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Research on Investment Efficiency and Its Influencing Factors of Iron and Steel Listing Company

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ABSTRACT

Iron and steel industry is one of the most serious duplicate construction industries, this paper reveals the micro basis of the repeated construction of the steel industry from the perspective of investment efficiency of iron and steel enterprises. This paper, based on the data of Chinese listed iron and steel company in 2010-2014, empirically tests its investment efficiency and influencing factors. The results show that over investment is consistent with inadequate investment in Chinese listed iron and steel company, and the overall performance is excessive investment. Among the influencing factors, investment opportunities, debt structure, government intervention, enterprise scale is positively related to over investment, and negatively related to the asset liability ratio.

I. Introduction

The iron and steel industry as the pillar of the national economy upstream raw material industry, is one of the most serious repeated construction industries. In April 2010, the State Council issued "the notice on further strengthening the elimination of backward production capacity, the steel industry is listed as the key area of governance. Overcapacity leads to the continued decline in steel prices, difficulties in business production and operation, the sharp falling of the overall efficiency of the industry. The China Iron and Steel Association statistics show that the steel composite price index falls down from 135.93 at the end of December in 2011 to 77.13 at the end of January in 2015, falling more than 40%. How to get rid of this excessive expansion of the cycle, has become an important problem restricting the healthy development of the iron and steel industry, also has a typical significance in the governance of duplicate construction and overcapacity problems. This paper takes the China's iron and steel listing Corporation as a sample, empirically testing the investment efficiency and its influencing factors of the listed iron and steel company, so as to revealing the micro basis of repeated construction of the iron and steel industry.

II. LITERATURE REVIEW

The traditional enterprise investment theory is mainly based on information asymmetry and principal agent theory, considering the special system background of transition economy, and government intervention has become an important factor affecting enterprise investment. In summary, based on the perspective of rational assumption of the management, corporate investment efficiency research gradually forms three kinds of theories of "financing constraints", "agency cost" and "government intervention".

The enterprise investment theory, based on financing constraints hypothesis, believes that the raise of financing constraints is mainly because of the capital market in the presence of asymmetric information and the resulting adverse selection and moral hazard makes the enterprise in the face of external financing needs to pay higher financing costs. Greenwald (1984) research on the reverse selection of enterprise investment under the asymmetric information, and find that the cost of financing is higher than the internal financing in the process of equity financing. From the perspective of the moral risk research, Jensen and Meckling believe that in the investment activities of the enterprises, lenders often bear more risk compared to the shareholders, if creditors expect this risk, they will improve the corresponding rate of return, which also makes the enterprise external financing costs rise. Li Jin et al. (2007) select the listed Corporation as a research sample in 2002-2004, and finding that the financing constraints of the company show significant positive cash flow sensitivity. Lian Yujun (2008) uses the generalized matrix estimation method to carry on the empirical test to the non investment efficiency of our country's listed Corporation, and the test results support the financing constraint hypothesis.

Based on the agency cost hypothesis, the theory of enterprise investment believes that the agency conflict can lead to inefficient efficiency. The study of Jensen (1986) believes that managers will use internal funds available for investment based on self-interest motives, business investment will increase with the increase of free cash flow. Hart and Moore (1995) assume that the manager's personal income is proportional to the company's investment expenditure. By constructing model based on accounting metrics, Richardson (2006), uses it to estimate normal business capital investment levels, and use the regression residuals of the model as a proxy variable of excessive investment and insufficient investment, in order to investigate the effect of free cash flow on over investment. Zhong Haiyang et al. (2010) find that under the background of "ownership phantom", the executives of state-owned enterprises with actual control right, often acquire benefits of control through excessive investment, the management agent layer is one of the important reasons causing the over investment in state-owned enterprises.

Based on the special institutional environment of China's transition economy, government intervention has become an important factor affecting the investment of enterprises. La Porta (1998) considers that the problem of inefficient investment of enterprises is not only the problem of corporate financial decisions; it is largely rooted in the imperfect institutional arrangements. Yang Huajun and Hu Yiming (2007) study that, multiplex target system, budget soft constraint, manager appointment mechanism and rigid wage controls of state-owned enterprises, can stimulate the managers in the state-owned enterprises engaged in over investment behavior. Cheng Zhongming (2008) studies that the local government intervention distorts the company's investment behavior, weakening the effect of the controlling share holder governance over investment. Zhang Honghui(2010) and Tang Xuesong etc. (2010), argue that the local government in order to achieve stable employment, increase tax revenue and GDP growth target, will intervene in the state-owned enterprises under its control, guide the state-owned enterprises to over invest.

