Are seasoned equity offering investors misled by analyst optimism bias? Evidence from investor bids in SEO auctions

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Abstract

Using unique seasoned equity offering (SEO) investor bid data in China, we examine the impact of analyst optimism bias on SEO investors' bids and the subsequent SEO discount. After accounting for information asymmetry and analyst coverage, our findings suggest that SEO investor bid prices are positively correlated with analyst optimism bias, suggesting that SEO investors are misled. The higher SEO bid price translates into a lower SEO discount. Our findings are robust to alternative measures of earnings forecasts, additional control variables, and SEO discounts. Additional evidence suggests that, when institutional investor ownership is lower or an SEO firm is less transparent, the positive correlation is more prominent. Our findings imply that analysts play more than one role in SEO pricing. In addition to lowering information asymmetry, analysts also mislead SEO investors by providing optimistically biased earnings forecasts.

Key words: seasoned equity offerings; optimism bias; information asymmetry; analysts

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1. Introduction

Analysts engage in information production by conducting research on the firms they cover. Among their research findings, earnings forecasts are an important piece of information. Market participants use these forecasts and other information to make decisions. However, the literature generally concludes that analysts are optimistically biased in their earnings forecasts (analyst optimism bias) due to their incentives to curry favor to management (e.g., Ke and Yu, 2006), generate trading commissions for their brokerages (e.g., Hayes, 1998), and promote investment banking business (e.g., O'Brien et al., 2005; Agarwal and Chen, 2008), for example.

Given that analyst optimism bias is a general phenomenon, the natural question is whether such a bias has economic consequences. The literature on the question is scant, however. An exception is the study of Xu et al. (2013), who document that analyst optimism bias regarding a firm is positively correlated with the firm's crash risk. This is because optimistic analysts primarily report positive information on the firm, so that investors are unable to gauge the firm's negative information. Once negative information on a firm accumulates beyond a threshold and is released to the market in a short period, its stock price crashes. The findings of Xu et al. suggest that investors may not be able to process information accurately and are misled by analyst optimism bias. However, few studies examine how investors react to analyst optimism bias directly, because it is challenging to identify investors' direct response.

In a parallel body of literature, seasoned equity offerings (SEOs) sell at a discount (e.g., Corwin, 2003; Kim and Shin, 2004). That is, a stock's SEO offer price, on average, is lower than its

prevailing market price. For instance, Corwin (2003) reports that, in the United States, the average SEO discount is 2.92%. Similarly, Chen and Wang (2007) report an average 21.6% discount in China. The SEO literature attributes the discount to the information asymmetry of the SEO firm. The discount is lower when the SEO firm has less information asymmetry, due to, for example, using a reputable underwriter or having a smaller SEO offer. Following the information asymmetry explanation, Bowen et al. (2008) document that a firm's SEO discount is smaller when a larger number of analysts are covering the firm. The authors contend that analyst coverage can reduce the firm's information asymmetry and thus lower the SEO discount. The SEO literature, however, seldom considers the impact of analyst optimism bias on the SEO discount.

Unlike initial public offerings (IPOs), analysts continue to provide earnings forecasts on a firm prior to its SEO. Obviously, when SEO investors submit their bids, analyst earnings forecasts form part of their information set. However, it is not clear whether and how SEO investor bids and SEO discounts relate to analyst optimism bias, due to the lack of investor bidding data. Leveraging a unique bidding database in China, this paper aims to examine whether investors are misled by optimistic earnings forecasts when they submit their bids for SEO shares. Given that SEOs are a common avenue for firms to raise capital, it is worth studying whether analyst optimism bias plays a role in SEO pricing.

We conduct our analysis using a sample of SEOs in China. Using Chinese SEOs has several advantages. First, the Chinese financial market is opaque (Piotroski and Wong, 2012), so analysts influence investor decisions. Firth et al. (2013) and Gu et al. (2013) suggest that analysts provide optimistically biased recommendations for the stocks their mutual fund clients hold. These biased recommendations help to support the stock prices. Thus, we infer that analyst earnings

forecasts, like analyst recommendations, also play a role in investors' investment decisions. Second, analyst optimism bias is common in China. Beside the reasons provided in the literature, Li (2008), Liu and Zhang (2008), and Wang (2009) document anecdotal evidence that providing optimistic earnings forecasts that please clients is critical to analysts' careers. Thus, analyst optimism bias is the norm rather than the exception in China. Third, the SEO pricing and disclosure system in China allows us to identify how investors react to analyst optimism bias. During our sample period, majority of the SEO firms in China chose a uniform-price auction system. The system asks investors to submit bids and the SEO offer price is determined by the market-clearing price for which investors' demand for SEO shares equals the issuer's supply. More importantly, of the issuers disclose investors' bid prices and quantity information gathered during the book building process. Hence, we can leverage investors' bid prices and quantities to gauge whether they react to analyst optimism bias prior to SEOs. To the best of our knowledge, we are the first in the SEO literature to study the impact of analyst optimism bias on investor bid prices and SEO discounts.

We offer several findings. First, we document that the SEO investor bid price is positively correlated with analyst optimism bias regarding the same stock. With the SEO offer price generally lower than the prevailing market price, the higher bid price translates into a lower SEO discount. That is, SEO investors are misled by analysts' optimistic earnings forecasts and, consequently, bid higher so that SEO discount is smaller. The findings remain intact after accounting for factors related to information asymmetry and are robust to alternative measures of earnings forecasts, additional control variables, and alternative methods to calculate SEO discounts. Second, we document that the impact of analyst optimism bias on the SEO discount is

insignificant when the SEO firm has higher institutional investor ownership or better information transparency, suggesting that SEO investors do not rely too much on analysts' optimistic earnings forecasts when information asymmetry is low. Third, we find that investors' optimistic view of the SEO valuation (due to analyst optimism bias) is at least part of the mechanism behind the impact of analyst optimism bias on the SEO discount. Overall, we conclude that, while lower information asymmetry translates into a smaller SEO discount, analyst optimism bias plays a role in lowering the SEO discount by misleading SEO investors.

