Private Equity Investment and Mergers and Acquisitions: Empirical Research on Big Data Based on Small and Medium Enterprise Board and Growth Enterprise Market

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Abstract: It has become easy and common to introduce private equity investment when Chinese listed companies conduct mergers and acquisitions. Private equity investment can help listed companies better understand and apply mergers and acquisitions. This paper selects 387 M&A transactions of all listed companies on China's SME board and GEM in 2017-2021 as the big data samples for empirical research. This research uses the ordinal logistic regression model as the main analysis tool, using CITC analysis algorithm α The coefficient algorithm was used to test the reliability and validity of the measurement scale, and the joint significance test was used to verify the effect of each variable. The study found that when companies introduce private equity investment institutions as shareholders, they will have a positive response to the performance of mergers and acquisitions. At the same time, the increase in the shareholding ratio of private equity investment in mergers and acquisitions also has a positive response to the performance of mergers and acquisitions. When private equity accounts for a large proportion in the acquirer's enterprises, the response of M&A performance is positive, which will promote the improvement of the company's excess return rate. When private equity investment is introduced into the acquirer company, the priority of payment methods is mixed payment, cash payment and stock payment.

1 INTRODUCTION

1.1 Background

According to China's M&A market data released by the my country Investment Research Institute in 2021, a total of 2,782 M&A transactions were concluded in the Chinese M&A market, a year-on-year increase of 5.26%. Among them, only 2,322 disclosed the transaction value, but the total amount of mergers and acquisitions of 252.1 billion US dollars was reached last year. Although private equity investment has participated in a large number of mergers and acquisitions by the acquirer, the role of PE in corporate mergers and acquisitions is not clear. This paper intends to carry out research on this, taking GEM and SME board listed companies as the research object, and examining the impact of PE as the major shareholder of the acquirer on M&A behavior, market valuation and business performance, including the choice of M&A payment methods, and the causes of M&A events. market response and changes in company performance before and after mergers and acquisitions, so as to make judgments about the role of PE in company mergers and acquisitions.

1.2 The Research Status

The definition of private equity investment is not publicly traded on stock exchanges to raise and trade funds (Barber, Brad M, Yasuda, et al, 2017). Foreign studies have concluded that private equity investment is characterized by high investment risk, but with high income potential. [2]. According to the definition report of the Federal Reserve Board, the private equity investment market is compared with others, and its high professional quality and professional management ability are obtained, and its main investment objects are some unlisted companies for financing activities (BoneWinkel, Pfeffer, 2006), the specialization specifically referred to here has gradually adapted to the market and even promoted the market after the practical test of long-term capital market economic

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activities. Shi 's point of view is that private equity investment mainly has the following effects on the merger and acquisition of the acquirer, which are supported by sufficient cash flow, attracting individual investors with high returns, and significantly reducing the merger and acquisition risk of the acquirer's enterprise. Reduce (Osuri, 2010). Luo 's point of view is that with the increase in the shareholding ratio of private equity in the acquirer, the M&A performance will also increase, but it will not affect the business performance of the company. (Boone, Broughman, Macias, 2018) The article published by Broughman and Fried first mentioned that private equity investment institutions promote the successful completion of mergers and acquisitions mainly through positive incentives, and share their own benefits in mergers and acquisitions; Repurchase, thus affecting the daily cash flow of the company, and the forced merger was successfully completed (Yu, Luo, 2016). Thompson and Richard believe that private equity investment can also introduce advanced management experience and technology to further promote the integration of acquirer companies (Shi, 2007). Stephan, Torsten and Harald believe that the involvement of private equity investment can not only improve the quality of cash flow but also improve the quality of company management (Stephen, 1998). Wright and Gilligan found that private equity investment will further participate in the daily operation and management of the company, improve the company's overall governance level, improve the company's daily turnover efficiency and comprehensive competitiveness. (Bencivenni, Simone, Murtas, et al., 2002) Metrick and Ayako found that firms backed by private equity investments promote more reasonable ownership structures.(Ghezzi, Mocci, 2012)

1.3 Research Hypothesis

(1) The impact of mergers and acquisitions supported by private equity investment on the improvement of merger and acquisition performance The advantages brought by the shareholding of private equity investment institutions not only bring various benefits to the acquisition of equity, but the influencing factors are also related to the withdrawal of private equity investment. Strategies are closely related, so they have good reasons for active, effective and rigorous oversight of the board (Cotter and Peck, 2001). As a result, Hypothesis 1 is proposed:

H1: Compared with the mergers and acquisitions carried out by the mergers and acquisitions of the mergers and acquisitions without private equity investment shares, the mergers and acquisitions of the mergers and acquisitions of the mergers and acquisitions of the private equity investment shares will bring better merger and acquisition performance.

