

Stock Liquidity and Corporate Investment Efficiency

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Abstract: For a long time, investment has played a key role in stimulating the economic growth of our country, but the low investment efficiency of listed companies has hindered listed companies from entering the stage of high-quality development. With the reform of financial market and the rapid development of China's capital market, the impact of capital market on the investment efficiency of listed companies has been paid more and more attention. Relevant studies have shown that stock liquidity can have an obvious effect on internal factors such as stock price information content, agency cost, management compensation incentive, etc., and then can have a certain effect on its investment efficiency. This paper selects A-share non-financial listed companies from 2013 to 2022 for empirical test, and finally draws a relatively robust conclusion: stock liquidity has a promoting effect on enterprise investment efficiency.

Keywords: Stock liquidity, Investment efficiency, Overinvestment, Underinvestment, Empirical test.

1. Introduction

Enterprise investment connects financing and capital allocation, determines the future cash flow and profit level, and forms the basis for the growth of micro-entities. In addition, investment, together with consumption and import and export, constitutes the troika that drives economic growth and becomes the engine of macro-economy, which greatly affects the operation of macro-economy. However, in recent years, a series of studies have shown that the investment efficiency of listed companies in China is generally not high, and there are widespread phenomena of under-investment and over-investment. Private enterprises and large local state-owned enterprises have over-invested, while China's smes have under-invested due to many constraints (Luo Qi et al., 2007). Extensive industries of traditional industries represented by real estate, steel, coal and other industries have experienced excessive investment (Zhu Xiwei et al., 2017). In view of the fact that China's economy is investment driven for a long time, the prevalence of inefficient investment will seriously hinder the steady and healthy development of the economy. Therefore, restraining over-investment, alleviating under-investment and improving the efficiency of capital allocation have become practical problems that need to be studied and solved urgently.

The factors that affect the investment efficiency of listed companies mainly include three aspects: cash flow, principal-agent relationship and information asymmetry. First of all, when the cash flow available for investment projects is abundant, the management may invest the abundant cash flow in the investment projects with negative net present value due to overconfidence or taking advantage of the investment projects for their own profit, resulting in the investment scale being blindly expanded. In the face of cash flow shortage, the lack of funds causes the company to give up the investment projects with high profits in the future, resulting in insufficient investment (Xie Zhong and Kong Lingxiang, 2018). Secondly, due to the principal-agent relationship, the company is prone to over-investment. The management expands the company scale by increasing investment projects, and then negotiates salary with the company based on the company scale. After expanding the company scale, on-the-job consumption can be increased. Finally, China's capital

market is still not perfect, and the information transmission and information feedback mechanism need to be further strengthened. Chen Yunsen and Huang Jianqiao (2019) found that the opening of China's A-share stock market can significantly improve the internal information quality of companies, improve the accuracy of analysts' forecasts, and thus improve the investment efficiency of listed companies.

Stock liquidity is one of the important indicators to measure the microstructure of capital market, so this paper studies whether the capital market can improve the investment efficiency of listed companies from the perspective of stock liquidity. The speed and difficulty of equity trading in capital market can be reflected by the level of stock liquidity, which is the basis for capital market to play its function of resource allocation. Most studies believe that stock liquidity can increase the information content of stock price of listed companies, reduce the principal-agent cost and improve the sensitivity of management compensation to stock price. This indicates that stock liquidity has many positive impacts on the internal governance of listed companies, but can improving stock liquidity further promote the improvement of investment efficiency of listed companies? This paper will try to explore it through the method of empirical analysis.

2. Literature Review

2.1. Factors Affecting Investment Efficiency

At the micro level, a large number of researches and literatures have shown that the factors affecting investment efficiency mainly include information asymmetry, principal-agent cost, financing constraints and management characteristics:

Firstly, in terms of the impact of information asymmetry on the investment efficiency of enterprises, Myers and Majluf (1984) pointed out that the information asymmetry inside and outside an enterprise will increase its financing cost, and then cause the under-investment of enterprises with insufficient capital. Corporate efficiency will be improved with the improvement of corporate information quality. Chen et al. (2007) showed that a company's information environment would also affect its investment efficiency. The management could obtain meaningful information from the company's

stock price information and integrate it into the company's investment. Zhong Ma (2015) found that after listed companies are forced to disclose social responsibility information, their investment efficiency will be significantly improved. Yu Wenchao et al. (2020) also found that the disclosure of government information can significantly improve the investment efficiency of enterprises, which is more effective for non-state-owned enterprises and listed companies in regulated industries.

