

Design and Implementation of Real Time Warning Module for Bank Financial Supervision System

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Abstract—The construction of a scientific and effective supervision of the commercial bank accounting risk early warning model for early identification and early warning of the risk of banks, taking timely measures to prevent and resolve risks, and preventing the risk of spreading have important practical significance. A real time bank accounting supervision system model of early warning module design method is proposed based on multiple discriminant. Software development and design of early risk warning system of bank accounting supervision are analyzed. Bank accounting supervision system of real time warning module is composed by the network communication module, data acquisition module, bus transmission module and warning program loading module. The system adopts embedded design, realizes the online risk warning for bank accounting supervision through the analysis and control of user behavior, the risk early warning module software accounting supervision system with embedded Linux technology is developed, build a credit risk, interest rate risk, accounting supervision of banking risk exchange rate risk prediction and alarm multivariate discriminant analysis model, real-time early warning and information classification of bank accounting supervision system through the boot loader, to cause a bank in the business activities of various expenses and the interest payments, accounting for business payments, and regularly according to the provisions and requirements into the form of financial statements. Bank financial analysis and risk measurement is obtained. The results show that the bank accounting supervision of the system can realize the real-time risk warning, and it can improve the bank's risk prevention and management ability.

Keywords- bank; accounting supervision; real early warning module; embedded; risk prediction

I. INTRODUCTION

Financial management is an important part of the bank management throughout the whole process of the banking business activities, is a comprehensive reflection of the bank management. It is not only the symbol of banking business is good or bad, and finally reflects the bank operation effect^[1]. Chinese takes "unified leadership, hierarchical management, independent accounting, income, bank financial the management system of the profit". The basic task is: national credit fund management, the reasonable use of credit fund supervision, to ensure the safety and integrity of state funds; actively expand the

sources of funds, credit enhancement ability, promote the harmonious and stable development of national economy; flexible allocation of funds, make full and reasonable use of funds, accelerate the flow of funds to implement economic accounting; in principle, to increase revenue, reduce the cost of capital, complete the profit plan; reasonable allocation of the financial funds, to enhance the ability of the bank's own development. The implementation of financial supervision; and maintain fiscal discipline. Bank accounting supervision and risk early warning is the National Bank of China in order to improve the efficiency of the use of credit funds, bank balances and financial activities around the general plan, accounting, analysis and control of behavior. To build a scientific and effective supervision of commercial bank accounting risk early warning model for early identification and early warning the risk of banks, and to take timely measures to prevent and resolve risks, prevent the risk, so it has important practical significance to spread. With China's accession to the WTO, the state-owned commercial banks to participate in international competition, need to be able to reach the international standard in risk management requirements, and the status of the Basel agreements and the requirements of the domestic commercial banks still have a large gap, how to strengthen risk management, improve the level of risk management, is an important problem facing the domestic commercial banks^[2].

Due to different national circumstances and banking supervision, the banking industry risk warning system construction are different, in the traditional method, method of early warning of the risk of commercial banks is mainly divided into expert analysis, financial ratio analysis and risk measurement model, first of all, the expert analysis method in 1980s, due to the debt crisis effect, banks generally begin to pay attention to the prevention and management of credit risk, mainly use the expert analysis method. The expert analysis method, mainly based on the Bank of the expert's experience and subjective analysis to assess the risk of commercial banks operating in the face, which mainly refers to the various elements of risk management were analyzed^[3]. The impact of commercial banks at present expert analysis, in the United States, Britain and Singapore are still widely used. In second, the financial ratio analysis method is to establish a risk analysis method based on financial indicators as CART model, structure analysis, multivariate discriminant analysis model and logit model, then the probit model, neural network model and so on. At

