Research on a Computer Aid Risk Control System Using Classification Capabilities of Support Vector Machines

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Abstract. The paper proposes the use of support vector machines to establish a financial early warning system and a method for financial risk monitoring, gives a financial evaluation index system and its quantitative methods, and uses the classification capabilities of support vector machines to establish a financial early warning model. At the same time, the paper explores and studies the combination of enterprise group's financial risk identification, assessment, response and management information system, and proposes an enterprise group's financial risk control information system. Through experimental comparison, the model based on the support vector machine has good consistency with the experimental data, which is in line with the expected results.

1. Introduction

In the context of modern market economy applications, enterprise groups are one of the mainstream forms of economic organization, which represent the economic strength of a country. With the development of the times, the operation mode of enterprise groups is constantly changing. This is accompanied by the expansion of its scale and the changes in its organizational structure [1]. Many problems have appeared in the internal management of the enterprise group, such as financial risk control problems. Which restricts the effective development of enterprise groups. In this application situation, we need to effectively control financial risks to meet the survival and development needs of enterprise groups.

The SVM method has a solid theoretical foundation and is a master of several standard technologies in the field of machine learning. In a number of challenging applications, it has obtained the best performance so far, and has shown good promotion performance in some fields, but SVM is rarely used in financial decision support systems. How to apply SVM to it? It is a question worth exploring. This article will study the application of support vector machines in financial early warning systems from the perspective of classification [2]. This article attempts to put forward the overall functional architecture of the financial risk control information system of enterprise groups, discusses the specific functions of each system module, and provides a modelling idea and method for the core link of financial risk identification and assessment. Develop the research and practice of financial risk control to make useful explorations.

2. SVM financial early warning model

Assuming that the influencing factors (feature vectors) of the normal operation of corporate finance are m (m>3), the required early warning alertness judgment is n (n>1), and there is a mapping from m-dimension to n-dimension [3]. If m is the input number of the support vector machine and n is the output number of the support vector machine, there is a bounded subset A in the m-dimensional Euclidean space R^m, and there is a bounded sub in the n-dimensional Euclidean space the mapping $F(A)$ of the set, namely

$$F: A \subset R^m \to R^n, Y = F(X) \tag{1}$$

For the training set $A(X,Y)$, an optimized approximate mapping G can be found through learning so that

$$y_f = G(x_i), i = 1,2,...,m \tag{2}$$

This mapping is highly non-linear. It is based on the compounding of simple non-linear functions and can express the complex phenomenon of financial early warning. This is the financial early warning model based on SVM.

3. Enterprise group financial risk control information system architecture

3.1. Overall structure

Based on the above analysis, combined with the characteristics of the enterprise group's financial risk control process and management information system, this paper proposes the overall functional architecture of the enterprise group's financial risk control information system, as shown in Figure 1 below.

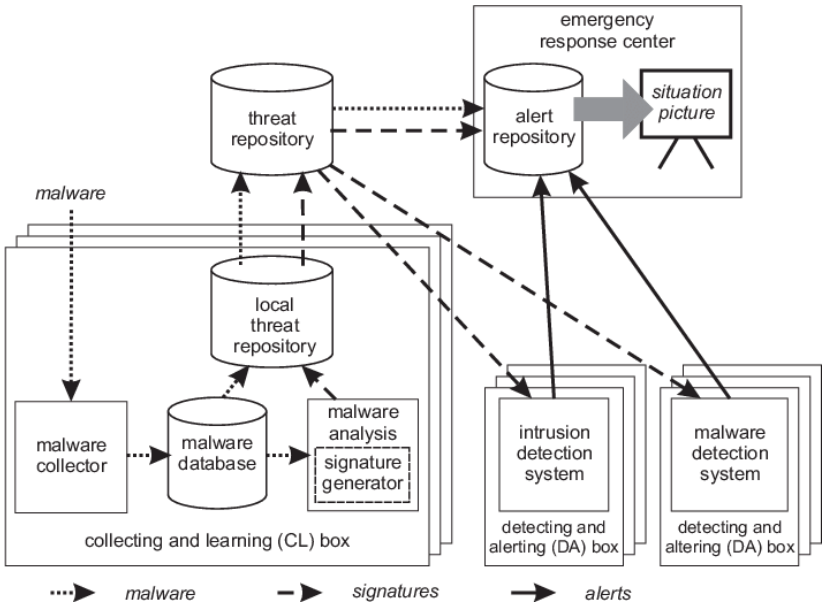

Figure 1. System functional architecture

The core function modules of the enterprise group financial risk control information system include data collection module, basic setting module, risk identification and evaluation module, risk response module and risk monitoring module. The data collection module mainly imports data related to financial risk control into the system, and performs necessary pre-processing to provide a data basis for risk

identification, assessment and response. The basic setting module is mainly to assist business managers to establish a risk evaluation index system, and use certain mathematical methods to construct a risk assessment model for use by business managers when implementing risk identification and assessment [4]. The risk identification and assessment module are mainly to provide convenient questionnaire survey functions for business managers, support the design, distribution, and reporting of various questionnaires, realize the automation of the survey process, and provide risk assessment methods and models for business managers to be friendly the interface form assists enterprise managers in carrying out the evaluation work, and improves the efficiency and quality of the evaluation process. The risk response module aims to realize the informatization of risk response decision-making. By promptly transmitting risk response strategies and specific control measures to relevant personnel, all levels of the enterprise group can clearly understand the management's risk response decisions and strengthen the risk control responsibilities of relevant personnel. The risk monitoring module provides business managers with continuous monitoring and early warning functions of financial risks. The work flow of the system and the connections between the modules are shown in Figure 2 below.

