

Impact of US Fed Tapering “News” on Demand for Bitcoin: Is Bitcoin Preferred to Gold and US Dollar as a Hedge Against Currency Risks?

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Abstract

We study the demand for Bitcoin, one of cryptocurrencies gaining recently a great deal of attention, as a store of value: an asset held for the purpose either of speculative investment (i.e., capital gains) or of hedging currency risks (i.e., changes in foreign exchange and inflation rates). Our contribution to the literature is to identify the hedging benefit of Bitcoin: for a given country, we aim to measure the effect of changes in the foreign exchange rate, which are de-facto exogenous shocks, on the price of Bitcoin (quoted in the given country’s local Bitcoin exchanges). In particular, we examine whether or not Bitcoin is preferred to gold and U.S. dollar as a hedge against currency risks. For this purpose, we examine how the relative price of Bitcoin to gold (or to US dollar) in several emerging market economies (e.g., India, Brazil, and Mexico) responded to the “news” about the looming possibility of U.S. Fed tapering policy (i.e., tightening U.S. monetary policy) around the beginning of May, 2013. The increased possibility of, but not actually implemented yet, tightening US monetary policy has led to capital outflows from a number of emerging market economies and hence large depreciations in such countries (labeled *treated*), while foreign exchange rates in some advanced economies (e.g., Hong Kong and Switzerland, labeled *controlled*) remained almost intact. As such, we examine how the relative price of Bitcoin to gold (or to U.S. dollar) behaved, in response to the tapering “news” shock, differently between such treated and controlled countries. We find that in treated countries experiencing the large depreciation, the relative price of Bitcoin to gold (or to U.S. dollar) substantially *decreased*, rather than increased, than in controlled countries. Our findings suggest that investors prefer gold and U.S. dollar to Bitcoin as a hedge against currency risks.

Keywords: Bitcoin, Hedging, Speculative investment, Exchange rate risk, Tapering policy.

I. Introduction

Bitcoin, one of the popular cryptocurrencies, has recently received a great deal of attention as investors' demand for Bitcoin has increased greatly. For instance, the price of Bitcoin (in terms of US dollars exchanged to one unit of Bitcoin) has increased more than tenfold in a year: it has increased from \$752 on November 28th 2016 to \$10,331 on November 27th 2017. Such a dramatic increase in the market value of Bitcoin naturally raises questions as follows: What are the causes of the increased demand for Bitcoin? What factors, and how, would affect the demand for Bitcoin in the future? Can the current high demand for Bitcoin be sustained in the long run or is it another bubble to burst? In particular, the sustainability of the current high demand for Bitcoin has generated debate among business leaders, financial experts, monetary policy makers, academic researchers and lay investors.¹ As such, it is important to study empirically the determinants of the demand for Bitcoin, to which we aim to contribute.

The benefits of Bitcoin can be listed as follows: as a speculative investment (i.e., capital gains), hedge against the currency risk (e.g., unexpected changes in the foreign exchange rate and inflation rate), and low-cost medium of exchange (i.e., small transaction fees for payment). In general, three benefits/functions of money have been discussed in economics as follows: medium of exchange, store of value, and unit of account. The first two functions of money (i.e., medium of exchange and store of value) are of our interest in studying the determinants of the demand for Bitcoin. Part of popularity of Bitcoin is due to its technological features (e.g., convenience of digital payment system and innovative blockchain technology to prevent the fraudulent behaviors), which can be thought of as the benefit in terms of a medium of exchange. The current low acceptance rate of Bitcoin among major retailers, however, suggests that the role of Bitcoin as a medium of exchange is likely to be a small factor in determining the current demand for Bitcoin. As such, we focus on the role of Bitcoin as a store of value, which refers to an asset held for the purpose either of speculative investment (i.e., capital gains) or of hedging currency risks (i.e., changes in foreign exchange and inflation rates).

Our contribution to the literature is to identify the hedging benefit of Bitcoin (as a store of value) by using an event-study regression framework. More specifically, we aim to measure how the price of Bitcoin responds to exogenous shocks that are likely to affect greatly the hedging benefit of Bitcoin as follows: For a given country, we aim to measure the effect of changes in the foreign exchange rate, which are de-facto exogenous shocks (because almost no country can control the foreign exchange rate in the

¹ For instance, Patrick M. Byrne (CEO of *Overstock.com*, one of major US retailers that started to accept Bitcoin since early January 2013) asserts that more firms should accept Bitcoin, while Jamie Dimon (CEO of *JPMorgan Chase*) called bitcoin "a fraud" at the Delivering Alpha conference presented by CNBC and Institutional Investor. Stephen Roach (senior fellow at *Yale University* and former chairman of *Morgan Stanley Asia*) says, in an interview with *CNBC* on 5th December 2017, that Bitcoin is a "dangerous speculative bubble."

global currency market), on the price of Bitcoin (quoted in the country's Bitcoin exchanges in terms of the local currency). In particular, we examine whether or not Bitcoin is preferred to gold and US dollar as a hedge against currency risks. For this purpose, we examine how the relative price of Bitcoin to gold (or to US dollar), where all of Bitcoin, gold and US dollar are in local currency terms and local prices observed in a given country, in several emerging market economies (e.g., India and Brazil) responded to the “news” about the looming possibility of US Fed tapering policy (i.e., tightening Fed money supply) around the beginning of May, 2013.

The increased possibility of, but not actually implemented yet, tightening US monetary policy has led to capital outflows from a number of emerging market economies and hence large depreciation in such countries (labeled *treated*), while foreign exchange rates in many advanced economies (e.g., Hong Kong and Switzerland, labeled *controlled*) remained relatively intact. As such, we examine how the relative price of Bitcoin to gold (or to US dollar) behaved, in response to the tapering “news” shock, differently between such treated and controlled countries.

Importantly, our difference-in-difference approach reduces the concern that our estimate of the effect of depreciation on the relative price of Bitcoin is contaminated by the omitted factors that are specific to the Bitcoin price (but not affecting the gold price) and common across all countries. For instance, we can consider the uncontrolled effect of unobserved changes in the speculative motive of investment in Bitcoin. That is, it is possible, though not so much likely, that around the time of the arrival of the Fed tapering “news,” investors may have suddenly changed their beliefs about an increase in the future price of Bitcoin. In this case, a simple OLS regression of the Bitcoin price (relative to the gold price) on the time dummy indicating the aftermath of the “news” shock would be biased. As long as such an unobserved change in the investors’ beliefs about the future price of Bitcoin takes place commonly across all countries, the effect of such an omitted factor is removed by our difference-in-difference regression framework, in which we compare the change (after the tapering “news” shock) in the price of Bitcoin (relative to the gold price) between the treated and controlled countries.

