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Can Bitcoin hedge the risks of geopolitical events?

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ABSTRACT

This paper investigates the role of the Bitcoin currency, in avoiding and surpassing the risks that are associated with the global geopolitical events, and circumstances. For this purpose, we have performed the bootstrap full, and the sub-sample rolling-window Granger causality tests, in order to explore the mutual influences between geopolitical risks (GPR) and Bitcoin prices (BCP). We have found that there are positive and negative influences that stem from GPR towards BCP. In this regard, the positive impacts ascertain that the Bitcoin currency can be considered as an asset that is developed in order to avoid GPR. However, this view cannot be held constant and absolute, without considering the negative effects of such an arrangement. Moreover, it is noteworthy that these results are not supported by the Intertemporal Capital Asset Pricing Model (ICAPM), which highlights that BCP can be positively affected by GPR. On the flipside, there is a positive influence extended from BCP towards GPR, which suggests that the Bitcoin market is a leading indicator that can be used to analyze the global geopolitical environment more accurately and comprehensively. Therefore, in situations involving severe global uncertainty and complicated geopolitical patterns, investors can benefit from the Bitcoin market in order to optimize their investments during the periods where the GPR are higher. Moreover, governments can also adopt, accept and boost the trend of BCP by considering valid GPR, and further promote the advances in encryption technology. They can also strengthen their supervision, in order to promote a healthy development of the Bitcoin market, which in turn is a significant indicator of the macroeconomic and political trends across the globe.

1. Introduction

The primary objective of this study is to investigate whether Bitcoin currency can hedge the risks associated with geopolitical events. Bitcoin is a cryptocurrency. Which means that it is a virtually encrypted digital currency that is founded by Satoshi Nakamoto, and exists in peer-to-peer (P2P) form (Nakamoto, 2008; Harvey, 2014). As an emerging product concept, Bitcoin and its market have developed quite rapidly, and in some cases, it can be considered as an asset that is used to avoid risks (Bouoiyour et al., 2019; Fang et al., 2019; Mamun et al., 2020), which also include any potential geopolitical risks (GPR). Geopolitics belongs to a branch of the subject of political geography (Gearóid, 1999). Geopolitical events include, as well as refer to wars, conflicts, tensions, etc., among the different nations and regions (Caldara and Iacoviello, 2017; Clance et al., 2018). High GPR, which are a result of geopolitical events, tend to stir panic amongst the people (Cheung and Blunden, 2008). These events then cause the general public to become more pessimistic about the future, and as a result, the investors' sentiments, when it comes to making successful and effective investments, drop low during the periods when the GPR are high. As a consequence of this, an upwards spike in the need and demand for the assets, such as Bitcoins, which hold a hedging ability, increases (Karalevičius et al., 2017; López-Cabarcos et al., 2019). This increase in demand causes the Bitcoin prices (BCP) to soar. An example of this can be the hike experienced in the Bitcoin prices when the world had been indulging in counterattacks towards the "Islamic State", when there was a civil war in Syria, when there were terrorist attacks in Belgium and France, in the U.S. election, and lastly, the Brexit move in 2016. Thus, we can believe that BCP will increase when there is a geopolitical event in the world (Mamun et al., 2020).

However, this view cannot be always held true as the hedging ability of the Bitcoin currency is still uncertain (Baek and Elbeck, 2015; Cheng and Yen, 2019). An example of this can be that, since 2014, there have been several geopolitical events that have taken place in the

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world. These include the annexure of Crimea by Russia, the escalations of the Islamic State of Iraq and al-Sham (ISIS) and the resulting conflicts between Ukraine and Russia, and the terrorist attacks in Paris. Despite all these global geopolitical developments, the BCP has still remained low in terms of its level. On the other hand however, Peter Tchir, a former executive director in Deutsche Bank, is of the opinion that the Bitcoin is a leading indicator when it comes to the global geopolitical environment. Generally speaking, the issue regarding whether the Bitcoin can hedge the risks of geopolitical events has not been clearly interpreted thus far. In that context, this paper investigates the time-varying Granger causality between the relationship of GPR and BCP, in order to further explain this particular issue. The mutually stimulating influence that exists these two variables can help investors to diversify their risks, and maintain their returns by considering the Bitcoin as an asset in their portfolio. Also, it can assist governments in ensuring a healthy development of the Bitcoin market, and promote national security by reducing the large fluctuations in BCP, and the risks associated with and due to the global geopolitical events.

When compared with the traditional fiat currency, the Bitcoin is independent of the control that is exercised by the central bank, and any financial institutions, even though it is calculated by the network nodes (Elwell et al., 2013). Interestingly, anyone may participate in the production of the Bitcoin, and may even circulate if around the world, if one is able to gain access to it via a computer that is connected to the Internet (Beikverdi and Song, 2015). Unless a particular country in question prohibits Bitcoin transactions (e.g., Bitcoin transactions are restricted in several countries, such as Indonesia and Pakistan), the common public of any country can gain access to, and hold the Bitcoin currency during the periods that are marked with high GPR (Amrina and Kusuma, 2018). Then, they may diversify their risks, reduce their losses and maintain their returns, which may possibly be significant and consideration worthy due to an increase in the BCP (Karalevičius et al., 2017; Bouoiyour et al., 2019; Fang et al., 2019; López-Cabarcos et al., 2019). Thus, in this context and thought process, the Bitcoin can be regarded as an effective asset that can be held by global investors in order to avoid the GPR. In addition to this, the BCP is affected by geopolitical events around the world, not just in several countries (Mamun et al., 2020). For instance, the Syrian war, and the Cyprus crisis in 2013 caused investors to store more Bitcoin currency in order to avoid GPR, which tend to drive up the BCP. Moreover, the political tension in North Korea in 2017 also lead to immense GPR, and as a result the BCP soared higher. The most consistent year in terms of the trends encapsulating GPR and BCP, is 2019, however, interestingly, the deterioration in the Middle East and the global trade wars has made these two variables move in the same direction. Although the BCP has not experienced a rapid increase post certain global geopolitical events, which were expected to send waves across the world of digital currencies (e.g., violent escalation of matters by ISIS and the resulting conflicts between Ukraine and Russia in 2014, The situation in Syria, and the attacks of the Saudi Arabian allied forces on Hodeida in 2018), we can still propose that the Bitcoin market had been affected by the global GPR. We can also conclude that the interrelationship between GRP and BCP is characterized by a worldwide approach that needs to be adopted. Therefore, this paper, analyzes the interactive mechanism that works between these two variables on a global level.

