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Research on China's M&A Efficiency Based on DEA–Tobit

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Abstract

M&A has always been the theme of country economic development and corporate transformation and upgrading, M&A promote the flow of capital between enterprises and make the optimal scale of operation by reallocating the resources and adjusting asset structure. Based on the perspective of acquirers and acquires, Research uses the DEA-Tobit method to measure the dynamic effect of 6 kinds of M&A way in the short and long period. Through empirical research, it shows that there are different effects in the efficiency of different M&A ways. The same way of M&A, due to the enterprises in different status in M&A, efficiency effect will be also different. Through the analysis of efficiency changes, Come to conclusion that for the asset acquisition and absorb and merge by the acquirers should be prevented from being too large, resulting in a decrease in scale efficiency; Debt restructuring can reduce the debt burden, and quickly improve the efficiency. It is difficult to improve the efficiency for acquires, if asset divestiture, asset replacement, equity transfer is related or not great events, enterprises should try to choose the external M&A objects. The conclusion of the research has an important guiding role in today economic background of the adjusting economy structure and de-stocking in china.

Keywords: DEA-Tobit, M&A way, M&A efficiency

1. Introduction

As a way of making optimization of capital allocation, M&A has become the selection of many enterprises with the need of transformation, upgrading and expansion in the capital market. Enterprises try to improve the allocation efficiency of asset through M & A and so as to realize the goal of maximizing profits. In the context of adjusting economy structure and de-stocking, traditional enterprises are more motivated and with the need to change the mode of development and operating direction, and M&A will be an important way to achieve this goal. For the moment, there are eight M&A ways for china's enterprises, enterprises choose one of M&A way base on their own condition. As all kinds of M&A ways adjust the allocation of asset in different ways, making difference changes in enterprises efficiency after the M&A. Therefore, under the different M&A ways, the research on the efficiency change before and after the M&A of enterprises will help to better guide the way selection of future M&A.

2. Literature Review

Scholars have done a great deal of research on the efficiency of M&A, however, the research mainly used event research method and financial indicator method. Since M &A is an important way to realize the optimal allocation of asset, many experts in recent years have begun to use the efficiency index (DEA) to measure the efficiency of M&A. Foreign scholars Odeck (2008) studied the effect of M&A of public transport sector in Norway using DEA method, and it is found that M&A bring great potential efficiency. In terms of scale efficiency, M&A enterprises are more efficient than others. Sufian and Habibullah (2009) used DEA method to study the changes of technical efficiency, pure technical efficiency and scale efficiency before and after M &A of Banks in Malaysia. Through a series of tests on three kinds of efficiency, it is found that M&A in Malaysia is driven by profits. Halko and Tzeremes (2013) used the Bootstrap-DEA method to study the short-run efficiency before and after bank M&A, and found that most M&A did not improve operational efficiency during the Greek fiscal crisis while 2011 year samples show that most M&A can improve short-run efficiency, confirming the M&A among banks does not necessarily bring operational efficiency. Mahabubur Rahman et al. (2016) constructed DEA with a constant return (CRS) and variable-scale return (VRS), respectively, and then used

pairing T to test whether there was a significant difference in DEA before and after mergers and acquisitions. It was found that M&A improved the efficiency of the target enterprises, though the effect is small.

In addition to the existing studies on the efficiency of enterprises before and after the M&A, and the factors affecting the efficiency of M&A, foreign scholars started to use the model to get the time-varying effects of M&A by controlling the other relevant variables. Du and Sim (2016) used panel models to study the impact of M&A on the efficiency of banks in six countries by introducing dummy variables before and after mergers and acquisitions. Similarly, Matt Schmitt (2017) used the fixed effects panel model to study whether M&A reduce patient costs. The hospital was divided into control groups and M&A groups to determine if the year dummy variables were significant. Therefore, after the control of relevant variables, the time variables can well describe the long-term and short-term effects of M & A.

Similarly, the main method of early Chinese scholars measured the performance of mergers are event research method and financial indicator method. Chinese scholars Feng and Wu (2001) applied the financial index method to study the differences performance of horizontal, vertical and mixed M&A. The results show that performance increased in the beginning and then decreased, and the performance of different types of M&A are differed at different periods. Wang Sen (2002) divided the equity restructuring into six categories, studies show that as the stock market matures, equity restructuring enhance enterprise performance. With the deepening of research, the measurement of performance has also been developed, and scholars began to use efficiency indicators to measure the performance of M & A Li and Zhu et al. (2003) first applied data envelopment analysis (DEA) to study the performance levels of 103 listed enterprises before and after M&A, and concluded that mergers and acquisitions have enhanced the efficiency of operation and management of listed enterprises. Both Zhou,L (2007) and Pan, S. M (2010) in their study of M&A performance used DEA to measure the efficiency of M&A. Liu, Y. Y (2012) used DEA-tobit method to study the M&A efficiency of China's steel industry, It was found that M&A has a time-lag effect on the efficiency of the steel industry. Lai, D and Tang, H. X (2016) used the three-stage DEA model to study M&A in the non-ferrous metals industry, and found that after M&A with a low comprehensive technology efficiency. The lower level of purely technical efficiency was the key factor affecting the overall efficiency , and proposed non-ferrous metal industry should pay attention to technological progress and innovation.

