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**Article**

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# The effect of affiliated analysts on stock recommendations: Evidence from share pledges in China

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## ABSTRACT

We use the share pledge context in China to examine how affiliated analysts whose securities companies are pledgees of share pledge firms issue stock recommendations on these listed firms. We find that their recommendations are more optimistic than those of non-affiliated analysts, and they are more likely to issue Buy and Add recommendations, suggesting that they issue optimistic rating reports for share pledge firms due to their conflicts of interest. We also find a dynamic adjustment in the stock recommendation behavior of these analysts, and their probability after issuing optimistic stock recommendations is significantly reduced before and after the years that the affiliation relationship between them and share pledge firms both began and ended. These affiliated analysts continue to issue optimistic stock recommendations after visiting the share pledge firms if they work in the same location as the firms, or if they are star analysts among New Fortune's "top five analysts," and when the information transparency of the share pledge firms is higher. In addition, the optimistic stock recommendation behavior of affiliated analysts is more significant in our sample of firms with high share pledge ratios and downward stock price pressure. The earnings forecast quality of affiliated analysts is also found to be lower, and they are less inclined to downgrade stock recommendations for these share pledge firms. Buy recommendations issued by both non-affiliated and affiliated analysts can bring cumulative excess returns in the short event window, but those issued by affiliated analysts are significantly negative in the long-term event window, and significantly lower than those issued by non-affiliated analysts. Overall, our study shows that affiliated analysts issue optimistic rating reports on share pledge firms due to conflicts of interest, which leads to decision-making bias in investors and thus decreases the stock

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price crash risk of the firms. Our findings further reveal the economic consequences of share pledging and extend our understanding of the behavior of analysts in a conflict of interest situation from the share pledge perspective.

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## 1. Introduction

The *Guidelines on Share Pledge Repo Transaction, Registration and Settlement*, which came into effect in May 2013, enable securities companies to engage in share pledges in China's capital market. According to Wind statistics, 45 percent of these listed firms have shareholders who pledged their shares as collateral to raise funds from securities companies. These companies have become the most important pledgees after financial institutions such as banks and trusts. The strategies used by controlling shareholders to avoid losing control rights during the share pledge period, such as share repurchase, information disclosure strategies, earnings management, tax avoidance, and cash holding policies, have been extensively discussed (Chan et al., 2015; Huang and Xue, 2016; Wang et al., 2018; Qian and Zhang, 2018), but limited evidence has been given for the effect and economic consequences of Share Pledge Repo Transactions. The research has mainly focused on pledgors or pledges from the perspectives of share pledge firms and not from those of the pledgees. The implementation of the Share Pledge Repo Transaction provides a useful context in which this unresolved issue can be examined. When securities companies engage in share pledges, the affiliated analysts as the information intermediaries issue research reports for these share pledge firms in the capital market. In this situation, the influence on the stock recommendation behavior of these analysts is a concern. Do affiliated analysts use their connections to obtain more private information and disclose conservative rating reports? Or is there a conflict of interest between affiliated analysts and share pledge firms, so that the analysts issue optimistic rating reports to help share pledge firms avoid the risk of stock price crashes? The evidence on this topic is currently limited. In this study, we provide empirical evidence on the relationship between affiliated analysts' stock recommendation behavior and share pledge firms.

Analysts are important information intermediaries in the capital market, and they thus have professional advantages and can extensively mine information. The rating reports they issue inform investors' decision-making, which improves the efficiency of information transmission and stock price sensitivity. When compiling their reports, analysts process public and private information that investors can use to make decisions. Firm-level information is an important source for analysts, so the quality of their rating reports is directly determined by their understanding and mastery of the firms' information. Share pledging as an activity conducted by shareholders can provide them with financing convenience, but also means the firm may risk losing control. To avoid the risk of a stock price crash, the share pledge firm may increase its risk-taking (Anderson and Puleo, 2015) and thus withhold bad news and increase information opacity. If affiliated analysts' securities companies accept the pledged shares of shareholders, can this connection between the analysts and the firms whose shares are pledged help the analysts gain more information about the firms and thus decrease their stock recommendation deviation? The *Guidance of Information Barrier System of Securities Companies* requires securities companies to establish information barrier systems against advisory service businesses, underwriting, investment banking, and research, but in practice, brokers have not effectively established these isolation measures, and their affiliated departments can still share information (Cao and Zhu, 2011). In addition, affiliated analysts gain advanced information about target firms, as research department analysts must provide industry, liquidity, profitability, and other information about the firms when assessing the Share Pledge Repo Transaction business, which to an extent helps alleviate information asymmetry. Thus, this information superiority means that affiliated analysts can issue more conservative stock recommendations for share pledge firms.