Since the birth of the Bitcoin currency, its ability to avoid risks, and the concerns about whether it can hedge the risks of geopolitical events, have attracted great attention by various experts and researchers. Dyhrberg (2016) suggests that the Bitcoin is useful for risk-averse investors who aim and aspire to reduce losses when they are confronted with the expectation of negative shocks in the market. Demir et al. (2018) highlight that the BCP can be predicted more accurately by considering the uncertainty and ambiguity that exists in the economic policies. As a result, the Bitcoin can serve as a hedging tool against this uncertainty. Moreover, Paolo and Iman (2018) reveal that as the Bitcoin acts as a hedge against uncertainty, as it responds positively to it at higher quantiles, and at shorter frequency movements of the BCP. Al-Yahyaee et al. (2019) ascertain that the GPR is capable of affecting the co-movements that take place between the volatility index (VIX) and the BCP, which means that GPR also happens to possess the ability to predict the BCP (Karalevičius et al., 2017). Bouoiyour et al. (2019) identify the Bitcoin as a safe haven against the risks that were caused as a consequence of the U.S. presidential elections in 2016. Bouri and Gupta (2019) suggest that the Bitcoin poses as a hedge against uncertainty which is partly caused by the global GPR, and based on this revelation, the BCP can be predicted more accurately. As a high GPR quotient tends to make spread panic in the public, López-Cabarcos et al. (2019) point out that investors' sentiments have certain influences on the volatility of the Bitcoin. Platanakis and Urquhart (2019) find that the portfolios that include dealing with the Bitcoin currency will yield significantly higher, risk-adjusted returns (Chuen et al., 2017; Troster et al., 2019; Wang et al., 2019). Furthermore, Mamun et al. (2020) indicate that the GPR command a risk premium, and the effects that GPR have on BCP are more significant and considerable during the periods when the economic environment is unfavorable. However, the view that the Bitcoin possesses the ability to effectively avoid risks, and that it is the winner after the gunshot, cannot always be deemed accurate and supportive of the various factors that come into play. In a counter argument, Yermack (2013) asserts that the Bitcoin currency is useless when it comes to effective risk management, and it is exceedingly difficult for its investors to hedge risks that are associated with it. Baek and Elbeck (2015) have presented evidence that the Bitcoin market is highly speculative in nature, and it hardly acts as a hedge or an investment tool. Following this, Bouri et al. (2017) revealed that the Bitcoin acts as a poor hedge, which is only appropriate for diversifying purposes. Furthermore, Matkovskyy and Jalan (2019) also suggest that risk-averse investors are more willing, and hence prone to making investments in safer financial assets, rather than the Bitcoin which is a riskier option during periods of national or global crisis. Adding to this suggestion, Smales (2019) also points out that until the Bitcoin market matures, it is unlikely that investors will find it to be worthwhile, especially in terms of considering the Bitcoin as a safe option of investment in times of a crisis. Charfeddine et al. (2020) indicate that cryptocurrencies, such as Bitcoins, are generally considered to be poor and inadequate hedging tools. Jareño et al. (2020) ascertain that the changes in the volatility index (VIX), and the Louis Fed' s Financial Stress Index (STLFSI) may have statistically significant influences, which are negative in nature, on the BCP. Qin et al. (2020) highlight that the uncertainty associated with the global economic policies can have both positive and negative influences on the BCP. And if that is indeed the case, the Bitcoin cannot always be effectively relied upon when it comes to avoiding the risks that are associated with this uncertainty. The extant studies primarily investigate a one-way effect that could oscillate from GPR to BCP, or vice versa. Only a few studies explore the time-varying mutual influences between these two variables, and this paper attempts to fill in the gaps that were presented by previous studies that were conducted on the interactions between the GPR and the BCP.

The research and study done in this paper will contribute towards the existing literature, and benefit potential investors and governments in ways that are manyfold. To begin with, the existing studies mainly investigate the impact that the GPR have on the BCP, or vice versa (Al-Yahyaee et al., 2019; Mamun et al., 2020). Also, the BCP is studied in relation to the global GPR, and isolated geopolitical events in the single region may result in an incomplete and incomprehensive analysis. Therefore, this study is a groundbreaking attempt to solve the issues of whether the Bitcoin is capable of hedging the risks associated with global geopolitical events, and, moreover, what relevance and role does the Bitcoin market have the wake of global GPR. Secondly, in the extant literature on this topic, the measurement of the GPR has mostly been possible by the usage, and application of dummy variables (Ferrara, 2010; Medel, 2015; Zhang et al., 2018). It must be known that

these dummy variables are only able to reflect, but not factually ascertain, whether there is a geopolitical event, which essentially ignores the magnitude of GPR. Thus, for the purpose of this study, we have chosen the GPR index (Caldara and Iacoviello, 2017) so as to represent the risks associated with the various global geopolitical events. The GPR index can also aid in measuring the intensity of the geopolitical events, which will in turn make this analysis more accurate. Thirdly, the observation that Granger causality between GPR and BCP may be not constant in nature, is ignored by the existing studies. Therefore, we have performed the bootstrap sub-sample rolling-window causality test (Balcilar et al., 2010; Su et al., 2019b; Su et al., 2020a) to improve the accuracy of the intended outcomes. Moreover, for the purpose of this study we also referred to the monthly data spanning over the time period from July 2010 to December 2019, so as to explore the relationship between the GPR and the BCP, by using the full and sub-sample tests. The empirical results suggest that the Bitcoin currency cannot always be viewed as an asset that can counter or be effectively used to avoid GPR, and it is also inconsistent with the Intertemporal Capital Asset Pricing Model (ICAPM), which states that GPR has a positive influence on the BCP. Rather, in reality, there is a positive influence of BCP on the global GPR. Moreover, the interrelationship between the GPR and the BCP may suggest to the investors that they can consider Bitcoin as an effective asset in their respective portfolios. An asset that investors can make use of in order to diversify the risks that they might incur, reduce their potential losses and eventually maintain their potential returns. Additionally, the government can also benefit from the interaction of BCP and GPR. They can do this by preventing Bitcoin bubbles, and consequently promoting a healthy development of the Bitcoin market. This way, the governments can also effectively reduce the costs that are associated, and caused by the geopolitical events, and eventually ensure national security.

The rest of the paper is arranged as follows: Section 2 illustrates the intertemporal capital asset pricing model between GPR and BCP. While Section 3 explains the empirical methods. Then, Section 4 introduces the data, and Section 5 reveals the empirical results. Lastly, Section 6 summarizes the study of this paper.

