International Journal of Asian Social Science, 2014, 4(6): 752-766

International Journal of Asian Social Science
ISSN(e): 2224-4441/ISSN(p): 2226-5139

journal homepage: http://www.aessweb.com/journals/5007

OVERINVESTMENT, UNDERINVESTMENT, EFFICIENT INVESTMENT DECREASE, AND EFFICIENT INVESTMENT INCREASE

Hairong Tang
Guangdong University of Finance and Economics
Yuqing Shen
School of Management and Economics, University of Electronic Science and Technology of China
Yao-Min Chiang†
Department of Finance, National Taiwan University

ABSTRACT

Using data of Chinese listed companies, we find that the relationship between capital expenditure growth and stock return does not monotonously increase or decrease. Four types of relationships exist between capital expenditure growth and stock returns: overinvestment, underinvestment, efficient investment decrease, and efficient investment increase. The first two types show inefficient investments, whereas the last two types show efficient investments. We further explore how ownership structure in Chinese listed companies affects the relationship between capital expenditure growth and stock return. We find that companies controlled by private investors tend to make inefficient investment decisions because of agency problems.

Keywords: Ownership structure, Overinvestment, Underinvestment, Stock return, Asset growth rate, Capital expenditure.

JEL Classification: G14, G32, G38.

1. INTRODUCTION

Several previous studies (Titman *et al.*, 2004; Anderson and Garcia-Feijóo, 2006) have shown that firms with higher capital expenditure increase have lower risk-adjusted returns. Titman *et al.* (2004) further showed this negative relation to be stronger for firms with larger investment increase.

In a later study, Titman *et al.* (2010) examined the asset growth effect in an international setting. Using data from over 13,300 firms across 40 countries during 1981-2005, they found that most countries exhibit a negative relation between asset growth and subsequent stock returns.

† Corresponding author
ISSN(e): 2224-4441/ISSN(p): 2226-5139

Specifically, asset growth effect is highly significant among developed countries, but is weak and nonsignificant among developing countries, including China.

Following the procedure of Titman *et al.* (2010), we collect data of firms listed in Shenzhen and Shanghai Exchange markets during 1999-2009 to test the asset growth effect. The evidence of treating all companies as a whole seems to support the findings of Titman *et al.* (2010) that Chinese companies show no asset growth effect.

We collect data from Chinese listed companies and construct a figure for capital expenditure growth and stock returns. As shown in Fig. 1, the relation between capital expenditure growth and stock returns does not monotonously decrease, implying no asset growth effect in these samples. However, Fig. 1 shows that the relation between capital expenditure growth and stock returns can be divided into four types based on the four quadrants. The first quadrant includes firms with positive capital expenditure growth and positive stock returns. A preliminary test for samples in the first quadrant shows that capital expenditure growth and stock return have a significantly negative relation. Higher capital expenditure growth is associated with lower return. These firms show overinvestment problems (Titman *et al.*, 2004). However, this negative relation does not exist in the second quadrant, which represents firms with negative capital expenditure growth and positive stock returns. The relation between capital expenditure growth and stock return is a positive one. Greater capital expenditure cut is associated with lower return. These firms have an underinvestment problem (Myers, 1977; Myers and Majluf, 1984). The third quadrant includes firms with negative capital expenditure growth and negative stock returns. A negative relation exists between capital expenditure growth and stock returns. Greater capital expenditure cuts lead to higher returns. Investment decrease decisions among these firms seem to have a good market feedback. The fourth quadrant is for firms with positive capital expenditure growth and negative stock returns. Greater capital expenditure growth helps improve returns. These firms' increasing investments help improve equity returns. These firms have efficient investments.

The overinvestment problem shows that lower returns are related to higher capital expenditure growth. However, not all increasing investments lead to lower stock returns. Investment can be efficient or inefficient. The potential conflicts of interest among managers, stockholders, and debt holders influence investment policies. These conflicts may give rise to inefficient investment decisions that typically fall under the problem categories of underinvestment and overinvestment. According to Jensen and Meckling (1976), if managers abuse their decision-making power by adopting unprofitable or overly risky projects that could damage the interests of equity holders and those of debt holders, the problem of overinvestment may occur. In contrast, Myers and Majluf (1984) indicated that interest conflicts between current and prospective shareholders might stimulate managers to reject positive net present value projects, and consequently decrease firm value. This is an underinvestment problem.

However, managers may serve shareholder interests by making appropriate investment decisions. When a company needs a growing policy, more capital expenditure growth may actually help improve the firm's stock returns. However, when a company needs an investment decrease strategy, more investment cuts may lead to positive stock reaction. These investment decisions are efficient, and the market reacts to these investment decisions with positive stock returns.

Titman *et al.* (2010) suggested corporate governance is one of three reasons for asset growth effect. Titman *et al.* (2009) found no significant relation exists between capital expenditures and subsequent stock returns for keiretsu firms, but a positive relation for independent firms. These studies show that ownership structure, a description of corporate governance, has an effect on the relation between capital expenditure growth and stock returns.

