JOURNAL OF INFORMATION PROCESSING SYSTEMS JIPS

Financial and Economic Risk Prevention and Countermeasures Based on Big Data and Internet of Things

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Abstract
Given the further promotion of economic globalization, China's financial market has also expanded. However, at present, this market faces substantial risks. The main financial and economic risks in China are in the areas of policy, credit, exchange rates, accounting, and interest rates. The current status of China's financial market is as follows: insufficient attention from upper management; insufficient innovation in the development of the financial economy; and lack of a sound financial and economic risk protection system. To further understand the current situation of China's financial market, we conducted a questionnaire survey on the financial market and reached the following conclusions. A comprehensive enterprise questionnaire from the government's perspective, the enterprise's perspective and the individual's perspective showed that the following problems exist in the financial and economic risk prevention aspects of big data and Internet of Things in China. The political system at the country's grassroots level is not comprehensive enough. The legal regulatory system is not comprehensive enough, leading to serious incidents of loan fraud. The top management of enterprises does not pay enough attention to financial risk prevention. Therefore, we constructed a financial and economic risk prevention model based on big data and Internet of Things that has effective preventive capabilities for both enterprises and individuals. The concept reflected in the model is to obtain data through Internet of Things, use big data for screening, and then pass these data to the big data analysis system at the grassroots level for analysis. The data initially screened as big data are analyzed in depth, and we obtain the original data that can be used to make decisions. Finally, we put forward the corresponding opinions, and their main contents represent the following points: the key is to build a sound national financial and economic risk prevention and assessment system, the guarantee is to strengthen the supervision of national financial risks, and the purpose is to promote the marketization of financial interest rates.

Keywords
Big Data, Financial and Economic Risks, Internet of Things, Prevention and Countermeasures

1. Introduction

Given the further development of the social economy, globalization has become an inevitable trend of economic development. Building a mature layout of international financial enterprises is an important step toward promoting the development of economic globalization. However, the development of anything has two sides. Whereas promoting the development of economic globalization, finance itself also carries great risks. Unlike the traditional real economy, the financial economy does not use real commodities as

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objects of exchange; the main trade objects of the financial economy are electronic commodities such as stocks, funds and bonds. Moreover, the financial economy is more profitable than the traditional commodity economy. Since 1990, starting in coastal cities, China has begun to build a financial economy system everywhere and has constructed bond, stock and other fund venues [1,2] (Fig. 1).
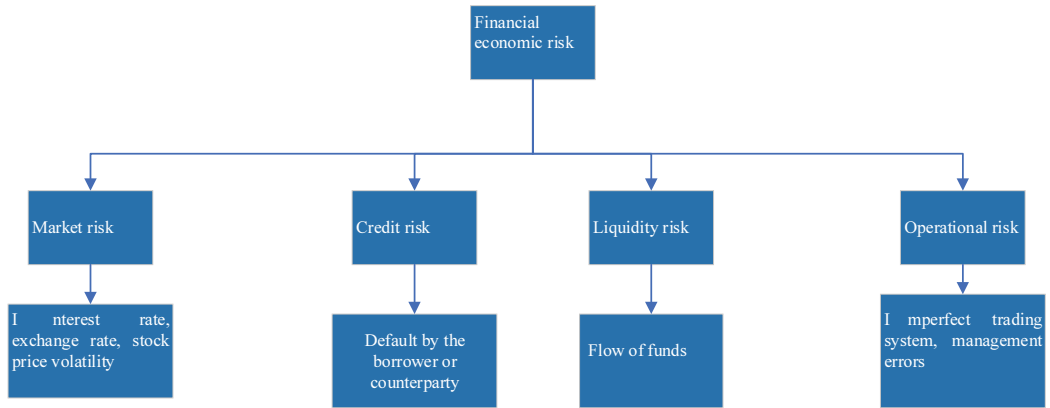

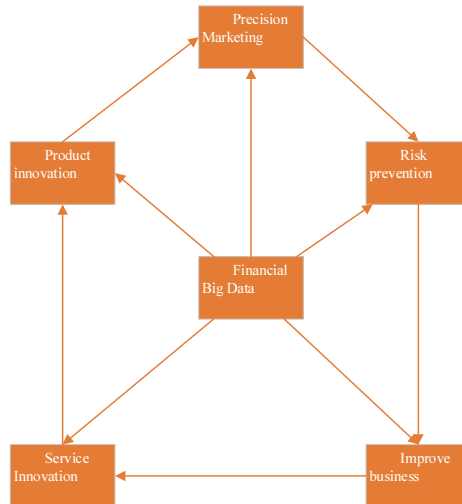**Fig. 1.** Financial transaction risk.

Fig. 2. Application of IoT and big data in the field of finance.