present, common in Germany and Japan and other countries of the risk early warning system use such method. Third, the risk measurement model, since 1990s, due to the continued decline of commercial bank loans and profits sheet business risk increasing, analysis of traditional asset liability management relies on commercial bank statements, lack of timeliness, asset pricing model is a blend of new financial derivative, and the variance and the coefficient to measure the risk (or assets) can only reflect the market volatility, these traditional methods is difficult to accurately define and measure the financial risk of commercial banks, commercial banks began to explore the use of more economical method to measure and control the credit risk^[4]. The relative lag and risk management with the past. It is difficult to adapt to the characteristics of changes in the market compared to a new generation of financial engineering experts using modern financial theory and mathematical tools will be applied modeling techniques and analysis methods in this field, in the traditional credit ratings based on the a number of risk model, it established risk value based on the probability of default, the expected loss is measured the model of core indicators, such as KMV credit monitor model, Credit Metrics (CreditMetrics) model^[5], CSFP credit risk measurement model and McKinsey model. From the development of China's commercial banks, the risks faced by Chinese commercial banks focused on credit risk, market risk, operational risk and liquidity risk. In this regard, this paper presents a multiple discriminant analysis model of bank accounting supervision system of real time warning module design method based on software development and early warning system of the risk of bank accounting supervision. The design of bank accounting supervision system is researched. Real time warning module by the network communication module, data acquisition module, a bus transmission module and warning program loading module, the system adopts embedded design, implementation of accounting supervision of banking risk warning in line and controller through the analysis of user behavior, build a credit risk, interest rate risk, exchange rate risk of bank accounting supervision risk prediction and alarm multivariate discriminant analysis model, real-time early warning and information classification of bank accounting supervision system through the boot loader, to cause a bank in the business activities of various expenses and the interest payments, accounting for business payments, and regularly according to the provisions and requirements into the form of financial statements, financial analysis and implementation of bank risk measurement. The results show that the real-time warning module of bank accounting supervision system designed in this paper has high practical value.

II. ANALYSIS OF RISK PRE-WARNING PRINCIPLE OF BANKING ACCOUNTING SUPERVISION

A. Main content of banking supervision

At the risk of real-time warning banks, the optimization is designed for accounting supervision system, the

efficiency of bank risk real-time early warning is improved, in order to realize the optimization design of the real-time warning module of bank accounting supervision system, first analyzes the main contents of bank accounting supervision, the main content of bank accounting supervision and risk early-warning are as follows: 1. The development of the financial system. The financial system is the organization of financial management norms, the implementation of financial supervision is the basis, the bank's business activities and staff with the bank in economic relations should follow the guidelines. The financial forecast algorithm is studied. According to the relevant historical data, considering the actual condition, development trend of the use of certain methods to make a scientific prediction of the future the financial situation and operating results. Through financial forecasting, puts forward the management activities of the target and the corresponding measures to complete the preparation target. Financial planning, Financial planning index is required financial forecast system, target specific^[6]. Through financial planning, the close links between the financial indicators, and the objectives of the bank's business activities to the various departments through the financial plan, each department has the direction of action, work pressure, according to the assessment. Financial accounting, to lead the bank in the business activities of various expenses and the interest payments, accounting for business payments, and regularly according to the provisions and requirements into the form of financial statements, to provide bank operation system and operating results, complete financial information, so that the governor and the relevant departments to understand the situation of banks the main activities. Financial analysis, on the basis of accounting, financial accounting and other related information around the banks financial, cost, profit and other indicators, check the financial cost, The completion of the profit index, analysis of the reasons affect the index of the plan, to distinguish between the capital operation of all sectors of the target responsibility, put forward some suggestions for improvement. The financial check. In the financial management, in addition to strengthen the daily management, strict control and supervision, also need to regularly or not according to the financial inspection. The country's fiscal policy, the provisions of the financial system, financial discipline requirements, the bank's business activities from its rationality, legitimacy, effectiveness and other aspects of inspection, in order to reveal the shortcomings and mistakes in business activities and illegal activities, promote the relevant departments and personnel to correct the error, the improvement work. With the establishment of bank accounting supervision, perfect financial management mechanism, enrich financial management, improve the quality of financial management professionals, and truthfully reflect the situation of bank capital and financial balance, safeguard national property safety^[7].

B. Main aspects of bank risk warning

The early warning of bank risk mainly includes credit risk, market risk, operation risk and liquidity risk, describe as follows^[8]:

(1) Credit risk, also called default risk. It is due to the counterparty (debtor) possibility of repayment difficult performance or unwilling to perform the debt caused by the loss of the creditor. The risk of bank credit risk mainly refers to the debtor fails to repay loans due to bank loan losses. The bank credit business is a traditional business, is also the main business. Bank is the social credit center, credit risk is concentrated. Therefore, in the modern credit economy, credit risk faced by the bank risk is more prominent, and the credit risk to the bank losses is huge.

