Economics Bulletin

Volume 42, Issue 3

A war in a pandemic- The recent spike in economic uncertainty and the hedging abilities of Bitcoin

Refk Selmi
ESC Pau Business School, Pau, France

Abstract

The ongoing Russian/Ukrainian war, along with sanctions imposed on Russia, poses a major shock to the world economy, merely two years after the COVID-19 pandemic. Accordingly, the global economic policy uncertainty has surged due to the resulting spiraling energy prices and economic disruptions. This paper uses a quantile-on-quantile approach to compare the ability of Bitcoin to hedge the economic policy uncertainty (EPU) of major global Bitcoin exchange markets (China, Japan, Korea and the United States) for the periods prior to and post-the COVID-19 and Russia's invasion of Ukraine. The results reveal that, prior to the pandemic, significant rises in EPU lead to high Bitcoin returns. After the COVID-19 and the recent war in Ukraine, the hedge effectiveness of Bitcoin is weakening due to the tight correlation with stocks in times of rising inflation expectations and the global central banks' hawkish response to it. Moreover, the Bitcoin hedging property is country-specific, and depends to different Bitcoin market conditions and various uncertainty levels. We explain this heterogeneity by differences across countries in terms of the recognition of Bitcoin as a legal tender, the Bitcoin trading volume, the exchange market maturity, and the investors' attitude towards risk.

The author would like to thank the editor Professor John P. Conley and the anonymous Reviewers for several helpful and constructive comments and suggestions on an earlier version of this article.
Citation: Refk Selmi, (2022) "A war in a pandemic- The recent spike in economic uncertainty and the hedging abilities of Bitcoin", *Economics Bulletin*, Volume 42, Issue 3, pages 1422-1431
Contact: Refk Selmi - s.refk@yahoo.fr.
Submitted: November 01, 2021. **Published:** September 30, 2022.

1. Introduction

The outbreak of the COVID-19 pandemic has led to a significant increase in the economic policy uncertainty (EPU). The recent Russia's invasion of Ukraine has exacerbated uncertainties surrounding the economic outlook (see Figure A1 in Appendix). The war imperils the world's economic recovery from the COVID-19 pandemic: inflation, food security, energy security and unprecedented supply-chain pressures. Rising commodity prices have yielded to growing anxieties across all economies. Oil prices increased markedly owing to increasing demand pressing against constrained supply. The inflation in 2022 have attained its highest level since 2011. For the global economy, Russia and Ukraine are important suppliers of raw materials including energy, metals, and agricultural products. The war has called into question the supply of these resources and accelerated their price development, reinforcing concerns about raising de-anchored inflation expectations, amplifying existing vulnerabilities (Selmi et *al.* 2022).

Since Bitcoin behave independently from economic and financial developments; therefore, during times of high uncertainty, cryptocurrencies (in particular, Bitcoin) offer significant diversification benefits for the investors. Bitcoin has been largely perceived as an alternative to avoiding political interference, war risks, and unusual economic shocks. *But does this works in a higher interest environment?* On 15 June 2022, in an attempt to bring inflation back down and to keep longer-term inflation expectations well anchored, the Federal Reserve increased its interest rate by three-quarters of a percentage point- the biggest rise since 1994. On 16 June, Bitcoin is trading at $20,971 – down 69.53% from its November 2021 all-time high of $68,789. Beyond interest rate projections, it is worth reflecting on the fact that Bitcoin has been behaving in a surprising way in times of rising inflation expectations. According to a recent report by Arcane research[1], open interest, or the total amount of contracts in the bitcoin futures market, has stabilized over the past few months (see Figure A2), highlighting a high degree of uncertainty among bitcoin traders, and then limited upswings in price.

The question of whether Bitcoin can provide an effective hedge and safe haven has been raised by several recent research studies (for instance, Baur et al. 2015; Bouri et al. 2017; Dyhberg 2016; Luther and Salter 2017; Selmi et *al.* 2018; among others). Baur et al. (2015) assessed the properties of Bitcoin and found an insignificant correlation between the Bitcoin and stocks, bonds and commodities in normal times and in periods of financial turmoil. Bouri et *al.* (2017) assessed the role of Bitcoin as a diversifier, a hedge, or a safe haven for movements in energy commodities and non-energy commodities. They deduced that Bitcoin could serve as an effective diversifier, hedge and a safe-haven against movements in energy commodity prices, but not for non-energy commodities. Some studies suggest that despite the volatile and speculative behaviors of Bitcoin, this cryptocurrency possesses hedging and safe haven characteristics and can be included in a portfolio to curtail the adverse consequences of untoward risks (Dyhberg 2016; Bouri et *al.* 2017; Selmi et *al.* 2018). Luther and Salter (2017) indicated that the attention towards Bitcoin rose significantly following the announcement that Cyprus would accept a bailout on March 16, 2013. Selmi et *al.* (2018) investigate the role of Bitcoin as a hedge, safe haven and diversifier against extreme oil price movements in comparison to gold under different market circumstances. Bouoiyour et *al.* (2019) explored the time-varying safe haven properties of different assets (in particular, oil, precious metals and Bitcoin) in times of rising uncertainty over the US 2016 presidential elections results, and showed that Bitcoin acts as a safe haven against U.S. stock losses in the short-run.

