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The Negative Impact of M&A Performance Betting Agreements on Investment Efficiency

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Abstract. Analyzing A-share listed companies M&A samples from 2008 to 2022, the study finds that performance betting agreements negatively impact investment efficiency, with greater negative effects at higher commitment levels. The impact is more significant in unaffiliated and non-state-owned transactions, enriching the literature related to the economic consequences of performance guarantees and providing experience and insights for enterprises to improve M&A investment efficiency and for regulatory authorities to improve M&A restructuring systems.

Keywords: Performance Betting Agreement; Investment Efficiency; M&A.

1. Introduction

Since the 18th CPC National Congress, the CPC Central Committee with Comrade Xi Jinping as the core attaches great importance to the work of the capital market and strengthens the centralized and unified leadership of the capital market, in which the role of mergers and acquisitions (M&A) of the capital market as the main channel has been continuously strengthened. In the past five years, M&A transactions amounted to about 10 trillion yuan. According to Wind, M&A in 2023 A-share listed companies involving a total of 511.095 billion yuan of transaction amount. With the gradual rebound of the economy in the future, the Comprehensive Registration System Reform will further stimulate the vitality of enterprise M&A. The performance betting agreements have become an important part of the listed company's M&A. The Securities and Futures Commission (SFC) issued the "Administrative Measures for Major Asset Reorganization of Listed Companies" in 2008, requiring that M&A under certain conditions should be mandatory to sign performance betting agreement, which is a series of agreements made between the investment and financing parties on the future business performance. When the actual performance of the target company within the specified period of time does not meet the promised performance, the acquirer needs to be compensated accordingly. The performance betting agreement is essentially a "put option" purchased by the acquirer, which is an insurance mechanism for the investor to cope with the investment risk.

According to the existing literature, performance betting agreements can reduce the risk due to the information asymmetry between the two parties. It can also make the subject party obtain financing quickly and motivate the subject party's senior management to work efficiently to promote the benign development of the enterprise (Lv and Han, Huibo, 2014[1]; Pan et al., 2017[2]). However, performance betting agreements have continuously generated problems in the implementation process in China. There are inflated promises in the M&A process, or the M&A premium is increased through betting agreements (Pan and Zhang, 2017[3]; Li et al, 2020[4]), and even earnings managementmay occur, in order to achieve short-term performance financial counterfeiting (Wang and Fan, 2017[5]; Yang, 2019[6]), which will lead to inefficient investment in the enterprise and losses to the value of the company. For example, in 2016, Eastone Century Technology purchased 100% equity of Ebelter with 1 billion cash and stock. The legal person of Ebelter was eventually jailed for financial fraud, and the stock price of Eastone Century Technology gradually declined from the high point of 16 yuan/share at the time of M&A, and only 5 yuan/share was left at the time of the criminal case in July 2018, which is a drop of nearly 70%. This investment behavior has caused great losses to its company value. Efficient investment can revitalize corporate funds and increase corporate value. At present, most of the academic research on investment efficiency is conducted from three perspectives of external macro-environment, internal corporate governance, and management

heterogeneity (Yao et al., 2020[7]). Few scholars have explored the impact of performance betting agreements on investment efficiency. Although some scholars have analyzed the role of performance betting agreements on investment efficiency from the perspective of both acquiring parties (Li and Huang, 2020[8]), they only cut in from the theoretical perspective and did not further delve into the mechanism and relationship between performance betting agreements and investment efficiency. Therefore, the research in this paper not only has certain theoretical significance, but also can provide practical suggestions for enterprises to improve investment efficiency. Accordingly, this paper intends to empirically test these issues. Whether the use of performance betting agreement in M&A of listed companies in the current capital market will affect the investment efficiency of enterprises? Is the impact of performance betting agreement on investment efficiency affected by the direction of performance commitment and the nature of M&A? Does it vary across the nature of property rights?

Based on the above issues, this paper uses M&A deals from 2008-2022 to study the impact of performance betting agreements in China's M&A on the company's investment efficiency. The results of the study show that companies signing performance betting agreements in M&A cause inefficient investment. The higher the level of performance commitment the stronger the negative effect. And the negative effect will be more significant in the of non-state-owned enterprises and unaffiliated transactions. Further research finds that signing two-way performance commitments further strengthens the negative effect of performance betting agreements on investment efficiency.

