Forecasting the Performance Improvements of Specially Treated Chinese Listed Companies after Asset Restructuring: A discriminant Analysis Approach

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Abstract

Using data collected from a sample of 42 companies, 11 different financial indicators are tested from which 4 are identified as good predictors of the performances of specially treated (ST) companies after asset restructuring. Different possible combinations of the four indicators are developed from which an optimal set consisting of three indicators are identified using linear discriminant function. The three optimal set of variables are total asset growth, asset-liability ratio, and return on equity. A linear discriminant function is developed, using these three indicators as variables, for predicting company performance after asset restructuring. Using out-of-sample testing, the predictive accuracy of this model was tested to be 79.3%. This shows that the model is an effective and useful tool for predicting a company's performance after assets restructuring. Further examples and illustrations with the data collected from the sampled companies also show that: (1) Companies which kick off the cap of ST successfully after asset restructuring will have a significant performance improvement in the year of asset restructuring and in the year after, (2) Performances of the companies that kick of the cap of ST successfully may not improve in the second year after assets restructuring, and (3) Companies that are still labeled as ST after asset restructuring may not be able to improve their performances in the following years if no other actions are taken.

Keywords: capital market, cross-validation, financial ratios, kicking off the cap of special treatment, out-of-sample testing, performance improvement, prediction accuracy.

1. Introduction

In order to maximize protection of investors' rights and control stock market risks optimally, Shanghai and Shenzhen Stock Exchanges made the following rule on April 22, 1998:

A listed company will be given a special treatment (ST) if: (a) there is a risk that the company's stock will be terminated on listing because of financial difficulties, and (b) stockholder's equity will be decreased because of difficulties of assessing development of the company.

As a result of rapid development of capital markets and the risky economic environment, asset restructuring of listed companies has become a popular strategy used by listed and small companies in China to rapidly improve their financial performance.

Asset restructuring has a major impact on the performance of companies around the world. It is the core of asset management. It can enable an enterprise to rapidly expand the size of

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assets. Through the market mechanism, a company can become a trans-regional, cross-ownership and cross-border operation by using asset restructuring. It is supposed to be an important means of improving business efficiency, competitiveness, and of achieving great efficiency in the allocation and use of resources. Since 2000 more than one million asset restructurings have been done across the world. The annual turnover from asset restructuring is nearly one trillion. These facts indicate that asset restructuring has become a very important and useful strategy for adjusting industrial structure, optimizing the allocation of resources, and achieving economies of scale; all of which are very vital to a company's increasing financial performance. Business organizations need good and effective tools for determining whether or not asset restructuring help managers to achieve their objectives of improving short- and/or medium-/long-term financial performance With such tools, business organizations will be able to assess the effectiveness of asset restructuring and determine whether additional or other steps for improving performance needs be taken. Unfortunately, there is presently a dearth of such good and effective tools.

In China, there are many cases of asset restructuring by listed companies. A lot of asset restructuring that have been done by listed companies have led to the great improvements of their (the listed companies') financial performance. For example, in 1998, ST XiangZhongYi achieved a significant performance improvement through asset replacement. In the same year, TsingHuaTongFang merged with LuYing Electronic and achieved great financial performance. In 2000, HuaLian Group transferred 50 percent of the shares of ShiZhuang Stock to HuaLian Business, making the latter firm the chief shareholder of ShiZhuang Stock. In 2000, Shandong SanLian reconstructed its organization by buying ZhengBaiWen in order to achieve a better allocation of resources. In 2003, TCL achieved brand acquisitions by merging with LeRoy. Hundreds of such cases of asset restructuring occur every year. In some of these cases, the companies' objectives are achieved, while in some they are not. Business organizations also need a good tool for predicting outcome of assets restructuring or their own performance outlook after assets restructuring.

Because asset restructuring, e.g., selling physical assets (Jensen 1991; Banerji 2008), is supposed to be able to quickly improve profitability, business environment, and assets quality of a company, it has become a preferred method for ST companies to improve firm performance. Thus, it is very necessary to identify financial indicators or ratios that can be used to determine whether a firm will achieve improved financial performance or not after asset restructuring. It is also important to develop a forecasting model that can be used to forecast whether or not a firm will be able to achieve performance improvement with asset restructuring. If a company predicts that asset restructuring will not be able to help it to improve financial performance, the company should consider some other possible options for achieving its objective.

A major objective of this research is to identify the best set of financial indicators that can be used to predict the performances of ST Chinese listed companies after assets restructuring. Another major objective is to develop a good and effective linear discriminant model for predicting the performance improvements of these companies after having undergone assets restructurings. One other objective is to determine the suitability and effectiveness of the discriminant model developed, using some numerical examples.