2. Intertemporal capital asset pricing model of the GPR and BCP

For the purpose of this study, we have proceeded with the application of the Intertemporal Capital Asset Pricing Model (ICAPM) in order to investigate the transmission mechanism between GPR and BCP (Cifarelli and Paladino, 2010). There are two assumptions in the ICAPM. On one hand, it is believed that informed traders (those who consider risk-return while investing), and feedback traders (those who consider the serial correlation of BCP) dominate the Bitcoin market. On the other hand, the systematic risk, which cannot be removed by diversification, is paid attention to by informed traders, and is represented by the GPR. The informed traders, will tend to reasonably predict the BCP according to the fluctuations in the GPR, and will also determine the amount of Bitcoin one should ideally aim to invest. Hence, the demand for them is represented by the Eq. (1):

$$I_t^d = \frac{E_{t-1}(\mathrm{BCP}_t) - \mathrm{BCP}^f}{\mu(\mathrm{GPR}_t)} \tag{1}$$

where I_t^d is the percentage of the Bitcoin bought exclusively by informed traders, among all possible investors during the time period denoted by t. $\mu(\mathrm{GPR}_t) > 0$ indicates that the value is positive, while $\mu'(\mathrm{GPR}_t) > 0$ denotes that the increase in GPR will lead to a rise in $\mu(\mathrm{GPR}_t)$. BCP^f represents the price of Bitcoin when there is no GPR. Whereas $E_{t-1}(\mathrm{BCP}_t)$ is the conditional expectation of BCP, based on the information during the time period $t-1$. Furthermore, BCP_t is an ex-post BCP, during the time period that is denoted by t. If there is a prevalence of only informed traders in the Bitcoin market, the value of I_t^d is going to be 1, and hence, Eq. (1) can be converted into the Capital Asset Pricing Model (CAPM), and represented by Eq. (2), which is developed by Sharpe (1964)

$$E_{t-1}(\mathrm{BCP}_t) = \mathrm{BCP}^f + \mu(\mathrm{GPR}_t) \tag{2}$$

We can observe that the increase in GPR will lead to a rise in the BCP. This also suggests that the Bitcoin currency can be considered as the winner after the gunshot, since this price hike. We then consider another kind of Bitcoin investors, i.e., the feedback traders. Bitcoin investors will closely follow the Bitcoin market and determine the current BCP demand in accordance with the previous BCP. Among all the investors, the percentage of the Bitcoin currency bought by feedback traders is denoted by $F_t^d = \gamma \mathrm{BCP}_{t-1}$ where $\gamma > 0$. If the Bitcoin market has both informed and feedback traders, the value of $I_t^d = 1 - F_t^d$, then, in this case, Eq. (1) can be rewritten as follows:

$$E_{t-1}(\mathrm{BCP}_t) = \mathrm{BCP}^f + \mu(\mathrm{GPR}_t) - \gamma\mu(\mathrm{GPR}_t)\mathrm{BCP}_{t-1} \tag{3}$$

Compared to Eq. (2), Eq. (3) has an additional term that is denoted by $-\gamma\mu(\mathrm{GPR}_t)\mathrm{BCP}_{t-1}$, which indicates that the feedback traders will make the Bitcoin market more or less fluctuating. The total coefficient of $\mu(\mathrm{GPR}_t)$ is $1 - \gamma\mathrm{BCP}_{t-1}$, which is a positive value as $\gamma\mathrm{BCP}_{t-1} = F_t^d < 1$. Therefore, from the ICAPM, we can determine that GPR happens to have a positive influence on the BCP. A high GPR means that there is a potential geopolitical event in question, such as a war or tension, and hence, the BCP will also increase in order to compensate for the losses incurred from GPR. For instance, the Syrian war and the Cyprus crisis in 2013 caused investors to store more hedging assets (e.g., Bitcoin) in order to avoid GPR, which drove up the BCP during this period. We can thus conclude that the Bitcoin can be viewed as an asset that is used to avoid GPR, and hence, it is the winner after the gunshot.

3. Methodology

3.1. Bootstrap full-sample causality test

According to the traditional vector auto-regression (VAR) model, the Granger causality test statistics must obey the standard asymptotic distributions. In order to avoid inaccurate results, and enhance the correctness of the causal relationship test, the usage of the critical values of the residual-based bootstrap (*RB*) method are proposed by Shukur and Mantalos (1997). Additionally, they point out that the *RB* method is appropriate for the tests which carry standard asymptotic distributions, even in smaller samples. Shukur and Mantalos (2000) developed the likelihood ratio (*LR*) tests, which can be revised by altering the features of power and size. In this paper, we have examined the mutual influences between GPR and BCP, by employing the *RB*-based modified-*LR* test. The VAR (p) system, with two variables, is constructed in the Eq. (4):

$$Z_t = \beta_0 + \beta_1 Z_{t-1} + \cdots + \beta_p Z_{t-p} + \mu_t \quad t = 1, 2, \ldots, T \tag{4}$$

Where the value of p is selected based on the Schwarz Information Criterion (SIC), which indicates an optimal lag order. The bivariate VAR (p) system can split the variable Z into GPR and BCP, which means that $Z_t = (\mathrm{GPR}_t, \mathrm{BCP}_t)$. In addition to this, the GPR and BCP may have a certain linkage with the U.S. dollar index (USDX), which in turn affects the interaction between these two variables (Dyhrberg, 2016; Zhu et al., 2017; Su et al., 2020b). Taking these variables into consideration, we then choose the USDX as a control variable, and rewrite Eq. (4) as follows:

$$\begin{bmatrix} \mathrm{GPR}_t \\ \mathrm{BCP}_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11}(L) & \beta_{12}(L) & \beta_{13}(L) \\ \beta_{21}(L) & \beta_{22}(L) & \beta_{23}(L) \end{bmatrix} \begin{bmatrix} \mathrm{GPR}_t \\ \mathrm{BCP}_t \\ \mathrm{USDX}_t \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \end{bmatrix} \tag{5}$$

where $\mu_t = (\mu_{1t}, \mu_{2t})'$ is a white-noise process. $\beta_{ij}(L) = \sum_{k=1}^{p} \beta_{ij,k} L^k$, where $i = 1, 2$, $j = 1, 2, 3$ and L is a lag operator, and then $L^k Z_t = Z_{t-k}$.

The null hypothesis that concludes that BCP has no influences on GPR, that is $\beta_{12,k} = 0$ for $k = 1, 2, \ldots, p$, can be tested based on Eq. (5).

Based on this, the results that the BCP is not a Granger cause for GPR, and vice versa, can be accepted. Likewise, the null hypothesis that GPR does not Granger cause BCP ($\beta_{21,k} = 0$ for $k = 1, 2, \ldots, p$) can also be accepted.

3.2. Parameter stability test

The assumption of the full-sample test is that the parameters of the VAR system are constant and stable, which is inconsistent with reality. Where the parameters are non-stable in nature, performing the full-sample test is not suitable, and is rather unfeasible as well. Following this revelation, for the purpose of this study, we employed the parameter stability tests, including the *Sup-F, Ave-F* and *Exp-F* tests, developed by Andrews (1993), and Andrews and Ploberger (1994). The *Sup-F* test can examine the sudden structural changes in parameters, whereas, the *Ave-F* and *Exp-F* tests can provide evidence of whether the parameters have experienced a gradual change over time. Furthermore, we also used the L_c statistics test (Nyblom, 1989; Hansen, 1992), in order to find out the evidence of whether the parameters follow a random walk process. By performing the above mentioned stability tests, if the parameters are determined to be time-varying, then there must be a non-stable interaction between GPR and BCP. Hence, we should rely on the application of the sub-sample test in order to investigate the mutual influences between these two time series.

