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COVID-19 Pandemic and the Safe Haven Property of Bitcoin

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COVID-19 Pandemic and the Safe Haven Property of Bitcoin

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Abstract

The commentaries in the literature point to the fact that cryptocurrencies, particularly Bitcoin, provide a safe haven feature to investors. The advent of COVID-19 offers a perfect opportunity to test this hypothesis. This study tries to validate this claim by examining the safe haven prowess of Bitcoin against measures of uncertainty (VIX, EPU and Oil Shock). We further make a comparison between pre- and post-analyses. Results confirm that prior to COVID-19, Bitcoin was able to maintain its widely acknowledged characteristics. However, the post COVID-19 announcement upturned the tides previously identified. We further make a comparison with other traditional asset (gold) and found that gold is resilient to these shocks.

Keywords: Bitcoin, Safe haven, COVID-19, and Uncertainty

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Abstract

The commentaries in the literature point out that cryptocurrencies, particularly Bitcoin, provide safe haven features to investors. The advent of COVID-19 pandemic offers a perfect opportunity to test this hypothesis. This study tries to validate this claim by examining the safe haven prowess of Bitcoin against measures of uncertainty (VIX, EPU, and Oil Shock). We further make a comparison between pre-and post-COVID-19 analyses. Results confirm that prior to COVID-19, Bitcoin was able to maintain its widely acknowledged characteristics. However, the post COVID-19 announcement upturned the tides previously identified.

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JEL classifications: E60, G1, I10

Introduction

The safe haven property of cryptocurrencies, with more emphasis on Bitcoin, has been widely documented in the literature (see Corbet et al., 2019; Ramona et al., 2019; for literature survey). The literature concludes that Bitcoin could be used as a hedging or diversification tool during shocks and exogenous turbulent periods. Three major reasons have been adduced to this stance: (i) it is immune to government power and control; (ii) it is uncorrelated with the dynamics of formal financial institutions and traditional assets; and (iii) the trading dynamics is purely conducted with the advent of technology and innovation techniques (Bouri et al., 2017; Smales, 2019; and Isah and Raheem, 2019). The attendant consequences of COVID-19 on the world economy are unprecedented and likened to the Great Depression (Bouri et al., 2020). There has been an excessive increase in the volatility of, and jumps in, the financial markets, which are perceived to be in response to either bad news related to COVID-19 or government's policy responses (Baker et al., 2020 a, b). This has influenced the rapid increase in the news-based measure of economic policy uncertainty (EPU) index of Baker et al., (2016). Essentially, this index jumped from 160 points in January 2020 to 400 by the end of April[1]. Similarly, the measure of risk averseness of investors, proxied by VIX, has also skyrocketed, reaching 83 as at March 2020[2].

Expectedly, the adverse consequences of the sudden increase in the level of uncertainty and risk averseness caused by the emergence of COVID-19 have been felt in the global financial markets. China and other Asian stock markets were the first causalities of COVID, before it spread to the rest of the world. Relatedly, virtually all the traditional and new financial assets have experienced downturn in their performance (Shehzad et al., 2020). The commodity markets are not exempted from this pandemic's shenanigan. For instance, the recorded oil price in April 2020 was sub-zero (i.e. negative), just as other oil related stocks (EOG Resources). The collapse in the oil price, in addition to oil price wars has triggered the free fall in the global stock prices. Historical data shows that other commodities (with the exceptions of gold, natural gas, coffee and rice) have recorded negative returns, since the advent of the pandemic (Salisu et at., 2020a). A strand of the literature has shown that countries that are sensitive to commodity prices movements tend to commove with the US markets conditions, i.e. tranquil and turbulent periods, (Aloui et al., 2011). The continuous spread of the coronavirus has instilled fear and panic among investors and other market participants. As such, they have started to resort to exploring avenues to diversify their portfolios. Guided by the literature, one of the often sought-after approaches is the design of portfolios to include cryptocurrencies.

