouri et al., 2017; Dyhrberg, 2016a).

This research aims to compare the effectiveness of Bitcoin and gold as hedge or safe-haven assets. By analysing their performance during periods of market stress, we seek to determine whether Bitcoin can serve as a viable alternative to gold. The analysis will focus on the relationship between Bitcoin (BTC), gold (GC), silver (SI), the S&P 500 index (SP500), and the CBOE Volatility Index (VIX), which serves as a measure of market volatility and investor sentiment (Cheah et al., 2018; Klein et al., 2018).

The relevance of this study can be found in the implications for investors and policymakers understanding these specific properties of Bitcoin and gold. For investors, identifying reliable hedge or safe haven assets is essential for effective portfolio management and risk mitigation (Baur & Lucey, 2010). For policymakers, insights into the behaviour of these assets during crises can inform regulatory decisions and financial stability measures (Corbet et al., 2018). This study contributes to the ongoing debate on the role of digital currencies in modern financial markets and provides empirical evidence to guide investment and policy decisions.

This article is organized as follows. In the next section, we present a condensed theoretical framework and elaborate the main objectives. We use separate section to build the analytical framework, followed by the methodology where we explain the data and empirical model. There is a specific section for analysis and discussion of the results and effects where we convey our findings, linking the empirical evidence to theoretical underpinnings. The article ends with conclusions and suggestions for future research.

2. Theoretical Framework

A hedge or safe haven

Unexpected declining returns and high volatility have been an integral characteristic of stock markets. Therefore, in such cases the investors are concerned with using investment vehicles that are defined either as hedge or, in extreme declines, as safe haven. A safe haven asset is considered the asset that holds value

in adverse market conditions, thus, enabling the investors to protect their wealth. One of the most important factors that makes investors seek for a safe haven is as a response to severe market shocks in a short period of time. The essence of such movement during severe market stress infers that investors take different positions in normal times compared to extreme adverse market conditions. An accepted framework to analyse gains and losses is the prospect theory that holds the theoretical foundations to examine the presence of safe haven. Prospect theory states that entities make their decisions based on perceived gains rather than perceived losses, therefore investigating the loss-aversion of investors (Tversky & Kahneman, 1992). In this regard, investors are either prone to allocating their assets into save haven or hedge which is in average correlation with another asset.

Further, a strong/weak hedge is defined as an asset that is negatively correlated/uncorrelated with another asset or portfolio on average (Baur & Lucey, 2010; Baur & McDermott, 2010). It must be said that a hedge does not have the property of reducing losses in periods of extremely declining markets, because there could be both positive and negative correlation on average (Hood & Malik, 2013).

On the other hand, a strong/weak safe haven is defined as an asset that is negatively correlated/uncorrelated with another asset or portfolio in certain periods only (Baur & Lucey, 2010). A specific characteristic is the non-positive correlation (zero or negative) in extreme market conditions for periods of stock market declines (Hood & Malik, 2013).

Gold is a very suitable asset for such an analysis, and there is an established literature that examines the suitability for this asset as safe haven or hedge. In general, precious metals can be used to hedge adverse market conditions because of their quality to perform best during high market volatility (Hillier et al., 2006). Further, gold can be used as safe haven in extreme market conditions or hedge, on average, against stocks (Baur & Lucey, 2010).

Bitcoin has sometimes been dubbed as digital gold; however, there is lack of consensus on this issue (Selmi et al., 2018). The main similarities between gold and bitcoin that can lead to taking under consideration of Bitcoin as either hedge or safe haven asset are the scarcity and cost of extraction, as well as, the fact that both assets lack governmental control, thus have finite supply (Dyhrberg, 2016a, 2016b). Further, due to such specificities of Bitcoin and its unique pricing mechanism it is also taken under consideration in high market uncertainty (Selgin, 2015; Shahzad et al., 2019).

On Gold

There is a significant body of literature that discusses safe haven and hedge properties of gold and the possibility for such characteristics for Bitcoin. In time of market stress investors, focus on safe haven assets that indicates that such adverse market conditions are opposed to normal market conditions. Hence, in such cases prospect theory is used because it analyses gains and losses, where investors evaluate their actions discarding final wealth levels and focus on valuing gains and losses differently (Tversky & Kahneman, 1974). Gold has been considered as safe haven asset in number of studies, where some observe the influences and nature of the gold market (Capie, Mills, & Wood, 2005; Tully & Lucey, 2007), and others put their attention on safe havens (Kaul & Sapp, 2006; Kopyl & Lee, 2016). Further, it is regarded to be a key component of monetary reserves, as well as, important asset for trading and currency hedging (Azimli, 2024; Capie, Mills, & Wood, 2005; Chiang, 2024), thus, investigating the dynamics of prices offers explanations on the relationship to other commodities and currencies (Adrangi, Chatrath, & David, 2000).

In times of crises, there is a strong motivation to test the viability of gold as safe haven or hedging asset from losses in the financial market. Thus, evidence shows that gold can hold its value if stock markets experience extreme negative returns (Baur & Lucey, 2010). Important features are the inflation-hedging ability and the exchange-rate hedging potential of gold (Capie, Mills, & Wood, 2005; Sherman, 1982). The safe haven properties have been analysed against various currencies, as well as, its relation to bonds (Kaul & Sapp, 2006; Ranaldo & Söderlind, 2010). The financial contagion literature finds that when investors are faced with losses, they shift their portfolios reflecting their fears in relative and absolute terms towards the average portfolio in environment of market shocks (Calvo & Mendoza, 2000; Forbes & Rigobon, 2002). Another line of thought, that is, the flight to quality literature states that in times of market shocks the investors move their portfolio from stocks to bonds (Hartmann, Straetmans, & de Vries, 2004; Soylu & Güloğlu, 2019), thus giving favourable background for analysis of potential hedging or safe haven assets. Thus, safe haven properties of gold have been extensively discussed in the literature giving most of the for and against arguments for considering gold for such a role (Areal, Oliveira, & Sampaio, 2015; Bilgin et al., 2018; Ciner, Gurdgiev, & Lucey, 2013).