Our findings contribute to the literature in several ways. First, we provide direct evidence that investors cannot see through analyst optimism bias. The literature consistently documents that analyst earnings forecasts are optimistically biased.[1] However, it is not clear whether investors are misled by the bias. A potential reason is that it is hard to identify investors' direct response to analyst optimism bias. Leveraging unique investor bid data on Chinese SEOs and the institutional environment, we provide a first study on the topic. Second, we advance the analyst literature by documenting that analyst optimism bias has economic consequences on a firm's capital formation. That is, investors pay more for the SEO shares and SEO firms leave less money on the table in the presence of analyst optimism bias and information asymmetry. The literature on analyst optimism bias primarily focuses on why there such a bias exists (e.g., O'Brien et al., 2005; Ke and Yu, 2006; Agrawal and Chen, 2008). The literature on its economic consequences is scant. This study adds to this thread of literature by investigating the impact of analyst optimism bias on a firm's capital formation. Third, we provide a new explanation for the role of analysts in lowering SEO discounts. Bowen et al. (2008) find that analyst coverage is negatively associated

[1]See Ramnath et al. (2008) for an excellent review.

with SEO discounts. They contend that analysts contribute to lower SEO discounts by reducing information asymmetry among investors. After accounting for analyst coverage and other factors, we document that a lower SEO discount resulting from analyst involvement is not totally due to their role in lowering information asymmetry. Instead, it is partially due to SEO investors being misled by analyst optimism bias. Overall, we document that analyst involvement in security research can play more than one role, echoing the findings of Malmendier and Shanthikumar (2014) that analysts speak in two tongues. Malmendier and Shanthikumar state that analysts issue optimism-biased recommendations but less optimistic forecasts, while our results show that analyst coverage helps lower information asymmetry but also misleads SEO investors into submitting a higher bid price for the SEO due to optimistically biased earnings forecasts.

2. Background, literature review, and hypothesis development

2.1 Background

The Chinese government recognizes the importance of capital formation in economic development and thus accelerates capital market development. SEOs (including rights offerings, public offerings, and non-public offerings) are an important source of equity capital formation. To preserve an orderly capital market, the China Securities Regulatory Commission (CSRC) has set up a series of regulations and rules for SEOs. Before 2006, Chinese public firms were not allowed to conduct non-public offerings.

In April 2006, the CSRC issued *Administrative Measures for the Issuance of Securities by Listed Companies*. This document lifted the ban on non-public offerings for listed firms in China. Since then, non-public offerings have become the primary method of

equity refinancing for listed firms in China. In 2015, completed non-public offerings had raised 670.95 billion RMB, accounting for 99.37% of the total SEO amount that year in China.[2]

In September2007, the CSRC issued *Rules for the Implementation of Non-Public Issuance by Listed Companies* to mandate firms to adopt either a fixed price mechanism or a uniform-price auction mechanism in conducting non-public SEOs.

When the target investors of an SEO are determined before a firm applies to the CSRC for approval, the SEO offering price must be set before issuance based on negotiations between the issuers and target investors. Since the SEO offer price is fixed under this mechanism, we refer to it as a fixed price mechanism. When an SEO firm does not determine the target investors of an SEO before it submits to the CSRC for approval, the SEO offering price must be determined through a uniform-price auction mechanism. Under the uniform-price auction mechanism, the SEO firm first sets a reserve price and an expected amount of funds to be raised (or expected shares to be sold) in a pre-arranged prospectus before proposing the SEO application to the CSRC. After obtaining the CSRC's approval, the SEO firm, with the help of an investment bank, invites a specific group of investors to submit their bids. These potential bidding investors must include but are not limited to strategic investors, top 20 shareholders, at least 20 mutual funds, at least 10 brokerage firms, and at least five insurance companies. After receiving bids from investors, the SEO firm sets the SEO offer price at the market-clearing bid price where the demand quantity is equal to the corresponding supply quantity. Investors whose bid prices are higher than the SEO offer price are allocated the number of shares they bid using the market-clearing price. We examine SEOs using the uniform-price auction mechanism.

[2] The information is fromhttp://www.csrc.gov.cn/pub/newsite/sjtj/ (accessed April 12, 2017).

Between the two pricing methods, majority of firms use the uniform-price auction mechanism. During our sample period, 1,065 of 1,659 SEO firms (about 64.2%) adopted the uniform-price auction mechanism.

2.2 Literature review

2.2.1 SEO discounts

SEO shares sold at a discount are a worldwide phenomenon. A common information-based explanation for SEO discounts is the information asymmetry between outside investors and SEO firms. That is, outside investors face an information disadvantage over SEO firms. Since outside investors demand a cushion of protection from the adverse information an SEO firm, the SEO firm needs to set the offer price below the market value of the stock to attract subscription.

The SEO literature examines the factors contributing to the discounts, with a focus on information asymmetry. Using US data, Corwin (2003) and Kim and Shin (2004) document that a higher relative SEO offer size and stock price volatility lead to larger SEO discounts. Mola and Loughran (2004) find that having a prior SEO and reputable underwriters translates into lower discounts for current SEOs. These earlier studies suggest that factors related to information asymmetry play an important role in SEO discounts. For instance, reputable underwriters, to preserve their reputation capital, are more eager to associate with better SEO firms. Therefore, the SEO discounts are lower when the SEO firm hires a reputable underwriter. Chan and Chan (2014) employ stock price synchronicity as a proxy for the informativeness of stock prices and find that SEO discounts are negatively associated with stock return synchronicity, providing new evidence of the information asymmetry explanation for SEO discounts.

In terms of Chinese SEOs, the literature reports similar findings. For instance, Poon et al. (2013) document that, when an SEO firm has a prior credit rating, the SEO discount is lower. The author contends that having a credit rating can reduce information asymmetry. Using a sample of Chinese SEOs, Huang et al. (2016) study the length of time required for the CSRC approval of SEOs. They find that when the CSRC takes longer to approve an SEO application, the discount is lower. The authors argue that longer SEO regulatory approval signals lower information asymmetry.

In a related study, Bowen et al. (2008) investigate the relation between analyst coverage and SEO discounts. These authors extend the traditional SEO literature by incorporating a new market participant, analysts, to explain the cross-sectional variance in the SEO discount. The study documents that higher analyst coverage translates into a lower SEO discount. It attributes the findings to lower information asymmetry among SEO investors when a firm is covered by more analysts.

In summary, the findings in the SEO literature support the information-based explanation for SEO discounts. However, most of the literature focuses on the characteristics of underwriters and issuers in the SEO pricing process. With exception of Bowen et al. (2008), few studies examine how external factors, such as analysts, are related to SEO discounts.

2.2.2 Analyst optimism bias

The literature generally concludes that analyst earnings forecasts and recommendations are optimistically biased. Earlier studies, such as that of Francis and Philbrick (1993), show that analysts' earnings forecasts are optimistic. The optimism bias is more severe in stocks with a sell

or hold rating. Hayes (1998) provides a model to show that analysts' incentives to generate trading commissions contribute to their optimism bias in earnings forecasts.

O'Brien et al. (2005) report that analysts respond promptly to good news but slowly to bad news in their recommendations when their firms have an investment bank relationship with the rated firms. Agrawal and Chen (2008) report similar conflicts of interest relating to the investment bank relationship and analyst recommendations.

Ke and Yu (2006) document that analysts who issue initial optimistic earnings forecasts followed by pessimistic earnings forecasts produce more accurate forecasts and are less likely to be dismissed by their brokerages. The authors attribute the findings to analysts currying favor to firm management to obtain better access to management's private information during the forecasting process.

