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Abstract : Bitcoin futures were launched by the Chicago Board of Options Exchange and the Chicago Mercantile Exchange group on December 18th, 2017. This study stands as a first attempt to explore the reactions of Bitcoin spot market to the launch of futures contracts. Using an event-study methodology and an adjusted asset pricing model, we show that Futures trading drove up the price of Bitcoin immediately after the announcement day. This reaction started to decrease noticeably following the launch of the futures contracts. Such outcome seems in line with the trading behavior that typically accompanies the launch of futures markets for an asset.

Keywords : The lunch of future contracts ; Bitcoin price ; Improved event study methodology.

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1. Introduction

Bitcoin is one of the most speculative, volatile and risky assets in the history of finance. Huge concerns have been raised about these Bitcoin properties. The extreme fluctuations have predominantly been attributed to the scandals and frauds which are rampant in the Bitcoin ecosystem, the lack of confidence in the bitcoin system, the large unknowns involved in the development of this digital currency (Bouoiyour and Selmi 2016; Ciaian et al. 2016; Bouoiyour et al. 2019), the informational inefficiency (Bariviera 2017; Cheah et al. 2018). Also, as Bitcoin is a decentralized currecy that not backed any central entity, the core system defies regulation and enforcement efforts, which exacebates the anxiety of financial regulators and cybercrime fighters (Möser et al. 2013). The blockchain poses also a barrier a further barrier to employing Bitcoin for general-purpose payments. Accordingly, Böhme et al. (2015) claimed that the growth of Bitcoin payments is actually not as quick as one might expect for a successful payments service. Moreover, because of the centralization in the Bitcoin ecosystem, counterparty risk has become wider (Böhme et al. 2015). The operations established with fraudulent intent also pose potential dangers to the Bitcoin ecosystem (Vasek and Moore 2015). These characteristics are to be taken against Bitcoin, as being a medium of exchange and a store of value. Even though volatile movements may harm the attractiveness of any asset, price swings can cause some trading benefits. This is something that many investors have been taking advantage of by buying Bitcoin and then selling at a profit (Selmi et al. 2018). In other words, its highly volatile behavior allows speculators and traders to earn supernormal returns in a short-time span. Besides, experts contend that increased state regulations around Bitcoin could make this cryptocurrency more attractive for investors and traders who formerly shied away from it due to its sizeable volatility and speculative nature (Cheung et al. 2015).

Another challenge facing the future of Bitcoin relies on countries' different regulatory announcements. Suspected of promoting money laundering and terrorism, Bitcoin has attracted a tremendous attention from regulators. While some countries have explicitly permitted its use and trade, others have banned it or restricted its usage. Even though the legal status of Bitcoin is still changing from one country to another, Bitcoin futures can be traded on regulated exchanges. Bitcoin futures contracts were launched in December 2017, and have gained a significant traction in the market. Investors and traders who seem unable to hold spot positions in Bitcoin mainly owing to compliance regulations, are now allowed to trade Bitcoin futures contracts. The introduction of futures would help tilt the scale a bit in the direction of Bitcoin. It would mitigate the risks associated to Bitcoin's lack of regulation. The Commodity Futures Trading Commission introduced specific rules for all speculators and investors in the futures contracts. This would undoubtedly attract professional traders and then raise the trading volume in the market. An increase of the trading volume is a very good news for Bitcoin traders and investors since it would establish the cryptocurrency futures as a significant financial instrument, and hence Bitcoin itself. A futures contract are a tool to hedge positions and minimize the risk of the unknown. It is also employed for arbitrating between current spot and future contracts. Since its launch, Bitcoin futures contracts were expected to herald stability and a sharp increase of liquidity in the crypto market. To our knowledge, no previous study attempted to examine the impacts of futures markets on Bitcoin spot prices.