Secondly, principal-agent aspects: excessive speculative activities will produce serious agency problems and reduce the investment efficiency of the company. Agency conflict causes enterprise investment to deviate from the optimal investment level, resulting in inefficient investment (Stulz, 1990; Zwiebel, 1996). Jensen (1986) believed that the agency problem between the principal and the agent was the main reason for the negative net present value of the agent's investment projects. Verdi (2006) believes that the impact of agency problems on investment efficiency may lead to both over-investment and under-investment. When the agency problem is serious, in order to satisfy its own interests and pursue short-term benefits of the enterprise, the management may often abandon investment projects with positive net present value, resulting in insufficient investment of the enterprise. As a result, external investors are not optimistic about the operating performance of the company, reducing the willingness of external investors to provide funds for the company, and raising the financing cost of the company. Cause the company to underinvest.

Finally, in terms of financing constraints, the empirical test of Yu Kun et al. (2014) found that frequent monetary policy stimulus would expand the difference in capital supply between state-owned enterprises and non-state-owned enterprises. Specifically, state-owned enterprises continue to obtain supportive loan subsidies, which will inevitably lead to a corresponding run on the loan resources of non-state-owned enterprises, and financing constraints will continuously reduce the investment efficiency of non-state-owned enterprises, resulting in insufficient investment. Deng Lu et al. (2017) found that excess bank loans would encourage companies to over-invest, and the self-interested behavior of management would aggravate such over-investment. According to the research of Su Fang and Chu Liping (2017), China's financial industry has a serious over-investment situation, especially the debt funds are especially abnormal.

2.2. Stock Liquidity and Corporate Investment Efficiency

The existing literature shows that stock liquidity can promote the investment efficiency of enterprises, but there are different opinions on its influence mechanism. Gu Naikang and Chen Hui (2010) found that stock liquidity improved the investment level of enterprises. Xiong Jiakai and Su Dongwei (2014) found through empirical studies that stock liquidity can help improve the investment efficiency of a company, and stock liquidity can improve the investment efficiency of a company through three intermediaries: financing constraint, principal-agent and stock price information content. Sun Jingwen et al. (2019) empirically found that institutional investors have a complete intermediary effect between stock liquidity and investment efficiency, and this intermediary effect in private enterprises is regulated by the heterogeneity of institutional investors. This paper holds that information asymmetry and principal-agent problem are the main

influence channels of stock liquidity to improve the investment efficiency of enterprises. In terms of alleviating information asymmetry, the improvement of stock liquidity can increase the information content of stocks, and affect the investment behavior of enterprises through the information feedback of stock prices. When stock liquidity rises, investors trading stocks will have less impact on stock prices, and informed traders will be motivated to dig out more characteristic information (Su Dongwei et al., 2013). The trading behavior of institutional investors can integrate more characteristic information into the company's stock price. Since professional investors' professional ability and analytical technology can fully reflect the economic information, they have mastered, their trading behavior reflects the change of information and adds effective information to the underlying stocks. Such effective information feedback effect can increase the investment behavior of enterprises (Bennett et al., 2020). From the perspective of the principal-agent relationship, the improvement of stock liquidity helps to enhance the supervisory power of enterprises, and the external supervision and governance function helps to reduce managers' irrational investment behaviors and effectively alleviate the principal-agent problem (Liang Hongyu et al., 2012), thus promoting the investment efficiency of enterprises. Based on the above theoretical analysis, this paper proposes the following hypotheses:

Hypothesis H: The improvement of stock liquidity can promote the investment efficiency of enterprises.

3. Empirical Framework

3.1. Sample Selection and Data Sources

This paper selects the data of China's A-share listed companies from 2013 to 2022 to study the correlation between stock liquidity and corporate investment efficiency. All the data in this paper are from the China Stock Market & Accounting Research Database, and the data are preliminarily processed as follows:

- (1) All financial listed companies are excluded because their capital structure and operating conditions are quite different from those of other industries;
- (2) Data with asset-liability ratio greater than 100% are excluded, which indicates that the company is insolvent and has greater operational risks;
- (3) The data of all listed companies in the year of IPO were excluded, because the stock liquidity of companies in the year of listing was too volatile;
- (4) Eliminate all listed companies labeled "ST", "*ST" and "PT" because they have serious operational problems and are at risk of delisting;
- (5) Obviously abnormal data are eliminated.

