Research Article

Organization Evolution of Fuzzy System Based on Financial Risk Degree of Commercial Banks

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After the market-oriented reform of China's financial industry, there have been some problems in financial risk assessment. In recent years, commercial bank finance has made rapid development, but on the whole, the financial risk assessment of commercial banks is still the weakest link in the Chinese financial system. This experiment selects data from state-owned commercial banks and foreign-funded commercial banks. Through the analysis and deconstruction of the macroenvironment, participants, and business models, this paper systematically combines the factors influencing the financial risk of commercial banks, which can identify the main sources of financial risk in this complex way of financing and clarify the effects of the transfer of financial risk between different participants. Based on this, the paper studies the differences between the assets and liabilities between banks on the risk-taking of banks and the reform of the organizational evolution of fuzzy system. According to the application scenarios and actual needs of commercial banks' financial risks, the entropy weight analysis method is used to reflect the weight of indicators by the difference degree of observed index values. The information quantity of indicators is measured to ensure that the established indicators can reflect most of the initial information. The experimental results show that, compared with state-owned banks, the proportion of foreign banks' assets in 2018 is very small. The highest value of public debt assets is 9.2 billion yuan, followed by financial institutions with 2.58 billion yuan, and deposit institutions with 280 million yuan. The central bank has no debt amount.

1. Introduction

1.1. Background and Significance. The financial risk assessment of commercial banks is the focus and difficulty of financial reform in China. How to achieve a fundamental breakthrough in the accuracy of assessment is an urgent problem and a difficult problem to solve. For a long time, information asymmetry and other factors, lack of effective collateral and high service costs, have restricted the effective provision of financial services. It is a difficult problem that basic financial services should be popularized to all people like medical, educational, postal, and other basic public services. The construction of bank financing channels plays an important role in the daily operation of banks and service points are the most basic channels for the execution of different businesses. Discussing the spatial organization of large commercial banks and the factors that influence them can optimize the layout of the system, increase the provision of financial risk services, and promote economic integration.

1.2. Related Work. In order to analyze whether personal financial risk propensity changes with family financial status and timing of individual and subjective portfolio risk, Lee derived risk propensity data from six different self-assessment aspects collected from the DNB family survey, which covers 1995–2015. Risk propensity is usually higher in the period of economic growth but lower in the period of economic recession. However, in the issue of safety investment, the risk tendency is not affected, and the risk tendency index is in a higher state in the positive return period of the stock market or the subjective risk period of the past investment. However, there are errors in the process of his investigation and research, resulting in inaccurate results [1]. Su and Furman analyzed the bilateral exchange rate returns of the Swiss Franc under the asset pricing framework to evaluate the risk aversion characteristics of the Swiss franc. Whether at average or during a crisis, a "safe haven" currency is a currency that provides a hedge against global

risk. In order to explore these problems, Su and Furman estimated the relationship between exchange rate returns and risk factors in the expanded UIP regression using the recently developed econometric method to explain the possibility that the regression coefficient may change over time. However, the method and process they studied are complicated and not very practical [2]. The way the government chooses to subsidize health interventions will affect the acceptance of health interventions and then affect the degree of medical benefits. In addition to medical benefits, some policies, such as public finance, can also provide insurance against catastrophic medical expenses. Robinson used an extended cost-benefit analysis to assess the health benefits and financial risk protection of nine interventions (including many others) that the government of Ethiopia aims to popularize. The nine interventions include measles vaccination, rotavirus vaccination, pneumococcal conjugate vaccination, diarrhea treatment, malaria treatment, pneumonia treatment, cesarean section, hypertension treatment, and *tuberculosis* treatment. However, his research is not very targeted, just a rough proof [3].