In general, to control risks they face, portfolio managers need to consider the dependence between assets in the international financial market in times of turmoil. Nevertheless, the fact that the uncertainty is unobserved has sparked a large research agenda on various uncertainty measures. Accordingly, Beckmann et *al.* (2017) claimed that the traditional and the well-known view on hedge and safe haven properties of one asset can be misleading and that it seems more useful and relevant to directly examine the correlation between an asset and uncertainty indicators. They added that various kinds of uncertainty and risk measures might have distinct impacts on the price dynamics of an asset. The present research complements prior empirical studies by investigating the hedging and safe haven abilities of Bitcoin under different Bitcoin market conditions and diverse uncertainty scenarios. It is evident that both time and frequency are prominent for Bitcoin price dynamics as Bitcoin has witnessed a remarkable variation since its creation (Weber, 2016). However, several works have differentiated the short- and long-term correlations between Bitcoin and other assets (see, for instance, Baur et *al.* 2015;

[1] https://arcaneresearch.squarespace.com/

Dyhberg, 2016). Besides, some studies have tested whether Bitcoin provides the ability of hedging against uncertainty by discriminating between short-run and long-run dynamics (see, for example, Bouri et *al.* 2017).

Along these lines, following are the contributions of the study to the existing literature: *Firstly,* I analyze the effects of the EPU on the returns of Bitcoin, considering the COVID-19 and the current Russian/Ukrainian war periods when uncertainty related to economic policy is higher. Evidently, there remains a strong need to learn more about the issue amidst the global COVID-19 pandemic and increasing geopolitical risks. This study is the first, to my best knowledge, to verify whether Bitcoin can serve as a hedge against economic uncertainty for the period prior to and post-the COVID-19 and the war in Ukraine. *Secondly*, since the empirical literature examining the relationship between global economic policy uncertainty and Bitcoin returns is an under-researched area of study, therefore this study aims at investigating the role of Bitcoin to act as a hedging tool against economic policy uncertainty in major global Bitcoin exchange markets (China, Japan, Korea and the United States). It must be pointed out that very limited studies have attempted to assess whether cryptocurrencies' returns are influenced by country-specific economic policy uncertainty. For instance, Cheng and Yen (2020) performed the predictive regression model to investigate China's EPU impact on predicting major cryptocurrencies' returns, in comparison to the U.S. and Japan. The findings show that the Chinese EPU index has significant predictive power for Bitcoin returns, while the EPU indices of the U.S. and Japan have weak predictive power. *Thirdly*, since the literature on impact of EPU on the hedging effectiveness of Bitcoin remains inconclusive, it seems prominent to revisit this relationship further because such an inference would be useful for the predictability of Bitcoin returns as well as the improvement of investor's diversification and hedging decisions depending upon the different Bitcoin market conditions (i.e., bear, normal or bull) and the level of economic policy uncertainty (i.e., low, middle, high). To this end, I use a quantile-on-quantile regression (QQR) to examine how the quantiles of a variable affect the conditional quantiles of another variable (Sim and Zhou, 2015). This technique provides a measure of average dependence and upper and lower tail dependence, allowing us to account for asymmetry and nonlinearity simultaneously. Having precise information about the asymmetric and nonlinear impacts of uncertainty on Bitcoin can be viewed as potential input to make the most effective hedging strategies and the optimal portfolio allocations (Bouri et al., 2017; Bouoiyour et al., 2019), especially in periods of heightened uncertainty surrounding the COVID-19 (Vurur, 2021; Ali et al., 2022, Syed et *al.*, 2022). Even though the quantile regression seems to be able to estimate the distinct responses of Bitcoin returns to uncertainty at various points of the conditional distribution of Bitcoin, it ignores that the level of uncertainty might also exert a significant influence on the Bitcoin's hedge and safe haven characteristics.

The results reveal that Bitcoin plays a hedging role during extreme uncertainty periods. However, with the increasing uncertainty related to the war in Ukraine, the Bitcoin's hedging potential is going to be significantly affected. The EPU's impact on Bitcoin returns is country-specific. This property seems sensitive to the different Bitcoin market states and the various uncertainty levels.

The structure of the remaining study is given as follows: section 2 provides data description, and elaborates the methodology of the study. Section 3 displays research results and discussion. Finally, section 4 offers concluding remarks, some asset allocation implications, and study limitations.

2. Data and methodology

2.1. Data and descriptive statistics

This study investigates the dynamic dependencies between Bitcoin returns and the uncertainty for the four major global Bitcoin exchange markets (i.e., China, Japan, Korea and United States) prior to and post-the COVID-19 and the war in Ukraine conditional on distinct Bitcoin market states (bear, normal or bull) and various kinds of uncertainty levels (low, middle or high). This investigation is first based on the returns of the Bitcoin price (BTR). I consider the price data for the Coin Desk Bitcoin Price Index (https://www.coindesk.com/price/). The Coin Desk Bitcoin Price Index represents an average of Bitcoin prices across leading Bitcoin exchanges, and therefore it detects global Bitcoin prices better than other alternatives. Baker et *al.* (2016) provided a specific country indicator for policy-related uncertainty. Regarding China, Baker et *al.* (2016) constructed a new index (CEPU) by identifying articles about economic uncertainty pertaining to China, and by flagging all articles that incorporate at least one term from the China term sets such as 'China', 'Chinese' and 'economy', 'economic' and 'uncertain', 'uncertainty'. In addition, they searched the subset of the China EU articles that also discuss policy

