The relationship between analyst coverage and overinvestment, and the mediating role of corporate governance. Evidence from China

Chia-Hsien Tang

College of Accounting and Auditing, Guangxi University of Finance and Economics, China; richtang626@gmail.com

Yen-Hsien Lee

College of Business, Department of Finance, Chung Yuan Christian University, Taiwan; Correspondence:yh@cycu.edu.tw

Wan-Zhu Lu

College of Business, Department of Finance, Chung Yuan Christian University, Taiwan; ttang0626@yahoo.com.tw

Li Wei

College of Accounting and Auditing, Guangxi University of Finance and Economics, China

[3225935941@qq.com](mailto:3225935941@qq.com)

**Abstract**

This study applied a quantile analysis to test the relationship between analyst coverage and overinvestment in Chinese firms and further sought to demonstrate the mediating effect of corporate governance on overinvestment. The empirical results show that analyst coverage causes overinvestment across all quantiles; however, corporate governance can diminish the effect of firm overinvestment in the higher quantile analysis. Additionally, the difference-in-differences method was used to explore the effectiveness of the Chinese government’s 2013 corporate governance reform, with the results confirming that that governance reform has been effective in inhibiting a firm’s overinvestment. The findings of this study indicate that analysts act as market supervisors in the Chinese capital market, improving corporate governance; however, their coverage does not appear to benefit firms or shareholders. This research highlights the need to review the role of analysts in the market to ensure they can reduce information asymmetry between managers and shareholders without causing overinvestment behavior.

**Keywords:** Analyst coverage, Corporate governance, Overinvestment, Difference-in-differences, Propensity score matching

1. Introduction

The investment decision is a key factor in determining the potential value, growth, and wealth of a firm (Chen, Xie and Zhang, 2017). In addition, appropriate investment decisions in research and development and advertising can increase a firm’s value (Hirschey and Weygandt, 1985; McConnell and Muscarella, 1985; Chan, Martin and Kensinger, 1990). In a perfect capital market, a firm invests in projects to create a positive net present value to increase the efficiency of investment decisions (Modigliani and Miller, 1958). However, in reality, the interests of managers and shareholders can diverge, and managers may not pursue investments that maximize shareholder wealth, leading to the potential for overinvestment. Many scholars have focused on overinvestment as a result of information asymmetry (e.g., Lara, Osma and Penalva, 2016) Managers often have greater control of a firm’s expenditure than external investors and hold the comparative advantage of information. As a result, managers can pursue their interests instead of maximizing shareholders’ wealth, leading to overinvestment. Moreover, information asymmetry can increase the agency costs of overinvestment.

Similar evidence is found in previous studies (Jensen, 1986; Stulz, 1990); managers have a strong motivation to invest in projects with a negative net present value, resulting in overinvestment, particularly in firms with abundant cash flow. To obtain accurate information, investors and shareholders must rely on outside analysts. Some scholars have a positive view of analysts as information providers that reduce information asymmetry between internal (manager) and external (shareholder)parties by using their professional and analytical skills to obtain timely and updated information from a firm (Hong, Lim and Stein, 2000; Frankel and Li, 2004). Analysts are intermediaries between internal and external parties, helping investors to understand the value of a firm and its investment and reducing information asymmetry (Bowen, Chen and Cheng, 2008; Kelly and Ljungqvist, 2012).

China has a unique capital market, and analysts play an important role in the market by providing investment information to investors. The characteristics of China’s capital market limits firms’ external financing and resource allocation; thus, firms rely on internal finance, trade credit, and informal fundraising rather than banks and equity (Guariglia and Yang, 2016). There are two main obstructions to external financing in China. First, state-owned banks carry non-performing loans, resulting in low efficiency. In addition, state-owned banks must allocate unprofitable funds to state-owned enterprises, increasing the difficulty for private firms to obtain external funds from state-owned banks (Allen, Qian and Qian, 2005; Guariglia, Liu and Song, 2011; Héricourt and Poncet, 2009). Second, many listed companies are still owned by the government, the stock market is inefficient, and stock prices often do not accurately reflect the actual value of firms; therefore, investors are reluctant to invest in the stock market. For these reasons, China's stock market is smaller than the Chinese banking industry (Allen et al., 2005; Wang, WuandYang, 2009). Doukas, Kim, and Pantzalis (2008) revealed that when a firm’s analyst coverage is high, the difficulty in obtaining external financing is gradually reduced. Therefore, analysts act as an information intermediary to deliver analytical information to resolve firms’ information asymmetry and external financing problems.

Previous studies also consider that analysts act in an external supervisory role in the capital market. The Enron bankruptcy incident in the United States shook investor confidence in the stock market and lead to an attitude of distrust toward analysts' reports[[1]](#footnote-1). Kadan, Madureira,Wang, and Zach (2008) revealed that analysts issue false reports to facilitate investment banking business and to obtain investment commissions. This behavior not only reduces the quality of reports but also damages the wealth of external shareholders. Analysts tend to focus on firms that have business with investment banking firms, which shows that mutual benefit drives analysts to focus on their preference firms (Doukas et al., 2008; Jensen, 2004, 2005). Furthermore, the earnings forecasts and stock recommendations issued by analysts cause external market pressure on managers, forcing them to pursue these forecasts and recommendations as short-term goals (He and Tian, 2013; Allen, Francis, Wu and Zhao, 2016; Irani and Oesch, 2016). To achieve their short-term goals, corporate managers may overinvest (Bebchuk and Stole, 1993); thus, excessive analyst coverage can result in a suboptimal investment decision (Doukas et al., 2008).

In times of rapid economic growth, legal and corporate governance systems can fall behind[[2]](#footnote-2), and, as a consequence, corporate governance may not effectively inhibit a firm’s overinvestment (Allen et al., 2005; Chen, Sun, Tang and Wu, 2011). In addition, the government may use political influence to force managers to overinvest to achieve political goals (Chow et al., 2010; Firth et al., 2012). However, corporate governance in China is developing, propelled by the Third Plenary Session of the 18th Communist Party of China Central Committee (hereafter referred to as the Third Plenary Session) in 2013[[3]](#footnote-3). The main direction of this session was to develop a socialist system with Chinese characteristics, modernize the national governance system, enhance governance capacity to achieve key reforms in socialization and modernization before 2020, and operate perfect and stable systems. Thus, the Chinese government has adopted a positive attitude to manage governance issues.

Several studies have investigated the quality of financial reports and the influence they have on firms’ investment decisions. Some studies explore whether analyst coverage can enhance or inhibit overinvestment. This study fills a gap in the current literature by providing an empirical framework that uses difference-in-differences to test the effectiveness of the Third Plenary Session by dividing firms into two groups: a treatment group of state-owned overinvestment cases and a control group of publicly-owned overinvestment cases. In addition, the study considers the endogenous impact; that is, when a firm tends to overinvest, analysts believe that the firm is more likely to achieve the analyst’s goals, causing analysts to pay more attention and analyze it via reverse causality. To solve the issue of reverse causality, this study adopts a lag of 1 for analyst coverage, following Yu’s (2008) instrumental variable of the expected coverage method. The measurement is based on the scale of firms changing over time; thus, the two-stage regression estimation is used to solve the endogeneity caused by analyst coverage.

The rest of this study is organized as follows. Section 2 reviews the relevant literature, Section 3 presents the data and methodology, and Section 4 discusses the empirical results. Section 5 tests the robustness, and Section 6provides concluding remarks.