Computational modeling of organizational processes is an important method for system organization operation. For this reason, Wong A. analyzed the dynamic evolution of an organization in a system organization and took individual behavior modeling as a task-oriented self-organization process. Taking a real system organization as an example, Wong A. analyzed the organizational process and studied the organizational structure, task flow, and information flow in the process. This method provides a method to understand the dynamic organization evolution process and shows its potential application in system organization [4]. Chiu and Carducci discussed the key methods that have emerged in recent years in the study of tissue evolution, including the increasing use of coevolutionary methods, with particular emphasis on the definition of rational analysis units. Then, Chiu and Carducci introduced the extensive, multiround, and reasonable review process [5]. In order to achieve the goal of expanding the knowledge spiral to the level of interorganizational epistemology, information technology tools and virtual communities can establish effective interaction to exchange knowledge and make banks develop harmoniously. Hsu and Chen took the platform developed by the European research project "BIVEE (Business Innovation in Virtual Enterprise Environment)" as an example. The selected research method was participatory action research (PAR). Two researchers conducted par in real-time, and the other two researchers also participated in the study. This study found that the virtual evolution of banks can lead SECI model to a cross-organizational level. In addition, learning history describes how all stages of SECI process, even socialization stage, occur or get support in virtual space [6].

1.3. Innovation

(1) Through the analysis of the practical problems encountered by commercial banks in China, the countermeasures of financial risks of commercial banks in China need to be controlled and prevented from the aspects of macroeconomy and microeconomy. From the macroeconomic perspective, we should not only strengthen the financial supervision of commercial banks' risks but also pay attention to information leakage. This requires the introduction of an exit mechanism and the strengthening of the restraint mechanism for commercial banks. First, based on the original financial derivatives, this paper puts forward the methods of using credit derivatives to prevent financial risks.

(2) For the prevention of financial risks, put forward specific constructive suggestions and the establishment of China's financial risk quantitative analysis system.

(3) Analyzing the historical situation of Chinese commercial banks and the existing asset and liability gap, this paper presents the idea of establishing a financial risk assessment system according to the characteristics of commercial banks.

2. Organization Evolution of Fuzzy System Based on the Financial Risk Degree of Commercial Banks

2.1. Evolution Stage of Fuzzy System Organization of Financial Risk Degree of Commercial Banks. The evolution of fuzzy system organization of financial risk degree of commercial banks refers to the system that needs to be guided by risk assessment strategy under external conditions. Risk assessment organization and coordination organization should coordinate the allocation of system resources, appropriate operation, and reasonable incentive and evaluate financial risk and service development [7]. According to the theory of business development, business is not only a social and economic organization but also a life organization. The financial risk system of commercial banks is a subsystem of commercial banks. It follows the general business life cycle model and can be divided into four different periods: embryonic period, developmental period, maturity period, and fusion reduction period.

2.1.1. Embryonic Stage. In the embryonic stage of the development of fuzzy system of financial risk degree of commercial banks, banks mainly introduce financial risk assessment, that is, to improve the accuracy of risk assessment of banks by analyzing various large-scale financial cases in the past. In the early stage of development, banks were not even responsible for risk assessment because China's banking industry was monopolistic and could not assess risks. Although the overall economic situation of the society was poor, the basic resources for investment were very small [8]. The environment has changed and the improvement of competition makes commercial banks realize the necessity of risk assessment, start implementing the relevant financial risk assessment system, and organize relevant departments, which make the financial risk system of commercial banks unclear to be shaped.

2.1.2. Growth Period. The formal establishment of the financial risk rating system of China's commercial banks has made the emerging financial products and services in the market receive extensive attention from major risk assessment institutions of banks [9]. However, due to the need to continue to improve the assessment ability, the assessment results mainly focus on the relatively simple assessment of existing financial products and services. Finally, according to the actual situation, the deviation caused by the degree of financial risk is analyzed and evaluated [10]. The vague system of the degree of financial risk of commercial banks has evolved from scattered and unstable hierarchical management to systematization and perfection, which shows that the financial risk assessment process is gradually standardized and information system design and information processing developed gradually. At present, banks have to invest a lot of human, financial, and material resources to shape the banks' rating. Moreover, the level of financial risk of China's commercial banks is basically defined at the moment.

2.1.3. Mature Stage. When the fuzzy system of financial risk degree of commercial banks reaches the maturity stage, the infrastructure of the system has been gradually completed, and the culture of risk assessment has penetrated into various departments of the bank. In this period of time, the bank evaluation system has gradually developed into a system based on financial risk assessment, followed by the continuous enhancement of evaluation ability [11]. However, the external demand of customers is constantly changing, the financial market and competitors' financial products are also constantly fluctuating, and the methods and capabilities of risk control have been mature.

