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The inevitable role of bilateral relation: a fresh insight into the bitcoin market

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ABSTRACT

This paper clarifies the association between the Sino-U.S. bilateral relation (BR) and Bitcoin price (BCP) by applying the bootstrap full- and sub-sample Granger causality tests. It reveals that BR has positive and negative effects on BCP. The negative impact points out that Bitcoin is viewed as a tool to avoid uncertainties caused by the deterioration of BR, also proving that the strained relation between China and the U.S. can stimulate the Bitcoin market. However, this opinion is not held under a positive impact, the main explanation is that the burst of bubble weakens its ability to hedge risks. The above conclusion is not consistent with the theoretical model, underlining that the Bitcoin market is boosted by the deterioration of BR. Conversely, there is a negative influence from BCP to BR, meaning that the relationship between China and the U.S. can be reflected by the Bitcoin market. Under the complex and volatile international situation, investors can benefit from this investigation to compensate for the losses and keep their wealth. Also, it helps the related authorities to create a stable investment environment and promote friendly bilateral relations.

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1. Introduction

The pivotal goal is to probe whether Bitcoin can avoid uncertainties caused by the deterioration of the Sino-U.S. bilateral relation (BR). Since Blockchain technology has a close relationship with various fields of activity, a careful investigation of cryptocurrency issue is an essential step in both political and economic fields (Șcheau et al., 2020; Tao et al., 2021a). As a leading virtual currencies worldwide, Bitcoin is proposed by Satoshi Nakamoto, and it is not controlled by any financial departments (Nakamoto, 2008; Nikic, 2018). Along with the maturity of the Bitcoin market, it

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attracts more investors around the world, and its ability to hedge risks has also appeared (Chan et al., 2019; Kalyvas et al., 2019; Qarni et al., 2019; Su et al., 2020b). If there is a risk or uncertainty (e.g., caused by the deterioration of BR), the demand for hedging asset (e.g., Bitcoin) may increase, then, there is a rise in Bitcoin price (BCP). This interaction can be explained in three aspects. Firstly, the strained relation between two countries, especially two influential countries (e.g., Sino-U.S., U.S.-Russia and U.S.-Japan), makes the public panic (Qin et al., 2021). Thereby, investors inclined to store Bitcoin to hedge uncertainties caused by the deterioration of BR, driving BCP to increase. Secondly, the strained relation may increase the economic policy uncertainty in related countries, which prompts investors to store Bitcoin (Demir et al., 2018; Fang et al., 2019). For instance, the confrontation between Japan and Korea caused by trade disputes increases the uncertainty of economic policies, making BCP at a relatively high level. Thirdly, the strained relation also can increase the geopolitical risks among relevant regions, causing the rise in hedging demand (Mamun et al., 2020; Su et al., 2020c). We can observe this phenomenon from the North Korea tensions in 2017, the attack on oil installations in Saudi Arabia and Iraq in 2020, etc. Thereby, it is obvious that the deterioration of BR can boost the Bitcoin market, but this view can not be always held. Since the burst of Bitcoin bubble, BCP has decreased dramatically (Li et al., 2018), even though there are strained relations, such as Saudi Arabia's allied forces attack on Hodeida, as well as the funding for U.S.-Mexico border security, could not be agreed. Conversely, several nations (e.g., Sweden, Ireland and the U.S.) accept the use of Bitcoin in some national elections. The diplomatic idea of each leader is different, which may affect the relations with other countries. Generally, the issue of whether Bitcoin can hedge uncertainties caused by the deterioration of BR is significant, and it has not been clarified comprehensively. Therefore, we solve the above issue by exploring the non-stable interaction between BR and BCP, which provides insights for the investors and related authorities. To begin with, investors can compensate for the losses and maintain their wealth by predicting BCP and avoiding the risks of a Bitcoin bubble. Then, the related authorities can create a stable investment environment and promote peaceful development by avoiding dramatic fluctuations in the Bitcoin market and alleviating the conflicts and confrontations.

The U.S. and China are the largest and second-largest economies in the world, the gross domestic products (GDP) are $20.6 trillion and $13.4 trillion in 2018[1], respectively. Thereby, the Sino-U.S. relation is crucial to global peace and development (Garrett, 2010). The deterioration of BR may have significant interactions with various fields, such as the pattern of Asian geopolitics (Evans, 2011), economic consequence and human interest (Supadhiloke, 2012), bilateral trade (Du et al., 2017; Su et al., 2020d), cross-border merger performance (Zhang & Mauck, 2018), foreign direct investment (Song et al., 2020). More importantly, BR also associates with BCP, which can be reflected in such events: In 2016, the Chinese and U.S. navies face off in the South China Sea, and the deployment of Terminal High Altitude Area Defense (THAAD) lead to the decline in BR and the rise in BCP. In 2017, Donald J. Trump directs the Office of the United States Trade Representative (USTR) to execute a "301 investigation"[2] against China, making BR and BCP move in the opposite directions.

In 2020, Trump administration has frequently accused and discredited China during the period with coronavirus disease 19 (COVID-19), causing BR to further deteriorate while BCP rises sharply. However, BR and BCP move in the same directions during certain periods. For instance, BCP falls dramatically after the burst of Bitcoin bubble, but BR is also in a downward trend mainly due to the fierce trade disputes between China and the U.S., as well as the suppression of Zhongxing Telecommunication Equipment (ZTE) and Huawei corporations. In addition, since some U.S. candidates use Bitcoin donation, the U.S. foreign political relations (e.g., the relation with China) can be affected by the Bitcoin market. Thereafter, we can observe that there is an association between BR and BCP, and hence, we choose the Sino-U.S. relationship to probe its correlation with the Bitcoin market.