2. Literature Review

2.1 Review of Analysts role in capital markets

In an unrestricted market, companies seek to invest in projects with a positive net present value (Modigliani and Miller, 1958). In reality, due to the diverging interests of managers and shareholders and financial limitations, companies must compromise, often resulting in overinvestment or underinvestment (Jensen and Meckling, 1976). As information intermediaries in the stock market, analysts must interact directly with managers and use their professional knowledge and analytical skills to form views on the company's future and express these views to customers through research reports or social media. Empirical results show that analyst reporting reduces information asymmetry (e.g., Hong et al., 2000; Frankel and Li, 2004).Information asymmetry increases the cost of capital (Myers and Majluf, 1984; Diamond, 1985; Easley and O’hara, 2004) and the potential for overinvestment (Stein, 2003; Jiang, Cai, Wang and Zhu, 2018).

Recent studies have emphasized that analysts can contribute to corporate governance through their ability to deliver business information to external stakeholders. Armstrong, Core, Taylor, and Verrecchia (2011) and Derrien, Kecskés, and Mansi (2016) show that analyst reporting can reduce the cost of capital. Doukas et al. (2008) and Derrien and Kecskés (2013) found that firms with higher analyst attention receive more external financing, and Dyck, Morse, and Zingales (2010) point out that financial analysts can effectively assume the role of detection and supervision in corporate fraud cases.

Analysts can act as external monitors and can expose manager misconduct and earnings forecasts. However, high analyst coverage often leads to reduced manager participation in earnings management because managers fear that analysts will discover and disclose the company's inflated earnings to the public(Yu, 2008; Irani and Oesch, 2013). Knyazeva (2007) believes that the information provided by analysts provides an alternative supervisory mechanism for a company’s board of directors and institutional investors.

The public and external shareholders can obtain information about a company's performance and its manager's compensation from the analyst's report and make a judgment on the company's vision. Meanwhile, analysts can directly communicate with managers and influence their management decisions. Therefore, analysts’ role in corporate governance can reduce information asymmetry between shareholders and managers and expose malpractice, which can lead to a decline in stock prices and increase managers' aversion to inefficient investment decisions.

Based on the previous literature, this study assumes that analysts can monitor the investment decisions of companies and release professional and accurate earnings forecasts to improve the investment efficiency of companies and reduce overinvestment. In other words, this study expects analysts' attention to reduce the potential for overinvestment. Therefore, the following hypothesis is proposed:

Hypothesis 1: A high level of analyst coverage will inhibit overinvestment

2.2 Relationship between analyst coverage and pressure on firms in the capital market

Analysts anticipate that firms can achieve the goals set in their reports, and investors believe that these reports are accurate (Kadan et al., 2008). Analysts transmit pressure on firms through their professional reports that cover the firm’s growth rate, earnings targets, and their recommended stocks. Managers may choose to adopt an overinvestment strategy to achieve the goals set by analysts to avoid the risk of stock price decreases. A single analyst report may not cause significant pressure on a firm; however, if several analysts are concerned about the company, the impact on the company's share price is likely to be significant.

Analysts can exert market pressure by releasing information on growth rates and profit targets, and their recommendations can have a significant impact on a firm’s stock prices. (He and Tian, 2013; Allen et al., 2016; Irani and Oesch, 2016). Analyst forecasts are often overly optimistic, and it is difficult for managers to achieve the analyst’s goals (Ertimuretal., 2011). Jensen (2004, 2005)found that as a result of the pressure induced by analysts' targets, managers modify their investment strategies to meet analysts' expectations and maintain stock prices. Moreover, they will pursue the short-term goals set by analysts at the expense of the long-term value of the company, which may lead to inefficient investment (Bartov et al., 2005; Graham et al., 2002) and overinvestment (Bebchuk and Stole, 1993).

Past literature also notes that once a firm reaches the target set by analysts, short-term returns increase significantly (e.g., Bartov, Givoly and Hayn, 2002). However, if the target is not achieved, the stock price falls and dividends (including those of managers) decline. Thus, the goals set by analysts exert pressure on managers (Matsunaga and Park, 2001; Graham, Harvey and Rajgopal, 2005; Skinner and Sloan, 2002). Guoetal. (2018) point out that high analyst coverage leads to an increase in venture capital investment and acquisition of other innovative firms, which significantly increase the patent and citation rights of the company. However, not all patents are beneficial to the future value of a company; some patents can reduce a company’s market value (Chen and Chang, 2010). Thus, excessive analyst coverage can result in managers choosing suboptimal investment strategies (Doukas et al., 2008).

Managers are expected to achieve the target stock price set by analysts; therefore, managers modify investment strategies to meet this target. However, the target may also reduce the investment efficiency of the firm and increase overinvestment. Therefore, the following hypothesis is proposed:

Hypothesis 2: A high level of analyst coverage will stimulate overinvestment.

2.3 Corporate governance and its effect onanalyst coverage and overinvestment

A firm’s investment strategy is critical to its future value and its shareholders’ wealth (Chen et al., 2017), and overinvestment is not an optimal strategy. When corporate governance is weak, managers will deviate from shareholders’ interests and choose investments with a negative net present value (Fama and Jensen, 1983). Previous studies reveal that firms can reduce information asymmetry, increase market value, and improve investment efficiency by implementing effective corporate governance (e.g., Core, Holthausen and Larcker, 1999; Biddle, Hilary and Verdi, 2009; Hartzell, Sun and Titman, 2014; Chen and Chen, 2012). In addition, when firms have an overinvestment strategy, corporate governance can reduce agency problems and improve the effectiveness of a firm’s investment strategy; thus, overinvestment will decrease (Chan, Chen and Hong, 2015; Chu, Yang and Yang, 2016).

Few scholars explore whether corporate governance through analyst coverage inhibits overinvestment. Boubaker and Labégorre (2008) conclude that analysts will pay less attention to firms with centralized corporate ownership due to the difficulty in obtaining information. Conversely, analysts tend to report more on firms with a pyramid-shaped ownership structure because minority shareholders rely on analysts to eliminate information asymmetry. This indicates that corporate governance affects analyst coverage. Bhat, Hope and Kang (2006) found that transparency in corporate governance significantly increases the accuracy of analysts’ forecasts; therefore, the disclosure of corporate governance can attract analyst coverage, a topic that is rarely discussed in previous studies. Thus, while pressure from analyst coverage leads to overinvestment (Hypothesis 2), corporate governance can decrease the overinvestment effect, resulting in the following hypothesis:

Hypothesis 3: Corporate governance can diminish overinvestment caused by excessive analyst coverage.

3. Method

3.1. Data

The data used in this study are obtained from the China Stock Market & Accounting Research database, covering analyst information, corporate governance, control variables, and overinvestment. The dataset covers the period between 2006 and 2016 for Chinese listed firms. In China, financial institutions and financing are strictly regulated and monitored by the government; therefore, we have eliminated financial institutions from the study. In addition, B and H shares are not considered.

3.2. Overinvestment specification

Following Richardson’s (2006) framework to calculatea firm’s overinvestment, this study definestotal investment () as the sum of capital expenditure (CAPEX) and acquisition expenditure (Acquisitions) deducted from revenue from the sale of property, plant, and equipment(SalePPE), as shown in equation (1). Moreover,total investment () is divided into two parts:investment expenditure for maintaining assets (I\_MAINTENANCE) and investment expenditure for new projects (), as shown in equation (2) (Strong and Meyer, 1990). Finally, investment expenditure for a new project can be divided into two parts:expected investment for a positive net present value () and abnormal or unexpected investment (), as shown in equation (3). The value of abnormal or unexpected investment can be positive or negative; positive denotes overinvestment, while negative represents underinvestment. This study isfocused on firms’overinvestment;therefore, our objective is to test the positive value of abnormal investment.