The research is organized as follows. Section 1 presents the Introduction, the objectives and the organization of our paper. Section 2 presents the concept and logic of asset restructuring and of according special treatments to some listed companies in China. Section 3 describes the

research sample and some financial indicators or ratios for forecasting company's performance. Section 4 briefly introduces the Fisher's discriminant function and Fisher's classification criterion. Section 5 presents the empirical design and analysis of our sample and develops the specific discriminant model for predicting performance improvement after asset restructuring. Findings, conclusions, and recommendations are presented in section 6.

2. The Concepts of Asset Restructuring and the Practice of According Special Treatment to Some Companies in China

2.1. The Concept and Logics of Asset Restructuring in China

An asset consists of all available resources that can bring benefits to a company. It includes an enterprise' economic resources, human resources and organizational resources.

In recent years, some Chinese researchers have defined the concept of asset restructuring from different perspectives. Yi (2005) explains the concepts of asset restructuring via the following:

"Shareholders of a listed company made significant adjustments to its assets structure. Most of passive asset restructuring happens together with the changes of listed companies' equities. There are also some cases of asset restructuring launched by original large shareholders of a listed company, which do not involved equities. Stock values and corporate performance commonly significantly changed for listed companies that employ passive asset restructuring."

Peng (2010) defined asset restructuring of listed companies in a more general form thus:

"It includes company expansion, contraction, change of ownership, and internal business restructuring behavior. The chief object in asset restructuring of listed companies is common stock equity, including: transactions of the whole equity and partial equity."

Xiong (2010) defined asset restructuring as follows.

"Under the need of firm survival or development, a company attempts to reconstruct its assets and main business through merger, acquisition, sale and some other capital operation means. The purpose is to optimize resources configuration."

The above researches define asset restructuring from various perspectives. Here, in this research, we will focus only on transactions among listed companies. Thus, in our research, asset restructuring will mean optimizing assets through stock transfer, acquisition, merger, asset stripping, and asset replacement. The objective of asset restructuring is to optimize enterprise's assets structure and improve the overall quality of enterprise assets.

2.2. The Different Types of Asset Restructuring in China

In this section, we will define the different types or categories of asset restructuring on which data will be collected for our study.

Different researchers have produced different classifications. Wan (2002) identified four types of asset restructuring, namely: reorganization with expansion, reorganization with contraction, transfer of corporate control, and internal restructuring. Weston (1998) divided asset restructuring into four main categories and thirteen sub-categories in his book entitled "Mergers, Restructuring and Corporate Control". These are summarized in Table 1.

Туре	Meaning
Expansion	Mergers and acquisitions, tender offer, companies association
Sale	Separation of a company, asset stripping of a company
Control of a company	Repurchase premium, stopping the protocol, anti-takeover provisions
	of amendment, proxy contests
Changes in ownership	Exchange of an offer, stock re-purchase, transfer to be non-listed
structure	companies, leveraged buy-out

Table 1. Classification of asset restructuring

Since our focus is on asset restructuring of Chinese listed companies, we will adopt the classification used in the Chinese security market. According to the rule governing the Chinese securities market, asset restructuring is classified into acquisition and merger, stock transfer, asset stripping, asset replacement and some other reorganization approaches. This is the classification we are using in this paper. We will not consider any other classification or type of asset restructuring. Thus, in this research, we classify asset restructuring into merger and acquisition, share transfer, asset stripping, and asset replacement here.

Merger and Acquisition (Kam et al., 2008; Hackbarth and Miao 2012; DePamphilis 2012; Thorbjomsen and Dahlen 2011) are popular means of growing firms (Huyghebaert and Luypaert 2010). They refer to acquisition and merger or equity investment of listed companies. They also lead to a change of the controlling stockholder. Acquisition means that an enterprise obtains the ownership of all or part of another enterprise by buying its stock or assets. Merger means that two or more enterprises form one firm. This type of reorganization is the most widely used way of reconstruction among asset restructuring of listed companies in China.

Stock transfer (Gastillo et al., 2008; Hill 2006) is another important practice in asset restructuring. In this type of asset restructuring, the stock equity is transferred from a shareholder of a listed company to some others. It is the most commonly used form of asset restructuring in China.

Asset stripping (Weiss and Wruck 1998) refers to a situation in which a listed company sells its subordinate department to another enterprise in order to obtain cash or securities trading. At present, the objective of asset stripping in China is to get rid of a number of non-operating assets or bad quality assets in order to increase a company's competitiveness and profitability by optimizing capital structure of the company. Merger and Acquisition are also popular in Japan (Ushijima 2009).

