Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 7, No. 1, 2023

The Analysis of the Influencing Factors of Virtual Currency Price Based on Multiple Regression Method

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Abstract: In view of the influencing factors of bitcoin price, this paper firstly summarizes the relevant data of bitcoin price and annual cumulative supply in the past ten years from the Block Chain website, and selects several explanatory variables including actual bitcoin supply, market macroeconomic level and the number of users. Then, Eviews9 software is used to establish a multiple linear regression model. The econometric test methods such as multicollinearity, heteroscedasticity and autocorrelation were carried out to test and modify the model. The results show that the supply and demand factors of bitcoin itself, internal factors and macroeconomic factors all have a certain impact on the price of bitcoin. The results show that the price of bitcoin is mainly affected by three factors: the supply quantity, the global average annual gross product and the cumulative number of users, among which the global average annual gross product is the largest.

Keywords: Virtual currency, Multiple linear regression, Bitcoin price, China market forecast, Eviews9.

1. Introduction

With the development of datalization, modern money presents the characteristics of virtualization. The sovereignty of the general currency is in the national center, determined by the central bank; The sovereignty of virtual currency is in the distributed individual nodes and decided by individuals. Its essence is the individual-centered information economy. The value conversion of general currency is completed in the currency market. And the value conversion of virtual currency is completed in the virtual currency market. The value exchange between general currency and virtual currency is completed through the overall exchange of the two markets. Under special conditions, there are immature individual market exchange relations. In addition, general currency and virtual currency are in different markets, and their exchange mechanisms are different.

In recent years, all kinds of virtual currencies have developed rapidly, and the digital currency represented by Bitcoin has achieved rapid development[1], has attracted wide attention from all parties. Since its inception in 2008, Bitcoin has become the fastest growing virtual currency in the world, with trading volume rising. However, due to the influence of policies, economic situation and many uncertain factors, the trading price of Bitcoin presents the characteristics of nonlinear, non-stationary and high volatility, which presents a great difficulty for the prediction of bitcoin price[2].

Bitcoin is a currency that lacks intrinsic value. There is no law governing the value of bitcoin. The risks of being a digital currency can be related to a number of factors[3].Through investigation and research of many factors affecting the price fluctuation of bitcoin, this paper focuses on the analysis of bitcoin currency supply, market macroeconomic level, the number of bitcoin users and other factors. Through multiple linear regression, an appropriate model is established to analyze the impact of various factors on the price fluctuations of bitcoin, and the influencing factors are regulated to achieve effective control of the price of bitcoin, and ultimately to help stabilize the virtual currency financial market.

2. Collection of Factors Affecting the Price of Bitcoin

2.1. Bitcoin supply quantity

It is generally accepted that the supply and demand of an element is an important factor in the elasticity of commodity prices. The supply of a factor depends, first of all, on its productive capacity[4].The supply quantity of Chinese banknote should be roughly comparable with the GNP. On this basis, we can adjust appropriately according to environment. Unlike traditional currencies, bitcoin has been officially declared to have a maximum supply of 21 million coins since its birth in 2009.In 2009, the birth of bitcoin, block reward 50 bitcoins, at the rate of mining 50 bitcoins every 10 minutes increased year by year, when the total number of bitcoins increased to 10.5 million, block reward halved to 25, when the total amount reached 15.75 million, block reward again halved to 12.5, after the total number will be permanently limited to about 21 million. As Bitcoin nears its maximum supply, consumer demand for it increases. Increased demand and limited supply could push the price of bitcoin higher. The gradual increase in the value of bitcoin mining and the limited supply also create a lot of uncertainty about the price of the digital asset.

2.2. Macroeconomic level of the market

The macroeconomic level of the market will more or less affect the consumption and investment of consumers. As a digital currency, Bitcoin does not participate in the actual commodity trading at present. Many people also dig or buy Bitcoin from the perspective of investment[5]And from the perspective of the investee, the macroeconomic level of the market also affects the price of bitcoin.In this regression analysis, we selected the global annual average gross domestic product (Per Capital GDP) as the index to measure, the macroeconomic level of the market.

2.3. Number of users

The number of users represents the number of bitcoin wallets in the world, which can also reflect the demand of

Bitcoin users and show the liking and acceptance degree of the public for this virtual currency.

3. Empirical Analysis

3.1. Research Ideas

According to our hypothesis, when an economic factor is affected by many other variables[6], we use multiple regression model to analyze the degree of influence of variables on its factors. The basic principle of multiple regression analysis is to use the least square method to model the relationship between multiple independent variables[7-10].