Hong and Kubik (2003) study the relation between analyst earnings forecasts and job separations. They document that 1) accurate forecasters can experience favorable career outcomes (such as moving to a better job), 2) after controlling for accuracy, more optimistic analysts are more favorable in job separations, and 3) job separations among analysts who cover stocks underwritten by their brokerages depend primarily on the extent of their optimism bias.

Mola and Guidolin (2009) find that when an analyst's brokerage firm engages in trades for mutual fund clients, it frequently makes favorable recommendations regarding the stocks that are held in these mutual funds. Guan et al. (2012) document that, after several reforms targeting investment banking-related conflicts of interest, analyst stock recommendations have less optimism bias but the bias persists in earnings forecasts. These studies generally report that analysts have strong incentives to refrain from reporting information that may negatively affect

stock prices due to conflicts of interest. Even after several regulatory reforms reported by Guan et al. (2012), optimism bias in earnings forecasts persists.

A parallel body of literature suggests that analysts face various challenges in processing firm information. When less negative information is available, the earnings forecasts are optimistically biased. Lang and Lundholm (1996) suggest that firms may not fully disclose all (negative) information so that analysts lack adequate information to make less optimistic earnings forecasts. Fang and Peress (2009) find that lack of media coverage does not help communicate negative information about a firm to the public. Accordingly, analysts receive less (negative) information about the stocks they cover. This body of literature suggests that analyst optimism bias in earnings forecasts may be due to a tough information environment.

In conclusion, most of literature on analyst optimism bias either shows there is indeed such a bias or examines the reasons behind the bias. The implicit assumption of analyst optimism bias is that investors are misled by it, because we continue to observe such bias even after regulatory reforms (Guan et al., 2012). However, no study *directly* investigates show investors react to analyst optimism bias. In addition, few studies explore the economic consequences of analyst optimism bias.

2.3 Hypothesis development

The analyst literature concludes that analysts have optimism bias. The question is whether investors are misled by the analyst optimism bias. Xu et al. (2013) document that firms covered by high analyst optimism bias have high crash risk, suggesting that investors may not be able to process information accurately and are misled by analyst optimism bias. Besides Xu et al. (2013), we do not find any studies related to the economic consequences of analyst optimism

bias. Hence, we do not make a priori predictions in the context of SEO investors facing analyst optimism bias in their bids for SEO shares.

If investors are misled by analyst optimism bias, they believe the SEO firm value is high. Then, they submit a higher bid for the SEO shares in a uniform-price auction system. All else being the same, the SEO discount will be lower. We note that the lower SEO discount here is not due to lower information asymmetry but, rather, to the investors being "fooled" by the analyst optimism bias. This is possible if investors rely on analyst research findings in making their decisions, especially when firms have higher information asymmetry. The Chinese stock market is shown to be opaque (Piotroski and Wong, 2012). In addition, Firth et al. (2013) and Gu et al. (2013) suggest that analyst earnings forecasts are influential in China. Thus, it is possible for SEO investors to be misled by analyst optimism bias. If this is the case, SEO investors bid higher and thus SEO discounts decrease as analyst optimism bias increases.

In contrast, investors, especially those with resources and experience, may not only use analyst earnings forecasts or may have the ability to "see through" optimistic earnings forecasts before making their SEO bidding decisions. In the Chinese uniform-price auction system, the involved parties are resourceful and experienced investors. Hence, they can potentially recognize analyst optimism bias. If investors can see through such bias, their SEO bids do not correlate with the analyst optimism bias. Therefore, analyst optimism bias has no impact on SEO investor bids and, consequently, has no impact on SEO discounts. Hence, the first testable hypothesis has two alternatives.

H1A: Analyst optimism bias is negatively correlated with SEO discounts.

H1B: Analyst optimism bias is not correlated with SEO discounts.

We leverage the degree of information asymmetry within an SEO firm to examine its moderating effect on the relationship between analyst optimism bias and SEO discount. We examine two aspects of information asymmetry. First, we consider firms with different levels of institutional investor ownership. Institutional investors have more resources and can monitor their invested firms well. Thus, we expect firms with disproportionately more institutional investor ownership to have lower information asymmetry. Second, we consider the firm's opaqueness. When a firm is transparent (less opaque), the information asymmetry is low. If *H1A* is valid, we should observe the impact of analyst optimism bias on the SEO discount to be more pronounced for SEO firms with less institutional investor ownership or high opaqueness. This is because, for these SEO firms with high information asymmetry, SEO investors are eager to look for information on the firm. Thus, analyst optimism bias has a better chance of misleading SEO investors.

In contrast, if *H1B* is the case, we should not find a significant moderating effect of institutional investor ownership and firm opaqueness. This is because SEO investors can examine the genuine value of the SEO firm due to less information asymmetry. Thus, analyst optimism bias is less effective in misleading SEO investors to submit a higher bid price. Hence, our second and third testable hypotheses are as follows.

H2A: The negative relation between analyst optimism bias and SEO discounts is more pronounced for SEO firms with less institutional investor ownership (or higher opaqueness).

H2B: The negative relation between analyst optimism bias and the SEO discount for SEO firms with less institutional investor ownership (or higher opaqueness) is not different from that for SEO firms with more institutional investor ownership (or lower opaqueness)

3. Data and methods

3.1 Data

Our data consist of all SEOs that adopt a uniform-price auction mechanism for 2007–2015. We begin in 2007 because this was the first year the CSRC allowed the uniform-price auction mechanism. A total of 1,065 SEOs used the uniform-price auction mechanism during our sample period. The data are obtained from the WIND database and the CNINF website (www.cninfo.com.cn). We manually obtain investor bid information from the CNINF website. Other accounting and finance information is extracted from the China Stock Market &Accounting Research database. We delete SEO firms without order books or complete financial information, financial firms, and firms with multiple SEOs in a year. After the screening, the final sample has 682 SEOs. We winsorize all the continuous variables at the 1% and 99% levels.

For the analyst earnings forecasts, we use those forecasts for the next fiscal year issued within one year before the SEO date. For example, if an SEO is offering on June 1, 2015, we use all the analyst forecasts for the earnings per share of fiscal year 2015 from June 1, 2014, to May 31, 2015.

