Dear Securities and Exchange Commission,

As the researchers specializing in the “bitcoin exchange rate,” we present significant interests in the proceedings to list and trade the shares of the United States Bitcoin and Treasury Investment (the “Trust”) in NYSE Arca, Inc. (the “Exchange”).

In Amendment No. 1 to SR-NYSEArca-2019-39, it says that “the value of Bitcoin is determined by the supply of and demand for Bitcoin on Bitcoin exchanges (and in private end-user-to-end-user transactions), as well as the number of merchants that accept them. ” We generally agree with this statement, even though the specific mechanism of bitcoin price formation is not entirely clear.

The traditional economic viewpoint states that price determination takes place in a marketplace and is enforced by the strength of supply and demand. Whether prices can fully reflect available information in a market is referred to as market efficiency (Malkiel & Fama, 1970). Based on the efficient market hypothesis, any deviations from the arbitrage price caused by asymmetric information will be evenly eliminated by market forces.

The U.S. dollar price of Bitcoin (USD/BTC) is the bitcoin price measured in U.S. dollars. On 18 December 2017, for example, the daily bitcoin price index provided by Bloomberg “closed” at 18674.48 USD/BTC. It says that the market forces agreed on one bitcoin worth $18674.48 U.S. dollars based on the information they have had at the last tick time of that day. Assume that the market tended to be efficient, this price should be informationally accurate, even without knowing how many factors contribute to form this price and how much each factor takes in the price. Its reciprocal $1/18674.48 \approx 0.000054$ BTC/USD is the dollar price measured in bitcoins, indicating the value of one dollar takes only a very slight share in the bitcoin price formation.

In the same fashion, the Euro price of Bitcoin on 18 December 2017 is 15528.90 EUR/BTC and its reciprocal is roughly equal to 0.000064 BTC/EUR. The value of one Euro is insignificant to a bitcoin.

The ratio of the U.S. dollar price of Bitcoin to the Euro price of Bitcoin is given by

$$(USD/BTC)/(EUR/BTC) = 18674.48/15528.90 \approx 1.2026.$$

There are several interpretations of this quotient.

First, the value of Bitcoin is measured in USD and EUR, respectively, and the quotient represents the ratio of the two measures, i.e., the U.S. dollar price of Bitcoin is 1.2026 times the Euro price of Bitcoin, indicating the U.S. users spend 1.2026 times more dollars than Euros spent by European users.

Second, since $(USD/BTC)/(EUR/BTC) = [1/(EUR/BTC)]/[1/(USD/BTC)] = (BTC/EUR)/(BTC/USD)$, the quotient is equal to the ratio of the reciprocal of the Euro price of Bitcoin to the reciprocal of the U.S. dollar price of Bitcoin. In other words, it is the ratio of the bitcoin price of Euro to the bitcoin price of the U.S. dollar. The value of the ratio implies that the value of one Euro is 1.2026 time that of one dollar, measured by Bitcoin.

Third, because $(USD/BTC)/(EUR/BTC) = (USD/EUR)^{BX}$, the quotient gives a new thing – the price ratio between U.S. dollars and Euros in bitcoin markets, called the "Bitcoin Exchange rate" of the U.S. dollar against Euro (Nan & Kaizoji, 2019b). The notation of $(USD/EUR)^{BX}$ is used to discriminate against the FX exchange rate of USD/EUR. The bitcoin exchange rate suggests at which rate one Euro can be change into U.S. dollars in bitcoin markets, and the value of $(USD/EUR)^{BX}$ on 18 December 2017 indicates the U.S. dollar price of Euro is at about 1.2026. The FX exchange rate of USD/EUR and its futures on the same day are 1.1782 and 1.2072, respectively. As shown in Figure 1, the time series of

the bitcoin exchange rate is intertwining with that of the FX spot rate over the period from April 2014 to September 2018.

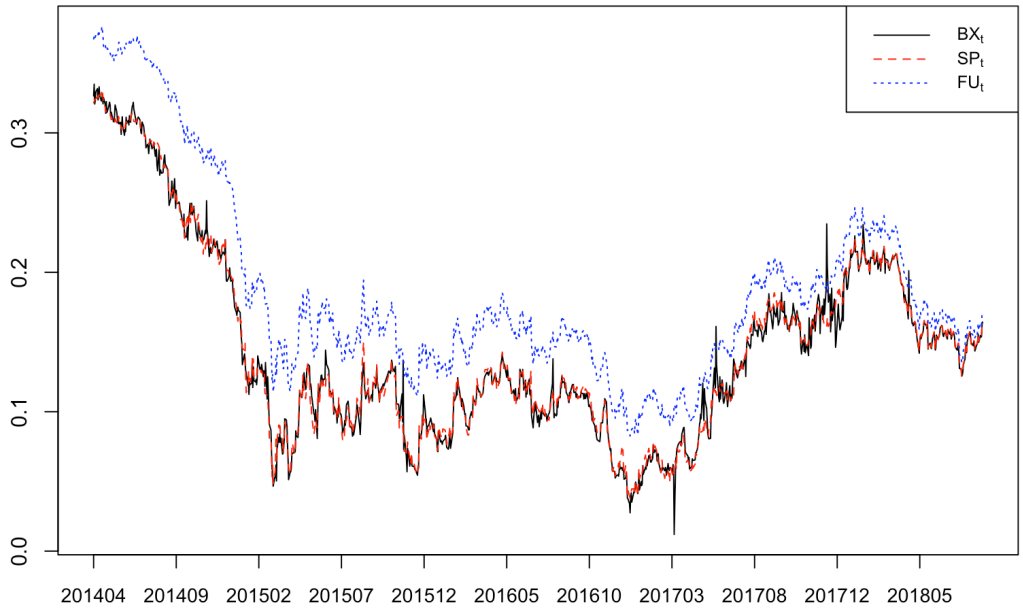

Figure 1. The logarithmic bitcoin exchange rate, FX spot rate, and FX futures of U.S. dollar against Euro.
Note: BX_t, SP_t, and FU_t denote the time series of the bitcoin exchange rate, FX spot and futures in logarithm, respectively.

Nan and kaizoji (2019) find the long-run bitcoin market efficiency in terms of U.S. dollar and Euro and the short-run error-correction mechanism in the bitcoin markets. These findings suggest that (i) some U.S. and European bitcoin markets are, in general, efficient, and even the values of U.S. dollar and Euro are only taking a very slight share of the bitcoin price formation, but their values appear to be fully reflected by bitcoin prices if we use the FX spot market as the criterion; (ii) when the ratio of the value of dollars to the value of Euros in bitcoin markets deviates from the FX spot rate, bitcoin market forces will correct these deviations all the time.

In conclusion, if bitcoin markets efficient in terms of U.S. dollar and Euro, we might assume the bitcoin markets are efficient regarding other factors as well, because if they are not, the price suggested the bitcoin exchange rate will be biased towards the FX spot rate due to the different responses the U.S. users and European users give to the information. (Kaizoji and Nan, 2019)

Reference

Malkiel, B. G., & Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, *25*(2), 383–417.

Nan, Z., & Kaizoji, T. (2019b). Market efficiency of the bitcoin exchange rate: Weak and semi-strong form tests with the spot, futures and forward foreign exchange rates. *International Review of Financial Analysis*.