2.1.4. Convergence Recession. In view of the development of information processing technology and the change of market demand and environment, the rapid change of financial industry is always full of opportunities and challenges. The establishment of fuzzy system of financial risk degree of any commercial bank cannot be done once and for all, and the financial risk rating system begins to enter the fusion recession period [12]. This includes two trends: first, further strengthening the system of unclear financial risk level of commercial banks. The result of accumulation and diffusion is accompanied by the continuous improvement of the value of customers' products and services, which makes the risk assessment system of commercial banks continue to grow and shrink. This means that there is a competitive relationship between peers and nonpeers, the volatility of the financial market, and regulatory policies. The arrangement of policies will eventually lead to the failure of commercial banks to adapt to customer demand and market environment in a timely manner, resulting in stagnation [13].

2.2. Characteristics and Types of Financial Risks. Risk is a commonly used but fuzzy concept. Financial risk refers to the uncertainty or possibility of economic entities suffering losses in financial activities. The characteristics of financial risk are as follows:

(1) Financial risk is related to loss, and financial risk is specific to the possible loss. For a specific financial activity, as long as there is a possible loss, it shows that it has financial risk. When an investment has multiple potential returns, the possible lower return is the relative loss compared with the higher return [14].

(2) Financial risk is the inherent characteristic of financial activities. If there are financial activities, there must be economic risks and financial risks, and financial activities are inseparable [15]. The uncertainty of financial activities is the source of financial risk. The greater the uncertainty of financial activities, the greater the financial risk.

2.3. Entropy Weight Analysis Method. Entropy weight analysis method is based on entropy to calculate the weight of each index. Its basic principle is to use the difference degree of observation indicators to reflect the weight of indicators. The entropy weight analysis method is an objective weighting method, which uses the information provided by the entropy value of each index to determine the weight of the index [14, 16]. Entropy weight analysis method is to use entropy weight method to determine the weight of indicators, which can avoid the interference of human factors on the weight of each index and make the evaluation index and evaluation results more in line with reality [17]. By calculating the entropy value of each index, the index information can be measured to ensure that the established indicators can reflect most of the initial information [18]. Proceed as follows:

(1) If there are m objects to be evaluated and n evaluation indexes to establish decision matrix, then the value of the ith evaluation object to the jth index is $x_{i,j}$ $(i = 1, 2, \ldots, m; j = 1, 2, \ldots, n)$ and the corresponding decision matrix X is

$$\begin{bmatrix} x_{11} & x_{12} & \ldots & x_{1n} \\ x_{21} & x_{22} & \ldots & x_{2n} \\ x_{31} & x_{32} & \ldots & x_{3n} \\ x_{m1} & x_{m2} & \ldots & x_{mn} \end{bmatrix}. \quad (1)$$

(2) Normalization of decision matrix

In order to ignore the different decision effects brought by different dimensions of indicators, it is necessary to standardize the X decision matrix by creating a normalized matrix $Y = (y_{ij})_{m*n}$. There are two ways to normalize the X decision matrix [19].

First, the benefit index is too large, so the following standardized format should be adopted:

$$y_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)}. \quad (2)$$

Second, the smaller better index, that is, the cost index, adopts the following standardized form:

$$y_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_j) - \min(x_j)}, \quad (3)$$

where y_{ij} is the normalized value of x_{ij}; $\max(x_j)$ and $\min(x_j)$ are the maximum and minimum values of the jth index, respectively. It can be found that, after standardization, $0 \le y_{ij} \le 1$.

2.4. Fuzzy System Algorithm.

The fuzzy system algorithm is not limited to fuzzy control and fuzzy systems theory but includes a wide range of research topics. For this reason, some people divide the fuzzy systems algorithm into four branches:

(1) Vague logic and artificial intelligence, which introduce approximate reasoning into classical logic and develop a special system based on fuzzy information and approximate reasoning [20]

(2) Fuzzy system, which includes fuzzy control and fuzzy method in signal processing and communication

(3) Security decision, which uses soft constraints to consider optimization problems [21, 22]

(4) In fuzzy mathematics, vague sets, which are used instead of classical sets to extend the concept to classical mathematics

Of course, from a practical point of view, these four branches are not completely independent but are interdependent and closely linked. The fuzzy algorithm in practice based on theory has yielded fruitful results, but the vague theory is still new. Although the application of fuzzy theory in control system has become more and more clear, efforts still need to be made to improve its accuracy and control speed, especially in other fields. Most methods and analyses are rare [23, 24].