More specifically, we choose the treated and controlled countries as follows: The impact of tapering “news” announcements by Fed policy makers on foreign exchange rates and national stock markets over the world has been widely discussed in economics and finance literature. (See, e.g., Eichengreen and Gupta (2014) and references therein.) According to Eichengreen and Gupta (2015), 36 of the 53 emerging market countries experienced depreciation between the end of April 2013 and the end of June 2013, when tapering news is announced. Eichengreen and Gupta (2015) find that the largest changes in the foreign exchange rate were in Brazil, India, Paraguay, South Africa, and Uruguay, with Brazil having the largest depreciation at 12.5 percent. Meanwhile, Aizenman et. al (2016) studied the transmission of the news about Fed tapering policy to emerging financial markets with “fragile” fundamentals. Among 27

emerging market sample, they categorize 16 countries as “fragile” group including Brazil, India, Mexico, Indonesia, and South Africa.

Based on the literature about the impact of the news about Fed tapering policy and data availability of Bitcoin price (quoted in the local Bitcoin exchanges in a given country), we take Brazil, India, and Mexico as the group of treated emerging market countries of which foreign exchange rates are heavily influenced by tapering “news.” We exclude countries such as Paraguay, South Africa, Indonesia and Uruguay mainly because data on the local price of Bitcoin in these countries is not available in early 2013.

Our controlled group of countries are selected such that these countries experienced relatively small depreciations and that data on the local price of Bitcoin is available. As a result, our controlled group of countries include Hong Kong, Switzerland, U.K., and Eurozone countries.²

We collect daily series of the local price of Bitcoin (based on trades of Bitcoin taking place in the local Bitcoin exchanges in a given country), local price of gold (in local currency terms), and price of US dollar in the local currency (i.e., the exchange rate of US dollar to the local currency) for each of treated and controlled countries. The sample period is from April 1st, 2013 to June 1st, 2013, where we take May 1st, 2013 as the cutoff date when the tapering “news” shock started to affect the foreign currency markets over the world. Indeed, since May 1st, 2013, the Fed policy makers started to mention the possibility about tapering policy, and foreign exchange rates in many countries fell sharply. For comparison, our cutoff date, May 1st, 2013, is before the official announcement date, May 22nd 2013, when then-Chairman Ben Bernanke officially mentioned about the tapering policy that will reduce Fed’s monthly bond purchase amount.

Our results for the difference-in-difference regression of the Bitcoin price relative to the gold price (or relative to the US dollar exchange rate) show that in treated countries experiencing the large depreciation after the tapering “news” shock, the relative price of Bitcoin to gold (or to the US dollar) substantially *decreased*, rather than increased, than in controlled countries that experienced small depreciations. Our findings suggest that investors, at least currently, prefer gold and US dollar to Bitcoin as a hedge against currency risks.

II. Related Studies: Bitcoin and other Digital Currencies

Bitcoin and cryptocurrencies have only recently emerged and has already gained much attention in economics, finance and business literature (Bohme et al. 2015; Evans2014; Van Alstyne 2014; Gans and Halaburda 2013). Political economy of bitcoin has been studied by Hendrickson, Hogan, and Luther

² For the case of Eurozone countries, the data on the Bitcoin price (quoted for trades taking place in Bitcoin exchanges located in these countries) is reported for a group of these countries but not for individual member countries.

(2015). They found that government's refusal to accept bitcoin is not sufficient to prevent bitcoin transactions. Viglione (2015) analyzed whether the degree of economic repression in a country can explain differences in bitcoin trading premium over the global price. Carlson (2016) examined the effect of country's history of capital controls or high rates of inflation on cryptocurrency popularity in case of Argentina.

In case of Bitcoin, a transaction is verified based on competition among agents searching for a cryptographic *proof of work* –“a verifiable demonstration that they have paid a cost in computation time” to add candidate block of transactions (Barrdear and Kumhof 2016). This unique decentralized system supports the benefits of bitcoin users; by approving valid transactions without disclosing the identity or involving interactions with third party institution.

There is a recent stream of studies that examine the adoption of cryptocurrencies in central bank. Barrdear and Kumhof (2016) in Bank of England studied the macroeconomic implications of issuing central bank digital currencies (CDBC). CDBC is a “universally accessible and interest-bearing central bank liability, implemented via distributed ledgers” that can be used as a medium of exchange. They found that issuing CDBC 30% of GDP can permanently increase GDP by three percentage points due to reduction in real interest rates, distortionary taxes and transaction costs. Bech and Garatt (2016) also studied the benefits of central bank cryptocurrencies (CBCCs). Bordo and Levin (2017) considered how a central bank digital currency (CBDC) would transform the current monetary system and monetary policy.

Bitcoin also has been previously studied as the means of diversification possibilities (Briere et al., 2013) and the arbitrage possibilities (Gandal and Halaburda, 2014). The hedging capabilities of bitcoin has been studied by Dyhrberg (2015). Based on Dyhrberg (2015), bitcoin and gold share similarities such as the origin of the value driven from the scarcity of supply with finite total supply. In addition, gold and bitcoin have high price volatility. He found that bitcoin can be used as a hedge against stocks and also against the US dollar in short term just like gold.

Athey, Parsahkevov, Sarukkai, Xia (2016) developed a model to study bitcoin adoption and the determination of the bitcoin price with a set of assumptions that excludes speculative bubbles and heterogeneous beliefs and that the primary use of bitcoin is for money transfer across borders for remittance. In the empirical analysis, they examined the history of individual transactions and describe patterns of adoption and utilization across different types of users, transactions, and geography. They found that the active (or frequent) usage was not growing quickly as of mid-2015 and the majority of bitcoin holders are investors and infrequent users.

Li and Wang (2017) investigate the determinants of the Bitcoin price, especially the three factors: technological factors (e.g., difficulty of mining), economic factors (e.g., interest rate and inflation rate), and speculative trading measured as the trading volume and price volatility.

This paper is related to the previous studies regarding extant findings about (i) macroeconomic conditions as a factor of bitcoin adoption rate, (ii) hedging capabilities of bitcoin, and (iii) the fact that as for the reason of holding Bitcoin, speculative motive is more important than transaction purposes. Our contribution to the literature is to identify the hedging benefits of Bitcoin relative to those of gold and U.S. dollar. For this purpose, we use a difference-in-difference regression framework by using the “news” about U.S. Fed tapering policy as an exogenous shock that shifted the hedging benefits of Bitcoin, gold, and U.S. dollar in several emerging market economies experiencing large depreciations after such a “news” shock. For comparison, most of previous empirical studies uses a multivariate regression analysis.

