

# How Analyst Attention Affects Inefficient Investment of Enterprises: The Mediating Role of Financial Constraints

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**Abstract.** This paper uses the data of Shanghai and Shenzhen A-share companies from the CSMAR database. The data range is from 2009 to 2019, studies the relationship between investment efficiency and financing constraints, and expounds on some of the problems faced by small and medium-sized enterprises today. The research uses a model to measure the optimal investment scale of the enterprise in the current period and uses the actual investment scale to gradually approach the optimal investment template to obtain the inefficient investment level of the enterprise. This paper studies the relationship between investment efficiency and financing constraints from an analyst's perspective. Research has found that analyst attention significantly impacts firms' inefficient investments. Analyst Attention and Report Attention can effectively alleviate corporate financing constraints and improve corporate investment efficiency, which is found that analyst attention and report attention have a more significant impact on small and medium-sized enterprises than on large enterprises.

**Keywords:** Financing Constraints; Investment Efficiency; SMEs; Analyst Attention.

## 1. Introduction

Financing constraints of small and medium-sized enterprises have been the focus of long-term attention [1]. Scholars have carried out more research on financing problems of small and medium-sized enterprises from different perspectives. This paper will analyze the investment efficiency, financing constraints, and current conditions of small and medium-sized enterprises based on the obtained data—some of the problems SMEs face.

Financing risk always accompanies financing problems, which is the primary way to control financing risk. The weak nature of SMEs, the mismatch of financial resources, and the imbalance of supply and demand have led to financing difficulties [2]. UNIDO defines SMEs in developing countries by the number of employees. For example, a small business with 5 to 19 workers, such as the small shops that can be found everywhere in the city, such as hair salons and steak bars. Such businesses typically have between 20 and 99 workers, including manufacturing and exporting [3]. Many researchers believe that the financing problems of small and medium-sized enterprises are closely related to the operation and management of the enterprises themselves [4]. They believe that small and medium-sized enterprises' financing difficulties have objective disadvantages such as insufficient strength, high operating risks, low credit, and short operating life [5]. Entrepreneurship is characterized by diversity — people have a lot of diversity [6]. Appropriate resources such as analysts to help run a company can significantly help SMEs. An analyst can determine in different situations. They can determine what SMEs can do to expand their business or when or how to seize the moment of success. While SMEs may think that they do not need business analysts and that the cost of hiring an analyst is an unnecessary expense, small businesses face the problem of surviving or missing out on opportunities to succeed. [7].

Realize information. What factors determine the effective investment of small and medium-sized enterprises in the formal financial market (effective investment is the project investment that can form

physical engineering quantities and exert investment benefits)? That is to consider SMEs' investment benefits from the analysts' perspective. We will analyze and prove these problems through different data. Analysts can help these companies to some extent. First, analysts can quickly respond to the company's data needs, conduct analysis and research according to the company's specific situation and different specific requirements of the company, and gain more compelling insight into business opportunities. [4]. Secondly, analysts can be responsible for providing high-value data solutions for business product development and business strategies based on discovering business problems.

Discuss the impact of investment and financing benefits on enterprises by controlling variables. This paper uses Shanghai and Shenzhen A-share companies from the CSMAR database to discuss SMEs' financing constraints and investment efficiency from the analysts' perspective. The study analyzes the direct relationship between current investment size, capital structure, primary business revenue growth, firm age, stock market returns, and CFO and discusses analysts' influence on small and mid-sized companies.

This paper is divided into four parts; the first part is the introduction, the second part is the research design, the third part is the empirical results, results, and the fourth part is the conclusion.

### 1.1 Data Sources

The source of the companies' data in Shanghai and Shenzhen A stock comes from the CSMAR database for the period from 2009 to 2019. CSMAR, abbreviate for China Stock Market & Accounting Research Database, is a holistic research-oriented database with an international professional standard that focuses on China's Finance and Economy and is tailored for academic research needs, developed by Shenzhen CSMAR Data Technology Co., Ltd. To ensure the objectivity and the accuracy of the study, the data has been selected based on the following criteria:

Firstly, financial institutions like banks and insurance companies because their asset structures are different from entity enterprises.

Secondly, excluding ST and \*ST companies as ST stands for "Special Treatment" in Shanghai and Shenzhen A stock market, which will occur when the company has an abnormal financial situation and is viewed as highly risky [8]. The criteria are usually categorized as (1) Net profit appears to be negative in recent two years, as known as the net asset value per share is lower than the face value of the share; (2) The stockholder's equity appears to be lower than the registered capital in recent two years; (3) the stock exchange or the China Securities Regulatory Commission judges that the company has irregular financial situation; the mark "\*" represent three years for the above situations; (4) company has to seize their operation due to unforeseen and irresistible reasons such as natural disaster or a severe accident, and not being able to operate normally again within three months; (5) "the company is involved in a damaging lawsuit or arbitration and (6) the company is bankrupt [8].

