

Construction of Financial Risk Monitoring and Early Warning System in Small and Micro Businesses

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Abstract. Currently, the small and micro businesses play a more and more important role in China's economic operation and development process. This paper starts from the operation features of small and micro businesses to carry out scientific selection and confirmation on main indexes for financial risk analysis of small and micro businesses, and make use of analytic hierarchy process (AHP), and comprehensive analog signal model system to carry out quantitative evaluation, scientific monitoring, and suitable early warning on financial operation risk of small and micro businesses for the purpose of establishing a set of monitoring and early warning system which meets the features of small and micro businesses.

Introduction

As the indicator used to determine the operation condition of corporate finance, the financial risk monitoring and early warning indexes are very important in monitoring and early warning analysis. While we establish the monitoring and early warning index system, we shall not only consider the completeness of index system, but also reduce the degree of correlation among indexes to maximum degree so that the index system established can be the minimum complete set with concentrated indexes. In this way, we can make the established index system realize the purpose of monitoring and early warning and alleviate the workload of financial risk monitoring and early warning activities, thus it is able to be suitable for actual demand of production and operation activities of small and micro businesses.

Generally speaking, the design of financial risk monitoring and early warning index system in small and micro businesses shall abide by following principles:

Principle of importance. It means that we shall fully consider the degree of contribution of change of index to the fluctuation of financial operation activities in small and micro businesses, and the selected indexes shall be able to stand for main aspects of corporate financial operation condition.

Principle of consistency. It means that the trend of change of selected indexes shall be consistent with the overall financial operation track monitored.

Principle of sensitivity. The change features of different indexes reflect different financial changes; while the indexes are selected, we shall ensure that the indexes selected must be highly sensible and reliable so that the indexes can show features of change while the changes will happen or just happen in overall corporate financial state.

Principle of stability. It means that the division standard can be kept relatively stable while the division is made on amplitude of variation of indexes selected.

Theoretical basis

Index system

According to above principles and operation features of small and micro businesses, we shall consider the following financial risk monitoring and early warning index system in the process of system construction:

Asset-liability ratio

It reflects the ratio of liability in enterprise capital, reveals the proportion of asset provided by creditors in all enterprise assets, and shows the degree of corporate debt management. The calculation formula is shown as below:

Asset-liability ratio = total liabilities ÷ total assets × 100%.

The asset-liability ratio both reflects the corporate operation risk, and reflects the corporate ability to carry out production and operation activities by use of funds provided by creditors. If this index is excessively large, it means that the enterprise has large operation risk; if the index is excessively small, it means the enterprise has poor financing capacity.

Current asset turnover

This index reflects the velocity of turnover of corporate working fund from input to return. The larger this index is, the stronger the enterprise has cashability; otherwise it shows that the enterprise has an obstructed operation and turnover.

Assets hedging and appreciation ratio

The assets hedging and appreciation ratio is the value after deduction of non-performing asset, and it reflects the corporate production and operation state.

Variable rate of cost

The cost management is always the core work of financial management activity, thus this index is set to monitor corporate production and operation state.

Variable rate of cost = current actual unit cost/actual unit cost in base period – 1

Profit ratio of sales

The profit ratio of sales reflects corporate profitability.

Sales-output ratio

Sales-output ratio = industrial sales value/total industrial output value

On one hand, the determination of lower limit of sales-output ratio is affected by economic factor, for the different enterprise strength determines different bearing capacity of sales-output ratio; on the other hand, it is affected by technical condition, such as inventory capacity.

Capacity utilization rate

The capacity is the quantity reflection of enterprise products which can be processed and completed under corporate fixed assets, and it is the technical and material basis for an enterprise to realize various kinds of production and operation activities. Its utilization rate directly determines corporate production economy. Generally speaking, the high capacity utilization rate shows strong corporate production economy, which can help the improve of corporate economic benefits; on the contrary, it means weak corporate production economy.