However, the independence of analysts can be questionable. They may have a close personal relationship with listed firms and may thus issue optimistic rating reports to gain more private information, which is

beneficial to managers (Francis and Philbrick, 1993; Das et al., 1998; Lim, 2001). Analysts may also selectively release optimistic rating reports on listed firms due to conflicts of interest in areas such as investment banking, sub-warehouse commissioning, and proprietary businesses (O'Brien et al., 2005; Mola and Guidolin, 2009). Control rights can provide controlling shareholders with dividends and other private benefits (Johnson et al., 2000). These potential benefits lead to shareholders of listed firms having control rights preferences. When controlling shareholders use their shares as collateral to obtain short-term loans, they are subject to margin calls, as the stock prices may fall below the desired level (Chan et al., 2015). When the market value of pledged shares drops below the maintenance requirement stated in the pledge contract, the pledgees can sell the shares. This forced sale can be very costly to controlling shareholders as they may lose their control rights. Thus, under external pressure, affiliated analysts are motivated to consider the listed firms and issue optimistic rating reports. These contribute to the market value management of share pledge firms and can lead to more private information from listed firms in the future. Share pledge business is also the basis of cooperation between securities companies and listed firms, which is conducive to the expansion of other securities businesses. The limited market resources make the securities companies face the pressure of competition, and the desire of securities companies to extend their businesses can lead affiliated analysts to issue optimistic rating reports on share pledge firms. Thus, the notion of conflicts of interest indicates that stock recommendations issued by these analysts for share pledge firms are more optimistic.

On the basis of the above analysis, we examine whether the relationship between securities companies and target share pledge firms can affect affiliated analysts' stock recommendation behavior. If so, can the behavior of affiliated analysts be explained by information superiority or by conflicts of interest?

Using A-share listed firms in China capital market from 2013 to 2017, we find that the stock recommendations of affiliated analysts on share pledge firms are more optimistic than those of non-affiliated analysts, and the affiliated analysts are more likely to issue Buy and Add recommendations, which suggests that they have issued optimistic rating reports on share pledge firms. We also find a dynamic adjustment of the stock recommendation behavior of affiliated analysts. The probability that affiliated analysts will issue optimistic stock recommendations is significantly reduced before and after the years in which the affiliation relationship between securities companies and share pledge firms began and ended. Thus, our findings support the hypothesis of conflicts of interest.

However, these findings may be due to information asymmetry between affiliated analysts and share pledge firms. To ensure this is not the case, we use the following methods to measure information asymmetry and examine whether affiliated analysts with more private information about share pledge firms can reduce the optimism of stock recommendations. First, site visits are found to be an important information acquisition activity for analysts, as they can communicate and interact with the managers face to face, which can enable them to acquire more private information about listed firms. Thus, corporate site visits can help affiliated analysts alleviate the information asymmetry with share pledge firms and improve the quality of their rating reports (Cheng et al., 2016). Second, according to new theories of economic geography, geographic proximity affects the efficiency of information transmission between different firms. The proximity between analysts and listed firms can affect the cost of the analysts' access to information of listed firms. Geographically proximate analysts possess an information advantage over others, and their earnings forecasts are thus more accurate (Malloy, 2005; Bae et al., 2008; O'Brien and Tan, 2015). Therefore, if the workplaces of affiliated analysts are located in the same provinces as the share pledge firms, they have better access to private information about the firms and issue more accurate earnings forecasts. Third, star analysts who have a better grasp of useful information from public or private domains can provide more accurate rating reports. They can also remain independent under the constraint of the reputation mechanism and can avoid the pressure from share pledge firms to improve the quality of their rating reports (Stickel, 1992; Jackson, 2005). Last, the information environment provided by listed firms determines the difficulty analysts face in obtaining information from them. The higher the information transparency of share pledge firms, the easier it is for affiliated analysts to acquire such information, and thus the information asymmetry between affiliated analysts and listed firms is reduced. We find that even if affiliated analysts have visited these share pledge firms, work in the same location as them, or are star analysts listed as one of the "top five analysts" by *New Fortune*, or if the information transparency of the firms is high, the analysts' stock recommendation behavior remains optimistic. This also supports our conflict of interest hypothesis.