Thirdly, excluding companies with the absence of variables such as company A doesn't have data in "Board size" or company B shows nothing in "No. of Independent Director" so that the data applied are all comprehensive in terms of variables.

Last but not the least, applying Winsorize method by modifying 1% of data from the minimal side and maximal side to make that 1% data closer to the rest values [9], excluding the extreme values and keeping the stability of data.

In the end, 28203 values are selected as effective samples.

#### 1.1.1 Core Independent Variables

Analyst Attention refers to the number of analyst team that has tracked and analyzed the targeted company. Each team is treated as "1," regardless of the size of the team.

Report Attention refers to the number of research reports that are tailored against the targeted company.

#### 1.1.2 Dependent Variables

Inefficient Investment refers to the situation when the company's actual investment level is not matching the optimal investment level [3].

In this study, SA Index, as the method learned [6], is used to determine the financial constrain that lay upon each company. It has the calculation formula of  $SA=0.737 \times Asset + 0.043 \times Asset2 - 0.040 \times Age$ ; The value of the SA index is usually negative, and the study picks the absolute value of the SA Index so that the higher the value, the higher the level of financial constraints that the company is bearing.

### 1.1.3 Control Variables

Asset refers to the total assets at the end of the year. Debt refers to the total debt at the end of the year. Age refers to the period of the company since it went public. Top 1 refers to the percentage of stock that the largest shareholder is holding. SOE=1 refers to the State-owned-enterprises, recorded as “1,” otherwise recorded as “0.” Foreign=1 refers to the foreign company, recorded as “1,” otherwise recorded as “0.” Board size refers to the board size of the company. No. of Independent Director refers to the number of independent directors. Salary refers to the salary of executives in the unit of 10000 Yuan. ROA refers to the return of assets in the unit of percentage.

## 1.2 Model Specification

The basic model that is applied for the investigation of dependent and independent variables in this research is the multiple regression model, by which there is more than one regressor variable within the regression analysis [9], demonstrated as the following equation:

$$y_i = \alpha_0 + \alpha_1 \times Variable_i + x_i' \beta + \varepsilon_i \quad (1)$$

In the equation,  $y_i$  stands for the dependent variable;  $\alpha_0$  and  $\alpha_1$  refers to the coefficients that are yet to be estimated;  $\varepsilon_i$  refers to the random variable that obeys standard deviation [10].

Below is the model that the research specifically utilizes to calculate and explain the optimal investment scale of companies:

$$\begin{aligned} Invest_{it} = & \beta_0 + \beta_1 Invest_{it-1} + \beta_2 Size_{it-1} + \beta_3 Lev_{it-1} + \beta_4 Growth_{it-1} \\ & + \beta_5 LnAge_{it-1} + \beta_6 Ret_{it-1} + \beta_7 CFO_{it-1} + \sum \beta_i Industry + \sum \beta_j Year \\ & + \varepsilon_{it} \end{aligned} \quad (2)$$

In formula (2), the “Invest” refers to the current investment scale of the company, the “Size” refers to the scale of the company itself; the “Lev” refers to the capital structure of the company; the “Growth” refers to the growth rate of the main core of the company’s business; the “Ln Age” refers to the age of the company, the “Ret” refers to the stock return of the company; the “CFO” refers to the Cash Flow from the company’s Operation activities, and “Industry” and “Year” are considered based on the industry that the company is located and the time length. The last term in the formula refers to the residual, which has the function of indicating the investment situation when the previous terms in the formula cannot fully demonstrate the optimal investment scale. If the residual value is positive, it means the company is over-investing; if the residual value is negative, it means the company is under-investing. The larger the residual value, the inefficient the investment will be.

## 1.3 Summary Statistics

Summary statistics are shown in Table 1. According to the summary statistics, the number of analysts and reports has a mean of 7.418 and 14.7389, which is relatively high on the scale of one year. The SA index has a standard deviation of 0.3056, which indicates that the data selected does not vary drastically, connoting the fact that the observed companies have relatively similar amount financial constraints. The difference between the minimum and maximum values of Inefficient Investment, Analyst Attention, and Report Attention is huge, denoting the fact that there will be a relatively large contrast between the investment efficiency and the number of reports and analysts,

which can refer to the assumption that there are certain relations between the amount of analyst and report attention and how effective the company invests.