3.2 Methods

3.2.1 Relation between analyst optimism bias and the SEO discount

We use the following multiple regression model to study H1A and H1B:

$$DISCOUNT_{i,t} = \alpha_1 + \alpha_1 OPTIMISM_{i,t} + \Sigma\alpha_j CONTROL_{i,t} + industry + year + \xi_{i,t} \quad (1)$$

where *DISCOUN T*is the SEO discount, which is (*CLS – OFFER)/CLS*; *CLS* is the prevailing market price one day before the SEO; *OFFER* is the SEO offer price; and *OPTIMISM* is analyst earnings forecast optimism. We use two measures: a) *OPTIMISM_MID* = (*MIDPOINT – ACTUAL)/CLS*, where *MIDPOINT* is the midpoint of all analysts' earnings forecasts one year before the SEO date and *ACTUAL* is the firm's actual earnings, and b) *OPTIMISM_MEAN*= (*MEAN – ACTUAL)/CLS*, where *MEAN* is the mean value of all analysts' earnings forecasts one year before the SEO date and *ACTUAL* is the firm's actual earnings. If *H1A* is valid, α_1 should be negative and significant. For *H1B* to be valid, $\alpha_1$should not be significant.

Following Bowen et al. (2008) and Huang and Zhang (2011), we include a set of control variables that fall into the following categories.

a) SEO issue: the subscription ratio of the largest shareholder (*BIGHOLDER_RATIO*), the relative SEO offer size (*ISSUE_RATIO*), the SEO offer size (*ISSUE_SIZE*), the underwriter's reputation (*REPUTATION*), and the SEO reserve price range (*RANGE*).

b) Stock market environment: stock return volatility (*VOLATILITY*), stock turnover (*TURNOVER*), and the stock market index return (*MARKET*).

c) Firm characteristics: institutional investor ownership (*INVEST_RATIO*), financial leverage (*LEV*), firm size (*SIZE*), the market-book ratio (*MB*), the ratio of cash flow from operations to total assets (*CFO*), the ratio of net fixed assets to total assets (*PPE*), and state ownership (*STATE*).

In addition, we follow Bowen et al. (2008) and include analyst coverage (*ANALYST*) as an additional control variable in Eq. (1) to account for analysts' role in reducing information asymmetry through information production. We present the detailed definitions of all the

variables in the Appendix. We pool all the data and use ordinary least squares to estimate Eq. (1) and cluster standard errors by year and firm.

To examine *H2A* and *H2B*, we partition the full sample into two sub-samples using institutional investor ownership (*INVEST_RATIO*) based on the industry median. For corporate opaqueness, we follow Hutton et al. (2009) and Kim and Zhang (2014) to proxy for financial reporting opacity (*OPAQUE*) as the sum of the absolute values of annual discretionary accruals for the three years prior to a firm's SEO. The annual discretionary accruals are estimated from the cross-sectional modified Jones model of Dechow et al. (1996).[3] If a firm's *OPAQUE* variable is larger than the industry median, the firm has poor corporate transparency and vice versa.

4. Results and discussions

4.1 Base results

We present summary statistics in Table 1. The mean of *DISCOUNT* is 0.1518, suggesting that, on average, an SEO offer price is 15.18% below the closing stock price one day before the issue date. The means of *OPTIMISM_MID* and *OPTIMISM_MEAN* are 0.0159 and 0.0160, respectively, indicating analysts' earnings forecasts, on average, are above the actual earnings using either the midpoint or the average of the forecasts.

Table 2 presents the results on the impact of analyst optimism bias on SEO discounts. Columns (1) and (2) show the results of simplified models, while columns (3) and (4) depict the results in full models. Consistently across the four columns, the coefficients of *OPTIMISM_MID* and *OPTIMISM_MEAN* are negative and significant at the 1% level. The results suggest that, when

[3]For details, see Hutton et al. (2009) or Kim and Zhang (2014).

analyst optimism bias is higher, the SEO discount is lower, suggesting that investors provide a higher SEO bid price. The findings are economically significant. For instance, using the results in column (4), we find the coefficient of *OPTIMISM_MEAN* to be -0.4026, suggesting that SEO discount decreases by 1.16% when analyst optimism bias increases by a standard deviation after accounting for other factors. The findings support *H1A*. We note that the coefficients of *ANALYST* are negative and significant at the 5% level in columns (3) and (4), which is consistent with the results of Bowen et al. (2008). While analyst coverage can reduce information asymmetry so that it lowers the SEO discount, analysts provide optimism bias to lower the SEO discount by misleading SEO investors. That is, analysts push the SEO offer price lower via their coverage but they also mislead SEO investors to bid higher via their optimistically biased earnings forecasts. In both scenarios, the SEO discount is lower.

Other control variables in columns (3) and (4) of Table 2, if significant, carry the expected signs, such as the coefficients of *BIGHOLDER_RATIO, MARKET,* and *INVEST_RATIO,* which are consistent with the SEO literature (e.g., Corwin, 2003; Kim and Shih, 2004). That is, when a large shareholder subscribes to more SEO shares, the stock market is on the rise, or institutional investor ownership is high, the SEO discount is lower due to the lower information asymmetry of the SEO firm. In contrast, the coefficients *of ISSUE_RATIO, VOLATILITY,* and *SIZE* are positive and significant, showing that, when the SEO issues a larger number of shares, has a larger reserve price range, has higher stock return volatility, and is a larger firm, the SEO discount is larger due to higher information asymmetry.

4.2 Moderating effects of institutional investor ownership and corporate transparency

We present the results on the moderating effect of institutional investor ownership in Table 3. In columns (1) and (2), for the sub-sample with higher institutional investor ownership, the coefficients of *OPTIMISM_MID* and *OPTIMISM_MEAN* are not significant. In contrast, the same coefficients are negative and significant at the 1% level in columns (3) and (4) for the sub-sample with lower institutional investor ownership. The magnitudes of the coefficients of *OPTIMISM_MID* and *OPTIMISM_MEAN* in columns (3) and (4) are much higher than the same coefficients in columns (1) and (2). That is, consistent with H2, the impact of analyst optimism bias on SEO discount is more pronounced for the sub-sample with low institutional investor ownership. Low institutional investor ownership means high information asymmetry, so that SEO investors need to refer more to analyst earnings forecasts. Thus, SEO investors are misled more by analyst optimism bias. Conversely, high institutional investor ownership can lower information asymmetry. Then, SEO investors can properly interpret analyst earnings forecasts (i.e., able to distinguish optimistic earnings forecasts from a firm's genuine good performance) so that analyst optimism bias does not relate to the SEO discount. The findings support *H2A*.