matters. For Japan, to construct an index of economic and related-policy uncertainty (JEPU), Baker et al. (2016) focused on articles in the Top Japanese newspapers (Yomiuri, Asahi, Mainichi and Nikkei) that include the following terms : 'economic or economy', 'tax', 'government spending', 'regulation', 'central bank' or 'certain', and 'uncertain or uncertainty'. Concerning the case of Korea, they developed a South Korean economic uncertainty Index (KEPU) based on six American newspapers, called, Donga Ilbo, Kyunghyang, Maeil Economic, Hankyoreh, Hankook Ilbo and Korea Economic Daily. They included solely the articles incorporating the terms 'uncertain or uncertainty', 'economic, economy or commerce', and other policy-relevant terms: government including 'Blue House', 'congress', 'authorities', 'legislation', 'tax', 'regulation', 'Bank of Korea', 'central bank'. For the U.S., the uncertainty index (USEPU) was developed based on search results from 10 large newspapers. The newspapers included USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the Houston Chronicle, and the Wall Street Journal. Specifically, the search had been focused on articles including the term 'uncertainty' or 'uncertain', the terms 'economic' or 'economy' and one or more of the following terms: 'congress', 'legislation', 'white house', 'regulation', 'federal reserve', or 'deficit'. Due to the availability of Bitcoin and country level uncertainty series, I use the Bitcoin-price data at a monthly frequency from December 2010 to May 2022. The monthly data for country specific uncertainty indicators have been sourced from this link http://www.policyuncertainty.com/index.html. Because I have not enough monthly observations to estimate after the pandemic and the war in Ukraine, I have made two estimates for two different periods: the first one corresponds to the period before the pandemic and the war spanning between December 2010 to December 2019, and the second one refers to an extended period (prior to and post-the COVID-19 and the war) that spans between December 2010 and May 2022. I transform the focal variables by taking natural logarithms to correct for potential heteroskedasticity. Then, I first-difference the time series under study.

Table 1 provides the descriptive statistics of the return series for the periods: the prior to and post- the COVID-19 and the war in Ukraine. Before the pandemic and the current war (Panel A), the average returns of Bitcoin are negative. Bitcoin exhibits the highest average return over the other returns, which is also the most volatile return. For the country level uncertainty indicators, we note that the average of the changes in all the time series is positive. The skewness coefficients are negative, and the kurtosis coefficients are above three for all return series, indicating that the probability distributions of the return series under study are skewed and leptokurtic, thereby rejecting normality. This anecdotal result is also confirmed by the Jarque-Bera statistics. After the COVID-19 and the Russian/Ukrainian war (Panel B), Bitcoin has become more volatile. The returns for all variables of interest are still non-normal, justifying the analysis of correlation under various scenarios based on extreme value distributions.

Table 1. Descriptive statistics of the return series

	BTR	CEPU	JEPU	KEPU	USEPU
Panel A. Prior to the COVID-19 and the war in Ukraine: From December 2010 to December 2019					
Mean	-0.0267	0.0189	0.0168	0.0213	0.0197
Median	-0.0283	0.0194	0.0191	0.0242	0.0203
Std. Dev.	4.4821	1.0345	0.0652	0.0559	0.0976
Skewness	-0.1345	-0.2245	-0.1019	-0.0762	-0.1358
Kurtosis	3.6624	3.8112	4.0256	3.1892	3.7815
Jarque-Bera	18.923*	16.932*	13.725*	18.031*	16.779*
Panel B. Prior to and post-the COVID-19 and the war in Ukraine: From December 2010 to May 2022					
Mean	-0.1019	0.0697	0.0513	0.0723	0.0771
Median	-0.1268	0.0795	0.0654	0.0809	0.0894
Std. Dev.	6.0367	2.3456	1.8873	2.1567	2.8924
Skewness	-0.2259	-0.1345	-0.1193	-0.0942	-0.1032
Kurtosis	4.1108	3.5672	5.0934	4.8814	3.7893
Jarque-Bera	23.872*	20.881*	24.093*	18.951*	19.623*

Notes: Std. Dev. symbolizes the Standard Deviation; the asterisk * denotes the significance at 1% level.

In addition, I test whether the reactions of BTR to the lagged uncertainty proxies is statistically different across distinct quantile levels for the two periods under study (Panels A and B, see Table 2). The Khmaladze test of Koekner and Xiao (2002) overwhelmingly reject the null hypothesis of slope equality for various quantiles of BTR and the considered uncertainty indicators (i.e., BTR, CEPU, KEPU and USEPU) at different levels of

significance. This result provides potential reasons for the usefulness of quantiles-based models over a standard OLS regression.

Table 2.The Khmaladze test of equality of the coefficient estimates across the entire range of quantiles

Variables	Test Statistics	
	Panel A. Prior to the COVID-19 and the war in Ukraine: From December 2010 to December 2019	*Panel B. Prior to and post-the COVID-19 and the war in Ukraine: From December 2010 to May 2022*
BTR	3.1867***	4.6212***
CEPU	4.4231***	2.8879**
JEPU	2.7952**	3.3765***
KEPU	3.3982***	4.1682***
USEPU	3.1082***	2.5610**

Notes: This table contains the statistics of the Khmaladze test introduced by Koenker and Xiao (2002) which is applied to the quantile regression coefficient estimates. The Khmaladze test is a joint test assuming that all the covariate effects satisfy the null hypothesis of equality of the slope coefficients across all quantiles. A rejection of this null favors the quantile regression model. ***, **denote the statistical significance at the 1% and 5% levels, respectively.

2.2. The quantile-on-quantile regression

The historical data of time series are the product of complex economic processes that can involve policy shifts, structural changes, sudden shocks, and political tensions among other factors. The combined influence of these various events is at the root of distributional characteristics of financial and macroeconomic time series (in particular, asymmetry, nonlinearity, heavy-tailness and extreme values).This study is the first to my best knowledge that uses a technique that allows for asymmetry and nonlinearity, namely quantile-on-quantile regression (QQR), to assess whether Bitcoin can serve as a form of a protection against uncertainty in China, Japan, Korea and the United States prior to and post-the pandemic and Russia's invasion of Ukraine, conditional on distinct Bitcoin market scenarios (i.e., bear, normal or bull) and different uncertainty levels (i.e., low, middle or high).