3.2. Variable Definitions

3.2.1. Measures of investment efficiency

In this paper, Richardson (2006), Xu Qian (2014), Chen Xiaodong et al. (2016), Li Wenwen et al. (2020) were used to measure the investment efficiency of a company to establish a model:

$$Inv_t = \alpha_0 + \alpha_1 Growth_{t-1} + \alpha_2 Lev_{t-1} + \alpha_3 Cash_{t-1} + \alpha_4 Age_{t-1} + \alpha_5 Size_{t-1} + \alpha_6 Ret_{t-1} + \alpha_7 Inv_{t-1} + \Sigma Industry + \Sigma Year + \varepsilon \quad (1)$$

Where: Inv_t : t The company's actual new investment

expenditure in year t = total investment - maintenance investment = cash paid for the purchase and construction of fixed assets, intangible assets and other long-term assets + net cash paid for the acquisition of subsidiaries and other operating units - Net cash recovered from the disposal of fixed assets, intangible assets and other long-term assets - net cash received from the disposal of subsidiaries and other operating units - (depreciation of fixed assets + amortization of intangible assets + amortization of long-term unamortized expenses) / Total assets at the beginning of the year. $Growth_{t-1}$: represents the growth opportunity of the company in the year $t-1$, expressed by the growth rate of operating revenue; Lev_{t-1} : represents the financial leverage ratio of the company in $t-1$ year, expressed by the asset-liability ratio; $Cash_{t-1}$: represents the company's cash flow situation in year $t-1$, using the net cash flow generated by operating activities/total assets at the beginning of the year; Age_{t-1} : indicates the age of the company in $t-1$, expressed by the listing years = observation year - IPO year; $Size_{t-1}$: indicates the size of the company's assets in $t-1$ year, expressed by the natural logarithm of the total assets; Ret_{t-1} : represents the company's stock return rate in year $t-1$, expressed by the annual return rate of individual stocks taking into account the reinvestment of cash dividends; Inv_{t-1} : indicates the new investment expenditure in year $t-1$. $\sum Industry$: indicates industry dummy variable. Based on the 2012 industry standard of China Securities Regulatory Commission (CSRC), the prefix "C" of manufacturing industry is 2 bits, and that of other industries is 1 bit, for industry classification. $\sum Year$: represents the year dummy variable; ε : represents the residual of the model.

The absolute residual value derived from model (1) is used to represent the non-investment Efficiency of listed companies (represented by $Inveff$), which is an inverse indicator of investment efficiency. Therefore, in the subsequent empirical test, the inverse number of $Inveff$ is used for empirical test (Efficiency).

3.2.2. Measures of stock liquidity

In this paper, Amihud illiquidity index is selected to measure stock liquidity:

$$ILLIQ_{i,t} = 10^8 * \frac{1}{D_{i,t}} * \sum \frac{|R_{i,t,d}|}{VOL_{i,t,d}} \quad (2)$$

Where: $D_{i,t}$: indicates the effective trading days of stock i in year t ; $R_{i,t,d}$: indicates the daily return rate of stock i on day d of year t considering the cash dividend reinvestment; $VOL_{i,t,d}$: the daily transaction amount of stock i on day d of year t (unit: RMB million).

The larger the value of illiquid indicator $ILLIQ$ is, the greater the change in return rate caused by trading volume per unit and the lower the Liquidity of the stock, which is a reverse indicator of stock liquidity. Therefore, in the subsequent empirical test, the negative number of $ILLIQ$ is used for empirical test (Liquidity).