3.2. Research methods - multiple linear regression model

(1) Classical Hypothesis

Hypothesis 1: The expectation of the random error term is $E(\varepsilon_i) = 0(i = 0,1,2,...,n)$

Suppose 2: the variance of the random error term is a constant: $Var(\varepsilon_i) = \sigma^2(i = 0,1,2,...,n)$

Suppose 3: the random error terms are independent of each other $Cov(\varepsilon_i, \varepsilon_i) = 0(i \neq j)$

Assume 4 that the random error terms are not correlated with explanatory variables $Cov(x_{ji}, \varepsilon_j) = 0(i = 1,2,...,n)(j = 1,2,...,n)$ .Usually assumed to be a non-random variable, this assumption automatically holds, at this time the explanatory variable is called exogenous explanatory.

Hypothesis 5: There is no multicollinearity in the model, that is, there is no linear relationship between explanatory variables, or the observed values of explanatory variables are linearly independent. The purpose of this assumption is to avoid the linear representation of one explanatory variable $x_1, x_2, \cdots, x_n$ with other explanatory variables, so as to obtain unique results for $\beta_1, \beta_2, \cdots, \beta_n$ the estimated values of the parameters.

Hypothesis 6: The random error ε term follows the multivariate normal distribution, $\varepsilon \sim N(0, \sigma^2 I_n)$ .This hypothesis actually includes hypothesis 1, hypothesis 2, hypothesis 3, hypothesis 4.

3.3. Model Setup

According to the research object, bitcoin price (Y_t) is selected as the explained variable, and bitcoin supply (X_{1t}), market macroeconomic level (X_{2t}) and the number of users (X_3) are selected as the explanatory variables. The general form of establishing multiple linear regression model is as follows:

$$Y_t = \beta + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Eviews9 was used to bring the collected and processed variable data into the multiple linear regression model established above, and the least square method was used to perform regression analysis on the data to obtain the OLS regression results, as shown in Table 1.

Table 1. OLS regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10549.96	2335.907	-4.516430	0.0040
X1	-0.000163	0.000108	-1.511985	0.1813
X2	1.076284	0.220101	4.889962	0.0027
X3	3.37E-05	5.87E-05	0.573886	0.5869
R-squared	0.982932	—	Mean dependent var	5505.849
Adjusted R-squared	0.974398	—	S.D. dependent var	5800.528
S.E. of regression	928.1207	—	Akaike info criterion	16.79337
Sum squared resid	5168448	—	Schwartz criterion	16.91441
Log like lihood	-79.96687	—	Hainan-Quinn criter	16.66060
F-statistic	115.1784	—	Dubbin-Watson stat	2.035716
Prob(F-statistic)	0.000011	—	—	—

Preliminary model results are

$$Y = -10549.96 - 0.000163X_1 + 1.076284X_2 + 3.37 \times 10^{-5} X_3$$

The multiple determinability coefficient is

$$R^2 = \frac{ESS}{TSS} = \frac{TSS - RSS}{TSS} = 1 - \frac{RSS}{TSS} = 1 - \frac{\sum e_i^2}{\sum (y_i - \bar{y})^2} = 0.982932$$

Where the multiplicity determinable coefficient represents the percentage of the explanatory variables jointly explained in the total sum of squares of deviation for $x_{1i}, x_{2i}, ..., x_{ki}$ .The larger the multiple determinable coefficients, the better the model fits the observed values, and the stronger the explanatory variables' ability to explain the explained variables. The t test of the coefficient of explanatory variable in the model is not significant, the coefficient sign of is opposite to the expected, the economic significance is unreasonable, and the model may have multicollinearity.

3.4. Test and correction of the model

1. Multicollinearity test of regression model

In this experiment, Eviews9 software was used to test the regression correlation coefficients of all variables in the model, and the correlation values between all explanatory variables were obtained. The results are shown in Table 2.It can be seen from the analysis of the table that the correlation coefficient between each explanatory variable is greater than 0.79, which can be prelim natively judged that there is correlation, possibly serious multicollinearity, and the variance inflation factor is used to test.

Table 2. Regression correlation of each variable

Correlation coefficient	Y	X1	X2	X3
Y	1.0000	0.7953	0.9877	0.9562
X1	0.7953	1.0000	0.8482	0.8165
X2	0.9877	0.8482	1.0000	0.9597
X3	0.9562	0.8165	0.9597	1.0000

In this paper, we calculate the variance inflation factor of the explanatory variable to make further explanation.