3. Experimental Evolution of Fuzzy System Organization Based on the Financial Risk Degree of Commercial Banks

3.1. Sample Data Selection and Statistical Description.

In this experiment, the data of state-owned commercial banks and foreign-funded commercial banks are selected for analysis. The main reason for choosing these two types of banks is that the banks have a relatively long listing period and large asset scale and have strong typicality. The selected time range is 2013–2019, a total of 7 years of annual data. Data sources are the Internet, financial statements released by commercial banks, and the official website of the National Bureau of statistics.

3.2. Main Contents of the Study

3.2.1. Bank Asset Level.

Relatively large banks are not easy to go bankrupt for the following reasons: the financing channels and business scope of banks are relatively large.

Therefore, once the risk occurs, the risk management channel of the bank can deal with and solve the risk better than the ordinary bank. Secondly, if the bank's asset scale is relatively large when the bank has problems, it will have a greater impact on the financial market and economic growth. Regulatory authorities need to take strong supervision, which reduces the possibility of bankruptcy and other risks of commercial banks but also limits the blind expansion of the scope of assets.

3.2.2. GDP Growth Rate.

The characteristics of the GDP growth rate of commercial banks determine that the development of commercial banks is cyclical. The development of the banking industry is closely related to the development of the whole economic environment and financial market. Therefore, in the analysis of this experiment, the GDP growth rate is introduced as the overall analysis index of the macro environment.

3.3. Benchmark Model.

Combined with a large amount of research data, banking risk is not short term but sustained. Therefore, this experiment constructs a potential model to study the impact of interbank business on risk-taking. At the same time, we will study the differences between the assets and liabilities between banks and build a reference model as follows:

$$\text{Inrisk}_{it} = \alpha_0 + \alpha_1 \text{Inrisk}_{it-1} + \alpha_2 \text{Inibasset}_{it} + \alpha_3 \text{Policy}. \quad (4)$$

In the model, the risk_{it} level of bank i in year t is taken into account, the lag phase of risk_{it} is included in the model to investigate the persistent impact of risk, ibasset_{it} is the interbank asset variable, and policy_{it} is the policy dummy variable.

4. Experimental Fuzzy System Organization Evolution Based on the Financial Risk Degree of Commercial Banks

4.1. Assets and Liabilities of Commercial Banks.

After China's accession to the world trade organization, the transition period will soon end, the financial industry will further open to the outside world, and the state-owned commercial banks will face more severe market competition. In accordance with China's WTO commitments, the regulatory authorities will remove the regional and customer restrictions on RMB business of foreign banks and encourage foreign banks to set up or transform their existing branches into corporate banks registered locally in China. In addition, corporate banks and branches of foreign banks that have not been transformed will be treated differently according to the principle of prudential supervision. Foreign bank branches will be more restricted than corporate banks in absorbing retail deposits and other RMB retail businesses of Chinese residents. Local branches of foreign banks registered in China will fully implement the principle of national treatment and allow them to operate comprehensive foreign exchange business

and RMB business, including RMB wholesale business and retail business. The branches of foreign banks can continue to do RMB wholesale business, but small retail businesses will be restricted to a certain extent and can only absorb fixed deposits of residents above the limit. In the experimental stage, our experimental object is the artistic visual form of ceramic murals and the data source is the questionnaire that was issued and retrieved. Here, we publish questionnaires by age group to reduce significant differences.

As shown in Table 1, from 2018 to 2019, the assets of the Central Bank of China's state-owned commercial banks decreased by 6.6% and the creditor's rights of deposit institutions and financial institutions decreased by 31.78% and 4%, respectively. The assets of these three kinds of projects have declined, only the government's creditor's rights have increased, and the increase rate has more than tripled.

