Analysis of Economic Risk Identification Evaluation and Management and Control Strategy Based on Support Vector Machine Algorithm

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Abstract: *With the deepening of economic globalization, China's participation in global foreign trade activities is constantly diversified, and at the same time it faces more and more risks. China's long-term accumulated risks in the future may be released intensively, causing high incidence. Potential risks in macro-economy, business environment, sovereign credit, debt and other fields will bring certain losses to enterprises and even hinder their development. Support Vector Machine (SVM) based on statistical learning theory is a new machine learning algorithm, which can successfully deal with classification and regression problems. Because of the excellent learning performance of SVM, this technology has become a research hotspot in current academic circles. This paper expounds the basic theory of support vector machine in detail, constructs the basic framework of economic investment risk prediction model based on support vector machine, and gives the concrete steps to realize the model and the key problems to be solved. The algorithm is very practical. Using support vector machine regression theory to predict economic risk not only enriches the existing risk prediction methods in theory, but also has important value in practical application.*

Keywords: *support vector machine algorithm; economic risk; risk assessment and control*

1. Introduction

China has been highly integrated into the global economy and the international division of labor system. With the rising share of China's economy in the world, the interactive influence and interactive feedback mechanism with the global economy have been strengthened. The interaction between the risk release in the process of economic transformation and the external impact of global economic fluctuations will significantly increase the risks and challenges faced by China. In recent years, extensive research on SVM methods has been carried out in China, but most of the research contents and methods still track and absorb foreign advanced achievements, and there are still few theoretical and application achievements that really achieve international leadership or breakthrough significance [1]. Therefore, we need to learn and master the relevant basic knowledge of SVM methods as soon as possible, focusing on the immature There are still some difficulties in the evaluation of economic risks, but there are still some difficulties in the evaluation of economic risks, and there are still some difficulties in the process of economic risk prediction [2]. This paper selects the economic indicators related to economic risk, and determines the correlation between these economic indicators and economic risk by using support vector machine algorithm, so as to provide reference for various industries to evaluate economic risk.

2. SVM principle and algorithm

SVM is a general feedforward network type, first proposed by Vapnik. The main idea of SVM is to establish a hyperplane as a decision surface that maximizes the separation margin between positive and negative examples. More precisely, SVM is an approximation of the structural risk minimization method [3]. This inductive principle is based on the fact that the error rate of the learning machine on the test data is bounded by the sum of the training error rate and a term that depends on the VC dimension (Vapnik Chervonenkisdimension), and in separable mode, the SVM has a The value of is zero and minimizes the second term, so although it does not utilize the domain knowledge of the

problem, SVM can provide good generalization ability in pattern classification problems, this property is unique to SVM [4].

Using the Lagrange optimization method, the optimal classification surface problem can be transformed into its dual problem. This dual problem has the same optimal value as the original problem, so the optimal solution can be obtained through the Lagrange multiplier, which is transformed into an inequality constraint. quadratic function optimization problem, so there is a unique optimal solution. The optimal classification function to solve is,

$$f(x) = \text{sgn}\{(w^T x) + b\} = \text{sgn}\left\{\sum_{j=1}^{n} \alpha_j^* y_j (x_j^\circ x) + b^*\right\} \tag{1}$$

Among them, α_j^* is the Lagrange multiplier corresponding to each sample. It can be proved that only a part of α_j^* is not zero, and the corresponding sample is the support vector. b^* is the classification threshold, which can be obtained by using any support vector, or by taking the median of any pair of support vectors in the two classes [5]. When the sample set is linearly inseparable, a slack variable $\xi_j \geq 0$ can be added to the equation to become,

$$y_j [(w^T x) + b] - 1 + \xi_j \geq 0 \tag{2}$$

The goal is to find the minimum of

$$(w, \xi) = \frac{1}{2} \|w\|^2 + C\left[\sum_{i=1}^{n} \xi_i\right] \tag{3}$$

That is, to construct a soft interval and compromise the minimum misclassification samples and the maximum classification interval. This is the so-called generalized optimal classification surface, where $C \rangle 0$ is a constant, which controls the degree of punishment for misclassification samples. Table 1 compares the evaluation results of SVM and neural network. It can be seen that the accuracy of SVM in the test sample set is 81.36%, which is significantly better than 79.20% of BP neural network model. Obviously, SVM has good robustness and can meet the requirements of practical application.

Table 1: Discrimination results of SVM model and BP neural network model

Model category	Training sample set		Test sample set	
	Accuracy	Error rate	Accuracy	Error rate
BP neural network model	82.17%	17.69%	79.20%	23.60%
SVM model	85.63%	14.96%	81.36%	15.36%

3. Potential risks to the Chinese economy

Based on China's six sector risk analysis framework, the risks in the period of economic transformation mainly involve finance, real estate, government debt, industrial transformation, population aging, social differentiation and other fields, as shown in Figure 1. These areas have many risk points, wide influence, mutual superposition and complex transmission mechanism [6].
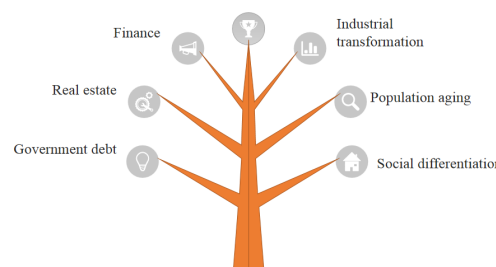