Rate of change of main product price index

The product price is directly affected by demand relation in external market and the condition of raw material supply market; meanwhile, the product price directly stipulates the trend of corporate production and operation activities and economic benefits. Therefore, to timely and keenly master the change trend of product price can greatly help to ensure that the enterprise financial operation is under good condition.

Receivable ratio

The receivable ratio reflects the quality level of corporate current assets; in case of excessively high receivable ratio, the turnover efficiency of corporate current assets will be seriously influence, thus impacting the normal operation of various kinds of production and operation activities; on the contrary, it is able to improve the operation efficiency of corporate cash flow and promote smooth implementation of corporate production and operation activities.

Liquidity ratio

The liquidity ratio directly reflects the operation efficiency of corporate funds. In case of high liquidity ratio, it means high operation efficiency of corporate funds, and the corporate financial risk is low accordingly; in case of low liquidity ratio, it means low operation efficiency of corporate funds, and the corporate financial risk is high accordingly.

Method selection

According to financial risk monitoring and early warning index system of small and micro businesses, it can be seen that the overall financial operation trend is determined by different aspects, and it is reflected as an integration of multiple indexes. Because each index has different degree of importance in reflecting overall financial operation trend, we shall reasonably determine the comprehensive weight of each index upon index integration. The common methods used to determine the index weight include Delphi method, analytic hierarchy process, and principal component analytical method, etc., and the project team selects analytic hierarchy process to solve the problem of determining index weight.

As a kind of multi-scheme and multi-evaluation factor method, the analytic hierarchy process (short for AHP) requires to carry out deep analysis on the essence of complicated decisions, influence factors, and intrinsic relation in advance, and then utilize little quantitative information to mathematize the thinking process so as to provide convenient decision-making method for complicated problems with multiple goals, multiple standards, and no structural features. This method is especially suitable for the situation under which it is hard to directly carry out accurate calculation on the decision-making result.

Model construction

The monitoring signal system is adopted to construct financial risk monitoring and early monitoring model for enterprise A.

Determination of critical point of single index and regional division

The determination of critical point of index plays a critical function in preparing early warning signal system, and it is a very complicated and detailed work. While we confirm the critical point of single index and aggregative index, we must abide by following two principles. Firstly, we shall determine the center line of fluctuation of index according to actual drop point of historical data of each index, and take the center line as the center of normal area of such index, and then we obtain fundamental critical point according to probability requirement that the index appears in different area, that is, the critical point in mathematical significance. Secondly, while the mathematical length is excessively short or the economy is kept under abnormal state for a long time, we shall reject the abnormal value for this index through economic theory and experience judgment, re-determine the center line and adjust fundamental critical point.

This paper adopts the principle of circular ratio method to determine the critical point of single index and aggregative index.

Determination of critical point of aggregative index and regional division

The combined score is the sum of score for each single index. The limit of early warning includes two values, which are also called “checking value”. Through taking these two checking values as boundary line, we can determine corresponding early warning signal. Based on the production and operation features of small and micro businesses, we think that it will be better to set three kinds of signals (“yellow light”, “green light”, “blue light”) than set five kinds of signals; on one hand, the operation is convenient and the economic meaning is clear; on the other hand, it is able to reflect the change trend of overall production and operation in a more accurate and quick way. The specific principle is: while the TC sequence of growth rate of index exceeds one checking value, the corresponding light will light; meanwhile, different score is given for different light; for example, 5 scores for “yellow light”, 3 scores for “green light”, and 1 score for “blue light”. According to the selected 10 early warning indexes, we can obtain the combined score via summing up the signal score shown by 10 indexes according to corresponding weight on a yearly or monthly basis. While all indexes are yellow light, the combined score is maximum value $5 \times M$ (M : number of single monitoring and early warning indexes); while all indexes are blue light, the combined score is minimum value M . Then, through the checking value of combined score, we can make a comprehensive judgment on which kind of light shall light as for current early warning signal. As for the checking value of aggregative index, we take 75% of $5 \times M$ as the boundary of “yellow light” and

“green light”; when M is 10, the full score is 50, and the checking value of this boundary is 37.5. Besides, we take 25% of full score as the boundary of “blue light” and “green light”; when M is 10, the checking value of this boundary is 12.5.