It can be found that Chinese and Foreign scholar’s research have concluded that, to some extent, M&A can promote the efficiency of enterprises. However, in their research methods, a large part research uses the event research method and the financial indicator method to compare the efficiencies before and after M&A. On the other hand, on the research object, the current research focuses on the whole event of M&A and seldom specifically classify the way of M&A to study the validity of each M&A way .

In order to better study the impact of M&A on the efficiency of enterprises. This article first classifies the M&A ways specifically, and then constructs the DEA index before and after M&A respectively, After controlling the related variables, the dummy variable of year is introduced to distinguish the short and long time dynamic influence of M&A by judging the significance of the year dummy.

3. DEA Model Construction and Input and Output Selection

3.1 DEA Model Construction

In 1978, an operational researcher formally proposed the Data Envelopment Model (DEA) in an article titled "Measuring the efficiency of decision making units." This model is mainly used for the relative validity between decision-making units. DEA uses mathematical programming models to evaluate the relative validity of decision-making units (DMUs) with multiple inputs and outputs. It determines whether the DMU is valid by judging whether DMUs are located on the "production frontier".

In DEA, each subject we call a decision making unit, denoted by "DMU". There are n decision units (j=1,2, ..., n); each decision unit has m input (i=1,2, ..., m); and has s outputs (r = 1, 2, ..., s);

X_{ij} is the i^{th} input of the j^{th} decision making unit; Y_{rj} is the r^{th} output of the j^{th} decision making unit;

DEA Input Model Construct:

$$\min \theta$$
$$s.t \sum_{j=1}^{n} X_j \lambda_j \leq \theta X_0$$
$$\sum_{j=1}^{n} Y_j \lambda_j \geq Y_0$$
$$\lambda_j \geq 0, j = 1, 2, \ldots, n$$

3.2 Selection Input and Output

The Selection of input and output plays a crucial role in correctly measuring the efficiency of the M&A. According to the existing literature on enterprises efficiency studies, the total assets of any enterprises determines the scale of its operations and is an important input. Various costs and expenses are incurred in the daily operations, all of which are also enterprise's important input. Here we use the total cost of business, which consists of operating costs and operating taxes and surcharges, and financial expenses, management expenses and sales expenses are consist of the total cost. In the output variables, here the use of operating income and total profit, these two indicators can better reflect the enterprise's main revenue and overall income. Therefore, here selects the following input and output indicators:

INPUT(X)	*Description*
Asset	X_1
The sum of business costs	X_2 (Including operating costs and business taxes and surcharges)
The sum of costs	X_3(Including financial costs, management fees and sales costs)
OUTPUT(Y)	
Operating income	y_1
The total profit	y_2

4. Empirical Study

4.1 Sample Selection

In order to ensure the comprehensiveness of the research and involve all types of mergers and acquisitions, we selected 8 types of M&A samples through the CSMAR.

4.2 Variable Selection

Enterprises efficiency is determined by a series of factors, both within the enterprise itself, as well as external economic factors. From the internal factors, the efficiency of the enterprise is influenced by the solvency, management ability, profitability, development ability. In addition, according to related research, the efficiency of enterprises are related to capital intensity and ownership structure. From the external factors, there are many factors that affect the efficiency of the enterprise. The most important one is the macroeconomic situation. Here uses the growth rate of GDP as an external factor. In order to capture the impact of M&A on enterprise efficiency in different years, this paper introduces the year dummy that represent the time effect. The relevant variable is as follows:

Variable category	Variable name	Variable code	Variable definition
Dependent variable	M&A efficiency	Crs_te Vrs_te Scale	DEA model
Control	Asset- liability ratio	zcfzl	Liability/ Asset
	Operating profit margin ratio	yylrl	Operating profit / operating income
	Total asset turnover ratio	zzczzl	Sales revenue / average total assets
	Total profit growth ratio	lrzezzl	Annual profit growth / total profit of the previous year
	Capital intensity	zbmjd	Total asset / operating income

	natural log of assets	lnzc	natural log of assets
	GDP		Annual gdp growth / total gdp
variables	Growth rate	gdp	of the previous year
	The largest shareholder		The largest shareholder's
	shareholding ratio	cgbl	shares/total shares
independent	year	λ_t	Take1in t year, otherwise is 0
variable	dummy		

