

Bitcoin Price Trends and Influencing Factors

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Abstract: Since 2008, a virtual currency called Bitcoin has been produced in the research report of Satoshi Nakamoto. This article describes the changes in Bitcoin prices and the factors that affect Bitcoin price changes. In terms of price changes, by examining the definition of Bitcoin and the external factors that affect Bitcoin, we have determined the impact of different external factors on the price change of Bitcoin. This article selects the daily transaction data from January 19, 2017 to April 4, 2018, the international bitcoin price, gold price, Shanghai Securities Composite Index, crude oil price, Shanghai Interbank Offered Rate and exchange rate data, and Unit root test Cointegration test and Granger causality test verify the influence of different factors on the price of Bitcoin, and finally concluded that there is a two-way causal relationship between Bitcoin and gold, Bitcoin and interest rates at the 99% significant level. There is a one-way causal relationship between oil, Bitcoin and the exchange.

1. Background and overviews

At the beginning of 2009, after Nakamoto's paper "Bitcoin: A Peer-to-Peer Electronic Cash System" was published, people began to lift the new "decentralized" currency outside of gold. Since then, Bitcoin getting active in the global market and become the world's fastest growing virtual currency in a few years. From 2009 to the present, the emergence of Bitcoin, which has been in the public eye for 10 years. Bitcoin is influential, and its growth has gone through a very tortuous process, and it has now become a virtual currency that has spread all over the world.

From a long term, the reason that Bitcoin is so hot is that people are more eager to pursue the potential of Bitcoin's huge appreciation space and speculation, instead of pursuing the original intention of Nakamoto Satoshi to use Bitcoin as a centralized payment. The data shows that the market value of Bitcoin has increased by 2200 times since its release. In October 2017, after the bitcoin price exceeded \$10,000, its price began to fall sharply to \$8,000 in November. Since October 25, 2019, bitcoin prices have skyrocketed, soaring 40% from the recent lows and breaking the \$10,000 mark.

2. Introduction

Although bitcoin has only been in its short period of ten years since its birth, domestic and foreign scholars have conducted a lot of research on the factors affecting the price of bitcoin. This article divides the factors affecting bitcoin prices into internal factors and external factors. At present, the mainstream views of the academic views believe that there are three main categories of factors affecting bitcoin prices: the supply, demand, the government's attitude towards bitcoin, and macroeconomic variables.

2.1 Impact of Supply and Demand on Bitcoin Price

The most direct and major factor affecting bitcoin prices should be the supply and demand of Bitcoin.

Demand side

Transactional demand and investment demand affect the price of Bitcoin at the same time. First of all, from the investment demand of Bitcoin, the differences in investment demand will directly affect the price of Bitcoin. Jihong Li (2016) studied the trading demand and investment demand of Bitcoin, and believed that both demands are generated for the price of Bitcoin in direct and positive impact. Qing Ling (2014) believes that the rise in bitcoin price is similar with the depreciation of the renminbi in time. After August 2015, the RMB began to depreciate and the stock market was turbulent, hot money flowed out of the country. Some investors used bitcoin to avoid capital controls, and this has driven the growth of bitcoin prices. During the RMB depreciation period, the demand for Bitcoin will increase, so the price of Bitcoin will increase (Xiaochen Yang, 2014). Hao Chen (2015) after empirical analysis, it is concluded that the impact of speculative demand on Bitcoin is greater than that of transactional demand, which could further illustrate that Bitcoin is a speculative commodity.

Supply side

According to Nakamoto's design, Yuewen Niu (2017) has strictly determined the supply quantity and supply time of Bitcoin in the early days of bitcoin issuance, so as time goes by, the difficulty of "mining" is getting bigger and bigger. The supply is getting smaller and smaller, which will lead to higher and higher prices for Bitcoin.