III. RESEARCH DESIGN

A. Variable Interpretation and Measurement

(1) Explained variable Investment expenditure (i). As used herein, the cash flow statement "building the fixed assets, intangible assets and other long-term assets to pay" as a measure of investment spending, when calculated by dividing the net value of fixed assets at the beginning.

(2) Investment opportunity (FQ). In this paper, we construct the proxy index of investment opportunity- the benchmark Q, and we will use the index to measure the investment opportunity.

(3) Free cash flow (flow). Cash flow uses the annual reports of listed companies from operating activities net cash flow balance to measure, and is different from common free cash flow measure method (listed company net profit + depreciation of fixed assets and other assets amortization).

(4) Control variable asset liability ratio (lev). Total liabilities of listing Corporation/ assets. Operating growth rate (yy), the year growth rate of the main operating income of the annual report.

(5) Debt structure (mat). Because companies are prone to excessive investment in the case of free cash flow, we use long-term liabilities / total liabilities to represent the debt structure.

(6) Government intervention index (gov). We use the government intervention index calculated by Fang Gang, etc. (2007) on behalf of local government intervention of the power enterprises, the greater the index, the smaller the local government intervention in the economy.

(7) Enterprise scale (size). Here we use the natural logarithm of the total assets of the listed corporation.

(8) Ownership structure. In which the proportion of the first largest shareholder ($n1$) presents the degree of concentration of ownership, and in addition to the largest shareholder, taking the ratio of the top five shareholders and the first largest shareholder equity ratio ($n5n1$) as the balance of ownership.

B. Model Design

Investment efficiency model to measure the efficiency of the investment listing Corporation, first of all, it needs to determine the optimal investment scale, and then use the actual investment to subtract the optimal investment will be the amount of no efficiency investment. Hayashi (1982) assumes under the conditions of perfect capital market that, the optimal investment expenditure of the enterprise depends on the investment opportunity; the model can be summarized as follows:

$$I_{it} = \beta_0 + (1/\alpha)_{it} + \varepsilon_{it} \quad (1)$$

Where, I_{it} is investment spending, $1/\alpha$ is the coefficient for capital adjustment, Q_{it} represents investment opportunities, it is a random disturbance term, representing the no efficiency investment of the enterprises. Tobin Q ratio as a proxy indicator of investment opportunities, Tobin Q ratio is defined as the ratio of the market value of the company's assets and book value. Adjusting the cost of a unit of investment and the purchase cost is equal to the shadow price of the capital, and the shadow price is called "the marginal Q", which represents the discounted value of the expected return of the new capital.

C. Construction of Investment Opportunity Proxy Index

Hayashi (1982) pointed out that, when meeting a number of specific conditions, the marginal Q and the average Q can be treated as equivalent. For China's listed Corporation, due to the stock market non efficiency and equity division problem, with the average Tobin Q instead of marginal Q will have a serious measure of error. Therefore, this paper constructs the benchmark Q as proxy indicators of investment opportunities. Marginal Q represents the value of a new unit of capital that will bring future marginal returns, namely is

$$E[q_{it} | \Omega_{it}] = \sum_{s=1}^{\infty} \lambda^s E[\pi_{it+s} | \Omega_{it}] \quad (2)$$

Where, E q_{it} it is the marginal Q, λ is the discount; s is the profit margin. To estimate the marginal Q value, then you must set the margins λ and ensemble of communication it . Where, it may be constituted by a set of variables reflecting the company's profitability linear combination, that is λ it b x_{it} . In which b is a constant vector that contains only 0 and 1, and x_{it} is a set of variables helping predict future capital marginal profitability. This article will set λ it 0 it , S_{it} , in which 0 it it and S_{it} representing the company's profits respectively- sales and capital ratios - capital ratio. In addition, providing that x_{it} is a stationary random process, and subject to the following procedure:

$$x_{it} = Ax_{it-1} + \eta_i + \gamma_i + \mu_{it} \quad (3)$$

Where, A is coefficient matrix, x_{it-1} is a second order lag of x_{it} , η_{it} is a random disturbance, and providing that it has no difference with x_{it} . In addition, we assume that companies make investment decisions based on the current financial situation, namely, it only contains the current value. Therefore, the following companies:

$$E[x_{it+s} | x_{it}] = A^s x_{it} \quad (4)$$

Taking formula (4) into (2) to

$$\begin{aligned}
 E[q_{it} : \Omega_{it}] &= \sum_{s=1}^{\infty} \lambda^s E[\pi_{it+s} : \Omega_{it}] \\
 &= \sum_{s=1}^{\infty} \lambda^s E[b' X_{it+s} : X_{it}] \tag{5} \\
 &= \sum_{s=1}^{\infty} b' \lambda^s A^s X_{it} = b' (I - \lambda A)^{-1} \lambda A X_{it}
 \end{aligned}$$

We marginal Q referred to as “reference Q”, abbreviated as FQ, $FQ_{it} = b'(I - \lambda A)^{-1} \lambda A X_{it}$ Where, $b = (1, 0)'$ I is matrix. Discount factor $\lambda = 1 / (1 + r)$ depreciation rate δ takes 12.5%, bank lending rate r takes 6%, therefore 0.8. It is worth noting that the use of profits and sales income information of the company in the process of constructing reference Q, this information can help predict a new unit of capital gains arising from the investment. Therefore, FQ is an ideal investment opportunity proxies.

D. Sample Selection and Data Sources

This paper selects our China’s Shanghai and Shenzhen and A-share listed steel companies for the study from 2010 to 2014. To ensure reliable and effective empirical results, make the following choices to the sample enterprises: selecting the sample steel enterprises only in the A-share market, while excluding H or B shares listed steel companies; removing the sample period ST and PT types of financial situation occurs of the steel companies; excluding the iron and steel enterprises of data missing or abnormal. After screening, we have 24 listed companies in 2010 - 2014 within the sample interval of 120 companies - year observations. In this paper, data comes from the Shenzhen GTA and WIN financial database.

IV. POSITIVE TEST

A. Variable descriptive statistics

We selected sample descriptive statistical analysis, and the results shown in table 1.

Table I
Descriptive statistics of variables

Variable	Observed Value	Average Value	Standard Deviation	Minimum Value	Maximum Value
Investment	120	0.347	0.43	0.001	2.346
Business Growth Rate	120	0.226	0.738	-0.182	1.735
Asset-liability Ratio	120	0.619	0.175	0.175	0.916
Debt Structure	120	0.378	0.256	0.091	0.813
Government Intervention Index	120	7.364	2.787	2.35	13.47
Enterprise Scale	120	8.945	0.534	8.205	11.504
Free Cash Flow	120	0.159	0.119	-0.347	0.714

B. The measure of investment efficiency

Assuming that there is no information asymmetry and agency cost problems, then the optimal investment is decided by the investment opportunity. Therefore, we estimate the optimal investment expenditure of the enterprises by the model (1), and then get the corresponding non efficiency investment (in which the positive values indicate excessive investment, a negative number indicates insufficient investment). From table 2 we can see that, from 2010 to 2014, On the whole, the average value of the non efficiency investment in the listed steel and iron Corporation is declining, for instance in 2010, 2011 and 2012, there is serious over investment, while in 2013 and 2014 the degree of over investment slows down. From the point of view of the number of non efficiency investment enterprises, from 2010-2014, in general there are over 2/3 of listed iron and steel companies exist over investment, in which the state-owned listed enterprises occupy a large proportion. Therefore, in general, the sample listed corporation is in a state of over investment.

Table2
The distribution of no efficiency investment in listed iron and steel company

	Mean Value	Over Investment	Mean Value	Insufficient	Mean Value
2010	0.341	18	0.486	6	-0.085
2011	0.323	17	0.395	7	-0.106
2012	0.305	16	0.356	8	-0.097
2013	0.296	16	0.349	8	-0.117
2014	0.287	14	0.33	10	-0.142
total	0.31	81	0.383	39	-0.109

The descriptive statistics of the actual investment and the optimal investment of sample iron and steel listed corporation are as shown in table 3. As can be seen from the table 3, if there is no information asymmetry and external financing constraints, then the optimal investment ratio of listed iron and steel company is the initial fixed assets of 34.7%. However, there is a problem of asymmetric information and agency problems in reality, 81 companies over investment yearly, and higher than the average optimal investment rate 43.5%, also 39 companies’ annual investment is insufficient, lower than the average optimal investment 15.7%.