In modern asset allocation, gold has long been regarded as a crucial element in a diversified investment portfolio. Its unique properties make it an attractive choice for investors seeking to mitigate risk and enhance returns. Unlike stocks and bonds, gold does not generate income or dividends; instead, it offers capital

appreciation and acts as a hedge against inflation and currency fluctuations. In times of market volatility, gold's historical stability provides a safe harbour for investors, helping to preserve wealth and protect against losses in other asset classes (Bekiros et al., 2017). During periods of economic instability or market downturns, gold often moves independently or in the opposite direction of traditional investments like equities and fixed income securities. This inverse relationship can help reduce overall portfolio volatility and enhance risk-adjusted returns. By allocating a portion of their assets to gold, investors can achieve a more balanced and resilient portfolio (Lucey & Li, 2015).

On Bitcoin

Global investors are also considering investing in cryptocurrencies, such as Bitcoin in recent years. Further, there is significant research related to many aspects of Bitcoin, specifically analysing its hedging capabilities (Dwita Mariana, Ekaputra, & Husodo, 2021; Dyhrberg, 2016a, 2016b; Pal & Mitra, 2019; Wang et al., 2019), relationships with other assets, such as currencies, bonds, equities (Jin et al., 2019; Klein et al., 2018), cryptocurrency uncertainty index (Chowdhury & Damianov, 2024; Lucey et al., 2022) or price influencing factors (Demir et al., 2018; Panagiotidis et al., 2019).

In this paper, two strains of Bitcoin literature are used. The first one analyses Bitcoin as a hedging or safe haven asset, that is, its attributes against uncertainty. Thus, the capability to be used as hedge against uncertainty, even to be proposed by scholars as safe haven, comes because its creation in a period of high economic uncertainty; hence, it is measured against uncertainty indicators. In the first instance, the attention is given to economic policy uncertainty (EPU) (Baker et al., 2016) where positive correlation to Bitcoin is observed, indicating that it can serve as a hedging asset. The second instance of measurement is against the stock market volatility index (VIX) (Bouri et al., 2017) where if there is low or high uncertainty, in short term, Bitcoin can be used as a hedge against global uncertainty. Further, some studies have been examining the relationship with oil price uncertainty identified through CBOE crude oil ETF volatility index (OVX) (Bouoiyour et al., 2019; Das et al., 2020). In most cases, the hedging ability of Bitcoin is considered to be limited, thus, it can be used under certain conditions to hedge risks and diversify investments. On the other hand, because of its volatility, high transaction costs and low liquidity, some of the research warns or opposes its use as safe haven (Smales, 2019). Further, during severe market downturn, such as during the last major pandemic, Bitcoin did not show key features of safe haven asset due to the direction of its price change which was in the same course

as the S&P 500 index (Conlon & McGee, 2020), thus the diversification into Bitcoin will potentially increase the downward risk of the portfolio.

The second line of research pairs Bitcoin to different assets such as gold, oil and others in order to determine comparative advantages or disadvantages of using this asset as safe haven or hedge. Interesting analyses can be found on the function of Bitcoin, precious metals, and oil as safe havens in the US stock market during the period of elevated uncertainty around the US presidential election (Bouoiyour et al., 2019). According to these findings, Bitcoin can only be used as a short-term safe haven, while precious metals (gold and silver) can be utilized as a medium- and long-term safe havens. Oil's hedging ability is considered unstable. Other research paths using the GARCH model and quantile regression with dummy variables argue that neither gold nor bitcoin can be used as a hedge against economic policy uncertainty and that their hedging capacities are only limited in extremely bull or bear markets (Wu et al., 2019).

Bitcoin and Gold

Divergent opinions exist among other academics regarding the hedging or safe haven potential of gold and bitcoin. It is argued that Bitcoin does not have the same hedging qualities as gold, and its use as a currency is extremely restricted (Baur et al., 2018). On the other hand, it is more of a speculative asset because Bitcoin has performed rather poorly in terms of price stability and availability (Shahzad et al., 2019) which could make it an alternative investment for high-value assets like gold and commodities. Further, another research streams that analyse major market shocks claim that Bitcoin proved ineffective as a hedge against the risks associated with the crude oil market, while gold might act as a safe haven asset (Das et al., 2020). As a result, there is no consensus in the literature regarding whether Bitcoin can hedge against risk similarly to other assets. Based on the previously affirmed literature, Bitcoin and gold have different hedging characteristics, proving that there are still some differences between the two. In contrast to the lengthy history of gold's involvement in human economic life, Bitcoin's development is still in its infancy and has not yet achieved the same level of global acceptance as gold. Furthermore, Bitcoin exhibits distinct features and is more susceptible to the policies imposed by large economies than gold. As a result, it is subject to greater influence from policy changes.

