WWS403-C03: Macroeconomic Prospects and Policies Professor Ashoka Mody

Refining Indicators of Chinese Capital Flight Using Bitcoin

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9 January 2018

This paper represents my own work in accordance with University regulations.

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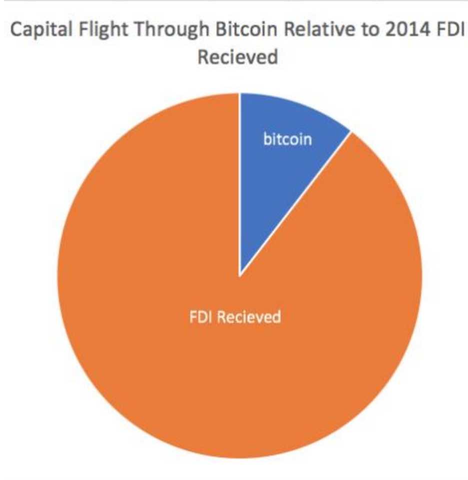
ABSTRACT

Capital flight describes an action of investors in which they transfer wealth out of their home country through illegal channels in response to adverse socioeconomic events in that country. This paper analyzes data to determine if Chinese investors engaged in capital flight using Bitcoin as a means by which to transfer their holdings in Chinese renminbi (RMB) into United States dollars (USD). Bitcoin is a decentralized virtual currency traded on exchanges globally. This paper attempts to determine if China's policy restricting Bitcoin trading, passed on December 5, 2013, curbed Bitcoin facilitated capital flight. I find that Chinese investors would have had a strong incentive to use Bitcoin to reallocate their assets from RMB into USD prior to December 5, 2013. My data demonstrates that Bitcoin enabled capital flight was made possible by arbitrage opportunities in an inefficient Bitcoin market. Arbitrage consists of simultaneously buying and selling identical securities to profit off the difference of prices in separate markets.[i] I will show Bitcoin is an incredibly speculative asset, and that speculation generates inefficiencies in the Bitcoin market because it prevents global Bitcoin prices from converging. I find that China's restriction was largely effective, and serves as a good example for how other countries might solve their problems of Bitcoin facilitated capital flight.

INTRODUCTION

Because China maintains an undervalued currency, and has historically manipulated foreign exchange rates, China is at an especially high risk of capital flight. Wealthy Chinese citizens often engage in capital flight motivated by opaque exchange rate policies and strict capital controls. To fix exchange rates, the People's Bank of China devalues the renminbi. This devalues the wealth of Chinese citizens. China has strict capital controls to enable fixing exchange rates. Capital flight is a violation of these capital controls and is therefore illegal. Chinese capital flight is consequential, as "in the early 2000's quarterly illicit capital outflows and inflows could be larger than the official FDI or the change in the external debts in the corresponding period."[ii] Capital flight has continued to redirect a significant portion of foreign direct investment (FDI), stripping the Chinese economy of needed resources.

Figure 1: *In 2014, capital flight via Bitcoin represented approximately 11% of FDI:*[iii]

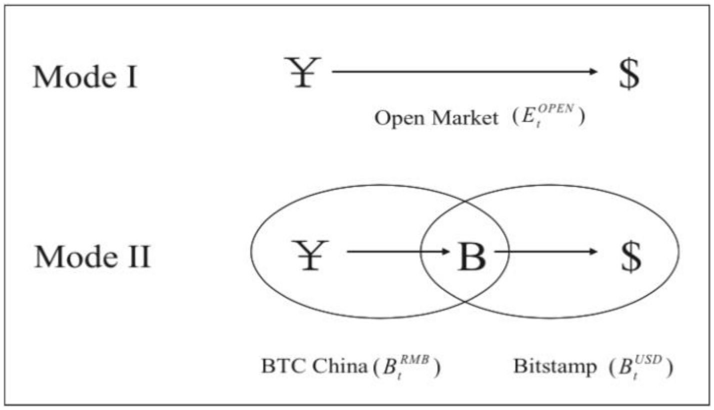


Chinese investors desire USD because of its stability. The transparency of the Federal Reserve and US Government enables citizens to reliably predict movements in the dollar's value, which is an unprecedented luxury for Chinese investors.

This paper examines China's response to Bitcoin enabled capital flight. Bitcoin is a virtual currency built upon a decentralized peer to peer network. Because it is decentralized, Bitcoin's value is not determined by a central bank, but rather the price people participating in the network are willing to pay for it. Bitcoin has historically been used for capital flight. In 2008, Iceland banned Bitcoin to halt money flight on the króna.[iv] This virtual currency is an ideal mechanism for illicit capital outflow because transactions are anonymous, and the associated data is encrypted. This means the Chinese government cannot identify which citizens or institutions were transferring wealth out of the country via Bitcoin. I will demonstrate Chinese investors were willing to pay a premium for these properties.