4.3The Establishment of DEA-Tobit Model

In order to more intuitively study how efficiency changes in each year after the M&A, we introduce the year dummy λ_t (t=0,1,2,3)into the regression model. Trying to get the impact of M&A in short and long term. Since the dependent variables here are based on DEA model, So its value is in the range of [0,1].Therefore, this article uses a limited tobit model. First we build the Tobit1-Tobit3 model as follows:

$$DEA_{it} = zcfzl_{it} + yylrl_{it} + zzczzl_{it} + lrzezzl_{it} + zbmjd_{it} + \ln zc_{it} + gdp_{it} + cgbl_{it} + \sum_{t=0}^{3} \lambda_t + \varepsilon_{it}$$

Through the tobit1-tobit3 model, we can observe the period effect of each year based on the acquirers or the acquirees after adopting some types of M&A.

In some M&A ways, the efficiency affected by M&A is small in some years alone, However, it may be significantly affected in the longer time horizon. Therefore, we set the year dummy variable to 0 before the M&A and the year after M&A is 1, which is:

$$\lambda = \begin{cases} 0, \text{ before the M\&A} \\ 1, \text{ after the M\&A} \end{cases}$$

So built the Tobit4-Tobit6 model as follows:

$$DEA_{it} = zcfzl_{it} + yylrl_{it} + zzczzl_{it} + lrzezzl_{it} + zbmjd_{it} + \ln zc_{it} + gdp_{it} + cgbl_{it} + \lambda + \varepsilon_{it}$$

5. Regression Analysis

5.1 Based on the Acquirer's Perspective of Various Ways of M&A

Table 1. Acquirer- Asset Acquisition regression result

Acquirer- Asset Acquisition						
	(1)	(2)	(3)	(4)	(5)	(6)
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.142***	-0.0350	-0.113***	-0.142***	-0.0434	-0.105***
	(0.0241)	(0.0293)	(0.0217)	(0.0240)	(0.0290)	(0.0216)
yylrl	0.132***	0.122***	0.0233*	0.133***	0.121***	0.0272**
	(0.0148)	(0.0177)	(0.0133)	(0.0147)	(0.0177)	(0.0135)
zzczzl	0.156***	0.101***	0.0708***	0.156***	0.0972***	0.0742***
	(0.0144)	(0.0168)	(0.0124)	(0.0143)	(0.0167)	(0.0126)
lrzezzl	-7.20e-05	-7.91e-05	1.54e-05	-6.92e-05	-9.12e-05	3.24e-05
	(7.07e-05)	(8.45e-05)	(6.18e-05)	(7.04e-05)	(8.44e-05)	(6.26e-05)
zbmjd	-0.00296***	-0.00279***	-0.000400	-0.00300***	-0.00276***	-0.000508
	(0.000397)	(0.000476)	(0.000368)	(0.000395)	(0.000475)	(0.000375)
lnzc	0.0233***	0.00227	0.0262***	0.0242***	0.00739	0.0197***
	(0.00676)	(0.00799)	(0.00719)	(0.00624)	(0.00734)	(0.00632)
gdp	0.539	0.773	-0.139	0.428	0.297	0.180
	(0.490)	(0.586)	(0.428)	(0.432)	(0.514)	(0.392)
cgbl	-0.0283	-0.0533	-0.00164	-0.0240	-0.0604	0.0172
	(0.0423)	(0.0523)	(0.0410)	(0.0419)	(0.0518)	(0.0398)
λ_0	0.00961	0.0261	-0.0165			
	(0.0142)	(0.0170)	(0.0128)			
λ_1	0.00610	0.0316*	-0.0287**			
	(0.0159)	(0.0189)	(0.0142)			
λ_2	-0.000929	0.0405*	-0.0466***			
	(0.0179)	(0.0213)	(0.0161)			
λ_3	-0.00389	0.0478**	-0.0593***			
	(0.0190)	(0.0225)	(0.0172)			
λ				-0.00529	0.0180	-0.0269***
				(0.0111)	(0.0133)	(0.00992)
Constant	0.222	0.686***	0.419***	0.214	0.634***	0.513***
	(0.151)	(0.179)	(0.158)	(0.149)	(0.175)	(0.150)
Observations	335	335	335	335	335	335
Number of dmu	48	48	48	48	48	48

Note: The significance levels of the regression results in the table represent: *** p <0.01, ** p <0.05, * p <0.1.