3.2.3. Control variable

In this paper, the control variables of five aspects (company size, profitability, solvency, growth ability and management characteristics) are selected. Company Size (Size): it is the natural logarithm of the total assets of the listed company at the end of the period after adding one; Profitability: expressed as return on equity (ROE), which is a company's net profit after tax divided by its net assets; Solvency: expressed by the asset-liability ratio (Lev) and the current ratio (Ldr), the asset-

liability ratio is equal to the total liabilities divided by the total assets, the current ratio is equal to the current assets divided by the current liabilities; Growth ability: expressed by the operating revenue growth rate (Growth); Management characteristics: expressed by the ratio of two part-time directors (Dual) and independent director ratio (Indep). When the chairman and general manager are the same, the Dual is 1; otherwise take 0. The independent director ratio is equal to the number of independent directors divided by the total number of directors.

Table 1. Definition of variables

| Property of variable | Variable symbol | Calculation mode |
|----------------------|-----------------|---|
| Explained variable | Efficiency | Defined in 3.2.1 |
| Explanatory variable | Liquidity | Defined in 3.2.2 |
| Control variable | Size | Ln (Ending total assets+1) |
| | ROE | Net profit/net assets |
| | Lev | Ending total liabilities/total assets |
| | Ldr | Current assets/current liabilities |
| | Growth | Annual operating income growth rate |
| | Dual | The chairman who is also the general manager takes 1, otherwise takes 0 |
| | Indep | Number of independent directors/Total number of board members |

3.3. Model Setting

In order to test the hypothesis, this paper draws on the studies of Xiong Jiakai and Su Dongwei (2014), Wen Jun and Feng Genfu (2021), and sets up a dual fixed effect model to test and study the relationship between stock liquidity and corporate investment efficiency:

$$Efficiency_{i,t} = \beta_0 + \beta_1 Liquidity_{i,t} + \beta X_{i,t} + \varepsilon_i + \varepsilon_t + \mu_{i,t} \quad (3)$$

Where: $Efficiency_{i,t}$ represents the investment efficiency of company i in year t ; $Liquidity_{i,t}$ indicates the stock liquidity of company i in year t ; $X_{i,t}$ represents the set of control variables, including company Size (Size), return on equity (ROE), asset-liability ratio (Lev), current ratio (Ldr), operating revenue growth rate (Growth), the ratio of two part-time directors (Dual) and independent director ratio (Indep). ε_i indicates the individual fixed effect; ε_t indicates the time fixed effect; $\mu_{i,t}$ represents the random disturbance term.

4. Conclusion

4.1. Descriptive Statistics and Correlation Analysis

STATA17 was used for all data processing and empirical processes in this paper. As shown in Tabel 2, descriptive statistics are made for the main variables in the paper. In terms of explained variables, the mean value of the index Efficiency, which measures the investment efficiency of listed companies, is -0.0368, the standard deviation is 0.0542, and the minimum value is -0.95, indicating that the investment efficiency of different companies varies greatly. In terms of explanatory variables, the mean value of the stock liquidity index (Liquidity) is -0.0392, the standard deviation is 0.109, the

minimum value is -6.169, and the maximum value is -0.0002, indicating that the stock liquidity of different companies varies greatly. The average growth rate of business income is 0.538, indicating that the listed companies in our country are in the rapid growth stage during the study period, which is consistent with the economic development stage of our country, and the listed companies may have low investment efficiency due to insufficient funds.

Table 2. Descriptive statistics of primary variables

| | (1) | (2) | (3) | (4) | (5) |
|------------|--------|---------|--------|---------|-----------|
| VARIABLES | N | mean | sd | min | max |
| Efficiency | 17,090 | -0.0368 | 0.0542 | -0.950 | -6.20e-07 |
| Liquidity | 17,090 | -0.0392 | 0.109 | -6.169 | 0.000201 |
| Size | 17,090 | 22.66 | 1.339 | 18.93 | 28.64 |
| ROE | 17,090 | 0.0450 | 0.468 | -45.74 | 2.778 |
| Lev | 17,090 | 0.443 | 0.197 | 0.00797 | 1.037 |
| Ldr | 17,090 | 2.197 | 2.954 | 0.0794 | 144.0 |
| Growth | 17,090 | 0.538 | 5.077 | -11.68 | 434.6 |
| Dual | 17,090 | 0.223 | 0.416 | 0 | 1 |
| Indep | 17,090 | 0.376 | 0.0574 | 0 | 0.800 |

Table 3 makes correlation analysis of core variables in the model to check whether there are serious multicollinearity problems in the regression model. We can observe from the table that the stock liquidity (Liquidity) is positively correlated with the corporate investment efficiency (Efficiency) at the level of 1%, that is, the greater the stock liquidity, the higher the investment efficiency of the company, which can preliminarily verify the hypothesis H in this paper.