Since their emergence, cryptocurrencies have proven to be a reliable provider of safe-haven and hedge features against uncertainties and shocks. Moreover, studies have found that cryptocurrencies gain value during periods of market turbulence. Since the Great Depression, the global economy has not witnessed the magnitude of shock posed by COVID-19[3]. Similarly, no previously identified epidemic has affected the global economy as much as COVID-19 (Ma

[1] Values surpassing 100 imply above average uncertainty level.
[2] Prior to the pandemic, this index has hovered between 12 to 15 points.
[3] The potency of this pandemic is largely attributed to the lockdown policies instituted in order to tame the spread of the virus (Bouri et al., 2020).

et al. 2020). The hedging and/or safe-haven characteristics of cryptocurrencies have largely remained unexplored during extreme bear market conditions. As such, it is yet to be validated whether cryptocurrencies would retain such features during COVID-19 pandemic era. The novelty and severity of this disease suggest that the best time to examine the safe haven property of Bitcoin is now.

The objective of this study is to examine the predictive prowess of Bitcoin in providing safe haven to COVID-19 induced shocks occasioned by increase in uncertainty (VIX and EPU) and commodity (oil) price collapse. The motivation for the consideration of these variables is due to the interconnection between financial and commodity markets, which has been enhanced by the activities of the financial investors. Hence, this serves as a new channel through which market participants' sentiment spillover these two markets (Bouri et al., 2020).

We offer four contributions to the literature. First, we built a predictive model of Bitcoin returns that accounts for the influence of shocks attributed to the COVID-19 pandemic. Second, we consider multiple shocks (VIX, EPU, and oil prices). This is in sharp contrast to previous studies that focused on a particular shock. Third, we conduct a pre- and post-COVID-19 announcement analyses. The need for this comparison is partly attributed to the stance that the existing market condition has an important role to play on the effectiveness of the safe-haven property of financial assets (Iqbal, 2017). Fourth, we conduct a more recent analysis, spanning 5 months post-COVID announcement. This study's dataset is limited to the US for two reasons: (i) there is a high spillover and contagion effects of the US markets on the rest of the world (Syriopoulos et al., 2015); and (ii) the country is the epicentre of the pandemic as it accounts for at least one-fifth of the indicators of the disease (number of death, hospitalisation rate, total infection rate and the number of new cases).

Highlighting the results, we show that Bitcoin is not able to effectively provide safe haven feature during the pandemic period. Following this introductory section, the rest of the paper is organized as follows: a short literature review is presented in section 2. Section 3 presents data and methodology. Section 4 discusses the empirical results. Section 5 gives the concluding remarks.

2. Succinct Literature Review

Studies examining the safe haven property of cryptocurrency is huge and has been adequately reviewed in the literature. Different methods(and models) have been specified(and analysed) to examine the safe haven hypothesis. For instance, Bouri et al. (2019) examined the relationship between Bitcoin and global financial stress using a copula-based approach to dependence and causality in the quantiles. Ji et al. (2019) used a directed acylic graph approach to examine the relationship between Bitcoin and other conventional assets. Results showed there is a lagged relationship, especially when Bitcoin is in bear market condition. Using Cross-quantilogram approach, Bouri et al. (2020a) tested the safe haven and hedging hypothesis of cryptocurrencies and US equity market.

Bouri et al. (2020b) studied how new assets (Bitcoin, gold, and commodities) provide safe havens for selected stock market indices. For a more detailed review, readers are referred to Corbet et al. (2019) and Ramona et al. (2019) for a literature survey.

Interestingly, the linkage between Bitcoin and COVID-19 is burgeoning. This is largely connected to the recency in the pandemic, which was first reported in January, 2020. Kristoufek (2020) studies the quantile correlation between Bitcoin and S&P500 and VIX. The author concludes that recent data do not support the claim of safe haven feature of Bitcoin. Conlon and McGee (2020) show that Bitcoin does not provide cover against turbulence in traditional markets. Using wavelet methods, Sharif et al. (2020) examine the connectedness between the spread of COVID-19, oil shock and economic policy uncertainty. Grobys (2020) presents results supporting a high correlation between Bitcoin and US stock, with the former providing a poor hedging option.