There are several innovative contributions to this study. In the first place, the existing papers have paid more attention to probing the effect of uncertainty on the Bitcoin market (Demir et al., 2018; Garcia-Jorcano & Benito, 2020; Goodell & Goutte, 2020; Urom et al., 2020; Wang et al., 2019), but hardly quest the correlation between BR and BCP. This exploration is a groundbreaking work to analyze whether the strained relation can stimulate the Bitcoin market, and what role of BCP in reflecting the Sino-U.S. relations. The outcomes point out that BR has positive and negative effects on BCP, but BR can be negatively impacted by BCP. These conclusions are inconsistent with the theoretical model, ascertaining that the deterioration of BR can boost the Bitcoin market. In addition, this investigation can give lessons to investors, they can predict the trend of BCP by analyzing BR, in order to compensate the losses and maintain their wealth. More importantly, they should prevent the crisis caused by the burst of the Bitcoin bubble. Also, this exploration is beneficial for the related authorities to avoid dramatic fluctuations in the price of Bitcoin, so as to build a steady Bitcoin market and boost public confidence. Meanwhile, they should alleviate conflicts and confrontations to promote the formation of a mutually respectful and win-win cooperative partnership. Moreover, the existing studies mainly perform the full-sample test, which can only obtain a stable Granger causal relationship, ignoring the time-varying correlation between BR and BCP. Then, this study employs the sub-sample test to conclude a more accurate and comprehensive result (Balcilar et al., 2010). By applying this method, the non-stable interaction between the Sino-U.S. relationship and the Bitcoin market can be obtained.

The remainder of this article is systematized as follow: the theoretical model is described in Section 2. Next is the methodology and data. The outcomes are presented in Section 4. Section 5 summarizes the results and gives lessons.

2. Literature review

The hedging ability of Bitcoin has drawn significant attention, and the previous studies mainly explore this issue through probing the influence from uncertainties (e.g., economic uncertainty, geopolitical events and partisan conflicts) to BCP, see it in Table 1.

Since blockchain technology is one of the latest information and communication technology (Tušek et al., 2021), some researchers view Bitcoin as an asset to hedge

Table 1. Summary of the previous studies.

Point of view	Authors (year of publication)	Details and conclusions
Supporting Bitcoin has the ability to hedge uncertainties	Bouri et al. (2017)	Bitcoin can be viewed as a hedging instrument against global uncertainty.
	Demir et al. (2018); Bouri and Gupta (2019)	The effect of uncertainty on Bitcoin price is significantly positive.
	Wang et al. (2019)	Bitcoin can hedge against stocks and bonds, also it is a safe haven in the monetary market.
	Mamun et al. (2020)	Geopolitical risks and global economic policy uncertainty cause a risk premium.
	Goodell and Goutte (2020) ; Lucey et al. (2021); Yousaf et al. (2021)	The outbreak of COVID-19 leads to an increase in Bitcoin price.
	Urom et al. (2020)	Bitcoin can be viewed as a safe-haven during bearish markets.
Not supporting Bitcoin has the ability to hedge uncertainties	Corbet et al. (2018)	The fluctuations of Bitcoin price have increased following the appearance of a futures contract.
	Conlon and McGee (2020)	Bitcoin does not act as a safe haven during the COVID-19 bear market.
	Dutta et al. (2020)	Bitcoin is not a safe haven asset for the fluctuations in crude oil price.
	Lyócsa et al. (2020)	The changes of Bitcoin price are not affected by most scheduled U.S. macroeconomic news.
	Chokor and Alfieri (2021)	The increase in the probability of regulation brings negative abnormal returns.
Explanation of the divergent views	Su et al. (2019a); Su et al. (2020b,c); Qin et al. (2021)	Bitcoin may act as an asset to hedge uncertainties (e.g., economic policy uncertainty, geopolitical risks, the fluctuations in gold and crude oil price) only in certain periods.
	Guo et al. (2021)	The safe haven, hedge and diversifier potential of Bitcoin are different in various conditions.

Source: Authors' Collations.

uncertainties. Bouri et al. (2017) prove that Bitcoin can be viewed as a hedging instrument against global uncertainty, which caused by the volatility in developed and developing equity markets. Demir et al. (2018) underline that the effect of uncertainty on BCP is significantly positive at the lower and higher quantiles, which means that Bitcoin may serve as a hedging tool against risks. Bouri and Gupta (2019) suggest that Bitcoin can act as a hedging asset by comparing two methods of measuring uncertainty, and BCP will be predicted effectively based on these uncertainties. Wang et al. (2019) evidence that Bitcoin can hedge against stocks, bonds and Shanghai Interbank Offered Rate (SHIBOR), also it is a safe haven if there exist extreme price fluctuations in the monetary market. Goodell and Goutte (2020) state that the levels of COVID-19 lead to an increase in BCP, particularly for the period post-April 5, 2020, and Bitcoin may act as an asset to avoid uncertainties during this time. Mamun et al. (2020) highlight that geopolitical risks and global economic policy uncertainty cause a risk premium, especially during the periods with an economic downturn. Urom et al. (2020) indicate that Bitcoin can be viewed as a safe-haven during bearish markets, and it may be considered as a part of portfolio diversification and other investment strategies. Yousaf et al. (2021) find that Bitcoin can consider as a

diversifier for the oil market during the COVID-19 period. Also, Lucey et al. (2021) develop a new measure of price and policy uncertainty in cryptocurrency markets, which can be used as an effective measure of uncertainty during the pandemic.

However, Bitcoin has the ability to hedge uncertainties can not always be supported. Corbet et al. (2018) identify that the fluctuations of BCP have increased following the appearance of a futures contract, which is not an effective tool to hedge risks. Conlon and McGee (2020) ascertain that Bitcoin does not act as a safe haven during the COVID-19 bear market, and even a small allocation to Bitcoin may cause to the rise in portfolio downside risk. Dutta et al. (2020) indicate that the risk is reduced if investors hold assets in gold and oil markets rather than including Bitcoin and oil in their portfolio, also Bitcoin is not a safe haven asset for the fluctuations in crude oil price. Lyócsa et al. (2020) point out that the changes of BCP are not affected by most scheduled U.S. macroeconomic news announcements, but hacking attacks have a considerably strong influence on it. Since the implementation of blockchain technologies induce risks (Șcheau et al., 2020), the governments tend to obtain an effective regulation of Bitcoin (Huang, 2019), while Chokor and Alfieri (2021) suggest that the increase in the probability of regulation adoption brings cryptocurrencies with negative abnormal returns.

For these divergent views, Qin et al. (2021) explain that Bitcoin may act as an asset to hedge uncertainties only in certain periods (also Su et al., 2019a, 2020b, 2020c). Similarly, Guo et al. (2021) prove the safe haven, hedge and diversifier potential of Bitcoin in stable time, which is undermined during the market turmoil.The previous studies pay more attention to the one-way influence from BR to BCP, also, few papers quest the non-stable interaction between BR and BCP. Thus, this study attends to fill these gaps in the existing investigations.

