Risk prediction of digital currency investment based on the quantitative economic model

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Abstract

With the rapid development of science and technology, the global political, economic and financial system are constantly impacted.As a new form of currency, the function of digital currency is highly sought after by investors around the world and wide attention from all walks of society.Economic and social problems are becoming increasingly complex, and people begin to study them with the help of mathematical models.Mathematical models can help people to understand social and economic problems very well.This paper requires the problems in the model construction, discusses the conditions for the correlation of the independent variables, and constructs the statistics to test the goodness of fit.However, at the same time, how to deal with the regulatory challenges and security threats posed by digital currency to the government, maintain and realize the healthy and sustainable development of their own economy and financial markets, and strengthen the coordination and cooperation between international regulatory agencies need to be the focus of regulatory authorities.

Keywords

digital currency; financial risk; regulatory measures; mathematical model; goodness of fit.

1. introduction

In recent years, the rapid development of digital currency has changed the global payment and consumption mode, and become a new financial business form that has attracted wide attention from all sectors of society and regulatory authorities. As a natural international currency, the scientific application of digital currency can solve the problems of excessive issuance and hyperinflation in currency issuance, which has a certain promoting effect on eliminating the negative impact of exchange rate fluctuations on the economy. However, due to its natural nature, digital currency is favored by investors, but also quite attractive to criminals, and can easily become the latest criminal tool for its extortion and attack, causing certain risks and hidden dangers to financial and social stability.

Although we still define digital currency by domestic and foreign scholars, governments have recognized the importance of digital currency, and their attitude has undergone a change from resistance to acceptance to expectation. In 2000, the digital currency provider, first E-bullion was founded, and digital currency entered the public eye. In 2008, Satoshi Nakamoto first put forward the bitcoin concept based on blockchain technology. Bitcoin and blockchain technology came out, which attracted the world's attention, and digital currency began to enter the era of cryptocurrency. In 2013, the United States recognized its legal status, causing the bitcoin price to soar.In 2017, the digital currency market gradually entered an adjustment period.In 2018, the Financial Stability Commission released the "Digital Assets" report, which pointed out that in order to adapt to the new development situation of the market, we need to further strengthen the supervision of digital assets.

Compared with western developed countries, China's digital currency research is relatively

late. Zhang Chengming (2012) from the perspective of the five characteristics, application prospects and social impact of digital currency, in-depth analysis of the impact and impact of digital currency on Chinese society. Li Jianjun and Zhu Yechen (2017) According to the actual situation of China's digital currency development, the digital currency is divided into wide, narrow two caliber, the former is relatively wide range, mainly including electronic, virtual, and cryptocurrencies, while the latter specifically refer to cryptocurrencies. Dai Jinping (2019) believes that digital currency is a new kind of unsovereign currency existing in the electronic payment and trading system, and is a value carrier to meet the value scale and exchange media function.

2. Construction of the quantitative economic model

With the rapid development of economy, in order to more objectively understand economic problems and deeply understand the internal laws of economic operation, people began to study economic problems from both qualitative and quantitative perspectives with the perspective of mathematical model. For example, when studying the problem of change in GDP, paying attention to observing the number of GDP changes is a quantitative study; while studying the structural change of GDP variables is a qualitative study. Qualitative and quantitative research are conducted on the same research subject from two perspectives, and this paper studies the problem of digital currency model construction from a quantitative perspective.

2.1. The assumptions of the regression model

A prominent British biologist and statistician, the family F.Gallton worked early in the field of chemistry and genetics.1889 F.Gallton and his friend, K.Pearson collected records of height, arms, and length of legs across thousands of families, trying to find specific manifestations of the relationship between their sons 'height and their father's height, F.Gallton studied this problem with the establishment of a uniary linear regression model, $Y= c+\beta X$ took parental height as the independent variable, child height as the dependent variable, and height mean as the constant term, while applying least squares to estimate the model parameters. Now it seems that there are many problems in the construction of Gallton, variable choice and the choice of a linear model is not clear basis, and Gallton did not test the model, but Gallton to choose variables, the model to study the problem has inspired the scholars of economic problems, later scholars began to use regression model to study economic problems.

In the linear classical model classical assumption, assuming the error term $\varepsilon_i \sim N(0, \sigma^2)$, namely i obeys a normal distribution, from which we can derive $y \sim N(\beta x, \sigma^2)$.The mathematical method constructs the model, where the exogenous and endogenous variables remain constant, the residuals of the model obey a normal distribution, and then the independent variable y obeys the $N(\beta x, \sigma^2)$ distribution. To study practical problems, we first need to determine the study subject, and then consider the factors affecting the study subject, namely the independent variables. The model was constructed based on the actual relationship between the independent variables and the study subjects.In general, the study subject is set as the dependent variable y, the influence variable as the independent variable x, and set the construction model as $y=f(x)+\varepsilon$, as the error of the model truth and the estimated value.