A growing body of studies is addressing the question of whether cryptocurrency, or Bitcoin, can serve as a safe haven, thus, an equities portfolio containing Bitcoin may improve risk return (Brière et al., 2015), or even it might become an

inflation hedge (Bouri et al., 2017). Further, Bitcoin can occasionally be seen as a safe haven against stock risk (Fang et al., 2019), and because it is not tied to conventional assets, it is especially helpful during emergencies (Gil-Alana et al., 2020). However, Bitcoin is a weak safe haven for the stock market but a robust safe haven for oil (Corbet et al., 2020). Nonetheless, a significant number of studies refute the idea that cryptocurrency might serve as a safe haven or a hedging asset (Goodell & Goutte, 2021; Klein et al., 2018). This is because there could be lower correlation with equity markets in times of stable and high economic growth and low interest rates, where they have moved in the same direction as the stock market (Choi & Shin, 2022; Conlon & McGee, 2020). On the other hand, the role of Bitcoin is within the confines of being a portfolio diversifier; however, gold is considered a superior portfolio diversifier than Bitcoin, especially for risk-averse investors (Pho et al., 2021).

Both Bitcoin and gold offer unique advantages as investment options. Gold's historical significance, intrinsic value, and stability make it a trusted hedge and safe haven. On the other hand, Bitcoin's scarcity, portability, and potential for high returns attract a new generation of investors seeking alternatives to traditional assets. The choice between Bitcoin and gold ultimately depends on individual investment goals, risk tolerance, and preferences. While gold remains a timeless store of value, Bitcoin's innovative technology and growing acceptance hint at a future where digital assets play an increasingly significant role in wealth preservation.

3. Methodology

Definitions

In accordance with Baur and McDermott (2010), we define a safe haven and a hedge as follows:

Hedge: An asset that, on average, has no correlation or a negative correlation with another asset or portfolio is defined as a hedge. On average, a rigorous hedge has a (strictly) negative correlation with another asset or a portfolio. Since the asset may have a positive correlation during stressful or turbulent market times and a negative correlation during regular times with an average negative correlation, a hedge does not have the (particular) ability to reduce losses during these times.

Diversifier: An asset is considered a diversifier if it has an average positive correlation (albeit not a perfect one) with another asset or portfolio. Since the correlation feature must only hold on average, the diversifier, like the hedge, lacks the (particular) ability to minimize losses in extremely unfavourable market conditions.

Safe haven: An asset that is uncorrelated or negatively correlated with another asset or portfolio during periods of market stress or volatility is considered to be a safe haven. In severe market situations, the unique characteristic of a safe haven asset is its non-positive correlation with a portfolio. The correlation should not be positive or negative on average but only be zero or negative in specific periods.

Data

The data consist of daily closing spot prices for gold (GC), bitcoin (BTC), silver (SI), the S&P 500 Index (SP500), and VIX (VIX). All the data used in the paper was obtained from Yahoo Finance via STATA. The data covers from September 14, 2014 to January 3, 2025.

The prices of all precious metals are expressed in US dollars per troy ounce and are traded at COMEX in New York. The CBOE VIX is one of the most extensively utilised volatility indices by investors as a benchmark. VIX is a consensus indicator of short-term volatility in the equity market since it expresses a 30-day implied volatility derived from S&P 500 traded options. For Bitcoin, Yahoo Finance uses CCC (CoinMarketCap) in New York that provides information and data such as prices, trade volumes, and market capitalization on cryptocurrencies, so the standard quote of Bitcoin is BTC/USD. Descriptive statistics for each of the five series under study are shown in Table 1.

Table 1: Descriptive statistics

	BTC			SI			SP500			VIX		
	Percentiles	Smallest	Largest	Percentiles	Smallest	Largest	Percentiles	Smallest	Largest	Percentiles	Smallest	Largest
1%	1076.9	1050.8	1500.4	1%	178.103	17901	1%	1903.63	1829.08	1%	9.65	9.14
5%	1146	1054.2	1865.3	5%	208.097	17901	5%	2016.71	1851.86	5%	10.75	9.15
10%	1189.5	1056.2	2742.9	10%	209.844	101173	10%	2070.03	1852.21	10%	11.96	9.19
25%	1252.8	1060.1	4935.735	25%	210.495	101459.3	25%	2372.6	1853.44	25%	13.35	9.22
50%	1500.4	1060.1	9359.735	50%	210.495	101459.3	50%	2972.69	1853.44	50%	16.265	9.22
75%	1865.3	2742.9	2742.9	75%	306.2095	101173	75%	4188.13	6075.11	75%	21.25	75.47
90%	2026.3	2744.2	2744.2	90%	57215.06	101459.3	90%	4764.76	6084.19	90%	26.93	75.91
95%	2380	2768.4	2768.4	95%	6448.171	106029.7	95%	5433.74	6086.49	95%	30.49	76.45
99%	2667.3	2788.5	2788.5	99%	94164.86	106140.6	99%	5969.34	6090.27	99%	41.98	82.69
Obs	2589	2589	2589	Obs	2589	2589	Obs	2589	2589	Obs	2589	2589
Sum of Wgt.	2589	2589	2589	Sum of Wgt.	2589	2589	Sum of Wgt.	2589	2589	Sum of Wgt.	2589	2589
Mean	1592.822	19657.28	19657.28	Mean	19.99873	19.99873	Mean	3320.459	3320.459	Mean	18.20146	18.20146
Std. Dev.	394.1085	22221.28	22221.28	Std. Dev.	4.743125	4.743125	Std. Dev.	1093.643	1093.643	Std. Dev.	7.209799	7.209799
Variance	155321.5	4.94E+08	4.94E+08	Variance	22.49724	22.49724	Variance	1196055	1196055	Variance	51.9812	51.9812
Skewness	0.766449	1.277367	1.277367	Skewness	0.716587	0.716587	Skewness	0.563588	0.563588	Skewness	2.628778	2.628778
Kurtosis	2.925935	3.927439	3.927439	Kurtosis	2.475498	2.475498	Kurtosis	2.280675	2.280675	Kurtosis	16.21149	16.21149

