The Crypto Shelter: A Safe Haven for Equity Market during the COVID-19 Pandemic

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Abstract

This study analyzes cryptocurrencies as a safe haven from the equity market during the Covid-19 pandemic from April 2020 to December 2021 and compares these with two traditional safe-haven assets, gold and US government bonds, by using the multiple linear regression model. This study hypothesizes that Bitcoin or "digital gold" can be a safe haven and a store of value during financial turbulence. However, our empirical results show that Tether performs a better safe-haven function than Bitcoin, other cryptocurrencies, and the two traditional shelters, gold and US government bonds. Tether also exhibits low volatility and negatively correlates with equity sample portfolios. However, it could not serve as a shelter during all the periods considered. Thus, investors can benefit from Tether to store the value of their portfolios during times of high market volatility. They should also consider their investment portfolios to find shelter and rebalance them for turbulent times. The limitation of this study does not investigate other properties of Bitcoin and cryptocurrencies, such as a medium of exchange as money, and it can be explored for further research.

Keywords: 1) Bitcoin 2) cryptocurrency 3) equity market 4) safe haven 5) Tether

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Introduction

During global financial crises (GFCs), the returns of most asset classes tend to decrease dramatically, and investors face significant losses on their portfolio investments. This is more visible on risky assets like equity. Thus, financial practitioners explore appropriate assets that will generate positive (or low negative) returns during the financial crisis, so-called "safe-haven asset." A safe-haven asset can be defined as an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil (Baur and Lucey, 2010, pp.217-229). The financial literature presents many asset classes with safe-haven properties such as government bonds, gold, or the Swiss franc. These assets are expected to move in the opposite direction to risky assets and allow investors to gain positive (or low negative) returns when a stock market crash occurs. However, Baur, Dimpfl and Kuck (2021) find that there is a trade-off that investors should take their consideration; that is, safe-haven assets show strong performance during the in-crisis period but are associated with weak performance outside of these periods.

Investors have looked to cryptocurrency as a possible alternative investment asset in the past few years. Bitcoin (BTC) is the asset with the most significant market capitalization in the cryptocurrency market. Academic studies such as Baur, Hong and Lee (2018, pp. 177-189) and Symitsi and Chalvatzis (2019, pp. 97-110) argue that Bitcoin has similar properties to gold, which can be a store of value and a safe-haven asset during financial turmoil. Several studies (Bouri, et al., 2017, pp.192-198; Shahzad, et al., 2019, pp.322-330) support the view that Bitcoin and some cryptocurrencies can play a safe-haven role and have properties like gold or the general commodity index. In other words, Bitcoin and alternative cryptocurrencies can represent an investment asset during GFCs, and they are suitable diversifiers. In 2021, practitioners adopted Bitcoin for their investment portfolios. The US Securities and Exchange Commission (SEC) approved a Bitcoin-strategy fund to enable investors to diversify their portfolios in the cryptocurrency market.

Conversely, several controversial arguments suggest that Bitcoin is a risky asset used for speculation and is not a safe haven. Bitcoin and cryptocurrencies are more volatile than conventional asset classes such as equity, bonds, or commodities. For instance, Harvey (2014) reveals that Bitcoin's volatility is around eight times higher than equity assets. Klein, Thu and Walther (2018, pp.105-116) confirm that Bitcoin is no safe haven and offers no hedging capabilities for developed markets. Baur and Hoang (2021) also document excess volatility of Bitcoin as a sign that investors may want to hedge their exposure to Bitcoin and find a safe haven against its extreme price fluctuations. Thus, the ambiguity around Bitcoin and cryptocurrencies remains in terms of their safe haven properties under extreme market conditions.

Since the outbreak of the Covid-19 pandemic, many studies have investigated the safe-haven property of Bitcoin and cryptocurrencies during the pandemic. Rubbaniy,

Khalid and Samitas (2021, pp.1741-1756) argue that long-term investors can invest in the cryptocurrency market to hedge their risks during the Covid-19 pandemic. Baur and Hoang (2021) add that Bitcoin investors seek out stablecoins like Tether (USDT) to act as a safe haven against Bitcoin when the latter experiences extreme negative price changes. Cheema, Faff and Szulczyk (2020, pp.88-115) also insist that Tether, the largest stablecoin, emerges as an influential global safe haven across various countries during the Covid-19 pandemic. Vukovic, et al. (2021) and Chemkha, et al. (2021, pp.88-115) find that there is no statistically significant direct influence of the COVID-19 crisis on the crypto market during the pandemic's first wave. It is evident that gold is a weak safe haven for the assets considered, and Bitcoin cannot provide shelter during the Covid-19 pandemic. This shows the two-flip argument during the Covid-19 pandemic and confirms the ambiguity regarding the safe-haven properties of Bitcoin and cryptocurrencies in the financial markets.