To further examine *H2A* and *H2B*, we study the moderating effect of corporate transparency on the impact of analyst optimism bias on the SEO discount. We present the results using *OPAQUE* to classify the full sample as a higher- or lower-corporate transparency sub-sample in Table 4. In columns (1) and (2), for firms with higher opaqueness, the coefficients of *OPTIMISM_MID* and *OPTIMISM_MEAN* are negative and significant at the 1% level, while the same coefficients are not significant for sub-samples with lower opaqueness in columns (3) and (4). These results suggest that when a firm is opaque (columns (1) and (2)), analyst optimism bias

has a high impact on the SEO discount. This occurs when a firm has a high degree of information asymmetry (due to higher opaqueness); SEO investors have less information about the firm. When analysts provide their earnings forecasts of the SEO firm, SEO investors are misled by the optimism (due to less information available). In contrast, when a firm is less opaque (columns (3) and (4)), SEO investors can see beyond the firm's optimistic information. Even if analysts provide optimistically biased earnings forecasts, SEO investors are not misled. Therefore, SEO investors bid SEO shares using their own information because there is no need to rely on analysts' earnings forecasts. Other control variables, if significant, carry the expected signs. Overall, the findings related to corporate transparency support *H2A*.

4.3 Transmission mechanism

According to H1A, the transmission mechanism underlying the fact that analyst optimism bias negatively affects the SEO discount is due to investors being misled by analyst optimism bias. Such bias misleads investors to bid higher prices for SEO shares. We conduct additional analysis in this section to determine if this is the case.

If investors are misled by analyst optimism bias, we expect that they bid higher prices. To examine this, we use the weighted average bid price (*W_BIDPRICE*) of all investors to capture the potential misleading. The weights are investors' bid quantities. We use the following set of equations to conduct successive tests to examine if *W_BIDPRICE* is the mediating variable behind the impact of analyst optimism bias on the SEO discount (Judd and Kenny, 1981; Barron and Kenny, 1986):

$$W\_BIDPRICE_{i,t} = \beta_0 + \beta_1 * OPTIMISM_{i,t} + \Sigma \beta_j CONTROL + INDUSTRY / YEAR + \mu_{it} \quad (2)$$

$$DISCOUNT_{i,t} = \delta_0 + \delta_1 * OPTIMISM_{i,t} + \delta_2 * W\_BIDPRICE_{i,t}$$

$$+ \Sigma\delta_j CONTROL + INDUSTRY / YEAR + \Delta_{i,t} \qquad (3)$$

The specific steps are

1) Examine the impact of *OPTIMISM* on *DISCOUNT*. If it is significant, continue.
2) Examine the impacts of *OPTIMISM* on *W_BIDPRICE*. If it is significant, continue.
3) Examine the impact of *OPTIMISM* and *W_BIDPRICE* simultaneously on *DISCOUNT*.

We have already conducted the tests in Step 1 in Eq. (1) as reported in Table 2. For Step 2, we examine Eq. (2). Finally, for the last step, we use Eq. (3) to conduct the test in Step 3. If δ_1 and δ_2 are both significant in Eq. (3), then *W_BIDPRICE* serves as a partial transmission channel for the relation between analyst optimism bias and SEO discounts. If δ_1 is not significant while δ_2 is significant in Eq. (3), then *W_BIDPRICE* is a complete transmission mechanism for the relation between analyst optimism bias and the SEO discount.

We present the findings in Tables 5 and 6. In Table 5, with *W_BIDPRICE* as the dependent variable, columns (1) to (4) show that the coefficients of analyst optimism bias (*OPTIMISM_MID* and *OPTIMISM_MEAN*) are consistently positive and significant at the 1% level. That is, when analyst optimism bias is high, investors, on average, bid higher prices for SEO shares. The results meet the condition in Step 2.

We present the results of Step 3 in Table 6. When we include the *OPTIMISM_MID* (or *OPTIMISM_MEAN*) and *W_BIDPRICE* variables together, we find that all coefficients of *W-BIDPRICE* across columns are significant and negative at the 1% level. In columns (1) and (2), the coefficients of *OPTIMISM_MID* and *OPTIMISM_MEAN* are insignificant. In columns (3) and (4), the coefficients of OPTIMISM_*MID* and *OPTIMISM_MEAN* are significantly negative but their magnitudes are smaller than those in column (3) and (4) of Table 2. The results suggest that

W_BIDPRICE is at least a partial transmission mechanism for the impact of analyst optimism bias on SEO discount.

4.4 Robustness checks

We provide several robustness checks on our findings in Panels A to C of Table 7. For brevity, we present only the key variables using *OPTIMISM_MID*. The findings using *OPTIMISM_MEAN* are qualitatively similar. In Panel A, we use analyst earnings forecasts six months before the SEO dates as an alternate measure of analyst optimism bias. The signs and significance of the estimated coefficients for the base equation (column (1)), the low-institutional investor ownership sub-sample (column (3)), and the high-opaqueness sub-sample (column 4) are similar to those of the corresponding columns in Tables 2 to 4.

In Panel B of Table 7, we include several additional control variables to account for potential missing variables. These additional control variables include chairperson and chief executive officer duality (*DUAL*), board size (*BOARDSIZE*), the ownership share of the largest shareholder (*BIG1*), and the ownership shares of the second to 10th largest shareholders (*BIG2–BIG10*). The results in Panel B are similar to those in Panel A.

In Panel C of Table 7, we use the average over 10 days of the stock price prior to the SEO to calculate the SEO discount. The results in Panel C are similar to those in Panel A. Overall, our findings support *H1A* and *H2A*.

5. Summary

Using unique SEO investor bid data in China, we examine the impact of analyst optimism bias on SEO investors' bids and the subsequent SEO discount. After accounting for information asymmetry and analyst coverage, our findings suggest that SEO investor bid prices are positively

correlated with analyst optimism bias, suggesting that SEO investors are misled. The higher SEO bid price translates into a lower SEO discount. Our findings are robust to alternative measures of earnings forecasts, additional control variables, and SEO discounts.

Additional evidence suggests that, when institutional investor ownership is higher (lower) or an SEO firm is more (less) transparent, the positive correlation is insignificant (remains significant). The additional evidence corroborates the traditional information asymmetry explanation of the SEO discount. That is, when information asymmetry is high, analyst optimism bias can mislead SEO investors to submit a higher bid price so that the SEO discount is lower. Analyst optimism bias is effective in misleading SEO investors when investors face adverse information asymmetry.

Our overall findings imply that analysts play more than one role in SEO pricing. On one hand, analyst coverage can lower information asymmetry so that the SEO discount is lower. In addition, analysts also provide optimistically biased earnings forecasts, which misleads SEO investors into bidding higher for the SEOs. Accordingly, the SEO discount is lower. While both analyst coverage and analyst optimism bias can reduce SEO discounts, we show that the underlying mechanisms are different.

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Appendix. Variable definitions

This table provides the definitions of all the variables.