**Table 1** Summary statistics

| Variable                    | Ols   | Mean      | Std. Dev. | Min      | Max       |
|-----------------------------|-------|-----------|-----------|----------|-----------|
| Inefficient investment      | 28203 | 2.7972    | 5.8097    | 0        | 37.1062   |
| SA index                    | 28203 | 3.4581    | .3056     | 2.3213   | 4.158     |
| Analyst Attention           | 28203 | 7.418     | 9.2714    | 0        | 41        |
| Report Attention            | 28203 | 14.7389   | 21.1949   | 0        | 101       |
| Age                         | 28203 | 9.4597    | 7.1422    | 0        | 25        |
| Asset, in millions          | 28203 | 12538.689 | 39849.043 | 186.5798 | 454342.39 |
| Debt, in millions           | 28203 | 7595.5625 | 28150.764 | 36.2757  | 336246.4  |
| top1                        | 28203 | 34.9138   | 15.0703   | .29      | 89.99     |
| SOE=1                       | 28203 | .3705     | .4829     | 0        | 1         |
| Foreign=1                   | 28203 | .0484     | .2146     | 0        | 1         |
| Board Size                  | 28203 | 8.6374    | 1.7109    | 5        | 15        |
| No. of Independent Director | 28203 | 3.1841    | .569      | 2        | 5         |
| Salary, in millions         | 28203 | 3.6437    | 3.5992    | .1577    | 24.1108   |
| ROA                         | 28203 | .0424     | .0669     | -.3281   | .2342     |

## 2. Empirical results

### 2.1 Benchmark Regression

By analyzing the results provided by the benchmark regression (Table 2), Ln analyst attention has a strong influence on firms' investment inefficiency. During the calculation of Benchmark regression, this research has utilized the industry effect and year dummy to obtain accurate results. In the first column (1) of the benchmark regression table, the statistical representation shows the inefficient investment coefficient is -0.4794, which demonstrates relatively high significance at the 1% level. To avoid omitted variable bias, the result of -0.250 in column (2) represents the coefficient of Ln Analyst Attention and inefficient investment after adding the control variables, such as age, Ln asset, etc. The result shows that, on average, when the Ln analyst attention increases by 1%, companies' inefficient investment tends to decrease by 0.2540 units, and the coefficient is significantly above the 1% level. Similarly, when Ln reports attention increases by 1%, the inefficient investment of the firm decreases by 0.2085 units, which is also significantly above the 1% level. Based on the analysis shown above, Ln analyst attention and Ln report attention can serve as instruments for firms to correct their inefficient investment.

**Table 2** Benchmark regression

| VARIABLES                      | (1)<br>OLS<br>Inefficient<br>Investment | (2)<br>OLS<br>Inefficient<br>Investment | (3)<br>OLS<br>Inefficient<br>Investment | (4)<br>OLS<br>Inefficient<br>Investment |
|--------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Ln Analyst Attention           | -0.4794***<br>(0.0331)                  | -0.2540***<br>(0.0395)                  |                                         |                                         |
| Ln Report Attention            |                                         |                                         | -0.3788***<br>(0.0266)                  | -0.2085***<br>(0.0320)                  |
| Age                            |                                         | 0.1368***<br>(0.0188)                   |                                         | 0.1411***<br>(0.0189)                   |
| Age-sq                         |                                         | -0.0022***<br>(0.0008)                  |                                         | -0.0024***<br>(0.0008)                  |
| Ln asset                       |                                         | -0.1316<br>(0.1070)                     |                                         | -0.1358<br>(0.1067)                     |
| Ln debt                        |                                         | 0.2150***<br>(0.0779)                   |                                         | 0.2196***<br>(0.0779)                   |
| top1                           |                                         | -0.0024<br>(0.0026)                     |                                         | -0.0024<br>(0.0026)                     |
| SOE=1                          |                                         | 0.0334<br>(0.1057)                      |                                         | 0.0258<br>(0.1059)                      |
| Foreign=1                      |                                         | -0.2195<br>(0.1373)                     |                                         | -0.2236<br>(0.1373)                     |
| Board Size                     |                                         | -0.1345***<br>(0.0320)                  |                                         | -0.1349***<br>(0.0320)                  |
| No. of Independent<br>Director |                                         | 0.3944***<br>(0.0956)                   |                                         | 0.3934***<br>(0.0955)                   |
| Ln salary                      |                                         | -0.2709***<br>(0.0567)                  |                                         | -0.2701***<br>(0.0567)                  |
| ROA                            |                                         | -4.8594***<br>(0.9200)                  |                                         | -4.8200***<br>(0.9219)                  |
| Constant                       | 3.8318***<br>(0.4290)                   | 5.5683***<br>(1.2147)                   | 3.8465***<br>(0.4292)                   | 5.5708***<br>(1.2137)                   |
| Observations                   | 28,203                                  | 28,203                                  | 28,203                                  | 28,203                                  |
| R-squared                      | 0.0382                                  | 0.0589                                  | 0.0378                                  | 0.0589                                  |
| Data                           | Unbalanced                              | Unbalanced                              | Unbalanced                              | Unbalanced                              |
| Industry Effect                | Yes                                     | Yes                                     | Yes                                     | Yes                                     |
| Year Dummy                     | Yes                                     | Yes                                     | Yes                                     | Yes                                     |