(1)

(2)

(3)

Next, this study takes investment expenditure in equation (1) to calculate expected investment () and abnormal investment (). Thus, the fit value corresponds to expected investment (), and the residual value corresponds to abnormal investment (), are constructed as follows:

(4)

In equation (4), is the measurement of a firm’s growth, calculated as the value of operating assets（）divided by the market value of equity. The value of operating assetsis calculated from the equation , the α is equivalent to , ω is derived following Ohlson’s (1995) study framework to calculate the parameters of abnormal earnings, r denotes the discount rates, BV is the ordinary share book value, X is the earnings after deducting for depreciation, d is the dividend, Leverage is the total liabilities divided by the total assets, Cash is the short-term investment divided by the total assets, Age is the log of the firm’s last year value, Size is the log of the firm’s total assets, Stockreturns is the change in firm market value in the current year deducted by the changeinlast year’s market value, Yeardummy is a dummy variable that controls for fixed effects between different years, andIndustrydummy is a dummy variable that controls for fixed effects between different industries.

3.2.1. Analyst coverage definition

This study defines analyst coverage as the number of analysts or teams analyzing firm i within t years. 1 represents a team that does not separately list its members.

3.2.2 Principle component analysis (PCA) of corporate governance

This study follows He, Chiu, and Zhang’s (2015) study to use PCA, which is a multivariate statistical analysis of the comprehensive index between multiple indicators. The advantage of this method lies in dimensionality reduction; that is, multiple variables are converted into individual or several main constituent variables. Corporate governance variables are all-encompassing and often interact; therefore, this study uses PCA to make linear combinations of possible related corporate governance variables to obtain new variables. The number of new variables obtained by PCA usually varies and is less than the number of original variables.

For the control variables, this study follows Chen et al.’s (2016) study to select control variables that include the largest shareholder (greater than 25% of total shares), the ratio of the top three shareholders, state-owned firms, the total number of shares outstanding, dual role of the Chief Executive Officer (CEO), the size of the board of directors, the number of independent directors, the number of supervisors, the number of executive directors, and the number of unpaid directors and supervisors. Largest shareholder ratio less than 25%is denoted as a dummy variable; when the largest shareholder ratio is less than 25% of the total outstanding shares of firm i at time t, the dummy variable is 1or 0 otherwise. The ratio of the top three shareholders is the average of the top three shareholders of firm i at time t. State-owned firm is a dummy variable; when the largest shareholder is state-owned firm i at time t, the dummy variable is 1or 0 otherwise. The number of shares outstanding is the percentage of the number of shares outstanding to the total number of ordinary shares of firm i at time t. Dual CEO is a dummy variable; when an individual is both chairman and CEO of firm i at time t, the dummy variable is 1 or 0otherwise. The size of the board of directors is the number of directors on the board of firm i at time t. The number of independent directors is the ratio of the number of independent directors of firm i at time t. The number of supervisors is the total number of supervisors of firm i at time t. Executive directors are the total number of executive directors of firm i at time t. The number of unpaid directors is the ratio of unpaid directors on the board of firm i at time t. Finally, the number of unpaid supervisors is the ratio of unpaid supervisors on the board of firm i at time t-1.

Chen et al. (2016) show that when the largest shareholder ratio is less than 25%,overinvestment increases; however, if the average of shares held by the top three shareholders is high, a firm will decrease overinvestment. This study takes the ratio of the largest shareholders to be less than 25% and applies the average ratio of the top three shareholders to undertake the PCA. Thus, two corporate governance variables are derived from the PCA: the ratio of the largest shareholders < 25% (PcaLhd) and the average ratio of the top three shareholders (PcaHerf3).

3.2.3. Control variables

Based on studies by Richard(2006), Chen et al.(2016), and Wang et al.(2016), this study controls for some firm characteristics that will affect overinvestment, including firm size(Size), sales (Sales), liabilities (Leverage), return on assets (ROA), foreign institutional investors (FC), Tobin’s Q(TQ), cash (Cash), and free cashflow (FCF). Additionally, scale of firm denotes the log of total assets, sales is total sales divided by total assets, and liability represents total liabilities divided by total assets. For foreign institutional investors, 1 represents the largest foreign shareholder and is 0 otherwise. Tobin’s Q is defined as the firm’s total market value divided by the cost of asset replacement. cash is defined as the short-term investment plus cash available at a firm divided by total assets. Firm cashflow is defined as the cashflow from the operation of assets deducted by the expected new investment (Richard, 2006).

3.3. Empirical Model specification

3.3.1 Analyst coverage and firm overinvestment

In order to test hypothesis 1 and 2, analyst coverage has ability to diminish firm’s overinvestment behavior; and firm’s overinvestment will increase it is due to analyst coverage is high. We have constructed the following equation:

(5)

In equation (5)，OI denotes overinvestment, AC is analyst coverage, and CV represents the control variables, which include firm size, sales, liability, Tobin’s Q, cash, free cashflow, and fixed effects. By considering the endogeneity in this study, firm overinvestment attracts analyst coverage; thus, we adopt the instrumental variable proposed by Yu (2008), expected coverage, for the two-stage regression analysis to solve the endogeneity problem arising from analyst coverage.

Following Yu (2008)[[4]](#footnote-4), the equations (6) and (7) are constructed to obtain the instrumental variable of expected coverage.

(6)

(7)

ExpectedCoverage\_ijt is the expected analyst coverage of broker j at time t. Brokersizej0 and Brokersizejt are the number of analysts hired by broker j in the base year and at time t.Coveragei0j denotes, within the middle of the base year, the number of analysts from broker i to analyze firm i. Furthermore, ExpectedCoverageijt is the expected analyst coverage of firm i in year t. Thus, we have constructed equations (8) and (9) to solve the endogeneity problem.

(8)

(9)

AC represents analyst coverage, and Instrument is the instrumental variable that includes the lag 1 of analyst coverage and the expected coverage. CV represents the control variables, which include firm size, sales, liabilities, ROA, foreign institutional investors, Tobin’s Q, free cashflow, and fixed effects.∈ denotes the error term of ε’s, and OI represents overinvestment.

3.3.2. Overinvestment, analyst coverage, and corporate governance models

To test Hypothesis 2, we construct the following equation:

(10)

In equation (10), OI is overinvestment, AC represents analyst coverage, and CG represents corporate governance in the PCA variables. CV denotes the control variables, which include firm size, sales, liabilities, ROA, foreign institutional investors, Tobin’s Q, cash, free cashflow, and fixed effects. To solve the endogeneity problem, we adopt two instrumental variables methods: the expected variable, proposed by Yu (2008), and two-stage regression estimation.