Table 3. Correlation coefficient matrix

| | Efficiency | Liquidity | Size | ROE | Lev | Ldr | Growth |
|------------|------------|-----------|-----------|-----------|-----------|----------|--------|
| Efficiency | 1.000 | | | | | | |
| Liquidity | 0.062*** | 1.000 | | | | | |
| Size | 0.071*** | 0.168*** | 1.000 | | | | |
| ROE | -0.014* | 0.013* | 0.051*** | 1.000 | | | |
| Lev | 0.055*** | 0.042*** | 0.505*** | -0.092*** | 1.000 | | |
| Ldr | -0.014* | -0.025*** | -0.250*** | 0.020*** | -0.476*** | 1.000 | |
| Growth | -0.153*** | -0.021*** | 0.021*** | 0.008 | 0.046*** | -0.004 | 1.000 |
| Dual | -0.049*** | -0.010 | -0.134*** | -0.021*** | -0.084*** | 0.070*** | -0.000 |
| Indep | -0.006 | -0.001 | 0.044*** | -0.005 | 0.013* | 0.008 | 0.000 |
| Dual | | | | | | | |
| Indep | | | | | | | |
| Dual | 1.000 | | | | | | |
| Indep | 0.104*** | 1.000 | | | | | |

4.2. Baseline Results

In this paper, the Two-way fixed effects model is first used to test hypothesis H. The explained variable is Efficiency, which represents the investment efficiency of listed companies. The larger the value, the higher the investment efficiency. The baseline results are shown in Table 4: Explanatory variable is the stock liquidity index (Liquidity), and its regression coefficient on the investment Efficiency of listed companies is 0.020, which has a significant positive correlation at 5% level. Hypothesis H is verified, indicating that the increase of stock liquidity is conducive to improving the investment efficiency of listed companies.

Table 4. Baseline results

| VARIABLES | (1) |
|--------------|---------------------------------|
| Liquidity | Efficiency 0.020** (2.13) |
| Size | -0.016*** (-7.73) |
| ROE | -0.002 (-1.34) |
| Lev | 0.005 (0.61) |
| Ldr | 0.000** (2.26) |
| Growth | -0.002*** (-5.08) |
| Dual | -0.001 (-0.31) |
| Indep | -0.003 (-0.17) |
| Constant | 0.320*** (6.84) |
| Observations | 17,090 |
| Number of id | 1,709 |
| R-squared | 0.079 |
| id FE | YES |
| year FE | YES |

4.3. Robustness Test

4.3.1. Replace the explained variable

For the explained variable investment Efficiency, this paper changes the measurement of Growth in model (1) for calculating regression residual from the growth rate of operating income to Tobin's Q, and recalculates the regression residual, using the absolute value of the new regression residual to take the opposite number as the measure of investment efficiency level (Effi2). As shown in (1) of Table 5, after replacing the explained variable, the coefficient before explanatory variable Liquidity was 0.038, which was significant at 5% level, indicating a positive correlation between stock liquidity and investment efficiency, which was consistent with the previous conclusion and further verified hypothesis H.

4.3.2. Measures of stock liquidity

For the explanatory variable stock liquidity (Liquidity), the original illiquid indicator Amihud is replaced by the bid-ask spread Roll indicator, which is an indirect measure of effective spread and is calculated as follows:

$$Roll_{i,t} = \begin{cases} 2\sqrt{-cov(\Delta P_t, \Delta P_{t-1})}, & \text{If } cov(\Delta P_t, \Delta P_{t-1}) < 0 \\ 0, & \text{If } cov(\Delta P_t, \Delta P_{t-1}) \geq 0 \end{cases} \quad (4)$$

Where: P_t : indicates the daily return rate of stock i in the t cycle, considering the cash dividend reinvestment; $cov(\Delta P_t, \Delta P_{t-1})$: represents the first-order difference series covariance of the daily return rate of stock i considering cash dividend reinvestment during the t period. The greater the value of this index, the lower the liquidity of the stock, so the inverse number (Roll) is also used to perform regression in testing the hypothesis.