The research contribution may be mainly reflected in the following. Firstly, there have been scholars who suggested that performance commitment can improve corporate investment efficiency (Du and Chai, 2021[9]). But this paper further comprehensively considers the impact of the company's board of directors' background, shareholding structure and other factors. At the same time this paper adopts alternatives to multiple indicator construction methods and finds that the performance betting agreements will lower the corporate investment efficiency with the further conclusion of the higher level of performance commitment the stronger the negative effect on investment efficiency ultimately. The conclusion enriches the economic consequences of performance betting agreements and becomes an important addition to the existing literature. Secondly, this paper further examines the mechanism of the impact of performance betting agreements on investment efficiency and comprehensively examines the nature of M&A and the impact of the content of the performance betting commitment, which enriches both the micro-research perspective of the factors affecting corporate investment efficiency and the research ideas of the performance betting commitment. Thirdly, this paper analyzes the defects and deficiencies of performance betting agreements in practical application. The design of the current M&A performance commitment system is contrary to the kernel of signaling theory and incentive effect, which helps policy makers and regulators to formulate targeted improvement measures. In addition, the high-quality growth of China's economy can’t rely on the blind increase in the amount of resources, but need to pay attention to the improvement of efficiency. Consequently, the improvement of enterprise investment efficiency is of great significance. The paper can offer the reference basis to improve the investment efficiency and the achievement of the development for enterprises.

2. Literature Review and Hypothesis

The paper further clarifies the vein of the impact mechanism of the performance betting agreements system on the basis of the previous work.

Performance betting agreement has a broad and a narrow sense. Broadly defined engagement criteria for betting agreements would include metrics such as IPOs as criteria for investor exit and share repurchase clauses. Narrowly defined performance betting agreement only takes the performance in a period of time as a criterion of terms, generally three years (Feng et al., 2023[10]). And this paper focuses on the performance betting agreement in the narrow sense.

2.1. The Relationship Between Performance Betting Agreements and Investment Efficiency

This paper proposes that there are two competing hypotheses between performance betting agreements and investment efficiency.

On the one hand, performance betting agreements will play a positive role. This is mainly realized through the following three paths:

Firstly, it's the signaling effect of performance betting agreement. The acquired firm transmits to the acquirer the signals of the company's good future operating expectations in the form of betting agreement (Lv and Han, 2014[1]), such as the company's expected profitability, expected growth ability and other multi-dimensional effective information, which helps to reduce the degree of information asymmetry of both parties. Resource Dependence Theory argues that information is a key element that affects the ability to make investment decisions (Ferreira and Laux, 2007[11]). The existence of high information asymmetry between firms will make the acquirer make wrong investment decisions. Therefore, the signaling effect of performance betting agreements helps to reduce inefficient investment behavior.

Secondly, it's the contractual effect of performance betting agreement. The essence of the performance betting agreement is a contract, the target profit level will be explicitly listed in the betting agreement, which means that the contract target can be trusted (Li et al., 2020[4]). At the same time, the existence of the performance compensation commitment mechanism means that when the acquired firm fails to meet the target profit level, the acquirer needs to be compensated for in other forms, which provides an additional layer of constraints and guarantees for acquirer and helps to improve the overall investment efficiency of acquirer.

Thirdly, it's the incentive effect of the performance betting agreement. The establishment of goals that exist with reasonable difficulty can play its orientation function, energy activation function, maintenance function, and arousal function (Li and Zhang, 2006[12]). The performance betting agreement requires the acquired firm to specify the company's operating goals for a certain period in the future, which helps to incentivize the management of the acquired firm to work hard to achieve the promised performance (Pan et al., 2017[2]) and make efforts to participate in the M&A teething problems (Li et al., 2020[4]).

On the other hand, performance betting agreements will probably have a reverse effect on investment efficiency. It is mainly transmitted through the following two paths:

Firstly, it's the adverse selection problem triggered by performance betting agreements. Theoretically, performance betting agreements have the effect of alleviating the information asymmetry problem, but they may also deepen the degree of information asymmetry between the two parties (Pan and Zhang, 2017[3]). For one thing, even if the acquired firm ultimately does not meet the promised performance, the acquirer needs to be compensated for the performance, but the compensation cost will be much lower than the profit of the premium. As a result, there may be a situation where the seller's assets are "inferior assets" but gives inflated performance promises (Li et al., 2020[4]). For another thing, it may deepen the information asymmetry between the major and minor shareholders, which may lead to the second type of agency problems (Ji et al., 2010[13]). The acquired firm may set up inflated commitments to push up the valuation of the acquisition and the share price of the company at the same time, thus forming an interest chain of "high commitments - high valuation - high share price". The top management of the acquired firm anticipates the risk of a sharp fall in the share price due to the failure to meet the promised performance, and therefore may cash out at a high level during the commitment period (Zhi et al., 2023[14]). In the case of deepening information asymmetry, the management of the acquired firm may actively choose to use the performance betting agreement with inflated promises from their own interests, and this adverse selection behavior will also make the acquirer's investment efficiency lower.