3.3.3. Quantile analysis of overinvestment, analyst coverage, and corporate governance

This study uses PCA to analyze the impact of analysts' coverage on overinvestment under different components. In addition, we discuss the relationship between corporate governance, analyst coverage, and overinvestment using PCA, as proposed by Koenker and Bassett (1978), to improve the situation of underestimation of the standard error. The PCA regression model is as follows:

(11)

In Equation (11), OI represents a firm’s overinvestment, is an independent variable of the vector of k×1, which includes AC, analyst coverage, CG, the main component of the corporate governance variable, and the control variable CV. is at the quantile of the θ^th, the vector of k×1 regression of unknown parameter(0,1)； is an unknown error term. Given X, the conditional quantile of OI at the this denoted as and the estimation result is Many empirical studies have confirmed that quantile regression assumes an independent error term with consistent distribution; however, the only condition withu\_θiis that it must satisfy . In other words, the error term of of the conditional quantile must equal zero. Therefore, the estimation of quantile regression in equation (12) can be used to solve the minimization problem:

(12)

We must minimize the weighted sum of absolute errors. If θ is 0.5, β(0.5) is the Median of y\_i. This minimization term can use linear programming or the general momentum method to form and solve the problem, as shown in equation (13) for computational ease.

(13)

Many estimates can be derived from. Buchinsky (1995) used equation (13) and agreed with the method of obtaining the estimation formula because this method is more efficient when the sample is small. In addition, the design of the matrix bootstrapping method enables robustness between the factors of regression and the error terms. The estimation is as follows:

(14)

In equation (14), is the estimation of the quantile regression based on thebootstrapping samples of j=1,…, B. To construct a joint test between the m quantile of (θ\_1,⋯,θ\_m ), the null hypothesis of this study is constructed as follows:

Where, R is a matrix of q×km, and r is a vector of q×1; therefore, the F test is as follows:

(15)

Under the null hypothesis, can follow F(q,n-k-1) asymptotically. In equation (11),is the estimation of variable-joint matrix variables obtained from matrix bootstrapping.

3.3.4. Difference-in-differences between overinvestment, analyst coverage, and corporate governance

Next, we test whether the reform and strengthening of the national system and governance level encouraged by the Chinese government has had an impact on the excessive investment of state-owned firms. This study adopts the difference-in-differences method proposed by Card and Krueger (1993) to test whether the overinvestment of state-owned firms has been significantly affected by the Third Plenary Session reform meeting.

The study distinguishes data into two groups before testing: the treatment group, which is state-owned firms affected by the reform meeting, and the control group of non-state-owned firms unaffected by the reform meeting. To measure the effect, it is necessary to assume that the overall environment causes no significant difference between the treatment group and the control group. Therefore, this study also employed propensity score matching (PSM) to identify key characteristics of the two groups to meet the assumption that there is no significant difference and that they are independent. Therefore, we have constructed the following equation (16):

(16)

E(X) is the cumulative probability function; if it is a normal distribution, then the probit model is used; otherwise, the logistic model is used. X is an important characteristic of a firm that determines whether the reform meeting is successful. According to Navone and Wu (2018), X includes analyst coverage, firm size, liability, Tobin’s Q, and cash. Pr() represents the probability function. State is a dummy variable; 1 is a state-owned firm or 0otherwise. When a firm is state-owned, under the influence of the important characteristics of X, the probability of its reform is high. The main purpose of PSM is to ensure the treatment and control groups have roughly the same distribution of important firm characteristics before the reform to determine the actual effect of the reform meeting (Treated Effect).

After the completion of PSM, we divide the effect of the reform meeting into four groups: the treatment group and the control group before the meeting, and the treatment group and the control group after the meeting with the following regression in equation (17):

OI=αT+βG+τTG+θCV+ε (17)

In equation (17), OI is overinvestment. T denotes the dummy variable of time, where T=0 is 2006 to 2013 and T=1 is 2014 to 2016.G represents a group dummy variable, where G=0 represents the control group and G=1 represents the treatment group. TG is the interaction effect of time and group; when T=1 and G=1, the interaction is not equal to 0 and is defined as the actual effect after the meeting; otherwise, it is defined as having no practical effect after the meeting. CV denotes other control variables that include the PCA of corporate governance, firm size, sales, liabilities, ROA, foreign institutional investors, Tobin’s Q, cash, free cashflow, and fixed effects. is the error term. The coefficient of α is the time effect, which is the difference before and after the meeting. The coefficient of β is the difference between the treatment and control groups. τ is the coefficient of interaction, which indicates the actual meeting effect. The treatment group denotes firms with high analyst coverage with overinvestment, while the control group denotes firms with low analyst coverage with overinvestment. In addition, we divide analyst coverage into three parts: high, medium, and low. We define high analyst coverage as more than three equal parts, while low analyst coverage is defined as less than three equal parts. Finally, the treatment and control groups are constructed as equations (18), (19), (20) and (21):

(18)

(19)

(20)

(21)

Equations (18) and (19) represent the difference of the treatment group before and after the meeting of government regulation reform, respectively, is the treatment group before the meeting, is the treatment group after the meeting,t denotes the treatment group (Treatment), 0represents before the meeting and is otherwise 0. Equations (20) and (21) represent the difference of the control group before and after the meeting, is the control group before the meeting, is the control group after the meeting, and c denotes the control group (Control).

Next, the difference between the treatment group before and after the meeting and the control group before and after the meeting is expressed as equations (22) and (23) below:

(22)

(23)

By subtracting equations (18) and (19) we find τ, which deducts the time effect to leave the actual meeting effect if the coefficient of τ is significant, the meeting is effective; otherwise, it is ineffective.

4. Results

4.1. Descriptive statistics

The descriptive statistics in Table 1 show that the average of overinvestment within non-financial firms in our study period is 0.038, while the standard deviation of overinvestment is 0.042, the maximum is 0.151, and the minimum is -0.093, showing a difference of0.244. The results indicate that there is significant volatility in overinvestment in Chinese firms. In different corporate governance and firm conditions, this relates to overinvestment or underinvestment. Analyst coverage standard deviation is 8.93, with a maximum of 65 and a minimum of1, which indicates that change in a firm’s performance will cause analyst coverage to increase or decrease, as expected. The average of free cashflow is -.0.005, with a maximum of 0.218 and a minimum of -0.236; thus, on average, Chinese firms have insufficient control over cashflow. Firms with different operational conditions reveal a difference in free cashflow available.