Listed companies in China can be grouped as follows based on their ownership structure: (a) controlled by state asset management bureaus (SMABs); (b) state-owned enterprises (SOEs), including those affiliated with the central government and those affiliated with the local government[1]; (c) private investors; and (d) foreign investors. Chen *et al.* (2009) found evidence to support that these distinct types of owners may affect firms' investment decision. We believe these four types of ownership structure have different relation between capital expenditure growth and stock returns.

This study investigates four types of investment efficiency: overinvestment, underinvestment, efficient investment decrease, and efficient investment increase, using samples from Chinese listed companies. We investigate how ownership structure affects the relation between capital expenditure growth and stock returns in each type of investment efficiency.

Our results show that ownership may have an effect on the relationship between capital expenditure growth and stock returns. Firms controlled by private investors, which have severe information asymmetry problems, tend to have inefficient investments in either overinvestment or underinvestment.

The paper is organized as follows: Section 2 presents the hypotheses to be tested. Section 3 provides a description of the sample and methodologies used in this paper. Section 4 discusses our results on the relationship between corporate investment and stock return, and explores how ownership structure affects the relationships between corporate investment and stock return. Section 5 provides the conclusion.

2. HYPOTHESES

Baker *et al.* (2003), Titman *et al.* (2004), Anderson and Garcia-Feijóo (2006), and Cooper *et al.* (2008) found that firms that substantially increase capital expenditures subsequently achieve negative risk-adjusted returns. Inconsistent with the hypothesis of perfect markets in Modigliani and Miller (1958), information asymmetries are attributed to the overinvestment phenomenon. Jensen (1986) argued that when informational asymmetries exist, interest conflicts exist between shareholders and managers. Managers may use free cash flow to undertake negative NPV, causing the overinvestment problem.

This paper first tests the overinvestment hypothesis using samples from Chinese listed companies and compares the results with the findings of Titman *et al.* (2010).

Hypothesis 1 - Firms that substantially increase capital expenditures subsequently achieve lower risk-adjusted returns.

[1] This category also includes companies affiliated to universities.

Information asymmetries may cause overinvestment and underinvestment problems. The overinvestment problem arises from the conflict between managers and shareholders. However, the underinvestment problem may be caused by interest conflicts between shareholders and bondholders. The substitution theorem of Jensen and Meckling (1976) states that riskier projects are expected to give larger benefits that shareholders mainly enjoy, whereas if large losses occur, these are passed on to bondholders. Myers (1977) proposed another reason for the underinvestment problem resulting from the conflict between shareholders and bondholders. Shareholders may not undertake positive NPV projects whenever the NPV is lower than the amount of debt issued. The information asymmetries induce a moral hazard problem. The underinvestment problem may also be because of adverse selection. Bondholders may require a higher premium on a firm that has good investment project quality just because they do not have sufficient information on the firm. Stiglitz and Weiss (1981) therefore argued that firms might decide not to issue debt and forgo the investment project.

The underinvestment problem can also be caused from the conflict between current and prospective shareholders. Myers and Majluf (1984) discussed this adverse selection problem. With information asymmetry, prospective shareholders cannot tell how good the firm's new project is and price the firm's new shares at a lower price. Current shareholders may therefore forgo positive projects.

Given the overinvestment problem, the relation between capital expenditure growth and stock return is negative. However, given the underinvestment problem that firms cut capital expenditure, the relationship between capital expenditure and stock return is positive.

Information asymmetries generate suboptimal investment strategies that do not maximize firm value. However, managers may serve shareholder interests by making optimal investment decisions. Investment can be efficient. Stock returns may possibly increase after a positive capital expenditure growth. The stock market has a positive reaction to the efficient investment increase policy of firms. In contrast, the stock market may also have a positive feedback to a firm's investment cuts. Market investors approve a firm's efficient investment decrease decision with a higher stock return.

Therefore, in this paper, we separate capital expenditure growth into positive and negative, and divide market reaction into positive and negative. We then combine capital expenditure and stock returns into four quadrants, as shown in Figure1.

(I). First Quadrant: Overinvestment

Hypothesis 2I – Given that firms have ***positive*** capital expenditure growth and afterwards ***positive*** risk-adjusted returns, firms that substantially increase capital expenditures subsequently achieve lower risk-adjusted returns.

(II). Second Quadrant: Underinvestment

Hypothesis 2II – Because firms have ***negative*** capital expenditure growth and afterwards ***positive*** risk-adjusted returns, firms that substantially cut capital expenditures subsequently achieve lower risk-adjusted returns.

(III). Third Quadrant: Efficient Investment Decrease

Hypothesis 2III – Because firms have ***negative*** capital expenditure growth and afterwards ***negative*** risk-adjusted returns, firms that substantially cut capital expenditures subsequently achieve higher risk-adjusted returns.

(IV). Fourth Quadrant: Efficient Investment Increase

Hypothesis 2IV – Because firms have ***positive*** capital expenditure growth and afterwards ***negative*** risk-adjusted returns, firms that substantially increase capital expenditures subsequently achieve higher risk-adjusted returns.

The relationship between state ownership and firm performance has been a focus of academic research. Research by Shleifer and Vishny (1997) and Shleifer (1998) shows that government intervention reduces firm value .Titman *et al.* (2010) argued that corporate governance contributes to the overinvestment problem. By investigating keiretsu firms and independent firms in Japan, Titman *et al.* (2009) found evidence to support that ownership structure affects the relation between capital expenditure growth and stock returns.