Operation and evaluation

We select various financial data of company A in Beijing from 2008 to 2013, import the model to carry out operation analysis, and then carry out comprehensive analysis on financial risk state and control condition of company A.

Calculation and analysis on single monitoring and early warning index

Asset-liability ratio (%)

The international common standard of asset-liability ratio is 40~60%, that is, the liability ratio in this interval is reasonable level of liability. According to this, we determine that the boundary value of asset-liability ratio is: $L \leq 50\%$, hot; $50\% < L \leq 60\%$, normal range; $L > 60\%$, shrinking.

Through calculating the asset-liability ratio of enterprise A from 2008 to 2013, it can be seen that the blue light has lit for asset-liability ratio since 2010, and it belongs to shrinking area, which shows that the corporate operation strength weakens and the creditors' degree of guarantee reduces in recent years, and the enterprise is under large operation risk at present. In terms of liability structure, the long-term liability accounts for a large proportion; furthermore, since 2011, the liability ratio is always under rising trend. Later, the enterprise operators shall pay more attention to research on rationality of enterprise liability and make the liability ratio fall to reasonable area.

Times of current asset turnover

This index reflects the velocity of turnover of corporate working fund from input to return. The larger this index is, the better the enterprise turnover is; otherwise it shows that the enterprise has an obstructed operation and turnover.

The state confirms that the standard value of times of current asset turnover of industrial enterprises is 1.62 times. According to this standard and long-term change trend, we utilize probability distribution calculation and combine with actual situation to obtain that the upper limit is 4 times and the lower limit is 1.6 times; in case of more than 4 times, the state is hot; in case of less than 1.6 times, the state is shrinking.

As for the enterprise A, although this index was under green-light area (normal warning area) from 2008 to 2012, the operation vale of this index was always under decreasing trend. In particular, in 2007, a large change happened in this index which operated into blue-light area and entered into shrinking state. Later, this enterprise shall pay attention to the research on change of market trend, reasonably organize the inputting structure and progress of enterprise products so as to make the structure and inputting time of enterprise products meet the demand of market change, effectively increase the sales income of enterprise products, and ensure rapid turnover of current assets.

Asset hedging and appreciation ratio (%)

The asset hedging and appreciation ratio is an index which reflects the hedging and appreciation situation of asset value, and the calculation formula is shown as below:

Asset hedging and appreciation ratio = owner's equity at the end of the period \div owner's equity at the beginning of the period

It is obvious that the lower limit of warning boundary must be 100% in order to ensure asset hedging and appreciation; in consideration of actual production and operation condition of company A, the upper limit is determined as 110%.

From 2008 to 2013, the asset hedging and appreciation ratio of company A was kept above 100%, which showed that this enterprise had strong ability in asset hedging and appreciation. However, from 2011 to 2013, this index was larger than 110%, thus it was relatively hot compared to average development speed of China's national economy. Later, this enterprise shall pay attention to reasonable injection of own funds at investment direction so as to timely avoid the financial risk caused by the investment project.

Variable rate of cost (%)

Except for considering the corporate internal objective condition, we shall combine with the average index of price rising to determine the boundary value of cost change. Through combination with actual production and operation condition of company A and the change in China's actual index of price rising, this paper uses "0" as the upper limit of index and the lower limit is determined as 10%.

The index of company was within shrinking interval from 2008 to 2013, and the cost change showed a rising trend. The great increase in cost has become a barrier which hinders the rapid development of this enterprise; therefore, this enterprise shall enhance the refined management work in its production and operation links so as to rapidly restrain the disadvantageous situation that the enterprise cost keeps rising.