For the following sections, this study begins with a literature review. It contains a review and brief description of safe-haven assets and the safe-haven role of Bitcoin and alternative cryptocurrencies in the financial market. The methods part describes the empirical methodology and data that help explain the performance of Bitcoin and alternative cryptocurrencies as a safe haven for the different equity portfolios. For the results part, it sets out the empirical findings of the ordinary least square regressions. Finally, our conclusion contains a summary and discussion of this study.

Literature Review

This section describes the theoretical background of cryptocurrencies that perform as safe-haven assets in portfolios during recent financial crises. In the past, when the financial market fell into crisis, such as during the US subprime mortgage crisis (2007–2009) or the European debt crisis (2011–2013), some assets performed better than others. Such assets are less volatile, and investors may gain a positive (or less negative) return. Baur and Lucey (2010, pp.217-229) define a safe-haven asset as one that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil.

Many academic studies investigate a variety of assets such as equities, bonds, and commodities regarding their safe-haven property. Baur and Lucey (2010, pp.217-229) investigate stocks, bond returns, and gold returns, and they find that gold is a hedge against stocks on average and a safe haven in extreme stock market conditions. Later research is consistent on this point. Baur and McDermott (2010a, pp.1886-1898; 2010b, pp. 63-71), Gürgün and Ünalmış (2014, pp.341-348), and Beckman, Berger and Czudaj (2015, pp.16-24) also find that gold can act as an effective safe haven during the financial crisis or equity markets severely decline. The ability of US government bonds to serve as a safe haven during turbulent times on stock markets is also examined. Meanwhile, Habib and Stracca (2015, pp.281-298), Hager (2017, pp.557-580), and Liu (2020, pp.451-483) indicate another potential safe-haven asset in the form of US short-term government bonds. Government bonds qual-

ify as active safe-haven assets during market turmoil. Furthermore, some studies evaluate safe-haven currencies and find the Swiss franc also exhibits safe-haven characteristics (Ranaldo and Söderlind, 2010, pp.385-407; Grisse and Nitschka, 2015, pp.153-164)

Apart from the conventional safe-haven assets, crypto safe-haven assets are often referred to in academic works and global financial investment literature after the price of cryptocurrency rapidly increased in the past few years. Several works analyze the safe-haven property of Bitcoin and other vital cryptocurrencies during previous financial turbulence and also compare their safe-haven performance with gold. Shahzad, et al. (2020, pp.322-330) compare gold and Bitcoin for the G7 stock markets and insist that gold and Bitcoin have distinct safe-haven and hedging characteristics.

Rubbaniy, Khalid and Samitas (2021, pp.1741-1756) use a non-financial market-based proxy of market stress that represents the fear of households and retail investors and, in so doing, identify cryptocurrencies as safe-haven assets. Furthermore, Bitcoin and gold also serve the roles of a safe haven for oil price movement, which can reduce oil-related portfolio risks. It can be employed in portfolios to balance out extreme price fluctuations on investment (Selmi, et al., 2018, pp.787-801).

Furthermore, due to the excess volatility of Bitcoin, there are debates about its ability to act as a safe haven. For instance, Smales (2019, pp.385-393) argues that Bitcoin is more volatile and less liquid than other assets; hence Bitcoin should not be treated as a potential safe haven. Baur and Hoang (2021) also demonstrate that stablecoins are a safe haven with respect to Bitcoin but are not always stable. Chemkha, et al. (2021, pp.88-115) compare the safe-haven properties of Bitcoin and gold. Their analysis shows that gold is a weak safe haven for the assets considered, and Bitcoin cannot provide shelter. Eventually, Shahzad, et al. (2019, pp.322-330) analyze the timely question of the safe-haven properties required for stock market investments during extreme market conditions. They provide evidence that the safe-haven roles of Bitcoin, gold, and commodities are time-varying and differ across stock market indices.

In addition to the previous financial crises, the safe-haven properties of Bitcoin and other alternative cryptocurrencies have been increasingly mentioned in financial research since the outbreak of the Covid-19 pandemic. Cheema, Faff and Szulczyk (2020, pp.88-115), Baur and Hoang (2021), Mariana, Ekaputra and Husodo (2021), and Rubbaniy, Khalid and Samitas (2021, pp.1741-1756) test the potential severe loss protection of Bitcoin and cryptocurrencies in relation to stock market investments. They state that some cryptocurrencies, such as Ethereum and Tether, performed better during the pandemic. By contrast, Conlon and McGee (2020), Chakma, et al. (2021, pp.71-85), and Vukovic, et al. (2021) do not find a statistically significant influence on the crypto market during the Covid-19 crisis.

The academic contributions of this study are twofold. First, it analyzes Bitcoin and alternative cryptocurrencies as safe-haven assets in two different portfolio investment

strategies: value and momentum. These portfolios were constructed by Kenneth R. French and his research team and published on their website.[2] The study also examines these cryptocurrencies in exchange-traded funds (ETF) equity portfolios in the US with different investment policies based on the market capitalization (large and small) and the investment style (value and growth) to reflect the explicit performance of practitioners in the equity market. Second, this study compares the performance of Bitcoin and other cryptocurrencies (as the current safe-haven assets of choice) with traditional shelters like gold and US government bonds. This will show the role and performance of Bitcoin and cryptocurrencies in the financial markets during the Covid-19 pandemic and compare their safe-haven characteristics with gold and US government bonds. In addition, the study extends the contribution of other papers by illustrating the difference in safe-haven performance in each wave of the pandemic from when it was recognized in the US in April 2020 to December 2021.

