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Research on Investment Behavior on the Perspective of Managerial Overconfidence: Evidence from Anhui Listed Companies

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Abstract: In this study, the managerial overconfidence theory was used to examine the over-investment phenomenon in Anhui Listed companies from behavioral corporate finance perspective. The results show that (1) Overconfident managers in Anhui listed companies tended to make over-investment decision, (2) Overconfident managers in Anhui listed companies further strengthened the over-investment behavior in the case of having abundant free cash flow and (3) Compared with non-SOEs, overconfident managers in Anhui state-owned listed companies were more inclined to over-invest in the case of having abundant free cash flow.

Key words: Over-investment, overconfidence, free cash flow, nature of property right

INTRODUCTION

The representative investment theories mainly depend on the assumption of rational-economic man. The main content of this assumption is that people are always driven by their profits and have the ability to make rational judgment and decisions under the condition of uncertainty. But Kahneman and Tversky (1979) and Tversky *et al.* (1990) found that people's judgments and decisions were often influenced by mentality, emotion, belief and preference; therefore, people can't always be rational. When we study corporate finance, we should take the psychological feature of participants into account to the influence of company management and decision-making. This manuscript will discuss the behavioral characteristics of managerial overconfidence for the impact on the investment behavior in the listed companies in Anhui province.

STUDY HYPOTHESIS

Simon *et al.* (2011) found that overconfident managers tended to accept investment projects earlier, but rational managers tended to put off to accept them. De Bond and Thaler (1985) and Heaton (2002) pointed out that managers' overconfidence led to investment and earnings alienation. Roll (1986) found that managers' arrogance (Hubris) would cause the failure of company mergers and acquisitions. He thought that managers gave high evaluation to takeover targets and ignored the curse

of the winners in the acquisition so as to make some acquisition activities detrimental to the value of the company. Therefore, this manuscript puts forward hypothesis H₁:

Hypothesis H₁: Overconfident managers tend to have on over-investment in the listed companies of Anhui province.

Traditional corporate finance theories held the view that the investment decision making only depended on the project's benefits and was independent of internal cash flow. Malmendier and Tate (2005) and Malmendier and Tate (2008) found that overconfident managers would destroy the capital market rules or corporate governance mechanisms to drive overinvestment when they can control abundant free cash flow. Otherwise, they will reduce overinvestment. Overconfident decision-makers may be heavily influenced by their illusion of knowledge and overoptimism to choose too many investment projects which will do harm to the value of company. Therefore, this manuscript puts forward hypothesis H₂:

Hypothesis H₂: Overconfident managers in Anhui listed companies further strengthened the over-investment behavior in the case of having abundant free cash flow.

Compared with non-SOEs, the government as the controlling shareholder is a very abstract behavioral body in state-owned listed companies in China (Xu and Yu, 2010; Xu, 2010). It is very serious in the problems of non independent governance, insider control and owner

absence in the governance structure of state-owned company so that the managers of state-owned listed companies can make irrational expansion. At the same time, state-owned listed companies always get more preferential space and more subsidies in the industry and market access. Financial institutions are also more willing to provide funds to them. In this case, the overconfident managers prefer to the pursuit of scale and some social factors when making investment decisions which can cause over-investment easily. Therefore, this manuscript puts forward hypothesis H₃.

Hypothesis H₃: Compared with non-SOEs, overconfident managers in Anhui state-owned listed companies were more inclined to over-invest in the case of having abundant free cash flow.

STUDY DESIGN

Econometric model of excessive investment: In order to investigate the relationship between the investment behaviors and the managers' overconfidence, According to Richardson (2006), this manuscript introduces the model of investment is:

$$I_t = \beta_0 + \beta_1 TobinQ_t + \beta_2 PB_t + \beta_3 ROE_t + \beta_4 OG_t + \beta_5 AG_t + \beta_6 I_{t-1} + \epsilon \tag{1}$$

In the Eq. 1, I_t is new capital spending; Tobin Q represents the company's growth opportunities; PB_t is Price-to-Book ratio; ROE_t is rate of return on common stockholders' equity; OG_t is growth rate of revenue; AG_t is growth rate of total assets; I_{t-1} is new capital spending for the previous year; β₀, β₁, β₂, β₃, β₄, β₅, β₆ represents regression coefficient of each variable; ε represents random error.