Empirical Model

This section introduces the econometric model that we employ to examine the hedging and safe haven characteristics of various assets in relation to the stock market. We make the assumption that the asset price in each scenario is reliant on shifts in the stock market and that this relationship is not continuous but rather impacted by extreme market circumstances. We employ the regression model as follows (Baur & McDermott, 2010):

$$R_{asset, t} = a + b_t R_{stock, t} + \varepsilon_t \quad (1)$$

$$b_t = c_0 + c_1 D(R_{stock} q_{10}) + c_2 D(R_{stock} q_5) + c_3 D(R_{stock} q_1) \quad (2)$$

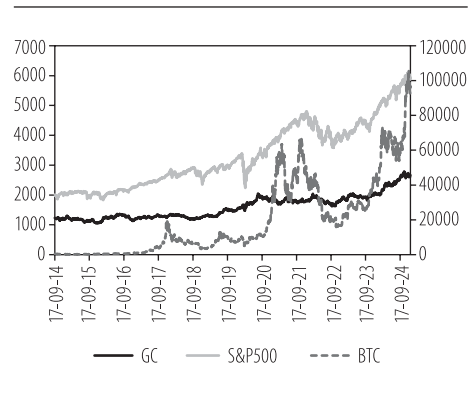
$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \quad (3)$$

The link between the stock returns and each asset (gold, bitcoin, silver, or VIX) is modelled by Equation (1). The parameters to estimate are α and b_t , where ε_t is the error term. In Equation (2) stipulates the model for the parameter b_t , and the parameters to be estimated are c_0 , c_1 , c_2 , and c_3 . Extreme stock market features are captured by the dummy variables $D(\dots)$, which are equal to one if the stock market surpasses a threshold determined by the first, fifth, and tenth percentiles of the stock market's return distribution. A relationship between specific asset and the stock market is evident if one of the parameters, c_1 , c_2 , or c_3 , is significantly different from zero. If the parameters in Equation (2) are negative and statistically different from zero, then the asset serves as a strong safe haven. On the other hand, the asset would be a weak safe haven if the parameters were non-positive. Indeed, to take under consideration the heteroscedasticity in time series data, Equation (3) offers a GARCH(1,1) model. Using Maximum Likelihood methods, all equations are simultaneously calculated.

4. Results

The following figures show the movements of the specific analysed assets individually and comparatively. Figure 1 shows the movement of S&P 500 stock index, Gold (GC), and Bitcoin (BTC) in the analysed period from September 14, 2014 to January 3, 2025. The S&P 500 and the price of Gold are measured on the left vertical axis, while Bitcoin is on the right vertical axis. Here we can visually compare the movements of these three key variables. Figure 2 shows the individual movements of all variables under study.

Figure 1: Movement in levels of the S&P 500, Gold and BTC

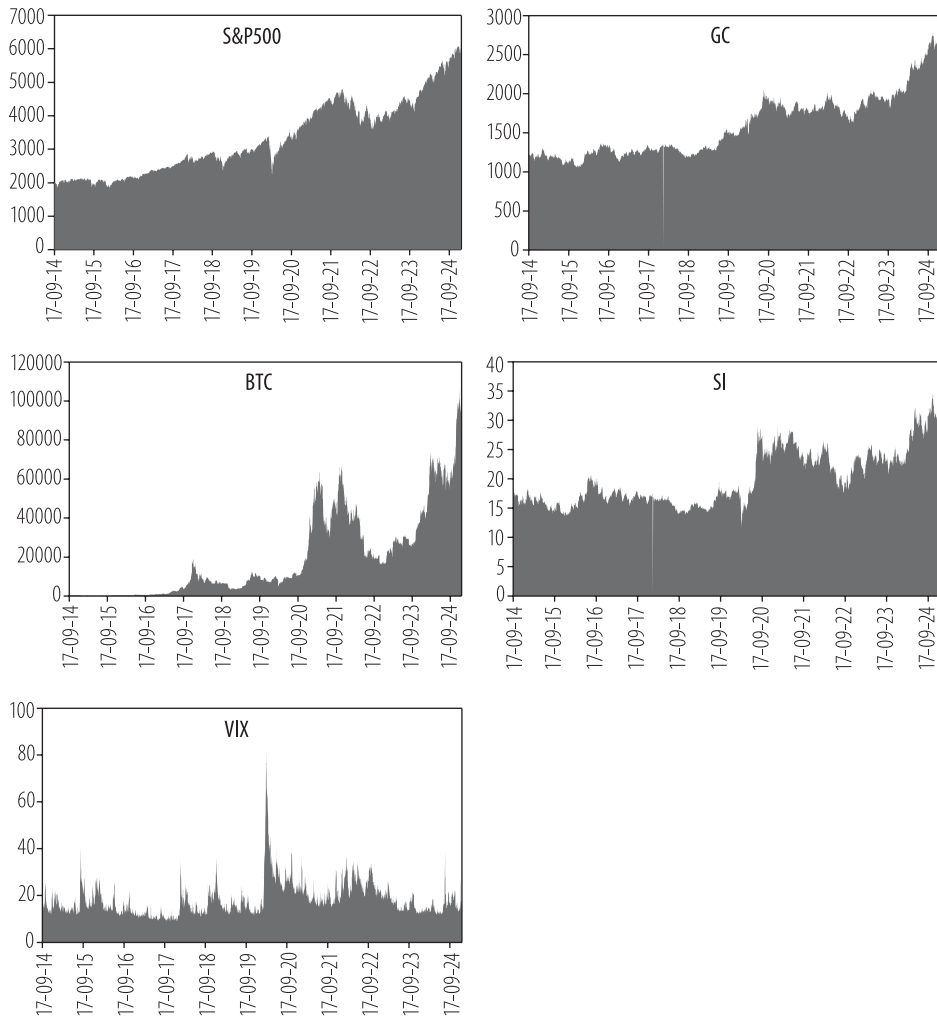


Source: Authors calculations

We also present the results from the model estimated above. Table 2 shows the estimates of a regression model given by Equations (1), (2), and (3). An asset is deemed a strong safe haven if the parameters in Equation (2) are negative and significant, whereas it is considered a weak safe haven if the parameters are non-positive.