III. Empirical Methodology

In this section, we discuss our empirical methodology: the event-study regression framework. In particular, we discuss the reason why the “news” about the US Fed tapering policy can be considered as exogenous shocks (i.e., “event”) to the hedging benefit of Bitcoin.

3.1. Shock to the Currency Value: Case of “News” about U.S. Tapering Policy and Depreciations in Emerging Market Economies in May 2013

In this section, we consider shocks to the value of local currencies in emerging market economies (e.g., India, Brazil, and Mexico) and investigate how such depreciation shocks affect the local demand for Bitcoin in these countries. More specifically, we consider the case of sharp depreciations of local currencies (i.e., decline in the number of U.S. dollars exchanged to one unit of a local currency) observed in many emerging market economies during the period around the beginning of May 2013, believed to be caused by the looming possibility of U.S. Tapering policy (which will be discussed in more detail below). In those countries that went through the turmoil of depreciations of such a large scale, the demand for Bitcoin as well as demand for gold and US dollar are expected to have increased substantially than before the depreciation shock for the reason as follows:

The real value of local assets (such as residential properties and stocks issued by domestic companies) is exposed to such a depreciation shock. For instance, in the aftermath of depreciation in India, the local asset’s price in U.S. dollar terms decreases and hence this local asset holder’s purchasing power in terms of imported goods (e.g., oil and gas) is reduced. By contrast, Bitcoin can be easily traded in the global market (e.g., sell to someone in the U.S. Bitcoin exchange in the U.S. dollar price) and hence the value of

Bitcoin is likely to be immune to the depreciation shock. For this reason, Bitcoin is likely to be used as a hedge against the foreign exchange rate risk. For the same reason, gold and US dollar are also held as a hedge against the foreign exchange rate risk because both gold and US dollar are also traded in global market and hence their real values are likely to be protected against the depreciation of the local currency.

As such, we examine how the value of Bitcoin, measured as the per-unit price of Bitcoin (in local currency), behaved in several emerging market economies during the aforementioned period of depreciation shocks. In particular, it is of our interest to examine whether or not Bitcoin is preferred to the two traditional tools to hedge the foreign exchange risk: gold and US dollar. As such, we examine how the local price of Bitcoin relative to the local price of Gold (or relative to the exchange rate of US dollar to the local currency) was affected by the “news” about the US Fed tapering policy, i.e., discussion of the possibility of tightening US monetary policy, which would trigger capital outflows from emerging market economies and hence cause depreciations of local currencies in such countries.

Importantly, we examine how the relative price of Bitcoin to gold (or to US dollar) behaved, in response to the tapering “news” shock, differently between treated countries, which experienced large depreciations, and controlled countries, which experienced small depreciations. This difference-in-difference approach enables us to reduce the concern that our estimate of the effect of depreciation on the relative price of Bitcoin is contaminated by the omitted factors that are specific to the Bitcoin price (but not affecting the gold price) and common across all countries. For instance, we can consider the uncontrolled effect of unobserved changes in the speculative motive of investment in Bitcoin. That is, it is possible, though not so much likely, that around the time of the arrival of the Fed tapering “news,” investors may have suddenly changed their beliefs about an increase in the future price of Bitcoin. In this case, a simple OLS regression of the Bitcoin price (relative to the gold price) on the time dummy indicating the aftermath of the “news” shock would be biased. As long as such an unobserved change in the investors’ beliefs about the future price of Bitcoin takes place commonly across all countries, the effect of such an omitted factor is removed by our difference-in-difference regression framework, in which we compare the change (after the tapering “news” shock) in the price of Bitcoin (relative to the gold price) between the treated and controlled countries.

Discussion: U.S. Tapering Policy and Depreciations in Emerging Market Economies in May 2013 We discuss in more detail the event of the “news” about the U.S. Fed tapering policy (reducing an increase in money supply), where such a news is considered to start from the beginning of May 2013. During the prolonged recession since 2008 financial crisis, the U.S. Fed has maintained the expansionary monetary policy so as to boost the U.S. economy and to reduce the unemployment rate by keeping the interest rates to the record lows, near zero for the case of the short-term interest rate, e.g., Federal funds

rate that is served as the daily interbank non-secured loan rate. For such a purpose of the expansionary monetary policy, the Fed has announced and implemented its policy of purchasing the U.S. government bonds, and at sometimes even corporate bonds, namely *Quantitative Easing* (QE) policy. As of the early second quarter in 2013, the U.S. economy gets closer to the recovery from the severe recession to the normal (e.g., the U.S. unemployment drops down toward to the targeted level of seven percent), and the Fed announces that it is considering to slow down its monetary supply by reducing the amount of bonds purchased by the Fed.

The official announcement of the Fed tapering policy (i.e., reducing the monthly amount of bonds purchased by the Fed) was released by Ben Bernanke, then-Chairman of Fed, on May 22nd, 2013. But, unofficial discussion, i.e., “possibility,” of Fed tapering policy has already started in the beginning of May 2013. Indeed, the interest rates in the U.S. Treasury bond markets have started to increase around the beginning of May 2013. As a result, global investors have started to move their funds away from capital markets in emerging market economies (e.g., Brazil, Russia, India) to capital markets in the U.S. and in other advanced economies. Thus, some emerging market economies (e.g., India, and Brazil) have started to experience large depreciations of their currencies at the beginning of May 2013.

3.2. Regression Framework

One period is set to one calendar day. Let $p_{i,j,t}$ denote the log of the Bitcoin price relative to the price of asset j in country i at period t , where both the Bitcoin price and the price of asset j are in terms of country i 's local currency. As discussed earlier, we consider the relative price of Bitcoin either to the price of gold $j = G$ or to the price of US dollar $j = D$. For a given country i , we write the regression equation of $p_{i,j,t}$ as:

$$\ln(p_{i,j,t}) = \beta_{0,j} * Treated_i + \beta_{1,j} * Time_t + \beta_{2,j} * Treated_i * Time_t + \varepsilon_{i,j,t} \quad (1)$$

where $Treated_i$ refers to the dummy indicating whether country i a country (labeled *treated dummy*), $Time_t$ the dummy indicating whether the time of observation t is after the arrival of the tapering news (labeled *after-news dummy*), and $Treated_i * TimeShock_t$ the interaction term between treated dummy and after-new dummy. And $\varepsilon_{i,j,t}$ denotes the error term, assumed independent across countries i and over time t .