(2) Differences in the impact of private equity ratio on M&A performance Bottazzi and Hellmann (2008) concluded through empirical research that the larger the shareholding ratio of private equity investment institutions in the acquirer’s company, the more likely the acquirer’s company will be in the process of M&A and reorganization. The influence of the company also increases, and then it can participate in the daily operation and high-level management activities of the invested company to a greater extent, so as to add more value to its equity during mergers and acquisitions. Therefore, Hypothesis 2 is proposed:

H2: The larger the shareholding ratio of private equity investment in the merger and acquisition of the acquirer, the better the effect of M&A and reorganization.

(3) Differences in the impact of private equity on M&A payment methods The article published by Andriosopoulos and Yang mentioned that the large sample analysis concluded that the acquirer will use stock and cash to meet the needs of M&A and reorganization transactions when conditions permit. Therefore, in most cases, private equity investment will be more inclined to mixed payment than cash payment under the ownership of the acquirer's enterprise. Therefore, Hypothesis 3 is proposed:

H3: Private equity investment institutions are most inclined to mixed payment in terms of M&A payment methods of the acquirer, and are the least interested in stock payment, and cash payment is moderate.

2 STUDY DESIGN

2.1 Data Sources

This paper takes the mergers and acquisitions events initiated by companies on the GEM and SME boards from 2017 to 2021 as a sample, and chooses the GEM as the research object because: On the one hand, the GEM companies are smaller in scale than the main board, and they often face financing difficulties before listing. , the capital demand for PE is higher; on the other hand, GEM companies are more high-tech-intensive, and more need PE to cultivate professional managers related to the company's business, so GEM companies are more inclined to introduce PE in the growth process , and is more likely to be affected by it. The screening criteria for M&A events are as follows: (1) The types of mergers and acquisitions are asset acquisition, tender offer and merger by absorption; (2) If the company has multiple mergers and acquisitions in a quarter, only the first one is taken as a research sample; (3) The transaction is successful; (4) The first announcement date, payment method, transaction scale and other information are complete, and finally 387 M&A events were obtained. The data of PE is collected manually by referring to the method of Wang et al. The prospectus is checked to determine whether there are private equity investors holding shares in the company. Information about shareholders can be obtained from the "Basic Information of the Issuer" in the prospectus. This part introduces the shareholders' information. The share capital composition determines whether there is PE involvement before the company's merger. All other data are from the CSMAR database.

2.2 Model and Variable Design

1. The explanatory variable of private equity investment research on M&A performance: The explanatory variable of model 1 and model 2 is M&A performance, which is represented by the cumulative excess return CAR. The window period selected here is around the date of the first M&A announcement. 30 days, as a surrogate variable to test the research question of this paper. Explanatory variables: Whether there is a dummy variable of private equity investment and the shareholding ratio of private equity are selected as explanatory variables. Control variables: the total proportion of shares held by the largest shareholder in the year before the acquirer company participated in the M&A and reorganization (TOP1), the acquirer company participated in the M&A and reorganization in the previous year's return on equity (ROE), and the acquirer company participated in the M&A and reorganization in the previous year. One-year asset-liability ratio (FinLev), the acquirer's free cash flow (FCF) in the previous year, the acquirer's main business revenue growth rate (Mincmgrrt) and company size in the year before the acquirer's participation in the M&A, and the company's scale is selected here. The logarithm of total assets (SIZE) and the type of merger and acquisition of the company in the previous year before participating in the merger and acquisition. Here, whether the two sides of the merger and acquisition are in the same industry is used to represent (SAME) horizontal merger is 1, otherwise it is 0, and the payment method (Y) is used as a control variable. and the payment method (Y) chosen by the M&A as a control variable, with numbers 1, 2 and 3 representing stock, cash and hybrid payments, respectively. Model (1) Regarding the research on the impact of private equity participation on M&A performance, model 1 is established as follows:

$$CAR\ [-30,\ 30]=\beta_0+\beta_1 PE\ +\beta_2 ROE\ +\beta_3 FinLev\ +\beta_4 TOP1+\beta_5 FCF\ +\beta_6 Mincmgrrt\ +\beta_7 SIZE\ +\beta_8\ SAME\ +\beta_9 Y+\varepsilon \quad (1)$$