Given the birth of Internet of Things (IoT) sensors, the amount of data in the information world has grown dramatically, and the substantial amount of data generated from IoT sensors has accelerated the birth of big data. Big data technology mainly involves the collection, management, processing, and analysis of massive amounts of data and is capable of handling massive amounts of data that are difficult to analyze using traditional methods. IoT and big data complement each other [3,4]. IoT sensors are important sources of big data, and the data generated by IoT can be analyzed as big data. IoT mainly includes the sensing part and the internal processing part, which overcomes the limitations of the information exchange of objects and constitutes a network of connected characters. In the application process, the Internet is often used in combination with big data and has important applications in

communication, education and financial convenience [3,4]. At present, given the rapid development of the financial economy, the financial risks faced by the government and enterprises are also growing. The specific model of IoT and big data in financial risk prevention is shown in Fig. 2 [5,6].

2. Financial and Economic Risk Analysis

Regarding policy, the state must develop a corresponding economic policy to achieve macrolevel control of the economy. The country's economic policy plays a fundamental role in regulating changes in the market. The former is a choice among high-risk, high interest, and low-risk interest, ignoring the avoidance of economic risks. Such operations often have an enormous impact on economic development. A sound system is a prerequisite to ensure the stable operation of group institutions; however, at present, some enterprises lack a sound economic management system, and there are no perfect economic risk avoidance measures, which leads substantially increases the probability of incurring financial risks in enterprise development process, especially financial enterprises [7,8].

3. Questionnaire Survey based on Financial and Economic Risks

3.1 Survey Process

To fully understand the current situation of financial and economic risk prevention in China, our investigation process is divided into the following steps. First, we conducted an interview with the person in charge of the economic management of Cheongdu to obtain the financial risk cases that it acquired during the year. Second, we investigated the major enterprises to better understand the current situation of financial and economic prevention in China and learned about these enterprises' internal management measures. Finally, we investigated the public to understand the current situation of financial and economic risk prevention. In the second group of experiments, we selected 10 enterprises in City A as the subjects of our survey. In the third group of the survey process, we randomly selected 200 people as respondents [9,10].

3.2 Survey Results

In the first group of experiments, we obtained data from the government of City A. These data are extremely informative. The specific results are as follows.

As shown in Table 1, the government reflects that our people have experienced the following problems in their productive life: illegal institutions fraudulently taking public deposits, illegal fundraising, lending and campus loans, and regulatory arbitrage. The main data are shown in Table 2.

Table 1. Data of City A government

Problem	Proportion
Illegal institutions fraudulently accepting public deposits	0.17
Illegal fund raising	0.23

Table 2. Employees' opinions on corporate financial management risks

Projects	Number of people	Proportion
Low risk awareness among management	125	0.625
Low risk awareness among employees	114	0.57
Lack of necessary accountability of the enterprise	103	0.515
Lack of reliable management system in the enterprise	59	0.295

We identified the following main problems: enterprise risk management, weak risk awareness of management, weak risk awareness of employees, lack of necessary accountability of the enterprise, lack of a reliable management system for the enterprise, and other problems. We randomly selected 200 citizens from the third group of experiments and conducted a questionnaire survey to determine the financial risks they encountered in their daily lives and the problems they thought existed in financial risk prevention. The specific data are shown in Table 3 [11,12].

Table 3. Citizens' problems of financial risk prevention

Projects	Proportion
Too many incidents of fraudulent loans in life	0.16
Lack of government publicity on financial risk prevention	0.27
Some illegal fund raising incidents are difficult to identify	0.34
Lack of understanding of financial risks among the elderly	0.14
Lack of systematic mastery of financial investment knowledge	0.09

3.3 Reliability Analysis and Validity Analysis of the Questionnaire

Table 4 shows that the Kaiser-Meyer-Olkin (KMO) value of the validity analysis is 0.736. According to the validity analysis criterion, when its coefficient is >0.06, the data used in this experiment are considered to have good reliability.

Table 4. Validity analysis

Project	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues (before rotation)	3.196	1.287	2.898	2.999
Variance explanation rate, % (before rotation)	19.62	9.64	10.90	8.97
Cumulative variance interpretation rate, % (before rotation)	16.61	88.24	67.13	47.08
Eigenvalues (after rotation)	3.88	1.35	4.26	2.15
Variance explained rate, % (after rotation)	86.89	66.68	69.22	69.55
Cumulative variance explained rate, % (after rotation)	77.67	76.63	79.99	88.55
KMO value	0.736			
Barth's spherical value	0			
Df	66			

An important criterion of reliability analysis is to test the credibility of the questionnaire survey. As shown in Table 5, the reliability coefficient of this experiment is 0.802, which is between 0.8 and 1, and has high reliability [13,14].