This paper conducts an improved event-study methodology following recent studies (in particular, Ramiah et al. 2016 ; Pham et al. 2018) that assesses the abnormal returns behavior of the Bitcoin market around the Bitcoin futures launch date (December 18, 2017). The event study methodology predicates that the abnormal returns of a market are a function of revenue minus cost. Zero abnormal returns imply that neither revenue nor cost changes as a consequence of the introduction of Bitcoin futures. Otherwise, positive and negative abnormal returns mean favourable and unfavourable consequences, respectively. Since its inception in 2009 till mid-2017, Bitcoin price was still under $4,000. In the second half of 2017, it raised notably to nearly $20,000, but decreased promptly since mid-December. Our results reveal that the Bitcoin market experienced a positive response on the announcement date, but this response started to decline immediately following the launch of the futures contracts. The remainder of the paper is organized as follows. Section 2 describes the event study methodology and data sources. Section 3 reports and discusses the main findings. Some concluding remarks are provided in section 4.

2. Methodology and data

To meticulously assess the Bitcoin market reactions to the launch of Bitcoin futures trading on the Chicago Mercantile Exchange on December 18, 2017, we follow Ramiah et al. (2016) and Pham et al. (2018) by adjusting daily returns to find out the ex-post-abnormal returns where the adjustment is determined through the Capital Asset Pricing Model (CAPM) to account for a number of unknowns. The abnormal returns (AR_t) are, thereafter, expressed as follows :

$$AR_t = \sum_{i=1}^{n} \ln\left(P_t \big/ P_{t-1} \right) - E(R_t) \qquad (1)$$

With $E(R_{it})$ is determined via the following equation:

$$E(R_t) = \beta_{0t} + \beta_{1t}(\tilde{r}_{Mt} - \tilde{r}_{Tt}) \qquad (2)$$

With P_t is the adjusted price of the Bitcoin market at time t, $E(R_t)$ is the expected return on the Bitcoin market at time t, $\tilde{r}_{Mt}$ is the market return, and $\tilde{r}_{ft}$ refers to the Bitcoin investment trust. The latter is used as a proxy of the market risk-free rate. In reality, the risk-free rate does not exist since even the safest investments have a smaller risk level. Because storing Bitcoin safely is very challenging, the Bitcoin Investment Trust's stocks can be regarded as an effective solution as it is protected by a robust security system that utilizes industry-leading security standards.

For the computation of abnormal returns, we require information on Bitcoin prices. We consider daily price data for the Coin Desk Bitcoin Price Index ranging from July 18, 2010 to March 31, 2018. The Coin Desk Bitcoin Price Index corresponds to the average of Bitcoin prices among leading Bitcoin exchanges, and thus it captures global Bitcoin prices better than other alternatives (https://www.coindesk.com/price/bitcoin). Throughout the rest of our investigation, we allow for the possible overreaction or under-reaction to the date related to the official launch of Bitcoin futures contracts whereby the market tends to correct its mistakes in subsequent periods. We define "0" as the event day. Thereafter, the estimation and event windows can be determined. The estimation window provides the information needed to specify the normal return (i.e., prior to the event day). The event window and the post-event window are used to investigate the behavior of the Bitcoin market following the introduction of futures contracts.

Accurately, we consider a window of 260 days, consisting of 239 days before the event day and 20 days after the event as well as the event day. It must be stressed at this stage that there is no consensus among academics on the most appropriate length of the estimation period, but MacKilay (1997) recommended to utilize an estimation period of 260 trading days. The cumulative abnormal returns (CAR) for the Bitcoin market are estimated over the event window [τ_1; τ_2] surrounding the event day t = 0, where [τ_1; τ_2] = ∈ [−5;+5],[−10;+10], and [-20; +20]. To assess thereafter the immediate change in systematic risk, we adjust the CAPM by incorporating an interaction variable. Our immediate risk model detects the average change in risk resulting from the launch of futures market. A dummy variable (*DV*), which takes the value of one on the first day of trading after the introduction of futures contracts and zero otherwise, is created in an attempt to depict the immediate changes in systematic risk. This *DV* is multiplied by the market risk premium to form the interaction variable. Based on Ramiah et al. (2018)'s study, the model to be estimated is expressed as follows :