This paper will analyze characteristics of the Bitcoin market that made Bitcoin an attractive method by which to facilitate capital flight. Specifically, it will determine if Chinese investors inflated the Bitcoin implied exchange rate due to high demand for capital flight (Figure 2). The dependent variable in this study is called the exchange rate differential, first published in Ju's "Capital Flight and Bitcoin Regulation."[v] It represents the strength of the Bitcoin implied exchange rate relative to the open market rate.

Figure 2: *The Bitcoin Implied Exchange Rate (Lu 2016).*



My study uses the same methodology as that of Ju, Lu, and Tu, and I confirm China's restriction policy was influential in ending Bitcoin facilitated capital flight. In the months following China's restriction policy, Bitcoin prices went through a period of volatility in which the Bitcoin implied exchange rate dipped below the open market exchange rate. Bitcoin prices then shifted, and the Bitcoin implied exchange rate became more favorable than the open market exchange rate, and renewed motivation for capital flight through Bitcoin. I find the volatility in this speculative market provides deeper insight into conclusions of prior research.

I will expand upon the research done by Ju, Lu, and Tu by adding more recent data, and proposing a new indicator: dates of intense media coverage. Analyzing volatility in Bitcoin prices, I will demonstrate that these dates are associated with the highest degrees of speculation in the market. The economic theory in which this indicator is rooted is as follows. Demand for Bitcoin to facilitate capital flight creates a tremendous excess of demand for Bitcoin.[vi] This surplus distorts the exchange rate differential because investors are willing to pay a premium on the open market rate to facilitate an illicit activity.[vii] Therefore, the Bitcoin implied exchange rate becomes discounted relative to the open market rate. The value of this discount is captured by arbitragers trading on the exchange rate differential.[viii] I will show that because arbitragers benefit from capital flight instances of intense speculation are correlated with high exchange rate differentials.[ix]

The rest of this paper discusses the rise and fall of the exchange rate differential, arbitrage and its impact on Chinese capital flight. I first discuss the ramifications of capital flight on the Chinese economy to illustrate the importance of this issue. Then I will depict how arbitragers profit off a distorted exchange rate differential generated by demand for capital flight. I will show speculation is correlated with both news coverage on Bitcoin, and the exchange rate differential. I will detail my research process and methods used, and demonstrate that dates of intense media coverage are a strong indicator by which to build evidence supporting Bitcoin facilitated capital flight. I finish concluding that China's Bitcoin trading restriction did eliminate capital flight, and should be used as a model to eliminate capital flight via Bitcoin in other countries.

IMPLICATIONS OF CAPITAL FLIGHT ON CHINA'S ECONOMY

Capital flight is a critical risk to China's economy because it reduces the effectiveness of monetary and exchange rate policies.[x] The People's Bank of China actively intervenes in currency markets to limit the appreciation of the renminbi against the U.S. dollar. China methodically purchases renminbi in global currency markets using foreign reserves to prevent deflation.[xi] Simultaneously, the Chinese central bank purchases foreign assets with domestic bonds to prevent inflation of domestic money supply.[xii]

Capital flight prevents the People's Bank of China from knowing how much RMB is held domestically versus overseas. This means the central bank cannot reliably know the extent to which there is outstanding supply or demand for RMB.[xiii] Ambiguity means China cannot know how much RMB to buy or sell in foreign currency markets to maintain its fixed exchange rate.[xiv]

Intervention in foreign currency markets has two economic implications of paramount importance. First, an undervalued renminbi gives China's exporters a comparative advantage as Chinese goods are relatively cheaper in global markets. The purchasing power of foreign currencies relative to the renminbi is artificially high due to China's manufacturing of the exchange rate. Exports accounted for 18.61% of China's gross domestic product (GDP) in 2016.[xv] This reflects the status of exports as a critical source of capital inflow in the Chinese economy. Second, currency interventions prevent the Chinese economy from overheating in an economic environment of excess demand.[xvi] China has run surpluses in its current and financial accounts driven by strong demand for Chinese exports, and high levels of FDI.[xvii] China's ability to attract tremendous sums of FDI is, in part, attributable to a favorable exchange rate for foreign investors. Due to these twin surpluses, the RMB faces constant pressure to appreciate.[xviii] Appreciation of the RMB is a serious risk to the Chinese economy as it would it could make the RMB overvalued because appreciation would cause exports to lose competitiveness. Overvalued exchange rates have historically been precursors for currency crises.[xix]

Therefore, the impact of capital flight has the potential to reverberate through the Chinese economy leaving it vulnerable to financial crises. It is for this reason Bitcoin facilitated capital flight has been an important issue for Chinese policy makers in the last five years.