An interesting strand of the literature has upheld the widely celebrated features of cryptocurrencies during the pandemic period. For instance, Corbet et al. (2020) confirmed the diversification benefits of Bitcoin in the Chinese stock markets. Conlon et al. (2020) examined the safe haven hypothesis of Bitcoin, Ethereum and Tether from the perspective of international equity index investors. Results confirm that both Bitcoin and Ethereum were unable to validate the hypothesis, while the reverse is the case for Tether. Goodwell and Goutte (2020) examine Bitcoin's reaction to, and co-movement with, COVID-19 using wavelet coherence approach. The study concludes that there is a positive relationship between COVID-19 and Bitcoin, thus establishing a safe-haven hypothesis of Bitcoin. Mariana et al. (2020) found that Bitcoin and Ethereum have a negative correlation with stock returns during the pandemic. Naeem et al. (2021) concluded that COVID-19 affected the efficiency of major cryptocurrencies, with Bitcoin and Etherum being the worst hit. Results further show that Ethereum provides a better safe-haven, as compared to Bitcoin. Dutta et al., (2020) using time-varying correlation, through DCC-GARCH model, found that Bitcoin is a diversifier, and not a safe-haven asset.

3. Methodology and Data

The safe haven hypothesis makes two fundamental assumptions: (i) investments in financial assets (Bitcoin, in this case) should, at least, preserve its prices during bear market or turbulent episodes; (ii) there is a positive correlation between measures of uncertainty and returns on financial assets. Financial models are highly susceptible to various forms of endogeneity issues (caused by reverse causality, omitted variables bias); heteroscedasticity and persistence (Salisu et al., 2021). Westerlund and Narayan (2012 and 2015) showed that these problems could be rectified by specifying the equation:

$$r_t = a + PUNC_{t-1} + v_t \tag{1}$$

Where r_t is the return of Bitcoin prices, UNC is the measures of uncertainty. In this study, we used variants of uncertainty (EPU, VIX, and oil price shock) while v_t is the error term. The null hypothesis of no predictability in equation (1) is that P = 0, which is estimated using ordinary least squares. To resolve the potential bias and the suspected persistence effect, equation one is re-specified as thus:

$$r_t = a + \Sigma^{5}_{i=1} P^{adj}_{i} UNC_{t-1} + y(UNC_t - q_0 UC_{t-1}) + v_t \quad (2)$$

Thus, P^{adj}_{i} is derived from $P^{adj}_{i} = P - y(1 - q_0)$, where q_0 is the degree of persistence in UNC_t, which Lewellen (2004) described as bias adjusted OLS that corrects for persistence. Endogeneity effect is corrected by the term $y(UNC_t - q_0 UC_{t-1})$ resulting from the correlation between UNC_t (i.e. the predictor) and the error term. The choice of 5 lags is to capture the days-of-the-week dynamics in the estimation process[4]. The problem posed by heteroscedasticity could be resolved by pre-weighting all the data by $1/\hat{\sigma}_s$ and then estimate the model using the OLS approach (Westerlund and Narayan, 2012; 2015).

The baseline model is the historical average. We test whether the inclusion of various measures of uncertainty will enhance the predictive model, relative to the baseline model. The uncertainty augmented model is termed the unrestricted model, while the baseline model is referred to as the restricted model. In line with the extant literature, we use three methods of forecast evaluation: Campbell and Thompson (2008, hereafter CT test), Clark and West (2007, hereafter CW test) and Theil's U- Statistics. Theil U-statistic less than unity (i.e.1) suggests that the predictive accuracy of the unrestricted model outweighs that of the restricted model. CW examines the forecast performance of these two nested models. The beauty of CW is to examine the statistical significance of the difference between the two errors of the models (i.e. unrestricted and restricted). The CW test is computed as follows:

$$\hat{f}_{t+k} = (r_{t+k} - \hat{r}_{1\,t,t+k})^2 - [(r_{t+k} - \hat{r}_{2\,t,t+k})^2 - (\hat{r}_{1t,t+k} - \hat{r}_{2\,t,t+k})^2] \quad (4)$$