$$\tilde{r}_{mt} - \tilde{r}_{ft} = \beta^0 + \beta^1 \left[\tilde{r}_{mt} - \tilde{r}_{ft}\right] * DV + \beta^2 DV_t + \tilde{\varepsilon}_t \quad (3)$$

where $\tilde{r}_{mt}$ is the market return at time *t*, $\tilde{r}_{ft}$ is the risk free rate at time t, *DV* is a dummy variable that takes the value of one on the first day of trading following the introduction of futures contracts and zero otherwise, β^0 is the intercept of the regression equation [E(β^0) = 0], β^1 corresponds to the coefficient of the average short-term systematic risk, and β^2 measures the coefficient of *DV*, $\tilde{\varepsilon}_t$ is the error term. The Equation (3) is estimated to identify the short-term change in systematic risk of the Bitcoin market.

3. Event study methodology results

This paper examines the reaction of the Bitcoin market to the launch of futures contracts. The Chicago Board of Options Exchange (CBOE) and the Chicago Mercantile Exchange (CME) group, the world's most leading derivatives marketplaces, announced 18th December as the launch date of Bitcoin futures contracts. Following this announcement, many other financial institutions began showing more confidence in this digital currency. The CME group proclaimed that Bitcoin futures contracts will be subject to several effective risk management measures. The latter incorporate, among others, an initial margin of 35 %, and a position and intraday price limits.

Table 1 summarizes ARs, CARs (-239 days) prior to the launch of futures contracts and CARs (5, 10, 15 and 20 days) and their t-statistics following the introduction of Bitcoin futures. We note that the Bitcoin market exhibited a positive response on the event day, but this reaction started to decerease immediately following the launch of the futures contracts. More specifically, the Bitcoin market witnessed an abnormal return of -0.34% over five trading days of the announcement, and continued to experience a cumulative abnormal return of -0.48% after twenty days.

Table 1. The reaction of the Bitcoin market to the launch of futures contracts

	Bitcoin
AR	0.72**
	(2.81)
CAR(-239)	1.14***
	(3.59)
CAR5	-0.34***
	(-3.62)
CAR10	-0.51**
	(-2.38)
CAR15	-0.42*
	(-1.76)
CAR20	-0.48***
	(-4.11)

Notes: AR: Abnormal returns; CAR: Cumulative abnormal returns; ∗, ∗∗, ∗∗∗ denote statistical significance at the 10%, 5% and 1% levels, respectively.

Importantly, the changes in the short-term systematic risk following the introduction of futures contracts are reported in Table 2. It is a common practice in finance to determine changes in systematic risk by using Beta. The latter is a measure of a volatility related to the market. A Beta of 0 indicates that the market under study is not vulnerable to systematic risk. A Beta of 1 or near to 1 implies that the market is sensitive to systematic risk. A Beta greater than 1 indicates that the considered market is very sensitive to systematic risk. The changes in short-term systematic risk of the Bitcoin market following the introduction of futures contracts are reported in Table 2. We show that the introduction of futures contracts has led to a decrease in systematic risk for the Bitcoin market immediately after the announcement date. Following the launch of futures contracts, the Bitcoin market experienced a marked increase in systematic risk.

Table 2. Changes in short-term systematic risk of the Bitcoin market following the lunch of futures contracts

	Bitcoin
Beta prior to the launch of futures contracts	0.49
Immediate risk	0.37
Beta post- the launch of futures contracts	0.71