Methods

This study examines the role of Bitcoin and alternative cryptocurrencies as a safe-haven asset in the US equity market by employing a multiple linear regression model. The model is adopted in many papers related to safe-haven assets (Baur and Lucey, 2010, pp.217-229; Baur, Hong and Lee, 2018, pp.177-189; Cheema, Faff and Szulczyk, 2020, pp.88-115; Baur and Hoang, 2021; Mariana, Ekaputra and Husodo, 2021; Vukovic, et al., 2021). This model estimates the relationship between the sample portfolios' and cryptocurrency returns. It also describes the safe-haven performance of each cryptocurrency in the equity portfolios during the Covid-19 pandemic period and in its different waves. Thus, this study employs the regression model as follows:

$$R_{it} = \alpha_0 + \beta_1 BTC_t + \beta_2 ETH_t + \beta_3 XRP_t + \beta_4 BNB_t + \beta_5 USDT_t + \beta_6 GOLD_t + \beta_7 USBOND_t + \varepsilon_t$$

Where:

R_{it} = average return of portfolio i at time t;

BTCt = Bitcoin return at time t;

ETHt = Ethereum return at time t;

XRPt = Ripple return at time t;

BNBt = Binance coin return at time t;

USDTt = Tether return at time t;

GOLDt = Gold spot return at time t;

USBONDt = US government bond return at time t;

ε_t = Error term.

This work mainly uses the portfolios established by Kenneth R. French's data library website for the dependent variables. These portfolios are based on two conceptual investment styles: value and momentum portfolios. This study concentrates on the greatest and the lowest ranks of the Value (V10, V01) and Momentum (M10, M01) portfolios. Kenneth R. French's data source ranks these portfolios in deciles by average returns.

This study investigates what an investment policy should consider in deciding the portfolio allocation of cryptocurrencies or more traditional shelters like gold and US government bonds as a safe haven during the Covid-19 pandemic and GFCs. This study also uses the average returns of the equity ETF

[2] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

portfolios in the US to represent the optimized portfolios in practice. These ETF portfolios are categorized into four groups, relying on the market capitalization (large and small size) and the investment style (value and growth stocks). Consequently, the analysis of ETFs in the US reflects the practical safe-haven performance of cryptocurrencies in different investment strategies in actual equity-market conditions.

This research includes five cryptocurrencies as independent variables: Bitcoin (BTC), Ethereum (ETH), Ripple (XRP), Binance Coin (BNB), and Tether (USDT); these were selected based on their market capitalization. These cryptocurrencies are in the top ten by market capitalization, and importantly their historical data cover the sample period of this research. They are examined their safe-haven property before the Covid-19 pandemic from January 2018 to December 2019. These results will be compared with the investigation during the Covid-19 pandemic from April 2020 to December 2021, the first peak of Covid-19 cases in the US.

A wave refers to an increasing number of confirmed Covid-19 cases that have a peak and then decrease, with some positive cases remaining. There are no fixed identification criteria for a wave of the pandemic issued by the World Health Organization and other international health organizations. Thus, this study identifies each wave of the Covid-19 pandemic from the beginning of a rising number of confirmed Covid-19 cases in the US until three months later. On this approach, this paper identifies four waves in the sample subperiod from April 2020 to December 2021.

Data for cryptocurrencies and the traditional safe-haven assets (gold and US government bonds) were collected from investing.com. This study uses the daily data from 1 January 2018 to 31 December 2021 from the Kenneth R. French website[3] to retrieve value and momentum portfolio information. Finally, the daily return data of the equity ETF portfolios in the US are from the Morningstar website.[4]

Results

Descriptive Statistics

Table No. 1 presents the descriptive statistics for the daily returns of the five cryptocurrencies selected – Bitcoin (BTC), Ethereum (ETH), Ripple (XRP), Binance coin (BNB), and Tether (USDT) – and two conventional safe-haven assets (gold and US government bonds). The statistics show the difference between the independent variables in two subperiods: before and during the Covid-19 pandemic. There are slight changes between the two subperiods in the standard deviation (std. dev) of the returns of most independent variables. However, the results illustrate significant changes in USDT and USBOND between the period before and during the Covid-19 pandemic. The results for the standard deviation of returns show the USDT return is less volatile in the pandemic period (from 0.0039 to 0.0005). By contrast, the standard deviation of USBOND returns increases significantly from 0.0104 to 0.1385 during the pandemic. One of the properties of assets that are safe havens during periods of financial turmoil is that they should be more stable during a crisis, and in this regard, USDT performs better than other sample assets.

[3] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[4] http://https://www.morningstar.com/

Table No. 1 Independent variables: descriptive statistics for before and during the Covid-19 pandemic.