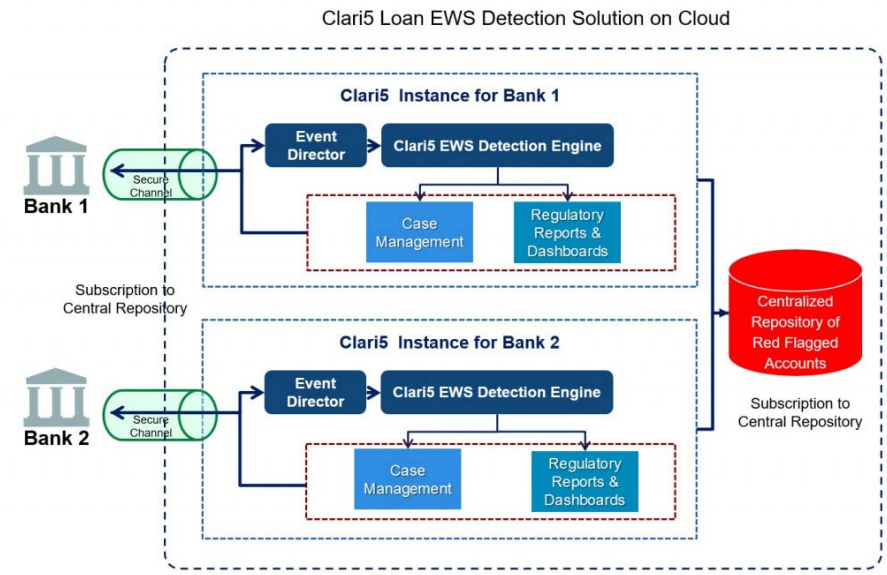

Figure 2. System workflow

3.2. Function analysis

3.2.1. Data acquisition module. Data collection is the basis for the operation of information systems and the prerequisite for financial risk control. Only by importing data related to risk factors into the system can the identification, assessment and response of risks be carried out. The system will design a data interface in accordance with national standards so as to directly collect data from information systems that support national standards [5]. For information systems that are still in the transitional stage or have not yet complied with national standards, it is necessary for technicians to write corresponding interface programs for data conversion.

3.2.2. Basic setting module. The function of this module is mainly to assist business managers to establish a risk evaluation index system, and use certain mathematical methods to construct a risk assessment model for use by business managers when implementing risk identification and assessment. For the content of risk indicators and the structural relationship between indicators, business managers can determine the size of the enterprise group, industry, development status, and past experience, or through expert surveys. Index weights need to be set according to modern risk management theories and methods, using certain mathematical methods.

3.2.3. Risk identification and assessment module. Financial risk identification is the first step in financial risk control. It is to determine the risk type, risk location, risk source, severity, etc. of the financial risk control object through continuous, systematic, and comprehensive judgment and analysis, and to discover risk factors the mechanism by which risk accidents lead to risk losses.

3.2.4. Risk response module. Financial risk response refers to the choice of financial risk response strategies. It is a critical stage of the financial risk control process. Based on the results of financial risk assessments, combined with risk tolerance, business managers should weigh risks and benefits, choose corresponding risk response strategies, and formulate specific risk control measures to scientifically and effectively suppress the occurrence of risk losses or increase risk returns. The risk response strategy is mainly the technical measures taken to prevent and reduce the risk loss before the formation of the risk [6]. It achieves the goal of minimizing the risk loss by avoiding, eliminating and reducing the probability of loss and reducing the degree of loss. The focus is on changing the risk accident and Conditions for expanding losses.

3.2.5. Risk monitoring module. The design goal of the risk monitoring module is mainly to provide business managers with continuous monitoring and early warning functions of financial risks. The main functional structure of the risk monitoring module is shown in Figure 3 below.