2.2 Impact of government intervention on Bitcoin price

Gang Liu, Juan Liu, and Wanrong Tang (2015) studied the impact of Sino-US policies on bitcoin prices and found that the government's perception of bitcoin's positive or negative interest had a direct, significant, and huge impact on Bitcoin. Lanting Yang (2017) believes that since 2016, China has begun to loosely target the policy of Bitcoin. For Bitcoin investors, a lot of benefits can be obtained through arbitrage. The looseness of the policy has led to an increase in demand for bitcoin, and the price of bitcoin will rise.

2.3 Impact of Macroeconomic Variables on Bitcoin Price

From the trend of bitcoin price changes, there may be many macroeconomic variables that may affect Bitcoin, such as exchange rate, interbank interest rate, stock index, gold price, crude oil price, and so on.

Xiaotong Tang (2017) used the international bitcoin price for empirical analysis. She passed the Granger test and found that the fluctuation of the gold price will have a positive impact on the price of Bitcoin. The analysis of the impulse response shows that the price fluctuation of oil will also have a positive impact on the gold sector.

Yuewen Niu (2017) through the analysis of Granger analysis and regression model parameters found that in the long run, although the price of Bitcoin is not affected by other markets, in the short term, it may be positively affected by the exchange rate and the Dow Jones index. The federal funds rate has a negative impact on bitcoin prices.

3. Economic Analysis of Bitcoin

3.1 Bitcoin price trend and floating analysis

Bitcoin price trend

From 2009 to the end of 2012, the price of Bitcoin fluctuated around \$10. Until December 2012, when the world's first officially recognized bitcoin exchange, the French Bitcoin Central Trading Exchange, was born. The awareness of the currency has widened, and the trading range of the Bit Cities had gradually expanded. In 2013, FinCEN, the financial crime enforcement system of the US financial department, issued the "Virtual Currency Personal Management Regulations" which showed that the US government began to recognize the status of Bitcoin and pushed the price of Bitcoin to continue to rise in just five months. The internal increase reached 2300%.

In June 2016, the Brexit results were announced. British Prime Minister David Cameron also announced his resignation. Then the pound plunged leading the investors chose to invest their money

in Bitcoin to reduce the risk. Bitcoin has no suspense to rise sharply: leading to bitcoin prices dived, and the decline once exceeded 25%. In August 2016, on the well-known Bitcoin trading platform, Bitinex, the special currency worth more than 60 million US dollars was stolen. In November of the same year, the voting results of the US election were released. Investors avoided the US policy after Trump took office. Certainty, a lot of investment in bitcoin, so that the price of bitcoin increased. In May 2017, after experiencing the “blackmail virus” and the public announcement of bitcoin by various governments, the price of Chinese bitcoin rose from the initial 8,000 yuan to the highest point of 19,000 yuan. In early November, all of China’s three major bitcoin trading platforms stopped trading.

Although the fate of Bitcoin is becoming more and more blurred, the value of the currency in the first quarter of 2018 has fallen more than \$ 1190. On October 25, 2019, \$ 55 billion in cash was injected into the cryptocurrency market, taking the entire market out of the doldrums. This is one of the biggest gains in recent history. This time the price of bitcoin rose by more than 40%. Bitcoin trader and analyst Alex Kruger said that this is the fourth largest increase in the history of bitcoin, a landmark move that even surpassed the increase at the end of 2017.

In October 2019, an advanced injection of \$ 55 billion has increased the price of Bitcoin by more than 40%, with a maximum income of more than \$ 10,300. It has since fallen back in Asian trading, with current revenues of more than \$ 9,500, still an epic proportion. The reasons for the soaring Bitcoin price includes: (1) CME bitcoin futures expired today on October 25, 2019. (2) President Xi Jinping supports blockchain in China. Last Friday, China officially announced that it will increase investment in blockchain, which is the basic technology of cryptocurrencies such as Bitcoin. (3) Crypto capital CEO arrested. Exchanges, such as Bitfinex, may get some of the seized 850 million back. (4) Bakkt just recently set a maximum record of 1,100 bitcoin for futures contract transactions and announced that it will launch bitcoin options on December 9, 2019.