We run a panel regression of the (log) Bitcoin price relative to the gold price and to the U.S. dollar price, respectively. By doing so, we aim to test whether or not the Bitcoin price (relative to the gold price and to the exchange rate of U.S. dollar) responded to the Fed-tapering “news” shock differently between

the treated and controlled countries. Thus, it is of our main interest to test whether or not the coefficient $\beta_{2,G}$ (or $\beta_{2,D}$) on the interaction term between treated dummy and after-news dummy is significantly different from zero.

3.3. Treated vs. Controlled Countries

We choose the treated and controlled countries as follows: The impact of tapering “news” announcements by Fed policy makers on foreign exchange rates and national stock markets over the world has been widely discussed in economics and finance literature. (See, e.g., Eichengreen and Gupta (2014) and references therein.) According to Eichengreen and Gupta (2015), 36 of the 53 emerging market countries experienced depreciation between the end of April 2013 and the end of June 2013, when tapering news is announced. Eichengreen and Gupta (2015) find that the largest changes in the foreign exchange rate were in Brazil, India, Paraguay, South Africa, and Uruguay, with Brazil having the largest depreciation at 12.5 percent. Meanwhile, Aizenman et. al (2016) studied the transmission of the news about Fed tapering policy to emerging financial markets with “fragile” fundamentals. Among 27 emerging market sample, they categorize 16 countries as “fragile” group including Brazil, India, Mexico, Indonesia, and South Africa.

Based on the literature about the impact of the news about Fed tapering policy and data availability of Bitcoin price (quoted in the local Bitcoin exchanges in a given country), we take Brazil, India, and Mexico as the group of treated emerging market countries of which foreign exchange rates are heavily influenced by tapering “news.” We exclude countries such as Paraguay, South Africa, Indonesia and Uruguay mainly because data on the local price of Bitcoin in these countries is not available in early 2013.

Our controlled group of countries are selected such that these countries experienced relatively small depreciations and that data on the local price of Bitcoin is available. As a result, our controlled group of countries include Hong Kong, Switzerland, U.K., and Eurozone countries.³

3.4. Sample Period

The sample period is from April 1st, 2013 to June 1st, 2013; it covers the two month period around our cutoff date of tapering “news” shock: May 1st, 2013. The period after such a cutoff date is considered as “after-shock” period during which the after-shock time dummy is set to one.

Our choice of the length of the sample period is mainly due to the tradeoff between the relevance to the event, for which a short-window sample period is preferred, and the large number of observations, for

³ For the case of Eurozone countries, the data on the Bitcoin price (quoted for trades taking place in Bitcoin exchanges located in these countries) is reported for a group of these countries but not for individual member countries.

which a long-window sample period is preferred. As such, we take the two month period (i.e., one month before and after, respectively, the cutoff “news” shock date) as our benchmark sample period.

IV. Data

4.1. Data Source

We collect daily series of the local price of Bitcoin (based on trades of Bitcoin taking place in the local Bitcoin exchanges in a given country), local price of gold (in local currency terms), and price of US dollar in the local currency (i.e., the number of local currencies exchanged to one US dollar) for each of treated and controlled countries. The daily Bitcoin prices are obtained from the aggregation website Bitcoin Charts [bitcoincharts.com], which provides data from 72 exchanges, trading Bitcoins in 31 currencies. We focus on a period of 60 days from April 1st, 2013 to June 1st, 2013.

We collect daily gold price series, in local currencies, from the website of *World Gold Council* for 11 countries. Gold price is per troy ounce. (Data on the gold price for major currencies is available from as early as 1978.) We also collect data on the daily exchange rates of several currencies from St. Louis FED.

4.2. Sample Countries

The data on the gold price is available for ten countries other than U.S. as follows: Australia, Canada, China, Eurozone, India, Japan, Switzerland, Thailand, and U.K. And the data on the exchange rate between U.S. dollar and local currencies are collected for a total 16 countries: Australia, Brazil, Canada, China, Denmark, Eurozone, Hong Kong, India, Japan, Mexico, Norway, Singapore, Sweden, Switzerland, Thailand, and U.K.

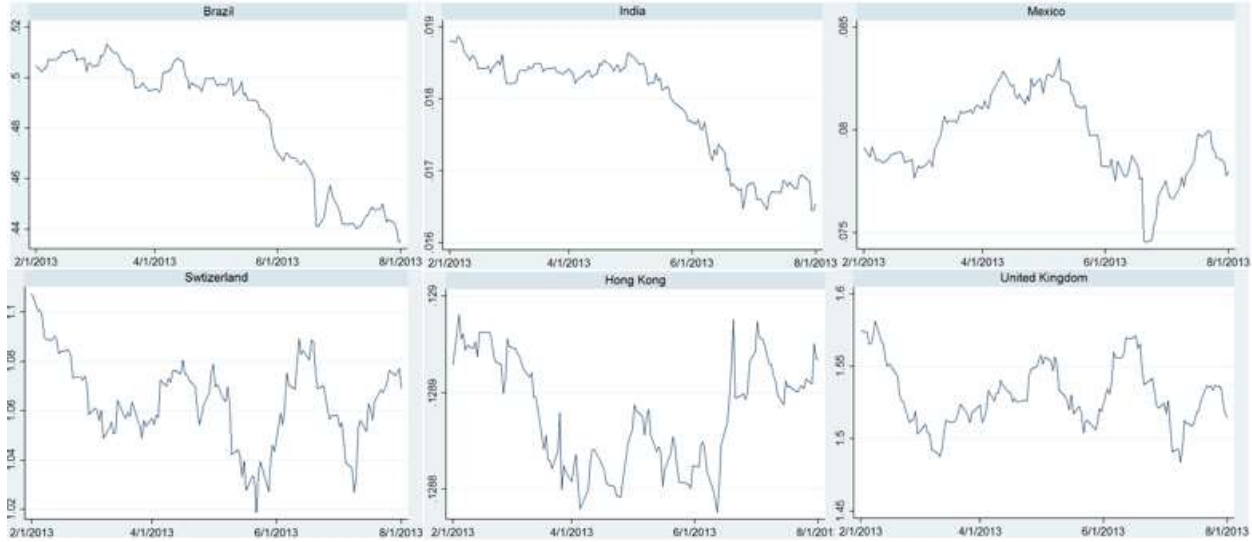
As mentioned earlier, data on local price of Bitcoin is available for 31 countries. Due to the limited availability of data either on gold price or on the exchange rate, we have either 10 sample countries for the case of prices of gold and Bitcoin or 16 countries for the case of U.S. dollar’s exchange rate and Bitcoin price. Note that U.S. is excluded from the sample given that the tapering news shock itself is originated from the U.S.

