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The Mediation effect for Bitcoin, Evidence from China Market on the Period of Covid-19 Outbreaking

Wen hsiang Chiu
National Taiwan University of Science and Technology

Shih-wei Hung
National Taipei University of Business

Chiung-ju Liang
National Taiwan University of Science and Technology

Abstract

The outbreak of Wuhan pneumonia in China in January 2020, we observed that sharp falls in Chinese stock markets were often followed by a brief drop in the price of Bitcoin followed by a notable increase. The fact that the outbreak of infectious disease in China had little impact on US markets and at least a portion of the funds flowed back to the US through Bitcoin transactions suggests that the price of Bitcoin is related to an outflow of Chinese funds to the US. Our analysis combining the computational aspects of cumulative prospect theory with the stochastic dominance method indicates that investors facing instability on Chinese markets use Bitcoin for hedge trading, perhaps as an intermediary in times of emergency.

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Contact: Wen hsiang Chiu - chiuwh@ntub.edu.tw, Shih-wei Hung - davidstan@ntub.edu.tw, Chiung-ju Liang - cjliang@mail.ntust.edu.tw.
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1. Introduction

Previous researches have indicated that Bitcoin is becoming a risk-averse tool for investors. Carrick (2016) reported that Bitcoin is often included in exchange-traded funds in emerging markets tends to balance investment portfolios in terms of risk aversion. Dyhrberg (2016) described Bitcoin as a currency as well as a commodity, which functions as a tool for hedging transactions (i.e., risk management). The use of bitcoin as a hedging tool is particularly obvious in the Chinese market (Wang, Tang, Xie and Chen, 2019). The rapid movement of funds out of China during the 2008 financial crisis indicates the fragility of Chinese financial markets and supervision mechanisms. Note however, that similar events occurred in other emerging markets at that time (Fratzsche, 2012). This prompted us to consider whether the outbreak of Covid-19 in China might prompt the transfer of funds to the US through Bitcoin transactions.

Employing the autoregressive distributed lag (ARDL) bounds testing method, innovation accounting method, and the vector error correction (VEC) Granger causality test, Bouoiyour and Selmi (2015) sought to identify the main determinants of Bitcoin prices based on attractiveness to investors, exchange-trade volumes, monetary velocity, estimated output volumes, hash rates, gold prices, and the Shanghai stock market. They concluded that Bitcoin is speculative in nature with few long-term prospects and no indication of being a safe haven.

Using the conceptual framework proposed by Barro (1979) in conjunction with time-series analysis, Ciaian et al. (2016) sought to characterize the formation of Bitcoin prices, while taking into account the factors that affect the price of conventional currencies as well as those associated specifically with digital currencies.

In investors behavior theory, Kahneman and Tversky (1979) proposed prospect theory based on observations that investor behavior tends to be irrational and/or random in nature. The promise of profits encourages the collection of investment data; however, many investors

follow sparse information or data that remains relevant only for a short period of time (Hirshleifer, Avanidhar and Sheridan, 1994). Other investors tend to follow more reliable indicators to increase earnings or reduce losses (Hirshleifer and Luo, 2001). Many researchers have examined the impact of emergencies on the international movement of capital; however, the effects of investor sentiment and virtual currencies have largely been overlooked. Our objective in the current study was to determine whether the outbreak of infectious disease could prompt the movement of funds into US markets through Bitcoin transactions. We also sought to identify the factors influencing investment behavior to provide a reference for governments and investors.

2. Research Methods and Data Sampling

2.1 Research Methods

The ordinary least squares (OLS) approach was adopted to analyze the effect for Bitcoin as a Medium for Capital Outflow in Chinese financial market. The Eq. 1-3 as follow:

$$BITCOIN_t=\beta_0+\beta_1 X_t^n+\varepsilon_t \quad (1)$$

$$OIL_t=\beta_0+\beta_1 X_t^n+\varepsilon_t \quad (2)$$

$$I_t^n=\beta_0+\beta_1 BITCOIN_t+\beta_2 X_t^n+\beta_3 OIL_t+\varepsilon_t \quad (3)$$

Where $BITCOIN_t$ refers to Bitcoin quotes on day t; $X^n{}_t$ refers to the Chinese stock index on day t (Shanghai Composite Index, SSEI and Shenzhen Securities Component Index, SZSC); OIL_t refers to quotes on S&P GSCI Crude Oil Index on day t; $I^n{}_t$ refers to the US stock index on day t (NYSE Composite Index, NYA and Dow Jones Index, DJINR).