The premise of constructing the econometric model: the dependent variable y of the dependent variable object and the independent variable x, a stable model relationship $y=f(x)$, the premise of the model is set to $y \sim N(EY, \sigma^2)$, $EY=f(x)$, the meaning is: the model itself is stable, when the independent variable x is set to a fixed value, then the observed value of the dependent variable y should be stable.

Theorem 1: In the mathematical economic model, if the dependent variable y has a stable relationship with the independent variable x, and the dependent variable y obeys a normal distribution, then the residue i also follows a normal distribution, that is, $\varepsilon_i \sim N(0,\sigma_2)$. The model assumption is set to $y \sim N(f(x), \sigma_2)$, yielding $\varepsilon_i \sim N(0,\sigma_2)$.

After the model is set, the dependent variable y has a stable function relationship with the independent variable x, and then you can directly use $\varepsilon_i \sim N(0,\sigma_2)$. It can be seen in the above argument that after constructing the model, under the premise that the model is stable, Proposition 1: assumes the error term $\varepsilon_i \sim N(0,\sigma_2)$, deriving $y \sim N(f(x),\sigma_2)$ vs. Proposition 2: assuming $y \sim N(f(x), \sigma_2)$, and the derivation that $\varepsilon_i \sim N(0,\sigma_2)$ is mutually inverse. Logically propositions 1 and 2 are two angles under the same assumption and can be deduced from each other.

2.2.   Model constant term setting

Build an econometric model to study practical economic problems, and often need the model to set constant terms. Such as: F.Gallton in the experiment between sons' height and father height, the model was set to $Y=C+\beta X$, F.Gallton sets the mean of height as a constant term. Keynes' consumption function $C=C_0+ay+\varepsilon$, and the constant term C_0 is set to a fixed level of necessary consumption. Classical linear regression models also often set constant terms, such as: the classical linear model $y=\beta_0+\beta_1 x +...\beta_k x +\varepsilon, \beta_0$ as the constant term, and x as the explanatory variable. The linear model selected e x planator y variable x on y degree reflected by the coefficient, constant term β_0 is a constant value, not constant term stereo geometric meaning, constant term only actual economic meaning, therefore, set the model, not all models have constant term, constant term must have a specific meaning, set constant term need both theoretical support, and the reality of the actual research problem.

Constant term setting rules: Build the econometric model to stud y practical economic problems. If the model dependent variable y has a long-term stable trend, that is, the dependent variable has the initial values unaffected by the independent variable, then building the econometric model needs to set the constant term.

The model setting constant term needs to start from the reality, first according to the empirical data and logic, put forward the basis for the long-term stable trend of the dependent variables, and then establish a mathematical economic model, fit the model with the obtained data, and analyze the economic problems with the measurement model. Model setting constant term, the most classical model is the Keynes consumption function $C=C_0+ay+\varepsilon$, the constant term C_0 is set as a fixed level of necessary consumption, the constant term of the Keynes consumption model conforms to the actual situation and economic theory, to build an econometric model must learn the idea of Keynes building a model, build the econometric model consistent with the actual economic situation.

2.3.   Variable interrelationship analysis and model construction

Studying the economic problems and constructing the econometric model, the form of the econometric model is a function of the dependent variable y and the selected independent variable x. The model is mainly set in three forms:

(1)$y=A+B+C+\varepsilon$

(2)$y=ABC+\varepsilon$

(1)$y=A+BC+\varepsilon$

Of these three forms, A, B, and C can be function expressions, and they can change to exponential functions, power functions, triangle functions, as well as linear functions. That is,

A, B, and C can all be mx, emx, xm, x m, sinmx + cosnx, where m can be a real number, polynomial. To study economic problems, we must set the model variable relationship as a continuous function, at least local continuous.To study practical problems, the independent variable x is the explanator y variable, and the dependent variable y is the explained variable, and the dependent variable y and the independent variable x. In economic theor y and social practice, the dependent variable y is affected by the independent variable x, that is, the dependent variable y decreases with the independent variable x or increases with the independent variable x.When stud ying the practical problem to build the model, the periodic relationship between the dependent variable y and the independent variable x is impossible.

The construction of the model analytical type is based on the economic theory and experimental data, which determine the relationship between the independent and dependent variables and the economic theory, and finally determine the analytical formula of the model. There are three forms of model construction: multiplication,plus, plus and multiplication mixture.