3.3. Bootstrap sub-sample rolling-window causality test

Balcilar et al. (2010) developed this method, in order to detach the whole time series into small sections, based on the rolling-window width. Pesaran and Timmermann (2005) ascertain that this width cannot be less than 20 if the parameters in the VAR system are non-stable. So, for the purpose of this study, the separated small parts were then scrolled through from the beginning to the end of the entire time series. It was after this that the specific way to perform this was shown, i.e., we let the extent of the entire sample be donated by L, and the rolling-window width be donated by w. The final version of every separated small part is shown as $w, w+1,\ldots, L$, and we can also compute the L-$w+1$ sub-samples. Each sub-sample can obtain a Granger causality result through applying the *RB*-based modified-*LR* statistic. Next, we obtained the outcomes of the sub-sample test. $N_b^{-1}\sum_{k=1}^{p}\hat{\beta}_{12,k}^{*}$ and $N_b^{-1}\sum_{k=1}^{p}\hat{\beta}_{21,k}^{*}$ are the mean values of a huge number of estimations, which suggest the impact of BCP on GPR, and the influence posed by the GPR to the BCP, respectively. N_b is the frequency of bootstrap repetitions, while $\hat{\beta}_{12,k}^{*}$ and $\hat{\beta}_{21,k}^{*}$ are parameters from Eq. (5).

4. Data

For the purpose of this study, we chose the monthly data, spanning from July 2010 to December 2019, in order to explore the Granger causal relationship between the geopolitical risks and the Bitcoin prices. The ultimate aim was to find evidence about whether the Bitcoin is the winner after the gunshot after all. The first report about the Bitcoin was published on July 11, 2010, and was made by Slashdot, which is a technology related medium. Also, in the same month, MT.Gox, the first Bitcoin trading platform was constructed, which made Bitcoin transactions more convenient, and thereby attracted more users to trade in the Bitcoin currency. As a general global practice, the Bitcoin prices (BCP) are denominated in U.S. dollars[1], in order to reflect the international Bitcoin market. Since that time, the BCP has experienced dramatic upward hikes, especially during several periods which have been marked with high geopolitical risks (GPR). Hence, the Bitcoin may be viewed as an asset that is used to effectively hedge the risks associated with certain geopolitical events. The geopolitical deterioration in the Middle East (e.g., attacks on Saudi Arabia's oil facilities, and Iraq's oil production base) and the global trade wars (mainly launched by the U.S.) caused the GPR to increase sharply in 2019. It was then when the investors became more willing to hold on to the Bitcoin currency, in order to avoid GPR, which in turn is capable of driving the BCP to rise even more, and vice versa. We can consider and concur, to an extent, that the fluctuations in the BCP may depend on the risks associated with the geopolitical events, i.e., the GPR, which is measured by Caldara and Iacoviello (2017)[2]. The GPR is constructed by computing the occurrence of words that are interrelated to the words that resonate with geopolitical risks, extracted from 11 of the leading international newspapers[3]. A higher value of GPR indicates that the risks associated with, and of geopolitical events are greater, and vice versa (Su et al., 2019a). Therefore, there may be interactions between the global geopolitical environments, and the digital currency market. Fig. 1 reveals the trends of GPR and BCP.

We can observe that the Bitcoin cannot always hedge the risks associated with geopolitical events. When the Bitcoin first appeared, the traders were on a few in number, and no formal Bitcoin exchange existed, and as a result the BCP continued to remain at a low level. The Syrian war and Cyprus crisis in 2013 not only caused the GPR to increase, but also lead and encouraged investors to be more willing to hold on to their digital currencies. Then, the rise in demand drove the BCP higher, which indicated that the Bitcoin could be viewed as an asset to avoid GPR. Since the year 2014, although there have been several global geopolitical events (e.g., The Russian invasion of Crimea, the escalations from ISIS and the resulting conflicts between Ukraine and Russia, and the terrorist attacks in Paris) that happened around the world, the BCP has remained at a low level. Hence, it shows that the Bitcoin failed to hedge the risks of the global geopolitical events during this period of time. At another instance, the tensions in North Korea, in the year 2017, caused the GPR to soar higher, which also lead the demand for the Bitcoin, and as a result, the BCP to increase. In addition to this, the large-scale injection of investment into Bitcoin currency (especially by China, Japan and South Korea) drove skyrocketed the BCP by about 2000% in the year 2017. However, this dramatic growth trend did not continue for long and there was a sharp decrease in the BCP in the year 2018, which was partly caused by the increase in the value of the U.S. dollar. Moreover, the global GPR remained at a high level due to the Syrian tensions and the attacks of the Saudi Arabian allied forces on Hodeida, and as a result the Bitcoin was not considered to be the winner after the gunshot during this period. In the year 2019, the deterioration in the Middle East, and the global trade wars lead to an increase in the GPR. After this the investors were inclined towards storing those assets which possessed the hedging ability, logically causing the demand for the Bitcoin and the BCP to soar. Also, the decrease in the GPR reduced the demand of the Bitcoin currency, and as a result the BCP, which indicated that the Bitcoin could be viewed as an asset to avoid GPR in 2019. In the current and the future settings any geopolitical events, especially launched by the U.S., may affect the value of the dollar which is taken to be the denomination currency of the Bitcoin. Keeping that in mind, any fluctuations in the BCP may be influenced by the U.S. dollar. Which means that if the value of the U.S. dollar reduces, it will lead to a rise in the BCP, and vice versa. Hence, it can be determined that the U.S. dollar index (USDX)[4] may have an

[1] The price of Bitcoin in U.S. dollars is taken from the Yahoo Finance (https://finance.yahoo.com/quote/BTC-USD?p=BTC-USD&.tsrc=fin-srch).

[2] GPR index is taken from the Economic Policy Uncertainty Website (http://www.policyuncertainty.com/gpr.html).

[3] The 11 newspapers include The Boston Globe, Chicago Tribune, The Daily Telegraph, Financial Times, The Globe and Mail, The Guardian, Los Angeles Times, The New York Times, The Times, The Wall Street Journal and The Washington Post.