3. The theoretical model of bilateral relation and bitcoin price

Since the intertemporal capital asset pricing model (ICAPM) is suitable for exploring the logical relationship between the return of risky assets and risk (Cifarelli & Paladino, 2010; Su et al., 2021), this study consider it to investigate the association between Sino-U.S. relation and Bitcoin market. ICAPM includes two assumptions: (i) both informed and feedback investors are in the society; (ii) the systematic risk is represented by the deterioration of BR. The informed investors take risk-return into account, and they predict BCP through analyzing BR. Then, their demand for Bitcoin is determined as Equation (1):

$$i_t^D = \frac{E_{t-1}(\mathrm{BCP}_t) - \mathrm{BCP}^f}{\mu(\mathrm{risk}_t)} \tag{1}$$

where i_t^D is the share of Bitcoin invested by the informed traders; $\mu(\mathrm{risk}_t) > 0$ and $\mu'(\mathrm{risk}_t) > 0$ suggest that this is a monotonically increasing function and all values are greater than 0; BCP^f and $E_{t-1}(\mathrm{BCP}_t)$ are the price of Bitcoin without the deterioration of BR and conditional expectation, respectively. Assuming that the Bitcoin market only has informed investors, then $i_t^D = 1$. Equation (1) can be transformed into

$E_{t-1}(\mathrm{BCP}_t) = \mathrm{BCP}^f + \mu(\mathrm{risk}_t)$, which is the capital asset pricing model (CAPM) developed by Sharpe (1964). It can be observed that the strained relation can stimulate the Bitcoin market, that is BR has a negative influence on BCP.

Then, we consider the feedback investors, who take the serial correlation of BCP into account, and the ICAPM proposed by Cifarelli and Paladino (2010) can be established. The share of Bitcoin invested by the feedback traders is $f_t^D = \theta \mathrm{BCP}_{t-1}$, where $\theta > 0$ and $f_t^D = 1 - i_t^D$, then Equation (1) can be rewritten as Equation (2):

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

It is obvious that the coefficient of $\mu(\mathrm{risk}_t)$ is $1 - \theta \mathrm{BCP}_{t-1}$, and this is a positive value as $\theta \mathrm{BCP}_{t-1} = f_t^D < 1$. Thus, BCP can be positively affected by the strained relation, and the reduction in BR may lead to the rise in BCP. For instance, the U.S. government has severer suppression of China in May 2020 (e.g., restrict the entry of some Chinese students and further impose sanctions on Huawei), which deteriorates the relationship between these two countries, causing BR to decrease. During this time, investors are more willing to hold hedging assets (e.g., Bitcoin), in order to avoid risks and compensate for their losses, driving BCP to soar. Thereby, a hypothesis can be derived from the ICAPM, that is Bitcoin can be viewed as a tool to avoid risks caused by the deterioration of BR, and the strained relation can stimulate the Bitcoin market.

4. Methodology and data

4.1. Methodology

If the standard normal distribution can be obeyed in the vector autoregression (VAR) model, the results of causal relationship test may be correct. However, the standard normal distribution cannot always be held in the VAR system. Then, the residual-based bootstrap (*RB*) statistics and the likelihood ratio (*LR*) test are put forward (Shukur & Mantalos, 1997; 2000), so as to ensure the accuracy of the full-sample estimations. This paper employs the *RB*-based modified-*LR* statistics to explore the interrelationship between BR and BCP. The system is shown in Equation (3):

$$\begin{bmatrix} \mathrm{BR}_t \\ \mathrm{BCP}_t \end{bmatrix} = \begin{bmatrix} \gamma_{10} \\ \gamma_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11}(L) & \gamma_{12}(L) \\ \gamma_{21}(L) & \gamma_{22}(L) \end{bmatrix} \begin{bmatrix} \mathrm{BR}_t \\ \mathrm{BCP}_t \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \end{bmatrix} \tag{3}$$

where $\mu_t = (\mu_{1t}, \mu_{2t})'$ is a white-noise process. $\gamma_{ij}(L) = \sum_{k=1}^{p} \gamma_{ij,k} L^k$, where p is an optimal lag order, which is selected according to the Schwarz Information Criterion (SIC); L is a lag operator. The alternative hypothesis that BCP affects BR ($\gamma_{12,k} = 0$) can be rejected when BCP does not Granger cause BR, and vice versa. Similarly, the alternative hypothesis that BR influences BCP ($\gamma_{21,k} = 0$) can also be evidenced.

The above method presumes that the estimations in the VAR models are unchanging, and it is not always consistent with the practice. Then, if the parameters are not constant, it is not appropriate to perform the above test. Thus, we apply *Sup-F*, *Ave-F* and *Exp-F* statistics, developed by Andrews (1993) and Andrews and Ploberger

(1994), which can identify the structural changes. In addition, this paper employs L_c test proposed by Nyblom (1989) and Hansen (1992), so as to evidence whether the parameter is subject to random walk. According to these four parameter stability tests, we can identify the non-constant correlation between BR and BCP. If the non-constant estimations exist in the VAR system, the sub-sample test should be employed to explore the Granger causality between BR and BCP (Balcilar & Ozdemir, 2013).

On the basis of rolling-window width w, this sub-sample method (Balcilar et al., 2010) divides the whole sample Q into small parts. Yet, the choice of this width is perplexed, the small one can not guarantee the accuracy, while a large one may reduce the frequency of scrolls. Pesaran and Timmermann (2005) indicate that w should not be less than 20 in the sub-sample test. Every part can get an outcome from the Granger causal relationship test by performing the *RB*-based modified-*LR* statistics. Thus, the estimations of this sub-sample method could be acquired as follows: $N_b^{-1}\sum_{k=1}^{p}\hat{\gamma}^*_{12,k}$ and $N_b^{-1}\sum_{k=1}^{p}\hat{\gamma}^*_{21,k}$ are the averages of a large number of estimations, revealing the influence from BCP to BR and the effect of BR to BCP; N_b is the times of bootstrap iterations; $\hat{\gamma}^*_{12,k}$ and $\hat{\gamma}^*_{21,k}$ are the estimations of Equation (3). Also, we employ 90% confidence interval, and the concerning upper (95^{th} quantile) and lower (5^{th} quantile) limits (Qin et al., 2021; Su et al., 2019b; Tao et al., 2021c).