Variables	Definitions
DISCOUNT	(*CLS – OFFER)/CLS*, where *CLS* is the prevailing secondary market price 1 day before the SEO and *OFFER* is the SEO offer price.
OPTIMISM_MID	Analyst optimism bias using the median as a common consensus of analysts, which is (*MIDPOINT – ACTUAL)/CLS*, where *MIDPOINT* is the midpoint of all analysts' earnings forecasts for the next year within 1year before the SEO date and *ACTUAL* is the actual earnings for the next year.
OPTIMISM_MEAN	Analyst optimism bias using the mean as a common consensus of analysts, which is (*MEAN – ACTUAL)/CLS*, where *MEAN* is the mean of all analysts' earnings forecasts for the next year within 1year before the SEO date and *ACTUAL* is the actual earnings for the next year.
ANALYST	The number of analysts covering a firm. It is the natural logarithm of the number of analysts covering plus one within one year before the SEO date.
BIGHOLDER_RATIO	The subscription ratio of the largest shareholder.
ISSUE_RATIO	Relative offer size, equal to the number of shares offered divided by the number of the issuers' outstanding shares before SEOs.
ISSUE_SIZE	Offer size, measured by the natural logarithm of proceeds.
REPUTATION	Reputation of the underwriter; if an underwriter is in the top 10 in terms of underwriting volume, the value is 1 and 0 otherwise.
VOLATILITY	The standard deviation of 30 days of stock returns prior to the SEO.
TURNOVER	Turnover ratio, equal to the average monthly turnover rate for 12 months prior to the SEO date.
MARKET	Market index return from the announcement day of the SEO offering to the issuing day.
INVEST_RATIO	Percent ownership of institutional investors.
LEV	Financial leverage, equal to total liabilities divided by total assets at the end of the fiscal year prior to the SEO.
SIZE	Natural logarithm of total assets at the end of the fiscal year prior to the SEO.
BM	Book -to- market ratio at the end of the fiscal year prior to the SEO.
CFO	Cash flows from operations, equal to cash from operations divided by total assets at the end of the fiscal year prior to the SEO.
PPE	Tangible assets, equal to the amount of net fixed assets divided by total assets at the end of the fiscal year prior to the SEO.

STATE	If a firm is state owned, it equals 1 and 0 otherwise.
YEAR	Year dummy variable.
INDUSTRY	Industry dummy variable.

Table 1. Summary statistics

This table presents summary statistics of the major variables used. The definitions of all the variables are presented in the Appendix.

	Mean	Std dev.	Minimum	p25	Median	p75	Maximum	N
DISCOUNT	0.1518	0.1063	-0.3309	0.0859	0.1498	0.2172	0.5233	682
OPTIMISM_MID	0.0159	0.0315	-0.1126	0.0023	0.0090	0.0233	0.4695	682
OPTIMISM_MEAN	0.0160	0.0287	-0.1055	0.0026	0.0094	0.0238	0.3599	682
ANALYST	2.5961	1.0471	0.6931	1.7918	2.6391	3.4340	4.8363	682
BIGHOLDER_RATIO	0.0683	0.1476	0.0000	0.0000	0.0000	0.0537	1.0000	682
ISSUE_RATIO	0.1375	0.0922	0.0012	0.0766	0.1217	0.1824	0.6168	682
ISSUE_SIZE	11.2840	0.9470	7.7832	10.7300	11.2690	11.8580	15.3350	682
REPUTATION	0.3827	0.4864	0.0000	0.0000	0.0000	1.0000	1.0000	682
VOLATILITY	0.0304	0.0121	0.0049	0.0217	0.0279	0.0367	0.0809	682
TURNOVER	0.5866	0.2102	0.1525	0.4481	0.5486	0.6828	1.7756	682
MARKET	-0.0001	0.0162	-0.0849	-0.0070	0.0006	0.0079	0.0813	682
INVEST_RATIO	0.0926	0.0590	0.0000	0.0480	0.0843	0.1268	0.4329	682
LEV	0.4437	0.1823	0.0510	0.3075	0.4417	0.5802	0.8731	682
SIZE	22.4160	1.0376	20.1740	21.6250	22.2390	23.0010	25.4210	682
BM	0.8230	0.6937	0.0854	0.3975	0.6132	0.9760	4.4067	682
CFO	0.0581	0.2028	-1.2053	-0.0025	0.0552	0.1060	3.6933	682
PPE	0.3704	0.4473	0.0007	0.1654	0.3037	0.4582	6.5902	682
STATE	0.4164	0.4933	0.0000	0.0000	0.0000	1.0000	1.0000	682

Table 2. Analyst optimism bias and the SEO discount

This table presents the results on the impact of analyst optimism bias (in earnings forecasts) on the SEO discount. The definitions of all the variables are presented in the Appendix. The t-statistics, reported in parentheses, are calculated based on standard errors clustered by firm and year. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.3957***		-0.3615***	
	(-2.85)		(-2.89)	
OPTIMISM_MEAN		-0.4440***		-0.4026***
		(-2.94)		(-2.96)
ANALYST			-0.0097**	-0.0097**
			(-2.37)	(-2.38)
BIGHOLDER_RATIO			-0.1316***	-0.1320***
			(-5.33)	(-5.35)
ISSUE_RATIO			0.3708***	0.3725***
			(6.49)	(6.51)
ISSUE_SIZE			0.0006	0.0006
			(0.09)	(0.08)
REPUTATION			-0.0028	-0.0027
			(-0.40)	(-0.38)
VOLATILITY			3.4051***	3.3880***
			(9.59)	(9.53)
TURNOVER			0.0150	0.0146
			(0.72)	(0.71)
MARKET			-0.5085**	-0.5130**
			(-2.39)	(-2.41)
INVEST_RATIO			-0.1980***	-0.1983***
			(-3.07)	(-3.08)
LEV			-0.0163	-0.0165
			(-0.53)	(-0.54)
SIZE			0.0184**	0.0186**
			(2.03)	(2.06)
BM			-0.0130	-0.0131
			(-1.48)	(-1.49)
CFO			0.0217	0.0210
			(1.19)	(1.15)
PPE			0.0049	0.0047
			(0.54)	(0.52)
STATE			-0.0061	-0.0067
			(-0.75)	(-0.81)
CONSTANT	0.1278	0.1279	-0.4515***	-0.4538***

	(1.23)	(1.23)	(-2.64)	(-2.65)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	682	682	682	682
Adj. R^2	0.129	0.129	0.358	0.358

Table 3. Analyst optimism bias, institutional investor ownership, and the SEO discount