Panel A: Form January 2018 to December 2019 (Before the Covid-19 pandemic)					
	Mean (%)	**Median (%)**	**Std.Dev (%)**	**Min (%)**	**Max (%)**
BTC	−0.0010	−0.0009	0.0417	−0.1705	0.1723
ETH	−0.0031	−0.0040	0.0524	−0.1989	0.1925
XRP	−0.0025	−0.0063	0.0608	−0.2981	0.3785
BNB	0.0028	−0.0005	0.0655	−0.3312	0.6280
USDT	0.0002	0.0002	0.0039	−0.0196	0.0210
GOLD	0.0018	0.0006	0.0111	−0.0223	0.0741
USBOND	0.0001	−0.0001	0.0104	−0.0596	0.0376
Panel B: From April 2020 to December 2021 (During the Covid-19 pandemic)					
	Mean (%)	**Median (%)**	**Std.Dev (%)**	**Min (%)**	**Max (%)**
BTC	0.0044	0.0024	0.0413	−0.1440	0.1941
ETH	0.0054	0.0034	0.0530	−0.2789	0.2596
XRP	0.0042	0.0021	0.0738	−0.4178	0.4384
BNB	0.0084	0.0040	0.0713	−0.3410	0.6997
USDT	0.00002	0.0000	0.0005	−0.0019	0.0031
GOLD	0.0006	0.0006	0.0106	−0.0495	0.0411
USBOND	−0.0012	0.0000	0.1385	−0.4667	0.9200

Correlation Matrix

Table No. 2 shows the daily-return correlations among seven independent variables, including five cryptocurrencies and two safeties (gold and short-term US bonds). The results illustrate the difference in the return correlation between two subperiods – before and during the Covid-19 pandemic. Ahead of the pandemic, it is noticeable that the returns on USDT (a stablecoin) are opposite to those of other cryptocurrencies. There are negative correlations between USDT and other cryptocurrencies and gold (around −0.0212−−0.1560). This correlation is similar to that for two other traditional safe-haven assets – GOLD and USBOND. Furthermore, during the pandemic, the USDT is the only asset for which the returns run in the opposite direction to the other independent variables. It is negatively correlated with ETH, XRP, GOLD, and USBOND (−0.0041−−0.0675). Another point of interest is the correlation of returns between BTC and other non-stable cryptocurrencies (ETH, XRP, and BNB). They have positive correlations in both subperiods (before and during the pandemic). Hence, non-stable cryptocurrencies are not suitable for use as safe-haven assets or as diversifiers for each other during periods of financial turmoil.

Table No. 2 Return correlations among independent variables before and during the Covid-19 pandemic.

Panel A: Form January 2018 to December 2019 (Before the Covid-19 pandemic)							
	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND
BTC	1.0000	0.8308	0.6659	0.6381	−0.1328	0.0379	−0.0581
ETH		1.0000	0.7633	0.6237	−0.0488	0.0163	−0.0327
XRP			1.0000	0.5148	−0.0212	−0.0516	−0.0339
BNB				1.0000	−0.1560	−0.0291	0.0052
USDT					1.0000	−0.0688	0.0547
GOLD						1.0000	−0.1160
USBOND							1.0000
Panel B: From April 2020 to December 2021 (During the Covid-19 pandemic)							
	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND
BTC	1.0000	0.8316	0.6145	0.6579	0.0250	0.1309	0.0926
ETH		1.0000	0.6563	0.6790	−0.0041	0.1420	0.0602
XRP			1.0000	0.5346	−0.0367	0.0653	0.0375
BNB				1.0000	0.0085	0.1027	0.0834
USDT					1.0000	−0.0675	−0.0245
GOLD						1.0000	0.0226
USBOND							1.0000

Regression Results

The regression analysis focuses on the correlations in returns of seven independent variables and equity portfolios in the US. The purpose is to investigate their safe-haven properties at the time of the Covid-19 outbreak. There is no multicollinearity problem in two different kinds of portfolios (Kenneth R. French's and ETF portfolios) and in two different subperiods (January 2018 – December 2019 and April 2020 – December 2021). Independent variables have the variance inflation factor (VIF) value below ten in Table No. 3 and Table No. 4.

This study begins to analyze the return correlations on the portfolios constructed by Kenneth R. French. The portfolios were selected by using the two conceptual investment strategies: value and momentum. Table No. 3 contains the results for the two subperiod to examine the safe-haven properties of each independent variable (asset).

The results for the period before the pandemic reveal remarkable evidence relevant to this comparison. The returns of USDT and USBOND perform more like a shelter during the pandemic than the other independent variables. USDT's return has an opposite direction with both value portfolios (high-value (−862.8522) and growth (−396.7537) portfolios)

as well as the low-momentum portfolio (–131.2538). Likewise, the return of USBOND reacts similarly to USDT. Three portfolios negatively correlate to USBOND: the low-value (growth) portfolio (–1.8933), the high-momentum portfolio (–3.6930), and the low-momentum portfolio (–5.72265), with a 90% confidence level. In other words, these results show the safe-haven attributes of USDT and USBOND, which are thus safe assets during financial turbulence.