Assets replacement refers to the situation in which a listed company trades assets that are not parts of the assets that are vital to the company's development (Zambujai-Oliveira and Duque 2011; Hartman 2004). The objective of this is to improve quality of assets, and to add a new profit growth point to the firm. Asset replacement is a special form of asset restructuring of listed companies, which is normally conducted between a listed company and its parent company. In General, the replaced assets are commonly non-commercial or non-performing assets; the replacing assets from the parent company are commonly high quality assets. Thus, asset quality and profitability of the listed company may be improved by this means.

2.3. The Principle of Special Treatment

The stock of a listed company that finds itself in the following situations will be labeled as specially treated (http://www.chinaacc.com) if:

- The net profits of the two most recent fiscal years are negative.
- The amount of shareholders' equity is lower than the registered capital.
- The CPA can not issue an opinion or issue a negative opinion on financial report.
- The amount of shareholders' equity is lower than the registered capital when the equity that should not be recognized is deleted.
- When profit of the previous year is adjusted by the recent financial report, the net profits of two consecutive fiscal years are negative
- Some other abnormal situations that may be identified by the China Securities Regulator or the stock exchange.

After the stock of a listed company is labeled as specially treated, the company can kick off the label of 'ST' if its financial performance improves. This situation happens when the following conditions are met: (1) The main business is normally operated, and (2) The net profit after deducting non-recurring profit is positive.

3. Selection and Description of Sample and Financial Indicator

3.1. Source of Data and Sample Selection Criteria

The data used in this research are collected from the "Overview of asset restructuring of listed companies in 2008" published by "the China Securities News", and the websites of Shanghai and Shenzhen Stock Exchange. The 11 financial indicators which are used to evaluate the performances of the sampled companies from the year 2007 to 2010 are obtained from "Sina Finance" (http://finance.sina.com).

We used the following three criteria in selecting our sample.

- The company should be specially treated in early 2008.
- The specially treated listed company reorganized its assets in 2008 after it is specially treated
- Special treatment and asset restructuring for the listed company both occurred in January 1, 2008 to December 31, 2008.

The sampled companies are further filtered as follows:

- Select ST A-share companies that have undergone asset restructuring (companies with debt reorganization are excluded)
- Exclude companies that were delisted in the past two years.
- Exclude companies that use more than one strategies or a variety of means for asset restructuring.

Thus, we only consider companies which use one single strategy for asset restructuring. The strategies used for asset restructuring include: share transfer, mergers and acquisitions, divestitures and asset replacement.

Sample data are processed by using Excel and SPSS.

3.2. Results of Sample Selection

Using the criteria for sample selection and screening presented earlier above, we finally selected a sample of 42 companies which use one single asset restructuring strategy in 2008 to improve their financial performance.

3.3. Descriptive Analyses of the Sample Data

3.3.1. Analyses and Classification Based on Labeling and Un-labeling the Cap of ST

Based on the process used to accord special treatments to ST companies and on the relevant provisions for labeling and un-labeling the caps of ST after asset restructuring, the sample was divided into two parts, namely: labeling the cap and un-labeling the cap of ST. The results are presented in Table 2.

 Table 2. Basic analyses and classification results with respect to labeling and un-labeling the Cap of ST

	Un-labeling cap	Labeling cap	Total
Quantity	20	22	42
Proportion	47.62%	52.38%	100%

The table shows that out of the 42 companies in the sample, 20 companies or 47.62% of the sample successfully kicked off the cap of ST while 22 or 52.38% of the sample did not. These results indicate that, with the use of a single asset restructuring strategy, the chance that a company will successfully kick off the cap of ST is 47.62%, which is less than 0.5. The management implication of this is that ST Chinese listed companies should be using hybrid asset restructuring strategies to improve their short-term financial performance. Using a single asset restructuring strategy may not be enough.

3.3.2. Analyses and Classification of Asset Restructuring Methods/Strategies

The four types of reorganization considered in this research are mergers and acquisitions, equity transfer, asset stripping, and asset replacement. Table 3 presents the analyses and classifications of the sample based on these four types of reorganizations. The table shows that mergers & acquisitions and share transfer are the most frequently used methods of equity transfer by the companies in the sample. 80% of the companies in the sample used these two methods of equity transfer. Transfer of shares alone is used by 45% of the 42 companies. It is by far the most frequently used method or strategy.