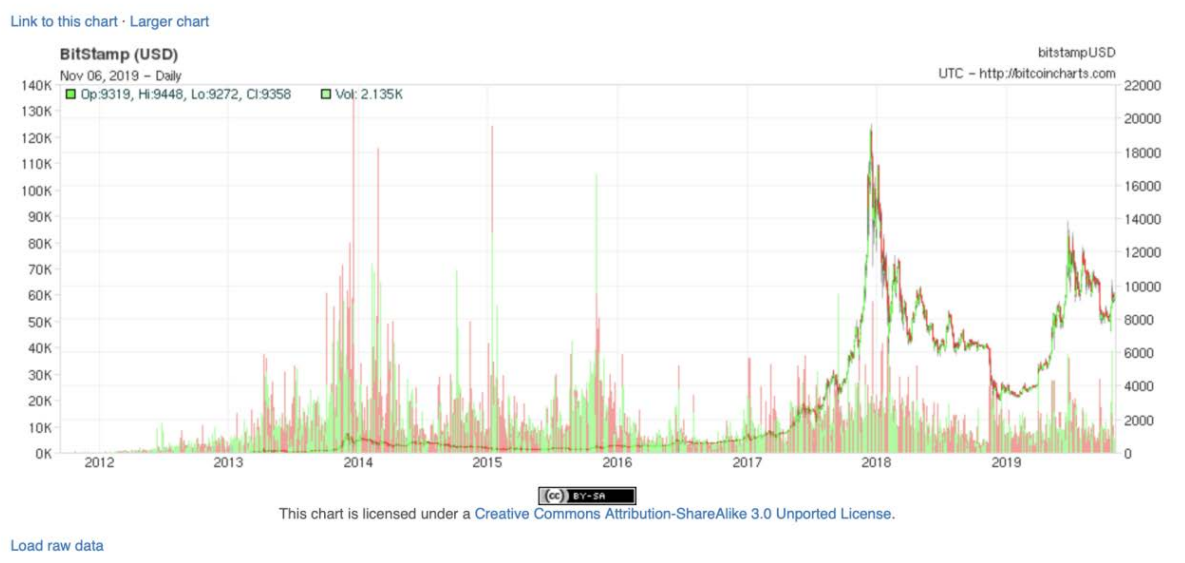


Figure 1. The trend of international bitcoin prices from 2009 to 2019.

3.2 Factors affecting Bitcoin price

The factors that influence the price path of Bitcoin can be roughly divided into internal factors and external factors. Intrinsic factors include the supply of bitcoin and the demand for bitcoin. The external factors are some macroeconomic variables, such as: exchange rate, interbank interest rate, stock index, gold price, crude oil price and so on. And this article mainly focuses on the analysis of external factors.

(1) Gold price

Bitcoin is also known as "paper gold" because Bitcoin has many characteristics, such as the way Bitcoin is issued, its circulation, and its cost are similar to gold. Bitcoin's “decentralized” design has attracted a large number of investors to invest. Many investors choose to put their money on gold or

bitcoin to avoid the uncertain risks in the capital market. Compared with gold, Bitcoin is undoubtedly an evolutionary version of gold. The coin has many similar characteristics, and the gold price has some positive effects on the bitcoin price.

(2) Oil price

Oil, known as the "black gold" of the earth, is the driving force for economic development in various countries. The amount of its resources will directly affect the quality of the world economy. Therefore, changes in the price of oil will affect the world's economic changes, thereby affecting investors' preferences and thus affecting the price of Bitcoin.

(3) Exchange rate

The exchange rates of different countries against the US dollar are different, and the exchange rate will change with time, so the price of buying bitcoin in different countries will be different. The price of buying bitcoin on the Internet is the same in different countries, so there is no arbitrage space between different countries. Under both roles, the price volatility of Bitcoin is less than the volatility of the value of the renminbi.

(4) Stock index

The stock market is often referred to as the "barometer" of the economic situation. When the service ticket index is low and the economy is not prosperous, investors will reduce their investment in the stock market and invest in the bitcoin market that can avoid risks.