Secondly, the performance betting agreement brings earnings management problem. Excessively high betting standards will lead to excessive operational pressure on management, which will result

in short-sighted behavior of management, i.e., overly focusing on the quantity of performance while ignoring the structure and quality of performance (Xu, 2016[15]). For example, it may cut R&D investment to achieve short-term performance targets (Yang, 2019[16]), or even engage in earnings management through financial fraud to whitewash performance during the commitment period (Wang and Fan, 2017[5]). Managers with strong "empire building" motives are more likely to lead to overinvestment (Jensen, 1986[17]), i.e., inefficient investment behavior. Therefore, the following hypotheses can be expected:

H1a: Performance betting agreements play an positive role on the investment efficiency.

H1b: Performance betting agreements play a reverse role on the investment efficiency.

2.2. The Relationship Between the Direction of Performance Compensation Commitment on the Impact Path of Performance Betting Agreement and Investment Efficiency

Performance compensation commitment can be divided into one-way performance compensation commitment and two-way performance compensation commitment.

On the one hand, the one-way performance compensation commitment only unilaterally has a safeguarding effect on the acquirer, while the two-way performance compensation commitment stipulates that the net profit in excess of the agreement will be returned to the acquired firm as income, which has a stronger incentive effect on the acquired firm. The subject enterprise has stronger initiative and motivation to enhance M&A earnings in order to obtain additional income (Lv et al., 2014[1]; Pan et al., 2017[2]).

However, on the other hand, assuming that the reverse mechanism of performance betting is valid, two-way performance commitment may lead to earnings management by management in order to achieve short-term goals to obtain additional income. That may cause distortion of management incentives and trigger inefficient investment behavior. Therefore, the second research hypothesis is proposed:

H2a: The effect of performance betting agreements on investment efficiency is stronger in two-way performance compensation commitment.

H2b: The effect of performance betting agreements on investment efficiency is stronger in one-way performance compensation commitment.

2.3. The Relationship Between the Whether M&A Involves Affiliated Transactions on the Impact Path of Performance Betting Agreement and Investment Efficiency

M&A transactions often focus on whether they are connected transactions.

On the one hand, some scholars believe that affiliated M&A is one of the ways for major shareholders to transfer company resources. In affiliated M&As, the betting agreement is not binding enough because the underlying assets are still essentially controlled by the majority shareholder (Zhai et al., 2019[18]). Additionally, the majority shareholder may manipulate the signing of the betting agreement as an informationally advantageous party, or even conceal the relevant negative information (Li et al., 2020[4]).

On the other hand, affiliated M&A is also a way to optimize resource allocation. Compared with unaffiliated transactions, affiliated transactions are subject to a variety of reviews from laws and regulations, exchange regulation, audit regulation, etc. In contrast, the degree of information asymmetry between the two parties in unaffiliated M&A is higher (Markides C and Williamson J. 1996[19]), which make adverse selection problems easier to occur. Therefore, the third research hypothesis is proposed:

H3a: The effect of performance betting agreements on investment efficiency is more pronounced in affiliated transactions.

H3b: The effect of performance betting agreements on investment efficiency is more pronounced in unaffiliated transactions.

2.4. The Relationship Between the Nature of Property Rights on the Impact Path of Performance Betting Agreement and Investment Efficiency

On the one hand, compared with private enterprises, the agency problem of state-owned enterprises is more serious, which leads that the problem of "insider control" is common (Quan et al., 2010[20]). Due to the existence of political promotion incentives for management of state-owned enterprises, there is a stronger construction of "empire building" motivation in order to accomplish political performance (Zheng et al., 2012[21]), which will lead to overinvestment. In addition, there is control over management compensation in SOEs (Chen et al., 2005[22]). Due to the low correlation between performance and compensation, the management of SOEs will be less sensitive to performance. Thus, they may lack the incentive to explore quality investment opportunities, which will lead to underinvestment. The mechanism design of SOEs makes their investment behavior contain too much influence of non-market-oriented political objective factors (Yuan and Rao, 2018[23]), which will lead to the negative effect of performance betting agreements on investment efficiency.