First, I assume θ as the quantile of Bitcoin returns (*BTR*) and propose the basic function for θ-quantile of Bitcoin returns.

$$E_t = \beta(\theta, Uncer_t) + \alpha(\theta)E_{t-1} + \varepsilon_t(\theta) \quad (1)$$

where E_t is defined as the differential logarithms for Bitcoin returns, $Uncer_t$ represents the uncertainty indicator and $\varepsilon_t(\theta)$ denotes an error term with a zero-quantile. Then, with the definition of τ-quantile of the uncertainty proxy, denoted as $Uncer^{\tau}$, I should extend the link function $\beta(\theta, Uncer_t)$ by taking a first order of Taylor Expansion, leading to

$$\beta(\theta, Uncer_t) \approx \beta(\theta, Uncer^{\tau}) + \beta(\theta, Uncer^{\tau})'(Uncer_t - Uncer^{\tau}) \quad (2)$$

Since $\beta(\theta, Uncer^{\tau})$ and $\beta(\theta, Uncer^{\tau})'$ are functions of θ and $Uncer^{\tau}$, and $Uncer^{\tau}$ is a function of τ , $\beta(\theta, Uncer^{\tau})$ and $\beta(\theta, Uncer^{\tau})'$ are both the function of θ and τ . Thus, I can rewrite $\beta(\theta, Uncer^{\tau})$ and $\beta(\theta, Uncer^{\tau})'$ as $\beta_0(\theta, \tau)$ and $\beta_1(\theta, \tau)$, and obtain the function as:

$$\beta(\theta, Uncer_t) \approx \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(Uncer_t - Uncer^{\tau}) \quad (3)$$

Then, I substitute Eq (3) into Eq (1), and obtain:

$$E_t = \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(Uncer_t - Uncer^{\tau}) + \alpha(\theta)E_{t-1} + \varepsilon_t \quad (4)$$

Unlike the quantile regression method, the quantile-on-quantile method assesses the effect of τ-quantiles of uncertainty in China, Japan, Korea and the United States (CEPU, JPEU, KPEU and USEPU, respectively) on θ-quantiles of Bitcoin returns, as the coefficients β_0 and β_1 depend on both values of τ and θ. Low or high θ-quantiles of Bitcoin returns indicate the extreme conditions of Bitcoin markets. Besides, low τ -quantiles of uncertainty imply episodes of collapsing uncertainty, while high τ –quantiles mean periods of rising uncertainty.

3. Empirical results

The ability of Bitcoin to act as a hedge and a safe haven in uncertain times depends on how Bitcoin returns and uncertainty are related. To differentiate between the hedge and safe haven properties, we determine the dependence between Bitcoin returns and changes in uncertainty levels in terms of average and joint extreme movements (Selmi et *al.*, 2018). Accurately, the Bitcoin is perceived as a hedge if it exhibits a positive link with uncertainty in normal states (i.e., when the uncertainty is at its middle level). It is seen as a safe haven if it is positively correlated with uncertainty when the uncertainty is higher.

To assess the dependence structure between Bitcoin returns and uncertainty during the bear (bull) scenarios, we considered the links between the 10th, 20th, 30th and 40th (60th, 70th, 80th and 90th). The return dependence during the normal state is determined through the centrally located quantiles (50th). The quantiles reflect how bearish, normal or bullish the Bitcoin market is and whether the uncertainty is low, middle or high. We can, therefore, give market participants a broader and accurate picture, instead of looking at just the average dependence or the time-varying relationship between two variables. Based on the quantile-on-quantile regression approach expressed in Equation (4), the entire dependence between the quantile of Bitcoin return (indexed by θ) and the quantile of country specific uncertainty (indexed by τ) can be synthesized by the slope coefficient $\beta_1(\theta,\tau)$. Being function of θ and τ, this parameter varies depending to the different Bitcoin market states and the nuances of uncertainty levels.

Figures 1(a), 1(b), 1(c), 1(d), 1(e), 1(f), 1(g), 1(h) plot slope coefficient, $\beta_1(\theta,\tau)$placed on the *z*-axis against the θ-quantiles of Bitcoin return and the τ-quantiles of changes in the uncertainty level, describing the reactions of Bitcoin to the economic and policy-related uncertainty of China, Japan, Korea and United States for two periods: Prior to the COVID-19 and the war in Ukraine from December 2010 to December 2019 (Panel A) and prior to and post-the COVID-19 and the war in Ukraine from December 2010 to May 2022 (Panel B).