4.2. Data

This paper selects the monthly details of 2010:M7 to 2020:M6, which can analyze the association between the Sino-U.S. bilateral relation and Bitcoin price, and further investigate whether Bitcoin can hedge uncertainties caused by the strained relation. In 2010, several events affect the bilateral relation between China and the U.S., such as President Barack Obama meets Dalai Lama[3], the South China Sea issue, as well as the U.S. and South Korea successively hold joint military exercises. We use the Sino-U.S. bilateral relation (BR) index[4], developed by Tsinghua University's Institute of International Relations, to reflect the relationship between China and the U.S. (Song et al., 2020). The BR index is obtained by scoring related events, and the score range is −9 to 9. This index mainly includes four aspects: visits (e.g., state visit, official visit and working visit), meetings (e.g., bilateral meeting and trilateral meeting), statements (e.g., government statement and diplomatic statement) and diplomatic events (e.g., behaviour, treaty and agreement). Additionally, for some events, scores can be combined in terms of form and substance. If this index is greater than 0, the bilateral relationship is ordinary (0 to 3), good (3 to 6), or friendly (6 to 9), and "9" indicates the highest degree of friendship. If this indicator is less than 0, the bilateral relationship is discord (-3 to 0), nervous (-6 to −3), or confrontation (-9 to −6), and "-9" means the lowest degree of friendship. Furthermore, MT.Gox (the first Bitcoin platform) is developed in July 2010, which provides an easier trading platform and attracts more attention to Bitcoin. This paper uses Bitcoin price (BCP) in U.S. dollars[5], to reflect the Bitcoin market. Thereafter, BCP fluctuates sharply and Bitcoin can be considered as a tool to hedge uncertainties caused by the strained relation during several times (Su et al., 2020c). The outbreak of COVID-19 in 2020, causing the

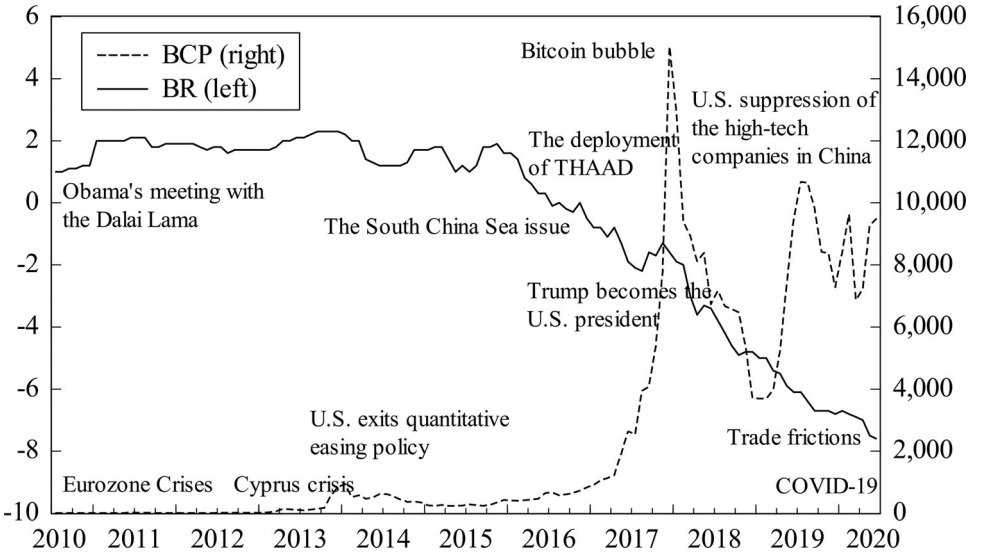

Figure 1. The trends of BR and BCP.
Source: Authors' Calculations.

demand for hedging asset (e.g., Bitcoin) to rise, and there is an increase in BCP. Also, during this period, trade frictions, the shift of manufacturing from China, suppression of high-tech companies in China, etc. lead to a decline in BR. Therefore, BR may have an interaction with BCP, which highlights that there is an association between the Sino-U.S. relationship and international cryptocurrency market. Figure 1 highlights the trends of BR and BCP.

We can observe that BR and BCP do not always move in the different orientations, revealing that the strained relation can not stimulate the Bitcoin market during several periods. Due to the lack of investors and official trading platforms, BCP fluctuates slightly at the beginning of the birth of Bitcoin, but BR has relatively large undulations caused by certain significant events (e.g., the South China Sea issue). In 2013, the Sino-U.S. relationship becomes better, but BR and BCP move in the same directions, since the Cyprus crisis causes to the decrease in investor sentiment, and they incline to invest digital currencies to avoid risks, driving BCP to rise. A similar conclusion can be noticed in 2014, the withdrawal from quantitative easing causes BCP to decrease, and BR also falls as the South China Sea issue. The Chinese and U.S. navies face off in the South China Sea in 2016, and the deployment of THAAD, leading to a sharp decline in BR. The deterioration of Sino-U.S. relation, as well as the unchanged Federal Funds Rate which causes the U.S. dollars to depreciate, drive the Bitcoin demand and BCP to rise. Due to the extensive investment of Bitcoin (especially in Asia), BCP has risen dramatically in 2017. Since Trump becomes the U.S. president, the U.S. government has contained China in the fields of economy, trade, science and technology, diplomacy, as well as international communication. All of these make BR move in the different directions with BCP in 2017, but this view can not be evidenced after the Bitcoin bubble bursts. BCP plummets during this period, while BR also decreases since the trade disputes between these two countries, the suppression of high-tech companies in China (e.g., ZTE and Huawei), etc.

Thereafter, there is a further decrease in BR, mainly due to the U.S. Treasury Department's listing of China as an "exchange rate manipulator", as well as the more fierce trade disputes and suppression. BCP begins to resume growth in the first half of 2019, in order to hedge the uncertainty caused by the decline in BR, but this view can not be held at the end of 2019. The COVID-19 breaks out around the world in 2020 (Tao et al., 2021b), which makes the global panic, investors are more willing to hold Bitcoin to reduce their losses and avoid potential risks, causing BCP to rise. Also, Trump administration has repeatedly accused and discredited China during this epidemic, restricted the entry of some Chinese students, and further imposed sanctions on Huawei, causing BR to further deteriorate. Hence, we can notice that Bitcoin can not always hedge uncertainties caused by the deterioration of BR. Generally, the interaction between the Sino-U.S. relationship and Bitcoin market is time-varying.