From the results of regression (1), (2) and (3) , we can conclude that: After the asset acquisition, the scale of efficiency index(Scale), except for insignificant impact on the year of M&A, The impact on the scale efficiency of 1-3 years after the M&A was significantly negative(-0.0287, -0.0466 and -0.0593respectively). For purely technical efficiency(VRS_TE), except for insignificant impact on the year of M&A, the impact on the purely technical efficiency in 1-3 years after M&A was significantly positive (0.0316, 0.0405 and 0.0478 respectively). However, for the comprehensive efficiency index (CRS_TE), the impact Asset Acquisition of is not significant.

We continue to change the year dummy, before and after the implementation of specific M&A were adopted at 0-1 dummy variables. From the columns (4), (5) and (6), can conclude that: After the Asset Acquisition, the effect of asset acquisition on scale efficiency is significantly negative, with a coefficient of -0.0269. For pure technical efficiency and technical efficiency, the way of Asset Acquisition is not significant. Therefore, the effect of model (3) and model (6) is consistent in direction. Other way of M&A impact base on acquirers can be seen in the appendix.

5.2 Based on the Acquiree's Perspective of Various Ways of M&A

Table 2. Acquiree- Absorb and merge regression result

Acquiree- Absorb and Merge						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.0300	0.0143	-0.0263	-0.0322	0.00611	-0.0261
	(0.0403)	(0.0385)	(0.0302)	(0.0398)	(0.0383)	(0.0301)
yylrl	0.791***	1.055***	0.119	0.793***	1.035***	0.124*
	(0.0976)	(0.122)	(0.0756)	(0.0971)	(0.119)	(0.0748)
zzczzl	0.106***	0.127***	0.0318**	0.106***	0.130***	0.0308**
	(0.0215)	(0.0363)	(0.0151)	(0.0211)	(0.0361)	(0.0149)
lrzezzl	0.000117	-0.000104	0.000277	0.000139	-6.27e-05	0.000286
	(0.000387)	(0.000376)	(0.000337)	(0.000386)	(0.000383)	(0.000337)
zbmjd	0.00179	0.0112**	-0.00637**	0.00175	0.0114**	-0.00658**
	(0.00369)	(0.00537)	(0.00268)	(0.00364)	(0.00530)	(0.00264)
lnzc	-0.00239	0.00802	-0.0138*	-0.000804	0.00989	-0.0131*
	(0.00965)	(0.0123)	(0.00757)	(0.00920)	(0.0123)	(0.00712)
gdp	0.203	-0.655	-0.00994	0.354	-0.481	0.0669
	(0.542)	(0.610)	(0.499)	(0.475)	(0.553)	(0.440)
cgbl	0.127**	0.0579	0.0727*	0.125**	0.0841	0.0709*
	(0.0540)	(0.0899)	(0.0380)	(0.0546)	(0.0858)	(0.0381)
λ_0	-0.0127	-0.00591	-0.0172**			
	(0.00952)	(0.00900)	(0.00850)			
λ_1	-0.0189*	-0.00556	-0.0236**			
	(0.0112)	(0.0114)	(0.0100)			
λ_2	-0.0189	-0.0142	-0.0204*			
	(0.0133)	(0.0132)	(0.0119)			
λ				-0.0146	-0.00583	-0.0193**
				(0.00902)	(0.00894)	(0.00813)
Constant	0.830***	0.650***	1.265***	0.784***	0.587**	1.244***
	(0.212)	(0.252)	(0.173)	(0.195)	(0.245)	(0.156)
Observations	55	55	55	55	55	55
Number of dmu	11	11	11	11	11	11

The results of regression (1), (2) and (3) can be seen from the above table, After the acquiree adopt absorb and merge way, For scale efficiency, the effect on scale 0-2 years after M & A was significantly negative(-0.0172, -0.0236, -0.0204 respectively). For purely technical efficiency, the impact of absorbing and merge are all negative, but not significant. For the technical efficiency, the first year after absorbing and the merger is a negative impact, and the coefficient is -0.0189, the rest of the year is not significant.

It is the same as studying acquirer's, Here continues to change the year dummy.Before and after the implementation of specific M&A were adopted as the 0-1 dummy variables. From the columns (4), (5) and (6)can conclude that: After the absorb and merge, the effect of absorb and merge on scale efficiency is significantly negative, and the coefficient is -0.0193.For purely technical efficiency and technical efficiency, the way of absorb and merge is not significant. Therefore, the results obtained using models (1) to (3) are same as

the models (4)-(6) basically. Another way of M&A impact base on acquirees can be seen in the appendix.

6 .Conclusions and Recommendations

This article is based on the perspective of acquirers and the acquirees, The impact of M&A way on the efficiency of enterprises can reach the following conclusions:

(1) When taking asset acquisition way, the pure technical efficiency and scale efficiency of the acquirers are affected positively and negatively respectively in the 1-3 years, while it does not have a significant impact on technical efficiency. This shows that the asset acquisition taken by enterprises, directly adds the physical assets of enterprises, which led to the problem of excessive scale inefficiencies. This requires that in the process of asset acquisition should prevent the scale of assets from too large, which is not conducive to efficient improvement.