[4] The U.S. dollar index is obtained from the Federal Reserve Board (https://

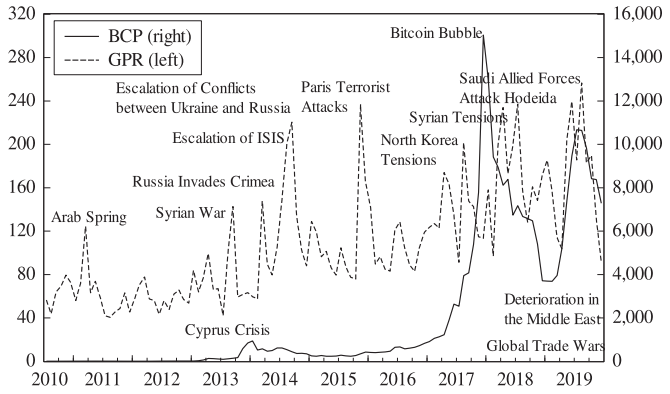

Fig. 1. The trends of GPR and BCP.

Table 1
Descriptive statistics for GPR, BCP and USDX.

	GPR	BCP	USDX
Observations	114	114	114
Mean	110.081	2155.160	88.649
Median	96.735	419.264	91.229
Maximum	256.630	15034.530	102.350
Minimum	40.510	0.062	73.030
Standard deviation	53.068	3422.350	8.562
Skewness	0.835	1.682	−0.145
Kurtosis	2.874	4.863	1.453
Jarque–Bera	13.333***	70.216***	11.763***

*** denotes significance at the 1% level.

effect on the mutual influence between GPR and BCP. In that case, we select it as a control variable in Eq. (5). It is noteworthy that usually, the interaction between GPR and BCP is complicated, as well as affected by USDX.

Table 1 reports the descriptive statistics in this regard. The averages of GPR, BCP and USDX suggest that they are centered at the 110.081, 2155.160 and 88.649, respectively. The positive skewness can possibly reflect that the GPR and BCP are right-skewed in terms of their distribution. Moreover, the kurtosis of BCP is greater than 3, thereby, this series satisfies the leptokurtic distributions. Meanwhile, the GPR and USDX satisfy the platykurtic distributions as well, since the kurtosis is less than 3[5]. Furthermore, the Jarque–Bera index points out that the GPR, BCP and USDX are significantly, non-normally distributed at a 1% level. Therefore, it is not appropriate to employ the traditional Granger test here. Furthermore, this paper employs the *RB* method in order to analyze the GPR and BCP, with potentially non-normal distributions, and also applies the bootstrap sub-sample rolling-window test so as to explore the mutual influences between these two variables. By taking into account the natural logarithms, we can avoid any potential heteroscedasticity in the GPR, BCP and the USDX. Also, the first differences of BCP and USDX have been chosen to avoid any involved variable from being non-stationary.

5. Empirical results

In order to test the stationarity of these three variables, we have applied the Augmented Dickey–Fuller (Dickey and Fuller, 1981) test, the Phillips–Perron (PP, 1988) test and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS, 1992) test, respectively. From Table 2, we can observe that all of these three variables are stationary in nature. Thus, we use the GPR, BCP and USDX to effectively construct the VAR models, and perform the required Granger causality tests.

According to Eq. (5), the bivariate VAR system is employed in order to examine the full-sample Granger causal relationship between GPR and BCP. We have chosen the optimal lag order at a value of 1, based on the SIC. Table 3 reports the results of the full-sample test, where the *p*-values point out that there is no significant interrelationship between GPR and BCP. This suggests that the GPR cannot affect the BCP and vice versa. These results are not consistent with the previous studies on this subject (Al-Yahyaee et al., 2019; Mamun et al., 2020), and the ICAPM results highlight that GPR has a positive influence on BCP.

The full-sample estimation in the bivariate VAR system assumes that the parameters are constant, and there is only one causality experienced in the whole time period under consideration. However, if the time series and VAR system develop structural mutations, the Granger causality between GPR and BCP would be non-constant (Balcilar and Ozdemir, 2013). In this regard, we employed the *Sup-F, Ave-F* and the *Exp-F* tests (Andrews, 1993; Andrews and Ploberger, 1994) in order to examine the parameter stability. We also used the L_c statistics test (Nyblom, 1989; Hansen, 1992) so as to examine whether the parameters follow a random walk process or not. The results of the parameter stability test are highlighted in Table 4.

The *Sup-F* test indicates that the GPR, BCP and VAR systems experienced sudden structural changes at the 1% level. Also, the *Ave-F* and *Exp-F* tests highlight that the parameters can gradually change over time in the GPR, BCP and VAR system at a 1% level. In addition to this, the null hypothesis of the L_c statistics test can be rejected at the 1% level, revealing that the parameters in the VAR system do not follow a random walk process. Therefore, through the parameter stability test, we can conclude that there is a time-varying interaction between the GPR and BCP. The full-sample test can only test the constant causal relationship, which is not suitable for this paper. Once these results were revealed, we applied the bootstrap sub-sample rolling-window causality test in order to investigate the time-varying interaction between these two variables. Also, for the purpose of these tests, a rolling-window width of 24-months[6] was taken into consideration, in order to ensure the accuracy of the Granger causal relationship analysis. Results can successfully indicate whether the null hypothesis that, GPR does not Granger cause BCP (or BCP does not Granger cause GPR) can be accepted or rejected. Moreover, the orientation of the influence from GPR to BCP (or the effects of BCP on GPR) can also be acquired.

Figs. 2 and 3 reveal the *p*-values, and the orientation of the influences that stem from the GPR to BCP. GPR Granger causes the BCP during the periods of July 2012–September 2012, October 2014–December 2014, September 2016–January 2017 and August 2019–November 2019, at a significance level of 10%. And during these periods, both the positive effects (October 2014–December 2014, September 2016–January 2017 and August 2019–November 2019) and the negative impact (July 2012–September 2012) exists between the relationship of GPR to BCP.

Furthermore, the positive effects of GPR on BCP can give a testament that the Bitcoin can be considered as an asset to avoid the risks associated with geopolitical events. Since the adverse effects of the geopolitical events (e.g., Russia invading Crimea, escalations of ISIS and the resulting conflicts between Ukraine and Russia) have now subsided, the GPR tended to show a decrease during the period between October 2014 and December 2014 (Caldara and Iacoviello, 2017). There were two reasons to explain the transmission mechanism that operated from

(*footnote continued*)
www.federalreserve.gov/econres/notes/ifdp-notes/IFDP_Note_Data_Appendix.xlsx).

[5] The leptokurtic distribution shows a much higher peak around the mean value, and fat tails, or higher densities of values at the extreme ends of the probability curve. The platykurtic distribution is exactly the opposite.

[6] To test the robustness of the empirical analysis, the study also applies the widths of 20-, 28- and 32-months to investigate the causal relationship, and the outcomes are unanimous with 24-months rolling-window.

Table 2
The results of unit root tests.

	ADF	PP	KPSS
GPR	−3.286 (1)**	−3.853 [3]***	0.064 [3]
BCP	−6.732 (1)***	−6.749 [2]***	0.066 [1]
USDX	−7.316 (1)***	−11.800 [5]***	0.085 [5]

Notes: The number in parenthesis indicates the lag order which is selected based on the SIC.
The number in the brackets refers to the bandwidth which uses Bartlett Kernel as suggested by the Newey–West test (1987).
*** and ** denote significance at the 1% and 5% levels, respectively.