## 2.2 Heterogeneity Analysis

In Table 3, the dummy variable is defined by the total asset of a firm in a year. A firm has a dummy variable of 1 if its total asset of the year is below the 50%, otherwise, it will have a dummy variable of 0. As demonstrated in the result of the heterogeneity analysis, the interaction coefficient of Dummy # Ln analyst attention (-0.3792) is negative. By adding the coefficient of Dummy # Ln analyst attention (-0.3792) with Ln analyst attention without the dummy variable (-0.2305), the coefficient for SMEs is -0.6097. Compared with the result of large enterprises, the coefficient without a dummy variable, the coefficient for SMEs is significantly greater than the coefficient for large enterprises. Similar patterns also apply to report attention. The overall coefficient of Dummy # Ln report attention

(-0.0711) and Ln report attention (-0.2090) excluding the dummy variable is -0.2801, which coincides with the result for analyst attention.

The pattern observed in this paper shows that the Ln analyst's attention has a larger impact on correcting inefficient investment for SMEs than large enterprises. Correspondingly, the interaction coefficient for the dummy # Ln report attention (-0.0711) also shows negative results, which means that the Ln report attention also has a stronger heterogeneous effect on SMEs than on large enterprises.

**Table 3** Heterogeneity analysis

| VARIABLES                       | (1)<br>OLS<br>Inefficient<br>Investment | (2)<br>OLS<br>Inefficient<br>Investment | (3)<br>OLS<br>Inefficient<br>Investment | (4)<br>OLS<br>Inefficient<br>Investment |
|---------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Ln Analyst Attention            | -0.4654***<br>(0.0345)                  | -0.2305***<br>(0.0411)                  |                                         |                                         |
| Dummy                           | -0.0196<br>(0.2766)                     | 0.6207**<br>(0.2758)                    | -0.6761**<br>(0.2661)                   | -0.0622<br>(0.2661)                     |
| Ln Report Attention             |                                         |                                         | -0.3882***<br>(0.0279)                  | -0.2090***<br>(0.0332)                  |
| Dummy # Ln Analyst<br>Attention | -0.4488***<br>(0.1190)                  | -0.3792***<br>(0.1174)                  |                                         |                                         |
| Dummy # Ln Report<br>Attention  |                                         |                                         | -0.0889****<br>(0.0099)                 | -0.0711***<br>(0.030)                   |
| Observations                    | 28,203                                  | 28,203                                  | 28,203                                  | 28,203                                  |
| R-squared                       | 0.0387                                  | 0.0592                                  | 0.0387                                  | 0.0592                                  |
| Data                            | Unbalanced                              | Unbalanced                              | Unbalanced                              | Unbalanced                              |
| Control                         | No                                      | Yes                                     | No                                      | Yes                                     |
| Industry Effect                 | Yes                                     | Yes                                     | Yes                                     | Yes                                     |
| Year Dummy                      | Yes                                     | Yes                                     | Yes                                     | Yes                                     |

### 2.3 Robustness Test

By conducting a robustness test using Panel FE (fixed effect) model (Table 4), the accuracy of the OLS model test can be verified. Observing the result generated from the robust test with control variables included, when the Ln analyst attention increases by 1%, the coefficient of inefficient investment is decreasing by 0.3691. On the other hand, when increasing the Ln report attention by 1%, the coefficient of inefficient investment decreases by -0.2976. Both coefficients for Ln analyst and Ln report attention are negative and are significantly above the 1% level, which shows a similar result to our OLS testing model. Similar trends occur when using the OLS and Panel FE method, which solidifies previous testing results to be robust.