(2) When taking asset replacement way, the pure technical efficiency of the acquirers will be affected in the short term without affecting other efficiencies. For the acquiree, except for the first year after the implementation of M&A to improve the scale efficiency, the impact of the remaining years is not obvious. This shows that for the acquirer's itself, although the asset replacement way can not change the size of the enterprise, the assets exchanged are in line with the development of the enterprise. Therefore, the advantages of management can be obtained, leading to the improvement of pure technical efficiency.

(3) When taking absorb and merge way, Both for the acquirers and the acquirees, the scale efficiency is significantly reduced. This results show that the size of M&A of China's listed companies some are too large. Once beyond the normal scale, will inhibit the development of enterprises, resulting in inefficiencies.

(4) When taking debt restructuring way, The technical efficiency, pure technical efficiency and scale efficiency of the acquirers in the year of M&A are all improved. Because the acquirers are the beneficiary in the debt restructuring, debt restructuring can be used to exempt the debt and reduce the financial claim on the enterprise, or financial claim turn into the capital of enterprises, making the efficiency increased. Therefore, for those enterprises with a large financial claim, they may consider adopting a debt restructuring to reduce their financial claim and thus enhance their operational efficiency.

(5) When taking the assets divestiture and equity transfer way, Basically has no effect on the efficiency of the acquiree. In the course of the research, we found that a large part of asset divestiture of the acquiree is the transaction between the related parties, and the equity transfer scale is not great. This non-substantive transaction is difficult for enterprises to improve the efficiency. Enterprises should avoid such non-substantive M&A, take more non-related and big scale M&A program.

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Appendix

Acquirer- asset replacement						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	0.115***	-0.294***	0.367***	0.109***	-0.309***	0.357***
	(0.0418)	(0.0957)	(0.0477)	(0.0423)	(0.0932)	(0.0529)
yylrl	0.606***	0.156	0.541***	0.605***	0.147	0.544***
	(0.0607)	(0.130)	(0.0770)	(0.0614)	(0.131)	(0.0783)
zzczzl	0.179***	0.139**	0.0680**	0.179***	0.147**	0.0801**
	(0.0388)	(0.0659)	(0.0306)	(0.0371)	(0.0639)	(0.0401)
lrzezzl	0.000842*	-0.000443	0.000834	0.000801*	-0.000439	0.000770
	(0.000456)	(0.00102)	(0.000567)	(0.000452)	(0.00101)	(0.000560)
zbmjd	-0.0525***	-0.0184	-0.0459***	-0.0516***	-0.0161	-0.0441***
	(0.00725)	(0.0150)	(0.00791)	(0.00717)	(0.0147)	(0.00880)
lnzc	-0.00452	0.0404*	-0.0313***	0.000598	0.0445**	-0.0357***
	(0.0140)	(0.0235)	(0.0113)	(0.0123)	(0.0216)	(0.0127)
gdp	-0.885	3.231	-2.985**	-0.942	3.191	-2.749**
	(0.951)	(2.081)	(1.325)	(0.942)	(2.049)	(1.260)
cgbl	0.0140	-0.199	0.144**	0.000542	-0.208*	0.186*
	(0.0632)	(0.123)	(0.0631)	(0.0619)	(0.120)	(0.0990)
λ_1	0.0347	0.130*	-0.0378			
	(0.0331)	(0.0666)	(0.0390)			
λ_2	0.0182	0.114	-0.0626			
	(0.0367)	(0.0715)	(0.0414)			
λ_3	0.0467	0.145*	-0.0634			
	(0.0414)	(0.0767)	(0.0449)			
λ_4				0.0254	0.127*	-0.0474
				(0.0329)	(0.0649)	(0.0381)
Constant	0.816***	-0.0974	1.575***	0.720***	-0.180	1.622***
	(0.267)	(0.467)	(0.230)	(0.243)	(0.438)	(0.250)
Observations	66	65	65	66	65	65
Number of dmu	11	11	11	11	11	11