By banning financial and credit institutions from trading Bitcoin, prior researchers believed Chinese policy makers had curbed capital flight through Bitcoin, and restored balance to the People's Bank of China's methodical fixing of exchange rates. The rest of this paper will demonstrate how prior researchers came to this conclusion, and whether it continues to be correct.

DATA AND EMPIRICAL STRATEGY

Characteristics of the Bitcoin Market:

To evaluate previous research on this subject completed by Ju, Tu, and Lu, I model my research off theirs. I use the same methodology to mitigate errors stemming from data collection and analysis. The primary difference between our studies is the time period covered. Ju analyzes the 429-day period spanning February 10,2013 to April 15, 2014. My research takes a more holistic view, examining data from September 13, 2011 to September 19, 2017. A longer time period allows me to evaluate historical trends in the Bitcoin market, and the lasting impact of China's restriction policy.

The dependent variable of this study is the exchange rate differential (Δ_t). This variable tracks the strength of the Bitcoin implied exchange rate relative to the open market rate. Δ_t was first published by Ju and is defined as $[(E^{IMPLIED}-E^{OPEN})-E^{OPEN}]/E^{OPEN}$.[xx] In a perfectly efficient market, Δ_t should not be statistically different from 0. This study tests a number of independent variables; each is an indicator affecting fluctuations in exchange rate differential (Table 1).

Table 1: *Descriptive statistics, February 10, 2013 to April 15, 2014*

Variable	Mean	Std. Dev.	Min	Median	Max
B_t^{RMB}	1976.164	1835.955	156.85	774.98	7115.95
B_t^{USD}	318.496	296.726	24.95	127.05	1111.56
E_t^{OPEN}	6.133	0.053	6.0412	6.1259	6.2443
Δ_t	0.019	0.068	-0.172	0.002	0.595
T_t^{RMB}	4.69 x 10^7	1.11 x 10^8	6.211 x 10^4	6.65 x 10^6	7.29 x 10^8
T_t^{USD}	7.340 x 10^6	1.10 x 10^7	4.732 x 10^5	2.30 x 10^6	7.23 x 10^7
M_t	4.309	4.518	0.628	2.681	29.904
D_t	.301	.459	0	0	1

$\mathbf{B_t^{RMB}}$: Bitcoin price in China denominated in RMB; $\mathbf{B_t^{USD}}$: Bitcoin price in USA denominated in USD; $\mathbf{E_t^{OPEN}}$: Open market exchange rate; Δ_t: Exchange rate differential; $\mathbf{T_t^{RMB}}$: volume of Bitcoin transactions in China on China's largest Bitcoin exchange, BTC China; $\mathbf{T_t^{USD}}$: volume of Bitcoin transactions in USA on America's largest exchange, Bitstamp; $\mathbf{M_t}$: Turnover Ratio, calculated as (T_t^{RMB}/ T_t^{USD}); $\mathbf{D_t}$: Dummy variable representing the time before (0) and after (1) China's restriction policy; Data on Bitcoin volumes and prices was compiled using Bitcoincharts.com

To test if the Bitcoin market displayed any signs Bitcoin was being used for capital flight, I first run a Wilcoxon signed rank test of the mean of Δ_t. This test demonstrates the data warrants further testing for capital flight. I test the period leading up to the People's Bank of China's announcement of the restriction policy, and the immediate period following (Table 2).

Table 2: *Characteristics of the Bitcoin market*

	Before the restriction policy (February 10, 2013 to December 5, 2013)	After the restriction policy (December 6, 2013 to April 15, 2014)
Wilcoxon signed rank test H_0: $\Delta_t = 0$	Z = 6.109 (p-value = 0.000) Mean = 0.028	Z = -0.780 (p-value = 0.436) Mean = -0.002