Research model: In order to test the hypothesis H₁, this manuscript introduces the following model:

$$I_{over,t} = \beta_0 + \beta_1 OCon_t + \beta_2 TobinQ_t + \beta_3 Size_t + \beta_4 ROE_t + \beta_5 TOP_t + \beta_6 Inde_t + \epsilon \tag{2}$$

In the Eq. 2, I_{over,t} is dependent variable, It can be used to test the relationship between the managers'

overconfidence and over-investment. When the residual value ε is positive, i.e., the investment model prediction values greater than zero, it represents over-investment. When the residual value ε is negative, it represents the lack of investment.

In order to test the hypothesis H₂ and H₃, this manuscript builds the Eq. 3-4:

$$I_t = \beta_0 + \beta_1 OCon_t + \beta_2 TobinQ_t + \beta_3 Size_t + \beta_4 ROE_t + \beta_5 TOP_t + \beta_6 Inde_t + \epsilon \tag{3}$$

$$I_t = \beta_0 + \beta_1 OCon_t + \beta_2 OCon_t * FCF_t + \beta_3 FCF_t + \beta_4 TobinQ_t + \beta_5 Size_t + \beta_6 ROE_t + \beta_7 TOP_t + \beta_8 Inde_t + \epsilon \tag{4}$$

Sample selection and data sources: This study takes the A-share listed companies in Anhui province in China as the sample from 2008-2011. There are 251 sample companies during this period. Twenty-two companies were then excluded from the sample (1) 4 financial and insurance listed companies, (2) 14 companies information disclosure is not complete and (3) 4 ST,*ST listed companies. After the exclusion, 229 eligible sample companies were gathered. The data come from the Wind database and CSMAR database in China.

EMPIRICAL ANALYSIS

Descriptive statistical analysis: Table 1 is descriptive statistics of the total sample. We can find that the mean of over-investment variable I_{over} is 0.640 and the mode is 1 which shows that more than half of the sample exists over-investment behavior. The mean of overconfidence variable OCon is 0.240 and the mode is 0 which suggests that manager' overconfidence sample accounts for only a part of in the total sample. The mean of interaction of OCon×FCF (overconfidence and free cash flow) is 0.004 which shows that managers tend to show the irrational behavior of overconfidence in the sample with a positive free cash flow.

Comparing between Table 2 and 1, we can find: (1) The mean of over-investment is 0.960 in overconfident sample and is greater than the mean (0.640) in the overall sample. The standard deviation (0.187) is less than that (0.240) in the total sample. This shows that the phenomenon of over-investment exist in the Anhui

Table 1: Total sample descriptive statistics

Variable	I _{over}	OCon	OCon*FCF	FCF	Tobin Q	Size	ROE	Top	Index
N	229	229	229	229	229	229	229	229	229
Mean	0.640	0.240	0.004	0.016	1.961	21.668	0.096	0.364	0.368
Med	1.00	0.000	0.000	0.062	1.478	21.499	0.096	0.342	0.333
Mode	1.000	0.000	0.000	0.040	1.202	21.220	0.024	0.321	0.333
SD	0.240	0.431	0.100	0.204	1.282	1.162	0.106	0.148	0.064
Min	0.000	0.000	-0.694	-1.198	0.013	19.510	-0.579	0.079	0.143
Max	1.000	1.000	0.370	0.370	8.991	25.154	0.554	0.754	0.800