The reason why transfer of shares of listed companies is popularly used by ST Chinese listed companies is because equity transfer can attract new shareholders to a listed company. New shareholders will input new assets in the company to rapidly change the company's assets portfolio, liabilities as well as earnings. Thus, it helps a company to kick off the cap of ST.

Transfer of shares is a fairly simple and quick means of asset reconstructing. Mergers and acquisitions is the second most used asset restructuring strategy. It is used by one-third of the

entire sample. It is also relatively simple to operate. Divestitures and asset replacement methods are least popular among the companies. The two methods are often associated with related party transactions; and related party lacks transparency. Investors consider asset replacement to be related to "Report of the restructuring".

Table 3. The frequency distribution of the use of the different types of asset restructuring strategies by the sampled companies

Restructuring	mergers and	share	asset	asset	Total
types	acquisitions	transfer	stripping	replacement	
Quality	14	19	7	2	42
proportion	33.33%	45.24%	16.67%	4.76%	100%

3.4. Selection and Description of Financial Indicators

When selecting our sample, we consider the following performance indicators, namely: profitability, solvency, operational capacity, and ability to grow. This leads us to the use of 11 sub-level financial indicators for our sampled companies. These include operating profit, revenue (OPE), total assets profit margin, return of equity (ROE); quick ratio, asset-liability ratio, equity ratio; inventory turnover rate, accounts receivables turnover rate, total asset turnover; main business revenue growth, and total assets growth rate. They are described in Table 4 below.

4. Fisher Discriminant Model

4.1. The Basic Idea of Fisher Discriminant Method

The Fisher discriminant method attempts to use data projection to differentiate one group from the other as much as possible after the projection (Abdi 2007; Fisher 1936). Analysis of variance is used to measure separation between groups. Consider the case of differentiating ST companies from non-ST companies in a sample using p financial indicators. The idea of variance analysis can be used to construct a discriminant function: $y=c_1x_1+c_2x_2+\cdots+c_px_p+b$, where x_1, x_2, \cdots, x_p are variables and c_1, c_2, \cdots, c_p , and b are the unknown coefficients The purpose of determining the coefficients is to make the deviation between two groups reach the maximum value and leave the smallest deviation within each group. After obtaining the discriminant function, it can be used to classify new samples. After putting the p indicator values from a new sample into the discriminant function, we can calculate and obtain the value of y. We then compare the value of y with the critical value of y_0 , a cut-off value, to finally determine which group the new sample belongs to.

4.2. Fisher's Classification Criterion

To determine the discrimination threshold, namely: the cut-off point of y_0 , assume the two groups have the same a priori probability and separate y_0 into the weighted average of $y^{(1)}$ and $y^{(2)}$. Thus, $y_0 = (n_1 y^{(1)} + n_2 y^{(2)})/(n_1 + n_2)$, where n_1 and n_2 refer to weights of $y^{(1)}$ and $y^{(2)}$. After a

new sample $X = (x_1, \dots, x_p)^T$ is substituted into the discriminant function to obtain y value, the label of the new sample is determined using the following criterion:

When $y^{(1)} > y^{(2)}$, if $y > y_0$ then $X \in G_1$; else if $y < y_0$ then $X \in G_2$. When $y^{(1)} < y^{(2)}$, if $y > y_0$ then $X \in G_2$; else if $y < y_0$, then $X \in G_1$.

Here, G_1 and G_2 refer to the classes that $y^{(1)}$ and $y^{(2)}$ respectively represent.

		F 1
	Sub-level indicator	Formula
Profitability	OPE	Operating Profit ÷ Revenue main business × 100%
	Total assets profit margin	Total profit ÷ average total assets×100%
	ROE	Net income ÷ Average shareholders' equity×100%
Solvency	Quick Ratio	Quick assets / current liabilities
	Asset-liability ratio	total liabilities / total assets×100%
	Equity ratio	total liabilities / shareholders' equity×100%
Operational	Inventory turnover rate	Cost of goods sold ÷ Average inventory balance
capacity	Accounts receivables	Credit net income ÷ Average accounts receivable
	turnover	
	total asset turnover	Net operating income / average total assets×100%
Ability to	Main business revenue	(Current main business income - the main business
grow	growth	income of the previous period) / period on the main
		business income×100%
	Total assets growth rate	Increase the amount of total assets this year / total
		assets early×100%

Table 4. Financial Indicators

5. Empirical Design, Results and Analysis

5.1. Research Hypothesis

In our analyses, we assume the dependent variable y of the discriminant function to be -1 if a company is still labeled as ST after asset restructuring and to be -1 if a company is labeled as non-ST after asset restructuring. Thus, given the dependent variable y of a discriminant function, the criterion used to determine whether asset restructuring is effective in helping a company to improve financial performance is represented by the following hypotheses: H1: y > 0 indicates that a ST company's performance improve after asset restructuring. H2: y < 0 indicates that a ST companies' performance does not improve after asset restructuring.