On the other hand, compared with private enterprises, state-owned enterprises are supervised by the government. Their information disclosure will be more transparent and standardized because information on internal operations, financial status and other aspects will be subject to stricter supervision and scrutiny, while insufficient disclosure of information by non-state-owned enterprises will lead to an increase in the degree of information asymmetry. At the same time, from the State Council's Decision on the Reform of the Investment System in 2004 to the Measures for the Supervision and Management of Investment in Central Enterprises in 2017, the investment system of state-owned enterprises has been continuously improved in recent years (Yan et al., 2020[24]). As the mixed reform of SOEs advances in depth, the introduction of non-state shareholders also makes SOEs gradually find a new balance (Zhang et al., 2022[25]), which enhances the overall investment efficiency of SOEs (Xu et al., 2021[26]). Therefore, the fourth research hypothesis is proposed:

H4a: The negative effect of performance betting agreements on investment efficiency is more obvious in state-owned enterprises.

H4b: The negative impact of performance betting agreements on investment efficiency is more obvious in non-state-owned enterprises.

3. Data and Model Construction

3.1. Data and Sample Selection

Since the "Administrative Measures for Major Asset Reorganization of Listed Companies" was promulgated in April 2008, this paper selects the M&A events of A-share listed companies from 2008 to 2022 as the research sample. The sample selection process is as follows:

1) Excluded samples from the financial industry;

2) Excluded the samples with missing financial data;

3) Excluded the ST and ST* samples;

4) For samples that have entered into performance betting agreement in M&A multiple times in the same year, only samples that signed performance betting agreement in M&A restructuring for the first time in that year are retained (Zhi et al., 2023[14]).

All the data about performance betting in this paper come from the thematic sub-base of betting agreements in the CSMAR database and the rest of the company's financial data and management data also come from the CSMAR database. A total of 16,488 observation are obtained after screening. In addition, in order to reduce the impact of extreme values on the regression results, this paper

winsorizes the tails of all continuous variables at the 1% level. In order to reduce the impact of the model residual correlation on the regression results, this paper also estimate cluster standard error at firm level.

3.2. Model and Variable Design

3.2.1. Model Design

For the research hypothesis of this paper, this paper proposes the following empirical model:

Hypothesis 1: $Absinv\_1 = \alpha_0 + \alpha_1 VAM + \alpha_2 Control + Year + Industry + \varepsilon$ (1)

Hypothesis 2: $Absinv\_1 = \alpha_0 + \alpha_1 SX + \alpha_2 Control + Year + Industry + \varepsilon$ (2)

Hypothesis 3: $Absinv\_1 = \alpha_0 + \alpha_1 RE + \alpha_2 Control + Year + Industry + \varepsilon$ (3)

3.2.2. Variable Design

The dependent variable in the above model is Absinv_1, which is the residuals of the investment expectation model are taken in absolute value. Referring to (Chen et al., 2019[27]; Liu, 2014[28]; Richardson, 2006[29]), the investment expectation model is constructed as follows:

$$Invest_t = \beta_0 + \beta_1 Lev_{t-1} + \beta_2 Size\_1_{t-1} + \beta_3 Age_{t-1} + \beta_4 TQ_{t-1} + \beta_5 CF_{t-1} + \beta_6 Return_{t-1} + \beta_7 Invest_{t-1} + Year + Industry + \xi \quad (4)$$

Invest is calculated as follows:

$$Invest = (BuyA + BuyC - SellA - SD)/Size \quad (5)$$

$Invest$ represents the level of investment of the enterprise in the year. $BuyA$ is the expenditure on constructing fixed assets, intangible assets and other long-term assets in the year. $BuyC$ is the net cash paid for acquiring subsidiaries and other business units. $SellA$ is the net cash recovered from disposing of fixed assets, intangible assets and other long-term assets. SD is the depreciation of fixed assets, depletion of oil and gas assets, and depreciation of productive biological assets. depreciation. The control variables include the firm's leverage levelLev, the logarithmic level of total asset size $Size\_1$, the number of years on the market Age, the firm's growth TQ, the cash ratio CF, the annual stock return $Return$, the year fixed effect $Year$, and the industry fixed effect $Industry$. By calculating model (5) and regressing model (4), the residuals ξ are the unanticipated investment level of the firm. Taking the absolute value of the residuals, the $Absinv\_1$ is to measure the firm's investment deviates from theoretical expectations.