**Table 4** Robustness test

| VARIABLES               | (1)<br>Panel FE<br>Inefficient<br>Investment | (2)<br>Panel FE<br>Inefficient<br>Investment | (3)<br>Panel FE<br>Inefficient<br>Investment | (4)<br>Panel FE<br>Inefficient<br>Investment |
|-------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|
| Ln Analyst<br>Attention | -0.4451***<br>(0.0662)                       | -0.3691***<br>(0.0808)                       |                                              |                                              |
| Ln Report<br>Attention  |                                              |                                              | -0.3574***<br>(0.0537)                       | -0.2976***<br>(0.0650)                       |
| Observations            | 13,024                                       | 13,024                                       | 13,024                                       | 13,024                                       |
| Number of id            | 1,184                                        | 1,184                                        | 1,184                                        | 1,184                                        |
| Data                    | Balanced                                     | Balanced                                     | Balanced                                     | Balanced                                     |
| Control                 | No                                           | Yes                                          | No                                           | Yes                                          |
| Industry Effect         | Yes                                          | Yes                                          | Yes                                          | Yes                                          |
| Year Dummy              | Yes                                          | Yes                                          | Yes                                          | Yes                                          |

## 2.4 Mechanism Test

The mechanism test in Table 5 specifically focuses on the effect of Ln analyst attention and Ln report attention on the value of the SA index. SA Index represents the level of financial constraint faced by enterprises. A higher SA index indicates a higher financing difficulty for enterprises. As shown in the mechanism test, by including the control variable, increasing Ln analyst attention by 1%, the SA index has decreased by 0.0263 units, and increasing Ln report attention by 1% also lowers the SA index by 0.0087 units. In comparison, increasing Ln analyst attention has a more significant impact on lowering the SA index than Ln report attention. The mechanism test shows Ln analyst attention and Ln report attention has mitigated the SA index and financial constraint faced by enterprises. Furthermore, increasing analyst attention and report attention eases firms' financial constraints, and assists firms to achieve higher investment efficiency. Therefore, enterprises can consider enhancing the investment towards analyst attention and report attention to increase their investment efficiency.

**Table 5** Mechanism test

| VARIABLES            | (1)<br>OLS<br>SA index | (2)<br>OLS<br>SA index | (3)<br>OLS<br>SA index | (4)<br>OLS<br>SA index |
|----------------------|------------------------|------------------------|------------------------|------------------------|
| Ln Analyst Attention | -0.0279***<br>(0.0035) | -0.0263***<br>(0.0036) |                        |                        |
| Ln Report Attention  |                        |                        | -0.0129***<br>(0.0038) | -0.0087***<br>(0.0025) |
| Observations         | 28,203                 | 28,203                 | 28,203                 | 28,203                 |
| R-squared            | 0.1635                 | 0.8239                 | 0.1734                 | 0.8344                 |
| Data                 | Unbalanced             | Unbalanced             | Unbalanced             | Unbalanced             |
| Control              | No                     | Yes                    | No                     | Yes                    |
| Industry Effect      | Yes                    | Yes                    | Yes                    | Yes                    |
| Year Dummy           | Yes                    | Yes                    | Yes                    | Yes                    |

### 3. Conclusion

This paper investigates the relationship between investment efficiency and financing constraints from the analysts' perspective using data from the CSMAR database of Shanghai and Shenzhen A-share firms. It is found that analyst attention has a significant effect on firms' inefficient investment. The above results suggest that analyst attention can correct the level of inefficient investment of firms to a certain extent. Firstly, we screened the data from the CSMAR database for firms that are physical and have variables, which are the main respondents of the research. Second, the model is used to calculate and explain the optimal size of the firm's investment. At the same time, we analyzed the results of the benchmark regression. It is found that firms' investment inefficiencies are significantly impacted by Ln analyst attention. Additionally, it is discovered that Ln reporting attention and Ln analyst attention both have a bigger effect on SMEs' non-investment efficiency than they do on large enterprises. The mechanism test demonstrates that firms' investment inefficiency is significantly influenced by Ln analyst attention. The mechanism test reveals that the SA index and financial constraints experienced by businesses have been lessened by Ln analyst and Ln report attention. Additionally, increasing analyst and report attention reduces financial limitations for businesses and helps businesses increase investment efficiency. The findings of this research demonstrate that as the financial market has grown, the economy has expanded quickly, and financial institutions have emerged, More and more companies rely on analysts' strategic analysis. To boost their investment efficiency, enterprises can think about increasing their investment in analyst attention and report attention.

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