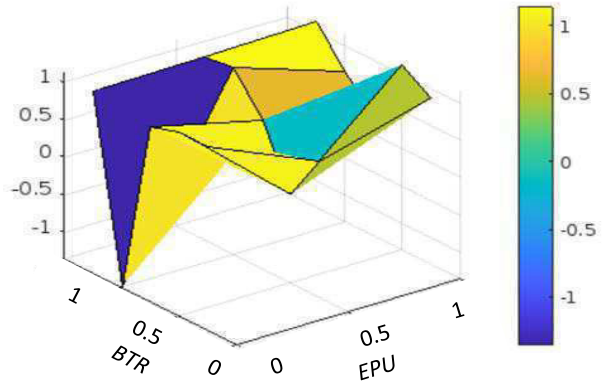
Before the pandemic and the war in Ukraine, it is shown that there is a positive and strong dependence between Bitcoin returns and the Chinese economic policy uncertainty when the Bitcoin market is rising (θ=0.7, 0.8, 0.9) and whatever the uncertainty level (see Fig 1(a)). For the case of Japan (Fig 1(b)), a positive relationship between the two variables of interest is found under bull Bitcoin market conditions (θ =0.9) and when the uncertainty is middle (τ= 0.4, 0.5). However, a negative or insignificant dependence is observed under different Bitcoin market state (i.e., bear, normal, bull) and the uncertainty is high (τ=0.8, 0.9). Fig 1(c) indicates that the response of Bitcoin returns to the uncertainty in Korea appears positive and strong when the uncertainty is low or middle (τ=0.2, 0.3, 0.4, 0.5, 0.6) and under normal and bull Bitcoin market regimes (θ=0.5, 0.6, 0.7, 0.8, 0.9). A negative relationship is, nevertheless, seen under bear Bitcoin market scenario (θ=0.1, 0.2, 0.3, 0.4) and when the uncertainty is high (τ=0.7, 0.8, 0.9). For the case of United States (Fig. 1(d)), Bitcoin reacts positively and significantly to uncertainty when the uncertainty level is high (τ=0.6, 0.7, 0.8, 0.9) and at various Bitcoin market states (θ=0.3, 0.4, 05, 0.7, 0.8, 0.9). But this association is likely to be relatively moderate when the Bitcoin market is collapsing (θ=0.1, 0.2), and the uncertainty is middle or high (τ=0.5, 0.6, 0.7, 0.8, 0.9).

By considering an extended period that accounts for the uncertainties related to the COVID-19 and Russia's invasion of Ukraine, the findings change significantly. Specifically, the hedging ability of Bitcoin is decreasing, though with varying extent. Fig 1(e) shows a negative response of Bitcoin returns to China's economic policy uncertainty when the Bitcoin market is bull (θ=0.6, 0.7, 0.8, 0.9), and when the uncertainty is high (τ=0.7, 0.8, 0.9). When the Bitcoin market is at its normal circumstance (θ=0.5) and the uncertainty is high, a negligible link is seen between the focal variables. Fig 1(f) underscores sharp changes in the hedging properties of Bitcoin. More particularly, a positive link is found when the uncertainty is highest (τ=0.9) and the Bitcoin market is collapsing (θ=0.2, 0.3, 0.4). Nevertheless, a negative dependence is observed under various kinds of uncertainty (i.e., low, middle and high) and distinct Bitcoin market scenarios (i.e., bear normal and bull). Fig 1(g) indicates that there is a positive but relatively modest link between BTR and KEPU when the uncertainty is high and under various Bitcoin market conditions. A negative relationship between these variables is shown when the uncertainty is low or middle and when the Bitcoin market is decreasing. For the United States, we note a negligible dependence between BTR and USEPU when the uncertainty is middle or high and whatever the Bitcoin market conditions.

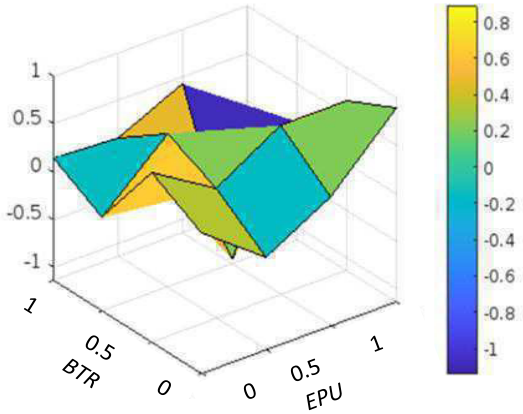
Figure 1. The slope coefficient, $\beta_1(\theta,\tau)$, with respect to Bitcoin and uncertainty estimated parameters by quantile-on-quantile regression approach (Prior to and post-the COVID-19 and the war in Ukraine)

Panel A. Prior to the COVID-19 and the war in Ukraine: From December 2010 to December 2019