4.3. Figures for Time Series of Bitcoin Price, Gold Price, and U.S. Dollar’s Exchange Rate

To illustrate the data, we plot time series of the three assets’ prices for several countries. Figure 1 plots time series of the exchange rates between U.S. dollar and local currencies (in terms of U.S. dollars

exchanged to one unit of a local currency) for six countries: Brazil (left-top panel), India (center-top panel), Mexico (right-top panel), Switzerland (left-bottom panel), Hong Kong (center-bottom panel), and U.K. (right-bottom panel). Scales of the vertical axis are different across countries.

Figure 1: Exchange rate, U.S. Dollars Per One Unit of Local Currency

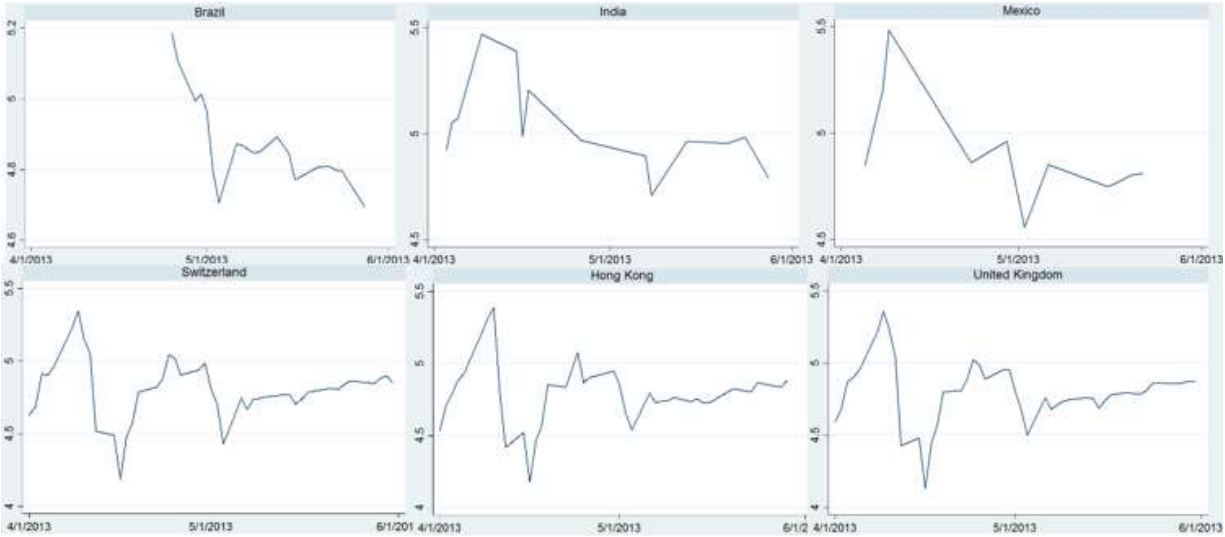


Note: this figure presents the foreign exchange rates (in terms of U.S. dollars exchanged to one unit of local currency) for six countries: Brazil (left-top panel), India (center-top panel), Mexico (right-top panel), Switzerland (left-bottom panel), Hong Kong (center-bottom panel), and U.K. (right-bottom panel). Scales of the vertical axis are different across countries.

From Figure 1, we can see that Brazil, India, and Mexico, the three treated countries, experienced large depreciations around the beginning of May 2013 when the tapering news started to spread over the world, while the exchange rate changed almost little in Hong Kong and Switzerland during the same period. In case of U.K., the exchange rate fluctuated to magnitude small, but not large.

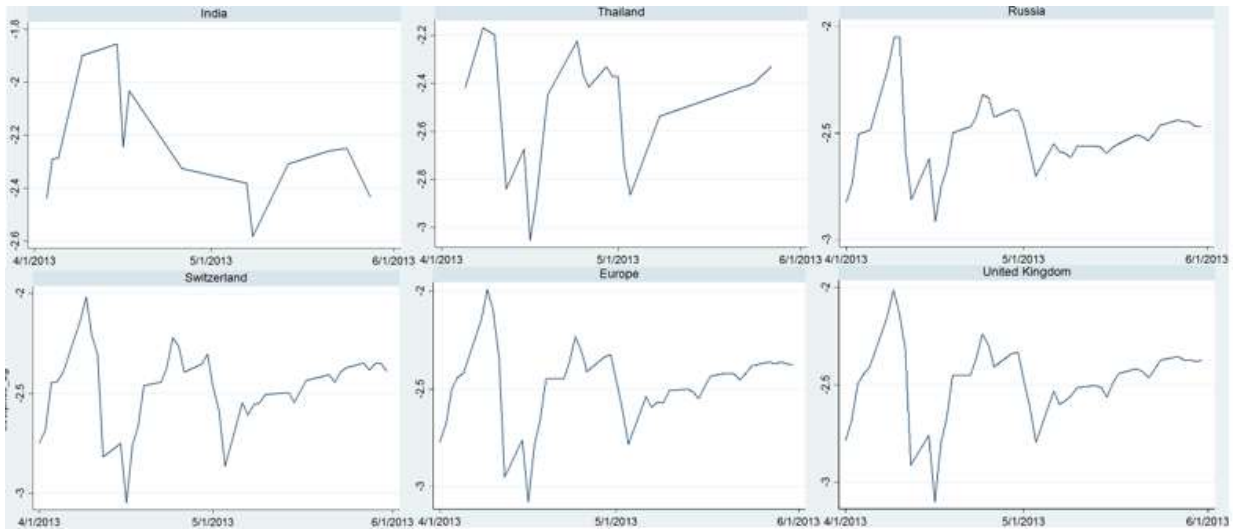
Figure 2 and 3 plot time series of the (log) relative price of Bitcoin to U.S. dollar's exchange rate and to the gold price, respectively. It is of our interest to examine how such a relative price of Bitcoin changed after the tapering news, especially its difference between the three emerging market countries that experienced large depreciations after the news and some advanced countries (e.g., Hong Kong and Switzerland) that experienced small (or almost little) depreciations.

Figure 2: Log of Relative Price of Bitcoin to U.S. Dollar



Note: this figure presents the (log) price of Bitcoin relative to U.S. dollar exchange rate (all in local currencies) for six countries: Brazil (left-top panel), India (center-top panel), Mexico (right-top panel), Switzerland (left-bottom panel), Hong Kong (center-bottom panel), and U.K. (right-bottom panel).