Where k is the forecast period; $(r_{t+k} - \hat{r}_{1\,t,t+k})$ and $(r_{t+k} - \hat{r}_{2\,t,t+k})$ are the forecasted errors due to the restricted and unrestricted models, respectively. $(\hat{r}_{1\,t,t+k} - \hat{r}_{2\,t,t+k})$ is the adjusted forecasted error. The sample average $\hat{f}_{t+k}$ is expressed as: $MSE_1 - (MSE_2 - adj.)$. Each term is computed as:

$$MSE_1 = P^{-1}(CC_{t+k} - \hat{C}C_{1t+k})^2;$$

$$MSE_2 = P^{-1}\Sigma(CC_{t+k} - \hat{C}C_{2t+k})^2_2; \text{ and}$$

$$Adj. = P^{-1}\Sigma(\hat{C}C_{1t+k} - \hat{C}C_{2t+k})$$

Where P is the number of the predictors employed to compute the averages. The forecast performances of both the restricted and unrestricted model must be ascertained. Hence, a model is specified where $\hat{f}_{t+k}$ is estimated against a constant and the resulting t-statistic for a zero coefficient is used to draw inference. A situation where the t-statistics > +1.286(+1.464), for a one-side, 0.10test(0.05test) leads to the rejection of the null hypothesis.

Understandably, a myriad of models have been explored by existing studies to examine the safe haven property of Bitcoin (Bouri et al., 2017; Smales, 2019; Conlon and McGee, 2020).

[4] Studies have found that financial returns tends to exhibit days-of-the-week effect (and Salisu et al., 2020a). The return series is regressed against dummy variables constructed for the five days of the week, which would help obtain days-of-the week adjusted returns. (Salisu et al., 2020a).

The comparative advantage of our model over others is due to the ability of the former to adequately capture some inherent properties of the predictor (endogeneity, persistence and conditional heteroscedasticity). More recent studies, such as Salisu et al., (2020a, b) have used similar model. In addition, our model is predictive in nature, which thus allows for out-of-sample estimation. Whereas, previous models had mainly rely on in-sample analyses.

We use daily dataset from 01-08-2019 to 30-05-2020. This sample period is dichotomized into pre-COVID (01/08/2019-30/12/2019) and post-COVID (01/01/2020-31/05/2020) announcements. As a result of data constraint (i.e. limited data availability), we use 75-25 data split for the in- and out-of-sample forecast evaluations, respectively. The three out-of-sample forecast horizons considered are: 10-day, 20-day and 30-day ahead forecast. Bitcoin data is sourced from CoinDesk (https://www.coindesk.com/price). Baker et al. (2016) is the source of EPU data; VIX and oil prices are collected from St. Louise Fred databank.

4. Empirical Results

Table 1 reveals the descriptive statistics. The Table indicates that the pricing dynamics of bitcoin was negatively impacted as a result of the pandemic. This is due to the relatively higher return for the periods prior to the pandemic's announcement, compared to the post announcement era. Unsurprisingly, there is higher level of uncertainty (as proxied by VIX and EPU) for the pandemic era. Statistics confirm weak potency of autocorrelation and heteroscedasticity for Bitcoin for period before the pandemic. However, the exact opposite suffices for the pandemic period. The two unit root tests explored in this study are the Augmented Dickey-Fuller and Narayan and Liu (2015). Table 2 provides results of the unit root tests, which confirms Bitcoin is level stationary, while VIX and EPU are first difference stationary, over the competing periods. There is evidence of persistence and endogeneity in the variables of interest, as shown in Table 3. Persistence is calculated based on AR(1).