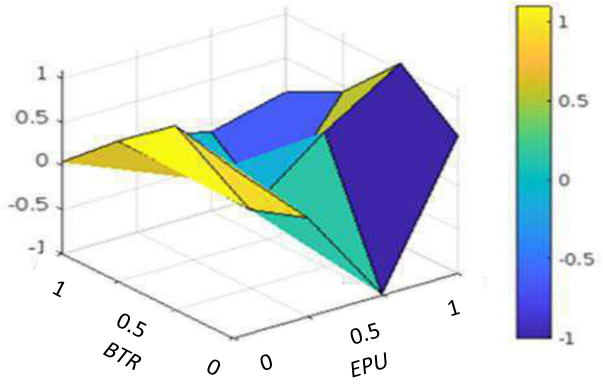
a) China



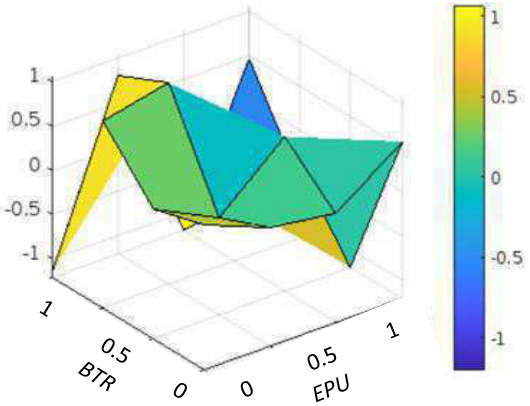
b) Japan



c) Korea

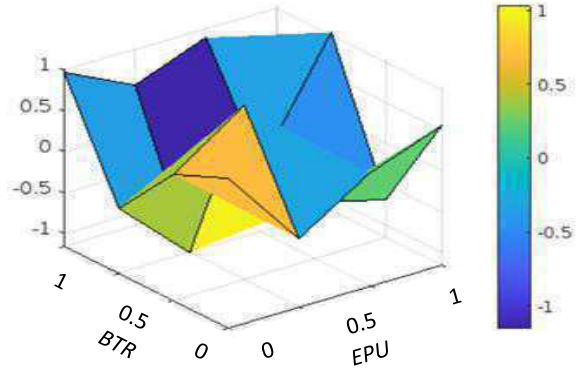


d) United States

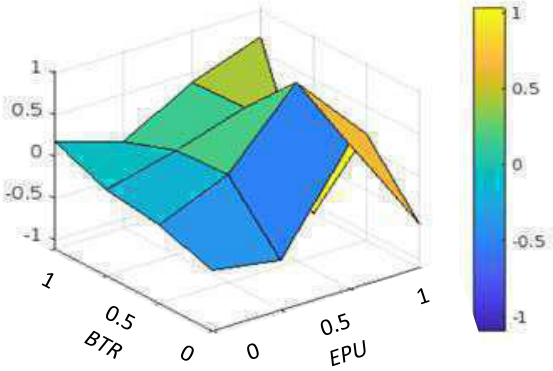


Panel B. Prior to and post-the COVID-19 and the war in Ukraine: From December 2010 to May 2022

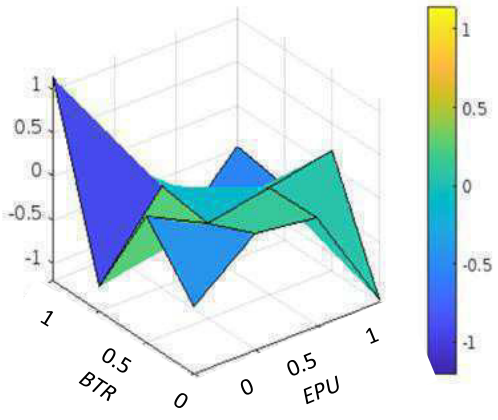
e) China



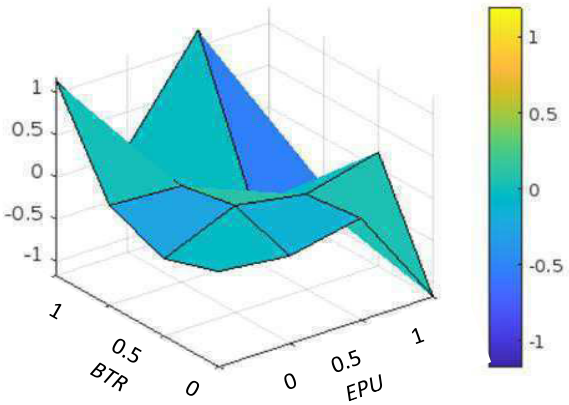
f) Japan



g) Korea



h) United States



Notes: The graphs show the estimates of the slope coefficient, $\beta_1(\theta,\tau)$placed on the z-axis against the quantiles of Bitcoin return (θ) on the y-axis and the quantiles of changes in the uncertainty level (τ) on the x-axis. The yellow (green) color corresponds to positive and strong (weak) values of the slope coefficient, while the dark (light) blue color corresponds to negative and pronounced (moderate) values of the slope coefficient.

Overall, the findings clearly reveal that recent events – from COVID-19 to Russian/Ukrainian war – provide a window into what sort of asset Bitcoin actually is. If it is a hedge and/or a safe haven, Bitcoin would be positively correlated with economic policy uncertainty. The recent performance of Bitcoin reinforces that it is a risky asset. The distinct responses of Bitcoin to the economic policy uncertainty across the different countries under study can be explained by: (a) *The recognition of Bitcoin as a legal tender*; Bitcoin has proven to be a disputable issue for regulators and law enforcements, both of which have targeted this virtual currency while trying to control its use. Up to now, many governments are still grappling to comprehend the cryptocurrency, in order to enact appropriate laws around it. Although Bitcoin is highly welcomed in some countries such as Japan, there are few countries including China that are circumspect of Bitcoin and unwilling to take risks due to its excessive volatility, decentralized nature, higher threat to the current monetary system, without neglecting its link to illicit activities like drug dealing and money laundering. Other countries such as Korea have not clearly made any determination on the legality of this virtual currency. The United States have indirectly admitted to the legal use of Bitcoin by approving some regulatory supervisions; (b) *The efficiency of the legal system*; Japan compared to the rest of the major global Bitcoin exchange markets, has developed very efficient regulations, industry standards and effective policies for both cryptocurrency exchanges and users. Japan is the first and only country that has a proper legal system regulating cryptocurrency trading. Japan has a solid legal system supporting the industry to build credibility among individual investors, without neglecting the Japanese familiarity with securities trading; (c) *The exchange market maturity and investors' attitude towards risk*; Chinese and Korean stock markets are relatively young compared to the Japanese and United States exchange markets. Although the Shanghai and Korea Stock Exchanges date back to1990 and 1956, respectively, the Tokyo Stock Exchange was established on 1878 and the United States exchange market is 223 years old. While the Japanese and United States economies play substantial roles in increasing investment funding for their corporations, China and South Korea's exchange markets have largely been linked to riskier investments, dominated by ordinary investors gambling their wealth rather than looking for long-term sound investments (Carpenter et al. 2015). Add to this that the majority of trading activities in Japan and United the States is driven by professional and institutional investors, whereas larger trading activities in China and Korea are mainly determined by individual investors, as uninformed and unsophisticated traders, amplifying the degree of information asymmetry in the market through trading (Chung and Wang 2016). The unsophisticated investors turn more to risky assets. In general, unsophisticated investors purchase complicated financial instrument without accurately understanding their associated risks.