Kahneman and Tversky (1992) also developed a weighting function referred to as cumulative prospect theory (CPT), the efficacy of which was verified in terms of stochastic dominance (SD). The following Eq.4 is the weight function for changes in investment behavior

in the event of an outbreak of infectious disease.

$$W^{-}(P)=\frac{P^{\delta}}{\left(P^{\delta}+(1-P^{\delta})\right)^{\frac{1}{\delta}}}$$

$$W^{+}(P)=\frac{P^{\gamma}}{\left(P^{\gamma}+(1-P^{\gamma})\right)^{\frac{1}{\gamma}}} \quad (4)$$

where $W^{-}(P)$ indicates the weight function of the return rate of investors less than 0; $W^{+}(P)$ indicates the weight function of the return rate of investors exceeding 0; P refers to the probability of the return rate. Note hat γ and δ were respectively estimated at 0.61 and 0.69 by Kahneman and Tversky (1992).

Using weight function by CPT with first-order stochastic dominance (CPT-FSD), $F'(P) > 0$ indicates that the return rate is proportional to the preference of investors, the Eq.5 as follow:

$$F'(P) \leq G'(P), \textit{for all possible } P \quad (5)$$

Thus, for a given rate of return, the cumulative probability of *F* is smaller than that of *G*; therefore, *F* is preferred to *G*.

2.2 Data Sampling

Bitcoin price series (BITCOIN) were calculated as the average of the highest daily price and the lowest daily price. Bitcoin price data were collected from the Investing.com website (https://hk.investing.com/crypto/Bitcoin /historical-data). Data pertaining to the Shanghai Composite Index (SSEI), Shenzhen Securities Component Index (SZSC), S&P GSCI Crude Oil Index (OIL), NYSE Composite Index (NYA), and Dow Jones Index (DJINR) were collected from the Capital IQ and Taiwan Economics Journal (TEJ) database. We also recorded daily observations of bitcoin prices covering the period from July 1, 2019 to February 7, 2020 (*n*= 147 observations).

3. Analysis of Empirical Results

Table 1 lists the results of OLS regression used to identify SSEI and SZSC in BITCOIN and OIL. We determined that BITCOIN was significantly negatively correlated with SSEI and SZSC, whereas OIL was significantly positively correlated with SSEI and SZSC. Table 2 lists the results of OLS regression used to identify DJINR and NYA in BITCOIN, SSEI, SZSC, and OIL. We determined that BITCOIN was significantly negatively correlated with DJINR. There was a significantly positive correlation between DJINR and SSEI as well as between SZSC and OIL. We determined that BITCOIN was significantly negatively correlated with NYA, whereas NYA was significantly positively correlated with SSEI, SZSC, and OIL.

As shown in Figure 1, the computational aspects of prospect theory were combined with the first order stochastic dominance method to estimate the probability weight function subjectively applied by investors during the sample period (until January 23, 2020). Chinese stock markets experienced sharp declines following the outbreak of Covid-19 and the closure of Wuhan city. Investors expected that the anticipated decrease in the demand for raw materials would lead to a sharp decline in the price of crude oil. At this point, the price of Bitcoin fell briefly and then rose. It is very likely that investors were using Bitcoin as a hedging transaction when faced with unstable market conditions in China.