Results of the predictability test is presented in Table 4. It can be deduced from the Table that Bitcoin is able to provide safe haven against some exogenous shocks during the period of market unrest, especially for EPU and VIX. The prowess of the safe haven feature is higher for pre-COVID announcement. Largely, these results have been confirmed by previous studies (e.g. Selmi et al., 2018; Mariana et al., 2020). This finding is also similar to the conclusion of Hood and Malik (2013) that safe haven effectiveness of financial assets is lower during crisis period. Interestingly, a strand of the literature has shown that the significance of the safe haven characteristics of Bitcoin is shock-specific (Selmi et al., 2020; Shahzad et al., 2020). For instance, Bouri et al., (2017) and Dutta et al. (2020) concluded that Bitcoin has a higher hedging and diversification prowess against oil markets related shock. Relating this stance to our results, we found that Bitcoin provides a weak (almost non-existence) haven for the oil markets. Our results about oil shock are also similar to the conclusion of Selmi et al. (2020) that the safe haven hypothesis of Bitcoin does not hold all the time.

Table 5 reports the out-of-sample forecast evaluations. The decision criteria for the Theil-U statistics is that values less than unity imply the unrestricted (i.e. uncertainty augmented) models are the preferred models relative to the restricted (i.e. historical average) model. For the pre-announcement era, our results support the preference for the unrestricted model.

These results hold for the different measures of uncertainty and forecasting horizons. The significance of the CW test further strengthens the results.

Focusing on the post-announcement period, both measures of forecasting evaluation were unable to confirm the safe haven property of Bitcoin. It then suggests that bitcoin can only shield investors of potential loss if the severity of the shock is mild. Since the advent of Bitcoin, the global economy has not witnessed shock of similar magnitude to those exhibited by COVID-19. This might partly be an attributable reason for the previously impressive performance of Bitcoin as reported in the literature. Relatively newer studies have also supported our results. For instance, many studies have shown a positive and high correlation between Bitcoin and stock returns (Kristoufek, 2020; Colnlon and McGee, 2020; and Grobys, 2020). If Bitcoin was truly a safe haven asset, it is expected that it should have a negative correlation with other competing financial assets.

Table 1: Descriptive Statistics

		Pre-COVID				Post-COVID			
		BITC.	VIX	EPU	WTI	BITC	VIX	EPU	WTI
	Mean	-0.003	15.123	100.34	0.075	-0.008	32.704	314.85	-0.0053
	SD	0.038	2.781	48.657	1.385	0.047	17.831	207.60	0.1199
	SK	0.882	0.940	1.397	1.768	-2.15	0.763	0.213	-0.8570
	KT	6.417	3.272	6.086	12.67	20.86	2.904	1.646	11.8865
Auto	K=2	1.234	0.868	3.265	10.08[a]	3.0873	200.65[a]	3.231	1.385
	K=4	0.885	2.654	4.213	11.60[a]	13.124[b]	379.11[a]	7.865	5.498
	K=6	0.820	3.269	6.265	11.61[a]	16.697[b]	531.18[a]	16.270	7.232
Hetero	K=2	1.973	6.569[a]	17.582[a]	1.637	0.0619	134.567[a]	2.1222	5.8283[a]
	K=4	1.193	4.665[a]	15.707[a]	0.8298	0.3171	85.0841[a]	1.2664	3.0300[b]
	K=6	0.878	2.256[b]	10.585[a]	0.5373	0.3183	58.2011[a]	1.1448	2.181[b]

Source: Authors' computation.

Note: SD, SK and KT are the associated statistics for standard deviation, skewness and kurtosis, respectively. Ljung-Box test Q-statistics and ARCH-LM test F-statistics are used to test for autocorrelation and heteroscedasticity, respectively. K is the number of lag. a, and b are the level of statistical significance at 1% and 5%, in that order.