4. Conclusions

The question of whether Bitcoin can provide an effective hedge against economic policy uncertainty has been raised by several recent research studies. However, with the unprecedented uncertainties surrounding the

COVID-19 and the current Russian/Ukrainian war, it has become prominent to rethink whether the hedging power of this cryptocurrency remains strong and consistent. This study uses a quantile-on-quantile regression to explore the relationship between Bitcoin returns and the economic and policy-related uncertainties for the four major global Bitcoin exchange markets (i.e., China, Japan, Korea and United States) under different Bitcoin market scenarios and low and rising uncertainty episodes.

Considering the period post-the pandemic and the war in Ukraine, the findings reveal that the hedge and safe haven abilities of Bitcoin are weakening. The Russia-Ukraine war and the U.S. Federal Reserve's move to scale back monetary support have forced investors to switch from risky assets such as stocks to safer alternatives. Cryptocurrencies, deemed a safe bet against economic uncertainty, do not appear to fall in the "safe" category. Indeed, the Bitcoin market volatility stemming from the war in Ukraine is hurting that argument. The case for Bitcoin as a hedge and safe asset like gold is weakening, because of its volatility and increased correlation to stock markets (see Figure A3). Even though crypto advocates have long championed a cryptocurrency as an asset uncorrelated from traditional financial markets, the crypto market is responding to the news of Russia's invasion of Ukraine in sync with equities.

Interestingly, the role of Bitcoin as a hedge and safe haven seems country-specific and conditional on the Bitcoin market conditions and the nuances of uncertainty levels. In other words, the analysis underscores that Bitcoin safe haven and hedging properties against global economic policy uncertainty mask significant disparities among country-specific uncertainty indicators. Although the Bitcoin hedging capabilities in times of high uncertainty has long been documented in the literature, our results indicate that there is substantial heterogeneity in how Bitcoin returns covary with country-specific indices. The heterogeneous responses of Bitcoin to uncertainty can be probably attributed to the characteristics of countries with respect the legal status of Bitcoin by country, the Bitcoin trading volume, the exchange market maturity, the degree of professionalism of market players and investors' attitude towards risk. From a risk management perspective, conducting such a fine analysis that accounts for asymmetry and nonlinearity (i.e., a state-by-state correlation) can have relevant risk management implications.

Regardless of the relevance of this article' outcomes, many other issues need to be addressed more thoroughly. Investment in Bitcoin entails a much better understanding of the associated risks (the liquidity problem, volatility, regulatory changes). Also, with the extreme urgency to step up a global response to address the climate emergency, the increasing push from investors for ESG-prioritized portfolios, and the desire of harnessing the growth of green finance, it has become prominent to rethink whether the hedging power of this cryptocurrency will remain strong and consistent amid decarbonization, given the high weight of energy within its mining process (see Kamal and Hassan, 2022).

References

Ali, M.H., Schinckus, C., Uddin, M.A. and Pahlevansharif, S., (2022) "Asymmetric effects of economic policy uncertainty on Bitcoin's hedging power" *Studies in Economics and Finance*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/SEF-05-2021-0186

Baker, S.R, Bloom, N., Davis, S.J. (2016) "Measuring economic policy uncertainty" *Quarterly Journal of Economics* **131**, 1593–1636.

Baur, Dirk G. and Hong, K. and Lee, Adrian D., (2015) "Bitcoin: Medium of Exchange or Speculative Assets?" Available at SSRN: http://dx.doi.org/10.2139/ssrn.2561183

Beckmann, J., Berger, T., Czudaj, R., (2017) "Gold Price Dynamics and the Role of Uncertainty" *Chemnitz Economic Papers*, No. 006 (May).

Bouoiyour, J., Selmi, R., Wohar, M., (2019) "Safe havens in the face of political uncertainty: A comparison between Bitcoin, oil and precious metals" *Applied Economics* **51(57)**, 6076-6088.

Bouri, E., Jalkh, N., Molnar, P., Roubaud, D. (2017) "Bitcoin for energy commodities before and after the December 2013 crash: diversifier, hedge or safe haven?" *Applied Economics* **49(50)**, 5063-5073.

Carpenter, J.N., Lu, F., Whitelaw, R.F. (2015) "The Real Value of China's Stock Market" *NBER Chinese Economy meeting*.

Cheng, H-P., Yen, K-C. (2020) "The relationship between the economic policy uncertainty and the cryptocurrency market" *Finance Research Letters* **35**, 101308.

Chung, C.Y., Wang, K., (2016) "The impact of individual investor trading on information asymmetry in the Korean stock market" *North American Journal of Economics and Finance* **37**, 472–484.

Dyhrberg, A. H., (2016) "Hedging capabilities of Bitcoin. Is it the virtual gold?" *Finance Research Letters* **16**, 139-144.

Kamal, J. B., Hassan, M. K. (2022) "Asymmetric connectedness between cryptocurrency environment attention index and green assets" *The Journal of Economic Asymmetries* **25**, e00240.

Kroner, K. F., Ng, V. K. (1998) "Modeling asymmetric movements of asset prices" *Review of Financial Studies* **11**, 844-871

Luther, W.J., Salter, A.W. (2017) "Bitcoin and the bailout" *The Quarterly Review of Economics and Finance* **66 (C)**, 50-56.