As discussed, investment inefficiency is mainly caused by the existence of information asymmetry. Companies controlled by private investors are more likely to have conflicts among managers, shareholders, and bondholders.

Hypothesis 3 – Companies controlled by private investors are more likely to have inefficient investment, either overinvestment or underinvestment.

3. DATA AND METHODOLOGIES

3.1. Samples

The sample includes 140,821 firm-month observations in China from July 1998 to June 2009. Companies are listed in Shenzhen and Shanghai Exchange markets. Data including financial statement information, stock returns, and background information were collected from the GTA database.

Monthly returns and capital expenditure growth rates were limited [-100%, 100%] to avoid outlier bias. We tested how ownership structure affects the relationship between capital expenditure growth and stock returns, and required each type to have at least 30 stocks. Therefore, we did not include companies controlled by foreign investors in our discussion. After this screening process, our final sample consisted of 140,821 firm-month observations.

We followed Titman *et al.* (2010) to define variables used in our tests.

- The total asset growth rate (*TAG*) is defined as the percentage change in total assets (*TA*) from year *t*-1 to year *t*, $TAG_t = (TA_t - TA_{t-1}) / TA_{t-1}$.
- Book-to-market ratio (BM_t) is the ratio of book value over market value at the fiscal year-end of year t.
- Firm size ($SIZE_t$) is measured by the market equity at the end of June of year t.
- Momentum (MOM_m) at month m, is the buy-and-hold return over the previous 6 months (m-7 to m-1).
- Risk-adjusted return is the difference between monthly return and risk-free rate. The risk free

rate is proxied by the 1-month savings rate of the corresponding month.

To meet the definition of these data, we collected data from July 1998 to June 2010. Table 1 shows summary statistics of the sample. Panel A reports background information of the whole sample and samples in different quadrants. The average firm has an adjusted return of 1.77% and an increased capital expenditure of 11.98%. The first quadrant has the largest sample size, followed by the fourth quadrant. These two quadrants contain firms with positive capital expenditure growth. Firm-month observations with positive capital expenditure growth account for 72.45%. This shows that firms in this sampling period tend to increase their capital investment. The typical firm in the third quadrant has the smallest size, which is evidence consistent with the definition of the third quadrant that firms are executing an efficient investment decrease policy.

Panel B reports the variable means for three types of ownership structures. We computed the average risk-adjusted returns and average capital expenditure growth for each ownership structure. Firms controlled by state asset management bureaus tend to be larger firms, and tend to have a larger book to market ratio, smaller capital expenditure growth, and higher adjusted returns. In contrast, companies controlled by private investors tend to be smaller firms, and tend to have smaller book-to market ratio, higher capital expenditure growth, and smaller risk-adjusted return, compared to companies controlled by state asset management bureaus. Firms controlled by private investors tend to have an overinvestment problem. State-owned enterprises have lowest risk-adjusted returns among the three types of ownership structures.

Panel C reports basic statistics by combining quadrant and ownership types. We treated each quadrant-ownership type as an observation. An examination of the samples in the first quadrant shows that state-owned enterprises and firms controlled by private investors tend to have worse investment performance than do firms controlled by state asset management bureaus. State-owned enterprises and firms controlled by state asset management bureaus have higher capital expenditure growth but lower stock returns than private investor type of ownership structures. In the third quadrant, firms controlled by private investors have the largest capital expenditure cuts and the highest stock returns. The market considers firm investment cuts as a proper action and reacts with positive feedback. When companies controlled by private firms increase capital expenditure growth, the market reacts in a negative manner, whereas when they cut additional capital expenditure, the market reacts with positive feedback. This is consistent with the implication of serious agency problems suggested by Myers and Majluf (1984).

3.2. Methodologies

3.2.1. Portfolio Analysis

We followed Titman *et al.* (2010) and used portfolio analysis to investigate whether the asset growth effect exists in the whole sample, in each quadrant, in each ownership type, and in each quadrant-ownership combination. We first formed quintile portfolios for each sample division based on capital expenditure growth. At the end of June in year *t*, all firms were ranked in ascending order based on their total asset growth (*TAG*) in year *t*-1 and were assigned to a corresponding quintile. Firms remained in their corresponding portfolios from July of year *t* to June of year *t*+1. The equal-weighted monthly returns on these quintile portfolios were calculated for the

same period and rebalanced in June of each year. We then calculated the return spread between low and high asset growth firms. The overinvestment hypothesis indicates that the return spread is significantly positive.