Table 3
Full-sample Granger causality tests.

Tests	H_0: GPR does not Granger cause BCP		H_0: BCP does not Granger cause GPR	
	Statistics	*p*-values	Statistics	*p*-values
Bootstrap *LR* test	2.625	0.110	0.549	0.490

Notes: To calculate *p*-values using 10,000 bootstrap repetitions.

Table 4
The results of parameter stability test.

Tests	GPR Statistics	*p*-value	BCP Statistics	*p*-value	VAR system Statistics	*p*-value
Sup-F	25.281***	0.003	189.727***	0.000	66.615***	0.000
Ave-F	13.050***	0.003	16.582***	0.000	25.134***	0.000
Exp-F	9.752***	0.002	90.645***	0.000	29.534***	0.000
L_c					3.762***	0.005

Notes: To calculate *p*-values using 10,000 bootstrap repetitions.
*** denotes significance at the 1% level.

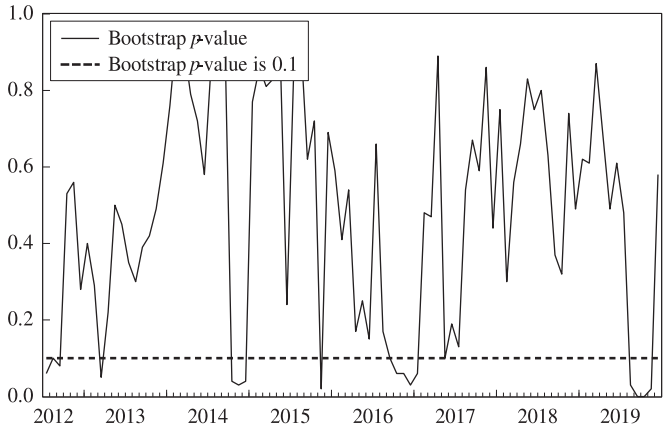

Fig. 2. Bootstrap *p*-values of rolling test statistic testing the null hypothesis that GPR does not Granger cause BCP.

GPR to BCP. On one hand, the reduction in the GPR lead to a decline in public panic, but their willingness to invest in hedging assets experienced a decline as well, which caused the demand for the Bitcoin and BCP to fall (Ciaian et al., 2014; Bouri et al., 2017; Wang et al., 2019; Mamun et al., 2020). On the other hand, although GPR had decreased, these geopolitical events brought with them a long-term economic downward pressure on Europe, leading to the depreciation of the euro. However, at this time, the U.S. was in a period of economic recovery, and these geopolitical events could not negatively affect its society – both these factors lead the dollar to appreciate. Since the Bitcoin is denominated in U.S. dollars, an increase in the value of the dollar caused a decline in BCP. Moreover, other reasons were also combined

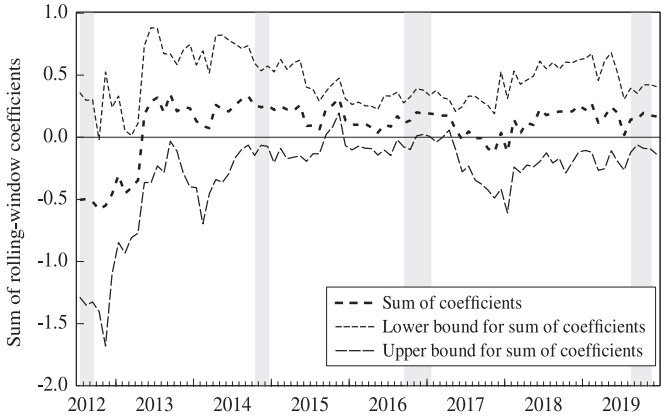

Fig. 3. Bootstrap estimates of the sum of the rolling-window coefficients for the impact of GPR on BCP.
Notes: The shaded areas indicate that GPR Granger causes BCP at the 10% significance level.

to explain this decline in BCP, such as the security issues (e.g., Mt.Gox, the largest trading platform in the world, has confirmed its closure, and 850,000 Bitcoins have been stolen) in the Bitcoin market (Bradbury, 2013; Mauro et al., 2018; Wu et al., 2019; Zaghloul et al., 2019). Moreover, several governments have restricted Bitcoin transactions (e.g., China has required banks and third-party payment agencies not to conduct any transactions in Bitcoin currency). As a result, the demand for Bitcoin led to a further decline, which spiraled in to a downward trend in BCP. Therefore, it can be concluded that the positive influence from GPR to BCP, during the period of October 2014–December 2014 can be verified.

A large number of geopolitical events have happened around the world between the years of 2016-2017. These include events such as the counterattacks to the “Islamic State”, the civil war in Syria, the terrorist attacks in Belgium and France, the North Korean tensions, as well as the U.S. election and the Brexit. It is safe to say that all of these driven the GPR to rise (Caldara and Iacoviello, 2017). There are four ways to explain the soar in BCP caused by high GPR in these years. Firstly, the high GPR made the public uncertain about the future, and the consumers’ confidence and investors’ sentiments in these situations took a sharp dip. Also, the public tended to store assets which possessed the hedging ability in order to reduce losses, and in turn the demand for the Bitcoin currency increased, despite its price already experiencing on an upward trend. As a result, the BCP then further experienced an increased (Ciaian et al., 2014; Bouri et al., 2017; Wang et al., 2019; Mamun et al., 2020). Secondly, the U.S. presidential election (Donald J. Trump v.s. Hillary D. R. Clinton) had not only increased the GPR but had also made Bitcoin more widely recognized. For instance, Kentucky's Senator, Rand Paul, who was one of the Republican presidential candidates, officially announced the acceptance of Bitcoin donations in order to compete in the presidential campaign. Hillary Clinton also supported the Bitcoin and blockchain technology in a policy statement that was aired all over the country. In another instance, Russia has been accused of using the Bitcoin currency to interfere in Trump's presidential election. All of these incidents and political moves usually help the investors know more about the Bitcoin, leading to an increase in its demand and, consequently, the BCP to increase. Thirdly, the Brexit, a geopolitical event, further depreciated the euro and the pound currencies. It was then that the demand for Bitcoin experienced an increase due to the logical explanation that it can be viewed as a virtual currency (Briere et al., 2013), thus, causing the BCP to increase. Fourthly, the rising trend of BCP attracted more investors to invest, especially in China, Japan and South Korea, further prompting the BCP to soar higher in 2017 (Li et al., 2018; Xiong et al., 2019). Keeping all these evidences in consideration, we can concur that GPR had the ability to

positively affect BCP during the period of September 2016–January 2017.