Reboredo, J.C. (2013) "Is gold a hedge or safe haven against oil price movements?" *Resources Policy* **38 (2)**, 130–137.

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.

Selmi, R., Hammoudeh, S., Makhlouf, F., Wohar, M. (2022) "Inflation in the wake of COVID-19 and the Russian/Ukrainian war: Which equity sectors can combat rising inflation expectations?" *Mimeo*.

Sim, N., Zhou, A., (2015) "Oil prices, US stock return, and the dependence between their quantiles" *Journal of Banking and Finance* **55**, 1-8.

Syed, A.A., Ahmed, F., Kamal, M.A., Ullah, A., Ramos-Requena J.P. (2022) "Is There an Asymmetric Relationship between Economic Policy Uncertainty, Cryptocurrencies, and Global Green Bonds? Evidence from the United States of America" *Mathematics* **10(5)**, 720.

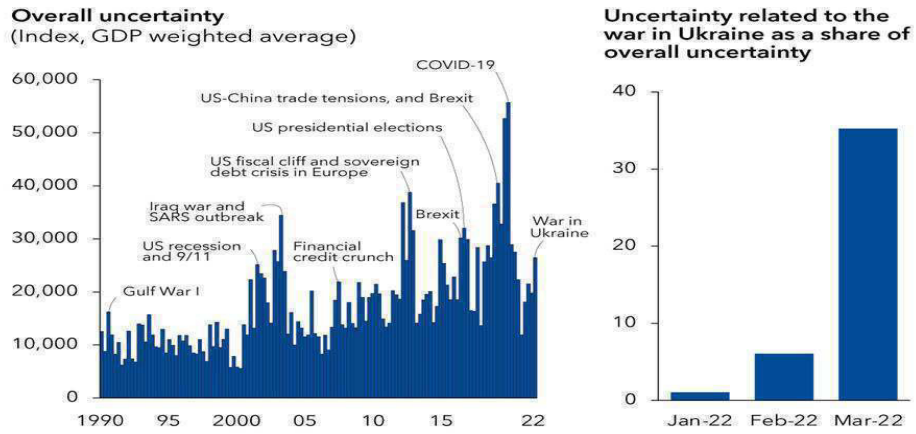
Vurur, N.S. (2021) "The Asymmetric Effect of Panic Index on Cryptocurrencies" *Front. Appl. Math. Stat.* **7**, 661388. doi: 10.3389/fams.2021.661388

Weber, B., (2016) "Bitcoin and the legitimacy crisis of money" *Cambridge Journal of Economics* **40(1)**, 1 – 41.

Xiao, Z., Koenker, R. (2009) "Conditional Quantile Estimation for Generalized Autoregressive Conditional Heteroscedasticity Models" *Journal of the American Statistical Association* **104**, 1696–1712.

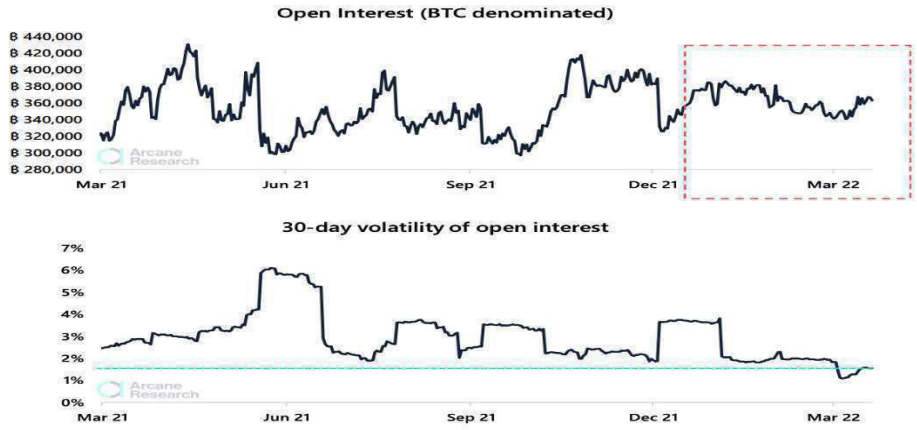
Appendix

Figure A1. The COVID-19, the war in Ukraine and the global economic uncertainty



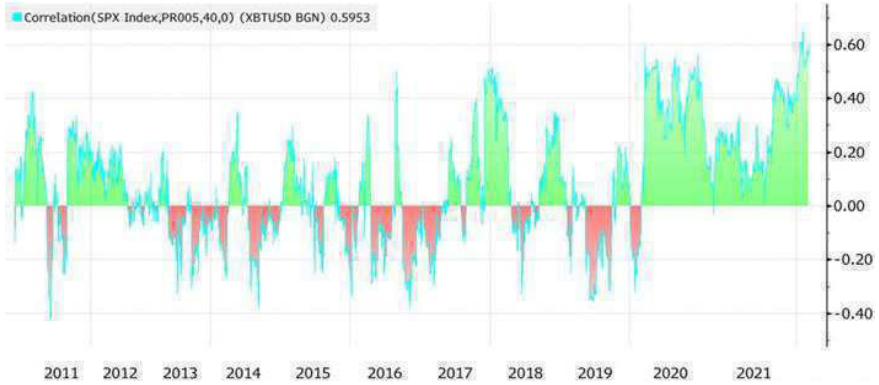
Source: Ahir et al. (2022); IMF report.

Figure A2. Bitcoin open interest and volatility



Source: Arcane Research (https://arcaneresearch.squarespace.com/).

Figure A3. The correlation between Bitcoin and S&P500 stocks prior to and post-the COVID-19 and the war



Source: Bloomberg.