3.2.2. Regression Analysis

Portfolio analysis provides the first insight on asset growth effect. However, we need to control other variables that may also affect stock returns. Therefore, we ran a regression controlling for other important variables. The following model is estimated using firm-month observations.

$$R_{i,t} - R_{f,t} = b_0 + b_1 TAG_{i,t-1} + b_2 Ln(BM_{i,t-1}) + b_3 Ln(SIZE_{i,t}) + b_4 MOM_{i,t} + b_5 ISSUE_{i,t} + e_{i,t} \quad (1)$$

where $R_{i,t}$ is the monthly return for company i from July of year t to June of year t+1, and $R_{f,t}$ is the risk-free rate of the corresponding month and is proxied by the 1-month savings rate. $TAG_{i,t-1}$ is the capital expenditure growth for company i in year t-1. $BM_{i,t-1}$ is the book-to-market equity ratio for company i in year t-1. $SIZE_{i,t}$ is firm size in June of year t. Both BM and $SIZE$ are adjusted to their natural logarithm. $MOM_{i,t}$ is the momentum for company i with the same period as the dependent variable.

We estimated the regression model (1) for the whole sample, samples in different quadrants, samples in different ownership types, and samples in different quadrant-ownership type combinations, using the Fama and MacBeth (1973) regression procedure. We reported estimates using the time-series averages of the monthly estimated coefficients and the corresponding t-statistics using the Newey-West robust standard errors.

4. EMPIRICAL RESULTS

4.1. Portfolio Analysis

Table 2 shows the results of portfolio analysis, which investigates whether a significant difference exists in return spread for low and high asset growth firms. If a significant difference exists, we can further investigate whether it is an overinvestment, underinvestment, efficient investment decrease, or efficient investment increase. Panel A shows no significant difference in return spread for the whole sample and no asset growth effect in Chinese listed companies as a whole. We also use portfolio analysis to investigate the effect of ownership structure on the relationship between capital expenditure growth and stock returns. Firms controlled by state asset management bureaus have a significant investment effect for all four quadrants. However, we cannot conclude our findings based on these preliminary tests because other variables exist that may also affect stock returns needing to be controlled. We run regression analysis, including other control variables, to investigate investment effects.

4.2. Regression Analysis

4.2.1. The Relationship between Capital Expenditure Growth and Stock Returns

Table 3 reports the regression results estimated for the whole sample and samples in different quadrants. For the whole sample, the coefficient on our main test variable, total asset growth is

.0010, which is positive but not significant. No significant negative relation exists between capital expenditure growth and stock returns and no sign of overinvestment in Chinese listed companies as a whole.

However, the coefficients on total asset growth in different quadrants are significant. The estimate for the first quadrant sample is significantly negative, supporting that with higher capital expenditure growth, stock returns are lower. These samples show an overinvestment problem. The coefficient estimate for the second quadrant sample is significantly positive. Capital expenditures growth in this quadrant is negative. Stock returns are lower when the investment cut is larger. These firms show an underinvestment problem. The estimate for the third quadrant is significantly negative. Companies in this quadrant have negative capital expenditure and negative stock returns. The market reacts to greater capital expenditure cuts with higher valuation. These firms make a right decision on efficient investment decrease. Firms in the fourth quadrant have positive capital expenditure growth and negative stock returns. The coefficient estimate for the fourth quadrant is significantly positive. With higher capital expenditure growth, stock returns are higher. Firms increase investment to improve their stock returns.

We ran a *t* test and Wilcoxon-Mann-Whitney test for differences in coefficient estimates among different quadrants. The results show that coefficient estimates among different quadrants are significantly different. This implies that it is necessary to separate samples into these four quadrants to have accurate conclusions on the asset growth effect.

For other control variables, the coefficient estimates for the book-to-market ratio are significantly positive for samples in the third and fourth quadrants. Comparatively, lower market value firms tend to have higher returns. The coefficient on firm size is significantly negative for samples in the third quadrant. With a larger size, stock returns are lower, implying that with smaller size, stock returns are higher. This is consistent with the characteristics of firms in this quadrant that are pursuing an efficient investment decrease policy.

4.2.2. Effect of Ownership Structure

Table 4 shows the effect of ownership structure on the relation between capital expenditure growth and stock returns. The regression results show that stock returns do not depend on asset growth. The *t* test and Wilcoxon-Mann-Whitney test show no significant difference in the coefficient estimates among different ownership structures. For the whole sample, no different investment effect exists for different ownership types.

We further tested the effect of ownership structure on the relationship between capital expenditure growth and stock returns within different quadrants. For companies controlled by private investors in the first quadrant, the coefficient estimate on total asset growth is significantly negative. A significant overinvestment problem exists for companies controlled by private investors. Firms with severe information asymmetry among managers, shareholders, and debt holders tend to have overinvestment problems.

For the second quadrant, coefficient estimates on total asset growth are all significantly positive for all three types of ownership structures, implying that these three types of ownership structures all have an underinvestment problem. This underinvestment problem may be caused by

agency problems between current and prospective shareholders, between managers and shareholders, or between shareholders and bondholders.

The third quadrant is for firms pursuing an efficient investment decrease policy. Coefficients on total asset growth for state-owned enterprises and for companies controlled by private investors are significantly negative. Greater capital expenditure cuts are related to higher returns.

Firms in the fourth quadrant are firms with positive capital expenditure growth and negative stock returns. The coefficients on total asset growth for both state-owned enterprises and companies controlled by private investors are significantly positive. With more capital expenditure growth, the magnitude of negative stock returns is smaller.