Table 2: Overconfident sample descriptive statistics

Variable	I_{over}	OCon*FCF	FCF	TobinQ	Size	ROE	Top	Index
N	56.000	56.000	56.000	56.000	56.000	56.0000	56.000	56.000
Mean	0.960	0.015	0.015	2.234	21.488	0.1070	0.353	0.372
Med	1.000	0.063	0.063	1.460	21.503	0.1120	0.348	0.333
Mode	1.000	0.040	0.040	0.932	19.510	0.1110	0.600	0.333
SD	0.187	0.203	0.203	1.503	1.118	0.1240	0.152	0.082
Min	0.000	-0.694	-0.694	0.932	19.510	-0.5790	0.085	0.143
Max	1.000	0.370	0.370	6.745	24.474	0.3110	0.708	0.800

Table 3: Different cash flow and peaceful property nature of the sample of descriptive statistics

	N	Variable	Mean	Med	Mode	SD	Min	Max
Positive free cash flow	163	I_c	0.136	0.116	0.039	0.095	0.007	0.620
		OCon	0.260	0.000	0.000	0.442	0.000	1.000
		OCon*FCF	0.026	0.000	0.000	0.058	0.000	0.370
		FCF	0.098	0.082	0.040	0.067	0.005	0.370
Negative free cash flow	52	I_c	0.131	0.110	0.015	0.087	0.015	0.380
		OCon	0.210	0.000	0.000	0.412	0.000	1.000
State-owned holding	106	I_c	0.161	0.137	0.137	0.101	0.018	0.547
		OCon	0.420	0.000	0.000	0.498	0.000	1.000
		OCon*FCF	0.048	0.000	0.000	0.078	0.000	0.370
		FCF	0.110	0.093	0.116	0.080	0.005	0.370
Non-state holding	57	I_c	0.123	0.099	0.039	0.089	0.007	0.620
		OCon	0.180	0.000	0.000	0.385	0.000	1.000
		OCon*FCF	0.014	0.000	0.000	0.037	0.000	0.169
		FCF	0.092	0.081	0.045	0.058	0.010	0.265

Table 4: State-owned and non-state-owned holding relevant variables T test and the Mann-Whitney U test

Variable	T test			Mann-Whitney U test				
	t	df	Sig.	Average difference	Mann-Whitney U	Wilcoxon W	Z	Sig.
I_c	-2.488	161	0.014	-0.038	2212.5	7883.5	-2.814	0.005
OCon	-3.188	92.728	0.002	-0.242	2290.5	7961.5	-3.330	0.001
OCon*FCF	-2.984	68.883	0.004	-0.033	2242.0	7913.0	-3.497	0.000
FCF	-1.499	87.999	0.137	-0.018	2689.5	8360.5	-1.154	0.249
TobinQ	-1.848	161	0.066	-0.399	2308.0	7979.0	-2.481	0.013
Size	5.644	160.311	0.000	0.823	1683.0	3336.0	-4.656	0.000
ROE	0.129	161	0.897	0.002	2921.0	8592.0	-0.348	0.728
TOP	1.731	161	0.085	0.039	2424.5	4077.5	-2.076	0.038
Index	-1.676	161	0.096	-0.019	2232.5	7903.5	-2.986	0.003

province listed companies and is greater than the proportion of matching samples. The results confirm that overconfident managers tend to over-investment and (2) The mean of value interaction OCon*FCF is 0.015 and is greater than that (0.004) in the total sample which means overconfident psychological factors may cause them to make more aggressive investment strategy, even if some investment projects will be losing.

According to the different free cash flow and the ultimate controller type, the sample is divided into two groups by that the free cash flow is greater or less than zero, state-owned or non-state-owned holding in Table 3. In the positive free cash flow group, the mean of I_c and OCon is 0.136 and 0.260 and is greater than the corresponding value of negative free cash flow group. In the state-owned holding group, the mean of I_c , OCon, OCon*FCF, FCF is 0.160, 0.420, 0.048 and 0.110, respectively and is greater than the value in the non-state-owned holding group. Compared with non-SOEs, the phenomenon of over-investment and managers' overconfidence is more obvious in the listed companies when the company has a positive free cash flow.