Meanwhile, only the return of a high-value portfolio negatively correlated with BTC (–32.8443) in the pandemic period. It is different from the results of the pre-pandemic period that the returns of BTC show a negative direction with the four equity portfolios. Additionally, the returns for GOLD, which are in the opposite direction to those of three equity portfolios before the pandemic, negatively correlate with the high-value portfolio (–31.5636) in the Covid-19 pandemic. Hence, BTC and GOLD do not act as a safe-haven asset for all portfolios during the Covid-19 outbreak, and USDT and USBOND perform better simultaneously.

Furthermore, other assets can act as a shelter in different portfolios during the Covid-19 outbreak. For example, the return of ETH has a negative correlation with the low-value portfolio (–6.3614) and the low-momentum portfolio (–3.0146), while XRP's return also has a negative correlation with two portfolios: the high-momentum portfolio (–10.1644) and the low-momentum portfolio (–6.4037).

This work also examines potential safe-haven assets in equity ETF portfolios in the US to determine the real risks in the equity market and potential actions for fund managers. Table No. 4 compares the analysis of four equity ETF portfolios in the US between the two subperiods: before and during the Covid-19 pandemic. This study uses the average return of the four equity ETF portfolios, relying on the market capitalization or stock size (large and small) and the investment style (value and growth stocks).

According to the regression results, BTC, USDT, and GOLD returns are negatively correlated with the four equity ETF portfolios in the US during normal market conditions. However, as Panel B in Table No. 4 shows, results differ during extreme market conditions. USDT is the only asset that negatively correlates with the three equity ETF portfolios (large-value (–0.2559), small-value (–0.2417), and small-growth (–0.4655) portfolios). At the same time, BTC and GOLD have a positive correlation with the average return of the samples. XRP's return also has a negative coefficient on the change in returns of the three equity ETF portfolios (large-value (–0.0005), large-growth (–0.0031), and small-growth (–0.0018) portfolios) during the pandemic period. These results show the safe-haven potential of USDT and XRP for equity ETF portfolios during crisis periods while BTC and GOLD do not. In summary, the results in Table 3 and Table 4 indicate that each asset can play the role of a safe haven in different portfolios or investment policies during financial turbulence.

Table No. 3 Multiple regression results on portfolio returns constructed by Kenneth R. French's research team in two subperiods: before and during the Covid-19 pandemic.

Panel A: Form January 2018 to December 2019 (Before the Covid-19 pandemic)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	-0.5623	-31.9837	9.6445	0.1468	1.4968	-174.0744	-23.4945	-109.2433	-0.0066
Low Value (V01, Growth)	0.3861	-57.8349.	36.8719	-14.0753	29.4691*	-79.2967	-44.3533	-60.2015	0.0023
High Momentum (M10)	-0.7578	-50.8337	8.7837	11.6883	31.4284.	232.0460	6.5957	-136.6173.	0.0049
Low Momentum (M01)	-1.5700	-86.1390	68.7060	22.7600	-2.4220	574.9780	-129.2070	36.9150	0.0032
VIF		3.5944	4.5097	2.4522	1.8168	1.0552	1.0335	1.0218	

Panel B: From April 2020 to December 2021 (During the Covid-19 pandemic)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	0.0753	-32.8443	16.5523	6.2626	8.9551	-862.8522	-31.5636	1.2738	-0.0069
Low Value (V01, Growth)	0.5854	22.5350	-6.3614	3.2455	-0.8087	-396.7537	20.0278	-1.8933	-0.0048
High Momentum (M10)	-0.0125	40.9377*	19.5646	-10.1644	7.2424	457.2198	59.3859	-3.6930	0.0518
Low Momentum (M01)	-0.0628	44.6483**	-3.0146	-6.4037	0.9822	-131.2538	49.8340	-5.72265*	0.0333
VIF		3.5128	3.9384	1.8460	1.9947	1.0117	1.0283	1.0128	

Note: V01 (V10) is the lowest (highest) decile portfolio ranked by the book-to-market ratio. M01 (M10) is the lowest (highest) decile based on the momentum from the previous 11 months of returns without the most recent month. The momentum construction rebalances every month. The data of these portfolios are from Kenneth R. French's data library.[5] The unstandardized coefficients, variance inflation factor (VIF), and adjusted R^2 of the regression are also in the table. * and ** indicate significance levels of 0.10 and 0.05, respectively

[5] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table No. 4 Multiple regression results for returns on equity ETFs in the US in two subperiods: before and during the Covid-19 pandemic.