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Acquirer- absorbing and merge						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.0690***	-0.0218	-0.0437**	-0.0663***	-0.0238	-0.0440**
	(0.0160)	(0.0357)	(0.0180)	(0.0153)	(0.0358)	(0.0186)
yylrl	0.279***	0.0372	0.222***	0.276***	0.0354	0.225***
	(0.0479)	(0.0969)	(0.0694)	(0.0468)	(0.0948)	(0.0677)
zzczzl	0.364***	0.319**	0.213***	0.353***	0.322**	0.228***
	(0.0489)	(0.128)	(0.0609)	(0.0480)	(0.129)	(0.0622)
lrzezzl	0.000298	0.000151	0.000889	0.000294	0.000212	0.000784
	(0.000472)	(0.00102)	(0.000730)	(0.000455)	(0.000975)	(0.000709)
zbmjd	-0.00994***	0.01000	-0.00806***	-0.00982***	0.0123	-0.00814***
	(0.00167)	(0.0223)	(0.00235)	(0.00162)	(0.0221)	(0.00229)
lnzc	-0.0266	0.0264	-0.0101	-0.0222	0.0269	-0.0110
	(0.0215)	(0.0224)	(0.0143)	(0.0199)	(0.0226)	(0.0153)
gdp	-0.0886	4.084*	-2.681*	-0.415	3.632*	-2.040
	(0.940)	(2.275)	(1.404)	(0.866)	(2.059)	(1.259)
cgbl	0.110	-0.398**	0.289*	0.0758	-0.421**	0.320**
	(0.115)	(0.188)	(0.155)	(0.105)	(0.185)	(0.159)
λ_0	-0.0231	0.0278	-0.0580			
	(0.0323)	(0.0674)	(0.0454)			
λ_1	-0.0262	0.0310	-0.0804*			
	(0.0356)	(0.0700)	(0.0487)			
λ_2	-0.00399	0.0544	-0.112**			
	(0.0396)	(0.0792)	(0.0550)			
λ_3	-0.00446	0.0512	-0.0957			
	(0.0466)	(0.0887)	(0.0632)			
λ				-0.0297	0.0275	-0.0677
				(0.0301)	(0.0619)	(0.0434)
Constant	1.109**	-0.191	1.150***	1.064**	-0.151	1.081***
	(0.498)	(0.631)	(0.388)	(0.478)	(0.629)	(0.398)
Observations	63	62	62	63	62	62
Number of dmu	9	9	9	9	9	9

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Acquirer-debt restructuring						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.0900***	-0.0680*	-0.0268	-0.0674*	-0.0519	-0.0147
	(0.0326)	(0.0374)	(0.0219)	(0.0358)	(0.0348)	(0.0218)
yylrl	0.00982*	0.0111*	-0.00588	0.0132**	0.0130*	-0.00302
	(0.00533)	(0.00668)	(0.00491)	(0.00586)	(0.00676)	(0.00486)

zzczzl	0.104	0.0396	0.0957	0.175**	0.105	0.119**
	(0.0793)	(0.0801)	(0.0584)	(0.0815)	(0.0832)	(0.0570)
lrzezzl	-0.000174	-0.000552	-0.000180	-0.000335	-0.000459	-0.000240
	(0.000355)	(0.000617)	(0.000286)	(0.000384)	(0.000554)	(0.000295)
zbmjd	-0.0119***	-0.00703**	-0.00665***	-0.0108***	-0.00596*	-0.00570**
	(0.00273)	(0.00322)	(0.00228)	(0.00305)	(0.00335)	(0.00229)
lnzc	0.00441	-0.0582*	0.0390***	-0.00852	-0.0566**	0.0353**
	(0.0286)	(0.0302)	(0.0147)	(0.0288)	(0.0274)	(0.0151)
gdp	-4.551***	-4.793**	-1.986	-0.947	-1.374	0.0718
	(1.569)	(2.114)	(1.469)	(1.128)	(1.388)	(1.016)
cgbl	-0.172	-0.264	0.0393	0.129	-0.0944	0.169
	(0.250)	(0.286)	(0.198)	(0.255)	(0.289)	(0.195)
λ	0.184***	0.239***	0.103*			
	(0.0601)	(0.0865)	(0.0577)			
λ	0.0251	0.0215	0.00553			
	(0.0585)	(0.0737)	(0.0552)			
λ	-0.100*	-0.0454	-0.0498			
	(0.0607)	(0.0795)	(0.0567)			
λ	-0.0533	0.0517	-0.0475			
	(0.0588)	(0.0745)	(0.0555)			
λ				0.0557	0.102**	0.0234
				(0.0428)	(0.0494)	(0.0372)
Constant	1.413**	2.755***	0.388	1.111*	2.225***	0.161
	(0.601)	(0.711)	(0.345)	(0.606)	(0.600)	(0.334)
Observations	49	49	49	49	49	49
Number of dmu	7	7	7	7	7	7