The most similar year for the prevailing trends of BCP and GPR was 2019, as both these variables experienced a rise before falling. Since the deterioration in the Middle East (e.g., the attacks on Saudi Arabia's oil facilities, and Iraq's oil production base, Iran suspending the implementation of its nuclear agreement in four phases, and Turkey cracking down on Kurdish forces in northern Syria), and the global trade wars (e.g., the trade disputes between China and the U.S., and Japan–Korea's trade disputes), the GPR showed a sharp increase. Due to this, we can logically ascertain the positive influence extended from GPR to BCP from three respective sides. Firstly, the risk aversion among the public surged, which increased the demand for Bitcoin and drove up the BCP (Ciaian et al., 2014; Bouri et al., 2017; Wang et al., 2019; Mamun et al., 2020). As the GPR gradually decreased, the consumer confidence and investor sentiment heated up, which caused the demand for the Bitcoin and thus the BCP to decline. Secondly, these geopolitical events created uncertainty over the supply of oil, leading to the dramatic fluctuations in oil prices (Su et al., 2017, 2020b). Thereby, investors are now showing lesser willingness to hold oil-related assets, and also as a result, driving the demand for other assets (e.g., Bitcoin) to increase, in order to avoid the risks associated with the large fluctuations in oil prices. Also, the higher global energy cost obstructed the miners to break-even, which decreased the supply of the Bitcoin as well (Das and Dutta, 2020). After the end of such geopolitical events, the oil price have stabilized once more, which has caused the BCP to decrease. Thirdly, since the Bitcoin had been showing a downward trend, the CEO of Brian Kelly Capital Management (BKCM) announced that, as a policy measure, an amount of $9000 would be given as a support to the investers who had invested in the Bitcoin market, as a contingency measure against any financial damage that they might incur. So, if the BCP ever fell below this level, it may give way to a wave of selling the Bitcoin currency with relative ease. In addition to this, other reasons have also contributed to the decrease in BCP, such as Bakkt[7] futures. The performance of Bakkt, as a platform for trading in digital currencies has been worse than expected, and on the contrary, Google has made significant progress in the phenomenon of quantum computing, which may pose as a threat to the Bitcoin market. Hence, we can conclude that BCP could have been positively impacted by GPR during the period of August 2019–November 2019. These results are consistent with the ICAPM, which highlights the positive influence of GPR to BCP.

However, the view that the Bitcoin is the winner after the gunshot cannot be supported when the negative influence from GPR to BCP comes into play. Since the Arab Spring has ended, the global geopolitical environment had been relatively stable during the period of July 2012–September 2012, with a low exposure to GPR (Caldara and Iacoviello, 2017). But at this point in time, the Bitcoin market was in the early stages of its development, and the rise in BCP could be explained from two different angles. On one hand, the hedging ability of the Bitcoin had not been fully noticed yet, so the BCP would not have experienced and significant changes due to with the risks associated with GPR. On the other hand, the base of BCP was extremely limited, and the existence of the inertia effect helped it achieve an upward trend without a significant drop. Therefore, even if GPR was at a low level, BCP was still on the rise. Therefore, we can conclude that there existed a negative influence of GPR on BCP, but this revelation cannot be supported by the ICAPM, which ascertains a positive effect from GPR to BCP.

Figs. 4 and 5 underline the bootstrap *p*-values, and the orientation of the impacts of the BCP on GPR. The BCP Granger caused GPR during the periods of May 2013–August 2013, and February 2016–June 2016,

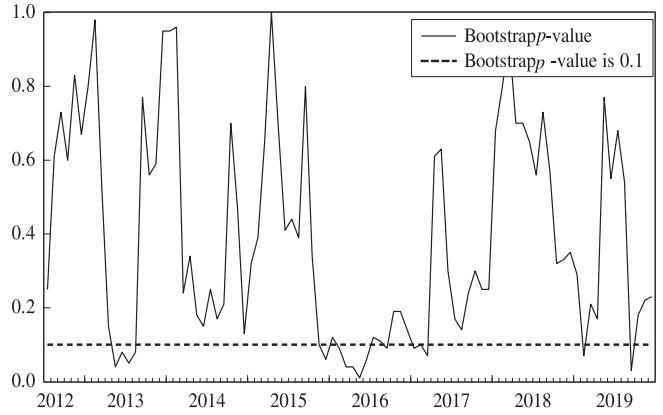

Fig. 4. Bootstrap *p*-values of rolling test statistic testing the null hypothesis that BCP does not Granger cause GPR.

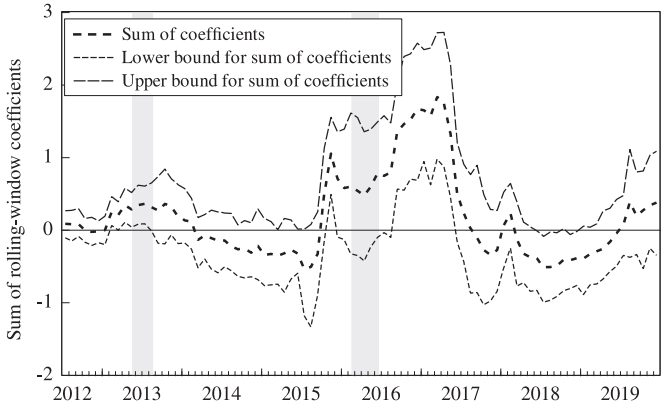

Fig. 5. Bootstrap estimates of the sum of the rolling-window coefficients for the impact of BCP on GPR.
Notes: The shaded areas indicate that BCP Granger causes GPR at the 10% significance level.

at a significance level of 10%, and there were examples of positive effects during these periods as well. The positive influences from BCP to GPR indicated that the Bitcoin market was able to reflect the condition of the global geopolitical environment. On May 14, 2013, the U.S. Department of Homeland Security froze two bank accounts which were owned by Mt.Gox. Also, the Thailand government announced a ban on Bitcoin transactions in July 2013. Both of these incidents caused the demand for the Bitcoin, and consequently, the BCP to fall during the period of May 2013–July 2013. Moreover, the geopolitical situation was stable at this time, which was also reflected by the Bitcoin market. So, in that case, both the BCP and the GPR were at a relatively low level. However, in August 2013, the Bitcoin was increasingly recognized by investors around the world (e.g., the first country in the world to officially recognize the legal and tax status of Bitcoin is Germany, as its government acknowledged this status on August 19, 2013), which eventually led to the rise in the Bitcoin's demand and, hence, the BCP. Additionally, the view that the Bitcoin was an asset to avoid GPR was also increasingly identified and critically discussed at that time. During this month, the deterioration of the Syrian war meant that the GPR had moved in the same direction as the BCP, and hence, the Bitcoin market reflected the geopolitical situation in advance. In conclusion, keeping in mind the global geopolitical situation of the time, the positive impact of BCP on GPR, during the period of May 2013–August 2013, can be verified.