5.2. Modeling Results and Analysis

5.2.1. T-test Results and Analysis

The two data groups from the sample and their descriptive statistics are presented in Table 5. Ttest can be used to determine whether or not the means of the two data groups are statistically equal. F-test can also be used to test the equality of the variances of the two data groups. Using our sample and the independent sample t-test, we tested the effectiveness of the 11 performance indicators in predicting what a company's performance will be after assets restructuring. The results are shown in Table 6. It can be seen from Table 6 that the average values for the 11 financial indicators of the 22 companies that are not able to improve financial performance significantly and kick off the cap of ST are different from the 20 companies that significantly improve their financial performance by assets restructuring. From Table 6 we can see that the two groups are significantly different with respect to indicators ROE and asset growth. The p-values for these two independent variables are less than 0.05. The p-value for the other two independent variables, namely: asset-liability ratio and equity ratio is about 0.1. Thus, they are also useful in differentiating firms with performance improvement after assets restructuring.

Table 5. The means, variances, and standard errors of the variables with respect to each group of companies

Name	Label	Number of Companies	Mean	Standard Deviation	Standard Error of the Mean
OPE	-1	22	45.8825	118.5290	25.2705
	1	20	26.2974	18.9161	4.2298
Total assets profit	-1	22	-105.4702	436.0067	92.9569
margin	1	20	1.9162	17.5853	3.9322
ROE	-1	22	-20.5340	26.8362	5.7215
	1	20	25.9655	87.7955	19.6317
Quick Ratio	-1	22	4.9010	5.4168	1.1549
	1	20	5.2685	8.4922	1.8989
Asset-liability ratio	-1	22	14.2158	16.2829	3.4715
	1	20	40.6712	92.3318	20.6460
Equity ratio	-1	22	0.4229	0.5066	0.1080
	1	20	0.6083	0.4211	0.0942
Inventory turnover	-1	22	1.0381	1.9310	0.4117
rate	1	20	0.8377	0.8946	0.2000
Accounts receivables	-1	22	214.4394	432.7181	92.2558
turnover	1	20	59.2712	26.6597	5.9613
Total asset turnover	-1	22	-32.8397	321.0770	68.4538
	1	20	181.3118	489.4183	109.4373
Main business revenue	-1	22	-12.2543	55.5796	11.8496
growth	1	20	7554.6491	33461.5020	7482.2194
Total assets growth	-1	22	-15.3311	22.6161	4.8218
rate	1	20	81.5933	202.6786	45.3203

5.2.2. Identification of Best Set of Performance Indicators and Determination of Their Predictive abilities

From the tests in Table 6, we identified four financial indicators that can be used to distinguish firms with significant performance improvement after assets restructuring from those without significant improvement. Here in this section, we will determine the optimal indicator set or optimal combination of indicators out of these four financial indicators for distinguishing firms with significant performance improvements after asset restructuring.

17.21

0.11

0.10

1.16

1.13

351.28

347.33

41.71

48.69

6833.47

8093.58

-9.10

-1.68

Table 6. Results o	f independent	samples T	-Test				
		Levene's equal va	test of triance	T-test of	f equal means	95% Confid of the I	lence Interval Difference
		F value	Sig.	T value	Sig. (2-tailed)	Lower	Upper
ODE	Equal variance	2.772	0.104	0.730	0.470	-34.66	73.83
OFE	Unequal variance			0.764	0.453	-33.53	72.70
Total assets profit margin	Equal variance	3.539	0.067	-1.099	0.278	-304.80	90.03
	Unequal variance			-1.154	0.261	-300.83	86.06
ROE	Equal variance	2.895	0.097	-2.368	0.023**	-86.19	-6.81
ROL	Unequal variance			-2.274	0.033**	-88.88	-4.12
Quick Ratio	Equal variance	0.451	0.506	-0.169	0.867	-4.77	4.03
	Unequal variance			-0.165	0.870	-4.90	4.16
A	Equal variance	4.459	0.041	-1.323	0.193	-66.87	13.96