According to the latest statistics of the network survey, before 2019, there were 26 wholly foreign-owned and Sino foreign joint venture legal person banking institutions registered in China, with 13 branches and subsidiaries; 105 foreign-funded banks from 31 countries and regions established 278 branches and 93 subbranches in 29 cities in China; 207 foreign-funded banks from 48 countries and regions set up 306 representative offices in 29 cities in China; the total deposits of foreign banks in China reached 58.9 billion US dollars, and the loan balance was 74.3 billion US dollars. There are 30 cities in China that have opened RMB business to foreign banks, of which 9 cities have opened up ahead of time. There are more than 200 types of businesses operated by foreign banks, and 172 foreign-funded banking institutions are allowed to operate RMB business. The RMB business of foreign banks has developed rapidly.

As shown in Figure 1, compared with state-owned banks, foreign banks have a small proportion of assets. The highest value of government debt assets is 9.2 billion yuan, followed by financial institutions with 2.58 billion yuan, and deposit institutions with 280 million yuan. The central bank has no debt amount. It can be seen that the government's assistance to foreign banks is great.

4.2. Deterioration of Economic Environment. According to the China Bureau of Economic Analysis, the inflow of foreign capital began to exceed the historical period and increased rapidly since 2015. The massive inflow of international capital creates a positive atmosphere for China's domestic market, which generally flows into the stock market and the real estate market, raising the price of these assets and causing huge financial bubbles. However, the speed of growth of the domestic real economy and the speed of adjustment of the economic structure can not afford a huge amount of capital. There is an increasingly acute imbalance between the virtual economy and the real economy, leading to the deterioration of the economic environment.

The real estate price index is used as the virtual asset price index, and the real GDP is used as the real economy index. In order to describe the departure relationship between the virtual economy and the real economy, it can be

TABLE 1: Balance sheet of state-owned commercial banks (unit: 100 million yuan).

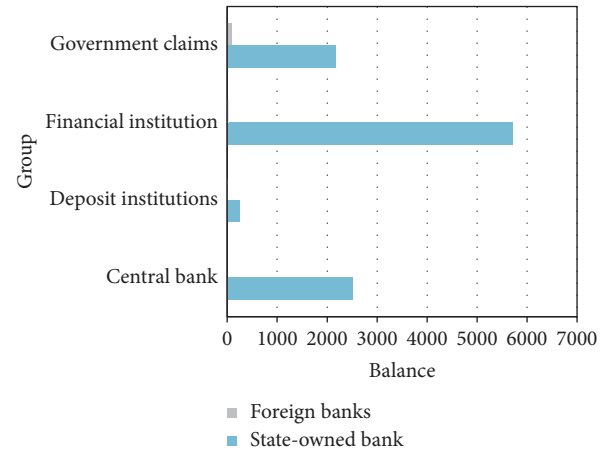| Project	2018	2019
Central bank	2513	2347
Deposit institutions	258	176
Financial institution	5716	5489
Government claims	2174	6482

FIGURE 1: Assets and liabilities of state-owned banks and foreign banks in 2018.

seen from Figure 2 that the growth capacity of the virtual asset price out of the real economy began to accelerate after 2015–2018, and the nonequilibrium state of the deviation will continue with time and finally reach the peak of deviation at the end of 2017. By the occurrence of accidental events, the expected changes, and asset prices falling, the virtual economy began to return to the real economy. Therefore, it can be concluded that the virtual economy is the most sensitive when it deviates from the real economy to the maximum regional critical state, and the financial crisis may break out at any time.

As shown in Figure 2, the development rhythm of China's economy in the past four years is a true portrayal. With the collapse of the Internet bubble, China's economy has entered a recession. In order to stimulate economic growth, the rate of interest reduction in the first few years has reached its lowest level in 31 years in 2017. Due to the loose policy of long-term low-interest rate and the conditions of loan, the money flowing into the real estate market has greatly led to the rise in real estate prices. On the other hand, China's real economy is short of new economic growth points. It can only maintain a low growth rate. Finally, the expansion of the virtual economy is ultimately constrained by the development scale and absorptive capacity of the real economy to the critical point, the real estate bubble bursted, and the financial crisis is triggered at any moment.