Figure 3: *Price Factors Driving the Exchange Rate Differential*

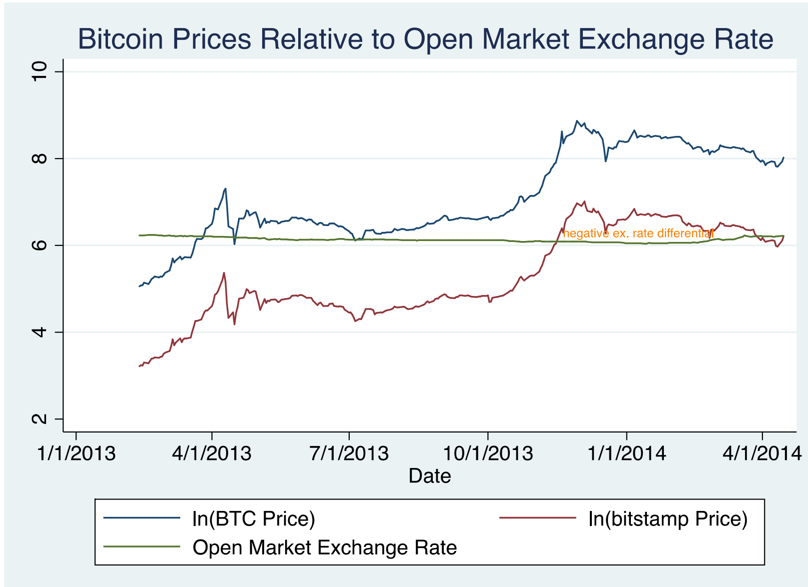


Table 2 demonstrates that Δ_t was significantly positive before the People's Bank of China's announcement of the restriction policy, with a z-score of 6.109 and a mean of 0.028. Following the announcement, Δ_t was not significantly different from zero with a daily mean of -.002 and a z-score of -0.78. This period of time is highlighted in Figure 3, and occurs when the ln price of Bitcoin traded on Bitstamp rises above the open market exchange rate. A positive Δ_t implies that $E^{IMPLIED}$ was greater than E^{OPEN} over that period. This provides strong evidence for capital flight because Chinese investors willing to pay a premium exchange rate presumably to facilitate an illegal action.[xxi]

This initial test indicates that China's restriction was effective; however, applying the same test to the subsequent 429 suggests this restriction policy could have been a temporary fix (Table 3). In this next period, Δ_t becomes positive and statistically significant once again, as it is more than three standard deviations from the mean. Additionally, Figure 4 demonstrates that the period in which ln Bitstamp price overtook the open market exchange rate was very brief.

Figure 4: *An Expanded Time Horizon of Price Factors Driving the Exchange Rate Differential*

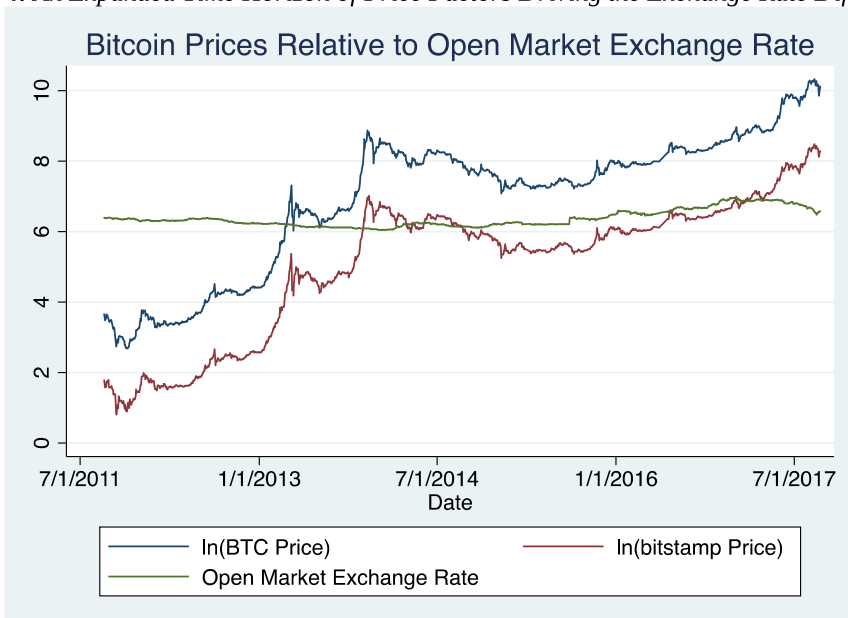


Table 3: *Characteristics of the Bitcoin market*

	Next 429 Day period (April 16, 2014 to December 30, 2015)
Wilcoxon signed rank test H_0: $\Delta_t = 0$	Z = 3.216 (p-value = 0.001) Mean = 0.003

Interpreting this test in the same way as that on the prior period, it appears Bitcoin again became a channel for capital flight. Because financial institutions are not able to purchase Bitcoin in this time period, it is safe to assume there was less capital flowing out of the country via Bitcoin.[xxii] This presumption is rooted in the fact that individuals generally do not have as much money as institutions. Therefore, it makes sense we observe a less extreme result; however, this test indicates capital flight was occurring even with the restriction policy having been implemented.