Figure 3: Log of Relative Price of Bitcoin to Gold



Note: this figure presents the (log) price of Bitcoin relative to gold (all in local currencies) for six countries: Brazil (left-top panel), India (center-top panel), Mexico (right-top panel), Switzerland (left-bottom panel), Hong Kong (center-bottom panel), and U.K. (right-bottom panel).

V. Results

In this section, we discuss the results of our empirical analysis. In particular, we discuss how the relative price of Bitcoin to U.S. dollar (or to gold) changed after the tapering news, especially its difference between treated and controlled countries that differ in terms of their exposure to the depreciation risk caused by Fed tapering news.

5.1. Descriptive Statistics

Table 1 presents summary statistics of the relative price of Bitcoin to gold and U.S. dollar, respectively, for each sample country. As shown by Table 1, the relative price of Bitcoin either to U.S. dollar or to the gold price exhibit differences across countries, which could be due either to the difference in the sample periods across countries or to the deviations from the law of one price in reality (e.g., some frictions in the financial market), where both of these two are possible. In particular, note that prices of Bitcoin, gold, and U.S. dollar are not necessarily the same across different countries, though these three assets are globally traded. The reason is that financial markets are, in reality, not perfectly integrated over the world so that differences in the local demand/supply could, at least temporarily, results in deviations from the law of one price (i.e., purchasing power parity (*aka* PPP)). As such, the relative price of Bitcoin either to U.S. dollar or to the gold price could exhibit differences across countries when common global shocks (e.g., news about the U.S. tapering policy) affect these countries differently. For instance, the announcement of the U.S. tapering policy might have affected (e.g., in terms of the foreign exchange rate and stock market valuation) some emerging market economies (e.g., India and Brazil) to magnitude greater than some advanced economies (e.g., Hong Kong and Switzerland). It is interesting to examine whether or not the relative price of Bitcoin also behaved systemically differently between these two groups of countries, which calls for a systemic statistical analysis, discussed in the next section.

Table 1: Summary Statistics

| Countries | Obs | Mean | S.D | Min | Max |
|---|-----|-------|-------|-------|-------|
| <i>Log relative price of Bitcoin to USD</i> | | | | | |
| United States | 62 | 4.803 | 0.186 | 4.179 | 5.369 |
| United Kingdom | 44 | 4.797 | 0.217 | 4.132 | 5.356 |
| Thailand | 19 | 4.761 | 0.280 | 4.181 | 5.195 |
| Switzerland | 43 | 4.806 | 0.211 | 4.185 | 5.348 |
| Sweden | 44 | 4.810 | 0.223 | 4.128 | 5.374 |
| Singapore | 40 | 4.813 | 0.234 | 4.155 | 5.409 |
| Russia | NA | NA | NA | NA | NA |
| Norway | 26 | 4.894 | 0.272 | 4.234 | 5.522 |
| Mexico | 11 | 4.899 | 0.249 | 4.557 | 5.485 |
| Japan | 44 | 4.799 | 0.221 | 4.093 | 5.388 |
| India | 14 | 5.026 | 0.208 | 4.709 | 5.468 |

| | | | | | |
|-----------|----|-------|-------|-------|-------|
| Hong Kong | 39 | 4.791 | 0.226 | 4.179 | 5.391 |
| Europe | 44 | 4.799 | 0.217 | 4.154 | 5.373 |
| Denmark | 40 | 4.802 | 0.223 | 4.059 | 5.359 |
| China | 40 | 4.802 | 0.221 | 4.208 | 5.390 |
| Canada | 44 | 4.797 | 0.213 | 4.260 | 5.389 |
| Brazil | 20 | 4.872 | 0.125 | 4.694 | 5.186 |
| Australia | 44 | 4.802 | 0.219 | 4.154 | 5.368 |

| <i>Log relative price of Bitcoin to Gold</i> | | | | | |
|--|----|--------|-------|--------|--------|
| United States | 45 | -2.479 | 0.197 | -3.050 | -1.994 |
| United Kingdom | 45 | -2.480 | 0.203 | -3.099 | -2.009 |
| Thailand | 20 | -2.516 | 0.255 | -3.051 | -2.170 |
| Switzerland | 44 | -2.473 | 0.196 | -3.046 | -2.018 |
| Sweden | NA | NA | NA | NA | NA |
| Singapore | NA | NA | NA | NA | NA |
| Russia | 45 | -2.516 | 0.168 | -2.915 | -2.049 |
| Norway | NA | NA | NA | NA | NA |
| Mexico | NA | NA | NA | NA | NA |
| Japan | 45 | -2.478 | 0.207 | -3.136 | -1.978 |
| India | 14 | -2.256 | 0.203 | -2.584 | -1.855 |
| Hong Kong | NA | NA | NA | NA | NA |
| Europe | 45 | -2.479 | 0.203 | -3.076 | -1.993 |
| Denmark | NA | NA | NA | NA | NA |
| China | 41 | -2.469 | 0.205 | -3.022 | -1.974 |
| Canada | 45 | -2.481 | 0.199 | -2.971 | -1.975 |
| Brazil | NA | NA | NA | NA | NA |
| Australia | 45 | -2.475 | 0.204 | -3.078 | -1.996 |

5.2. Main Results

In this section, we discuss the main results for the event-study panel regression of the Bitcoin price relative to the gold price (or to the exchange rate of U.S. dollar).

We begin by discussing how the Bitcoin price and gold price have behaved differently between U.S. and India around the Fed-tapering “news” shock period. Note that differently from U.S., India experienced large depreciation after such a news announcement. As such, the need for hedging is likely to increase greatly in India in the aftermath of the arrival of the news. In particular, it is of our interest to examine whether Bitcoin was preferred to the traditional hedging tools, e.g., gold and U.S. dollar, in India. Therefore, we estimate how the log prices of Bitcoin and gold (or log prices of Bitcoin and log exchange rate of U.S. dollar to a local currency) behaved differently before and after the news shock, especially how such a price change is different between Bitcoin and gold (or between Bitcoin and U.S. dollar). Formally, the regression equation in this case is written as:

$$\ln(q_{i,j,t}) = \delta_0 * Treated_j + \delta_1 * Time_t + \delta_2 * Treated_j * Time_t + e_{i,j,t} \quad (2)$$

where $\ln(q_{i,j,t})$ refers to the log of the price of asset j in country i at period t , $Treated_j$ the dummy indicating whether or not asset j of observation is Bitcoin (labeled Bitcoin dummy), $Time_t$ the dummy indicating whether or not the period t of observation is after the arrival of the tapering news (labeled after-news dummy), and $e_{i,j,t}$ the error term. The coefficient on the interaction term between the Bitcoin dummy and after-news dummy $Treated_j * Time_t$ is of our main interest. In the following regressions, we consider either (Bitcoin, gold) sample or (Bitcoin, U.S. dollar) sample for a given country.