4.3. Global Liquidity Flooding and World Economic Imbalance. At the same time, the situation of global liquidity flooding and economic imbalance is becoming
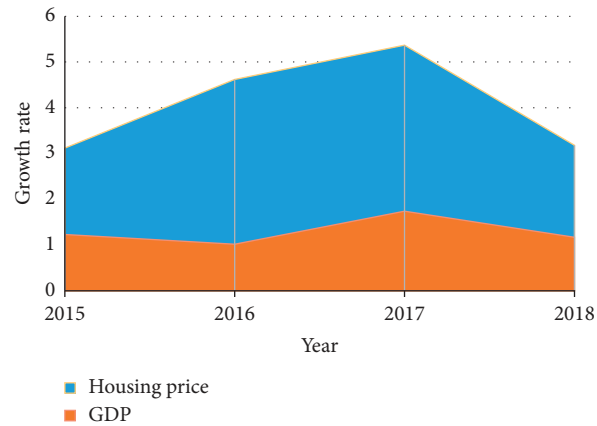
FIGURE 2: The relationship between virtual economy and real economy.

more and more serious. All these are inseparable from the current international monetary system in which the dollar is the dominant currency. After the cold war, China has become the world's number one hegemon. China's comprehensive strength determines the leading position of the US dollar in the international monetary system. However, this is a US dollar–based international monetary system that has become a deeper world economic factor for the outbreak of the subprime mortgage crisis. The global liquidity flooding and global economic imbalance brought about the foreshadowing of Chinese subprime debt crisis.

Loose monetary policy has led to global liquidity. Along with the breakdown of the NASDAQ technology bubble, China's domestic economic growth rate has dropped rapidly. As shown in Figure 3, the change of GDP growth rate between China and the United States from 2013 to 2018 is described. We can see that the GDP growth rate of both countries exceeded 3% from 2014 to 2015, but the situation turned sharply in 2016, and the GDP growth rate dropped to less than 1%. In response to China's loose monetary policy to stimulate the economy, countries around the world also keep interest rates at a low level.

4.4. Current Account Revenue and Expenditure and Government Expenditure. The global economic imbalance is mainly manifested in China's current account deficit and fiscal deficit, while the emerging market countries represented by the United States maintain a long-term trade surplus with China. This increasing imbalance is not conducive to the coordinated development of the world economy and is also the underlying cause of the outbreak of the subprime mortgage crisis. On the one hand, as a big consumer country, China has long implemented the way of expanding domestic demand to stimulate economic growth and employment, which has led to a serious shortage of private and government savings, especially the use of the special function of financial innovation tools to encourage early consumption. In the modern

financial crisis early warning system, the current account deficit/GDP has become an important assessment index. If the deficit level can be controlled within a certain scale, it is generally 4%, which is meaningful to promote domestic consumption capacity and introduce advanced technology. If the deficit continues to expand, the equilibrium state of economic development will be affected. According to the economic operation data of China before the subprime debt crisis released by the world bank, since 2015, China's current account revenue and expenditure has been in a deficit state and has deteriorated year by year. By the end of 2017, the ratio of current account deficit to GDP has reached 4.8%, and the fiscal expenditure deficit has also been 1.8%, as shown in Figure 4.

On the other hand, due to the relatively backward economic development and lack of capital in Asia, an industrial system dominated by the manufacturing industry has been formed in the international division of labor system, which determines that Asia has been pursuing export-oriented policies for a long time to drive domestic economic development. With the continuous increase of trade surplus, a large amount of foreign exchange reserves has been accumulated. In order to reduce the shrinking of foreign exchange reserves caused by the devaluation of RMB, the countermeasures adopted by developing countries are to invest the foreign exchange reserves back to China in the form of purchasing China's treasury bonds so as to make up for the current account deficit by capital account inflow and maintain the stability of RMB exchange rate. It is such a positive feedback mechanism that enables China's current account to be supported by the capital account for a long time, and thus the debt consumption pattern of China is also supported.