4. Robustness tests

There exist different ways to ascertain the robustness of our results. In this study, we have first tested their sensitivity to the inclusion of further control variables. These variables incorporate supply-demand determinants, the speculative contributors, the technical factors (in particular, the hash rate) and the macroeconomic and financial drivers. Precisely, the frequency at which one unit of Bitcoin is used to purchase tradable or non-tradable products for a given period (monetary velocity, MV) may exert a significant influence on Bitcoin. Further, the attention-driven investors' attitudes towards Bitcoin may exert a positive or negative effect on the price of Bitcoin depending on whether good or bad news dominate social media networks (Bouoiyour and Selmi 2015). To measure the speculative attitude of Bitcoin, we use the daily views from Google Trends by searching the term "Bitcoin" (TTR). Besides, the emergence of Bitcoin has provided new approaches concerning payments such as the "hash rate (HR)". HR is the measuring unit of the processing power of the Bitcoin network. It makes an intensive mathematical operation that has a significant impact on Bitcoin purchasers (Ciaian et al. 2016). Moreover, Bitcoin is driven by different macroeconomic and financial factors including the Shangai market index (SMI), the ratio between volumes on the currency exchange market and trade (ETR). Table A1 (Appendix) reports all the data used and the sources. In brief, the equation to be estimated is denoted as:

$$\tilde{r}_m - \tilde{r}_{ft} = \delta^0 + +\delta^1 \left[\tilde{r}_{mt} - \tilde{r}_{ft}\right] * DV + \delta^2 DV_t + \delta^3 MV_t + \delta^4 ETR_t + \delta^5 HR + \delta^6 SMI + \delta^7 TTR + \tilde{\xi}_t \quad (4)$$

where, $\tilde{r}_{mt}$ is the market return at time t, $\tilde{r}_{ft}$ is the risk free rate at time t , DV is a dummy variable that takes the value of one on the first day of trading following the introduction of Bitcoi futures and zero otherwise, δ^0 is the intercept of the regression equation [E(δ_i^0) = 0], δ_i^1 measures the average short-term systematic risk of the Bitcoin market, δ^2 corresponds to the DV coefficient, δ^3 is the change in monetary velocity coefficient, δ_i^4 corresponds to the change in the exchange-trade ratio coefficient, δ^5 corresponds to the hash rate coefficient, δ^6 refers to the Shangai market index coefficient, δ^7 corresponds to the attractiveness towards Bitcoin coefficient and $\tilde{\xi}_t$ is the error term.

By controlling for potential control variables, our results do not change fundamentally. Table 3 summarizes ARs, CARs before and after the announcement of the launch of futures contracts. We robustly find that Bitcoin market experienced a sharp increase in the day relative to the launch on December 18th, 2017 (i.e., t=0). But this response becomes negative over 5 to 20 trading days from the announcement date.

Table 3. The reaction of the Bitcoin market to the launch of futures contracts after controlling for further control variables

	Bitcoin
AR	0.63***
	(5.28)
CAR(-239)	1.23**
	(2.71)
CAR5	-0.29***
	(-4.37)
CAR10	-0.41*
	(-1.86)
CAR15	-0.38***
	(-3.72)
CAR20	-0.52***
	(-3.37)

Notes: AR: Abnormal returns; CAR: Cumulative abnormal returns; ∗, ∗∗, ∗∗∗ denote statistical significance at the 10%, 5% and 1% levels, respectively.

Furthermore, the changes in the short-term systematic risk following the announcement of the launch of Bitcoin futures are still solid and unambiguous after controlling for relevant explanatory variables (*MV*, *ETR*, *HR*, *SMI*, see Equation (4)). It is often revealed that the launch of futures contracts had led to an immediate decline in systematic risk for Bitcoin following the announcement day (see Table 4).