0.685

0.108

0.012

0.530

0.033

0.000

-1.264

-1.283

-1.294

0.424

0.438

1.599

1.678

-1.692

-1.659

-1.062

-1.011

-2.231

-2.127

0.221

0.207

0.203

0.674

0.665

0.118

0.108

0.098

0.107

0.295

0.325

0.031**

0.046**

-70.12

-0.48

-0.48

-0.75

-0.73

-40.95

-36.99

-470.01

-476.99

-21967.28

-23227.38

-184.75

-192.17

Tab

Unequal

variance Equal

variance

Unequal

variance Equal

variance Unequal

variance Equal

variance

Unequal

variance Equal

variance

Unequal

variance Equal

variance

Unequal

variance Equal

variance

Unequal

variance

0.167

2.695

6.860

0.401

4.889

15.718

** Indicates that p-value is less than 0.05.

The number of possible combinations or sets of financial indicators that can be obtained from these four financial indicators is $C_4^1 + C_4^2 + C_4^3 + C_4^4 = 15$. Here $C_4^1 = 4$ means that the indicator set has one indicator. $C_4^2 = 6$ means that the indicator set has two indicators. $C_4^3 = 4$ means that the indicator set has three indicators. $C_4^4 = 1$ means that the indicator set has four indicators. The possible financial indicator sets for this problem are presented in Table 7.

Asset-liability ratio

Inventory turnover

Accounts receivable

total asset turnover

Main business

revenue growth

total assets growth

rate

Equity ratio

rate

$C_{4}^{1} = 4$	ROE	Asset-liability ratio	Equity ratio	Growth rate of
				total assets
$C_{4}^{2} = 6$	ROE,	ROE	ROE, Growth	Assets liability
4	Asset-liability ratio	Equity ratio	rate of total assets	ratio Equity ratio
	Asset liability ratio,	ROE ratio, Growth		
	Growth rate of total	rate of total assets		
	assets			
$C_{4}^{3} = 4$	ROE, Asset liability	ROE, Asset liability	ROE, Equity ratio,	Asset-liability
4	ratio Equity ratio	ratio, Growth rate of	Growth rate of	ratio, Equity ratio
		total assets	total assets	Growth rate of
				total assets
$C_{4}^{4} = 1$	ROE, Asset -liability	ratio, Equity ratio, Growt	h rate of total assets	

 Table 7. The possible or candidate financial indicator sets

To determine the optimal indicator set, we try all the different combinations of financial indicator sets listed in Table 7 using the linear discriminant function $y = c_1x_1 + c_2x_2 + \dots + c_px_p + b$, where x_1, x_2, \dots, x_p are the mean values of the financial indicators and c_1, c_2, \dots, c_p , and b are unknown coefficients. The results of computations, trials, and analyses show that the optimal or most effective set of indicators for differentiating firms with significant performance improvement after assets restructuring from those without significant improvement or any improvement is asset-liability ratio, return on equity, and total asset growth. From the results in Table 8-10, the discriminant function obtained with these variables is $y = 0.439x_1 - 0.469x_2 + 0.58x_3$ where x_1, x_2 , and x_3 are variables representing total asset growth, asset-liability ratio, and return on equity respectively.

 Table 8. Eigenvalues and canonical correlation

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	0.241	100	100	0.441

 Table 9. Wilks' Lambda and the results of Chi-Square test

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	0.806	8.307	3	0.04

Table 10. Standardized canonical discriminant function coefficients

	Function
Growth rate of total assets	0.439
Asset-liability ratio	-0.469
ROE	0.580

The validation and cross-validation accuracy rates are respectively 76.2% and 73.8%. The conclusion that can be drawn from this is that, more than 70% of the time, these three indicators can successfully differentiate firms with significant performance improvements after asset restructuring from those without significant improvement or any improvement. A summary of the results of the analyses is presented in Tables 11a and 11b below.

In the cross validation, each company is classified by the discriminant function developed with the data from other companies. That is, the cross-validation covers all the 42 companies. . When a company is used as a validating case, data from the remaining 41 companies are used in

developing the discriminant function used for the cross validation. In all, the cross validation process was repeated 42 times since we have 42 companies in our sample.

The prediction accuracy was calculated by dividing 42 by the number of times that correct predictions are made. The results show that the discriminant function developed from the data from all the 42 companies classified 76.2% of the 42 companies correctly and that 73.8% of the companies were correctly classified with the cross-validation process.

5.3. Further Illustrations and Comparisons of the Performances of ST and Non-ST Companies

It should be recalled that 20 out of the 42 companies in our sample achieved improved financial performance and were able to kick off the cap of ST after asset restructuring while 22 did not. The 20 companies that kicked off the cap of ST are known as Non-ST companies while those that failed to kick off the cap of ST are known as ST companies.

Here in this section, we use graphical illustrations to study and compare these two categories of companies. The graphs drawn for these illustrations are presented in Figures 1-3.