**Table 1.** Descriptive statistics

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Mean | Standard  Deviation | | Q1 | | Median | | Q3 | | Maximum | | Minimum | |
| OI | 0.038 | 0.037 | 0.010 | | 0.025 | | 0.054 | | 0.151 | | 0.000 | |
| AC | 9.799 | 8.938 | 3.000 | | 7.000 | | 14.000 | | 65.000 | | 1.000 | |
| FCF | -0.005 | 0.075 | -0.049 | | -0.005 | | 0.038 | | 0.218 | | -0.236 | |
| Size | 21.940 | 1.297 | 21.022 | | 21.796 | | 22.688 | | 25.823 | | 19.256 | |
| Sales | 0.661 | 0.477 | 0.348 | | 0.552 | | 0.822 | | 2.692 | | 0.054 | |
| TQ | 2.208 | 2.032 | 0.879 | | 1.606 | | 2.774 | | 11.287 | | 0.208 | |
| Cash | 0.177 | 0.130 | 0.087 | | 0.140 | | 0.230 | | 0.658 | | 0.009 | |
| Leverage | 0.470 | 0.208 | 0.310 | | 0.477 | | 0.631 | | 0.944 | | 0.056 | |
| Roa | 0.007 | 0.006 | 0.003 | | 0.006 | | 0.008 | | 0.100 | | 0.000 | |
| DFrogn | 0.251 | 0.434 | 0.000 | | 0.000 | | 1.000 | | 1.000 | | 0.000 | |
| Lhd | 0.173 | 0.125 | 0.076 | | 0.146 | | 0.243 | | 0.800 | | 0.001 | |
| Herf3 | 0.452 | 0.498 | 0.000 | | 0.000 | | 1.000 | | 1.000 | | 0.000 | |
| State | 0.046 | 0.209 | 0.000 | | 0.000 | | 0.000 | | 1.000 | | 0.000 | |
| B Share | 0.035 | 0.183 | 0.000 | | 0.000 | | 0.000 | | 1.000 | | 0.000 | |
| Isduality | 0.233 | 0.423 | 0.000 | | 0.000 | | 0.000 | | 1.000 | | 0.000 | |
| Board | 8.968 | 1.834 | 8.000 | | 9.000 | | 9.000 | | 18.000 | | 3.000 | |
| Supervisor | 3.739 | 1.221 | 3.000 | | 3.000 | | 5.000 | | 13.000 | | 1.000 | |
| Executive | 5.706 | 1.379 | 5.000 | | 6.000 | | 6.000 | | 12.000 | | 1.000 | |
| Indirect | 0.368 | 0.054 | 0.333 | | 0.333 | | 0.400 | | 0.800 | | 0.091 | |
| Nopaiddirect | 0.218 | 0.191 | 0.000 | | 0.222 | | 0.364 | | 0.889 | | 0.000 | |
| Nopaidsper | 0.132 | 0.135 | 0.000 | | 0.111 | | 0.222 | | 1.000 | | 0.000 | |
| Tradableshare | 0.327 | 0.289 | 0.003 | | 0.303 | | 0.578 | | 1.000 | | 0.000 | |

1 OI represents a firm’s overinvestment, AC is analyst coverage, free cashflow (FCF), firm size(Size), sales (Sales), Tobin’s Q(TQ), cash (Cash), liabilities (Leverage), return on assets (ROA), DFrogn is foreign institutional investor, Lhd denotes the ratio of the largest shareholders < 25%, Herf3 represents the average ratio of the top three shareholders, State denotes as state-owned firm, B Share represents firm listing in B market, Isduality is dual role of the Chief Executive Officer, Board is the size of the board of directors, Indirect is the number of independent directors, Supervisor is the number of supervisors,, Executive is the number of executive directors, Nopaiddirect is the number of unpaid directors and supervisors. Tradableshare is the ratio of outstanding shares.

4.2. Result of relationship between analyst coverage, corporate governance, and overinvestment

To test the relationship between analyst coverage, corporate governance, and overinvestment, we use the least-squares regression model, with the empirical results shown in Table 3. The coefficient of analyst coverage is 0.000316 at a 1% significance level, as shown in column 1, which implies that a firm’s overinvestment is positively related to analyst coverage; when analyst coverage increases, firms increase overinvestment, which is inconsistent with Hypothesis 1 but consistent with Hypothesis 2. In column 2, the PCA of corporate governance of the largest shareholders ratio < 25% shows a coefficient of -0.000581at a significance level of 5%.This shows that overinvestment is negatively correlated with the variable related to largest shareholder's shareholding < 25%. In turn, more effective corporate governance has a higher proportion of the largest shareholder's shareholding ratio <25%, and the more effective the overinvestment. In column 3, the coefficient of corporate governance PCA of the average shareholding ratio of the top three shareholders is -0.000586at the 5% significance level, which indicates that overinvestment is significantly negatively correlated with the average shareholding ratio of the top three shareholders. Column 4 shows the interaction coefficient between analyst coverage and corporate governance, indicating that the largest shareholder ratio < 25% is -0.0000709at the 1% significance level, which indicates that under the supervision of corporate governance, the impact of analyst coverage on overinvestment can be significantly suppressed, and the effect of analyst coverage on overinvestment will be restrained in the presence of effective corporate governance. The findings are consistent with Hypothesis 2. In column 5, the interaction coefficient between analysts' coverage and the average ratio of the top three shareholders is -0.0000709 at the 1% significance level, which indicates that under the supervision of corporate governance, the impact of analysts' coverage on overinvestment can be significantly suppressed, and the effect of analyst coverage on overinvestment will be restrained when corporate governance is perfect.

**Table 2.** Result of relationship between analyst coverage, corporate governance, and overinvestment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | OI | OI | OI | OI | OI |
| AC | 0.000316\*\*\* |  |  | 0.000310\*\*\* | 0.000310\*\*\* |
|  | (5.51) |  |  | (5.43) | (5.43) |
| PcaLhd |  | -0.000581\*\* |  | 0.0000994 |  |
|  |  | (-2.15) |  | (0.29) |  |
| PcaHerf3 |  |  | -0.000586\*\* |  | 0.0000989 |
|  |  |  | (-2.16) |  | (0.29) |
| AC\* PcaLhd |  |  |  | -0.0000709\*\*\* |  |
|  |  |  |  | (-2.72) |  |
| AC\* PcaHerf3 |  |  |  |  | -0.0000709\*\*\* |
|  |  |  |  |  | (-2.74) |
| FCF | 0.000771 | 0.00353 | 0.00355 | 0.00260 | 0.00262 |
|  | (0.12) | (0.56) | (0.56) | (0.41) | (0.42) |
| Size | -0.00294\*\*\* | -0.00135\*\*\* | -0.00133\*\*\* | -0.00277\*\*\* | -0.00275\*\*\* |
|  | (-5.56) | (-3.07) | (-3.03) | (-5.13) | (-5.09) |
| Sales | -0.00744\*\*\* | -0.00560\*\*\* | -0.00559\*\*\* | -0.00705\*\*\* | -0.00704\*\*\* |
|  | (-4.25) | (-3.25) | (-3.25) | (-4.04) | (-4.04) |
| TQ | 0.00135\*\*\* | 0.00180\*\*\* | 0.00180\*\*\* | 0.00140\*\*\* | 0.00141\*\*\* |
|  | (3.85) | (5.37) | (5.38) | (4.00) | (4.01) |
| Cash | -0.0174\*\*\* | -0.0167\*\*\* | -0.0167\*\*\* | -0.0185\*\*\* | -0.0185\*\*\* |
|  | (-4.42) | (-4.25) | (-4.25) | (-4.70) | (-4.69) |
| Leverage | -0.00183 | -0.00420 | -0.00422 | -0.00155 | -0.00159 |
|  | (-0.66) | (-1.53) | (-1.54) | (-0.55) | (-0.56) |
| ROA | -0.00900 | -0.0990 | -0.0991 | -0.0373 | -0.0377 |
|  | (-0.08) | (-0.90) | (-0.90) | (-0.33) | (-0.33) |
| Dfrogn | -0.00163 | -0.00193 | -0.00191 | -0.00180 | -0.00178 |
|  | (-0.77) | (-0.90) | (-0.89) | (-0.84) | (-0.83) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Industry & Year Effect | Yes | Yes | Yes | Yes | Yes |
| R-Square | 0.0672 | 0.0645 | 0.0646 | 0.0692 | 0.0692 |
| Adjusted R-Square | 0.0638 | 0.0611 | 0.0611 | 0.0655 | 0.0656 |