Overall, our results show that because of information asymmetry, companies controlled by private investors tend to have suboptimal investment, of either overinvestment or underinvestment. Although the performance measured in stock returns of state-owned enterprises is the worst among all three types of ownership structures, no sign of an overinvestment problem exists, but an underinvestment problem is present. The market always has positive feedback on firms' efficient investment decisions. Both an efficient investment decrease strategy by which firms cut capital expenditure and an efficient investment increase strategy by which firms increase capital expenditure have higher stock returns.

5. CONCLUSION

Using data of Chinese listed companies in Shenzhen and Shanghai Exchange markets, we tested the four investment effects: overinvestment, underinvestment, efficient investment decrease, and efficient investment increase. Treating all samples as a whole, our conclusion is similar to that of Titman *et al.* (2010); no asset growth effect exists in China. However, this effect should be investigated among different ownership structures because different ownership structures have different influences on firms' investment decisions.

We separated firms into three ownership structures: companies controlled by state asset management bureaus, state-owned enterprises, and companies controlled by private investors. Information asymmetry tends to be more serious for firms controlled by private investors. Our results show that these firms tend to have suboptimal investment; either overinvestment or underinvestment. State-owned enterprises tend to have underinvestment problems.

Investment can be inefficient or efficient. When firms make the right investment decisions, the market may react in positive feedback with higher stock returns.

REFERENCES

Anderson, C. and L. Garcia-Feijóo, 2006. Empirical evidence on capital investment, growth options, and security returns. Journal of Finance, 61(1): 171-194.

Baker, M., J. Stein, C. and J. Wurgler, 2003. When does the market matter? Stock prices and the investment of equity-dependent firms. Quarterly Journal of Economics, 118(3): 969-1006.

Chen, G., M. Firth and L. Xu, 2009. Does the type of ownership control matter? Evidence from China's listed companies. Journal of Banking and Finance, 33(1): 171-181.

Cooper, M.J., H. Gulen and M.J. Schill, 2008. Asset growth and the cross-section of stock returns. Journal of Finance, 63(4): 1609-1651.

Fama, E.F. and J. MacBeth, 1973. Risk, return and equilibrium: Empirical tests. Journal of Political Economy, 81(3): 607-636.

Jensen, M., 1986. Agency costs of free cash flow: Corporate finance and takeovers. American Economic Review, 76(2): 323–329.

Jensen, M. and W. Meckling, 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4): 305-360.

Modigliani, F. and M. Miller, 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review, 48(3): 261–297.

Myers, S. and N. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics, 13(2): 187–221.

Myers, S.C., 1977. Determinants of corporate borrowing. Journal of Financial Economics, 5(2): 147-175.

Shleifer, A., 1998. State versus private ownership. Journal of Economic Perspectives, 12(4): 133-150.

Shleifer, A. and R. Vishny, 1997. A survey of corporate governance. Journal of Finance, 52(2): 737-783.

Stiglitz, J. and A. Weiss, 1981. Credit rationing in markets with imperfect information. American Economic Review, 71(3): 393–410.

Titman, S., K.C., K.C.J. Wei and F. Xie, 2009. Capital investments and stock returns in Japan. International Review of Finance, 9(1-2): 111-131.

Titman, S., K.C.J. Wei and F. Xie, 2004. Capital investment and stock returns. Journal of Financial and Quantitative Analysis, 39(4): 677-700.

Titman, S., K.C.J. Wei and F. Xie, 2010. Access to equity markets, corporate investments and stock returns: International evidence. Unpublished Paper.

Figure-1. The relation between capital expenditure growth and return.

This figure shows the relation between capital expenditure growth and stock returns. The x-variable is capital expenditure growth, whereas the y-variable is stock return.

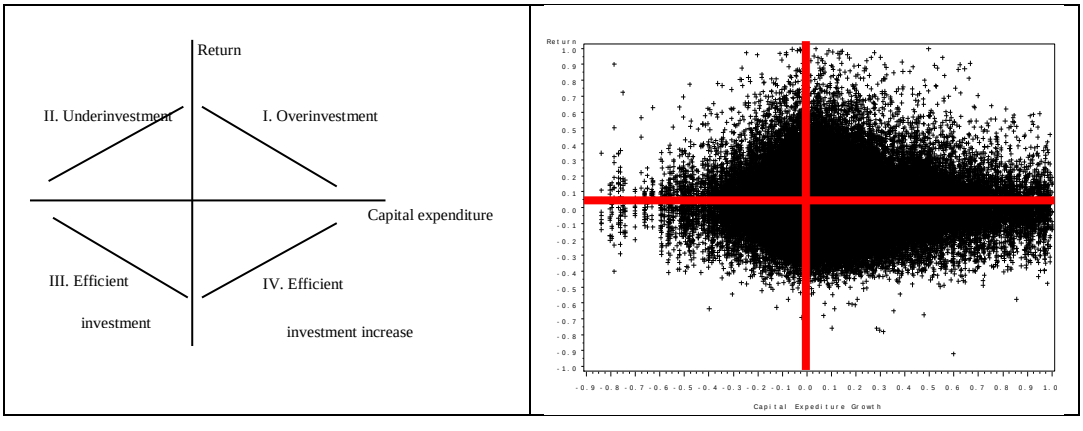

Table-1. Summary Statistics

The sample includes 140,821 firm-month observations in China from 1999-2009. Panel A reports firm characteristics for all samples and samples in different quadrants. Quadrants are divided by total asset growth and adjusted return. Panel B shows basic summary statistics of samples by ownership type. Panel C treats each quadrant-ownership combination as an observation. Mean and (median) are shown in the table.