(2) Market risk. It is due to the market price (interest rate, exchange rate, stock price and the commodity price risk) adverse changes in the bank's internal and external business losses. Trading and non trading market risk exists in the bank. The Basel Committee on market risk is defined as the risk of balance sheet position the loss caused by the variation of market price. According to the requirement of market risk include: various types of financial instruments and related stocks and interest rate risks involved in A. trading account; B. the whole bank foreign exchange risk and product risk. Specifically, the market risk is mainly from interest rate risk, exchange rate risk, stock price risk and commodity price risk, respectively, refers to the interest rate, exchange rate, the risk of adverse changes in stock price and the commodity price brings.

(3) Operational risk. According to risk types can be divided into four types, respectively, internal operation process, human factors, institutional factors and external events. According to the risk factors can be divided into seven types, including: internal fraud; external fraud; safety problems of employment practices and workplace safety problems; customers, products and business activities the banks maintain physical assets management; damage; business interruption and system error; administration, delivery and process management.

Liquidity risk

(4) Liquidity risk. It is one of the main risks faced by Chinese commercial banks. With the opening of the financial market continues to increase, once liquidity risk enlarges into a liquidity crisis, it will cause irreversible loss of liquidity risk and credit risk, compared with the market risk and operational risk, the reasons for the formation of more complex and widely, is generally regarded as a kind of comprehensive risk.

Above all, the early-warning indexes of commercial banks' risk early warning index system are divided into four categories, that is, credit risk warning index, market risk warning index, operation risk warning index and liquidity risk warning index^[9,10].

III. OVERALL DESIGN AND FUNCTION INDEX ANALYSIS OF RISK PRE-WARNING MODULE OF THE FINANCIAL SUPERVISION SYSTEM

A. Overall structure description of financial supervision system real-time warning module design

In order to optimize the design and implementation of bank accounting supervision system of real time warning module, firstly analyzes the general model of system design, to optimize the design of the real-time warning module of bank accounting supervision system, real time warning module of bank accounting supervision system includes 4 basic types of entities like: data processing and application of risk real-time early warning target observation and collecting bank accounting supervision and settlement data in the sensor nodes and the sensing field, bank accounting supervision and settlement data information query and control commands through the communication network or Internet, for the analysis of information fusion and feature of interest rate, exchange rate, real time analysis and judgment, the stock price and the commodity price and other factors in the overall analysis. Model of real time warning module of bank accounting supervision system designed in this paper is shown in Figure 1.

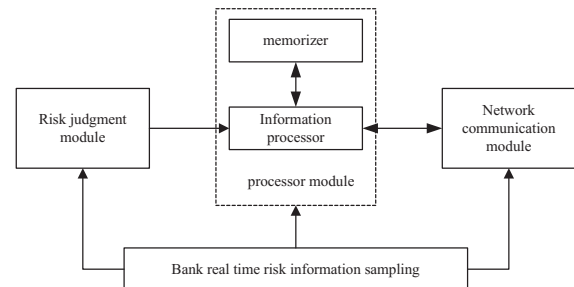


Figure 1. General model of bank accounting supervision system real time warning module

Figure 1 shows that the bank accounting supervision system of real time warning module includes the network communication module, data acquisition module, a bus transmission module and warning program loading module, it takes the embedded system design method, the realization of online bank accounting supervision through risk warning analysis and control of user behavior. The original information of real time warning module of bank accounting supervision system of accounting and financial information through the Internet or wireless sensor network sampling, real-time risk warning in the accounting supervision system has Ad Hoc network mobility, also has the fault tolerance performance is very strong, the overall design idea of the system description and analysis the function of system design specifications, provide overall guidelines for optimization design of accounting supervision system.

B. Analysis of key points of function index analysis and early warning module design

On the basis of the overall design of the system, describe the real-time warning module features of bank accounting supervision system designed in this paper. Through the commercial bank risk characteristics analysis and data fusion to improve the detection, monitoring and data of the accounting and financial information, according to the above analysis, the main architecture of real-time warning module of bank accounting supervision system designed in this paper include the following aspects:

(1) The network application support layer. Application of network accounting supervision system risk in real-time early warning support layer provides the foundation of information technology network coverage, network deployment through application of accounting supervision system in the optimization layer, to provide more energy consumption for the accounting supervision system, improve the network living space, according to the above analysis get real-time early warning module, bank accounting supervision system designed in this paper is to realize the remote access and network query and management functions.