Model (2) Research on the impact of private equity ratio on M&A performance. On the basis of model 1, the dummy variables of private equity investment are replaced with equity ratio variables, and model 2 is established as follows:

$$CAR\ [-30,\ 30]=\beta_0+\beta_1 PRO\ +\beta_2 ROE\ +\beta_3 FinLev\ +\beta_4 TOP1+\beta_5 FCF\ +\beta_6 Mincmgrrt\ +\beta_7 SIZE\ +\beta_8\ SAME\ +\beta_9 Y+\varepsilon \quad (2)$$

2. The research on the influence of private equity investment on the payment method of M&A is explained variable: the explanatory variable of model 3 is the payment method of the acquirer participating in the merger and acquisition, using Y is an unobservable latent variable, x represents the explanatory variable, and β is the corresponding. The coefficient to be estimated, e is the error term. The observed value of Y has the following three values: y = 1 (stock payment), y = 2 (cash payment), y = 3 (mixed payment). Explanatory variable: In model three, choose private equity The presence or absence of investment is used as an explanatory variable to explain the model. Control variables: the total proportion of shares held by the largest shareholder in the year before the acquirer company participated in the M&A and reorganization (TOP1), the acquirer company participated in the M&A and reorganization in the previous year's return on equity (ROE), and the acquirer company participated in the M&A and reorganization in the previous year. One-year asset-liability ratio (FinLev), the acquirer's free cash flow (FCF) in the previous year, the acquirer's main business revenue growth rate (Mincmgrrt) and company size in the year before the acquirer's participation in the M&A, and the company's scale is selected here. The logarithm of total assets (SIZE) and the type of merger and acquisition in the year before the party company participated in the merger and acquisition. Model (3) In order to explore the impact of private equity investment on M&A payment methods, the research line of this model is to study the preference degree that private equity investment should select for three payment methods under the ownership of the acquirer. The third model is established as follows:

$$y= x\beta+ e,\ e \mid x \sim \text{logit}\ (0,\ 1) \quad (3)$$

3 EMPIRICAL ANALYSIS

3.1 Descriptive Statistics

```
. summarize pe pro car y finlev  roe top1 fcf mincmgrrt size y same
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Variable	Obs	Mean	Std. Dev.	Min	Max
pe	387	.1472868	.3548504	0	1
pro	387	.007758	.0289874	0	.361567
car	387	.0202212	.4194195	-.625	4.9506
y	387	2.124031	.4666231	1	3
finlev	387	.3780879	.170795	.06	.92
roe	387	.0857106	.0789353	-.66	.44
top1	387	.4064858	.130062	-.11	.8
fcf	387	-1.33e+09	9.29e+09	-1.73e+11	7.51e+08
mincmgrrt	387	.5304238	4.217123	-.5095	82.6992
size	387	21.33556	.9642831	19.05663	25.24264
y	387	2.124031	.4666231	1	3
same	387	.5348837	.4994273	0	1

Figure 1: Descriptive Statistics(owner-draw).

2017.1.1-2021.12.31 A total of 387 companies on the SME board and ChiNext participated in mergers and acquisitions as acquirers, including 57 companies backed by private equity and 330 companies without private equity support. The descriptive test results of listed companies on the SME board are shown in the table above. Table 4-2 lists the relevant variables adopted in this merger. In the research sample of this paper, there are 21 pure stock payment, 60 mixed payment, and 306 pure cash payment; the average value of PE is about 0.14, which reflects the introduction of private equity investment by the acquirer in all M&A events. The overall proportion is about 15%; for the selection of control variables, the average size of enterprises is about 21.34, of which the extreme difference is large; in the M&A transaction market of the small and medium-sized board and the ChiNext, the average asset-liability ratio Finlev is about 0.37, The average ROE of the return on equity is about 0.09, and the average free cash flow FCF is negative, indicating that most of the GEM and companies are in good financial condition but the degree of free cash flow is poor; the shareholding ratio of the largest shareholder is 0.41, indicating that in the sample The management rights of the largest shareholder in the company are relatively concentrated; the maximum growth rate of the main business income is 82.70%. The growth vitality of the entire small and medium-sized board and the ChiNext board is relatively high, and the development potential of the company is relatively large. When private equity institutions invest More screening and judgments are needed; at the same time, the average number of payment methods chosen by the acquirer companies is close to 2 and the variance is small, so they still choose a large number of cash payments; the proportion of horizontal mergers and acquisitions in the entire sample reached 53%, indicating that companies have more choices Horizontal mergers and acquisitions expand their market share and accumulate energy for the next step of development and growth.

3.2 Empirical Analysis

1) Regression analysis for model one