This table presents the results of the moderating effect of institutional investor ownership in the impact of analyst optimism bias (in earnings forecasts) on SEO discount. We partition the sample into sub-samples with *INVEST_RATIO* being above (or equal or below) the median in the firm's industry. The definitions of all the variables are presented in the Appendix. The t-statistics, reported in parentheses, are calculated based on standard errors clustered by firm and year. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)
	INVEST_RATIO > median		*INVEST_RATIO* ≤ median	
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.0408		-0.7744***	
	(-0.22)		(-4.01)	
OPTIMISM_MEAN		-0.0756		-0.8518***
		(-0.40)		(-3.94)
ANALYST	-0.0080	-0.0080	-0.0113*	-0.0114*
	(-1.34)	(-1.34)	(-1.85)	(-1.86)
BIGHOLDER_RATIO	-0.1807***	-0.1812***	-0.0769*	-0.0788*
	(-5.48)	(-5.49)	(-1.88)	(-1.92)
ISSUE_RATIO	0.3703***	0.3723***	0.4929***	0.4913***
	(5.28)	(5.29)	(4.51)	(4.50)
ISSUE_SIZE	0.0079	0.0077	-0.0046	-0.0039
	(0.72)	(0.71)	(-0.39)	(-0.33)
REPUTATION	-0.0072	-0.0070	-0.0130	-0.0131
	(-0.76)	(-0.74)	(-1.13)	(-1.14)
VOLATILITY	3.1941***	3.1850***	3.6512***	3.6387***
	(6.58)	(6.56)	(6.51)	(6.48)
TURNOVER	0.0167	0.0166	0.0309	0.0293
	(0.56)	(0.55)	(1.01)	(0.96)
MARKET	-0.7382**	-0.7353**	-0.4698	-0.4451
	(-2.29)	(-2.29)	(-1.46)	(-1.38)
INVEST_RATIO	-0.2404**	-0.2426**	0.1503	0.1657
	(-2.41)	(-2.43)	(0.60)	(0.66)
LEV	0.0488	0.0492	-0.0773	-0.0767
	(1.18)	(1.19)	(-1.56)	(-1.54)
SIZE	0.0053	0.0054	0.0322**	0.0322**
	(0.41)	(0.42)	(2.25)	(2.24)
BM	-0.0301***	-0.0300***	0.0021	0.0018
	(-2.62)	(-2.61)	(0.15)	(0.13)
CFO	0.0109	0.0102	0.0177	0.0166
	(0.32)	(0.30)	(0.73)	(0.68)
PPE	-0.0064	-0.0062	0.0041	0.0034
	(-0.32)	(-0.31)	(0.36)	(0.30)
STATE	0.0017	0.0016	-0.0139	-0.0153
	(0.16)	(0.14)	(-1.07)	(-1.17)
CONSTANT	-0.0796	-0.0788	-0.4137	-0.4227
	(-0.35)	(-0.35)	(-1.61)	(-1.65)

Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	352	352	330	330
Adj. R^2	0.451	0.451	0.280	0.279

Table 4. Analyst optimism bias, transparency, and the SEO discount

This table presents the results on the moderating effect of corporate transparency (*OPAQUE*) in the impact of analyst optimism bias (in earnings forecasts) on the SEO discount. We partition the sample into sub-samples with *OPAQUE* being above (or equal or below) the median in the firm's industry. The definitions of all the variables are presented in the Appendix. The t-statistics, reported in parentheses, are calculated based on standard errors clustered by firm and year. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)
	OPAQUE > median		*OPAQUE* < median	
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.5925***		-0.2418	
	(-2.89)		(-1.21)	
OPTIMISM_MEAN		-0.6155***		-0.2477
		(-2.92)		(-1.09)
ANALYST	-0.0113*	-0.0112	-0.0214***	-0.0216***
	(-1.66)	(-1.64)	(-2.87)	(-2.88)
BIGHOLDER_RATIO	-0.0373	-0.0380	-0.1943***	-0.1940***
	(-0.85)	(-0.87)	(-5.00)	(-4.99)
ISSUE_RATIO	0.3939***	0.3949***	0.2103**	0.2099**
	(4.41)	(4.43)	(2.05)	(2.04)
ISSUE_SIZE	-0.0303**	-0.0306**	0.0222	0.0217
	(-2.16)	(-2.18)	(1.25)	(1.22)
REPUTATION	-0.0024	-0.0028	-0.0064	-0.0063
	(-0.21)	(-0.25)	(-0.48)	(-0.46)
VOLATILITY	4.3465***	4.3456***	2.1354***	2.1126***
	(7.39)	(7.39)	(3.58)	(3.53)
TURNOVER	0.0338	0.0331	0.0223	0.0223
	(0.89)	(0.87)	(0.58)	(0.58)
MARKET	-0.2774	-0.2930	-0.8591**	-0.8694**
	(-0.86)	(-0.91)	(-2.26)	(-2.29)
INVEST_RATIO	-0.1462	-0.1443	-0.2480**	-0.2479**
	(-1.43)	(-1.41)	(-2.10)	(-2.09)
LEV	-0.0215	-0.0213	-0.0321	-0.0327
	(-0.42)	(-0.42)	(-0.56)	(-0.57)
SIZE	0.0495***	0.0500***	0.0060	0.0065
	(3.31)	(3.35)	(0.31)	(0.34)
BM	-0.0295**	-0.0299**	-0.0123	-0.0129
	(-1.98)	(-2.01)	(-0.83)	(-0.87)
CFO	0.0461	0.0456	-0.0007	-0.0011
	(1.14)	(1.13)	(-0.02)	(-0.03)
PPE	0.0171	0.0166	0.0216	0.0220
	(1.46)	(1.42)	(0.76)	(0.77)
STATE	0.0008	-0.0003	0.0092	0.0088
	(0.06)	(-0.02)	(0.64)	(0.61)
CONSTANT	-0.8369***	-0.8448***	-0.1046	-0.1100

	(-3.09)	(-3.12)	(-0.33)	(-0.35)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	300	300	278	278
Adj. R^2	0.420	0.420	0.334	0.333

Table 5. Analyst optimism bias and investor bid prices

This table presents the results of the impact of analyst optimism bias (in earnings forecasts) in investors' weighted average SEO bid prices. We use investors' bidding quantities as the weights. The definitions of all the variables are presented in the Appendix. The t-statistics, reported in parentheses, are calculated based on standard errors clustered by firm and year. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)
	W_BIDPRICE	*W_BIDPRICE*	*W_BIDPRICE*	*W_BIDPRICE*
OPTIMISM_MID	0.4604***		0.3741***	
	(3.09)		(2.63)	
OPTIMISM_MEAN		0.5179***		0.4091***
		(3.20)		(2.64)
ANALYST			0.0017	0.0017
			(0.36)	(0.37)
BIGHOLDER_RATIO			0.0946***	0.0950***
			(3.37)	(3.38)
ISSUE_RATIO			-0.2604***	-0.2619***
			(-4.00)	(-4.03)
ISSUE_SIZE			-0.0010	-0.0009
			(-0.11)	(-0.10)
REPUTATION			0.0110	0.0108
			(1.35)	(1.33)
VOLATILITY			-3.5472***	-3.5314***
			(-8.79)	(-8.74)
TURNOVER			-0.0369	-0.0365
			(-1.57)	(-1.55)
MARKET			0.2454	0.2507
			(1.01)	(1.04)
INVEST_RATIO			0.1598**	0.1598**
			(2.18)	(2.18)
LEV			0.0196	0.0199
			(0.56)	(0.57)
SIZE			-0.0159	-0.0161
			(-1.54)	(-1.56)
BM			0.0154	0.0156
			(1.54)	(1.56)
CFO			-0.0152	-0.0146
			(-0.73)	(-0.70)
PPE			-0.0084	-0.0083
			(-0.82)	(-0.81)
STATE			-0.0071	-0.0066
			(-0.76)	(-0.70)

