Causes and early-warning model analysis of st: comparison based on financial and non-financial indexes

Wu Xihui*

Department of Economy and Management, Henan Polytechnic Institute, Nanyang city, Henan Province, China. 473000

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Abstract

ST is the special treatment of stock exchange to all enterprises with management problems, which all listed companies concern and try to avoid. Although ST generally involves financial problems, it is influenced by both financial and non-financial factors. As a result, a ST early-warning model was established in this paper based on financial and non-financial indexes of enterprises. The established model includes 14 financial indexes (e.g. profitability, debt paying ability, growth potential, operation and management, as well as utilization of assets) and 15 non-financial indexes (e.g. ownership structure, board size and composition, major connected transactions of enterprises and investor protection). Both Z and P of the model can reflect risks of ST. This paper analyzed 9 conditions and ST possibility of enterprises with different Z values for two successive years according to their practical situations. To avoid ST, enterprises are suggested to discover risks promptly and improve their management, organizational structure and cost control.

Keywords: ST members; early-warning model; financial index; decision making reference

1 Introduction

ST English for special treatment, abbreviated as "ST" .The Shanghai and Shenzhen Stock Exchanges announced to give special treatment (ST) to stock exchange of listed companies with abnormal financial conditions on April 22nd, 1988. Such abnormal conditions mainly include two: 1) net profit of listed companied is audited negative for two fiscal years; 2) the net asset value per share of listed companies is audited lower than the per value of stock in the latest fiscal year. To avoid ST, listed companies have been paying attentions on their finance and financial problems since then. In this paper, ST causes were analyzed deeply and a ST early-warning model was established.

2 ST causes analysis

Enterprises with ST are mainly characteristic of abnormal finance, including (1) negative shareholders' equity in the latest fiscal year; (2) negative net profit in the latest fiscal year; (3) lower shareholders' equity than registered capital in the latest fiscal year; (4) negative expected profit in the current fiscal year and even in the coming several fiscal years caused by catastrophe failure; (5) financial distress and freezing of assets. It is analyzed that there are financial and non-financial causes of ST.

2.1 FINANCIAL CAUSES

Financial causes are the main and most direct causes of ST, including temporary debt crisis, long-term (1~2 fiscal years) financial conditions, business performance, and development trend of enterprises.

Temporary debt crisis of enterprises: As a temporary financial problem of enterprises, temporary debt crisis, including short-term capital chain rupture, short-term debt insolvency and expansion-induced capital shortage, will make stock exchanges to consider whether to give ST to the enterprise. Generally, temporary debt crisis of enterprises is caused by their poor temporary behaviors, operation and management.

Long-term financial conditions: It is one of the decisive factors of ST. Enterprise with net deficiency for two successive fiscal years will receive ST. Moreover, stock exchanges also will give ST to enterprises with net deficiency in the current fiscal year and expected net deficiency in the next fiscal year.

Business performance of enterprises: It is the root cause of ST, which will be reflected by financial data finally. Management problems of enterprises include internal management problems, massive employee turnover, failure to achieve product effectiveness caused by poor marketing, low profit margin due to poor control of production cost, and operating deficit because of poor overall cost control.

Development trend of enterprises: Both enterprises and industries have life cycle. Enterprises at the end of life cycle will have unsatisfying expected economic benefit and are easy to suffer loss. ST will be given to those suffering loss for successive fiscal years.

2.2 NON-FINANCIAL CAUSES

Non-financial causes refers to those having no direct relation to finance but exerting important impact on the operation and development of enterprises, mainly including composition of assets, board size and composition, major business activities and stakeholders of enterprise.

Composition of assets: Most of China's listed companies are dominated by state-owned shares because they are transformed from state-owned enterprises. Some people argue that state-owned-enterprises reform is to make up owner's absence through property right reform. Some

* *Corresponding author's* e-mail: wuxihui8888@163.com

believe that due to excessive policy burden and social burden, enterprises are struggling to survive, so state-owned-enterprises reform is to solve low efficiency and poor management of enterprises through marketization. Generally speaking, private enterprises achieve higher business efficiency and better business performance compared to state-owned enterprises. In other words, enterprises with higher proportion of state-owned holding have lower business efficiency but higher risk of ST.