The results from the GARCH(1,1) model, gold and Bitcoin both serve as effective hedges due to their statistically substantial negative connection with the S&P 500. Upon examining the related coefficients, we discover that BTC has a significantly larger coefficient (in absolute value) than gold, suggesting that it is a lot more effective hedge. However, silver and VIX have a positive correlation, indicating that these cannot be considered as hedge, but rather move with the stock market as a whole.

When the safe haven properties of either gold or Bitcoin are analysed, there is evidence that BTC exhibits negative and statistically significant relationship with the stock market, making it a good candidate for a safe haven. On the other hand, gold (GC) has only non-positive, but not statistically significant relationship with the stock market, which adds to the basic readings that it is a good hedge asset.

Figure 2: Movement in levels of all analysed variables

The movements of percentiles are quite interesting to grasp as there are mixed results where GC and BTC move along with the stock market. The 1st percentile of both assets is positive, which may indicate that when a shock is present, all assets move along at the same moment. However, there is divergence further if considering 5th and 10th percentiles. Thus, if we examine the percentile results, GC is negative at 5th percentile, and BTC is negative and statistically significant at the 10th percentile.

As previously mentioned, the characteristic of a safe haven asset is that, in the event of severe market conditions, its return is either negatively correlated with another asset or non-correlated with a portfolio. As a result, we are interested in correlation during particular time periods, which is related to the characteristics of hedging or diversifier assets. Some percentiles have positive coefficients, albeit negligible. Given that the correlation between returns is negative but negligible, we may infer from daily data that gold can be viewed as a hedging asset for the S&P 500 Index. On the other hand, with the exception of Bitcoin's position in lower percentiles, Bitcoin has significant correlation to be considered as save haven asset for the S&P 500 Index.

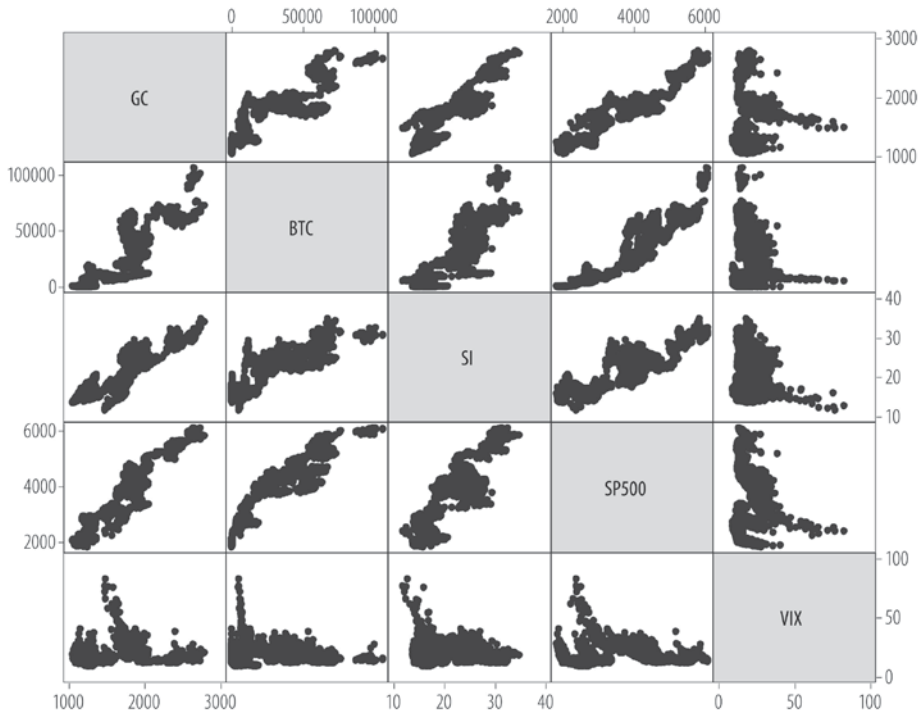
Table 2: Hedge and safe haven assessment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	GC	ARCH	BTC	ARCH	GC	ARCH	BTC	ARCH
SI	39.59*** (0.179)		1,146*** (7.097)					
VIX	4.462*** (0.0807)		123.0*** (2.295)					
SP500	0.196*** (0.000666)		11.99*** (0.0356)					
L.arch		1.012*** (0.0404)		1.055*** (0.0322)		1.009*** (0.0428)		1.036*** (0.0298)
L.garch		-0.00184 (0.00113)		-0.00297*** (0.000517)		-0.000731 (0.00226)		-0.000904*** (0.000327)
q_SP500_1					11.98*** (0.568)		465.7*** (20.27)	
q_SP500_5					-3.310 (3.350)		125.7 (114.7)	
q_SP500_10					1.989 (3.281)		-484.8*** (113.8)	
Constant	71.27*** (2.399)	55.89*** (5.750)	-46,099*** (91.64)	317,468*** (22,178)	952.8*** (2.569)	321.1*** (41.72)	-8,321*** (87.44)	420,309*** (33,608)
Observations	2,589	2,589	2,589	2,589	2,589	2,589	2,589	2,589

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 3: Scatterplot Matrix



5. Conclusion

Finding a safe haven for their investments is essential for investors, particularly during times of market volatility. The hedging and safe haven qualities of different assets must therefore be re-evaluated continuously. Indeed, the latest regulatory developments, approvals of exchange-traded fund (ETF) and wider inclusion of new asset classes in investor's portfolios may favour a specific shift towards broadening the investment base and seeking for new, innovative ways to be increase safety during market shocks.