Constant	0.8830***	0.8829***	1.3527***	1.3552***
	(7.93)	(7.93)	(6.95)	(6.96)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	682	682	682	682
Adj. R^2	0.124	0.124	0.272	0.272

Table 6. Transmission mechanism

This table presents the results of the impact of analyst optimism bias (in earnings forecasts) on investors' weighted average SEO bid prices. We use investors' bidding quantities as the weights. The definitions of all the variables are presented in the Appendix. The t-statistics, reported in parentheses, are calculated based on standard errors clustered by firm and year. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.0556		-0.1159*	
	(-1.51)		(-1.96)	
OPTIMISM_MEAN		-0.0614		-0.1341**
		(-1.29)		(-2.18)
W_BIDPRICE	-0.7387***	-0.7386***	-0.6565***	-0.6563***
	(-6.15)	(-6.15)	(-5.06)	(-5.07)
ANALYST			-0.0086***	-0.0086***
			(-3.16)	(-3.16)
BIGHOLDER_RATIO			-0.0696***	-0.0697***
			(-2.94)	(-2.95)
ISSUE_RATIO			0.1999***	0.2006***
			(5.30)	(5.34)
ISSUE_SIZE			0.0000	-0.0000
			(0.00)	(-0.00)
REPUTATION			0.0044	0.0044
			(0.92)	(0.94)
VOLATILITY			1.0764*	1.0705*
			(1.90)	(1.90)
TURNOVER			-0.0092	-0.0093
			(-1.03)	(-1.04)
MARKET			-0.3474	-0.3485
			(-1.40)	(-1.41)
INVEST_RATIO			-0.0931*	-0.0934*
			(-1.83)	(-1.85)
LEV			-0.0034	-0.0034
			(-0.16)	(-0.16)
SIZE			0.0080	0.0081
			(1.31)	(1.33)
MB			-0.0029	-0.0029
			(-0.51)	(-0.51)
CFO			0.0117**	0.0114**
			(2.06)	(2.01)
PPE			-0.0007	-0.0007

			(-0.12)	(-0.13)
STATE			-0.0108***	-0.0110***
			(-3.92)	(-4.01)
Constant	0.7800***	0.7799***	0.4365***	0.4356***
	(7.41)	(7.40)	(4.98)	(5.01)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	682	682	682	682
Adj. R^2	0.674	0.674	0.715	0.715

Table 7. Robustness analysis

Panel A: Using analyst earnings forecasts 6 months before the SEO

	(1)	(2)	(3)	(4)	(5)
		INVEST_RATIO > median	*INVEST_RATIO* < median	*OPAQUE* > median	*OPAQUE* < median
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.3992**	-0.0067	-0.8836***	-0.6768***	0.0333
	(-2.48)	(-0.03)	(-2.92)	(-3.07)	(0.10)
ANALYST	-0.0104**	-0.0058	-0.0137*	-0.0144*	-0.0131
	(-2.16)	(-0.89)	(-1.72)	(-1.82)	(-1.52)
Other control variables	Yes	Yes	Yes	Yes	Yes
CONSTANT	-0.4530***	-0.0880	-0.7680***	-0.9800***	-0.1504
	(-2.61)	(-0.40)	(-2.91)	(-3.68)	(-0.43)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
N	631	327	304	280	254
Adj. R^2	0.347	0.407	0.277	0.429	0.314

Panel B: With additional control variables

	(1)	(2)	(3)	(4)	(5)
		INVEST_RATIO > median	*INVEST_RATIO*< median	*OPAQUE* > median	*OPAQUE* < median
	DISCOUNT	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*	*DISCOUNT*
OPTIMISM_MID	-0.3828***	-0.0118	-0.7857***	-0.5884***	-0.2752
	(-3.08)	(-0.07)	(-4.04)	(-2.79)	(-1.40)
ANALYST	-0.0098**	-0.0091	-0.0102	-0.0107	-0.0237***
	(-2.39)	(-1.54)	(-1.61)	(-1.50)	(-3.12)
Additional control variables:					
DUAL	0.0003	0.0089	-0.0104	0.0008	0.0049
	(0.04)	(0.79)	(-0.74)	(0.06)	(0.32)
BOARDSIZE	-0.0167	-0.0283	0.0086	0.0133	-0.0256
	(-0.85)	(-1.10)	(0.26)	(0.41)	(-0.70)
BIG1	0.0249	-0.0192	0.0549	0.0453	-0.0261
	(0.81)	(-0.44)	(1.16)	(0.87)	(-0.47)
BIG2-10	0.0288	-0.1023*	0.0889	-0.0297	0.0322
	(0.73)	(-1.78)	(1.49)	(-0.40)	(0.43)
Control variables	Yes	Yes	Yes	Yes	Yes
CONSTANT	-0.3675**	0.0255	-0.5423**	-0.9641***	-0.2079
	(-2.11)	(0.11)	(-2.06)	(-3.35)	(-0.65)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
N	673	346	327	296	274
Adj. R^2	0.359	0.465	0.275	0.408	0.331

Panel C: Using the average stock price 10 days before the SEO to calculate the SEO discount

	(1)	(2)	(3)	(4)	(5)
		INVEST_RATIO > median	*INVEST_RATIO* < median	*OPAQUE* > median	*OPAQUE* < median
	DISCOUNT_10	*DISCOUNT_10*	*DISCOUNT_10*	*DISCOUNT_10*	*DISCOUNT_10*
OPTIMISM_MID	-0.2627**	0.0574	-0.6711***	-0.6148***	-0.2031
	(-2.15)	(0.28)	(-3.26)	(-2.70)	(-0.92)
ANALYST	-0.0149***	-0.0113*	-0.0128*	-0.0136*	-0.0192**
	(-3.59)	(-1.70)	(-1.95)	(-1.79)	(-2.31)
Control variables	Yes	Yes	Yes	Yes	Yes
CONSTANT	-0.6307***	-0.2161	-0.6971**	-0.7579**	-0.3523
	(-4.27)	(-0.85)	(-2.55)	(-2.52)	(-1.02)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
N	682	352	330	300	278
Adj. R^2	0.326	0.410	0.279	0.391	0.271