Table 2: Fed-Tapering “News” Shock: Bitcoin vs. Gold

| Ln price | United States | India |
|---|-----------------------|-----------------------|
| Time: After news | -0.0508*** [0.000] | -0.0398*** [0.003] |
| Treated : Bitcoin price (Controlled: Gold price) | -2.4765*** [0.000] | -2.1971*** [0.000] |
| Time*Treated | 0.0018 [0.971] | -0.1744** [0.039] |
| Constant | 7.3053*** [0.000] | 11.3013*** [0.000] |
| No. of observation | 107 | 65 |
| R-square | 0.9867 | 0.9885 |
| Prob > F | 0.000 | 0.000 |

Note: this table presents results for the event-study regression of the log prices of two assets, Bitcoin and gold, for U.S. and India, respectively. ‘Time’ refers to the after-shock dummy, ‘Treated’ the Bitcoin dummy, and ‘DID’ the interaction term between after-shock dummy and Bitcoin dummy.

Table 2 presents the results for the regression equation (2). We are interested in the (log) price change, captured by the ‘Time’ dummy indicating the aftermath of the arrival of tapering news, especially the difference in the price change between Bitcoin and gold, captured by the interaction term between the after-news dummy and Bitcoin dummy. In this regression for a given country, we also control for the Bitcoin-fixed effect, via the Bitcoin dummy, labeled ‘Treated.’ We can see that in U.S., there is no significant difference in the price change (after the news) between bitcoin and gold. By contrast, in India, the Bitcoin price relative to the gold price significantly decreased, by about 17 percent, after news. This finding suggests that in India experiencing a large depreciation, investors might have preferred gold to Bitcoin as a hedge against the foreign exchange rate risk. The reason is that the sharp decline in the relative price of Bitcoin to gold observed in India is not likely due to some events specific to Bitcoin because Bitcoin-specific negative shocks, if any, should have also affected negatively the relative price of Bitcoin to gold in U.S. but it was not the case in the data.

We investigate if the same pattern is also found for the case of Bitcoin vs. U.S. dollar in the sense that U.S. dollar is also one of the traditional hedge against the depreciation risk of the local currency. For a given country, we take the exchange rate of U.S. dollar in terms of local currencies (i.e., the number of a local currency exchanged to one U.S. dollar) as the price of U.S. dollar. We compare the relative price change of Bitcoin to U.S. dollar after the news shock between India and Hong Kong. Note that Hong Kong's dollar is pegged to U.S. dollar, implying that in Hong Kong, the exchange rate between U.S. dollar and Hong Kong dollar was hardly affected by the tapering news. By contrast, India experienced a large depreciation after the tapering news. It is of our interest to examine how the relative price of Bitcoin to U.S. dollar changed differently between India and Hong Kong.

Table 3: Fed-Tapering “News” Shock: Bitcoin vs. U.S. Dollar

| Ln price | Hong Kong | India |
|--|-----------------------|-----------------------|
| Time: After news | -0.0002*** [0.000] | 0.0119*** [0.002] |
| Treated : Bitcoin price (Controlled: U.S. Dollar) | 4.8246*** [0.000] | 5.1093*** [0.000] |
| Time*Treated | -0.0510 [0.341] | -0.2262*** [0.008] |
| Constant | 2.0494*** [0.000] | 3.9949*** [0.000] |
| No. of observation | 98 | 64 |
| R-square | 0.9962 | 0.9978 |
| Prob > F | 0.000 | 0.000 |

Note: this table presents results for the event-study regression of the log prices of two assets, Bitcoin and U.S. dollar, for Hong Kong and India, respectively. ‘Time’ refers to the after-shock dummy, ‘Treated’ the Bitcoin dummy, and ‘DID’ the interaction term between after-shock dummy and Bitcoin dummy.

Table 3 presents the results for the regression of the log prices of Bitcoin and U.S. dollar on the after-shock time dummy, Bitcoin dummy, and the interaction term between the after-shock time dummy and Bitcoin dummy. We can see that in Hong Kong, the relative price of Bitcoin to U.S. dollar did not significantly changed after the news shock. By contrast, in India, the relative price of Bitcoin to U.S. dollar significantly declined, by about 23 percent. Taken together, these results suggest that in India experiencing a large depreciation, Bitcoin is less preferred to U.S. dollar as a hedge against the depreciation risk of the local currency. The reason is that in Hong Kong experiencing almost no depreciation, the relative price of Bitcoin to U.S. dollar did not decline during the same period, indicating that the sharp decline in the relative price of Bitcoin observed in India is not likely due to Bitcoin-specific negative shocks. If there were Bitcoin-specific negative shocks, then the relative price of Bitcoin to U.S. dollar should have also dropped substantially in Hong Kong, which was not the case in the data.

To sum, we have found that in India experiencing a large depreciation after the tapering news, the relative price of Bitcoin either to gold or to U.S. dollar declined substantially, by about 17 percent or more. By contrast, after the tapering news, the relative price of Bitcoin to gold did not significantly decrease in U.S., and the relative price of Bitcoin to U.S. dollar did not significantly changed in Hong Kong. Our findings for U.S. and Hong Kong suggest that the decline in the relative price of Bitcoin to gold (or to U.S. dollar) observed in India is not likely due to Bitcoin-specific negative shocks. Note that after the tapering news, India experienced a large depreciation, while U.S. and Hong Kong experienced almost no depreciation during the same period. Thus, our findings suggest that the two traditional hedging vehicles, gold and U.S. dollar, are still preferred to Bitcoin as a hedge against the depreciation risk of a local currency.

We proceed to looking for more systemic evidence supporting our earlier findings for the case of India. As discussed earlier in section III, we have three treated countries: Brazil, India, and Mexico, which satisfies two conditions: (i) they experienced large depreciations after the tapering news, and (ii) data on the local price of Bitcoin is available. We aim to examine whether or not the changes in the relative price of Bitcoin to gold (or to U.S. dollar) after the tapering news are significantly different between treated countries, which experienced large depreciations, and controlled countries, which experienced either little or small depreciations. The reason why we focus on the difference in such a (relative) price change between treated and controlled countries is that as discussed earlier, we want our estimate of the response of the treated countries' Bitcoin prices to the depreciation shock (caused by the tapering news) not contaminated by the effect of omitted factors, if any, specific to Bitcoin. Put differently, in our event-study regression analysis, we control for the change in the relative Bitcoin price observed in the controlled countries is served as a proxy for the effect of omitted factors specific to Bitcoin.