The explanatory variable in the above model (1) is VAM. Referring to (Feng et al., 2023[10]), if a betting agreement is used in M&A, then VAM=1, otherwise VAM=0. The explanatory variable in model (2) is SX. Referring to (Zhai et al., 2019[18]), if there is a two-way performance commitment in M&A, then SX=1, otherwise SX=0. The explanatory variable in model (3) is RE. Referring to (Lv et al., 2014[1]), if the M&A is an affiliated transaction, then RE=0, otherwise RE=1.

In addition, according to the literature (Chen et al., 2019[27]; Lu et al., 2023[30]; Guo et al., 2020[31]; Pan et al., 2020[32]); Huang and Huang, 2022[33]), the model also controls for the firm's net increase in cash and cash equivalent, Profitability, CEO duality, board size, proportion of independent directors, and proportion of shares held by the first largest shareholder.

4. Empirical Testing and Results

4.1. Descriptive Statistics

Table 2 reports the descriptive statistics of the main variables. The mean value of the performance betting variable is 0.181, indicating that the use of performance betting in M&A in the current year accounts for 18.1% of the total sample. The mean value of the performance commitment direction

variable is 0.439, indicating that 43.9% of the sample using performance bets are two-way performance commitments. The mean value of the connected transaction variable is 0.613, indicating that unaffiliated transactions in M&A during the year accounted for 61.3% of the total sample. The standard deviation of the level of inefficient investment is larger than the mean, implying that this data is more discrete and the level of inefficient investment varies across samples. The descriptive statistics of other control variables are basically consistent with previous studies.

Table 1. The definition of Variables

Characteristic	Variable	Definition and Calculation
Dependent Variable	Absinv_1	Model (4) regression residuals take absolute values to evaluate the level of inefficient investment*100
	Absinv_2	Model (6) regression residuals take absolute values to evaluate the level of inefficient investment*100
	Absinv_3	Model (7) regression residuals take absolute values to evaluate the level of inefficient investment*100
Explanatory Variable	VAM	If a betting agreement is used in M&A, then VAM=1, otherwise VAM=0.
	SX	If there is a two-way performance commitment in M&A, then SX=1, otherwise SX=0
	RE	If the M&A is an affiliated transaction, then RE=0, otherwise RE=1.
	Increase	(committed performance for the current period-committed performance for the previous period)/committed performance for the previous period
Control Variable	Size_1	Total assets at the end of the year are expressed in natural logarithms
	Lev	It is the asset-liability ratio which equal to total liabilities divided by total assets at year-end
	ROA	It is the return on total assets which equal to net profit for the year divided by total assets at year-end
	TQ	It is the Tobin's Q ratio which equal to market capitalization for the year divided by total assets at the end of the year
	CF	Closing balance of cash and cash equivalents divided by current liabilities
	CashFlow	Net cash and cash equivalents at end of year minus net cash and cash equivalents at beginning of year
	Age	Number of years since listing
	Return	Annualized individual stock returns considering reinvestment of cash dividends
	Dual	If the chairman and general manager are the same person, then Dual=1, otherwise Dual=0
	Bsize	Number of Board of Directors
	Dboard	Number of independent directors divided by number of board directors
	Top1	Shareholding ratio of the company's largest shareholder
	Property	If it is a state-owned enterprise, then Property=1, otherwise Property=0
	Year	To control the impact of macro-environmental changes
	Industry	To control industry impact

4.2. Benchmark Regression Results

Table 3 reports the results of testing the research hypotheses. The regression (1) shows that the coefficient of the performance betting variable VAM is 0.559 with a positive significance at the 1% level, which supports the hypothesis H1b that performance betting agreements act inversely on the investment efficiency. The regression (2) shows that the coefficient of the two-way performance commitment variable SX is 0.311 with a positive significance at the 1% level, which supports hypothesis H2a that the negative effect of the two-way performance compensation commitment on

the efficiency of the investment is stronger than that of the one-way performance compensation commitment.