Panel-A. Whole sample and samples in different quadrants.

Sample	*N*	Adjusted return	Total asset growth	Book to market ratio	Firm size	Momentum
All samples	140,821	0.0177	0.1198	0.4402	3634.5519	0.1348
		(0.0051)	(0.0850)	(0.3717)	(1441.7284)	(0.0091)
First quadrant	52,787	0.1158	0.2017	0.4746	4625.4613	0.1452
		(0.0817)	(0.1471)	(0.4124)	(1616.9495)	(0.0267)
Second quadrant	20,924	0.1283	-0.1057	0.4710	2341.5490	0.1841
		(0.0928)	(-0.0687)	(0.3967)	(1198.3158)	(0.0449)
Third quadrant	17,680	-0.0980	-0.1050	0.3909	1989.9982	0.1397
		(-0.0768)	(-0.0691)	(0.3141)	(1123.4433)	(-0.0084)
Fourth quadrant	48,718	-0.0939	0.2101	0.4065	3726.2389	0.1019
		(-0.0726)	(0.1522)	(0.3416)	(1546.3755)	(-0.0135)

Panel-B. Basic summary statistics by ownership structure.

Ownership structure	*N*	Adjusted return	Total asset growth	Book to market ratio	Firm size	Momentum
Firms controlled by state	58,550	0.0458	0.1088	0.5267	5308.83	0.3388
asset management bureaus		(0.0392)	(0.0761)	(0.4690)	(1848.73)	(0.2208)
State-owned enterprises	30,365	-0.0089	0.1219	0.5012	3141.96	-0.0688
		(-0.0122)	(0.0915)	(0.4690)	(1515.69)	(-0.1074)
Firms controlled by	51,906	0.0014	0.1309	0.3069	2029.09	0.0238
private investors		(-0.0096)	(0.0918)	(0.2681)	(1123.5800)	(-0.0397)

Panel-C. Basic description by quadrants and by ownership structure.

	Firms controlled by state asset management bureaus			State-owned enterprises			Firms controlled by private investors		
	N	Adjusted return	Total asset growth	*N*	Adjusted return	Total asset growth	*N*	Adjusted return	Total asset growth
First quadrant	24,939	0.1501	0.1895	10,415	0.0843	0.2016	17,433	0.0855	0.2192
		(0.1182)	(0.1371)		(0.0645)	(0.1510)		(0.0568)	(0.1594)
Second quadrant	10,899	0.1586	-0.1062	3,389	0.0974	-0.1047	6,636	0.0942	-0.1054
		(0.1229)	(0.0693)		(0.0704)	(0.0697)		(0.0678)	(0.0678)
Third quadrant	6,059	-0.1206	-0.1038	4,173	-0.0981	-0.1055	7,448	-0.0797	-0.1057
		(0.0897)	(0.0700)		(0.0840)	(0.0722)		(0.0682)	(0.0679)
Fourth quadrant	16,385	-0.1255	0.2087	12,175	-0.0877	0.1957	20,158	-0.0719	0.2199
		(0.0956)	(0.1519)		(0.0759)	(0.1436)		(0.0618)	(0.1589)

Table-2. Portfolio Analysis

This table shows the test for return spread between low and high asset growth firms. Quintile portfolios are formed based on capital expenditure growth. Panel A shows the results for the whole sample and samples in different quadrants. Panel B shows the results for different ownership structures. Panel C, D, E, and F report the results for different ownership structures in different

quadrants. ***, **, and * denote the difference is significant at the 1, 5, and 10% level, respectively.

Panel-A. Whole sample and samples in different quadrants.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
Whole sample	0.0128	0.0152	0.0092	0.0098	-0.0024	-0.0006
First quadrant	0.0925	0.0956	0.0754	0.0781	-0.0031	-0.0027
Second quadrant	0.1019	0.1103	0.0876	0.0922	-0.0083	-0.0046
Third quadrant	-0.0780	-0.0879	-0.0653	-0.0728	0.0098	0.0075
Fourth quadrant	-0.0722	-0.0712	-0.0568	-0.0600	-0.0010	0.0032

Panel-B. Different ownership structures in whole sample.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
SMABs	0.0158	0.0246	0.0244	0.0128	-0.0088	0.0116
SOEs	0.0060	0.0047	0.0053	-0.0015	0.0013	0.0068
Private investors	0.0118	0.0252	0.0000	0.0054	-0.0133	-0.0053

Panel-C. Different ownership structures in the first quadrant.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
SMABs	0.1324	0.1402	0.1200	0.1186	-0.0078	0.0014
SOEs	0.0693	0.0992	0.0649	0.0707	-0.0299*	-0.0058*
Private investors	0.0895	0.0723	0.0619	0.0610	0.0171	0.0009

Panel-D. Different ownership structures in the second quadrant.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
SMABs	0.1672	0.1684	0.1180	0.1284	-0.0013	-0.0104
SOEs	0.0859	0.1018	0.0750	0.0626	-0.0159	0.0124
Private investors	0.0742	0.0942	0.0721	0.0777	-0.0200	-0.0056

Panel-E. Different ownership structures in the third quadrant.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
SMABs	-0.0868	-0.1068	-0.0664	-0.0879	0.0200	0.0215
SOEs	-0.0668	-0.0916	-0.0597	-0.0903	0.0248**	0.0306**
Private investors	-0.0670	-0.0870	-0.0595	-0.0745	0.0200*	0.0150*

Panel-F. Different ownership structures in the fourth quadrant.