The descriptive statistics are revealed in Table 2. The means of BR, BCP (Level) and BCP (Difference) are −0.496, 2471.301 and 0.1001, respectively. BR is a left-skewed distribution since the value of skewness is negative, while BCP (Level) and BCP (Difference) are right-skewed distributions. The kurtosis of BR is less than 3, and this variable satisfies the platykurtic distribution, while BCP (Level) and BCP (Difference) satisfy the leptokurtic distributions. In addition, the Jarque-Bera indexes suggest that the distributions of BR, BCP (Level) and BCP (Difference) are not normal at the 1% level. Thereby, performing the traditional causality tests is not appropriate for our investigation. Then, we apply the *RB* statistics to analyze the association among these related variables and use bootstrap sub-sample rolling-window test to explore the time-varying interrelationship between BR and BCP[6].

5. Empirical results

According to Equation (3), we can analyze the full-sample causality between BR and BCP. Then, based on the SIC, we select 1 as the optimal lag order. The outcomes of the full-sample result is highlighted as Table 3, and it is obvious that BR has no significant association with BCP, suggesting that BCP can not influence BR, and vice versa. The above results are not supported by the existing studies (Demir et al., 2018; Qin et al., 2021; Su et al., 2020c; Urom et al., 2020; Wang et al., 2019), as well as the

Table 2. Descriptive statistics for BR and BCP.

		BCP	
	BR	Level	Difference
Observations	120	120	119
Mean	−0.496	2471.301	0.1001
Median	1.200	453.620	0.0328
Maximum	2.300	15034.530	1.5819
Minimum	−7.600	0.062	−0.5967
Standard Deviation	3.073	3618.944	0.3284
Skewness	−1.037	1.380	1.5131
Kurtosis	2.603	3.716	7.1197
Jarque-Bera	22.300***	40.645***	129.5624***

Notes: "Difference" means taking the natural logarithms and first differences.
***denotes significance at the 1% level.
Source: Authors' Calculations.

Table 3. The outcomes of full-sample test.

H_0: BR does not cause BCP		H_0: BCP does not cause BR	
Statistics	*p*-values	Statistics	*p*-values
0.742	0.390	0.125	0.710

Source: Authors' Calculations.

assumption of the ICAPM which reveals that BCP can be negatively influenced by BR.

The full-sample test in Equation (3) assumes that no time-varying parameter exists in the VAR system, and there is only one Granger causality in the overall sample. However, this supposition is not correct if there are structural mutations in the variables and VAR models, and BR has a non-stable association with BCP. Therefore, we use the *Sup-F*, *Ave-F* and *Exp-F* statistics, as well as the L_c test to identify these dynamic characteristics. The outcomes of the above tests are reported in Table 4.

The *Sup-F* and *Exp-F* statistics underline that the constancy does not hold in BR, BCP and VAR system at the 1% level. The *Ave-F* test reveals that the parameter instability exists in BR and BCP at the 1% level, while it is not significant in the VAR system. In addition, the parameters are not subject to the random walk, which is shown in the L_c test. Thereby, we can conclude that BR and BCP have a time-varying association. Yet, the full-sample test only catches a stable Granger causality, and it is not appropriate for our investigation. Therefore, this study applies the sub-sample method to analyze the non-stable mutual influence between BR and BCP. In addition, this study selects the rolling-window width is 24-months[7], ensuring the robustness of the empirical results (Su et al., 2020a). Then, we can prove whether the fluctuations in BR have an impact on BCP, and vice versa. This impact is positive or negative can also be observed (Table 4).

Figures 2 and 3 point out the *p*-value and orientations of the effects from BR to BCP. The alternative hypothesis of BR Granger causes BCP can be accepted during the periods of 2013:M5-2013:M7, 2017:M12-2018:M2, 2018:M12-2019:M4 and 2019:M12-2020:M2 at the 10% level, and both positive (2017:M12-2018:M2) and negative (2013:M5-2013:M7, 2018:M12-2019:M4 and 2019:M12-2020:M2) influences exist from BR to BCP.

BCP can be negatively impacted by BR evidence that Bitcoin can hedge uncertainties caused by the deterioration of BR. The adverse impacts of several events (e.g., Obama meets Dalai Lama, the South China Sea issue and the U.S. and South Korea successively hold joint military exercises) that lead to the deterioration of BR has gradually weakened. Moreover, Xi Jinping has visited the U.S., and met with Obama at the Annenberg Estate in California from June 7 to 8, 2013. This meeting is the first face-to-face contact and exchange between the heads of the Chinese and U.S. after the government changes, then BR is in an upward trend (Su et al., 2020d). There are two sides to analyze the decrease in BCP due to the high BR. On the one hand, the better relationship between these two countries brings confidence to the public (Jiang et al., 2020; Qin et al., 2021), which reduces the willingness to invest in hedging asset (e.g., Bitcoin). Then, the demand for Bitcoin has declined, causing BCP to decrease. On the other hand, high BR leads the uncertainties of economic policies and the risks

Table 4. The outcomes of parameter stability test.

	BR		BCP		VAR models	
	Statistics	*p*-values	Statistics	*p*-values	Statistics	*p*-values
Sup-F	60.418***	0.000	49.300***	0.000	129.969***	0.000
Ave-F	12.603***	0.004	13.387***	0.003	13.778	0.107
Exp-F	25.766***	0.000	20.213***	0.000	60.542***	0.000
L_c					3.196***	0.006

Source: Authors' Calculations.