For a long time, China has maintained its consumption and investment through external debt. The financial derivatives related to subprime mortgage have brought this debt growth mode to the extreme. With the outbreak of the subprime mortgage crisis, it is also indicated that the mode of promoting domestic economic growth through huge fiscal deficit, trade deficit, and large amount of international capital inflow is unsustainable.
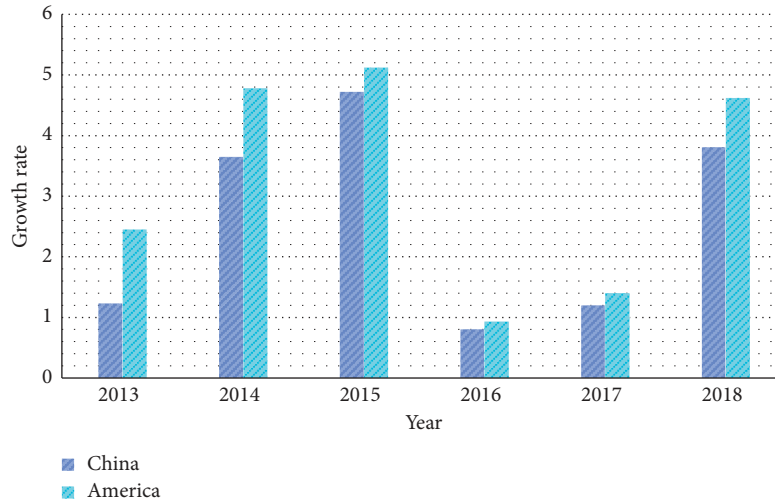
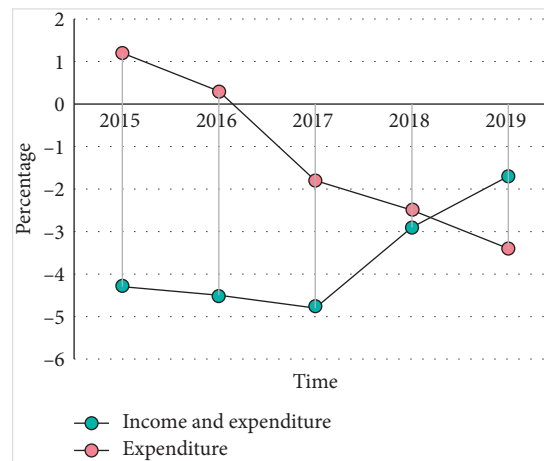FIGURE 3: Change of GDP growth rate from 2013 to 2018.

FIGURE 4: Current account revenue and expenditure and government expenditure in China.

5. Conclusions

With the rapid development of China's economy, the financial industry plays an increasingly important role in the national economy. Commercial banks account for nearly 92% of the total assets of China's financial industry. They are responsible for the implementation of macrocontrol of the national economy and the rational allocation and flow of social resources. On the one hand, they will also play a particularly critical role. However, due to historical reasons and its own problems, coupled with economic globalization, China's economic activities are more and more affected by international financial activities. Therefore, China's commercial banks are facing a variety of financial risks. The biggest risks faced by commercial banks include credit risk, market risk, and operational risk. Financial risk management is based on different technologies and methods. Therefore, appropriate methods and strategies should be adopted to manage and evaluate financial risks so as to ensure financial security, maintain finance in a relatively safe and stable environment, improve economic efficiency, and ensure that commercial banks can better serve the economy and society.

Convention is a key concept in the theory of evolutionary economics. A contract is a company's ability to be sensitive to the external environment and to anticipate changes in the external environment. Its application is "procedural" and usually automatic. It is the basis for companies or other types of organizations to engage in financial activities and to de0termine their behavior in a particular activity. The performance of a business or institution should be determined in accordance with its own practices and the practices of other institutions and financial sectors. The self-organization of the evolution of the vague system of the degree of financial risk of commercial banks is also based on contracts; the innovation strategy and the implementation of various innovation policies, management procedures, incentive policies, and corporate culture are the financial banking system contracts.

In the evolution process of complex system, the structure of the system as a whole is always adjusted under the influence of internal and external fluctuations. However, when the internal and external fluctuations represented by microfluctuations are formed, they are related to integrity

and initiative. According to the cross-action and mutual correlation, it violates the overall limitation of the initial structure of the system. When it changes greatly, it promotes the instability of the initial structure of the system and inevitably leads to the qualitative change of the overall structure of the system. In this process of frequent mutation, it may be caused by an incentive caused by internal fluctuations, or it may be caused by an invasion caused by external fluctuations. In the process of transformation, the reasons for the quantitative and qualitative changes of the system are also ambiguous.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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