Methodology for Formal Tests of the Bitcoin Market

The Wilcoxon signed rank tests provide the framework for more formal tests of the effect of China's restriction policy. Again, I model these tests off those of Ju, Lu, and Tu's. In each test, I regress Δ_t against a number of explanatory variables. The explanatory variables in the first test are given in Table 1. The first regression was calculated as follows:[xxiii]

$$\Delta_t = \alpha_0 + \alpha_1 \log\left(T_t^{RMB}\right) + \alpha_2 D_t + \varepsilon_t \tag{1}$$

$$\Delta_t = \beta_0 + \beta_1 \log\left(T_t^{RMB}\right) + \beta_2 M_t + \beta_3 D_t + \varepsilon_t \tag{2}$$

$$\Delta_t = \gamma_0 + \gamma_1 \Delta_{t-1} + \gamma_2 \Delta_{t-2} + \gamma_3 \log\left(T_t^{RMB}\right) + \gamma_4 M_t + \gamma_5 D_t + \varepsilon_t \tag{3}$$

$$\Delta_t = \Delta_0 + \Delta_1 \Delta_{t-1} + \Delta_2 \Delta_{t-2} + \Delta_3 \log\left(T_t^{RMB}\right) + \Delta_4 \log\left(T_{t-1}^{RMB}\right) + \Delta_5 M_t + \Delta_6 D_t + \varepsilon_t \tag{4}$$

Refer to Table 1 for definitions of each term.

Model one (1) is the benchmark regression, in which I regress Δ_t against log T_t^{RMB} and D_t. I use the log to indicate eliminate a strongly positively skewed distribution of residuals, which persisted without the transformation.[xxiv] D_t is a crucial component of each model, as it distinguishes which observations occurred prior to the restriction, and which occurred following the restriction.

The second model (2) introduces M_t the turnover ratio. The turnover ratio controls for inertia in the Bitstamp and BTC exchanges. Creating a ratio of volume of transactions between these exchanges controls for the presence of an exchange rate discount due to persistently higher momentum in Bitcoin trading in one currency.[xxv] Because we are only concerned with the presence of discounts due to capital flight, it is important to control for other sources of discounts.

The third model (3) presents a lagged dependent variable using one and two-day lags, Δ_{t-1} and Δ_{t-2}, for the discount Δ_t. I elected to use one and two-day lags to align my model with that of prior researchers who had determined this optimal lag length.[xxvi] These lags are important because they control for inertia in the whole Bitcoin market. Bitcoin has experienced rapid growth, so it is important to analyze daily changes in Δ_t to we can avoid autocorrelation between our explanatory and response variables resulting from an overall positive trend in the industry. The fourth model (4) introduces a lagged variable for log Turnover Ratio. The rationale for this variables conclusion is that for the inclusion of lagged variables of Δ_t.

To explain irregularities and outliers in this model, I will add dummy variables controlling for dates of intense news coverage to encompass these outliers within the model. This second test will be calculated using the exact same regression equations used in prior research's model, but will include dummy variables controlling for intense media coverage in America on Bitcoin in Model 5, and global coverage in Model 6.

Empirical Reasoning for Addition of "Dates of Intense Media" Dummy Variable

Controlling for speculation is an important expansion of the model used in prior research because correlations in that model could be a function of speculation, not capital flight. To declare speculation has a critical effect on Δ_t, I find it first important to demonstrate that Bitcoin is a tremendously speculative asset. In "Speculative Trading and Stock Prices," Jianping Mei defines a speculative asset as having, "a positive association between trading volume and prices."[xxvii] Typical stock prices would decrease as supply in the market increases, but that does not hold for speculative assets. He states this relationship exists because, "when the ability of arbitragers to short an asset is limited, the marginal buyer of shares tends to be an optimist… as volatility of the difference of investors' opinions increases, investors trade more often and the value of the resale option increases" (you could not short Bitcoin at this time).[xxviii]

The relationship between trade volume and price enables me to prove that there is statistically significant speculation on days of intense media coverage. These days are: December 19, 2011, the date Bitcoin was featured on *The Goodwife* launching it into popular culture; November 18, 2013, date of a US Senate hearing on Bitcoin; September 18, 2015, date Bitcoin was declared a commodity by the US securities and exchange commission; November 2, 2015, date Bitcoin was on the cover of *The Economist*; and November 8, 2016, date of Trump's election, which pushed global economies into a period of intense uncertainty.[xxix] Table 4 demonstrates that there is statistically significant speculation on every day except for the date of the *Economist* feature. This means there was uniquely high correlation between change in daily Bitcoin transaction volume and price. Examining the r-squared values also shows that these dates help $\Delta\log(T_t)$ explain more of the variation in $\Delta(B_t)$.