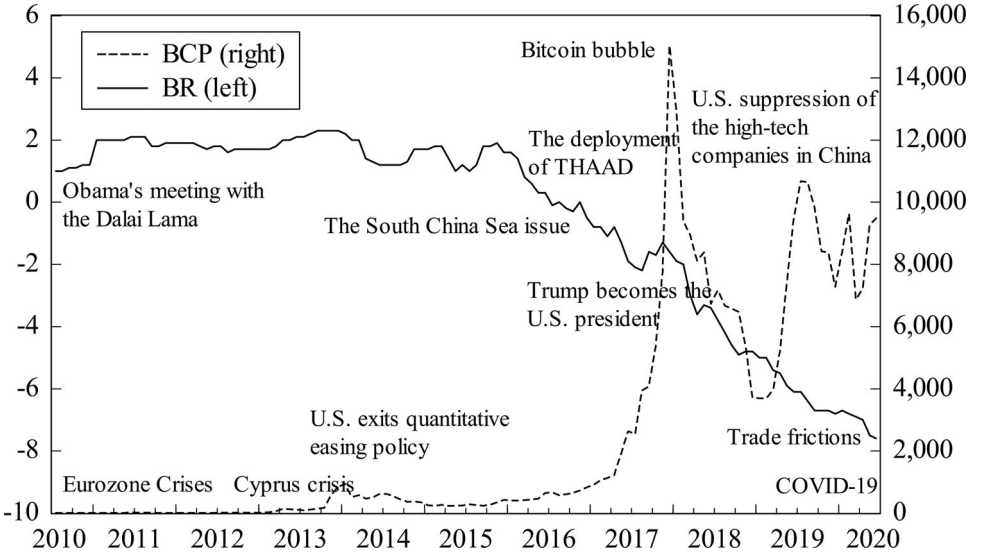

Figure 2. Bootstrap *p*-value of sub-sample method for the effect from BR to BCP.
Source: Authors' Calculations.

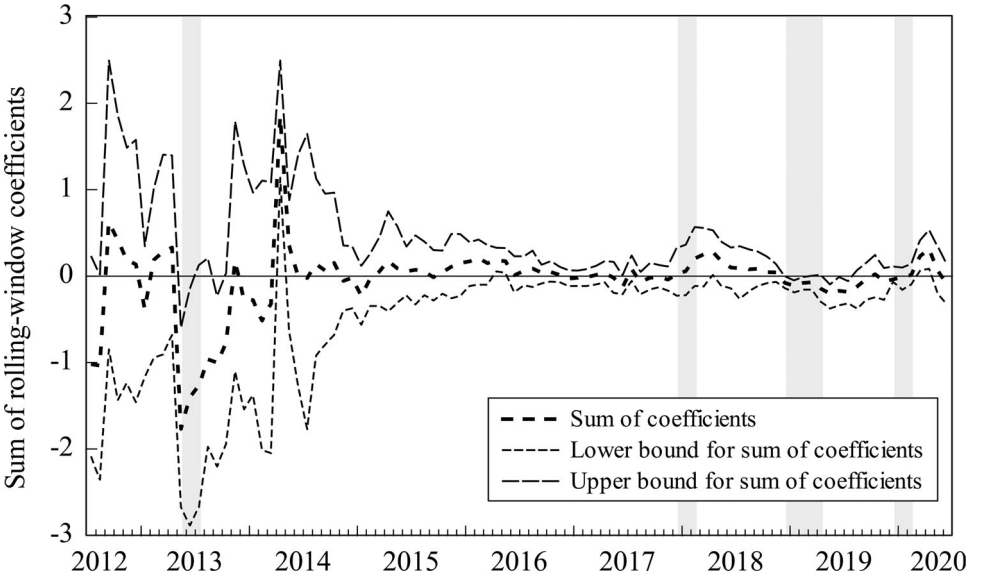

Figure 3. The sum of the sub-sample estimations for the influence of BR on BCP.
Source: Authors' Calculations.

of geopolitical events to fall, also decreasing the hedging demand for Bitcoin (Fang et al., 2019; Mamun et al., 2020; Su et al., 2020c). In addition, the interruption of Mt.Gox operation causes traders to sell Bitcoin, the reduction in Bitcoin storage further leads BCP to decline. Therefore, we can conclude that BR can negatively affect BCP during the period of 2013:M5-2013:M7.

The U.S. and China have reached a 90-day truce during the Group 20 (G20) Argentina summit in December 2018, and the consultations are held several times in the first four months of 2019. However, huge damages, caused by the fierce trade disputes and the suppression of high-tech companies in China (e.g., ZTE and Huawei), already exist. And these losses and costs can not be offset or compensated immediately, hence, BR is still in a downward trend. We can explain the negative effect from BR to BCP from three aspects. Firstly, the reduction of BR makes the public panic (Jiang et al., 2020; Qin et al., 2021), and they incline to invest in Bitcoin to hedge uncertainties of the deterioration of BR (López-Cabarcos et al., 2021), which drives BCP to increase. Secondly, low BR caused by the fierce trade disputes between these two countries, as well as the U.S. government shutdown (December 22, 2018, to January 25, 2019), make the economic policy uncertainty at a relatively high level. Then, high uncertainty leads to Bitcoin demand to rise, causing BCP to soar (Demir et al., 2018; Fang et al., 2019). Thirdly, the decline in BR also causes a rise in geopolitical risks, which brings more demand for hedging to Bitcoin, driving BCP to increase (Su et al., 2020c). Furthermore, the U.S. Securities and Exchange Commission (SEC) is suspected of suddenly approving the issuance of Bitcoin Exchange Traded Fund (ETF). Due to this news, BCP is pulled up to above $5000 in April 2019. Thus, the negative impact of BR on BCP during the period of 2018:M12-2019:M4 can be proved.

On January 13, 2020, the U.S. Treasury Department has stated to remove China from the list of "exchange rate manipulator". In addition, China and the U.S. have formally signed their phase one economic and trade agreement[8] on January 15, 2020. This is a mutually beneficial and win-win agreement, which may prevent BR from continuing to deteriorate. However, BR is still at a low level, mainly due to the outbreak of COVID-19. During this epidemic, Trump administration has repeatedly accused and discredited China, and accelerated the shift of manufacturing from China, both of them make BR at a confrontation level. The negative impact of BR on BCP can be analyzed from three sides. Firstly, the confrontation between these two countries makes the public more willing to hold Bitcoin, to maintain their wealth (López-Cabarcos et al., 2021), which drives BCP to rise. Secondly, with the large-scale spread of COVID-19, BR may further deteriorate, and the investors have negative views of the future development. Thereafter, their pessimistic expectations prompt them to store relatively safe assets, such as Bitcoin, causing BCP to soar. Thirdly, this epidemic also leads the prices of several assets to plummet, such as oil, stock and certain commodities (Sharif et al., 2020). Then, the demand for these assets decreases, while investors are inclined to store Bitcoin which price is on an upward trend. Moreover, the geopolitical events (e.g., attack on the oil installations in Saudi Arabia and Iraq) also bring huge risks (Mamun et al., 2020; Su et al., 2020b, 2020c), making Bitcoin demand and BCP

further increase. Hence, we can evidence that BCP can be negatively affected by BR during the period of 2019:M12-2020:M2.