```
. reg car pro finlev roe top1 fcf mincmgrrt size y same,robust

Linear regression                               Number of obs     =        387
                                                F(8, 377)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.1624
                                                Root MSE          =     .38841
```

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
pro	4.436959	2.053959	2.16	0.031	.3983088	8.475609
finlev	-.081826	.1010539	-0.81	0.419	-.280526	.1168739
roe	.2315055	.2389574	0.97	0.333	-.2383508	.7013617
top1	.1017733	.1623794	0.63	0.531	-.2175093	.421056
fcf	1.70e-13	8.14e-13	0.21	0.834	-1.43e-12	1.77e-12
mincmgrrt	-.0006311	.0014771	-0.43	0.669	-.0035354	.0022732
size	-.0042523	.0165826	-0.26	0.798	-.0368582	.0283536
y	.0939445	.0359438	2.61	0.009	.0232691	.16462
same	.128098	.0400902	3.20	0.002	.0492695	.2069264
_cons	-.2233448	.3424317	-0.65	0.515	-.8966601	.4499705

Figure 2: Model-One Logistic Regression(owner-draw).

$$CAR[-30,30]=-0.052+0.213PE+0.179ROE-0.963FinLev+0.108TOP1-6.68e-14FCF-0.001MINCMGRRT-0.013SIZE+0.106Y+0.123SAME+\varepsilon \quad (4)$$

According to the results of the table, through the research on all domestic SME board and GEM M&A events in the past five years, model 1 is used. When the explanatory variable of whether there is private equity investment in the acquirer's enterprise, the regression analysis shows that the R2 value is 0.1039, It shows that the overall fitting degree of model 1 is good, and the experimental results have reference value. Checking the T value shows that at the 5% significance level, the cumulative excess return CAR is significantly correlated with the acquirer's return on equity in the previous year, and the asset-liability ratio in the previous year is negatively correlated, especially the type of merger and payment method The relationship is obvious, and the company's profitability and M&A performance have no obvious relationship with other control variables. The reason for the control variable is that a reasonable payment method can avoid the crisis of the company's daily operating cash flow, and a successful horizontal merger can save the production cost of the company and improve the performance of mergers and acquisitions. Finally, the conclusion drawn from Model 1 is that private equity investment in SME and GEM acquirers will bring about better M&A performance. The main reason is that private equity investment institutions participate as acquirers. After mergers and acquisitions, the company usually has a target company integration period of about one year. Even if the private investment institution has no long-term investment in the acquirer’s company, it is only for the pursuit of short-term interests, but in order to maximize the investment income of private equity investment. , during the period of integrating the target company, there will still be participation in the operation and management of the acquirer's company.

2) Regression Analysis for Model Two.

```
. reg car pe finlev roe top1 fcf mincmgrrt size y same,robust

Linear regression                               Number of obs     =        387
                                                F(8, 377)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.1039
                                                Root MSE          =     .40174

------------------------------------------------------------------------------
             |               Robust
         car |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |    .213423    .0999989     2.13   0.033     .0167975    .4100486
      finlev |  -.0963567    .1086714    -0.89   0.376    -.3100348    .1173214
         roe |   .1792096    .2312214     0.78   0.439    -.2754354    .6338547
        top1 |   .1084295     .170616     0.64   0.525    -.2270486    .4439077
         fcf |  -6.68e-14    8.16e-13    -0.08   0.935    -1.67e-12    1.54e-12
   mincmgrrt |   -.000806    .0014562    -0.55   0.580    -.0036693    .0020573
        size |  -.0129344    .0177234    -0.73   0.466    -.0477835    .0219146
           y |   .1063473    .0393272     2.70   0.007     .0290191    .1836755
        same |   .1225052    .0410826     2.98   0.003     .0417254    .2032849
       _cons |  -.0523974    .3743904    -0.14   0.889    -.7885525    .6837577
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Figure 3: regression analysis of model 2(owner-draw).