Table 4: *Demonstrating Bitcoin is a Speculative Asset*

Price ($\Delta B_t^{RMB}/\Delta B_t^{USD}$ or B_t^{RMB}/B_t^{USD})	(1) $\Delta\log(T_t^{RMB})$	(2) $\Delta\log(T_t^{USD})$	(3) $\Delta\log(T_t^{RMB})$&Dummies	(4) $\Delta\log(T_t^{USD})$&Dummies
$\Delta\log(T_t^{RMB})$	0.435***		0.325***	
	(0.0103)		(0.0170)	
GoodWife			0.170	-1.210***
			(0.214)	(0.218)
SenateHearing			1.198***	-0.546**
			(0.254)	(0.257)
Economist			0.447	-0.725***
			(0.277)	(0.260)
Commodity			0.703*	-1.199***
			(0.359)	(0.354)
Trump			1.693***	1.246***
			(0.140)	(0.135)
$\Delta\log(T_t^{USD})$		0.544***		0.471***
		(0.0119)		(0.0177)
Constant	-3.703***	-5.926***	-2.897***	-4.396***
	(0.158)	(0.154)	(0.234)	(0.208)
Observations	1,513	1,508	1,513	1,508
R-squared	0.540	0.579	0.594	0.630

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

These dates are especially interesting because on days of intense media there is a strong positive correlation between volume and price in China, but a strong negative correlation in America.

I believe this negative correlation is a function of the way in which each of these press releases portray Bitcoin. For example, on *The Good Wife* episode entitled, "Bitcoin for Dummies," with much of the episode spent prosecuting the creator of Bitcoin, as the virtual currency is at odds with the US Treasury. Additionally, *The Economist* article was entirely about how Bitcoin is a bubble. Furthermore, each of these publications would be seen by Americans and not by Chinese citizens. I believe these widely circulated negative depictions fo Bitcoin discouraged those holding Bitcoin, and swayed them to sell. Therefore, the majority of transactions on these days would be people selling

Bitcoins. This generated an excess supply of Bitcoins on Bitstamp, which caused the price to fall.

By comparison, the election of Donald Trump was a global event incentivizing purchase of Bitcoin as the world slipped into economic uncertainty (cite why Bitcoin good in uncertainty).[xxx] This event generated a positive relationship between volume and price. This date is included to demonstrate concrete evidence specific events have substantial impacts on the Bitcoin market.

Models 1 and 2 demonstrate that daily change in volume and price typically have a significant positive correlation. It is critically important that BTC Volume and price had a significantly positive relationship as Bitstamp's was negative. Falling prices on Bitstamp create arbitrage opportunities for Chinese investors to capitalize on an advantageous $E^{IMPLIED}$. This analysis has demonstrated that Δ is affected by speculation, as days of intense speculation have significant effects on Bitcoin prices.

RESULTS AND ANALYSIS

Table 5 provides the results generated using the regression equations of previous researchers. This model yields very significant results, which means that these explanatory variables capture a lot of the variation in the dependent variable. Each regression demonstrates Bitcoin volume $\log(T_t^{RMB})$ has a significantly positive effect on the exchange rate differential discount Δ_t. This indicates capital flight was occurring during this time period because premiums paid on each transaction raise Δ_t. The significantly positive correlation exists because Bitcoin is a speculative asset: high degrees of trading volume are correlated with high prices. As BTC volume rises, so does its price. When BTC's price rises faster than Bitstamp's, Δ_t becomes larger. On these days, $E^{IMPLIED}$ and, therefore, Δ_t are particularly high as they are a function of BTC and Bitstamp pricing. Therefore, the relationship between $\log(T_t^{RMB})$ and Δ_t in this regression reinforces ideas indicated in Table 4.