Table 2. The Descriptive Statistics of Main Variables

Variable	N	mean	sd	max	min	p25	p75
Absinv 1	16488	0.992	2.612	62.50	0	0	0.461
VAM	16488	0.181	0.385	1	0	0	0
SX	3003	0.439	0.496	1	0	0	1
RE	3053	0.613	0.487	1	0	0	1
Property	16488	0.159	0.366	1	0	0	0
Size 1	16488	22.00	1.174	28.61	17.89	21.22	22.56
CF	16488	0.891	1.419	11.55	0.0210	0.207	0.951
CashFlow	16488	1.052e+08	6.862e+08	4.179e+09	-1.690e+09	-9.259e+07	1.461e+08
Lev	16488	0.388	0.211	4.995	0.00800	0.235	0.519
Age	16488	5.942	3.277	15	0	3	8
ROA	16488	0.0350	0.0730	0.306	-0.271	0.0140	0.0680
Dual	16488	0.366	0.482	1	0	0	1
Bsize	16488	8.213	1.542	18	4	7	9
Dboard	16488	37.94	5.370	57.14	33.33	33.33	42.86
Top1	16488	32.73	14.58	75.55	8.650	21.52	41.90
TQ	16488	2.175	1.264	7.652	0.928	1.355	2.526
Return	16487	0.136	0.585	14.28	-0.822	-0.230	0.319

The regression (3) shows that the coefficient of the affiliated transaction identification variable RE is 0.183 with a negaitive significance at the 10% level, which supports hypothesis H3b that the negative effect of performance betting on investment efficiency is more pronounced in unaffiliated transactions. In regression (4) a sub-sample regression is conducted, the coefficient of the performance betting variable VAM in the SOE group is 0.382, with a t-value of 3.10, which is significantly positive at the 1% level, while the coefficient of the performance betting variable VAM in the non-SOE group is 0.553, with a t-value of 9.71, which is significantly positive at the 1% level. The t-value of the non-SOE group as well as the coefficients are significantly larger than those of the SOE group sample, implying that the negative effect of performance betting on investment efficiency is more pronounced in non-SOEs, which supports hypothesis H4b.

4.3. Robustness Testing

4.3.1. Change Proxies Variables

For the verification of the negative effect of performance betting on investment efficiency, in order to ensure the robustness of the results, we use the replacement explanatory variable VAM and the dependent variable $Absinv\_1$ respectively.

For the replacement of the explanatory variable VAM, this paper, with reference to (Li et al., 2023[34]), the performance commitment growth rate $Increase$ is used to replace VAM, which can further study the performance compensation level and investment efficiency impact.

For replacing the dependent variable $Absinv\_1$, in this paper, with reference to (Chen and Huang, 2019[27]; Biddle et al 2009[35]; Chen et al 2011[36]), we set up the following investment expectation model to replace the inefficient investment level $Absinv\_1$ respectively:

$$Invest_t = \beta_0 + \beta_1 TQ_{t-1} + Year + Industry + \xi \quad (6)$$

$$Invest_t = \beta_0 + \beta_1 TQ_{t-1} + \beta_2 NEG_{t-1} + \beta_6 TQ_{t-1} \times NEG_{t-1} + Year + Industry + \xi \quad (7)$$

Table 3. Regression Results of Performance Betting and Investment Efficiency

	(1)	(2)	(3)	(4)	
	Absinv_1	Absinv_1	Absinv_1	Absinv_1	Absinv_1
	Full sample	Betting sample	Full sample	SOE group	Non-SOE group
VAM	0.559***			0.382***	0.553***
	(0.053)			(0.123)	(0.057)
SX		0.311***			
		(0.103)			
RE			0.183*		
			(0.104)		
Size_1	0.125***	0.478***	0.466***	0.036	0.186***
	(0.021)	(0.076)	(0.074)	(0.036)	(0.027)
CF	-0.056***	-0.129**	-0.132**	-0.099*	-0.046***
	(0.016)	(0.061)	(0.060)	(0.051)	(0.017)
CashFlow	-0.000	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lev	0.033	-0.641	-0.652	-0.239	0.062
	(0.120)	(0.422)	(0.411)	(0.287)	(0.132)
Age	0.023***	0.008	0.004	0.026***	0.024***
	(0.005)	(0.019)	(0.018)	(0.010)	(0.006)
ROA	-0.163	0.416	0.442	0.367	-0.381
	(0.277)	(0.676)	(0.647)	(0.644)	(0.301)
Dual	0.033	0.199*	0.209**	-0.081	0.021
	(0.036)	(0.103)	(0.102)	(0.107)	(0.039)
Bsize	-0.022	-0.037	-0.034	-0.014	-0.009
	(0.015)	(0.045)	(0.045)	(0.026)	(0.019)
Dboard	-0.001	-0.001	0.002	-0.009	0.004
	(0.004)	(0.012)	(0.012)	(0.008)	(0.005)
Top1	-0.005***	-0.007*	-0.008**	-0.007**	-0.003**
	(0.001)	(0.004)	(0.004)	(0.003)	(0.001)
TQ	0.140***	0.298***	0.263***	0.142***	0.140***
	(0.017)	(0.053)	(0.052)	(0.047)	(0.019)
Constant	-1.944***	-9.050***	-8.774***	0.457	-3.638***
	(0.478)	(1.700)	(1.671)	(0.816)	(0.635)
Year	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES
Observations	16488	2937	3051	2625	13862
R-squared	0.238	0.197	0.196	0.259	0.241