Board size and composition: Board size will affect the management efficiency of companies. Generally speaking, small board will contribute to better supervision. Over large board will lead to poor communication and performance of board members. The regulation capacity and role performance of board will influence the overall business operation significantly. Compared to small-scale enterprises, large-scale ones are more likely to suffer financial deterioration. If president and general manager are in the charge of the same person, it is impossible for the board to play its supervisory role. The president may seek personal gain through the position of general manager, thus influencing management efficiency of the company. Therefore, it is necessary to analyze their effect on ST. Furthermore, presidents of many enterprises come from affiliated enterprises. They are neither paid by the enterprise nor enjoying shareholding. Consequently, they won't undertake the supervision responsibility but possess corporate resources, which will also influence management efficiency of the company.

Major business activities: Prompt protection to right and interest of investor is unavailable in China due to the imperfect legal system. Some significant trading activities have become important means for controlling shareholders to infringe rights and interests of other shareholders and dispossess enterprise assets. According to the annual reports of China's listed companies, real connected transaction is very complicated and has various forms. Asset purchase, equity transaction, material purchase and sale of goods all can become profitable channels of controlling shareholder. After controlling the board and mangers, the controlling shareholder often embezzles or occupies and even transfers business property by taking the advantages of major trading activities. This will surely bring adverse impact on the financial condition and business performance of enterprises.

Stakeholders of enterprise: This includes investor protection and corporate guarantee. Without a perfect legal system, many rights and interests of investor are beyond the protection of legal system. However, different of investor protection can be depicted according to different types of audit opinions. Enterprises receiving qualified audit opinion on their financial reports are believed having information disclosure issues. They may cheat investors with fake financial information. Recently, external guaranty of China's listed companies has attracted wide social attentions. Corporate guarantee has become a big potential risk of enterprises. Enterprises with higher loan than affordability are likely to get in trouble of debt collection in future. If the secured party couldn't fulfill debt repayment, liabilities of the enterprise will increase suddenly, which will influence its financial conditions significantly.

3 ST early-warning model

3.1 MODEL BUILDING

It is concluded that ST is determined by financial indexes and non-financial indexes. Financial indexes include profitability, debt paying ability, growth potential, operation and management as well as utilization of assets. Non-financial indexes include ownership structure, board size and composition, major connected transactions of enterprises and investor protection. Profitability contains return on equity (A_1), return on assets (A_2) and operation profit of entirety (A_3). Debt paying ability contains current ratio (B_1), quick ratio (B_2), ratio of total liabilities (B_3) and long-term liability rate (B_4). Growth potential contains asset growth rate (C_1), main business revenue growth rate (C_2) and stockholders' equity growth rate (C_3). Utilization of assets contains total assets turnover (D_1), inventory turnover (D_2) and accounts receivable turnover (D_3). Working capital/total assets (E_1) and retained earnings/total assets (E_2) are another two financial indexes. Ownership structure contains proportion of state-owned shares (F_1), proportion of circulating shares (F_2) and share proportion of the largest shareholder (F_3). Board size and composition contains CEO share-holding rate (G_1), board size (G_2), scale of supervisor board (G_3) and oneness of president and general manager (G_4). Non-financial indexes also include annual audit opinion (H_1), connected transaction (H_2), external guaranty (H_3), agency cost (H_4) and company scale (H_5).

Suppose there's significant difference (P>5%) between ST company and the matching company in three fiscal years. Then, A_1, A_2, C_1, C_2, , C_3 D_1, D_2 and D_3 can be calculated. Considering the collineation of variables, correlated variables have to be eliminated through correlation coefficient matrix, thus getting A_2, C_1, C_2, D_1, D_2 and D_3. Effect of financial indexes on ST can be analyzed by the regression model:

$$P(Y_i=1)=\frac{1}{1+\exp(-Z_i)}$$

$$Z_i=a_{i0}+a_{i1}A_2+a_{i2}C_1+a_{i3}C_2+$$
$$a_{i4}D_1+a_{i5}D_2+a_{i6}D_3+\varepsilon_i$$
$$i=1,2,3$$

Similarly, the regression model taking non-financial indexes as variables can be established:

$$P(Y_i=1)=\frac{1}{1+\exp(-Z_i)}$$

$$Z_i=b_{i0}+b_{i1}F_1+b_{i2}F_2+b_{i3}F_3+b_{i4}G_1+b_{i5}G_2+b_{i6}G_3+b_{i7}G_4$$
$$+b_{i8}G_5+b_{i9}H_1+b_{i10}H_2+b_{i11}H_3+b_{i12}H_4+b_{i13}H_5+\varepsilon_i$$
$$i=1,2,3$$

$i=1,2,3$ is time point of the enterprise in three successive fiscal years. This implies that the early-warning model has to conduct regression analysis on business performance of the enterprise in the latest three fiscal years. Regression results are inconstant. Any variable may achieve either good or bad fitting effect.