Table 5: *Regression Results Modeling Prior Research*

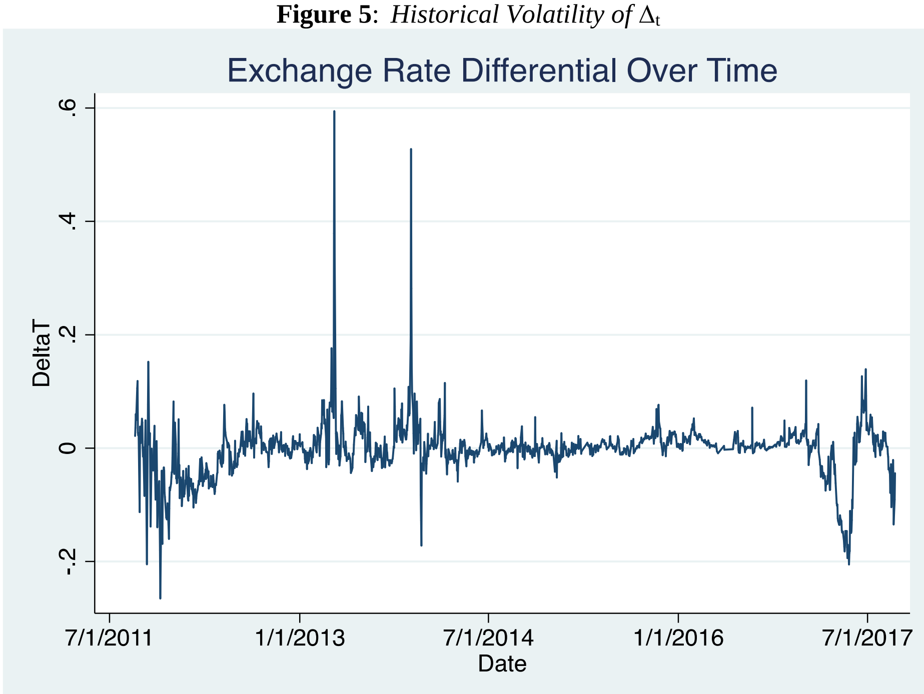
Δ_t	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
$\log(T_t^{RMB})$	0.0139***	0.0132***	0.00636**	0.0115***
	(0.00338)	(0.00472)	(0.00300)	(0.00387)
Δ_{t-1}			0.882***	0.893***
			(0.191)	(0.192)
Δ_{t-2}			-0.287**	-0.289**
			(0.123)	(0.123)
$\log(T_{t-1}^{RMB})$				-0.00597**
				(0.00287)
M_t		0.000361	-4.89e-05	5.35e-05
		(0.00109)	(0.000661)	(0.000664)
D_t	-0.0568***	-0.0551***	-0.0252***	-0.0229***
	(0.0104)	(0.0129)	(0.00796)	(0.00786)
Constant	-0.185***	-0.176***	-0.0858**	-0.0736*
	(0.0490)	(0.0658)	(0.0426)	(0.0431)
R-squared	0.158	0.159	0.597	0.600

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Incorporating Δ_{t-1} and Δ_{t-2} demonstrates that the primary indicator of Δ_t is the value of Δ_t in the prior days. Δ_{t-1}'s correlation coefficient of .882 means that Δ_t the prior day is the best indicator of Δ_t today. What is interesting is that Δ_{t-2}, Δ_t two days prior, is negatively correlated with Δ_t. This indicates the extent of Δ_t's volatility as it rarely moves in the same direction for multiple days (Figure 5). I attribute both this volatility and that of $\log(T_t^{RMB})$'s to Bitcoin's speculative nature, and the fickleness of investor opinion – demonstrated by the affect media has on prices.

Turnover ratio M_t weakens the model. It is the sole variable not significantly correlated with Δ_t, and it weakens the correlations of each of the other explanatory variables. M_t does nothing to explain the variation between the explanatory variables and exchange rate differential. Interpreted in isolation, it indicates that Bitcoin was never used as a vehicle for capital flight. Given the tremendous volume of transactions, and volatility of Δ_t I do not find this result surprising or problematic.

Figure 5: *Historical Volatility of* Δ_t



Additionally, Table 5 shows that the restriction policy dummy is significantly negative in each model. This correlation suggests that the announcement of this Bitcoin trading restriction eliminates capital flight via Bitcoin, as high Δ_t indicates capital flight. To determine if this restriction policy permanently ended capital flight, I ran this same regression over the subsequent 429-day period (Table 6). It was in this period Table 3 and Figure 4 indicated there could have been a resurgence of capital flight via Bitcoin.

Table 6: *Regression Results Modeling Prior Research in the Subsequent Period*

Δ_t	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
$\log(T_t^{RMB})$	0.000229	0.00121	0.000648	-0.000168
	(0.000584)	(0.00102)	(0.000942)	(0.00182)
Δ_{t-1}			0.494***	0.496***
			(0.0771)	(0.0771)
Δ_{t-2}			0.0962	0.0933
			(0.0585)	(0.0590)
$\log(T_{t-1}^{RMB})$				0.000940
				(0.00166)
M_t		-4.21e-05*	-2.67e-05	-2.98e-05
		(2.54e-05)	(2.32e-05)	(2.26e-05)
D_t	-0.0155***	-0.0146***	-0.00592***	-0.00587***
	(0.00171)	(0.00172)	(0.00155)	(0.00154)
Constant	0.0107	-0.00627	-0.00502	-0.00719
	(0.0104)	(0.0177)	(0.0163)	(0.0162)
R-squared	0.203	0.209	0.454	0.454

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A more thorough analysis of this period demonstrates that China's restriction policy was effective in eliminating capital flight via Bitcoin. The policy dummy continues to be significantly negative in each model, and $\log(T_t^{RMB})$ ceases to be significant. For reasons stated in the interpretation of Table 5, this indicates that there is no longer a high demand for capital flight.