Figure 1: China's economic risk analysis

On the financial side, as equity pledge has become one of the main financing methods of Chinese private enterprises, and the continuously falling stock market is increasingly blowing up the financing liquidation line of Chinese private enterprises, resulting in the breaking of the financing chain of private enterprises, which in turn leads to a serious financial acceleration contraction. At present, the breaking of the financing chain of Chinese private enterprises is still expanding. The profits of traditional industries with aging supply have soared, but the profit growth rate of new economy industries has been severely depressed. The distribution structure of profits and the growth structure of investment are obviously upside down, and the supply structure of the whole economy is further distorted, which will have a negative impact on the next investment. At present, China's housing prices are at a high level, but with the increase of purchase restriction measures, the growth rate of sales in the property market has been declining continuously, and the high housing prices that are not supported by enough transaction volume are difficult to sustain [7]. From the perspective of industry, China's current trade pattern is actually in the name of a surplus, but it doesn't enjoy the corresponding surplus. A large number of exported low-end industrial products consume domestic energy and raw materials, and increase the environmental burden, but only get low profits; However, some high-end commodities are still processing trade realized by multinational companies using China's labor force and manufacturing capacity. The surplus formed is borne by China, but the profits belong to multinational companies. The root of the current supply structure distortion is that the expansion of "de-capacity" interferes with the adjustment mechanism of market price for profit and investment. The rise and fall of the market value of capital and the expansion and contraction of the real estate market are all increasing or decreasing the scale of social credit.

4. Selection of management and control strategies for economic risks based on support vector machines

Theoretically, the identification and evaluation of economic risks need to do the following: First, implement large-scale structural tax reduction as soon as possible to promote the continuous optimization of supply structure. The tax reduction measures implemented by the Trump administration of the United States have greatly improved the profitability of enterprises and effectively stimulated the recovery of the American economy. However, when there is violence in China's overcapacity industries and the profit growth rate of enterprises in non-surplus industries slows down or even drops sharply, it is even more necessary to take structural tax reduction measures to adjust the distorted wealth distribution effect and reduce the tax burden of enterprises in non-surplus industries. It is suggested to reduce the value-added tax rate and enterprise income tax rate by 5 percentage points for non-surplus industries, that is, the value-added tax rate should be reduced from 17% to 11%; The enterprise income tax rate will be reduced from 25% to 22%, and the surplus industries can be appropriately taxed. It is suggested that the enterprise income tax for steel, coal, refining, building materials and non-ferrous metals industries should be adjusted from 25% to 33%, and the "administrative means to remove capacity" should be replaced by "economic leverage to remove capacity" [8], so as to reverse the further distortion of China's economic supply structure and promote the upgrading of the supply structure. Second, pursue a sustainable trade balance strategy. Thirdly, the indicator system is constructed during risk assessment. The comprehensive evaluation index of economic investment economic risks in economies is based on the identification of economic risks of investment in economies in transition. The principal component analysis method is to recombine the original variables of the model into several synthetic variables that do not have linear correlation through mathematical dimensionality reduction methods. The newly formed comprehensive variable can reflect most of the information of the original variable. After each index variable is orthogonally transformed, a new comprehensive variable is formed. The larger the cumulative variance contribution rate, the more information it reflects the original variable. , and generally select the comprehensive variable whose variance contribution rate is greater than 87%, in order to conform to the "two-eight principle" of statistics.

In terms of practical application, investment risk prediction involves many complex and uncertain factors, and there is no obvious functional relationship between the factors. For such problems that are difficult to establish an accurate mathematical model and easy to collect learning samples, it is very suitable to solve them by using support vector machine method. Moreover, support vector machine has good nonlinear quality, high fitting accuracy, flexible and effective learning method The fully distributed storage structure and the hierarchy of model structure make it have great application potential in prediction.

However, the application research of SVM still needs to be widely carried out to promote the SVM

method to play a greater role in practical risk analysis applications . First, how to generate a new algorithm for training SVM with higher efficiency to reduce training time and computational complexity, which is particularly important for problems with large data volumes. Second, in the face of massive data in practical problems, developing efficient and fast SVM algorithms will be a problem to be solved. However, how to find a more suitable smooth function and how to apply the smoothing technique to SVR, feature selection and clustering deserves further study. Third, the traditional classification SVM mainly discusses the second-class problem, and there are some studies on the multi-class problem, most of which are decomposed into multiple second-class problems to solve. How to deal with multi-class classification problems more reasonably and efficiently deserves further study.

5. Conclusion

Support vector machine transforms complex learning problems into simple problems in high-dimensional linear space to solve them, which enhances the reliability and control ability of the algorithm. By introducing the idea of kernel function, this method can solve learning problems with higher feature dimensions. By introducing different optimization strategies, the training process of support vector machine can be optimized globally and the learning efficiency can be improved. From the theoretical point of view, support vector machine has greater advantages than traditional methods, which is mainly reflected in the following aspects: it has a good theoretical foundation. Under the guidance of statistical learning theory, support vector machine overcomes the defects of other methods, such as the "over-learning" problem of neural network. Under the principle of structural risk minimization, the support vector machine method has good generalization ability, which makes it have better learning ability under the condition of small sample learning. On the basis of establishing a good early warning mechanism for economic risks, the Chinese government can identify and evaluate economic risks in a timely and effective manner, and put forward countermeasures, thus effectively reducing the economic losses caused by insufficient risk assessment.

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