Integrating financial index and non-financial indexes,

$$P(Y_i = 1) = \frac{1}{1 + \exp(-Z_i)}$$

$$Z_i = a_{i0} + a_{i1}A_2 + a_{i2}C_1 + a_{i3}C_2 + a_{i4}D_1 + a_{i5}D_2 + a_{i6}D_3$$
$$b_{i0} + b_{i1}F_1 + b_{i2}F_2 + b_{i3}F_3 + b_{i4}G_1 + b_{i5}G_2 + b_{i6}G_3 + b_{i7}G_4$$
$$+ b_{i8}G_5 + b_{i9}H_1 + b_{i10}H_2 + b_{i11}H_3 + b_{i12}H_4 + b_{i13}H_5 + \varepsilon_i \ ,$$

where $i = 1, 2, 3$;

Let $c_{i0} = a_{i0} + b_{i0}$ and the model is changed into:

$$Z_i = c_{i0} + a_{i1}A_2 + a_{i2}C_1 + a_{i3}C_2 + a_{i4}D_1 + a_{i5}D_2 + a_{i6}D_3$$
$$+ b_{i1}F_1 + b_{i2}F_2 + b_{i3}F_3 + b_{i4}G_1 + b_{i5}G_2 + b_{i6}G_3 + b_{i7}G_4$$
$$+ b_{i8}G_5 + b_{i9}H_1 + b_{i10}H_2 + b_{i11}H_3 + b_{i12}H_4 + b_{i13}H_5 + \varepsilon_i$$

$$P(Y_i = 1) = \frac{1}{1 + \exp(-Z_i)}$$

Model coefficient can be acquired by analyzing data of the ST Company before and after the ST. Subsequently, coefficient shall be determined to analyze Z value of the ST Company in the past three fiscal years. Z value reflects the business performance changes of the ST Company, thus revealing the ST possibility of Z. This also can be reflected by P analysis.

3.2 MODEL ANALYSIS

Suppose N and M are the critical Z of the enterprise and ST Company, respectively. If $Z < N$, the enterprise will receive ST from the stock exchanges. If $N < Z < M$, the enterprise may receive ST in future. If $M < Z$, the enterprise is beyond the risk of ST. Therefore, we will get 27 possible results when analyzing enterprise data in three fiscal years, which represent different conditions of the enterprises. It is much simpler to analyze enterprise data in two successive fiscal years, having 9 possible results. To simplify the analysis, results of the third fiscal year were inferred from data analysis in two successive fiscal years.

TABLE 1 Possible results of the established model

Type	$Z < N$	$N < Z < M$	$M < Z$
$Z < N$	①	②	③
$N < Z < M$	④	⑤	⑥
$M < Z$	⑦	⑧	⑨

Note: Rows are range of Z in the first fiscal year. Columns are range of Z in the second fiscal year.

Enterprises in ① condition have receive ST. Enterprises in ① condition for two successive fiscal years are surely have serious financial crisis. Enterprises in ④ condition have financial problem in one fiscal year, which have ST risk. However, their financial problems are solved in the second fiscal year, indicating that they are in good development. If $N < Z < M$ or $M < Z$ in the third fiscal year, they are improving continuously and enjoy promising prospect. However, if $Z < N$, they are not improved and their financial problems fail to get fundamental solutions. They still have ST risk. Enterprises in ⑦ condition are improving continuously and have low ST risk. Enterprises in both ④ and ⑦ conditions have certain financial problems which deserve their high attentions. Actually, enterprises showing $N < Z < M$ or $Z < N$ in any one fiscal year have certain ST risk, which shall be concerned greatly. Therefore, enterprises in ② condition have ST risk, higher than those in ④ condition. This is because enterprises in ④ condition are improving and their ST risk is lowering continuously, while those in ② condition are worsening and their ST risk is increasing.