(5) Interest rate index

The interest rate index is an important indicator to measure the adequacy of funds in the financial market, and it also reflects the capital cost of Bitcoin. In addition, the interest rate index can also anticipate inflation.

In the following, we will conduct a quantitative test of these five hypotheses through empirical analysis.

4. Empirical analysis

4.1 Variable selection

This article chooses the international Bitcoin daily closing price to measure the price of Bitcoin (BIT); for the gold price (GO), the gold spot price of AU9999 is selected; for the stock index (EQ), the Shanghai Securities Composite Index is adopted; for the crude oil price (OIL), this paper uses the futures price of the US crude oil company; for the interest rate (SHI), the Shanghai Interbank Offered Rate was selected; for the exchange rate (EX), the RMB to US dollar exchange rate was selected. The daily transaction data of each data from January 19, 2017 to April 4, 2018 was selected for analysis.

Based on January 19, 2017, the data was indexed by the formula of $(x - \min(x)) / (\max(x) - \min(x))$. For economic data calculation, in order to prevent the heteroscedasticity in the model from affecting the test data too much, this paper performs natural logarithm processing on the data, Ln represents the processed data, and Rn represents the first-order difference form of the data (such as LGO is gold. The natural logarithm after price indexing, RGO is the first-order difference of the natural logarithmic sequence of gold prices).

4.2 ADF unit root test

In this paper, the Eviews7.2 version software and the ADF unit root test method are used to perform the unit root test on the natural logarithm and the first-order difference of the six sets of data. If the data is stable in the same order, the coherent test can be performed on the stationary data, see Table 1.

Table.1. ADF unit root test

	ADF test value	1% threshold	5% threshold	10%threshold	Conclusion
LBIT	-2.483950	-3.452519	-2.871195	-2.571986	unstable
RBIT	-10.33601	-3.452674	-2.871263	-2.572023	stable
LSHI	-3.529129	-3.452596	-2.871229	-2.572004	stable
RSHI	-21.13965	-3.452519	-2.871195	-2.571986	stable
LOIL	-5.487302	-3.453997	-2.871845	-2.572334	stable
ROIL	-19.07013	-3.454085	-2.871883	-2.572354	stable
LGO	-2.876442	-3.452519	-2.871195	-2.571986	stable
RGO	-18.23609	-3.452519	-2.871195	-2.571986	stable
LEX	-4.693796	-3.452674	-2.871263	-2.572023	stable
REX	-17.47874	-3.452753	-2.871298	-2.572041	stable
LEQ	-4.232650	-3.452674	-2.871263	-2.572023	stable
REQ	-16.59820	-3.452753	-2.871298	-2.572041	stable

Through the ADF test on the bitcoin price, Shanghai interbank offered rate, oil price, gold price, exchange rate, and Shanghai Securities Composite Index, it is found that under the 90% confidence level, only the bitcoin price and the gold price series are stable items. The other four time series cannot reject the original hypothesis of the original unit root, that is, the four sets of data are not stable.

Continue to test the unit root. At this time, select the sequence after the first-order difference: bitcoin price, Shanghai interbank interest rate, oil price, gold price, exchange rate, Shanghai Securities Composite Index for unit root test. The differentially processed data can reject the null hypothesis at a significant level of 10%, which becomes a stationary sequence.

4.3 Johansen cointegration test

Since the first-order difference will make the data lose its original special nature, especially when analyzing financial data, the loss of some characteristics will affect the direction of analysis. Therefore, it is necessary to consider the cointegration test to compensate for the shortcomings of the first-order difference. The variables involved in the cointegration relationship are two different variables, each of which is not stationary, but the two variables are grouped together and float together.

The JJ co-integration test (JJ test) is now used to test the long-term relationship by performing JJ tests on the same-order variables LBIT, LGO, LOIL, LEX, LEQ, and LSHI. Using Eviews 7.2, the JJ test value is obtained. The test results are shown in Table 2.