The study also provides evidence of the changing safe haven property of assets over a longer period. Specifically, gold, a traditional asset, loses its role as a safe haven asset and it is used more as a hedge. On the other hand, somewhat odd development is that Bitcoin slowly emerges as a safe haven asset for the stock markets. Additionally, Bitcoin shares several traits with gold, which has sparked interest among academics and investors. Thus, as a new asset class, it is still growing and will take some time for most investors to accept it as a safe haven investment, as opposed to just being a speculative one.

These findings help asset managers and investors in selecting the best safe haven investments, particularly during times of market shocks. Furthermore, the findings can help portfolio managers employ more effective hedging techniques to lessen the negative effects of market volatility. Because policy shifts can significantly affect the future relationship between stocks, foreign exchange currencies, commodities, and cryptocurrencies, policymakers must carefully consider the role of changes to the policy environment.

6. Limitations

In addition to the US stock market under study, a more comprehensive investigation is required to see whether the function of safe haven/hedging assets in other markets has evolved. Second, only two safe-haven assets are being examined: Gold and Bitcoin. Therefore, future researchers may include more asset classes and stock market indices in their research to obtain more thorough research results.

Declaration of AI Use

During the preparation of this manuscript, the authors did not use an AI tool. All generated outputs were critically reviewed, edited, and approved by the authors, who take full responsibility for the final content of the manuscript.

Acknowledgements

The authors acknowledge UGD, Università degli Studi di Torino and Edith Cowan University for their support to this research.

References

1. Adrangi, B., Chatrath, A., & David, R. C. (2000). Price discovery in strategically-linked markets: the case of the gold-silver spread. *Applied Financial Economics*, 10(3), 227-234. <https://doi.org/10.1080/096031000331644>
2. Areal, N., Oliveira, B., & Sampaio, R. (2015). When times get tough, gold is golden. *The European Journal of Finance*, 21(6), 507-526. <https://doi.org/10.1080/1351847X.2013.854821>
3. Azimli, A. (2024). Is gold a safe haven for the U.S. dollar during extreme conditions? *International Economics*, 177, 100478. <https://doi.org/https://doi.org/10.1016/j.inteco.2024.100478>
4. Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring Economic Policy Uncertainty*. *The Quarterly Journal of Economics*, 131(4), 1593-1636. <https://doi.org/10.1093/qje/qjw024>
5. Baur, D. G., Hong, K., & Lee, A. D. (2018). Bitcoin: Medium of exchange or speculative assets? *Journal of International Financial Markets, Institutions and Money*, 54, 177-189. <https://doi.org/https://doi.org/10.1016/j.intfin.2017.12.004>
6. Baur, D. G., & Lucey, B. M. (2010). Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold. *Financial Review*, 45(2), 217-229. <https://doi.org/https://doi.org/10.1111/j.1540-6288.2010.00244.x>
7. Baur, D. G., & McDermott, T. K. (2010). Is gold a safe haven? International evidence. *Journal of Banking & Finance*, 34(8), 1886-1898. <https://doi.org/https://doi.org/10.1016/j.jbankfin.2009.12.008>
8. Bekiros, S., Boubaker, S., Nguyen, D. K., & Uddin, G. S. (2017). Black swan events and safe havens: The role of gold in globally integrated emerging markets. *Journal of International Money and Finance*, 73, 317-334. <https://doi.org/https://doi.org/10.1016/j.jimonfin.2017.02.010>
9. Bilgin, M. H., Gozgor, G., Lau, C. K. M., & Sheng, X. (2018). The effects of uncertainty measures on the price of gold. *International Review of Financial Analysis*, 58, 1-7. <https://doi.org/https://doi.org/10.1016/j.irfa.2018.03.009>
10. Bouoiyour, J., Selmi, R., & Wohar, M. E. (2019). Safe havens in the face of Presidential election uncertainty: A comparison between Bitcoin, oil and precious metals. *Applied Economics*, 51(57), 6076-6088. <https://doi.org/10.1080/00036846.2019.1645289>
11. Bouri, E., Gupta, R., Tiwari, A. K., & Roubaud, D. (2017). Does Bitcoin hedge global uncertainty? Evidence from wavelet-based quantile-in-quantile regressions. *Finance Research Letters*, 23, 87-95. <https://doi.org/https://doi.org/10.1016/j.frl.2017.02.009>