However, the statement of the strained relation can stimulate the Bitcoin market is not approved by the positive influence. In December 2017, the Trump administration has released its first National Security Strategy Report, labeling China and Russia as "rival powers" that "were aggressively undermining American interests around the globe". Coupled with the increasingly fierce trade disputes, Taiwan issue and the South China Sea issue, BR has declined sharply, but BCP is also in a downward trend. It can be observed that Bitcoin cannot hedge uncertainties caused by the deterioration of BR, and the major reason for this phenomenon is the burst of Bitcoin bubble (Su et al., 2020b, 2020c). Since the Bitcoin bubble bursts, BCP plummets since the end of 2017. Thereafter, the investors have low confidence in the Bitcoin market and quickly sell it, causing Bitcoin demand and BCP to fall dramatically (Xiong et al., 2020). The continual plunge of BCP causes a long-term public panic on the Bitcoin market, and the ability of Bitcoin to avoid risks or uncertainties has been significantly undermined. Even if the relationship between China and the U.S. deteriorates, it can not stimulate the Bitcoin market, BCP is still in a rapid downward trend. Thereby, we can prove that BR and BCP move in the same direction during the period of 2017:M12-2018:M2. The positive effect is not supported by the ICAPM, which underlines that the deterioration of BR can boost the Bitcoin market.

Figures 4 and 5 highlight the *p*-value as well as orientations of the impacts of BCP on BR. The alternative presumption of BCP Granger causes BR can be accepted during the periods of 2016:M8-2016:M9 and 2017:M7-2017:M8 at the 10% level. There are negative effects from BCP to BR during these two periods, suggesting that the relationship between China and the U.S. can be reflected by the Bitcoin market.

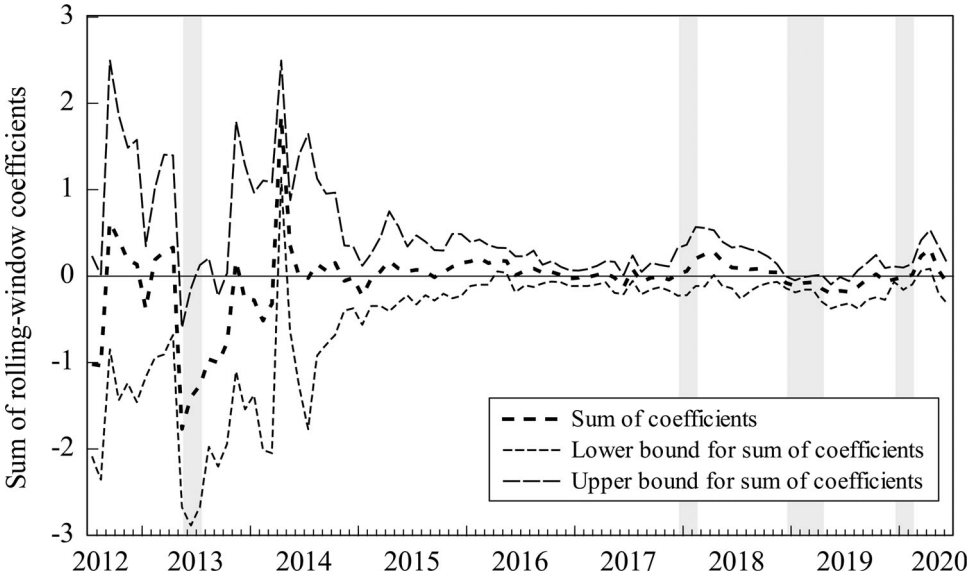

Figure 4. Bootstrap *p*-value of sub-sample method for the effect from BCP to BR.
Source: Authors' Calculations.

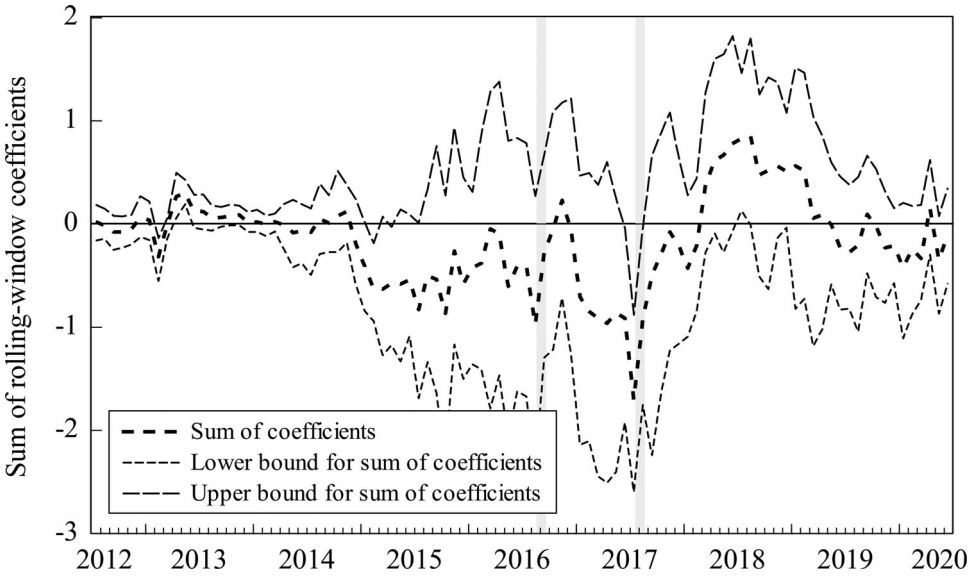

Figure 5. The sum of the sub-sample estimations for the influence of BCP on BR.
Source: Authors' Calculations.

An increase in BCP in 2016 can be explained in two ways. From the perspective of demand, the Bitcoin traders have increased dramatically around the world, and its liquidity is also greatly enhanced (Su et al., 2020c). Additionally, the U.S. presidential election and Brexit increase Bitcoin demand to hedge risks and uncertainties. From the perspective of supply, Bitcoin has experienced a halving of mining, which reduces its supply. The rise in demand and the decline in a supply drive BCP to soar and the upward trend of Bitcoin value makes the public know its function to hedge risks better (Bouoiyour et al., 2019; Bouri et al., 2018). Meanwhile, BR is in a downward trend, which can be reflected by the Bitcoin market. The Chinese and U.S. navies face off in the South China Sea in July 2016, which is the most dangerous and largest confrontation at sea since the Cold War. In the same month, the U.S. and South Korea have decided to deploy the THAAD, which causes BR to further deteriorate. Due to the hedging ability of Bitcoin, the rise in BCP may compensate for the risks of strained relation between these two countries, hence, the Sino-U.S. relation can be reflected by the Bitcoin market. Thereby, we can evidence that BR and BCP move in the different directions during the period of 2016:M8-2016:M9.