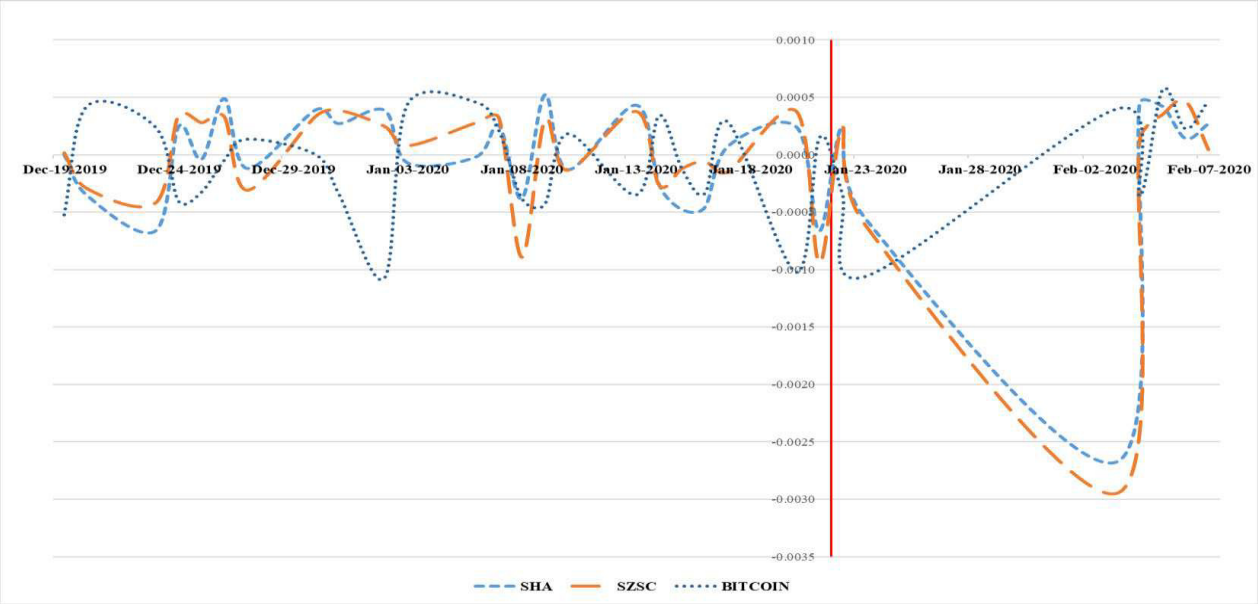
As shown in Fig. 2, the outbreak of Covid-19 in China had very little impact on US markets, indicating that a portion of the funds flowed back to the US through Bitcoin transactions. Due to restriction on the flow of capital flow from China, it is very likely that in the future, Bitcoin will emerge as an alternate avenue for the flow of capital.

Table I. OLS regression estimates related to Bitcoin and S&P Oil Index

BITCOIN PANEL A				
	MODEL (1)		MODEL (2)	
β_0	26850.13	***	23775.81	***
	(0.000)		(0.000)	
SSEI	-6.016	***		
	(0.001)			
SZSC			-1.501	***
			(0.000)	
R^2	0.102		0.302	
Adj-R^2	0.096		0.297	
F-statistics	16.492		62.820	
OIL PANEL B				
	MODEL (3)		MODEL (4)	
β_0	-24.87		203.96	***
	(0.509)		(0.000)	
SSEI	0.114	***		
	(0.001)			
SZSC			0.011	***
			(0.000)	
R^2	0.356		0.159	
Adj-R^2	0.352		0.153	
F-statistics	80.288		27.328	

This table shows that regressing result of Panel A is Bitcoin (BITCOIN), Shanghai Composite Index (SSEI) and Shenzhen Securities Component Index (SZSC). The Panel B is the regressing result of S&P GSCI Crude Oil Index (OIL), Shanghai Composite Index (SSEI) and Shenzhen Securities Component Index (SZSC). This study comprises daily data from July 1, 2019 to February 7, 2020. The value in parentheses are *t*-value, and ***, **, * represent 1%, 5%, 10% levels of significance.

Figure 1. Weighting Function from Cumulative Prospect Theory with First Order Stochastic Dominance (SSEI, SZSC, BITCOIN)



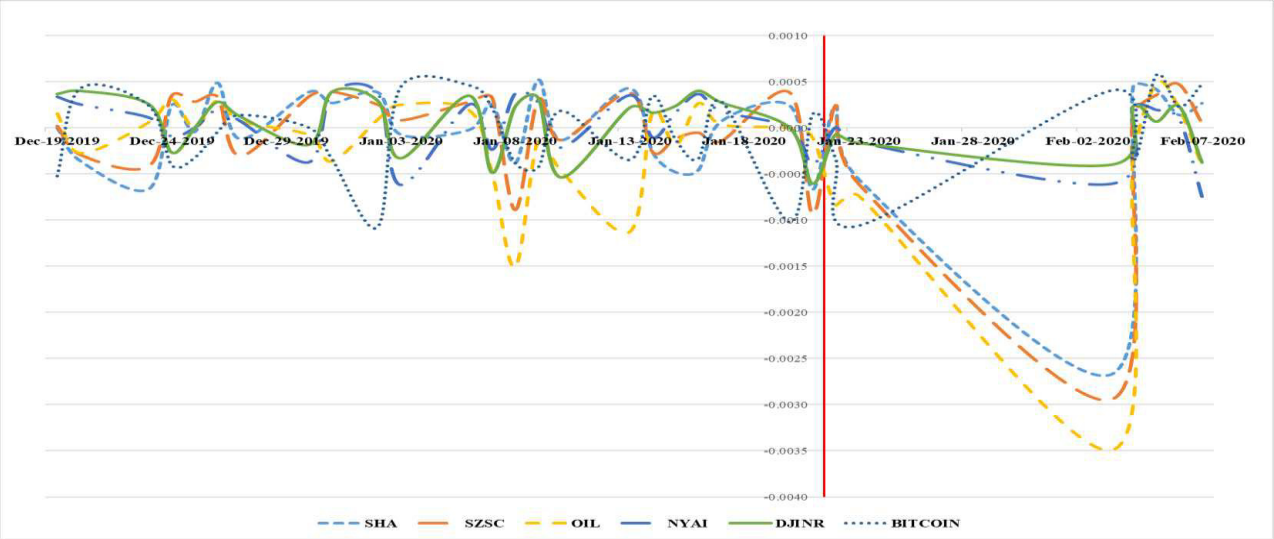
This figure presents that used cumulative prospect theory with first order stochastics dominance to fit investor behaviors. We found that investors sell out Chinese stocks from January 23, 2020, to February 04, 2020, and buy in bitcoin from January 23, 2020, to February 04, 2020.