Constructing additive model rules: construct mathematical economic model to study practical economic problems. If there is no correlation between independent variables, that is, independent variables are independent dependent variables, then the model analytics can be set to $y=A+B+C+\varepsilon$, where A, B and C are function polynomials.

Constructing multiplicative model rules: construct mathematical economic model to study practical economic problems. If there is a correlation between independent variables, that is, independent variables and influence dependent variables, then the model analytics can be set to $y=ABC+\varepsilon$, where A, B and C are function polynomials.

Construct additive and multiplication hybrid model rules: construct mathematical economic model to study practical economic problems, if there is no correlation between some independent variables, some independent variables, then the model analytic can be set to be $y=A+BC+\varepsilon$, where A, B, C as a function polynomial. In practical research, additive form models and multiplication form models have been widely used, and many results have been achieved in studying economic problems.The classical linear model is the typical additive form, the classical linear model $y=\beta_0+\beta_1 x+...\beta_k x+\varepsilon$, the classical linear premise assumption is that all independent variables are not correlated, and independently affect the dependent variables. The CD production function is the typical multiplication form, the CD production function $y=K\alpha L\beta+\varepsilon$, the variables affecting the production are capital and labor, and the two independent variables also affect each other.The models of additive and multiplication mixed forms are a synthesis of additive and multiplicity forms and can also be used to analyze practical economic problems.

The construction form of the model is determined by the relationship between the model dependent variables and the independent variables, testing the interrelationship between the variables, and the most commonly used test is the Granger causal test. The Granger causal test has drawbacks in studying practical problems.The Granger causal test can only test the time series data, and the time series variables must meet two requirements before performing the Granger causal test. First, the required time-series variables are a stationary sequence. Second, there are long-term stable relations between the two variables.The Granger causality test sets the test variables provided that the two variables are linear causality, which also increases the limitations of the variable test. Granger once demonstrated that pseudo-regression also occurs when all the variables are stationary, and that the stationarity test in the variable Granger causal test is only necessary for the existence of the variables. In sum up, the construction of the model requires a detailed analysis of the actual situation of the research problem, to clarify the mutual relationship between the variables, and finally to determine the

model analytical formula.

3. Risk and hidden dangers of digital currency

Friedman (2000) believes that the central bank's coin tax entry will also be partly damaged.In addition, Fan Yunhui and Li Yaoxin (2014) pointed out that the relevant laws and regulations of China's digital currency supervision are relatively vague and imperfect, and there are lack of legal system in trading platforms, which are easy to seize the loopholes by criminals, and there are certain legal risks and regulatory risks. Wang Xin and Ren Zhe (2016) believe that virtual currency, the lack of central bank endorsement, not only lacks credit guarantee, but also does not have practical value in the market. Therefore, the price is vulnerable to market expectations and poor liquidity. In addition, Bingjian and Reddicay (2017) believe that the emergence of digital currency has impacted the existing central bank monetary system, monetary policy and bank profitability, etc.   At the same time, it will also affect the liquidity of the banking system, and even cause liquidity risks and other problems. Wang Qian and Xie Huajun (2020) believe that the rapid development of digital currency poses obvious challenges to a country to implement the monetary policy of the central bank, and has the risk of theft and coordinated attack. At the same time, it also leads the central bank to try to issue the digital currency of the central bank. In addition, the emergence of digital currency may also affect financial stability and the implementation of monetary policy by affecting the financial market infrastructure, financial intermediaries and markets, and the coin tax returns of central banks. Because digital currency is an emerging thing, in addition to the above problems, digital currency also has the probability of the outbreak of policy risk, price bubble risk, technical risk and so on.

4. Investment supervision and forecast plan

The supervision of digital currency by various governments mainly starts from clarifying the legal status, standardizing the digital currency trading related service agencies, taxation and regulatory coordination to prevent the spread of illegal activities, and to prevent and defuse the relevant risks and hidden dangers of digital currency. Based on China's real national conditions, we should adhere to the principle of fair competition, standardize and guide the development of digital currency and its related technologies, which can be focused on from the following aspects:

Strengthen legal protection and improve institutional guarantee. First, the legal system is formulated and improved as soon as possible to determine the concept, supervision and responsibility of digital currency in the form of law.Standardize the specific operation process of digital currency transactions, introduce judicial protection, and improve the transparency of digital currency transactions.Second, clarify the scope of application of the law, clarify the industry categories of digital currency-related enterprises, the allowed business scope and the scope of application of the current Internet financial regulations, straighten out the definition relationship between the existing Internet financial regulations and digital currency supervision and regulations, and actively promote the construction of digital currency legal system.Third, to ensure the authority of the central bank, revise the Anti-Money Laundering Law, incorporate digital currency transactions into the regulatory framework of anti-money laundering and anti-terrorism financing, and reduce the probability of anti-money laundering risks.Implement the anti-money laundering obligations to prevent the abuse of digital currency.