Panel A: Form January 2018 to December 2019 (Before the Covid-19 pandemic)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	0.0005	-0.03481.	0.0217	0.0102	0.0092	-0.1110	-0.0684.	0.0349	0.0145
Large-Growth ETFs	0.0007	-0.0368	0.0271	0.0099	0.0115	-0.0988	-0.0394	0.0433	0.0080
Small-Value ETFs	0.0003	-0.0372.	0.0241	0.0109	0.0072	-0.0847	-0.0688.	0.0450	0.0104
Small-Growth ETFs	0.0005	-0.0404.	0.0238	0.0127	0.0130	-0.0193	-0.0234	0.0566	0.0058
VIF		3.5944	4.5097	2.4522	1.8168	1.0552	1.0335	1.0218	

Panel B: From April 2020 to December 2021 (During the Covid-19 pandemic)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	0.0011.	0.0374	0.0302	-0.0005	0.0028	-0.2559	0.0361	0.0025	0.0477
Large-Growth ETFs	0.0012.	0.0493*	0.04300*	-0.0031	0.0017	0.0430	0.1509**	-0.0024	0.1033
Small-Value ETFs	0.0016.	0.0544	0.0261	0.0012	0.0096	-0.2417	0.0221	0.0062	0.0299
Small-Growth ETFs	0.0010	0.0698*	0.0386	-0.0018	0.0098	-0.4655	0.1268.	0.0009	0.0938
VIF		3.5128	3.9384	1.8460	1.9947	1.0117	1.0283	1.0128	

Note: The unstandardized coefficients, variance inflation factor (VIF), and adjusted R^2 of the regression are also in the table. * and ** indicate significance levels of 0.10 and 0.05, respectively.

This part investigates the safe-haven function of five cryptocurrencies and two primary safe-haven assets, GOLD and USBOND, in each wave of the Covid-19 pandemic. Multicollinearity problem is found among cryptocurrencies such as BTC, ETH, XRP, and BNB in the first wave subperiod of the Covid-19 outbreak (April 2020–June 2020), as can be seen in Panel A of Table No. 5 and Table No. 6. Their VIF values are over ten during the first subperiod, but they are below ten in the second, third, and fourth subperiod of the pandemic.

The regression results in Table No. 5 for the Kenneth R. French equity portfolios show different influences of each independent variable in each pandemic wave. For example, BTC's return negatively correlates with every portfolio in the first wave of the Covid-19 outbreak (high-value (−948.1700), low-value (−106.8779), high-momentum (−34.2922), and low-momentum (−10.5543) portfolios). However, this result is identified for other portfolios in the later waves of the pandemic. Likewise, there is a negative correlation of USDT's return against every portfolio in the third wave of the Covid-19 pandemic (high-value (−2787.0000), low-value (−1194.5387), high-momentum (−749.0830), and low-momentum (−799.2091) portfolios), but other waves show different results.

Nonetheless, the results on the selected portfolios are not noticeable to conclude a safe-haven characteristic of seven independent samples for each portfolio in the different subperiods. Each asset reacts to the fluctuation of four Kenneth R. French portfolios in each wave. For example, GOLD's return has a negative correlation with the high-value portfolio (−26.5698) and the high momentum portfolio (−367.4610 with a 90% confidence level) in the second wave, while GOLD's return is negatively correlated with the high-value (−27.8100) and low-momentum (−52.0105) portfolios in the third wave. Similarly, BNB's return has a negative correlation with the high-value (−746.3000) and the low-value (−54.1446) portfolios in the first wave, but it is negatively correlated with the low-value (−29.8392) and the low-momentum (−10.2796) portfolios in the second wave of the Covid-19 outbreak. Thus, most results in Table 5 show the reaction of seven assets differently in the four Kenneth R. French equity portfolio returns in each pandemic wave. Each asset can act as a safe haven in a different wave and portfolio.

In terms of equity ETF portfolios in the US, the remaining results in Table No. 6 are the return correlations between USDT and four portfolios. USDT's returns are negatively correlated with all four portfolios during the first, third, and fourth waves. For instance, USDT's return strongly affects the large-value (−2.4534) and the large-growth (−1.1474), as well as the small-value (−5.2717) and the small-growth (−4.4900) ETFs with a statistically significant coefficient in the third wave of the pandemic. The returns of USDT also exhibit safe-haven characteristics against all four portfolios during the fourth wave, with a significant coefficient on the large-value portfolio (−11.1300) and the small-value portfolio (−20.6500).

Furthermore, GOLD's returns negatively affect almost every ETF portfolio in the second, third, and fourth waves of the

Covid-19 pandemic. The results also present a negative movement between the returns of four ETF portfolios and the returns of BTC or “digital gold” during the first and fourth waves and ETH’s returns during the second and third waves. These results in Table No. 6 go in the same direction rather than Table No. 5. They reveal the stronger reactions of Tether (USDT) as a safe asset in extreme market conditions compared to other assets like major cryptocurrencies or traditional safe assets like gold and US government bonds. This finding is consistent with those of Cheema, Faff and Szulczyk (2020, pp.88-115), Baur and Hoang (2021), Mariana, Ekaputra and Husodo (2021), and Rubbaniy, Khalid and Samitas (2021, pp.1741-1756) who find that some cryptocurrencies such as Ethereum and Tether better perform than other cryptocurrencies during the pandemic. However, according to the results for each wave of the pandemic, Tether or any other shelter assets cannot be a safe haven at all times. For example, Tether does not exhibit safe-haven characteristics in the second wave of the Covid-19 pandemic.