Table II. OLS regression estimates related to DJINR and NYA

DJINR								
PANEL A								
β_0	60938.04	***	16408.20	***	21810.76	***	35798.77	***
	(0.000)		(0.004)		(0.000)		(0.000)	
BITCOIN	-0.843	***						
	(0.000)							
SSEI			12.503	***				
			(0.000)					
SZSC					3.220	***		
					(0.000)			
OIL							55.941	***
							(0.000)	
R2	0.374		0.232		0.733		0.170	
Adj-R2	0.370		0.227		0.731		0.165	
F-statistics	86.769		43.878		397.884		29.797	
NYA								
PANEL B								
β_0	14978.61	***	4011.31	***	6207.37	***	8521.29	***
	(0.000)		(0.002)		(0.000)		(0.000)	
BITCOIN	-0.185	***						
	(0.000)							
SSEI			3.149	***				
			(0.000)					
SZSC					0.725	***		
					(0.000)			
OIL							15.296	***
							(0.000)	
R^2	0.340		0.277		0.699		0.239	
Adj-R^2	0.350		0.272		0.697		0.234	
F-statistics	74.589		55.538		336.811		45.596	

This table shows that regressing result of Panel A is Dow Jones Index (DJINR), Bitcoin (BITCOIN), Shanghai Composite Index (SSEI), Shenzhen Securities Component Index (SZSC) and S&P GSCI Crude Oil Index (OIL). The Panel B is the regressing result of NYSE Composite Index (NYA), Shanghai Composite Index (SSEI) and Shenzhen Securities Component Index (SZSC) and S&P GSCI Crude Oil Index (OIL). This study comprises daily data from July 1, 2019 to February 7, 2020. The value in parentheses are *t*-value, and ***, **, * represent 1%, 5%, 10% levels of significance.

Figure 2. Weighting Functions from Cumulative Prospect Theory with First Order Stochastic Dominance (SSEI, SZSC, OIL, NYA, DJINR, BINCOIN)



This figure presents that used cumulative prospect theory with first order stochastics dominance to fit investor behaviors. We found that investors sell out Chinese stocks, US stocks and Oil from January 23, 2020, to February 04, 2020, and buy in bitcoin from January 23, 2020, to February 04, 2020.

4. Conclusions

The outbreak of Covid-19 in China in January 2020 had a severe impact on the performance of Chinese markets, prompting the flight of capital and indirectly driving up the price of bitcoin. The fact that US stock markets continued climbing during this period suggests a link between the price of Bitcoin and the outflow money from China into the US. We observed that the price of bitcoin was negatively correlated with the two major stock indexes (SSEI and SZSC) in China, but positively correlated with stock markets (NYA and DJINR) in the US. Following the outbreak of Covid-19, Chinese stock markets experienced a sharp decline. Investors anticipated a subsequent drop in the demand for raw materials, which caused to a sharp decline in the price of crude oil. The fact that the infectious disease had little impact on the US market indicates that a portion of the funds made their way back to US capital markets. During this period, the price of bitcoin briefly fell and then rose again, which suggests that investors had been using bitcoin to hedge their transactions in the face of unstable and with capital controls markets in China. Our analysis combining the computational aspects of cumulative prospect theory with the stochastic dominance method indicates that investors facing instability on Chinese markets use Bitcoin for hedge trading, perhaps

as an intermediary in times of emergency.

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