12. Brière, M., Oosterlinck, K., & Szafarz, A. (2015). Virtual currency, tangible return: Portfolio diversification with bitcoin. *Journal of Asset Management*, 16(6), 365-373. <https://doi.org/10.1057/jam.2015.5>
13. Calvo, G. A., & Mendoza, E. G. (2000). Rational contagion and the globalization of securities markets. *Journal of International Economics*, 51(1), 79-113. [https://doi.org/https://doi.org/10.1016/S0022-1996\(99\)00038-0](https://doi.org/https://doi.org/10.1016/S0022-1996(99)00038-0)
14. Capie, F., Mills, T. C., & Wood, G. (2005). Gold as a hedge against the dollar. *Journal of International Financial Markets, Institutions and Money*, 15(4), 343-352. <https://doi.org/https://doi.org/10.1016/j.intfin.2004.07.002>
15. Cheah, E.-T., Mishra, T., Parhi, M., & Zhang, Z. (2018). Long Memory Interdependency and Inefficiency in Bitcoin Markets. *Economics Letters*, 167, 18-25. <https://doi.org/https://doi.org/10.1016/j.econlet.2018.02.010>
16. Chiang, T. C. (2024). Evidence of Gold as a Hedge or Safe Haven Against Risks and Policy Uncertainty*. In C.-F. Lee & M.-T. Yu (Eds.), *Advances in Pacific Basin Business, Economics and Finance* (Vol. 12, pp. 77-109). Emerald Publishing Limited. <https://doi.org/10.1108/S2514-465020240000012003>
17. Choi, S., & Shin, J. (2022). Bitcoin: An inflation hedge but not a safe haven. *Finance Research Letters*, 46, 102379. <https://doi.org/https://doi.org/10.1016/j.frl.2021.102379>
18. Chowdhury, M. S. R., & Damianov, D. S. (2024). Uncertainty and bubbles in cryptocurrencies: Evidence from newly developed uncertainty indices. *International Review of Financial Analysis*, 91, 102949. <https://doi.org/https://doi.org/10.1016/j.irfa.2023.102949>
19. Ciner, C., Gurdgiev, C., & Lucey, B. M. (2013). Hedges and safe havens: An examination of stocks, bonds, gold, oil and exchange rates. *International Review of Financial Analysis*, 29, 202-211. <https://doi.org/https://doi.org/10.1016/j.irfa.2012.12.001>
20. Conlon, T., & McGee, R. (2020). Safe haven or risky hazard? Bitcoin during the Covid-19 bear market. *Finance Research Letters*, 35, 101607. <https://doi.org/https://doi.org/10.1016/j.frl.2020.101607>
21. Corbet, S., Katsiampa, P., & Lau, C. K. M. (2020). Measuring quantile dependence and testing directional predictability between Bitcoin, altcoins and traditional financial assets. *International Review of Financial Analysis*, 71, 101571. <https://doi.org/https://doi.org/10.1016/j.irfa.2020.101571>
22. Corbet, S., Meegan, A., Larkin, C., Lucey, B., & Yarovaya, L. (2018). Exploring the dynamic relationships between cryptocurrencies and other financial assets. *Economics Letters*, 165, 28-34. <https://doi.org/https://doi.org/10.1016/j.econlet.2018.01.004>

23. Das, D., Le Roux, C. L., Jana, R. K., & Dutta, A. (2020). Does Bitcoin hedge crude oil implied volatility and structural shocks? A comparison with gold, commodity and the US Dollar. *Finance Research Letters*, 36, 101335. <https://doi.org/https://doi.org/10.1016/j.frl.2019.101335>
24. Demir, E., Gozgor, G., Lau, C. K. M., & Vigne, S. A. (2018). Does economic policy uncertainty predict the Bitcoin returns? An empirical investigation. *Finance Research Letters*, 26, 145-149. <https://doi.org/https://doi.org/10.1016/j.frl.2018.01.005>
25. Dwita Mariana, C., Ekaputra, I. A., & Husodo, Z. A. (2021). Are Bitcoin and Ethereum safe-havens for stocks during the COVID-19 pandemic? *Finance Research Letters*, 38, 101798. <https://doi.org/https://doi.org/10.1016/j.frl.2020.101798>
26. Dyhrberg, A. H. (2016a). Bitcoin, gold and the dollar – A GARCH volatility analysis. *Finance Research Letters*, 16, 85-92. <https://doi.org/https://doi.org/10.1016/j.frl.2015.10.008>
27. Dyhrberg, A. H. (2016b). Hedging capabilities of bitcoin. Is it the virtual gold? *Finance Research Letters*, 16, 139-144. <https://doi.org/https://doi.org/10.1016/j.frl.2015.10.025>
28. Fang, L., Bouri, E., Gupta, R., & Roubaud, D. (2019). Does global economic uncertainty matter for the volatility and hedging effectiveness of Bitcoin? *International Review of Financial Analysis*, 61, 29-36. <https://doi.org/https://doi.org/10.1016/j.irfa.2018.12.010>
29. Forbes, K. J., & Rigobon, R. (2002). No Contagion, Only Interdependence: Measuring Stock Market Comovements. *The Journal of Finance*, 57(5), 2223-2261. <https://doi.org/https://doi.org/10.1111/0022-1082.00494>
30. Gil-Alana, L. A., Abakah, E. J. A., & Rojo, M. F. R. (2020). Cryptocurrencies and stock market indices. Are they related? *Research in International Business and Finance*, 51, 101063. <https://doi.org/https://doi.org/10.1016/j.ribaf.2019.101063>
31. Goodell, J. W., & Goutte, S. (2021). Co-movement of COVID-19 and Bitcoin: Evidence from wavelet coherence analysis. *Finance Research Letters*, 38, 101625. <https://doi.org/https://doi.org/10.1016/j.frl.2020.101625>
32. Hartmann, P., Straetmans, S., & de Vries, C. G. (2004). Asset Market Linkages in Crisis Periods. *The Review of Economics and Statistics*, 86(1), 313-326. <http://www.jstor.org/stable/3211675>
33. Hillier, D., Draper, P., & Faff, R. (2006). Do Precious Metals Shine? An Investment Perspective. *Financial Analysts Journal*, 62(2), 98-106. <https://doi.org/10.2469/faj.v62.n2.4085>
34. Hood, M., & Malik, F. (2013). Is gold the best hedge and a safe haven under changing stock market volatility? *Review of Financial Economics*, 22(2), 47-52. <https://doi.org/https://doi.org/10.1016/j.rfe.2013.03.001>