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Acquiree- assets divestiture						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.0103	-0.0682	0.0576	-0.00754	-0.0783	0.0744
	(0.0317)	(0.0770)	(0.0590)	(0.0318)	(0.0796)	(0.0631)
yylrl	0.413***	0.0817	0.367***	0.423***	0.0971	0.417***
	(0.0749)	(0.124)	(0.0955)	(0.0714)	(0.133)	(0.112)
zzczzl	0.1000***	0.104*	-0.0108	0.0965***	0.0919	0.0143
	(0.0310)	(0.0558)	(0.0461)	(0.0290)	(0.0604)	(0.0481)
lrzezzl	2.18e-05	0.000297**	-0.000225***	2.07e-05	0.000314*	-0.000216**
	(5.70e-05)	(0.000136)	(7.89e-05)	(5.67e-05)	(0.000179)	(9.39e-05)
zbmjd	-0.0747***	-0.0398***	-0.0411***	-0.0747***	-0.0399***	-0.0409***
	(0.00614)	(0.0125)	(0.00803)	(0.00616)	(0.0136)	(0.00897)
lnzc	0.0207*	-0.0125	0.00547	0.0201*	-0.00968	0.00842
	(0.0122)	(0.0223)	(0.0153)	(0.0111)	(0.0233)	(0.0160)
gdp	-1.168*	-0.212	0.0713	-1.214**	-0.703	0.348
	(0.621)	(1.068)	(0.735)	(0.565)	(1.109)	(0.809)
cgbl	0.121***	0.201**	-0.221**	0.123***	0.212**	-0.212**
	(0.0431)	(0.0953)	(0.0966)	(0.0425)	(0.0997)	(0.0977)

λ_0	-0.0164	-0.0126	0.0323			
	(0.0207)	(0.0371)	(0.0251)			
λ_1	-0.00171	-0.0229	0.0442*			
	(0.0221)	(0.0395)	(0.0253)			
λ_2	-0.000370	0.0677	-0.0292			
	(0.0233)	(0.0429)	(0.0266)			
λ				-0.00883	0.000138	0.0206
				(0.0178)	(0.0356)	(0.0245)
Constant	0.527**	1.168***	0.936***	0.544**	1.166**	0.813**
	(0.241)	(0.449)	(0.344)	(0.219)	(0.468)	(0.349)
Observations	60	60	60	60	60	60
Number of dmu	10	10	10	10	10	10

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Acquiree - asset replacement						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	0.189***	0.246***	0.00215	0.192***	0.263***	-0.0151
	(0.0680)	(0.0952)	(0.0648)	(0.0670)	(0.0931)	(0.0630)
yylrl	0.512***	0.493***	0.130***	0.508***	0.501***	0.116***
	(0.0519)	(0.0647)	(0.0419)	(0.0507)	(0.0627)	(0.0409)
zzczzl	0.150***	0.177***	0.0109	0.147***	0.181***	0.00773
	(0.0257)	(0.0415)	(0.0244)	(0.0255)	(0.0418)	(0.0240)
lrzezzl	0.000337	0.00130	-0.000169	-2.36e-05	0.00129	-0.000511
	(0.00118)	(0.00131)	(0.000930)	(0.00115)	(0.00127)	(0.000914)
zbmjd	-0.00581**	0.00749*	-0.0101***	-0.00681**	0.00723*	-0.0106***
	(0.00272)	(0.00409)	(0.00216)	(0.00267)	(0.00410)	(0.00212)
lnzc	-0.0328**	-0.0337	-0.0105	-0.0330**	-0.0373*	-0.00670
	(0.0144)	(0.0214)	(0.0146)	(0.0142)	(0.0209)	(0.0140)
gdp	-1.036	-0.793	0.229	-0.818	-0.645	0.264
	(0.866)	(0.929)	(0.636)	(0.856)	(0.914)	(0.629)
cgbl	-0.209**	-0.432***	0.134	-0.192**	-0.421***	0.144
	(0.0944)	(0.139)	(0.0900)	(0.0933)	(0.139)	(0.0887)
λ_0	0.0266	0.0320	0.0157			
	(0.0239)	(0.0261)	(0.0179)			
λ_1	0.0324	0.0168	0.0407**			
	(0.0265)	(0.0293)	(0.0202)			
λ_2	-0.000579	0.00893	0.0175			
	(0.0282)	(0.0318)	(0.0218)			
λ				0.0241	0.0243	0.0240
				(0.0216)	(0.0236)	(0.0164)

Constant	1.553***	1.603***	1.124***	1.532***	1.652***	1.048***
	(0.306)	(0.450)	(0.308)	(0.305)	(0.444)	(0.299)
Observations	78	78	78	78	78	78
Number of dmu	13	13	13	13	13	13