		Label	Predicted Group N	Total	
			-1	1	Total
	Count	-1	16	6	22
Original	Count	1	4	16	20
Original	%	-1	72.7	27.3	100.0
		1	20.0	80.0	100.0
	Count	-1	16	6	22
Cross-validation		1	5	15	20
	0/	-1	72.7	27.3	100.0
	/0	1	25.0	75.0	200.0

 Table 11a. Classification results



Figure 1. The trend of the yearly changes in the mean of ROE after asset restructuring

Name	$x_1(\%)$	$x_2(\%)$	$x_3(\%)$	<i>y</i> /100	Labeled as non-ST after asset
37	2(79	72.02	120 (4	1 1 (40	restructuring
Yuyuan	-26.78	/3.93	-120.64	-1.1640	NO
Saige	-13.92	18.61	-30.73	-0.3266	Yes
Huanghai	-3.89	95.70	31.31	-0.2843	No
Xintian	37.31	68.09	-21.29	-0.2790	No
Tianhong	-26.45	72.24	-20.70	-0.5750	No
Meiyan	-13.83	57.37	-3.14	-0.3480	No
Yuandong	-11.59	8.39	3.21	-0.0716	No
Xinlong	-2.75	63.85	1.11	-0.3051	No
Guoxiang	-9.82	19.90	2.74	-0.1205	No
Haina	849.35	74.73	16.95	3.4765	Yes
Qianyao	-13.79	52.71	22.78	-0.1756	Yes
Taige	-20.42	20.72	-33.48	-0.3810	No
Keyuan	-27.76	173.61	44.43	-0.6785	Yes
Chunlan	-6.86	15.50	0.64	-0.0991	No
Xiangli	-12.18	20.50	11.35	-0.0838	No
Qionghua	-23.56	55.42	6.11	-0.3279	No
Huiyuan	1.22	76.94	1.41	-0.3473	No
Baimao	-13.27	44.62	-16.89	-0.3655	No
Huajian	20.30	72.09	14.60	-0.1643	Yes
Changhe	-57.58	26.61	3.67	-0.3563	No
Zhongliao	-0.24	67.17	26.74	-0.1610	Yes
Maiya	-1.62	75.05	-36.47	-0.5706	No
Yalong	6960.07	83.65	11.28	30.2278	Yes
Jiangquan	-15.52	20.41	2.91	-0.1470	Yes
Huaguang	-11.22	62.62	7.05	-0.3020	No
Jiantong	-1.30	5.10	0.42	-0.0272	No
Changyu	-3.02	92.10	-34.53	-0.6455	No
Gaotao	-9.95	50.25	-13.95	-0.3603	No
Huangtai	-16.09	50.41	3.04	-0.2894	No

 Table 11b. Testing results



Figure 2. The trend of the yearly changes in the mean of asset-liability ratio after asset restructuring



Figure 3. The trend of the changes in the mean of growth rate of total assets after asset restructuring

A careful study and analyses of the above graphs lead to the following conclusions.

1) The performances of the companies that kick off the cap of ST successfully improve significantly in the first year after asset restructuring, compared with the previous year. In the year before assets restructuring, the ROE, asset-liability ratio, and growth rate of total assets of these non-ST companies are respectively 354.63%, 72.28% and 22.67% on average. In the year of asset restructuring, there is a rise in the growth rate of total assets, and a decline in ROE and asset-liability ratio. The decline of asset-liability ratio for non-ST companies means better performance since this type of company commonly holds a lot of liability. In 2009, the first year after asset restructuring, both ROE and growth rate of total assets increased for non-ST companies while the asset-liability ratio decreased. The ROE increased from 25.97% to 768.75%. The growth rate of total assets increased from 81.59% to 219.67%. Asset-liability ratio became slightly lower from 59.27% to 59.07%. They all indicate that better performance is achieved by assets restructuring. Thus, we can conclude that companies which kick off the cap of ST successfully after asset restructuring will have a significant performance improvement in the year of asset restructuring and in the first year after assets restructuring. Asset restructuring effectively help this type of companies to improve financial performance in the short term.

2) The performances of the companies that kick off the cap of ST successfully (the non-ST companies) do not significantly improve in the second year after assets restructuring. From the above graphs, we can see that the ROE decreased from 768.75% in 2009 (the first year after assets restructuring) to 12.4% in 2010 (the second year after assets restructuring). Also, the growth rate of total assets fell significantly from 219.67% in 2009 to 120.81% in 2010. This, therefore, shows that assets restructuring is more helpful in improving the short-term performance of non-ST companies than in improving their longer-term performance.