(2) of Table 5 shows the regression results after the replacement of explanatory variables. The coefficient before

explanatory variable Roll is 0.128 and is significant at the 1% level, indicating a positive correlation between stock liquidity and investment efficiency, which is consistent with the conclusion above and further verifies hypothesis H.

4.3.3. Measures of stock liquidity

In the sample time series of this paper, there exists an important domestic financial shock - the stock market crash in China in 2015. After the impact of major adverse financial events, the stock liquidity level of enterprises may be depleted, and ignoring such factors will easily cause some endogenous interference. Therefore, the financial crisis factor is removed in the following, that is, the sample of enterprises from 2016 to 2018 is deleted and then the regression is carried out again.

(3) of Table 5 shows the regression result after excluding the impact of stock market crash. The coefficient of explanatory variable is 0.020, which is significant at the 10% level. The core conclusion "the improvement of stock liquidity has a promoting effect on the investment efficiency of enterprises" has not changed.

Table 5. Robustness tests

| VARIABLES | (1) Effi2 | (2) Efficiency | (3) Efficiency |
|--------------|----------------------|----------------------|----------------------|
| Liquidity | 0.038** (2.41) | | 0.020* (1.88) |
| Roll | | 0.128*** (3.31) | |
| Size | -0.014*** (-5.90) | -0.016*** (-7.70) | -0.007*** (-4.57) |
| ROE | -0.007* (-1.96) | -0.002 (-1.34) | -0.002 (-1.45) |
| Lev | 0.002 (0.19) | 0.005 (0.69) | 0.001 (0.14) |
| Ldr | 0.000** (2.46) | 0.000** (2.26) | 0.000 (1.52) |
| Growth | -0.002*** (-5.96) | -0.002*** (-5.12) | -0.001** (-2.35) |
| Dual | -0.001 (-0.57) | -0.001 (-0.29) | -0.001 (-0.38) |
| Indep | -0.012 (-0.52) | -0.003 (-0.16) | 0.010 (0.74) |
| Constant | 0.275*** (5.28) | 0.318*** (6.88) | 0.110*** (3.35) |
| Observations | 14,080 | 17,090 | 11,963 |
| R-squared | 0.085 | 0.078 | 0.052 |
| Number of id | 1,408 | 1,709 | 1,709 |
| id FE | YES | YES | YES |
| year FE | YES | YES | YES |

4.4. Endogeneity Test

Since stock liquidity and investment efficiency may be mutually causal, leading to endogenous problems, and the instrumental variable method can effectively solve endogenous problems, this paper draws on the research practices of Su Dongwei and Xiong Jiakai (2013) and Jayaraman and Milbourn (2012). In this paper, stock liquidity with a lag of one period (liq1) is selected as the instrumental variable of stock liquidity (Liquidity), and Two-stage least squares method (2SLS) is used for regression

estimation.

Table 6 shows the results of the second stage regression of 2SLS. The regression coefficient is 0.721, which is significantly positive at 5% level. This is similar to the results of baseline results mentioned above, which further verifies the promoting effect of stock liquidity on corporate investment efficiency.

Table 6. Endogeneity tests

| VARIABLES | (1) |
|--------------|----------------------|
| | Two Efficiency |
| Liquidity | 0.721** (2.20) |
| Size | -0.009* (-1.94) |
| ROE | -0.001 (-0.96) |
| Lev | 0.032*** (3.10) |
| Ldr | 0.001** (2.32) |
| Growth | -0.001*** (-3.11) |
| Dual | -0.008*** (-3.81) |
| Indep | 0.004 (0.23) |
| Constant | 0.172 (1.58) |
| Observations | 15,381 |
| R-squared | -1.853 |

5. Further Test

5.1. Property Rights Nature Difference

All samples are divided into state-owned enterprises and non-state-owned enterprises according to the property rights of the actual controller. The regression results of state-owned enterprises and non-state-owned enterprises are shown in Figure 7 (1) and (2) respectively. The regression coefficient of explanatory variable is insignificant in state-owned enterprises, while the regression coefficient of non-state-owned enterprises is significantly positive at 5% level. This shows that the promoting effect of stock liquidity on enterprise efficiency is more significant in non-state-owned enterprises. The possible reasons are analyzed: In non-state-owned enterprises, the ownership structure is more complex, and the role of ownership structure on corporate governance is more obvious. Small and medium-sized shareholders will also actively participate in corporate governance, so that the investment efficiency is higher. The coefficient of state-owned enterprises is not significant, which may be due to the special nature of state-owned enterprises in China, which determines that state-owned shares occupy an absolute dominant position, state-owned legal persons have absolute control over the company, and small and medium-sized shareholders have little checks and balances on major state-owned shareholders. Therefore, stock liquidity has no significant promoting effect on investment efficiency.