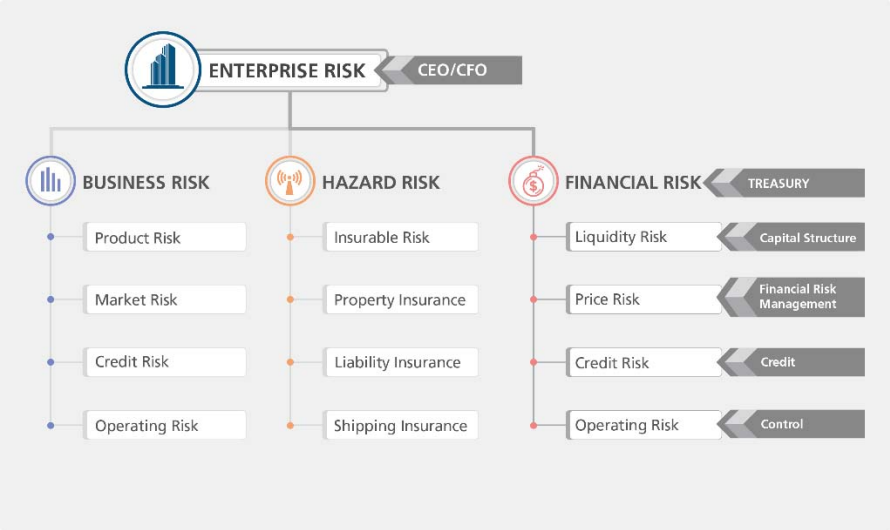

Figure 3. Functional structure of risk monitoring module

Financial risk early warning is mainly to set risk early warning indicators, and obtain relevant data in real time through data sharing with other information systems, continue to automatically calculate and monitor the value of risk indicators, and compare them with present thresholds. If it exceeds the early warning threshold Value will issue warnings to realize real-time monitoring, diagnosis and early warning of financial risks.

4. System Test

4.1. Model establishment

In this research, a prediction model is proposed, which is based on the support vector machine algorithm to predict the company's revenue, operating profit and net profit. We extracted 23 financial indicators such as asset-liability ratio, cash ratio, operating profit ratio, and financial leverage, and analysed the forecasting performance of the forecasting model based on the support vector machine algorithm using the financial data of a manufacturing company from 2009 to 2019. The model uses financial indicators

from 2009 to 2015 and corporate performance from 2010 to 2015 as the training data set. For fine-tuning, set the pre-trained weight and bias parameters as the initial values of the support vector machine algorithm [7]. Then put the output layer on top of the pre-trained network to form the basic FNN architecture. In order to better reflect the recent relationship between predictors and company performance, we use the support vector machine algorithm to fine-tune the parameters of the neural network.

4.2. Experimental results

In order to test the performance of the model, we used the training model and the test data set to predict the company's performance revenue and net profit from 2016 to 2019. The results are shown in Figure 4 and Figure 5.

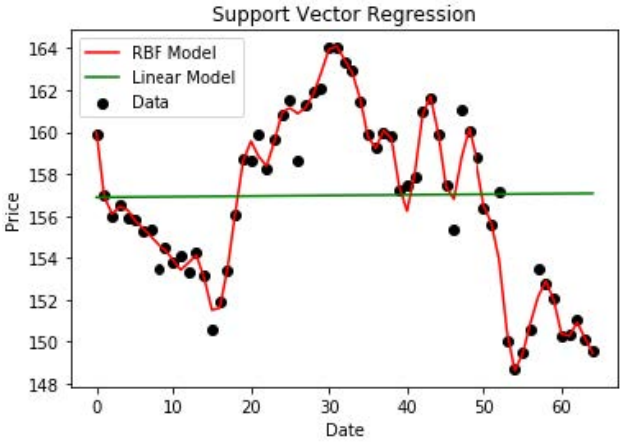

Figure 4. Operating income forecast chart

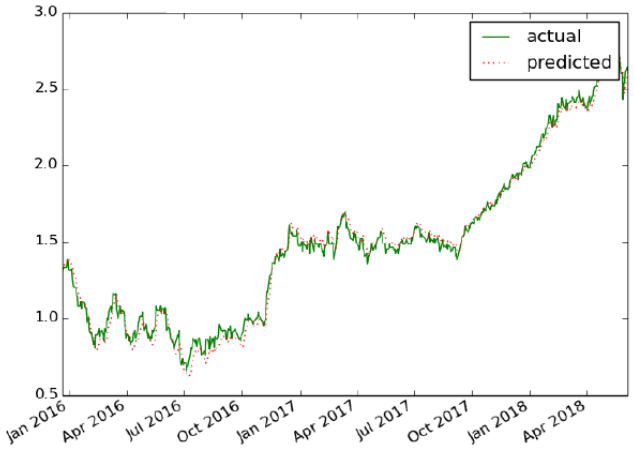

Figure 5. Net profit forecast chart

5. Conclusion

This paper analyses in detail the process and methods of financial risk control of enterprise groups through the study of the characteristics of financial risk control of enterprise groups, and studies the combination of financial risk control and management information systems. The paper adopts support vector machine method to make prediction with higher credibility than neural network method. The support vector machine method not only overcomes some of the shortcomings of neural network technology, such as difficulty in network model and structure selection, easy to fall into local minima,

prone to over-learning, and limited promotion ability, but also has higher prediction accuracy and credibility. It shows that it has good application value in the financial crisis early warning system of listed companies.

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