(2) The network software architecture. By optimizing the design of network software architecture for real-time warning module of bank accounting supervision system, to ensure the information security management and accounting supervision of banking and calculation in the process of network information. The core layer is the middleware software in the network adapter layer, network adapter provides a high degree of flexibility, the risk of bank real time warning fusion complete wireless sensor network access services through data, realize the routing configuration, topology adjustment and other functions.

(3) The application of security middleware technology. Real time warning module of bank accounting supervision system is designed in this paper, and it includes the application of security middleware technology. Through the application of security middleware technology, security monitoring, security management, security audit and other functions, improve the security of network application, to protect the security of real time early warning module of bank accounting supervision system.

IV. KEY TECHNOLOGY OF EARLY WARNING MODULE DEVELOPMENT

A. Algorithm design

According to the analysis of the overall design and function of real time warning module of bank accounting supervision system described above, the modular design of the system, including data acquisition module of accounting management, data analysis module and data output module, and then the network module design of accounting supervision system, the accounting risk management of real time warning banks in data processing, wireless communication, accounting information storage and embedded control. A multivariate discriminant analysis

model of bank accounting supervision system of real time warning module based on the design method, construction for credit risk, interest rate risk, exchange rate risk of bank accounting supervision risk prediction and alarm multivariate discriminant analysis model, the algorithm is described as follows:

This paper uses multiple discriminant self-organizing maps(SOM) algorithm for risk prediction algorithm, multiple discriminant As an unsupervised learning algorithm, the analysis method has good application value in bank risk prediction, and the self-organizing mapping learning model of multivariate discriminant analysis is shown in Figure 2.

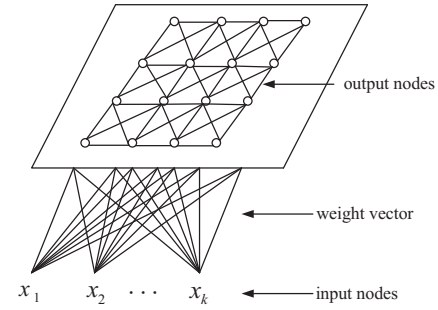


Figure 2. Self-organizing mapping learning model of multivariate discriminant analysis

The risk characteristic information of the bank accounting supervision is selected, and the information processing and data mining are carried out in the multivariate discriminant analysis model shown in Figure 2, the algorithm realization steps are described as follows:

Step1: Select the SOM self-organizing map network to input the training vector set $x(t) = (x_0(t), x_1(t), \dots, x_{k-1}(t))^T$, k is the number of training vectors. The sample number N of bank financial risk data and input node in multivariate discriminant analysis model are given, set $x(t)$, $t = 0, 1, \dots, n-1$, SOM network initialization processing is taken, in the input layer, set the time sampling node initial value $t = 0$;

Step2: Set up a training vector model for risk identification of bank financial supervision by combining the risk transmission data setting frequency response of the input bank financial supervision and the self-organizing neural network mapping $x(t) = (x_0(t), x_1(t), \dots, x_{k-1}(t))^T$;

Step 3 Set up the self-organizing neural network (N, M) , calculates the sensitive characteristic information vector input to the bank accounting system $x(t)$. The self-organizing learning of neurons with hidden layer is used to obtain the distance of the connected weight vector ω_j of all output

nodes: $d_j = \sum_{i=0}^{k-1} (x_i(t) - \omega_{ij}(t))^2$, $j = 0, 1, \dots, N-1$, Wherein $\omega_j = (\omega_{0j}, \omega_{1j}, \dots, \omega_{k-1,j})^T$;

Step 4: The nodes with sensitive information are obtained from the SOM self-organizing map network, and the minimum distance nodes are obtained as N_{j^*} , $d_{j^*} = \min_{0 \leq j \leq N-1} \{d_j\}$;

Step 5: After training all the L training vectors, the adaptive weighted weights of the N and the output node N_{j^*} are adjusted and the feature mining of the data is carried out in the geometric neighborhood $NE_{j^*}(t)$, weight is: $\omega_{ij}(t+1) = \omega_{ij}(t) + \alpha(t)(x_i(t) - \omega_{ij}(t))$.