Table No. 5 Multiple regressions on selected portfolios constructed by Kenneth R. French's research team for selected cryptocurrencies and traditional safe-haven assets for Covid-19 waves.

Panel A: The first wave of the Covid-19 pandemic (from April 2020 to June 2020)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	-11.1500.	-948.1700	668.7800	637.6400	-746.3000	22225.8100*	2089.6000*	70.6600*	0.0787
Low Value (V01, Growth)	2.5510	-106.8779	95.7312	83.6273	-54.1446	1744.8458	183.9769	-0.0763	-0.0505
High Momentum (M10)	1.4779	-34.2922	-37.9458	89.7847	23.0902	-607.0012	108.3036.	-1.1498	0.0545
Low Momentum (M01)	-0.8780	-10.5543	20.7901	3.3969	0.4017	-412.3748	25.6903	0.7890	-0.0454
VIF		10.8594	15.8831	11.5234	15.0137	1.1134	1.1034	1.1560	

Panel B: The second wave of the Covid-19 pandemic (from July 2020 to September 2020)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	-0.3851	12.0315	-28.1841	51.2312.	14.1226	2305.4573.	-26.5698	6.4020	0.0718
Low Value (V01, Growth)	1.2926	74.0477	6.2104	-17.3168	-29.8392	1364.8241	81.3249	0.7186	-0.0708
High Momentum (M10)	-2.0520	323.0160**	-46.6690	44.0760	106.1520.	983.3210	-367.4610*	31.2810	0.3100
Low Momentum (M01)	0.4278	19.0379	39.9731	-23.3387	-10.2796	1215.7204	49.5347	26.5621.	-0.0032
VIF		3.0962	3.7135	3.2964	2.1776	1.2348	1.5173	1.1844	

Panel C: The third wave of the Covid-19 pandemic (from November 2020 to January 2021)

Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	0.0490	-51.5300	13.7500	-4.3220	-26.0100	-2787.0000.	-27.8100	2.0310	-0.0326
Low Value (V01, Growth)	0.6547	41.6513.	-70.6998**	2.7067	62.9924*	-1194.5387	11.6981	23.2666*	0.1743
High Momentum (M10)	1.1470	27.7500	-7.3320	-21.0450	46.7130	-749.0830	26.9540	14.2090	-0.0298
Low Momentum (M01)	-0.6524	26.6022	24.6266	-2.1626	-64.7888*	-799.2091	-52.0105	2.7727	0.0118
VIF		2.5414	2.6275	1.3141	1.2679	1.0589	1.0395	1.0218	

Panel D: The fourth wave of the Covid-19 pandemic (from August 2021 to December 2021)									
Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
High Value (V10)	0.2205	-15.3828	-25.3922	17.4616	27.8895.	-5690.0227*	-57.2999	5.2580	0.1182
Low Value (V01, Growth)	0.1798	-32.8049	15.1182	12.9774	13.7847	-6543.6509	-69.4626	-1.2652	-0.0490
High Momentum (M10)	-0.0619	2.8180	32.6400	-4.7370	6.1520	-3649.0000	-106.9000	-19.5600*	0.0582
Low Momentum (M01)	-1.1085	19.4840	-13.5344	26.3034	-4.2716	1463.3922	20.9646	-7.6359	-0.0003
VIF		3.7938	5.1773	3.5842	3.2452	1.0921	1.1116	1.0227	

Note: V01 (V10) is the lowest (highest) decile portfolio ranked by the book-to-market ratio. M01 (M10) is the lowest (highest) decile based on the momentum from the previous 11 months of returns without the most recent month. The momentum construction rebalances every month. The data of these portfolios are from Kenneth R. French's data library.[6] The unstandardized coefficients, variance inflation factor (VIF), and adjusted R^2 of the regression are also in the table. * and ** indicate significance levels of 0.10 and 0.05, respectively.

Table No. 6 Multiple regressions on the equity ETFs in the US for selected cryptocurrencies and traditional safe-haven assets for Covid-19 waves.

Panel A: The first wave of the COVID-19 pandemic (from April 2020 to June 2020)									
Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	-0.0015	-0.2699	0.0488	0.3529	0.2122	-2.4522	0.1654	-0.0011	0.2832
Large-Growth ETFs	0.0000	-0.2704.	0.1566	0.1079	0.2845	-2.8550	0.2088	0.0001	0.3395
Small-Value ETFs	-0.0020	-0.2556	0.0080	0.5103.	0.1374	-2.4267	0.1904	0.0086	0.2496
Small-Growth ETFs	-0.0009	-0.2437	0.0573	0.3368	0.2000	-3.0070	0.3438	0.0075	0.3246
VIF		10.8280	15.8757	11.4520	14.8926	1.1130	1.1012	1.1553	
Panel B: The second wave of the COVID-19 pandemic (from July 2020 to September 2020)									
Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	0.0004	0.1152	-0.0186	0.0418	0.0469	3.5180	-0.0743	0.0062	0.1192
Large-Growth ETFs	0.0014	0.1932.	-0.0045	0.0527	0.0016	0.6422	-0.0523	-0.0061	0.1155
Small-Value ETFs	0.0000	0.1425	-0.0040	0.0630	0.0485	7.8250.	-0.0192	0.0132	0.1196
Small-Growth ETFs	0.0005	0.1991*	-0.0205	0.0698	0.0171	4.0951	0.0004	-0.0013	0.2304
VIF		3.0962	3.7135	3.2964	2.1776	1.2348	1.5173	1.1844	