I will now delve deeper into the significance of $\log(T_t^{RMB})$ in Table 5. As I have demonstrated, $\log(T_t^{RMB})$ could be driven either by speculation or capital flight. To solidify capital flight caused this correlation, I control for days of intense speculation in Table 7. To assess speculation in the Bitcoin market historically, I include observations ranging from September 9, 2011 to September 19, 2017.

Table 7: *Regression Including Days of Intense Speculation*

Δ_t	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6
$\log(T_t^{RMB})$	0.00305***	0.00319***	0.000784***	0.00195	0.00271	0.00261
	(0.000331)	(0.000402)	(0.000289)	(0.00191)	(0.00189)	(0.00188)
Δ_{t-1}			0.794***	0.795***	0.774***	0.765***
			(0.112)	(0.112)	(0.110)	(0.110)
Δ_{t-2}			-0.0136	-0.0132	-0.0300	-0.0393
			(0.0902)	(0.0903)	(0.0903)	(0.0913)
$\log(T_{t-1}^{RMB})$				-0.00126	-0.000134	5.24e-05
				(0.00191)	(0.00192)	(0.00191)
M_t		-2.57e-06	-1.05e-06	-6.45e-07	-1.73e-06	-1.31e-06
		(1.61e-06)	(1.13e-06)	(1.02e-06)	(1.11e-06)	(1.18e-06)
D_t	-0.00640***	-0.00710***	-0.00199		-0.0108	-0.0255
	(0.00214)	(0.00246)	(0.00139)		(0.0103)	(0.0285)
GoodWife					0.000518	0.000748
					(0.0102)	(0.0102)
SenateHearing					-0.00360	0.0109
					(0.0149)	(0.0311)
Economist					-0.0188	0.00689
					(0.0117)	(0.0314)
Commodity					-0.00682	0.0154
					(0.0114)	(0.0312)
Trump						-0.00873***
						(0.00240)
Devalued						-0.0220
						(0.0286)
Constant	-0.0491***	-0.0509***	-0.0124**	-0.0114**	-0.0318***	-0.0331***
	(0.00523)	(0.00592)	(0.00482)	(0.00482)	(0.0110)	(0.0111)
Observations	1,516	1,516	1,514	1,514	1,514	1,514
R-squared	0.057	0.058	0.637	0.637	0.645	0.649

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This model confirms the correlation between $\log(T_t^{RMB})$ and Δ_t was generated by capital flight. Models 1 and 2 reflect takeaways from my analysis of Table 4. These models simply dictate turnover and price (Δ_t being the metric for price) are significantly correlated. Because China's restriction was in place for most of the dates in Table 7, this correlation is most likely due to speculation not capital flight.

Models 5 and 6 test the significance of intense speculation on Δ_t. Table 7 demonstrates that intense speculation had no significant impact on the correlation between $\log(T_t^{RMB})$ and Δ_t. The correlation coefficient of $\log(T_t^{RMB})$ increases in these models, which reinforces the analysis of Table 4. However, this correlation does not increase to the point at which it becomes statistically significant. This model shows Δ_{t-1} is singularly the best indicator of Δ_t.

Only the date of Trump's election is significant. As stated, this was the single biggest incentive to purchase Bitcoin since its inception, so it is not surprising this result is significant. As this event does not have a statistically significant impact on the correlation between $\log(T_t^{RMB})$ and Δ_t, we can conclude definitively that speculation is not affecting the strong correlation between $\log(T_t^{RMB})$ and Δ_t in Table 5.

CONCLUSION

This paper examined forces moving the exchange rate differential, and the implications for Bitcoin enabled capital flight from China. Capital flight is a critical risk to the Chinese economy because it handicaps the People's Bank of China's ability to fix exchange rate. Ability to maintain fixed exchange rates prevents China's economy from experiencing a currency crises. Capital flight creates arbitrage opportunities, enabling investors to profit off distorted exchange rate differentials generated willingness of Chinese investors to pay a premium for Bitcoin. Dates on intense speculation have a significant impact on Bitcoin trading volumes and prices; however, speculation does not significantly impact the relationship between volume and exchange rate differential. My results indicate that capital flight was the singular cause of increases in exchange rate differential. Furthermore, I find China's Bitcoin restriction policy was effective in eliminating capital flight via Bitcoin. Prohibiting financial institutions from trading

Bitcoin mitigates Bitcoin's effect on the real economy by reducing the supply of money available to escape through Bitcoin. This is an effective measure for any country concerned about capital flight through Bitcoin.

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