Table 4: Fed-Tapering “News” Shock and Price of Bitcoin Relative to U.S. Dollar

| Dependent variable: | Ln (Bitcoin/US Dollar) | Ln (Bitcoin/US Dollar) |
|--------------------------------|--|-----------------------------------|
| Controlled countries: | Model I (Hong Kong, Switzerland, UK, Eurozone) | Model II (All other countries) |
| Time: After news | -0.0606* [0.062] | -0.0643*** [0.001] |
| Treated :Brazil, India, Mexico | 0.2738*** [0.000] | 0.2659*** [0.000] |
| Time*Treated | -0.2210*** [0.000] | -0.2174*** [0.000] |
| Constant | 4.8280*** [0.000] | 4.8359*** [0.000] |

| | | |
|--------------------|--------|--------|
| No. of observation | 215 | 556 |
| R-square | 0.1560 | 0.0708 |
| Prob > F | 0.000 | 0.000 |

Note: this table presents results for the event-study panel regression of the (log) Bitcoin price relative to the exchange rate of U.S. dollar. ‘Time’ refers to the after-shock dummy, ‘Treated’ the treated country dummy, and ‘DID’ the interaction term between after-shock dummy and treated country dummy.

Table 4 presents the results for the panel regression of the relative Bitcoin price (to U.S. dollar) on the after-shock time dummy, the treated-country dummy, and the interaction term between the two dummies (i.e., results for the regression equation (1)). Model I is the case in which we choose the four countries as the controlled countries: Hong Kong, Switzerland, U.K., and Eurozone countries, while in the case of Model II, we include all countries other than the three treated countries into the group of controlled countries.

From the results for Model I in Table 4, we can see that the coefficient on the interaction term between after-news dummy and treated-country dummy is significantly negative, about -0.22 percent. That is, our results for the difference-in-difference regression of the Bitcoin price relative to US dollar show that in treated countries experiencing the large depreciations after the tapering “news” shock, the relative price of Bitcoin to US dollar substantially *decreased*, rather than increased, by about 22 percent than in controlled countries that experienced small (or almost no) depreciations. These findings confirm our earlier findings that investors, at least currently, prefer US dollar to Bitcoin as a hedge against currency risks.

Note that our findings are hardly likely to be driven by the effect of omitted factors, if any, specific to Bitcoin. The reason is that as discussed earlier, Bitcoin-specific omitted factors are effectively controlled by our difference-in-difference regression framework in which the effect of such Bitcoin-specific omitted factors should be reflected to the controlled country’s change in the relative price of Bitcoin, which is then compared to that of the treated country.

Our findings are robust to an alternative case in which we include more sample countries into the group of controlled countries. See the results for Model II in Table 4.

We carry out the same difference-in-different regression analysis for the case in which the Bitcoin price relative to the gold price is analyzed. Regression results in this case are presented by Table 5.

Table 5: Fed-Tapering “News” Shock and Price of Bitcoin Relative to Gold

| Dependent variable: | Ln (Bitcoin/Gold) | Ln (Bitcoin/Gold) |
|---------------------|-------------------|-------------------|
| | Model I | Model II |

| Controlled countries: | (Hong Kong, Switzerland, UK, Eurozone) | (All other countries) |
|--------------------------------|---|-----------------------|
| Time: After news | -0.0083 [0.814] | -0.0124 [0.551] |
| Treated :Brazil, India, Mexico | 0.3023*** [0.000] | 0.3062*** [0.000] |
| Time*Treated | -0.1900** [0.043] | -0.1859** [0.035] |
| Constant | -2.4732*** [0.000] | -2.4772*** [0.000] |
| No. of observation | 148 | 389 |
| R-square | 0.1178 | 0.0522 |
| Prob > F | 0.001 | 0.000 |

Note: this table presents results for the event-study panel regression of the (log) Bitcoin price relative to the gold price. ‘Time’ refers to the after-shock dummy, ‘Treated’ the treated country dummy, and ‘DID’ the interaction term between after-shock dummy and treated country dummy.

From Table 5, we can see that the same as for the results in Table 4, the interaction term between after-shock dummy and treated-country dummy is significantly negative: this coefficient is about -0.19 (quite similar to the one in Table 4, which is about -0.22). Results for both Model I and Model II in Table 5, in particular the coefficient on the interaction term between after-shock dummy and treated-country dummy, imply that in treated countries experiencing the large depreciations after the tapering “news” shock, the relative price of Bitcoin to gold substantially *decreased*, rather than increased, by about 19 percent than in controlled countries that experienced small (or almost no) depreciations. These findings suggest that investors prefer gold to Bitcoin as a hedge against currency risks.

VI. Conclusion

We study how the demand for Bitcoin as a store of value is affected either by speculative investment motive (i.e., capital gains) or by need for hedging currency risks (i.e., changes in foreign exchange and inflation rates). Our contribution to the literature is to identify the hedging benefit of Bitcoin by estimating the causal effect of the foreign exchange rate on the price of Bitcoin. In particular, we examine whether or not Bitcoin is preferred to gold and US dollar as a hedge against currency risks.

For the purpose of identification, we examine how the relative price of Bitcoin to gold (or to US dollar) responded to the “news” about U.S. Fed tapering policy (i.e., tightening U.S. monetary policy) around the beginning of May, 2013. In response to such a news shock, several emerging market countries (e.g., India, Brazil, and Mexico), labeled *treated*, experienced large depreciations in their currencies, while foreign exchange rates in some advanced countries (e.g., Hong Kong and Switzerland), labeled *controlled*, remained almost intact. As such, we examine how the relative price of Bitcoin to gold (or to

US dollar) behaved, in response to the tapering “news” shock, differently between such treated and controlled countries.

We find that in treated countries experiencing the large depreciation, the relative price of Bitcoin to gold (or to US dollar) substantially *decreased*, rather than increased, than in controlled countries. Our findings suggest that investors still prefer gold and US dollar to Bitcoin as a hedge against currency risks.

It would be interesting to explore other events, such as banking and financial crisis, that are likely to have affected the speculative investment motive and the need for hedging the currency risk. We leave it for future work.

VII. References

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