Table 4. Changes in short-term systematic risk of the Bitcoin market following the lunch of futures contracts

	Bitcoin
Beta prior to the launch of futures contracts	0.52
Immediate risk	0.44
Beta post- the launch of futures contracts	0.83

To further check the robustness of our findings, we apply a variety of tests on all of the regression models. The Chow test is used to detect the existence of structural breaks following the launch of futures contracts, the Wald test is applied to control for redundant variables, AR and MA terms are included to account for possible autocorrelation and several GARCH specifications (symmetric versus asymmetric and linear versus nonlinear) are carried out to correct for the ARCH effects. We confirm the previous findings. Detailed results are available upon request. It must be pointed out that the event study methodology has been largely criticized for several reasons including the non-normality of the abnormal return distribution, greater kurtosis and positive skewness that may affect the parametric t statistics. To avoid these shortcomings, we carry out the Corrado (1989) non-parametric ranking test and the non-parametric conditional distribution suggested by Chesney et al. (2011) to assess the response of the Bitcoin market to the lunch of Bitcoin futures contracts. Our findings reported in Table 5 are supported by the robustness test results displayed in Table 5. After controlling for asynchronicity (corrado test), we robustly find that the lunch of Bitcoin futures result had negatively impacted the Bitcoin market. Consistently with the aforementioned tests, the findings of the non-parametric conditional probability of Chesney et al. (2011) reveal that the Bitcoin markets reacts significantly to the introduction of futures contracts.

Table 5. Robustness tests for the Bitcoin market following the lunch of futures contracts

Sectors		Conditional probability	
	$t_{Corrado}$	CP	t-stat
Bitcoin	-0.46	0.39**	2.68

Notes: ** denotes statistical significance at the 5level.

5. Discussion and conclusion

The present research applies an event-study methodology and an adjusted asset pricing model) to find out how return in the Bitcoin spot market changed in response to the launch of futures market. Our findings robustly reveal that the Bitcoin market experienced a sharp increase in systematic risk. While the immediate response was positive, a negative reaction was shown some days following the launch of Bitcoin futures.

The immediate increase in the Bitcoin spot prices can be explained by an initial excitement of the Bitcoin community at the launch of futures contracts. In fact, it was highly expected that the Bitcoin market could witness rising liquidity from the influx of new investments, and since futures contracts would offer risk mitigation and huge hedging and safe haven opportunties. In addition, it povided the protective security and regulatory legitimacy. Accurately, trading in Bitcoin futures has a benefit for investors and traders in those countries that have legaly prohibited or restricted bitcoin trading. This is because trading in Bitcoin futures doesn't imply trading in Bitcoin itself. But why *the Bitcoin price fall following the launch of Bitcoin futures?* The answer to this question is not easier. But this is not the first time that markets observed a turning point following the introduction of a new instrument. Such outcome appears consistent with the trading behavior that generally accompanies the launch of futures contracts for an asset. Specifically, the market is driven by optimistic and pessimistic traders (Fostel and Geanakoplos, 2012). Indeed, with the launch of Bitcoin futures, pessimists could bet on a Bitcoin price collapse, buying and selling contracts with a low delivery price in the future than the spot price. Offers of future Bitcoin deliveries at low price would undoubtedly lead to downward pressure on the spot price. Moreover, pessimistic traders might lack the attention, willingness, or ability to enter the market on the first trading days following the announcement. Accordingly, the total volume of transactions in the Chicago Mercantile Exchange futures market began very low, with an average trading volume of contracts promising to deliver about 12,000 Bitcoins over the first five days of trading, in comparison to an estimated spot market turnover of 200,000 Bitcoins.

Regardless Bitcoin being in the midst of a drawn-out bearish market, the year 2019 would show two new potential competitors. The Nasdaq is moving ahead with drastic plans to launch its own Bitcoin futures in 2019 ; Likewise for Intercontinental Exchange. Further progress in the futures space is, therefore, highly expected.

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Appendix

Table A1. Data sources

Variables	Definition	Sources
BTC	The Bitcoin price index	CoinDesk (www.coindesk.com/price)
TTR	The attention to Bitcoin	Google Trends (http://trends.google.com)
MV	The monetary velocity of Bitcoin	Blockchain(http://www.blockchain.info)
ETR	The exchange-trade Ratio	Blockchain (http://www.blockchain.info)
HR	The hash rate	Blockchain (http://www.blockchain.in
SMI	The Shangai market index	DataStream of Thomson Reuters