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

NEG is a dummy variable. If the operating income growth rate is less than 0, then NEG=1, otherwise NEG=0. The absolute value of the residuals from the regression after controlling for year- and

industry-fixed effects in model (6) is $Absinv\_2$ while in model (7) is $Absinv\_3$, which is used to proxy for the level of inefficient investment.

The regression results are shown in Table 4 below. The coefficient of performance commitment growth rate $Increase$ in regression (6) is 0.00018, which is significantly positive at 1% level, implying that the higher the level of performance commitment, the stronger the negative impact on investment efficiency. The coefficient of VAM in regression (7) is 0.823, which is significantly positive at 1% level. And the coefficient of VAM in regression (8) is 0.841, which is also significantly positive at 1% level. The overall regression results are basically robust.

4.3.2. Instrumental Variables Approach

Table 4. Results of Regression with Replacement Variables and Two-stage Regression with Instrumental Variables Approach

	(6)	(7)	(8)		(9) First stage	(10) Two stages
	Absinv_1	Absinv_2	Absinv_3		VAM	Absinv_1
Increase	0.000***			VAMRatio	1.003***	
	(0.000)				(0.090)	
VAM		0.823***	0.841***	VAM		1.124***
		(0.073)	(0.073)			(2.89)
Size_1	0.458***	0.219***	0.216***	Size_1	0.003	0.123***
	(0.077)	(0.030)	(0.030)		(0.005)	(5.78)
CF	-0.144**	-0.042*	-0.049**	CF	-0.022***	-0.043**
	(0.061)	(0.023)	(0.023)		(0.003)	(-2.30)
CashFlow	-0.000	-0.000*	-0.000*	CashFlow	-0.000	-0.000
	(0.000)	(0.000)	(0.000)		(0.000)	(-1.17)
Lev	-0.702*	0.417**	0.424**	Lev	-0.035	0.053
	(0.420)	(0.166)	(0.165)		(0.023)	(0.45)
Age	0.003	-0.022**	-0.023***	Age	-0.005***	0.026***
	(0.019)	(0.009)	(0.009)		(0.002)	(5.03)
ROA	0.420	-0.308	-0.030	ROA	-0.077	-0.137
	(0.656)	(0.402)	(0.398)		(0.061)	(-0.49)
Dual	0.207**	0.071	0.075	Dual	0.018*	0.022
	(0.103)	(0.052)	(0.052)		(0.009)	(0.58)
Bsize	-0.032	-0.043**	-0.041*	Bsize	-0.011***	-0.016
	(0.046)	(0.021)	(0.021)		(0.003)	(-1.03)
Dboard	0.004	-0.005	-0.004	Dboard	-0.004***	0.001
	(0.012)	(0.006)	(0.006)		(0.001)	(0.23)
Top1	-0.009**	-0.007***	-0.007***	Top1	-0.002***	-0.004**
	(0.004)	(0.002)	(0.002)		(0.000)	(-2.54)
TQ	0.280***	0.122***	0.122***	TQ	-0.010***	0.145***
	(0.053)	(0.024)	(0.024)		(0.003)	(8.24)
Constant	-8.557***	-2.654***	-2.628***	Constant	0.330***	-2.766***
	(1.702)	(0.678)	(0.673)		(0.102)	(-5.27)
Year	YES	YES	YES	Year	YES	YES
Industry	YES	YES	YES	Industry	YES	YES
Observations	2986	16488	16488	Observations	16488	16488
R-squared	0.197	0.233	0.234	R-squared	0.124	0.229

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

The findings of the previous study may be endogenous due to the problems of omitted variables and reverse casuality. Consequently, this paper adopts the instrumental variable approach to further mitigate the endogeneity problem. On the one hand, the signing of performance betting may be affected by some difficult-to-observe omitted variables on both sides of the M&A (Wu and Jiang, 2023[37]). The omitted variable will also affect the firm's investment efficiency, which in turn leads to biased model estimation. On the other hand, the reality is that performance betting occurs before and the company's investment efficiency decreases after, but it does not exclude the case that the company actively chooses to use performance betting in M&A due to the decrease of its own investment efficiency.