Samples	Mean		Median		Mean difference	Median difference
	5th quintile	1st quintile	5th quintile	1st quintile		
SMABs	-0.0912	-0.0813	-0.0705	-0.0653	-0.0098	-0.0052
SOEs	-0.0631	-0.0960	-0.0532	-0.0819	0.0329**	0.0286***
Private investors	-0.0838	-0.0726	-0.0627	-0.0566	-0.0112	-0.0061

Table-3. Regression results of stock returns on capital expenditure growth

Panel A reports regression estimates. Panel B shows the results using the t-test for difference in means, and the Wilcoxon-Mann-Whitney test for differences in medians for regression estimates in different quadrants. ***, **, and * denote significance at the 1, 5, and 10% level, respectively. Coefficients and (t_value) are shown in the table.

Panel-A. Regression estimates for the whole sample and samples in different quadrants.

Variables	Whole sample	First quadrant	Second quadrant	Third quadrant	Fourth quadrant
Total asset growth	0.0010	-0.0116	0.0480	-0.0506	0.0162
	(0.31)	(-5.02)***	(8.15)***	(-6.64)***	(5.12)***
Log(book-market ratio)	0.0286	-0.0044	-0.0029	0.0664	0.0590
	(3.67)***	(-0.51)	(-0.39)	(8.31)***	(6.65)***
Log(firm size)	-0.0020	-0.0014	0.0006	-0.0057	-0.0023
	(-1.27)	(-0.90)	(0.44)	(-4.47)***	(-1.39)
Momentum	-0.0089	0.0069	0.0029	-0.0377	-0.0178
	(-1.16)	(0.99)	(0.43)	(-4.64)***	(-2.24)**
Intercept	0.0506	0.0682	0.0359	0.0856	0.0278
	(1.40)	(1.91)*	(1.08)	(2.69)***	(0.76)
N	132	132	132	132	132

Panel-B. Difference tests in different quadrants.

Quadrants	Mean		Median		Mean difference	Median difference
1 vs. 2	-0.0116	0.0480	-0.0058	0.0334	-0.0595***	-0.0392***
1 vs. 3	-0.0116	-0.0506	-0.0058	-0.0246	0.0391***	0.0188***
1 vs. 4	-0.0116	0.0162	-0.0058	0.0097	-0.0278***	-0.0155***
2 vs. 3	0.0480	-0.0506	0.0334	-0.0246	0.0986***	0.0579***
2 vs. 4	0.0480	0.0162	0.0334	0.0097	0.0317***	0.0237***
3 vs. 4	-0.0506	0.0162	-0.0246	0.0097	-0.0669***	-0.0343***

Table-4. Effect of ownership on the relation between stock returns on capital expenditure growth

This table shows the regression results for samples in different ownership structures. Panel A reports regression estimates. Panel B shows the results using the t-test for difference in means, and the Wilcoxon-Mann-Whitney test for differences in medians for regression estimates in different ownership structures. ***, **, and * denote significance at the 1, 5, and 10% level, respectively. Coefficients and (t_value) are shown in the table.

Panel-A. Regression estimates for samples in different ownership structures.

Variables	Firms controlled by state asset management bureaus (1)	State-owned enterprises (2)	Firms controlled by private investors (3)
Total asset growth	0.0004	0.0107	0.0021
	(0.03)	(1.48)	(0.35)
Log(book-market ratio)	0.0260	0.0347	0.0201
	(1.24)	(1.92)*	(1.80)*
Log(firm size)	-0.0053	-0.0026	-0.0017
	(-1.86)*	(-1.00)	(-0.78)
Momentum	-0.0140	-0.0321	-0.0056
	(-1.15)	(-1.40)	(-0.69)
Intercept	0.1181	0.0508	0.0482
	(1.99)**	(0.93)	(0.97)
N	132	132	132

Panel-B. Difference tests in different ownership structures.

Ownership Structures	Mean		Median		Mean difference	Median difference
(1) vs.(2)	0.0004	0.0107	-0.0006	0.0018	-0.0103	-0.0024
(1) vs.(3)	0.0004	0.0021	-0.0006	-0.0009	-0.0017	0.0003
(2) vs.(3)	0.0107	0.0021	0.0018	-0.0009	0.0086	0.0027

Table-5. Regression results for different ownership structures given different quadrants

This table shows the regression results for samples in different quadrant-ownership structure combinations. Panel A, C, E, and G report regression estimates. Panel B, D, F, and H show the results using the t-test for difference in means, and the Wilcoxon-Mann-Whitney test for differences in medians for regression estimates in different quadrants. ***, **, and * denote significance at the 1, 5, and 10% level, respectively. Coefficients and (t_value) are shown in the table.