1 OI represents a firm’s overinvestment, AC is analyst coverage, PcaLhd denotes as the PCA of corporate governance of the largest shareholders ratio < 25%, PcaHerf3 represents the corporate governance PCA of the average shareholding ratio of the top three shareholders, Control Variables include free cashflow (FCF), firm size(Size), sales (Sales), Tobin’s Q(TQ), cash (Cash), liabilities (Leverage), return on assets (ROA), Industry and Year Effect is the fixed variable. 2\*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

4.3. Endogeneity of analyst coverage and overinvestment

Yu (2008) used the instrument variable method to eliminate endogeneity. Table 4 shows the results of the instrument variable estimation. In Column 1, the coefficient of analyst coverage is0.000443 at the 5% significance level, and the coefficient of intercept is -0.0000692, indicating that the coefficient of PCA of the largest shareholders ratio < 25%is -0.0000692. The results show that the ratio of the largest shareholders< 25% can effectively restrain overinvestment caused by analysts, which is in line with Hypothesis 3. Table 4 shows that under the condition of only analysts’ coverage, the coefficient of analysts’ coverage to overinvestment is 0.000440 at the 5% significance level, which indicates that the influence of analysts’ coverage on overinvestment is significant and positive, consistent with Hypothesis 2. In addition, the interaction of the average ratio of the top three shareholders and analyst coverage shows that analysts' coverage has a significant positive correlation with overinvestment, and the interaction coefficient of analyst coverage and corporate governance PCA of the average ratio of the top three shareholders is -0.0000692at the 1% significance level, which indicates that the corporate governance principal component average shareholding ratio of the three major shareholders can effectively restrain overinvestment caused by analysts, which aligns with the expectation of Hypothesis 3.

Table 3. Results of the instrumental variable method in the two-stage regression estimation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | AC | OI | AC | OI |
| Expected Coverage | 0.6352018\*\*\* |  | 0.6668544\*\*\* |  |
|  | 19.12 |  | 19.07 |  |
| AC |  | 0.000443\*\* |  | 0.000440\*\* |
|  |  | (-2.47) |  | (-2.46) |
| PcaLhd | -0.2963869\*\*\* | 0.000118 |  |  |
|  | (-5.34) | (-0.34) |  |  |
| Expected Coverage\*PcaLhd |  | -0.0000692\*\*\* |  |  |
|  |  | (-2.63) |  |  |
| PcaHerf3 |  |  | -0.2851294\*\*\* | 0.000119 |
|  |  |  | (-5.45) | (-0.34) |
| Expected Coverage\* PcaHerf3 |  |  |  | -0.0000692\*\*\* |
|  |  |  |  | (-2.65) |
| Control Variables | Yes | Yes | Yes | Yes |
| Industry & Year Effect | Yes | Yes | Yes | Yes |
| R-Square | 0.3951 | 0.0221 | 0.3953 | 0.0222 |
| Adjusted R-Square | 0.3931 | 0.0206 | 0.3933 | 0.0207 |

1OI presents firm’s overinvestment, AC is analyst coverage, PcaLhd denotes as the PCA of corporate governance of the largest shareholders ratio < 25%, PcaHerf3 represents the corporate governance PCA of the average shareholding ratio of the top three shareholders, and Industry and Year Effect are the fixed variables. 2\*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

This study further investigates the relationship between analyst coverage, corporate governance, and overinvestment at different quantiles to test the consistency with previous regression results. Table 5, Panel A, shows that the impact of analysts' coverage and corporate governance is the largest in shareholder < 25% on overinvestment under different components of overinvestment. At0.1, 0.25, 0.5, 0.75, and 0.9overinvestment quantiles, the coefficients are significant at the 1% or 5% level, which indicates that higher analyst coverage tends to result in a firm’s overinvestment. In addition, at 0.1, 0.25, 0.5, 0.75, and 0.9 overinvestment quantiles, the interaction of corporate governance is the largest in shareholder ratio < 25%, and analyst coverage has no significant effect on overinvestment. In particular, for the 0.75and 0.9 overinvestment quantiles, the coefficient of overinvestment is -.0.00147 and -0.000136, respectively, at the 1% and 5% levels, respectively. The result indicates that in corporate governance, a higher percentage of largest shareholder shares < 25% can inhibit the effect of analyst coverage on a firm’s overinvestment, which is in line with Hypothesis 2.

Panel B shows 0.1, 0.25, 0.5, 0.75, and 0.9 overinvestment quantiles. All results are significant at the 1% level, which reveals that when analyst coverage is high, firms tend to overinvest. At 0.1, 0.25, and 0.5 quantiles, there is no significant effect on overinvestment by the interaction of corporate governance of PCA, the average ratio of the top three shareholders, and analysts' coverage. At 0.75, and 0.9 quantiles, the coefficient of the interaction of the average ratio of the top three shareholders and analysts' coverage is -0.000143 and -0.000135, respectively, and is significant at the 1 % level, which indicates that the higher the average ratio of the top three shareholders, the more restrained the impact of analysts' coverage on overinvestment, which is in line with the expectation of Hypothesis 2.

Table 4. Results of the analyst coverage, corporate governance and overinvestment quantile regression

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | OI(0.1) | OI(0.25) | OI(0.5) | OI(0.75) | OI(0.9) |
| Panel A: PcaLhd (PSA) |  |  |  |  |  |
| AC | 0.0000540\*\*\* | 0.0000671\*\* | 0.000279\*\*\* | 0.000590\*\*\* | 0.000506\*\*\* |
|  | (3.06) | (2.07) | (5.54) | (5.29) | (3.19) |
| PcaLhd | -0.0000682 | -0.000229 | 0.000211 | 0.000461 | 0.000560 |
|  | (-0.52) | (-1.50) | (0.60) | (0.74) | (0.55) |
| PcaLhd | 0.00000444 | 0.0000104 | -0.0000422 | -0.000147\*\*\* | -0.000136\*\* |
|  | (0.53) | (0.74) | (-1.64) | (-3.03) | (-2.54) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Industry & Year Effect | Yes | Yes | Yes | Yes | Yes |
| R-Square | 0.0672 | 0.0645 | 0.0692 | 0.0947 | 0.0970 |
| Adjusted R-Square | 0.0638 | 0.0611 | 0.0655 | 0.0925 | 0.0949 |
|  | OI (0.1) | OI (0.25) | OI (0.5) | OI (0.75) | OI (0.9) |
| Panel B: PcaHerf3(PSA) |  |  |  |  |  |
| AC | 0.0000545\*\*\* | 0.0000659\*\*\* | 0.000281\*\*\* | 0.000584\*\*\* | 0.000512\*\*\* |
|  | (3.28) | (2.70) | (3.79) | (6.84) | (2.79) |
| PcaHerf3 | -0.0000694 | -0.000222 | 0.000237 | 0.000442 | 0.000562 |
|  | (-0.73) | (-1.19) | (0.57) | (0.73) | (0.59) |
| PcaHerf3 | 0.00000424 | 0.0000101 | -0.0000410 | -0.000143\*\*\* | -0.000135\*\* |
|  | (0.49) | (0.87) | (-1.39) | (-4.32) | (-2.09) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Industry & Year Effect | Yes | Yes | Yes | Yes | Yes |
| R-Square | 0.0672 | 0.0646 | 0.0692 | 0.0947 | 0.0970 |
| Adjusted R-Square | 0.0638 | 0.0611 | 0.0656 | 0.0925 | 0.0949 |

1OI presents firm’s overinvestment, AC is analyst coverage, PcaLhd denotes as the PCA of corporate governance of the largest shareholders ratio < 25%, PcaHerf3 represents the corporate governance PCA of the average shareholding ratio of the top three shareholders,, Control Variables include free cashflow (FCF), firm size(Size), sales (Sales), Tobin’s Q(TQ), cash (Cash), liabilities (Leverage), return on assets (ROA), Industry and Year Effect is fixed variable. 2\*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

4.4. Quasi treatment design

Based on the quasi-experimental event of external shocks, this study adopts the difference-in-differences method to test the effectiveness of the policies of the Third Plenary Session. We assume that the reform of the legal system is not determined by analyst or firm characteristics; however, the reform of policies will affect a firm’s future operation by increasing or decreasing its operational performance and investment strategies. The treatment group is state-owned firms, while the control group is non-state-owned firms. The reason is to test whether the goal of the Third Plenary Session has enhanced the national governance system; thus, state-owned firms must be the first priority to test in this study and are, therefore, set as the treatment group.