It can be observed that BCP has skyrocketed in 2017, and there are three ways to explain this phenomenon. Firstly, the annual output of Bitcoin begins to reduce, which leads to a decrease in its supply. Secondly, the geopolitical events (e.g., the North Korea tensions) and U.S. partisan conflicts (e.g., Trump's policy uncertainty after taking office as the president) cause the transaction volume to increase, then, driving BCP to increase (Colon et al., 2020). Thirdly, with BCP continuing to soar, more investors are attracted to the Bitcoin market, which leads to a further rise in BCP and eventually the formation of a bubble (Li et al., 2018). Similar to the period of 2016:M8-2016:M9, with the help of the hedging ability of Bitcoin, BCP can be considered as an effective indicator to reflect BR. Since Trump instructs the Office of the

USTR to conduct a "301 investigation" against China, there is a decline in BR. Thus, BR moves in the opposite direction to BCP during the period of 2017:M7-2017:M8 can be concluded.

Generally, the bootstrap full-sample test suggests that BR and BCP have no significant Granger causal relationship, and this conclusion is not correct as the estimations in the VAR models are considered constant. Then, four parameter stability tests are employed to examine whether there is an inconstant correlation between BR and BCP. The outcomes highlight that BR, BCP and the VAR models have structural mutations, then, we perform the sub-sample test to explore the non-stable association between these two variables. The conclusions underline that BR has positive and negative effects on BCP. The negative influence reveals that the fall of BR leads to an increase in BCP, indicating that Bitcoin is considered as a hedging tool to avoid uncertainties caused by the deterioration of BR. Thus, Bitcoin can hedge uncertainties caused by the deterioration of BR. However, this opinion can not be supported by the positive effect from BR to BCP, and the major explanation of this phenomenon is the burst of the Bitcoin bubble. BCP has plummeted during this time even though the relationship between China and the U.S. is tenser. The above results are inconsistent with the ICAPM, which points out that BCP will increase if BR is in a downward trend. Conversely, BR can be negatively affected by BCP, which indicates that the Sino-U.S. relationship can be reflected by the Bitcoin market.

6. Conclusion

This paper probes the correlation between the Sino-U.S. relationship and the Bitcoin market, and further evidence of whether Bitcoin can hedge uncertainties caused by the strained relation. We explore the mutual influence between BR and BCP through employing the full-sample and rolling-window methods. It points out that BR has positive and negative effects on BCP. The negative effect reveals that Bitcoin can be considered as a tool to hedge uncertainties caused by the deterioration of BR since the reduction in BR brings upward momentum to BCP. Thereby, it is obvious that the strained relation between China and the U.S. can stimulate the Bitcoin market, but this view can not be supported by the positive effect. The positive influence can be interpreted by the burst of the Bitcoin bubble, causing BCP to fall sharply even if BR is at a low level. The above conclusions are inconsistent with the ICAPM, underlining that the deterioration of BR will be beneficial to the rise in BCP. Conversely, BCP can negatively affect BR, indicating that the relationship between China and the U.S. can be reflected by the cryptocurrency market. Through investigating the non-stable interaction between BR and BCP, this paper can evidence that the ability of Bitcoin to avoid uncertainties caused by the deterioration of BR only holds in certain periods.

Understanding the hedging ability of Bitcoin and Sino-U.S. relationship, as well as the association between BR and BCP can provide insights to the investors and related authorities. On the one hand, BR negatively impacts BCP during several periods. Then, investors can predict the changes of BCP according to the relationship between China and the U.S. If the relationship is strained, they can hold Bitcoin or consider it

as an asset in the portfolio, to compensate potential losses and maintain the wealth. Also, the related authorities can grasp the trend of BCP, then, they can avoid dramatic fluctuations in the Bitcoin market, which is conducive to create a stable investment environment. However, both investors and related authorities should prevent the crisis caused by the burst of the Bitcoin bubble. If there is a Bitcoin bubble, investors should sell it to reduce the losses. Also, the related authorities should take measures in advance to relieve panic and boost public confidence. On the other hand, the Sino-U.S. relationship can be reflected by the Bitcoin market several times. The related authorities should innovate the encryption technology and reinforce the supervision, in order to improve the stability of the Bitcoin market and make it more accurate in its reflection of the Sino-U.S. relationship. Moreover, through the Bitcoin market, they can grasp the trend of BR. Then, they should alleviate conflicts and confrontations, and build a mutually respectful and win-win cooperative partnership, which can reduce the risks and uncertainties. In the future research, we will consider a similar study with an interval of one year and compare the results obtained. Also, if the investment bubble does not burst in a year or two, whether the conclusions have withstood the short-term test of time should be further investigated.

Notes

1. These data are taken from international monetary fund (*https://www.imf.org/external/index.htm*).
2. The "Section 301" refers to the entire content of sections 1301-1310 of the Comprehensive Trade and Competition Act of 1988.
3. The 14th Dalai Lama, Tenzin Gyatso. In spite of China's strong opposition, the U.S. President Barack Obama and many senior U.S. officials including Secretary of State Hillary Clinton and Speaker of the House of Representatives Nancy Pelosi meet with Dalai, which deteriorates the Sino-U.S. relation.
4. The bilateral relation between China and the U.S. index is taken from Tsinghua University's Institute of International Relations.
5. The Bitcoin price can be acquired from the Yahoo Finance. In order to avoid the potential heteroscedasticity and possible instability of BCP, we take the natural logarithms and first differences.
6. The BCP below refers to the Bitcoin price after the logarithmic difference.
7. To test the robustness of the sub-sample outcomes, we select 20-, 28- and 32- months to conduct analyses, the estimations are identical with 24-months.
8. This agreement includes nine chapters: preamble, intellectual property, technology transfer, trade in food and agricultural products, financial services, macroeconomic policies and exchange rate matters and transparency, expanding trade, bilateral evaluation and dispute resolution, final provisions.

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