Table 2: Unit Root Tests

Pre-COVID Announcement							
ADF Test				NL Test			
Bitcoin	VIX	EPU	WTI	Bitcoin	VIX	EPU	WTI
-8.8089 [a] I(0)	-8.7096 [a] I(1)	-14.1421[a] I(1)	-10.1384 [a] I(0)	-9.561 [a] I(0)	-5.4842 [a] I(0)	-11.0776 [a] I(1)	-13.245 [a] I(0)
Post-COVID Announcement							
Bitcoin	VIX	EPU	WTI	Bitcoin	VIX	EPU	WTI
-10.9371[a] I(0)	-4.3894 [a] I(1)	-17.2788[a] I(1)	-12.1845[a] I(0)	-12.053[a] I(0)	-19.0114 I(1)	-15.8577 I(1)	-15.252[a] I(1)

Source: Authors' computation.
Note: [a] implies 1% level of statistical significance, while I(0) and I(1) implies level and first difference stationary. ADF= Augmented Dickey Fuller and NL is the Narayan and Liu (2015) test.

Table 3: Persistence and Endogeneity Model

Pre-COVID				Post-COVID			
Persistence	Endogeneity			Persistence	Endogeneity		
	VIX	WTI	EPU		VIX	WTI	EPU
0.104 [a]	13.826[a]	0.0002 [a]	-0.4688	-0.0652[a]	-0.238	-0.002	-40.325

Source: Authors' computation.
Note: [a] implies 1% level of statistical significance

Table 4: Results of Predictability Test

Pre- COVID-19 Announcement		
VIX	EPU	WTI
0.0654*** (0.0013) [5.659]	0.0598** (0.0198) [3.255]	0.0050* (0.0015) [2.536]
Post-COVID-19 Announcement		
0.00256** (0.0085) [2.2153]	0.0364** (0.0103) [1.569]	0.0002 (0.0016) [2.556]

Note: *** and ** & * imply the rejection of the null hypothesis of no predictability at 1% , 5% & 10% levels of significance, respectively. Values in parentheses - ( ) denote standard errors while those reported in square brackets – [ ] are for t-statistics.

Table 5: Results of Out-of-Sample Forecast Evaluation

		VIX			EPU			WTI		
		H=10	H=20	H=30	H=10	H=20	H=30	H=10	H=20	H=30
Pre-Announcement	Theil	0.997	0.993	0.995	0.994	0.994	1.006	0.985	0.976	1.004
	CW	3.727	3.254	1.652	2.984	2.287	1.285	3.174	4.612	1.259
Post-Announcement	Theil	1.265	1.005	1.018	1.009	1.039	1.049	0.992	1.368	1.227
	CW	3.823	4.528	3.054	4.101	2.592	1.425	3.215	2.979	3.721

Note: Theil is the Theil U statistics

5. Conclusion

Bitcoin has emerged as the new financial instrument that promises to provide safe haven for investors. Since its emergence and prior to COVID-19 pandemic, there has not been any significant shock to the financial market, hence the inability to empirically validate the safe haven behaviour of Bitcoin in extreme market period(s). This study specified a predictive model for the out-of-sample forecast of Bitcoin's safe haven property.

We show that prior to COVID-19, Bitcoin was able to maintain its widely acknowledged characteristics. However, the post COVID-19 announcement upturned the tides and showed that the safe haven hypothesis of Bitcoin fizzles out. Hence, it is safe to conclude that the safe haven property of Bitcoin is only limited to calm and tranquil financial market conditions. We also show that the prowess of the safe haven nature is sensitive to the type of shock, as Bitcoin was able to provide strong cover against EPU and VIX shocks; the same cannot be said about oil shock.

An obvious policy implication of the study is that market participants would be better off by designing their portfolios to align more towards Bitcoin during tranquil period. In addition, the non-oil market investors should consider building portfolios that would seek to include more presence of Bitcoin, especially when the market is in unsettled state. However, oil market investors should consider other assets, aside Bitcoin, in their investment strategies to offset the down-risk of the market in the pandemic era (i.e. when the market is in turmoil state). We would like to urge readers to interpret our results with caution given the small sample size and the infancy in the conception of cryptocurrencies as compared to the traditional assets. There has been increased in the pace of Bitcoin's volatility in the pandemic era, as compared to pre-pandemic (as indicated in Table 1). This might imply that the safe haven characteristics is dynamic and time-varying. As such, this provides an opportunity for future studies to account for the time-varying nature of the safe haven properties of Bitcoin.

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