In 2016, there were several reasons to explain the rise in the demand for the Bitcoin. Dozens of Bitcoin exchanges seemed to have appeared around the world, and the transaction volume in most countries and regions showed a surge, especially in China, Japan and

[7] Bakkt is a platform for buying, selling, storing and using digital currencies, created by the New York Stock Exchange parent company Intercontinental Exchange (ICE) in August 2018.

South Korea. The hardcore game fans announced their wholehearted acceptance of Bitcoin payments, on the famous game platform Steam. Simultaneously, Microsoft had joined the Digital Traders Association, which was an organization that focused on the concept of block chaining. In another part of the world, the Australian government auctioned about 25,000 Bitcoins. All of these different variables drove the BCP to soar during the period of February 2016–June 2016, and the high value of the Bitcoin made its hedging capabilities better known, and popular in the public. Meanwhile, GPR had also experienced an upward trend, which could have been logically predicted by BCP, due to its hedging ability. Although the risks of the terrorist attacks in Paris had subsided, and GPR showed a decrease from November 2015–January 2016, there was still a slight increase in the GPR from February 2016–June 2016 (Caldara and Iacoviello, 2017). The main reason was that the Brexitists had gained a favorable position in the referendum on whether the U.K. was leaving the European Union (EU) in June 2016. Moreover, the European integration process had been frustrating, and the global geopolitical and economic patterns have changed ever since. Keeping these factors in mind, we can prove that the BCP and GPR moved in the same direction during the period of February 2016–June 2016. Also, we can highlight that the Bitcoin market could be viewed as an effective indicator in order to reflect the changes in the global geopolitical environment.

To sum up, the results of the bootstrap full-sample Granger causality test suggest that there is no Granger causal relationship between GPR and BCP, which may not be accurate, as the parameters in the VAR system are supposedly stable. The parameter stability tests prove that these two variables, and the VAR system experience sudden structural changes. Hence, in this paper, we have applied the sub-sample test, in order to explore the time-varying interrelationship between the GPR and BCP. The empirical results reveal that there are both positive and negative influences of the GPR on BCP. The positive effects indicate that the BCP will increase when there is a geopolitical event, and vice versa. Also, we can conclude that the Bitcoin can be viewed as an asset which can be used to avoid the risks associated with the global geopolitical events, since the value of Bitcoin will enhance if the GPR is high. However, the negative impact of the GPR on BCP suggests that the Bitcoin cannot always be considered as an asset that is used to avoid risks associated with geopolitical events. This revelation was especially true and relevant during the early days of the Bitcoin market. The above conclusions are not supported by the ICAPM, which highlights that the GPR affects BCP in a positive manner. Conversely, the BCP tends to have a positive influence on the GPR, which means that the movement of the Bitcoin market should be taken into account when understanding the global geopolitical environment.

6. Conclusion

This paper explores the Granger causality between the Bitcoin market and the global geopolitical environment, in order to ascertain whether or not the Bitcoin can hedge the risks associated with the global geopolitical events. There are several contributions of this paper to the existing literature, as well as to the investors who might be interested in trading activities that are relevant to the Bitcoin markets. Firstly, this study is a groundbreaking attempt to solve and address the issues of whether the Bitcoin is capable of hedging the risks associated with the global geopolitical events, and what is the role of the Bitcoin market in reflecting upon these GPR. Secondly, for the purpose of this study, we chose the GPR index (Caldara and Iacoviello, 2017) to represent the risks of geopolitical events, in order to make our analysis more accurate. Thirdly, we performed the sub-sample test to investigate the time-varying, mutual influence, between the GPR and the BCP. The empirical results established that there are positive and negative influences extended from the GPR to the BCP. The positive effects indicates that the Bitcoin can be viewed as an asset to avoid GPR, which also proves that the Bitcoin is the winner after the gunshot. However, this view cannot be supported when the negative impacts came into consideration, especially during the early days of the Bitcoin market. The above results are not consistent with the ICAPM, which diagnoses that there is a positive influence of the GPR on the BCP. On the contrary, GPR can be positively affected by BCP, which suggests that the Bitcoin market is a leading indicator, when it comes to reflecting and providing contingency for the financial risks associated with the global geopolitical events. By analyzing the time-varying interrelationship between GPR and BCP, we can also conclude that the Bitcoin can be considered as an asset to avoid GPR during several time periods, but this is not always going to be the case.

By clarifying the demand for the Bitcoin currency, in order to avoid the risks of geopolitical events, and the transmission mechanism between GPR and BCP, we can give key lessons to potential investors and governments. On one hand, the GPR can affect BCP during certain time periods. Due to this, investors can predict the BCP more accurately in accordance with the GPR, and also determine the level of investment to be made in the Bitcoin market. Also, potential investors can consider the Bitcoin as an asset in their portfolio, in order to diversify their risks, reduce their losses and maintain their returns. The government can also adapt its policies according to the trend which the BCP is following, based on GPR. This is necessary in order to implement relevant policies that will eventually aid in preventing the Bitcoin bubbles, as well as any dips and downward plunges in BCP, which may reduce the public's confidence. This way, the relevant authorities can promote a healthy development of the Bitcoin market.

On the other hand, the increase in the BCP may lead the GPR to rise during certain time periods, indicating that the Bitcoin market is an effective tool, which should be taken into account by governments when discussing the global geopolitical environments. If these measures come into effect, the related departments can take measures in advance, in order to reduce the potential costs that may be incurred after, or even during, the geopolitical events. These departments can also be proactive in protecting the public security, and hence, enhance the confidence of the people in their governments. Thereby, they can ensure a healthy and stable development of each country, which is beneficial to ensure and safeguard world peace, in the larger scheme of events. More importantly, the increasing trend of cryptocurrency represents a new phase of technology-driven markets. The governments should support the development of encryption technology, and strengthen market supervision. Governments must also promulgate relevant laws and regulations, in order to ensure the regular and orderly development of the cryptocurrency market. The related industries also need to develop secure and reliable network security technologies and protocols. Furthermore, further technological breakthroughs must be achieved, in order to increase the popularity of cryptocurrency applications, which will especially aid in making overseas payments easier and more complete. If these suggestions are effectively implemented, we can expect that cryptocurrency will penetrate into most of the most aspects of human society, and its market will become a significant leading indicator of the macroeconomic and political situations of any nation.

In the future research, we will consider whether the improvements in encryption technologies can increase the value, as well as the hedging ability of the Bitcoin. Other than that, the asset (e.g., Bitcoin, gold or dollar) or portfolio that should be held on to during the periods with high GPR should also be taken into account in future studies.

Author statement

Chi Wei Su: Conceptualization, Methodology, Software Meng Qin: Data curation, Writing- Original draft preparation. Ran Tao: Visualization, Investigation. Xue-Feng Shao: Writing and Editing, Lucian Liviu ALBU: Construct paper structure. Muhammad Umar: Reviewing and Editing.

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