5.2. Company Size Difference

All samples are divided into large and small enterprises

according to the median Size of listed companies. (3) and (4) in Figure 7 show the regression results of large and small enterprises respectively. The regression coefficient of explanatory variable stock Liquidity is not significant in large-scale enterprises but is significantly positive at 10% level in small-scale enterprises, indicating that stock liquidity has a more significant promoting effect on enterprise efficiency in small-scale enterprises.

Table 7. Heterogeneity test

| | (1) | (2) | (3) | (4) |
|--------------|--------------------------|--------------------------|---------------------------|--------------------------|
| VARIABLES | State-owned | Non-state-owned | large-scale | small-scale |
| Liquidity | -0.001 (-0.15) | 0.021** (1.97) | 0.060 (1.32) | 0.019* (1.81) |
| Size | - 0.011*** (-3.51) | - 0.020*** (-6.80) | - 0.012*** (-3.51) | - 0.023*** (-4.45) |
| ROE | -0.009** (-2.52) | -0.001 (-1.15) | - 0.021*** (-11.84) | -0.001 (-1.23) |
| Lev | 0.010 (0.79) | -0.010 (-0.90) | -0.005 (-0.29) | 0.006 (0.52) |
| Ldr | -0.000 (-0.51) | 0.000** (2.19) | -0.000 (-0.71) | 0.000 (1.08) |
| Growth | -0.001** (-2.38) | - 0.002*** (-5.59) | - 0.002*** (-5.54) | -0.001 (-1.52) |
| Dual | 0.003* (1.77) | -0.002 (-0.89) | 0.003 (0.86) | -0.002 (-0.93) |
| Indep | -0.005 (-0.13) | 0.010 (0.49) | -0.007 (-0.20) | -0.014 (-0.84) |
| Constant | 0.222*** (3.00) | 0.393*** (6.18) | 0.252*** (3.15) | 0.445*** (4.11) |
| Observations | 7,615 | 9,475 | 8,545 | 8,545 |
| R-squared | 0.031 | 0.114 | 0.111 | 0.055 |
| Number of id | 844 | 1,007 | 1,149 | 1,199 |
| id FE | YES | YES | YES | YES |
| year FE | YES | YES | YES | YES |

6. Conclusion

In the past, China was in the stage of rapid economic growth, economic growth mainly relies on the production of high pollution, high input and high energy consumption to pull, for a long time, China's extensive development model is reflected in the side as the low investment efficiency of market players. However, with China's economic development changing from a high-speed growth stage to a high-quality development stage, it is very important to study the factors affecting the company's investment efficiency and how to improve the company's investment efficiency. This paper selects China's A-share non-financial listed companies

from 2013 to 2022 as the research object, and tests the impact of stock liquidity changes from the capital market on the investment efficiency of enterprises through the dual fixed effect model. The following conclusions are obtained:

The improvement of the stock liquidity of China's A-share listed companies has A promoting effect on their investment efficiency, indicating that with the increase of stock liquidity, the investment efficiency of listed companies will also be improved. The performance of the company's stock liquidity in the capital market can affect the company's internal behavior, so as to improve the company's investment efficiency.

In addition, the promoting effect of stock liquidity on enterprise efficiency is more significant in non-state-owned enterprises. The ownership structure of non-state-owned enterprises is more complex, so its ownership structure plays a more obvious role in corporate governance. Minority shareholders will also actively participate in corporate governance, which makes non-state-owned enterprises more efficient in investment. However, the special nature of China's state-owned enterprises determines that state-owned shares occupy an absolute dominant position, state-owned legal persons have absolute control over the company, and small and medium-sized shareholders have little checks and balances on major state-owned shareholders. Therefore, the promotion effect of stock liquidity on investment efficiency is not significant compared with non-state-owned enterprises.

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