Strengthen the drive and support for technology to ensure information security.First,we will accelerate the research and development and testing of core fintech technologies such as

blockchain and big data, establish and build a multi-scenario application prototype system, and study and verify the feasibility, technology stability and business adaptability.Learn and absorb the technical advantages of private digital currency, innovate and optimize the cryptographic theory and technology, solve and coordinate the contradiction between the convenience needs and security needs of digital currency, and ensure the effective implementation and transmission of monetary policy.Second, we will promote the construction of digital currency issuing institutions and trading platforms, constantly improve the security of network equipment level, and ensure the smooth operation of the digital currency system technically, and strengthen and improve the construction of new financial infrastructure from multi-dimensions such as distribution and circulation system, payment and settlement system, and supporting regulatory facilities.Third, we will make full use of big data, cloud computing and other new technologies to carry out the construction of regulatory infrastructure, and give full consideration to the various scenarios of digital currency in the distribution and circulation system, to ensure the smooth circulation of digital currency. In terms of payment and settlement system, we will increase investment in network infrastructure construction such as optical fiber, and improve the network bandwidth and capacity.

Strengthen supervision and establish a digital currency supervision system. First of all, the introduction of advanced regulatory concepts, the establishment of special regulatory departments and institutions, improve the regulatory system and measures.We will avoid an over-regulatory and regulatory vacuum, maintain the stability of the financial system and sustainable economic development, and ensure the security and stability of the financial system. We will incorporate illegal digital currencies into the financial regulatory system, and establish a regulatory system, including the industry entry threshold and launch mechanism, inter-ministerial joint conference mechanism, and multi-departmental cooperation, to improve the overall regulatory capacity. Secondly, adhere to the principle of appropriate supervision, implement the administrative licensing system of the trading platform, and refine the regulatory requirements. Maintain the flexibility of regulatory measures, to achieve a variety of measures, step by step supervision and comprehensive supervision. According to the institutional importance and risk degree of the issuer, reasonably allocate regulatory resources, and emphasize behavior supervision and prudential supervision.Finally, a hierarchical structure and hierarchical supervision system are established to ensure that digital currency issuing institutions and trading platforms have strict internal control measures and scientific technical monitoring means, strictly distinguish their own assets and customer assets, and do not misappropriate or occupy customer funds.

Strengthen the risk early warning and information disclosure of digital currency, and enhance the awareness of industry self-discipline. First, we will strengthen the risk early warning and information disclosure of digital currencies. Financial consumer protection departments should regularly issue typical complaints of digital currency, and early risk warning and early notification to prevent them in the bud.Digital currency issuers and trading platforms should disclose relevant information to financial consumers in timely, accurate and comprehensive manner in easy to understand language, while reminding risks and shall not carry out false publicity. Secondly, establish industry standards, establish evaluation criteria, give full play to the role of self-discipline of the digital currency industry, and guide the promotion of self-discipline awareness of the digital currency industry. Strict industry access, and conduct the qualification examination and operation inspection of the existing bitcoin issuance and sales of other digital currency commodities, so as to control risks from the source. In addition, to ensure information security, and actively explore the digital currency financial consumer protection system.First, for the different target groups of digital currency, explore diversified

educational models, carry out targeted financial knowledge popularization activities, strengthen the popularization and publicity of digital currency knowledge, and enhance the risk awareness of financial consumers. Second, strengthen the protection of personal information of digital currency, establish and improve the establishment of consumer risk protection institutions.We will establish a sound coordination mechanism to ensure consistent and efficient actions, and maintain the confidence of financial consumers.

Strengthen publicity and education to improve investors' risk identification ability. First, actively use the Internet to clearly and vividly publicize digital currency knowledge and risks to the public, develop their financial cognition and risk identification ability, and guide their rational investment; Second, strengthen professional investors, although investors have full practical experience and ability in the traditional financial sector and domestic and foreign financial market situations, and third, to provide a good investment education environment for digital currency investment.

6.Strengthen international cooperation and enhance the international coordination and consistency of supervision. Under the international rules of equality, fairness and cooperation, the international cooperation relations and national cooperation mechanisms of digital currency regulators should be established to clarify the number.The jurisdiction of cross-border trading of Chinese currency should jointly safeguard the legitimate rights and interests of financial consumers in cross-border transactions and the stability of the financial system, and strengthen international exchanges and cooperation in the protection of digital currency financial consumers. We will establish a financial regulatory coordination mechanism and strengthen international cooperation.

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