Table3
Descriptive statistics of real investment and optimal investment

Items		Observed Numbers	Mean Value	Standard Deviation	Minimum Value	Maximum Value
Actual investment	Full sample	120	0.347	0.431	0.001	2.346
	Positive residual group	81	0.662	0.494	0.247	2.346
	Negative residual group	39	0.143	0.083	0.001	0.269
optimal investment	Full sample	120	0.307	0.097	0.182	1.132

C. Influencing Factors of Inefficient Investment

Based on the above test results, this paper uses the logistic model to study the impact of enterprise size, debt structure and government intervention on the efficiency of investment in listed corporation. In this paper, the insufficient investment sample assignment is 0, and the over investment sample assignment is 1. The regression analysis results are shown in table 4. The test results show that the investment opportunities, debt structure, enterprise scale, enterprise free cash flow and the government intervention index are positively correlated to the over investment of listed iron and steel companies, asset liability ratio, the largest shareholder shareholding ratio are negatively correlated to the over investment of the listed iron and steel companies.

Table 4
Logistic regression results of no efficiency investment in the listed iron and steel company

	(1)	(2)	(3)	(4)	(5)
	model1	model2	model3	model4	model5
Investment opportunity	10.74** (2.04)	10.98** (2.17)	11.81** (2.36)	10.55** (2.29)	11.35** (2.34)
Asset liability ratio	-1.54 (-1.21)	-2.57* (-1.85)	-2.51* (-1.83)	-2.69** (-2.12)	-1.472 (-1.17)
Debt structure	1.619* (1.87)	1.549* (1.75)	1.537* (1.73)	1.669* (1.87)	1.634* (1.85)
Government intervention index	0.105* (1.73)	0.154** (2.39)	0.151** (2.38)	0.159** (2.47)	0.107* (1.74)
Enterprise scale	1.209*** (3.76)	1.643*** (4.17)	1.626*** (4.01)	1.481*** (4.21)	1.201*** (3.68)
Free cash flow of enterprise	0.773 (0.51)	0.879 (0.59)	0.918 (0.61)	0.938 (0.63)	0.759 (0.51)
Largest shareholder		-2.211* (-1.93)	-3.353 (-0.71)		
Sample number	120	120	120	120	120

Note : a.*, **, *** are respectively shown in 10%, 5%, 1% with significant level b. The numerical value in bracket is Z statistic.

V. CONCLUSIONS AND POLICY IMPLICATIONS

The research results show that the no efficiency investment exists in China's iron and steel listed Corporation, with the coexistence of excessive investment and insufficient investment, and the overall performance is over investment. In the no efficiency investment factors of the listed iron and steel companies, investment opportunities, debt structure, the scale of enterprises, the government intervention and free enterprise cash flow are positively correlated to steel listed companies over investment, the asset liability ratio, the largest shareholder ownership are negatively correlated to the over investment of the listed iron and steel companies. In view of the research conclusion, it can obtain the following policy implications: firstly, deepening the market-oriented reform of the state-owned enterprises, reducing the local government administrative intervention, to play the market regulation mechanism affecting corporate investment scale. Secondly, actively prevent excessive investment in state-owned iron and steel enterprises in the continuous accumulation of debt risk. Debt structure, company size and excessive investment are in positive correlation, and over investment brings the sharply rise of the debt, and the high rate of assets and liabilities, increasing the uncertainty of the operation of enterprises, and ultimately affecting the business performance. Thirdly, changing the dominant position of state-owned enterprises to encourage private capital to enter, achieving diversification of investment entity, improving the financing support of private steel enterprises. Fourthly, in the long run, to improve the investment efficiency of the listed iron and steel company, eliminate the blind investment in state-owned steel listing Corporation, it should further improve the shareholding structure of listed iron and steel company. For the existence of the "Owner-less" problem, we need to improve the corporate governance mechanism to solve the problem.

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