From the test results, the equation of model 2 is as follows:

$$car[-30,30]=-0.223+4.437pro+0.232roe-0.082finlev+0.102top1+1.70e\text{-}13fcf-0.001mincgrrt-0.004size+0.094y+0.128same+\varepsilon \quad (5)$$

It can be seen from the table that, through the research on all sme board and chinext m&a events in the past five years, the equation of model 2 is used. When the private equity investment shareholding ratio in the acquirer's enterprise is used as the explanatory variable, the regression analysis shows that the value of r2 shows it is 0.1624. At the 5% significance level, the return on net assets and the asset-liability ratio of the acquirer in the year before participating in the m&a and reorganization are significantly related to the cumulative excess return car of participating in the m&a and reorganization, but the asset-liability ratio in the previous year showed a significant correlation. Negative correlation, but these two variables do not significantly affect the m&a performance of the smes and chinext listed companies. Among them, the proportion of private equity holdings is large to a certain extent, which can significantly improve the m&a performance of listed companies. The main reason for the above phenomenon is that the increase in the proportion of shares held by private equity institutions in the acquirer's enterprise has a negative impact on the company's profitability. Said to be a major positive, the greater the proportion of private equity investment in the acquirer's enterprise, the stronger the ability to dominate and influence the management. Combined with the conclusions of model 1, it can be concluded that private equity investment has a positive incentive effect on the m&a performance of listed companies on the sme board and the chinext board, and the acquiring company is affected by private equity investment. Moreover, the larger the shareholding ratio of private equity investment in the acquirer companies in the sample, the better the m&a performance of the m&a and reorganization of the sme board and the chinext board.

3) logistic Analysis of Model Three

Table 1: Logistic analysis of model three(owner-draw).

	(1)	(2)	(3)
PE	0.1328***	0.1295**	0.1502**
	(2.33)	(2.29)	(2.21)
FinLev		0.9169**	0.9935**
		(2.27)	(2.27)
ROE		-2.9795***	-3.0382***
		(-3.09)	(-3.14)
FCF		1.1206	1.3092
		(1.19)	(1.32)
TOP1			-0.0203
			(-1.19)
Mincmgrrt			0.8692
			(1.22)
SIZE	0.1129	0.0573	0.0711
	(0.86)	(0.36)	(0.42)
SAME	0.1422	0.1032	0.0826
	(1.02)	(0.79)	(0.81)
Pseudo R-squared	0.1106	0.1192	0.1248
LR statistics	-246.13	-242.46	-240.23
N	387	387	387

Z values in parentheses, * * and * * * indicate significant at 5% and 1% significance levels respectively

Through the logistic analysis of Model 3, we explore how the intervention of private equity investment affects the acquisition method selection preference of the acquirer company. In Table 5-3, through the regression analysis of model 3, in the results of regression 1, only the variable private equity investment and the other two M&A characteristics are introduced, and it is found that private equity investment is significant at the 1% level. Then introduce the relevant corporate governance structure and financial indicators respectively, and construct regressions 2 and 3. The regression results show that the influence of private equity investment on the choice of payment method is significant at a significance level of 5%.

From this, it can be concluded that the overall preference for the selection of the dependent variable Y is 1<2<3, that is, the method of mixed payment is the most preferred, and stock payment is rarely selected, and the payment in cash is more moderate and common. . The main reason for the above results is that in order to maximize their own interests, private equity investment institutions will actively intervene in the M&A decision-making activities of the acquirer's company to ensure the company's daily operating cash flow while preventing its own equity from being diluted. Choose a hybrid payment that is relatively compromised in terms of method.

4 CONCLUSIONS

Through the above empirical test and analysis, we can find that private equity investment has a positive and positive role in promoting the M&A performance of the invested companies after the merger. M&A performance will also show a better level; the M&A performance of companies invested by private equity capital after M&A is significantly better than that of companies without private equity capital support, and the proportion of private equity holdings is positively correlated with M&A performance; private equity investment In order to improve their own investment returns, institutions will improve by choosing payment methods. The reason for the above phenomenon is that private equity investment institutions have matured after years of development, and companies on the small and medium-sized board and the ChiNext board are highly active. Because private equity investment is highly specialized in management and supervision, it can effectively improve the merger and reorganization activities of enterprises. , and provides a series of value-added services to help enterprises improve the effect of mergers and acquisitions. Compared with other variables, private equity investment has a significant impact on the improvement of M&A performance and the choice of M&A payment method, indicating that private equity investment has a more obvious effect on the optimization of corporate governance structure and has a strong influence on corporate decision-making. Therefore, we believe that the capital market should welcome the entry of private equity investment with a more open and inclusive attitude, and the improvement of quality should be paid more attention by all parties than the increase of quantity. The degree of specialization and the further improvement of the quality of private equity investment institutions will promote the healthy and stable development of my country's capital market.

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