35. Jin, J., Yu, J., Hu, Y., & Shang, Y. (2019). Which one is more informative in determining price movements of hedging assets? Evidence from Bitcoin, gold and crude oil markets. *Physica A: Statistical Mechanics and its Applications*, 527, 121121. <https://doi.org/https://doi.org/10.1016/j.physa.2019.121121>
36. Kaul, A., & Sapp, S. (2006). Y2K fears and safe haven trading of the U.S. dollar. *Journal of International Money and Finance*, 25(5), 760-779. <https://doi.org/https://doi.org/10.1016/j.jimonfin.2006.04.003>
37. Klein, T., Pham Thu, H., & Walther, T. (2018). Bitcoin is not the New Gold – A comparison of volatility, correlation, and portfolio performance. *International Review of Financial Analysis*, 59, 105-116. <https://doi.org/https://doi.org/10.1016/j.irfa.2018.07.010>
38. Kopyl, K. A., & Lee, J. B.-T. (2016). How safe are the safe haven assets? *Financial Markets and Portfolio Management*, 30(4), 453-482. <https://doi.org/10.1007/s11408-016-0277-5>
39. Lucey, B. M., & Li, S. (2015). What precious metals act as safe havens, and when? Some US evidence. *Applied Economics Letters*, 22(1), 35-45. <https://doi.org/10.1080/13504851.2014.920471>
40. Lucey, B. M., Vigne, S. A., Yarovaya, L., & Wang, Y. (2022). The cryptocurrency uncertainty index. *Finance Research Letters*, 45, 102147. <https://doi.org/https://doi.org/10.1016/j.frl.2021.102147>
41. Pal, D., & Mitra, S. K. (2019). Hedging bitcoin with other financial assets. *Finance Research Letters*, 30, 30-36. <https://doi.org/https://doi.org/10.1016/j.frl.2019.03.034>
42. Panagiotidis, T., Stengos, T., & Vravosinos, O. (2019). The effects of markets, uncertainty and search intensity on bitcoin returns. *International Review of Financial Analysis*, 63, 220-242. <https://doi.org/https://doi.org/10.1016/j.irfa.2018.11.002>
43. Pho, K. H., Ly, S., Lu, R., Hoang, T. H. V., & Wong, W.-K. (2021). Is Bitcoin a better portfolio diversifier than gold? A copula and sectoral analysis for China. *International Review of Financial Analysis*, 74, 101674. <https://doi.org/https://doi.org/10.1016/j.irfa.2021.101674>
44. Rinaldo, A., & Söderlind, P. (2010). Safe Haven Currencies. *Review of Finance*, 14(3), 385-407. <https://doi.org/10.1093/rof/rfq007>
45. Selgin, G. (2015). Synthetic commodity money. *Journal of Financial Stability*, 17, 92-99. <https://doi.org/https://doi.org/10.1016/j.jfs.2014.07.002>
46. Selmi, R., Mensi, W., Hammoudeh, S., & Bouoiyour, J. (2018). Is Bitcoin a hedge, a safe haven or a diversifier for oil price movements? A comparison with gold. *Energy Economics*, 74, 787-801. <https://doi.org/https://doi.org/10.1016/j.eneco.2018.07.007>

47. Shahzad, S. J. H., Bouri, E., Roubaud, D., Kristoufek, L., & Lucey, B. (2019). Is Bitcoin a better safe-haven investment than gold and commodities? *International Review of Financial Analysis*, 63, 322-330. <https://doi.org/https://doi.org/10.1016/j.irfa.2019.01.002>
48. Sherman, E. J. (1982). Gold: A conservative, prudent diversifier. *The Journal of Portfolio Management*, 8, 21-27.
49. Smales, L. A. (2019). Bitcoin as a safe haven: Is it even worth considering? *Finance Research Letters*, 30, 385-393. <https://doi.org/https://doi.org/10.1016/j.frl.2018.11.002>
50. Soyulu, P. K., & Güloğlu, B. (2019). Financial contagion and flight to quality between emerging markets and U.S. bond market. *The North American Journal of Economics and Finance*, 50, 100992. <https://doi.org/https://doi.org/10.1016/j.najef.2019.100992>
51. Tully, E., & Lucey, B. M. (2007). A power GARCH examination of the gold market. *Research in International Business and Finance*, 21(2), 316-325. <https://doi.org/https://doi.org/10.1016/j.ribaf.2006.07.001>
52. Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. *Science*, 185(4157), 1124-1131. <http://www.jstor.org/stable/1738360>
53. Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297-323. <https://doi.org/10.1007/BF00122574>
54. Wang, P., Zhang, W., Li, X., & Shen, D. (2019). Is cryptocurrency a hedge or a safe haven for international indices? A comprehensive and dynamic perspective. *Finance Research Letters*, 31, 1-18. <https://doi.org/https://doi.org/10.1016/j.frl.2019.04.031>
55. Wu, S., Tong, M., Yang, Z., & Derbali, A. (2019). Does gold or Bitcoin hedge economic policy uncertainty? *Finance Research Letters*, 31, 171-178. <https://doi.org/https://doi.org/10.1016/j.frl.2019.04.001>