Enterprises in ⑤ condition are in high ST risk all the time. They shall have been aware of this in the first fiscal year but still made no improvement in the second fiscal year, indicating the high seriousness of the problem. Enterprises in ⑧ have achieved some improvement but still have ST risk. Attention shall be paid to the Z value of the third fiscal year. If $M < Z$, the ST risk is eliminated; otherwise, the ST risk still exist. Enterprises in ③ condition are worsening and shall keep a close eye on this. They are got in ST trouble directly, indicating that there are big affairs which cause direct and significant impact on their finance and business operation. Enterprises in ⑥ condition are also worsening, but not as prominent as those in ③ condition. They are suggested to discover and solve problems promptly to turn losses into gains. Enterprises in ⑨ condition are beyond the ST risk (including potential ST risk). They are in good development with sound finance and management.

4 Suggestions

Except for enterprises in ⑨ condition, rest enterprises shall pay attention to ST risk. Although the established model can provide early warning of ST risk, it couldn't offer solutions. As a result, enterprises are suggested to discover and solve problems from the following aspects:

(1) They shall improve business management. Enterprises shall inspect management problems from management philosophy and management flow and efficiency. Generally speaking, continuous renewal of thinking is the primary thing to increase management level. To achieve sustainable development, every enterprise shall set up the idea of innovation, study and maintain management innovation seriously, innovate continuously and pursue excellence. Secondly, enterprises shall set up concept of lean production. The core of lean production is to eliminate waste in production and other business activities thoroughly. They shall take high-efficiency domestic and foreign advanced enterprises as benchmarking, analyze their operation processes from the perspective of lean production, reorganize business process and abolish functional departments, branches or production lines which can only increase cost but couldn't create final value to customers. Meanwhile, listed enterprises shall keep globalization in mind. As China enters into the WTO and global economic integration progresses, especially with the wide application of Internet and IT, enterprise survival targets to the whole world. The geographic concept of production and supply-marketing fades gradually. In other words, enterprises shouldn't be restricted within one region or one country, but shall allocate resources effectively around the whole world.

(2) They shall perfect the organizational structure. Modern enterprise transformation to reduce proportion of state-owned shares is a good solution to stock equity problems. President and general manager shall be

assumed by two persons. Common organizational structure problems can be solved by restructuring. Unreasonable organization structure will hinder normal operation of enterprises significantly and even cause business failures. On the contrary, appropriate and high-efficient organizational structure can release enterprise energy to the maximum extent and make internal departments cooperate better, thus achieving "1+1>2" business operation. Organizational structure is the most basic structure of business process, sector setup and function planning. Common organizational structure includes centralization, decentralization, straight line and matrix forms. Enterprise shall choose appropriate organizational structure cautiously according to practical situations. Restructuring shall take various factors into account, such as enterprise environment, strategy, scale, business characteristics, technical level, human resources, etc. To survive and develop, enterprises shall adapt to environmental changes continuously and meet corresponding requirements. Therefore, environment is one key determinant of organizational structure. Organization structure is the main tool for enterprises to fulfill their business strategies. Different strategies require different organizational structures. Organizational structure shall be adjusted promptly to meet requirement of strategy implementation. With the continuous expansion, enterprise will have increasingly complicated activities, more employees, posts and departments, as well as refining division of labor. Enterprises with numerous business lines have to equip with corresponding resources and management means to satisfy business demand.

(3) They shall improve cost management and control, the core financial problem. Different enterprises shall adopt different strategies for cost management and control. Generally speaking, cost management shall start from cost origins, including time origin, space origin and business origin. The intersection of these three origins is the foundation of cost generation. The foundation of cost generation is nature of available economic resources and their interrelations, including technical feature of means of labor, quality standard of subject of labor, quality and skills of worker, technical standard of product, organizational structure, functional division, management system, culture and external cooperative relationship of enterprises. Changing the foundation of cost generation is the root of continuous cost reduction.

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Author

Wu Xihui, 1971.09, Nanyang, Henan Province, P.R. China

Current position, grades: the vice-professor of department of economy and management, Henan Polytechnic Institute, Henan, China.
Scientific interest: Her research interest fields include research and practice of accounting theory
Publications: more than 16 papers published in various journals.
Experience: She has teaching experience of 7 years, has completed six scientific research projects.