We select $VAMRatio$, the proportion of signed betting agreements for financing events in the industry where we are located in the same year, as an instrumental variable (MARWICKA et al. 2020[38]). The proportion of betting agreements signed for financing events in the same industry in the same year will serve as industry information that will affect the decision of whether to choose performance betting agreements in corporate M&A, but does not directly affect the strategic change behavior of individual firms (HUANG FUGUANG et al., 2022[39]). In this paper, the instrumental variable was tested for correlation, and the p-value of both Durbin and Hausman tests was 0, which means that the original hypothesis can be rejected at 1% confidence level, i.e., VAM has a certain degree of endogeneity. The eigenvalue is 1883.35, which is significantly larger than the empirical value, implying that the instrumental variable is a strong instrumental variable.

The regression results of the instrumental variable are also shown in Table 4 below. The coefficient of VAM in the baseline regression before the inclusion of the instrumental variable is 0.559 with a p-value of 0. Then the coefficient of VAM in the regression after the adoption of the instrumental variable is 1.124 with a p-value of 0, both of which are significant and positive at the 1% level. After mitigating the endogeneity problem through the instrumental variables approach, the conclusion that performance betting agreements play a negative role in investment efficiency remains robust.

4.4. Analysis of Mediation Effects

Table 5. Test Regression Results for Mediation Effects

	(11)	(12)
	Goodwill Impairment	DA
VAM	28331379.415*	1.159e+08**
	(16209029.459)	(50319800.239)
Control	YES	YES
	YES	YES
Constant	-7.896e+07	9.212e+09
	(2.795e+08)	(1.206e+10)
Year	YES	YES
Industry	YES	YES
Observations	3224	16206
R-squared	0.137	0.057

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

Referring to (Jiang, 2022[40])'s analysis and suggestion of intermediation effect, the mechanism analysis in this paper will explore the causal relationship between the explanatory variable VAM and the mediator variables, which means further test of the path of M&A premium and earnings management caused by deepening information asymmetry. The excessive M&A premium will lead to goodwill impairment in the future, so the M&A premium is measured by the current year's

Goodwill Impairment. The earnings management is referenced in (Dechow ,1995), which portrays the level of earnings management DA through the modified Jones model.

The regression results of explanatory and mediating variables are shown in Table5. The coefficient of VAM in regression (11) is significantly positive at 10% level, implying that there is a causal relationship between performance betting and M&A premium with goodwill impairment. The coefficient of industry VAM in regression (12) is significantly positive at the 5% level, implying that there is a causal relationship between performance betting and earnings management.

5. Summary

5.1. Research Conclusions

This paper takes the sample of M&A of A-share listed companies from 2008-2022 as the research object and discusses around the impact of performance betting agreement on investment efficiency, which is a powerful supplement to the economic consequences and research ideas of the existing performance betting research. To a certain extent, it can make up for the shortcomings of the existing research related to investment efficiency, and at the same time, it can also provide an important reference for the enterprises and the regulators. The empirical research in this paper finds that the use of performance betting agreements in M&A events will have a negative impact on corporate investment efficiency, and the higher the level of performance commitment, the stronger the negative impact. Further analysis finds that the negative impact of performance betting commitments on investment efficiency is stronger in the sample with two-way performance commitments. In addition, the negative effect of performance betting agreements signed in unaffiliated transactions on investment efficiency is stronger compared to affiliated transactions. The difference in the nature of enterprise property rights will also affect the role of performance betting. The negative effect of performance betting agreements will be stronger in NSOEs.

5.2. Research Implications

The main research insights are as follow. Firstly, this paper starts from the perspective of investment efficiency and further studies the negative economic consequences of performance betting agreements, enriching the research literature related to performance betting agreements and investment efficiency. Secondly, acquirers should rationally use performance betting agreements in the process of M&A, especially for unaffiliated transactions as well as for NSOEs. This paper provides some references for corporate investment and M&A decisions. Thirdly, the design of performance betting agreements needs to be optimized. This paper can provide empirical evidence for regulators to improve the M&A system, such as increasing the punishment for performance commitment defaults and breach of trust, to provide a better institutional environment for performance betting.

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