According to Table 4, there are significant differences among over-investment scale, overconfidence, OCon*FCF, the company size, ownership concentration and proportion of independent directors between non-SOEs and SOEs. The above mean difference is -0.038, -0.242, -0.033 by T test and it is statistically significant which suggests that state holding listed companies in Anhui province is higher than the matching samples on these aspects. This may be due to the nature of the State-owned companies "father effect". Compared with other companies, they are more likely to get funds, other kinds of resources and the smaller threshold of the investment constraints which strengthen the managers' overconfidence, expand the scale of investment and affect the effectiveness of investment. It tested the hypothesis H_3 .

Regression analysis:

Multiple regression analysis of the investment model: According to Table 5, the correlation is all below 0.499 which indicates there are no serious collinearity problem in this equation and can run multiple regression analysis.

Table 5: investment forecast model of regression results

	Coefficient	t	Sig
Constant	0.027**	3.235	0.001
TobinQ	-0.007	-1.374	0.171
PB	0.002	1.421	0.398
ROE	-0.004	1.551	0.932
OG	-0.002**	-2.578	0.011
AG	0.005	0.602	0.548
I_{t-1}	0.417**	7.039	0.000

R² 0.296 Adj-R² 0.286. F-statistic 9.773***. **,** imply statistically significant at 5 and 1% levels, respectively

Table 6: Logistic regression results

Variable	Equation 1		Equation 2	
	Coefficient	Sig.	Coefficient	Sig.
constant	2.596	0.000	3.429	0.577
OCon	0.699	0.370	0.467**	0.025
Tobin Q			2.232**	0.013
Size			-0.107	0.679
ROE			4.951	0.185
TOP			0.345	0.864
Index			-5.249*	0.094

The Adj-R² is goodness of fit test and reaches 28.6% in the regression equation. Although the degree is not high, it can partly demonstrate the economic sense of this value. Richardson (2006) applied this model to check U.S. listed companies and found that the Adj-R² value was also only 32.6% and the F value is 9.773. Therefore, the investment expectation model is credible. The level of new investment is positively correlated with PB, AG, I_{t-1} and the coefficient value of the last investment expenditure is the biggest (0.417) and significantly positive at the 1% level. It shows that the company's investment decisions are largely dependent on the past empirical data.

Over-confidence and over-investment in logistic regression analysis: Table 6 shows the results of logistic regression for model 2. This table is used to check if manager's overconfidence would lead to the over-investment behaviors in the whole sample. Equation 1 gives the regression results concerning only one variable of overconfidence. Equation 2 is the regression results incorporated into other control variables on the bases of Eq. 1. The results of Eq. 1 show that the sole factor of overconfidence is correlated with over-investment at 0.699. The results of Eq. 2 show that the overconfidence coefficient is 0.467 and significant at 5% level which means that over-confidence is correlated with over-investment and the managers, are prone to over-invest in the case of overconfidence. This conclusion supports the hypothesis H₁. The proportion of independent directors has negative correlation with over-investment behavior, so independent directors can promote the efficiency of corporate governance to some extent and play an important role in restraining the irrational behaviors of company managers.

Table 7: Return of the different group samples of cash flow

Variable	FCF>0		FCF<0	
	Variable	T value	Coefficient	T value
(constant)	-0.026	-0.272	-0.103	-0.521
OCon	0.010**	0.033	0.006	0.319
TobinQ	0.060**	16.109	0.061*	8.555
Size	0.001	0.233	0.003	0.349
ROE	0.090	1.782	0.015	0.273
TOP	0.068**	2.192	0.015	0.370
Inde	0.002	0.063	0.129	0.780
F-statistic	59.227		18.782	
Sig	0.000		0.000	
Adj-R ²	0.683		0.677	
N	163		66	