Table.2. Johansen cointegration test

Hypothesized No. Of CE (s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.379715	217.3648	95.75366	0.0000
At most 1*	0.133027	85.07615	69.81889	0.0019
At most 2*	0.081316	45.53527	47.85613	0.0813
At most 3*	0.037291	22.04210	29.79707	0.2962
At most 4*	0.033185	11.51510	15.49471	0.1817
At most 5*	0.007792	2.166844	3.841466	0.1410

Trace test indicates 2 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

It is known from the above results. There are and only two cointegration relationships between LBIT, LGO, LOIL, LEX, LEQ, and LSHI. It can be seen that although there are rules of the six different variables, there is a long-term stable relationship between these variables.

4.4 Granger causality test

In this paper, the lag period in the Granger causality test is determined by finding the AIC index of each variable, and the lag period in the Granger causality test is obtained by the minimum AIC index. This paper uses Eviews7.2 to perform Granger analysis on different variables. The results are shown in Table 3.

Table.3. Granger causality test

	Obs	F-Statistic	Prob.	Conclusion
GO does not Granger Cause BIT	276	3.73130	0.0057	Reject the null hypothesis
BIT does not Granger Cause GO		4.67855	0.0012	Reject the null hypothesis
OIL does not Granger Cause BIT	279	4.41755	0.0238	Reject the null hypothesis
BIT does not Granger Cause OIL		1.94161	0.1646	Accept the null hypothesis
SHI does not Granger Cause BIT	278	2.62767	0.0346	Reject the null hypothesis
BIT does not Granger Cause SHI		1.70468	0.0138	Reject the null hypothesis
EX does not Granger Cause BIT	278	3.08790	0.0312	Accept the null hypothesis
BIT does not Granger Cause EX		1.14657	0.0415	Reject the null hypothesis
EQ does not Granger Cause BIT	278	1.04026	0.3548	Accept the null hypothesis
BIT does not Granger Cause EQ		0.55921	0.5723	Accept the null hypothesis

According to the above test results, there is a two-way causal relationship between bitcoin and gold, bitcoin and interest rate at a significant level of 95%. There is a one-way causal relationship between bitcoin and oil, bitcoin and exchange rate, bitcoin and stock index. There is no causal relationship between them. From this it can be inferred that at a significant level of 95%, gold prices, interest rates and oil are the Granger causes of bitcoin price changes. Gold prices, oil prices, and interest rates directly lead to the formation of inflation, which is the direct cause of bitcoin movements. Therefore, when inflation increases, the price of Bitcoin will rise.

5. Conclusion

This paper describes the changes in the price of Bitcoin and the factors that affect the price of Bitcoin. According to Bitcoin's fluctuation chart, it can be seen that the price of Bitcoin is rising and falling and then rises in a downward cycle, but the overall trend is still that the price of Bitcoin is rising, because the difficulty of mining is getting more, the larger the interference of governments, the greater the impact of the price of Bitcoin.

In terms of affecting the price of Bitcoin, this article first studies the impact of Bitcoin's inherent supply and demand factors on the price of Bitcoin. The relationship between supply and demand directly affects interest rates, causing inflation to affect the price of Bitcoin. This article focuses on the impact of external factors on the price of bitcoin, and selects the AU999 spot gold price, the Shanghai Securities Composite Index, the US crude oil futures price, the Shanghai Interbank Offered Rate, and the RMB to USD exchange rate to study these different the impact of factors on Bitcoin. Through a series of tests such as Johansen cointegration test and Granger causality test, the impact of these six factors on the price of Bitcoin was verified. It is analyzed that the price of gold and oil have a positive effect on the price of bitcoin.

Although the Chinese government still maintains a conservative attitude towards Bitcoin, blockchain technology and a variety of electronic virtual currencies have begun to develop rapidly. Electronic virtual currencies have their existence rationality, creating more possibilities and more opportunities for the Broad prospects of Chinese economy.

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