Table 5. Reliability analysis

Sample size	Number of projects	Cronbach' α coefficient
200	10	0.802

4. Financial and Economic Risk Prevention Model based on Big Data and IoT

4.1 Model Introduction

Using IoT, we can monitor production, circulation, consumption and other data in real time. Through big data technology, we can deeply mine and analyze these data to identify anomalies, fluctuations and trends in economic operations and propose early warnings and timely suggestions to provide decision support for the government and enterprises. The specific model is shown in Fig. 3.
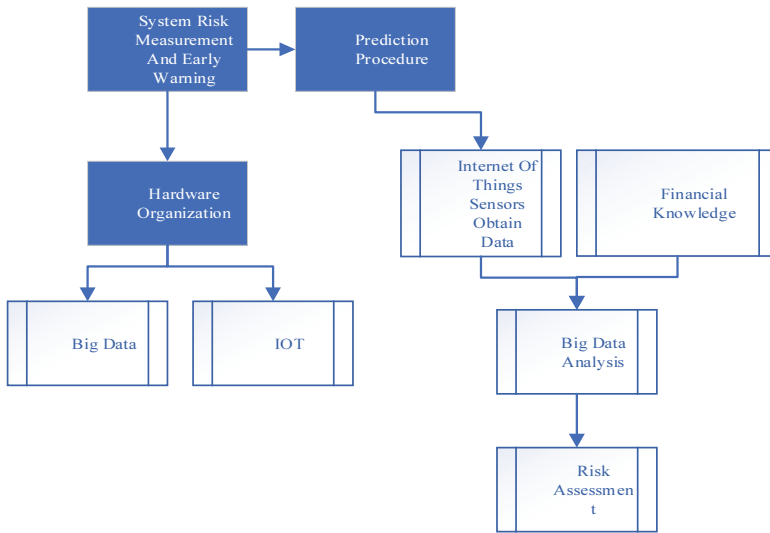

Fig. 3. Economic risk-specific model.

4.2 Key Steps of the Model

Key Step 1: As shown in Eq. (1), the prerequisite for big data analysis and screening is sufficient data, which are mostly obtained by IoT sensors. As shown in Eq. (1), Cov is a series of processing functions for processing different data. Var is the adjustment factor [15]:

$$\sigma_p^2 = \frac{1}{n}Var + 91 - \frac{1}{n}:Cov. \tag{1}$$

Key Step 2: After the processing of Eq. (2), we can initially screen out suspicious data for the next step of the analysis. $Cov9$ represents multiple iterations of R_1 and R_m. ω represents the weight. R_n and represents the R_m data sequence obtained by IoT sensor detection to prevent economic risks [16]:

$$\sigma_m^2 = \omega_1 Cov9R_1, R_m: +\omega_2 Cov9R_2, R_m: +\omega_n Cov9R_n, R_m \tag{2}$$

Key Step 3: The initial screening of big data will include a deep analysis of the data; the specific analysis process is shown in Eq. (3). After the analysis of Eq. (3), we can wait for the raw data that can be used for decision-making. β is the adjustment factor. The purpose of Step 3 is to explore economic and financial risks in detail.

$$Cov9R_i, R_m := \beta_i \sigma_m^2 \tag{3}$$

Key Step 4: Here, ω is the weight and β is the adjustment factor. The fourth step is to further screen the enterprises to further avoid economic risks.

$$\sum_{i=1}^{n} \omega_i \beta_i = 1 \tag{4}$$

4.3 Testing the Effectiveness of the Model

As shown in Table 6, when the artificial neural network is used for evaluation, the prediction accuracy is as high as 95.12%, indicating that the model constructed in this experiment is highly suitable, and the influence of outliers is slightly greater. Therefore, it is necessary to increase the amount of data pre-processing to improve the accuracy of the input data. The concentration and reliability are also excellent [17].

Table 6. The results of the comprehensive evaluation method (unit: %)

Project	Value
Risk prediction accuracy	88.32
Outlier effect	0.63
Risk concentration	95.12
Degree of reliability	69.80

5. Financial Economic Risk Prevention Measures

A sound national financial and economic risk prevention mechanism can effectively avoid investment risks. A sound risk assessment system and a perfect risk assessment system can be used to effectively identify and establish corresponding preventive measures before a financial crisis occurs. The use of a scientific assessment can effectively reduce the damage caused by risks to our economy and promote the development of our economy in the direction of globalization. In addition to establishing a risk assessment system, strengthening the training of employees is also necessary. Building a sound national financial and economic risk system requires high-quality, relevant talent. The state has a supervisory role in the development of the financial market. For the sustainable and healthy development of the national financial economy, the national government must fulfill its supervisory obligations, strengthen the supervision of financial institutions, formulate relevant policies and regulations, develop industry norms for the financial industry, etc. On the one hand, the state needs to strengthen the supervision of individual and corporate credit to eliminate credit risk at the root. On the other hand, the state needs to regulate market transaction activities and maintain the orderly conduct of the financial transaction market [18].

6. Conclusion

To promote the development of the financial industry, we built a financial and economic risk prevention model based on big data and Internet of Things. This model can be used to not only perceive individuals' behavior but also help individuals avoid financial risks. On the other hand, this model can also help companies screen and select high-risk projects. The innovations of this article are mainly in the following three aspects. First, this article has studied the prevention of financial risks from the aspects of big data and IoT, and the research perspective is novel. Second, the questionnaire survey of the article has been divided into four parts, and the survey process was sufficient. Finally, the model constructed by the article is innovative and professional.

Conflict of Interest

The authors declare that they have no competing interests.

Funding

None.

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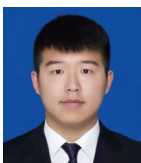
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