Profit ratio of sales (%)

The formula is: profit ratio of sales = total profit ÷ sales revenue × 100%.

According to the overall requirement of company, it is determined that the upper limit of index is 10%, and the lower limit is 5%.

According to the calculation, from 2008 to 2013, the profitability of company A decreased year by year. Since 2012, its profitability has decreased to shrinkage area, which further proves that the hedging and appreciation of this enterprise are not caused by the improvement of enterprise production and operation performance; in particular, under the condition of large increase in enterprise cost, the reduction of sales profitability is very disadvantageous to enterprise development. Therefore, how to coordinate the sharp relation between the increase of product cost and the decrease of sales profitability has become a serious problem which shall be faced by enterprise in the future.

Calculation and analysis on aggregative monitoring and early warning index

According to financial risk comprehensive monitoring and early warning index weight table and evaluation index data analysis, the evaluation scores for comprehensive financial risk monitoring and early warning index of company A over the years are shown as below.

Table 1. Comprehensive financial risk monitoring and early warning table of company A from 2008 to 2013

	2008	2009	2010	2011	2012	2013
Index value	17.4	15.24	13.92	16.44	14.28	12.6
Light	Green	Green	Green	Green	Green	Green
Warning region	Normal	Normal	Normal	Normal	Normal	Normal

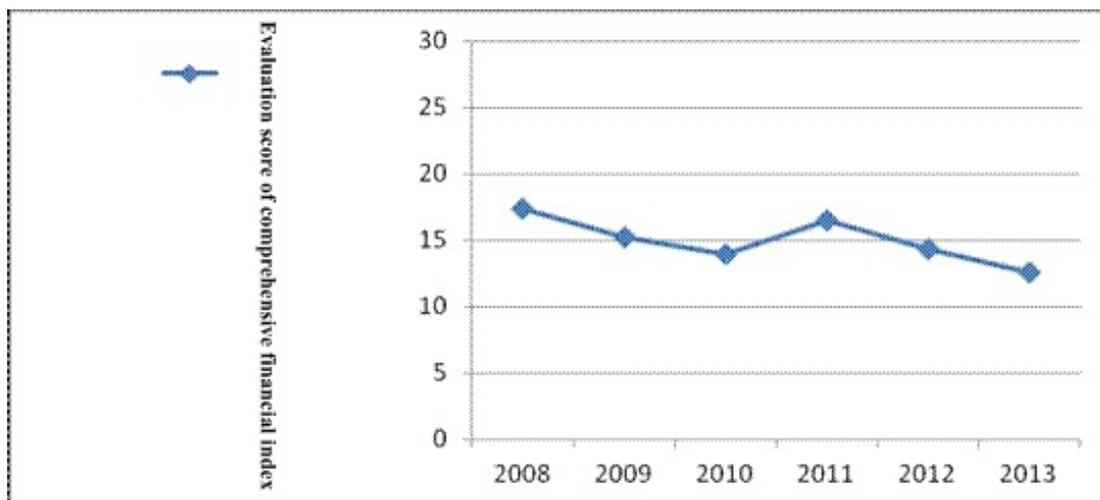


Fig 1. Comprehensive financial risk monitoring and early warning diagram of company A

According to the diagram above, it is shown that the overall trend was decreasing although the comprehensive financial risk monitoring and early warning indexes of company A were under normal state from 2008 to 2010; in particular, the comprehensive evaluation values in 2012 and 2013 were lower than the mean value of comprehensive index, that is, lower than 15 scores, which showed that the overall financial operation was developing toward a direction harmful for corporate benign development. Therefore, the company A shall timely adopt corresponding improvement measures,

and especially adopt the targeted positive measures with respect to product cost and enterprise investment projects so as to reverse the current trend of disadvantageous development as soon as possible.

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