3) The companies that are still labeled as ST after assets restructuring are not able to improve their business performance in the following years. The above charts show that the mean of ROE did not increase. It declined in the year of asset restructuring and in the first year after asset restructuring. In the second year after asset restructuring, the mean of the ROE for this category of companies increased. The likely reason for this is that these companies might have used some other methods/strategy to improve their business performance. The average of the asset-liability ratios of these companies showed similar patterns or trends. In terms of growth rate of total assets, the means did not show any increases in the year of asset restructuring but they increased in the first year and second year after asset restructuring. In general, asset restructuring has little or no impact on some ST companies' abilities to improve their financial performance.

5.4. Further Tests and Analyses with a New Sample

In order to test the effectiveness of the discriminant function in predicting the success (or lack of it) of companies using asset restructuring in Chinese Market, we collected 29 ST listed companies that used asset restructuring in 2009 to improve their financial performances. The discriminant function $y = 0.439x_1 - 0.469x_2 + 0.58x_3$, which was developed earlier in section 5.2.2 was used as the assessment tool. The results of the analyses results are shown in Table 11 below.

When the results obtained from the discriminant function analyses above are compared with the actual data obtained from the 30 companies, the results obtained from the analyses are found to be consistent with the actual status and actual data from 23 of the 29 companies. This shows that the prediction accuracy rate of this discriminant function is 79.3%. This is close to cross-validation accuracy. This result shows that the discriminant analysis is an applicable, effective and useful tool for the Chinese Market.

In the table, the companies with positive y values achieve better financial performance. These ST companies are very likely going to kick off the cap of ST. At least, their chances of doing that are better than those of other companies.

There are circumstances and instances in which ST companies are not able to kick off the cap of ST. The discriminant function does not have 100% accuracy in testing. Therefore, if the y value of a sampled company is greater than 0, we cannot be sure that the company's performance will completely get better after asset restructuring, and we cannot be completely sure that the company will succeed in kicking off the cap of ST. All what we can say is that the company has a good possibility of succeeding. What the manager of the company's y value is less than 0, we cannot be sure that the company will never kick off the cap of ST. However, what we can say is that the company besides that the company will never kick off the cap of ST. However, what we can say is that the company gets less chance. What the manager of the company should do in this case is to try more means or strategies to turn impossibility into possibility.

6. Findings, Conclusions, and Recommendations

6.1. Findings and Conclusions

The results of this research have shown that the discriminant function developed in this paper can be used to assess and predict the short-term performance improvement of listed companies after asset restructuring. The three variables used in the model were selected from 11 candidate financial indicators after some tests and analyses were done. The results of the research show that the three variables and, of course, the model are good predictors of a company's performance after assets restructuring. The in-sample, cross-validation, and out-of-sample accuracies of the fitted discriminant function are 76.2%, 73.8%, and 79.3% respectively.

Other important and useful findings from the research include the following.

1) Companies that kick off the cap of ST successfully after asset restructuring will have a significant performance improvement in the year of asset restructuring and the year after This means that assets restructuring is more helpful in improving short-term performance;

2) Performances of companies that kick off the cap of ST successfully do not improve significantly in the second year after assets restructuring. This shows that assets restructuring is less helpful in improving their relatively longer-term performance;

3) Companies that are still labeled as ST after asset restructuring will not be able to improve their business performances after asset restructuring if no other actions are taken. This indicates that asset restructuring has little or no impact on some ST companies' abilities to improve their financial performance.

4) Mergers & acquisitions and share transfer are the most frequently used methods of equity transfer by the companies. Transfer of shares alone is by far the most frequently used method. Mergers and acquisitions are second most used means of asset restructuring. Divestitures and asset replacement methods are least popular among the companies.

6.2. Recommendations

We recommend that specially treated companies should focus on improving profitability, solvency, and ability to grow by using asset restructuring or hybrids of some of the growth strategies discussed in this research.

Further research needs be done in the areas of the assessment and prediction of long-term performance of ST companies after asset restructuring. We suggest that many other steps should be taken to improve the performance of any company after asset restructuring. These include the improvement of corporate governance structure, process re-engineering, optimization of allocation and use of resources.

Acknowledgments: This research is partially supported by the National Natural Science Foundation of China (No. 71171179), the Zhejiang Provincial Philosophy and Social Science Foundation of China (No. 11ZJQN081YB), and the Zhejiang Provincial QianJiang Talent Project - Social Science. The authors gratefully thank anonymous referees for their useful comments and corrections, and Prof. Joel K. Jolayemi (the Editor-in-Chief of Annals of Management Science) for his work.

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