Table 3. Test results of variance inflation factor method

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	5456461	63.3435	NA
X1	1.17E-08	20.7056	3.5648
X2	0.0484	160.6981	15.0635
X3	3.44E-09	24.2649	12.6805

Experience has shown that if the variance inflation factor is used, it usually indicates severe multicollinearity between this explanatory variable and the remaining explanatory variables. The variance inflation factor of the explanatory variables tested $VIF \geq 10$ this time is much greater than 10, indicating a serious multicollinearity problem.

(2) Correction of multicollinearity

In this paper, the stepwise regression method is adopted for multicollinearity correction. After many references, eliminations and corrections, the optimal model obtained is as follows:

$$Y = -11394.17 + 1.0502 X_2$$

t = (-11.4723) (17.8742)

$$R^2 = 0.9756, \overline{R^2} = 0.9725, F = 319.4881, DW = 1.7906$$

The modified coefficient of determination of the model is high, with a value of 0.9756. The results of F-test and T-test are significant, and the test of economic significance is reasonable. The results are shown in Table 4.

Table 4. Stepwise regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11394.17	993.1916	-11.4723	0.0000
X2	1.0502	0.0588	17.8742	0.0000

(3) Autocorrelation test

The partial correlation coefficient test of this operation is shown in Figure 1.According to the bar chart of Partial Correlation coefficients, none of the partial correlation parts of the model exceed the dotted line, indicating that there is no autocorrelation in the graph.

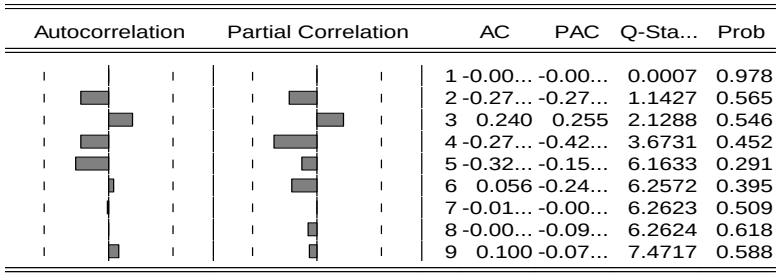

Figure 1. Partial correlation coefficient test

Therefore, the final statistical model result is $Y = -11394.17 + 1.0502 X_2$ .That is the price of the virtual currency bitcoin is mainly affected by the global average annual GDP (Per Capital GDP), and the price of bitcoin will increase by 1.0520 units for every unit increase in the global average annual GDP

4. Epilogue

4.1. Analysis of Results

As a branch of currency development that attracts much attention in today's society, the price of virtual currency is also affected by many aspects. Under the development of a huge market, the price of virtual currency bitcoin also increases or decreases every year. Its future development trend is also a hot topic of discussion in the industry. From the perspective of macroeconomics, this paper selects the cumulative annual supply of bitcoin, the global average annual GDP (Per Capital GDP) and the cumulative number of users as three factors affecting the price of bitcoin. Finally, the result of regression analysis shows that the price of virtual currency bitcoin is mainly affected by the global average annual GDP.

4.2. China's market laws and policies

1. Areas of Criminal law Regulation:

Bitcoin transactions have the characteristics of decentralization, anonymity, trans-regional and so on. While ensuring the security of bitcoin transactions, these characteristics also attract many criminals to use bitcoin or carry out illegal actions against bitcoin. Cross-border exchange of virtual currency is used to convert criminal proceeds and earnings into overseas legal currency or

property, which has become a new means of money laundering crimes. Some involved economic crimes take virtual currency as an object of crime or as a criminal means, bringing security challenges to Chinese finance[11];However, at present, our legal regulations on Bitcoin are not perfect, and the criminal regulation on bitcoin-related behavior is facing many practical problems.

2. The field of civil and commercial law

At present, our country has only two identical normative legal documents with effect on bitcoin. One is the "notice on the prevention of Bitcoin risk" led by the Banking and Insurance Regulatory Commission. It is the first normative document on bitcoin issued in our country, reminding the majority of bitcoin consumers to prevent the risk; Second, at the end of 2017, China's seven major financial regulatory authorities led by the People's Bank of China issued the "Notice on Preventing the risk of coin issuance financing" for the bitcoin market, that the coin issuance financing is suspected of illegal and criminal activities, requiring the closure of all the platform of coin issuance financing and the majority of investors to be vigilant about the risk of coin issuance financing[12].Both documents deal a major blow to Bitcoin-related businesses. At the same time, however, the legal documents do not directly address the question of the legality of bitcoin in the country or whether it is legally protected and whether it is legal for individuals to trade bitcoin with each other. It makes bitcoin in an unregulated "gray area". The domestic financial market is more chaotic and people are having more and more disputes with Bitcoin.

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