Wherein, $N_j \in E_{j^*}(t)$, $0 \leq i \leq k-1$, $0 \leq \alpha(t) \leq 1$ is geometric topological neighborhood $NE_{j^*}(t)$ sensitive characteristic parameters of neuron training, decreases with time as $NE_{j^*}(t)$;

Step 6: The training parameters of the input training vectors and the neurons in the monitoring system are not calculated by the threshold decision criterion, and the distortion parameters of the information feature extraction are obtained d_j . The code vectors with minimum distortion are chosen as hidden layer neurons N_{j^*} . Through neural network classified control, the risk judgment threshold is obtained $d_{j^*} = \min_{0 \leq j \leq N-1} \{d_j\}$. If you enter the sample data, then $t = t + 1$, go to step (2), until all the L training vectors have been trained, the classification, extraction and data mining of the risk sample data of banking accounting supervision are realized.

B. Software development design

In a risk prediction algorithm based on the design, software development of real-time early warning and information classification of bank accounting supervision system is taken, through the bootloader, to lead the bank in the business activities of various expenses and the interest payments, accounting for business payments, and regularly according to the provisions and requirements into the form of financial statements, implementation bank financial analysis and risk measurement. The complete accounting supervision system consists of a scheduler and some components, in TinyOS 2.x, using unique () function to compile the application and other system components, to achieve real-time early warning of risk management accounting established by adaptive allocation to provide the TaskBasic interface with the construction parameters abstract components in comprehensive hardware components and high-level software components, command is used to initialize and run the task, high-level components to the underlying components Ordered MCU idle components accounting supervision system through the parameter sleep represents the task queue. Graphical user interface Qt/Embedded 4.6 is used to create RFID bank accounting supervision system of real time warning module, visualization control and human-computer interaction, visual program the early warning system of the compilation, installation, software development and design are obtained.

V. SYSTEM PERFORMANCE TEST AND ANALYSIS

In order to apply the performance of real time warning module of bank accounting supervision system test paper design, analysis system test and simulation experiment are taken, Qt C++ API running multiple execution risk warning in embedded equipment discriminant analysis algorithm, program loading and writing data, integrated intelligent real-time early warning control module construction bank accounting supervision system, software debugging in embedded ARM environment, the system debugging process equipment used for: Inter Pentium TYP3220A random data generator and Opengl32PST3202 programmable controller, data acquisition in the set 00H address, the reset value of f0H bus data, risk warning module of the sampling bandwidth of 12dB, the initial frequency of the system is 2KHz, according to setting up the simulation environment and parameter oscillation control curve of different ways in real-time early warning system of bank accounting supervision as shown in Figure 3, analysis shows that this method has less oscillation in real-time warning of banking accounting supervision system, which shows that the risk warning is real-time and accurate.

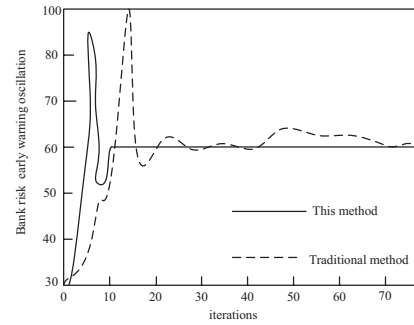


Figure 3. Oscillation control curve of real time warning of banking accounting supervision system

VI. CONCLUSIONS

This paper studies the design method of accounting regulatory risk warning model of commercial bank, realizes the early identification and early warning of the risk of banks, and to take timely measures to prevent and resolve risks, to prevent the spread of risk. A real bank accounting supervision system model of early warning module design method is proposed based on multiple discriminant. Software development and design of early risk warning system of bank accounting supervision are analyzed, accounting supervision of banking system of real time warning module by the network communication module, data acquisition module, a bus transmission module and warning program loading module, the system adopts embedded design, realize the online risk warning bank accounting supervision through the analysis and control of user behavior, build a credit risk, interest rate risk, the risk of bank accounting supervision the exchange rate risk prediction and alarm multivariate discriminant analysis model of silver through the guide loading program. The real-

time warning and information classification for accounting supervision system is obtained, and it can improve risk warning ability. The results show that the accuracy and real-time performance of this method of accounting supervision of banking risk early warning is good, it has good application value in the bank risk prevention and management.

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