In addition, the implementation date of the Third Plenary Session was November 2013. To avoid the risk of information disclosure before the implementation of the policy, which will affect the study’s sample data, we exclude 2013, and compare the two years before (2011 and 2012) and after (2014 and 2015) the Third Plenary Session. In this study, 2011 and 2012 are denoted as being before the event, and the treatment group is matched with the control group first to ensure that the difference between the two groups is not caused by other events or differences. Following Navone and Wu’s (2018) study, we select the treatment and control groups characteristics, which include firm size, liabilities, Tobin’s Q, cash, and analyst coverage to run PSM.

Table 5 shows the average difference in each variable before and after the reform meeting. The results indicate that for analyst coverage on the treatment and control groups, the characteristics of firm size, liabilities, Tobin’s Q, and cash are all significant, while after PSM, analyst coverage is not significant between the treatment and control groups.

Table 5 Results of propensity score matching of firm characteristics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Before/After | Treatment | Control | Difference | P value |
| AC | U | 7.4185 | 8.6984 | -1.2799 | 0.0000\*\*\* |
|  | M | 7.4245 | 7.4837 | -0.0592 | 0.8640 |
|  |  |  |  |  |  |
| Size | U | 22.6630 | 21.8080 | 0.8550 | 0.0000\*\*\* |
|  | M | 22.6630 | 22.6510 | 0.0120 | 0.8170 |
|  |  |  |  |  |  |
| Leverage | U | 0.5485 | 0.4103 | 0.1382 | 0.0000\*\*\* |
|  | M | 0.5482 | 0.5530 | -0.0047 | 0.5530 |
|  |  |  |  |  |  |
| TQ | U | 1.3947 | 2.4793 | -1.0846 | 0.0000\*\*\* |
|  | M | 1.3956 | 1.4626 | -0.0670 | 0.2310 |
|  |  |  |  |  |  |
| Cash | U | 0.0067 | 0.0063 | 0.0003 | 0.0790\* |
|  | M | 0.0066 | 0.0065 | 0.0001 | 0.5290 |

1AC is analyst coverage, firm size(Size), liabilities (Leverage), Tobin’s Q(TQ), cash (Cash). U denotes as before analyst coverage matching, while M denote as after matching. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

After completing PSM, this study further investigates the impact of the Third Plenary Session on the treatment and control groups by using the difference-in-differences approach. Table 6 shows the difference before (Diff1) and after (Diff2) the reform.

The results in Table 6 show that the coefficient of the treatment and the control group is 0.039 and 0.036, respectively, with differences before the implementation of -0.002and a p-value is 0.233, indicating that there is no significant difference between the treatment group and the control group before the policy implementation. The coefficient of the treatment and the control group is 0.036 and 0.027, respectively, with differences after the implementation of -0.0009 and a p-value is 0.008 at the 1% significance level, which shows there is significant difference between the treatment group and the control group after the policy implementation. Finally, the study also uses difference-in-differences testing to compare the difference between Diff1and Diff2. The results show that the difference is -0.007 with a p-value of 0.008 at the 1% significance level, verifying that overinvestment of state-owned companies has significantly reduced as an outcome of government reform.

Table 6. Results of the difference-in-differences test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | OI | Standard  deviation | T value | P value |
| Before |  |  |  |  |
| Control | 0.039 |  |  |  |
| Treated | 0.036 |  |  |  |
| Diff1 (treated-control) | -0.002 | 0.002 | -1.200 | 0.230 |
| After |  |  |  |  |
| Control | 0.037 |  |  |  |
| Treated | 0.027 |  |  |  |
| Diff 2(treated-control) | -0.009 | 0.003 | 3.300 | 0.001\*\*\* |
| Diff1-Diff2 | -0.007 | 0.003 | 2.14 | 0.033\*\* |

1 OI denotes as overinvestment, Diff represents as difference. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively

5Robustness test

To test the robustness of our method, we divided analyst coverage into three equal parts and took the last third of analyst coverage, then undertook PSM. Table 7 represents the results, showing that there is no significant difference in analysts' coverage before PSM, and while there are differences in other important firm characteristics before, there is no significant difference in the important characteristics of each firm after PSM.

Table 7. Results of propensity score matching of high analyst coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Before/after | Treatment | Control | Difference | P Value |
| AC | U | 9.5057 | 9.8810 | -0.3753 | 0.4880 |
|  | M | 9.5057 | 8.8284 | 0.6773 | 0.2340 |
|  |  |  |  |  |  |
| Size | U | 22.4480 | 21.5830 | 0.8650 | 0.0000\*\*\* |
|  | M | 22.4480 | 22.3790 | 0.0690 | 0.3210 |
|  |  |  |  |  |  |
| Leverage | U | 0.5330 | 0.3860 | 0.1470 | 0.0000\*\*\* |
|  | M | 0.5330 | 0.5363 | -0.0032 | 0.7710 |
|  |  |  |  |  |  |
| TQ | U | 1.1854 | 1.7483 | -0.5629 | 0.0000\*\*\* |
|  | M | 1.1854 | 1.2231 | -0.0377 | 0.5150 |
|  |  |  |  |  |  |
| Cash | U | 0.0075 | 0.0068 | 0.0008 | 0.0190\*\* |
|  | M | 0.0075 | 0.0075 | 0.0000 | 0.9210 |

1AC is analyst coverage, firm size(Size), liabilities (Leverage), Tobin’s Q(TQ), cash (Cash). U denotes as before analyst coverage matching, while M denote as after matching. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

Table 8 shows the effectiveness of reform shown by difference-in-differences testing after PSM. The results show that there is a difference in firm’s overinvestment between the treatment and control groups before and after the meeting. Before the meeting, the p-value of the treatment and control group overinvestment is 0.489, which indicates that there is no significant difference, while the p-value of the treatment and control groups overinvestment after the meeting is 0.489 at the 10% level. Next, we compare the difference between the two groups and obtain a p-value of 0.075 at a significance level of 10%, which indicates that the reform promoted by the Third Plenary Session is still effective despite the high analyst coverage of the latter third of analysts.