, imply statistically significant at 10 and 5% levels, respectively

Multivariate regression analysis of different cash flow

samples: Table 7 is the regression results of the Eq. 3. It aims to examine the influence on the company's investment caused by the overconfident managers by different levels of cash flow. As shown in Table 7, the F values are 59.227 and 18.782, respectively in different free cash flow samples and the Sig values are both 0.000. Therefore, the equation is significant. The Adj-R² values are 0.683 and 0.677, respectively which means that the degree of fit of the equation is pretty high. In the negative free cash flow group, the overconfidence coefficient is 0.006 without significance which demonstrates that overconfident managers will restrain over-investment when free cash flow is negative. In the positive free cash flow group, the overconfidence coefficient is 0.010 with significance on the level of 5% which shows that abundant free cash flow will strengthen the influence on over-investment caused by the irrational psychological factors of the managers. In the case of adequate free cash flow, the blind optimism of the company's decision makers might lead to the ignorance of the accompanying risk, even if for some projects with negative net present values. We can conclude that the regression result supports the hypothesis H₁. Stock concentration (TOP) is positively and significantly correlated with over-investment. The higher the TOP value is, the easier for the largest shareholder to violate the welfare of other stakeholders for his or her own sake and the easier to cause investment twist.

Multivariate regression analysis of different property

rights samples: The regression result by model 4 is shown in Table 8. The overconfidence coefficient is 0.048 and 0.026, respectively in state-owned and non state-owned listing Corporation in Anhui province. The former is larger than the latter and the former is significantly positively correlated at the 5% level which demonstrates that the manager's overconfidence in the state-owned holding company show more significant.

Table 8: ?????????

Variable	State-owned holding		Non-state-owned holding	
	Coefficient	T-value	Coefficient	T-value
(constant)	-0.274	-0.956	-0.150*	-1.565
OCon	0.048**	2.066	0.026	1.145
OCon*FCF	0.299*	2.252	0.203	1.220
FCF	0.563**	4.690	0.260**	3.128
TobinQ	0.055**	10.476	0.065**	14.634
Size	0.009	0.705	0.005	1.222
ROE	0.130*	2.019	0.132**	1.987
TOP	0.070	1.332	0.072**	2.121
Inde	-0.019	-0.666	-0.099	-0.336
F-statistic	39.249		23.484	
Sig	0.000		0.000	
Adj-R ²	0.745		0.763	
N	106		57	

***imply statistically significant at 10 and 5% levels, respectively

The value of OCon*FCF in the state owned and non state-owned holding company are 0.299 and 0.203. The former is larger than the latter and the former is significantly positively correlated at the 10% level which shows that overconfident managers in state-owned companies is easier to lead to over-invest compared with non state-owned company while the cash flow is sufficient.

In complicated principal-agent relationship in the state-owned holding company, the absence of owners and other factors lead to low efficiency of supervision to managers. The overconfidence behaviors of managers are indulgent so that they usually expand investment way to win his own and set up individual image because of self-interest motive. The results lead to overinvestment. The empirical testing is highly consistent with the hypothesis H₃.

CONCLUSION

The manuscript takes the A-share listed companies in Anhui province in China as the object of study in 2008-2011. It tests the degree of the manager's overconfidence by earnings forecast deviation method and investigates the effects of irrational psychological characteristics on investment behaviors. The research suggests that: (1) Overconfident managers in Anhui listed companies tended to make over-investment decision, (2) Overconfident managers in Anhui listed companies further strengthened the over-investment behavior in the case of having abundant free cash flow. When the overconfident managers realize that the company has sufficient resources, overconfidence psychological factors would make its investment strategy more radical even in some bad investment projects and (3) The serious insiders control problem of state-owned holding company is caused by absence of state-holder.

Compared with the non state-owned holding company, overconfident managers of state-owned listing companies in Anhui province are easier to expand irrational investment because of selfish motives, obtaining higher personal image and political achievements. Therefore, the characteristics of managerial overconfidence have a profound influence on investment behavior of the listing corporation in Anhui province.

Based on this, here are some suggestions. First of all, we need perfect the independent director system. Constructing the independent director market and improving the independent director's talent pool, selection mechanism and credit evaluation system can strengthen the independent director's treatment effectiveness by reputation mechanism to constrain overconfident manager's irrational behavior. Secondary, we should strengthen the institutional investors and promote institutional investors as an active shareholder management in the corporate governance. Thirdly, it is important to create professional manager market. Finally, we should standard the relationship between government and enterprises and perfect the governance role of credit system.

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