[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Panel C: The third wave of the COVID-19 pandemic (from November 2020 to January 2021)									
Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	0.0031*	0.0834.	-0.0531	0.0109	-0.0425	-2.4534	-0.1675	0.0490*	0.0702
Large-Growth ETFs	0.0019	0.0979.	-0.0523	0.0140	-0.0235	-1.1474	0.1203	0.0234	0.0059
Small-Value ETFs	0.0063*	0.0553	-0.0313	0.0028	-0.0639	-5.2717*	-0.2782	0.0705.	0.0319
Small-Growth ETFs	0.0043**	0.1169*	-0.0001	0.0108	-0.1435466**	-4.4900**	-0.0083	0.0349	0.1903
VIF		2.5143	2.6171	1.3135	1.2632	1.0589	1.0414	1.0210	
Panel D: The fourth wave of the COVID-19 pandemic (from August 2021 to December 2021)									
Portfolio	Intercept	BTC	ETH	XRP	BNB	USDT	GOLD	USBOND	Adjusted R^2
Large-Value ETFs	0.0004	-0.0170	0.0039	0.0424	0.0314.	-11.1300*	-0.1358	0.0050	0.2110
Large-Growth ETFs	0.0003	-0.0156	0.0938*	-0.0323	0.0266	-2.9737	-0.0521	-0.0119	0.1515
Small-Value ETFs	0.0008	-0.0174	-0.0487	0.0817*	0.0589	-20.6500**	-0.1249	0.0033	0.2049
Small-Growth ETFs	0.0002	-0.0474	0.0510	0.0171	0.0721.	-14.0700.	-0.0926	-0.0080	0.1855
VIF		3.7938	5.1773	3.5842	3.2452	1.0921	1.1116	1.0227	

Note: The unstandardized coefficients, variance inflation factor (VIF), and adjusted R^2 of the regression are also in the table. * and ** indicate significance levels of 0.10 and 0.05, respectively.

Conclusion and Discussion

This study investigates the safe-haven reaction of the five cryptocurrencies (Bitcoin, Ethereum, Ripple, Binance Coin, and Tether) and two safety assets (gold and US government bonds), relying on the safe-haven definition of Baur and Lucey (2010, pp.217-229) in the equity market in the US during the Covid-19 pandemic. This study also uses multiple linear regression. It compares the coefficient (β) results of five cryptocurrencies with two traditional safe-haven assets to identify the difference between the traditional and the digital shelter assets during the financial turmoil. Our empirical results emphasize the importance of cryptocurrencies – especially Tether (USDT) – as a safe haven during financial turmoil. The results indicate that USDT is a stablecoin with low return volatility (low standard deviation) in a period of turbulence. It is also more stable than the traditional safe-haven assets such as gold and US government bonds in the Covid-19 pandemic.

Moreover, the empirical analysis presents the better safe-haven reactions of USDT in the equity ETF portfolios in each wave of the pandemic compared to other cryptocurrencies and the traditional safe-haven assets. This reflects the safe-haven characteristic of USDT in practical portfolios like ETFs in the US. The evidence is consistent with Conlon, Corbet and McGee (2020) and Baur and Hoang (2021) who find that Tether performs better than other cryptocurrencies during the pandemic. The findings are beneficial for investors and fund managers in financial and cryptocurrency markets to find the best safe-haven asset like USDT during the Covid-19 outbreak, and these results can be used for managing their portfolios as well as using USDT as a store of value for their portfolios during the turbulence period with high market volatility in the future.

Meanwhile, our results show that the safe-haven characteristics of USDT do not occur in the second wave of the Covid-19 pandemic, which indicates that USDT cannot be a shelter for all pandemic times. Like Conlon, Corbet and McGee (2020), they state that a safe haven cannot protect a negative return of portfolios in every time frame and can change over time. Practitioners should consider their investment portfolios to find a suitable shelter and rebalance their portfolios for turbulent times. Regulators and policymakers should be concerned with the high volatility of cryptocurrency markets. Many investors are speculating on the high volatility crypto assets without understanding the cryptocurrency characteristics. Thus, regulators should provide more information on the fact that cryptocurrencies differ from other asset classes like stocks, bonds, and commodities to protect investors' benefit.

The limitation of this study does not investigate other properties of Bitcoin and cryptocurrencies, such as a medium of exchange as money. This limitation can be explored for further research.

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