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Acquiree - absorbing and merge						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	-0.0300	0.0143	-0.0263	-0.0322	0.00611	-0.0261
	(0.0403)	(0.0385)	(0.0302)	(0.0398)	(0.0383)	(0.0301)
yylrl	0.791***	1.055***	0.119	0.793***	1.035***	0.124*
	(0.0976)	(0.122)	(0.0756)	(0.0971)	(0.119)	(0.0748)
zzczzl	0.106***	0.127***	0.0318**	0.106***	0.130***	0.0308**
	(0.0215)	(0.0363)	(0.0151)	(0.0211)	(0.0361)	(0.0149)
lrzezzl	0.000117	-0.000104	0.000277	0.000139	-6.27e-05	0.000286
	(0.000387)	(0.000376)	(0.000337)	(0.000386)	(0.000383)	(0.000337)
zbmjd	0.00179	0.0112**	-0.00637**	0.00175	0.0114**	-0.00658**
	(0.00369)	(0.00537)	(0.00268)	(0.00364)	(0.00530)	(0.00264)
lnzc	-0.00239	0.00802	-0.0138*	-0.000804	0.00989	-0.0131*
	(0.00965)	(0.0123)	(0.00757)	(0.00920)	(0.0123)	(0.00712)
gdp	0.203	-0.655	-0.00994	0.354	-0.481	0.0669
	(0.542)	(0.610)	(0.499)	(0.475)	(0.553)	(0.440)
cgbl	0.127**	0.0579	0.0727*	0.125**	0.0841	0.0709*
	(0.0540)	(0.0899)	(0.0380)	(0.0546)	(0.0858)	(0.0381)
λ_0	-0.0127	-0.00591	-0.0172**			
	(0.00952)	(0.00900)	(0.00850)			
λ_1	-0.0189*	-0.00556	-0.0236**			
	(0.0112)	(0.0114)	(0.0100)			
λ_2	-0.0189	-0.0142	-0.0204*			
	(0.0133)	(0.0132)	(0.0119)			
λ				-0.0146	-0.00583	-0.0193**
				(0.00902)	(0.00894)	(0.00813)
Constant	0.830***	0.650***	1.265***	0.784***	0.587**	1.244***
	(0.212)	(0.252)	(0.173)	(0.195)	(0.245)	(0.156)
Observations	55	55	55	55	55	55
Number of dmu	11	11	11	11	11	11

Acquiree - equity transfer						
	tobit1	tobit2	tobit3	tobit4	tobit5	tobit6
VARIABLES	crs_te	vrs_te	scale	crs_te	vrs_te	scale
zcfzl	0.0178	-0.0433	0.0574	0.0171	-0.0464	0.0590
	(0.0555)	(0.0636)	(0.0358)	(0.0549)	(0.0649)	(0.0362)
yylrl	0.0645	0.0297	0.0610*	0.0652	0.0371	0.0573
	(0.0573)	(0.0628)	(0.0370)	(0.0571)	(0.0648)	(0.0376)
zzczzl	0.226***	0.227**	0.0555	0.227***	0.205**	0.0609
	(0.0694)	(0.100)	(0.0440)	(0.0667)	(0.0913)	(0.0442)
lrzezzl	3.03e-05	5.22e-05	-1.32e-05	3.49e-05	0.000103	-3.28e-05
	(5.97e-05)	(0.000116)	(3.79e-05)	(5.39e-05)	(0.000114)	(3.56e-05)
zbmjd	0.00674	0.000448	-0.00181	0.00758	0.000134	0.000368
	(0.00894)	(0.0121)	(0.00563)	(0.00829)	(0.0117)	(0.00546)
lnzc	0.0387**	0.0302	0.0150	0.0394**	0.0347	0.0139
	(0.0185)	(0.0272)	(0.0117)	(0.0181)	(0.0262)	(0.0119)
gdp	0.420	0.193	0.731*	0.440	-0.0928	0.855*
	(0.683)	(0.963)	(0.437)	(0.660)	(0.936)	(0.438)
cgbl	0.178*	0.133	0.0913	0.171*	0.0801	0.104
	(0.0997)	(0.152)	(0.0638)	(0.0957)	(0.140)	(0.0638)
λ_0	-0.000801	-0.0260	0.0148			
	(0.0458)	(0.0498)	(0.0296)			
λ_1	-0.0164	-0.0224	-0.0126			
	(0.0393)	(0.0478)	(0.0254)			
λ_2	-0.00510	-0.00765	-0.00192			
	(0.0425)	(0.0494)	(0.0275)			
λ_3	-0.00225	0.0344	-0.0296			
	(0.0444)	(0.0516)	(0.0286)			
λ				-0.00784	-0.00702	-0.00887
				(0.0321)	(0.0394)	(0.0212)
Constant	-0.208	0.128	0.476*	-0.223	0.0922	0.475*
	(0.405)	(0.579)	(0.255)	(0.393)	(0.563)	(0.259)
Observations	48	49	48	48	49	48
Number of dmu	7	7	7	7	7	7