Table 8. Results of difference-in-differences testing of high analyst coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | OI | Standard  Deviation | t value | P value |
| Before |  |  |  |  |
| Control group | 0.037 |  |  |  |
| Treated group | 0.039 |  |  |  |
| Diff1 (treated-control) | 0.002 | 0.003 | 0.690 | 0.489 |
| After |  |  |  |  |
| Control group | 0.036 |  |  |  |
| Treated group | 0.030 |  |  |  |
| Diff 2(treated-control) | -0.006 | 0.004 | 1.720 | 0.086\* |
| Diff1-Diff2 | -0.008 | 0.004 | 1.790 | 0.075\* |

1OI denotes as overinvestment, Diff represents as difference. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

Next, this study considers that if there is a high or low level of overinvestment within the treatment group or the control group, it will alter the effectiveness of the reform and the accuracy of the overall test. Therefore, we add overinvestment as an important variable in PSM. Table 9 shows the results of PSM after including overinvestment, indicating that there are significant differences in a firm’s important characteristics except for analyst's coverage and ROA before PSM, while after PSM, none of the important variables show significant differences.

Table 9. Results of propensity score matching ofoverinvestment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Before/After  Matching | Treatment  Group | Control  Group | Difference | P value |
| OI | U | 0.0394 | 0.0455 | -0.0061 | 0.0470\*\* |
|  | M | 0.0394 | 0.0361 | 0.0033 | 0.3040 |
|  |  |  |  |  |  |
| AC | U | 19.4250 | 17.5930 | 1.8320 | 2.5400 |
|  | M | 19.4250 | 18.2020 | 1.2230 | 0.1540 |
|  |  |  |  |  |  |
| Size | U | 23.1280 | 21.8150 | 1.3130 | 0.0000\*\*\* |
|  | M | 23.1280 | 23.0300 | 0.0980 | 0.3870 |
|  |  |  |  |  |  |
| Leverage | U | 0.5187 | 0.3500 | 0.1687 | 0.0000\*\*\* |
|  | M | 0.5187 | 0.5340 | -0.0153 | 0.3760 |
|  |  |  |  |  |  |
| TQ | U | 1.2392 | 1.9337 | -0.6945 | 0.0000\*\*\* |
|  | M | 1.2392 | 1.2835 | -0.0443 | 0.6370 |
|  |  |  |  |  |  |
| Roa | U | 0.0075 | -1.5000 | 1.5075 | 0.8530 |
|  | M | 0.0075 | -59.9000 | 59.9075 | 0.7630 |

1AC is analyst coverage, firm size(Size), liabilities (Leverage), Tobin’s Q(TQ), cash (Cash).. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively. U denotes analyst coverage before matching and M denotes analyst coverage after matching. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10 shows that the p-value of overinvestment difference between the treatment group and the control group before the reform is 0.244 and 0.113 after the meeting, and there is no significant difference. By comparing the difference between the two groups, the p-value is 0.049 at the 5% significance level, thus confirming that the reform is still effective after overinvestment is added as one of the important variables, and has become insignificant after implementation, which shows that the influence of past reforms is still effective at reducing overinvestment.

Table 1**0** Results of difference-in-differences testing using overinvestment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | OI | Standard  Deviation | T value | P value |
| Before |  |  |  |  |
| Control group | 0.036 |  |  |  |
| Treated group | 0.039 |  |  |  |
| Diff1 (treated-control) | 0.003 | 0.003 | 1.170 | 0.244 |
| After |  |  |  |  |
| Control group | 0.036 |  |  |  |
| Treated group | 0.030 |  |  |  |
| Diff 2(treated-control) | -0.006 | 0.003 | 1.590 | 0.113 |
| Diff1-Diff2 | -0.009 | 0.004 | 1.970 | 0.049\*\* |

1OI denotes as overinvestment, Diff represents as difference. 2 \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

5. Conclusions

With the rapid growth of China’s economy in recent years, investors have paid increasing attention to China's market, and the role of analysts in the capital market remains controversial. This study shows that Chinese analysts remain unable to reduce firms’ agency problems caused by overinvestment; on the contrary, analysts can cause a substantial increase in overinvestment without effectively eliminating the information asymmetry between firms and investors. When analysts are unable to resolve firms’ internal problems, they seek corporate governance as a resolution. The results of this study show that corporate governance can effectively reduce the overinvestment effect caused by analysts in China, while also creating and maximizing a firm’s value. However, the empirical results reveal that corporate governance is effective only when a firm’s overinvestment is extreme, indicating that there is still a need to reform the system. Overall, the empirical findings of this study indicate that analysts act as market supervisors in the Chinese capital market; however, their coverage provides little benefit to firms or shareholders.

The results indicate that high analyst coverage leads to an increase in overinvestment because managers seek to achieve the earnings target specified in the analysis report. However, corporate governance can diminish a firm’s overinvestment caused by analyst coverage, which protects shareholders’ investment in the firm. This study employed the instrumental variable to address the endogeneity effect between analysts and overinvestment to determine if there is a different scenario; however, the results were the same. Furthermore, quantile analysis was used to test the effect of analyst coverage at different quantiles, demonstrating that analyst coverage increases a firm’s overinvestment at all quantiles, which further establishes the influence of analysts on the Chinese market. When overinvestment is at the 75% and 99% quantiles, a firm’s overinvestment is significant; however, corporate governance can reduce the impact of overinvestment. Corporate governance can protect shareholders in cases of excessive overinvestment. Previous scholars have empirically shown that analyst coverage can solve information asymmetry within poorly managed firms. Thus, were commend further research using different explanatory variables to explore whether Chinese analysts can act as information transmitters to increase the investment efficiency of firms and protect shareholders' wealth.

**Conflicts of Interest:** The authors declare no conflict of interest.

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1. http://www.nasd.com/RegulatoryEnforcement/NASDEnforcementMarketRegulation/GlobalSettlement/index.htm and Kadan et al., (2008) have shown that Global Analyst Research Settlements, 2003, is an executive agreement between the U.S. Securities and Exchange Commission, the financial industry regulatory authority, and the New York Stock Exchange and major U.S. investment banks. The core issue of the judgment is the conflict of interest between the 10 largest investment banks and analysts in the United States. The settlement amount of US$1.435 million shows that analysts have issued false research reports for their own trading commission and investment banking business, thus damaging their investment research quality and credit. [↑](#footnote-ref-1)
2. China adopts a dual board of directors, which is formed by an executive board (all executive directors) and an independent board of supervisors (all non-executive directors).Company law in China stipulates that a limited liability firm shall set up a board of directors and a board of supervisors, and, according to Article 51 of the Company Law of the People's Republic of China, a limited liability company shall set up a board of supervisors with no less than three persons. A limited liability company with a small number of shareholders or a small amount of capital may set up one or two supervisors, and no board of supervisors is required. [↑](#footnote-ref-2)
3. The Third Plenary Session formulated policies to determine the orientation of China’s economic and institutional reforms in subsequent years. Hu, Tang, and Yan (2017) indicate that the Third Plenary Session, 2013, introduced the overall goal of comprehensively deepening reform, which required comprehensively promoting reform in economic, political, cultural, and social systems. The specific goal was to improve the socialist economy, socialist democracy, socialist culture, social management, and ecosystems. [↑](#footnote-ref-3)
4. Yu (2008)indicated that the change in securities firms’ revenue or profit are related to the number of analysts employed rather than a firm’s characteristics and investment strategies, which are instrumental variables to capture the change in analyst coverage. This means that the instrumental variable affects the independent variable but not the dependent variable, which satisfies the exclusive restriction. Thus, we adopt the instrumental variable to solve the endogeneity problem in this study. Moreover, the base year in this study is 2011–the middle year during the sample period–and firms within the base year must have at least one analyst coverage before it can be used to estimate instrument variables. [↑](#footnote-ref-4)