Panel-A. Three ownership structures in the first quadrant.

Variables	Firms controlled by state asset management bureaus	State-owned enterprises	Firms controlled by private investors
Total asset growth	-1.3904	0.0373	-0.0184
	(-1.04)	(0.74)	(-2.21)**
Log(book-market ratio)	0.7684	-0.0389	-0.0066
	(1.04)	(-1.15)	(-0.48)
Log(firm size)	0.1062	0.0004	-0.0031
	(0.96)	(0.09)	(-1.16)
Momentum	-0.0211	-0.0164	0.0101
	(-0.42)	(-0.69)	(1.22)
Intercept	-2.2126	0.0265	0.1062
	(-0.95)	(0.30)	(1.80)*
N	132	132	132

Panel-B. Difference tests in different ownership structures in the first quadrant.

Ownership Structures	Mean		Median		Mean difference	Median difference
(1) vs.(2)	-1.3904	0.0373	-0.0173	-0.0103	-1.4277	-0.0069***
(1) vs.(3)	-1.3904	-0.0184	-0.0173	-0.0127	-1.3720	-0.0046***
(2) vs.(3)	0.0373	-0.0184	-0.0103	-0.0127	0.0557	0.0024

Panel-C. Three ownership structures in the second quadrant.

Variables	Firms controlled by state asset management bureaus	State-owned enterprises	Firms controlled by private investors
Total asset growth	0.0801	0.1426	0.0851
	(3.63)***	(4.05)***	(4.16)***
Log(book-market ratio)	0.0427	-0.0094	-0.0196
	(0.80)	(-0.21)	(-1.01)
Log(firm size)	-0.0006	-0.0100	0.0002
	(-0.14)	(-2.66)***	(0.09)
Momentum	-0.0159	-0.0171	0.0133
	(-0.61)	(-0.65)	(0.87)
Intercept	0.0424	0.2324	0.0416
	(0.45)	(3.03)***	(0.71)
N	132	132	132

Panel-D. Difference tests in different ownership structures in the second quadrant.

	Mean		Median		Mean	Median
Quadrants	(1)	(2)	(1)	(2)	difference	difference
1 vs. 2	0.0801	0.1426	0.0211	0.0504	-0.0626	-0.0293
1 vs. 3	0.0801	0.0851	0.0211	0.0436	-0.0051	-0.0226
2 vs. 3	0.1426	0.0851	0.0504	0.0436	0.0575	0.0068

Panel-E. Three ownership structures in the third quadrant.

Variables	Firms controlled by state asset management bureaus	State-owned enterprises	Firms controlled by private investors
Total asset growth	-0.2088	-0.0661	-0.0747
	(-1.39)	(-3.42)***	(-2.81)**
Log(book-market ratio)	0.0022	0.0045	0.0872
	(0.05)	(0.13)	(2.23)
Log(firm size)	0.0027	-0.0048	-0.0068
	(0.33)	(-1.29)	(-1.13)
Momentum	-0.0728	-0.0454	-0.0362
	(-1.02)	(-2.14)**	(-3.66)
Intercept	-0.1108	0.0873	0.1021
	(-0.57)	(1.03)	(0.87)*
N	132	132	132

Panel-F. Difference tests in different ownership structures in the third quadrant.

	Mean		Median		Mean	Median
Quadrants	(1)	(2)	(1)	(2)	difference	difference
1 vs. 2	-0.2088	-0.0661	-0.0319	-0.0384	-0.1427	0.0064
1 vs. 3	-0.2088	-0.0747	-0.0319	-0.0468	-0.1341	0.0149
2 vs. 3	-0.0661	-0.0747	-0.0384	-0.0468	0.0086	0.0084

Panel-G. Three ownership structures in the fourth quadrant.

Variables	Firms controlled by state asset management bureaus	State-owned enterprises	Firms controlled by private investors
Total asset growth	0.0001	0.0640	0.0275
	(0.00)	(3.11)***	(2.38)**
Log(book-market ratio)	0.0948	0.1028	0.0441
	(1.86)*	(3.59)***	(3.96)***
Log(firm size)	-0.0126	-0.0025	-0.0010
	(-1.11)	(-0.66)	(-0.33)
Momentum	-0.0245	-0.0502	-0.0145
	(-1.42)	(-2.34)**	(-1.53)
Intercept	0.2322	0.0005	0.0031
	(1.03)	(0.01)	(0.05)
N	132	132	132

Panel-H. Difference tests in different ownership structures in the fourth quadrant.

	Mean		Median		Mean	Median
Quadrants	(1)	(2)	(1)	(2)	difference	difference
1 vs. 2	0.0001	0.0640	0.0021	0.0223	-0.0640**	-0.0202**
1 vs. 3	0.0001	0.0275	0.0021	0.0092	-0.0274	-0.0071
2 vs. 3	0.0640	0.0275	0.0223	0.0092	0.0366	0.0131