Although we have eliminated the possibility of information asymmetry, our finding that affiliated analysts issue optimistic stock recommendations when their securities companies engage in share pledges and are pledgees of the share pledge firms could be due to the connections between securities companies' other business involvements and these firms, as this could affect the stock recommendation behavior of affiliated analysts. To eliminate any interference from the additional connections of affiliated analysts, we remove from our data share pledge firms that have relationships with affiliated analysts via the investment banking, sub-warehouse commissions, and proprietary businesses of securities companies (O'Brien et al., 2005; Bessler and Stanzel, 2009; Cao and Zhu, 2011). After eliminating the sample with these conflicts of interest, our findings are still valid. Our tests show that the information asymmetry between affiliated analysts with share pledge firms and the connections between other businesses of securities companies with share pledge firms does not influence our conclusion, and that the interest conflict caused by share pledge financing affects the independence of affiliated analysts, and leads to their optimistic stock recommendations for the firms.

Based on this, we further examine the stock recommendation behavior of affiliated analysts in different scenarios. First, we divide the sample into high ratio vs. low ratio groups of pledged shares and expect to find that the influences of affiliated analysts' stock recommendation behavior in the two groups differ. The controlling shareholders who pledge most of their shares to securities companies are usually subject to more pressure from margin calls, as the stock prices may fall below the desired level and the shares that they hold cannot meet the demand to make up the drop in stock price (Chan et al., 2015). We expect the stock recommendation behavior of affiliated analysts to be more optimistic and radical in the high-share pledge ratio sample than in the low ratio sample. Our empirical results show that affiliated analysts are positively associated with the likelihood of stock recommendations for the high-share pledge ratio firms. Second, we test the effect of downward stock price pressure on affiliated analysts' stock recommendation behavior. The share pledge firms are faced with the threat of maintaining the stock price under downward pressure in China's capital market, which can prompt affiliated analysts to issue optimistic rating reports and help share pledge firms effectively manage the market value. We follow the stock market cycle measurement method of Kao et al. (1998), and define an upward trend as when the monthly average stock returns in the past 12 months are greater than 0, as the stock price is increasing, and an average of less than 0 as a downward trend, as the price is decreasing. We expect the stock recommendation behavior of affiliated analysts to be more optimistic when the stock price is following a downward trend. We also find that the association between affiliated analysts and the likelihood of stock recommendation is stronger when the stock price displays a downward rather than an upward trend.

Stock recommendations only include five categories: "Sell," "Reduce," "Neutral," "Add," and "Buy." The recommendation behavior of affiliated analysts cannot be quantitatively explained from this, as the level of subjectivity is too high. Further analyses show that if the earnings forecast quality is low, the bias of earnings forecasts is higher and the accuracy lower. From both quantitative and qualitative perspectives, our results show that affiliated analysts issue optimistic rating reports for share pledge firms.

We also examine the economic consequences of affiliated analysts' optimistic stock recommendations. We find that their optimistic behavior makes them more likely to upgrade or maintain rather than downgrade their stock recommendations for share pledge firms. The Buy recommendations issued by non-affiliated and affiliated analysts can lead to cumulative excess returns in the short event window. However, the cumulative excess returns of Buy recommendations issued by affiliated analysts are significantly negative in the long-term event window and significantly lower than those issued by non-affiliated analysts. This finding shows that investors do not recognize the optimistic behavior of affiliated analysts in the short event window, and that analysts' independence can only be identified after long-term market correction. Thus, the stock recommendations of affiliated analysts can significantly reduce the stock price crash risk of share pledge firms.

Our study makes several contributions to the literature. First, we contribute to share pledge research from the perspective of the Share Pledge Repo Transaction. The literature regards the share pledge as homogeneous, and most studies compare the differences between share pledge and non-share pledge firms (Chan et al., 2015; Qian and Zhang, 2018), thus ignoring the heterogeneity of share pledges. The implementation of the Share Pledge Repo Transaction provides us with a context through which we can overcome previous difficulties, and with a new perspective for understanding the heterogeneity of share pledges.

Second, we extend the research into share pledges from the perspective of the pledgee. The literature has extensively examined the effect of share pledges on the pledgor and corporate behavior at the firm level, such

as share repurchasing, information disclosure strategies, earnings management, tax avoidance, and cash holding policies (Chan et al., 2015; Huang and Xue, 2016; Wang et al., 2018; Singh, 2017). However, few studies have examined the effect of share pledges on pledgees' behavior. We examine this effect on analysts' behavior through the context of securities companies that conduct Share Pledge Repo Transactions and thus become pledgees. Our study thus extends the research into the economic consequences of share pledges and enriches the literature about share pledge from the perspective of the pledgee.

Last, we provide an interpretation of the conflicts of interest of analysts and thus extend the literature on analyst independence, which has previously been examined through the relationships of investment banking, sub-warehouse commissions, and the proprietary business of securities companies (Michaely and Womack, 1999; O'Brien et al., 2005; Bessler and Stanzel, 2009; Cao and Zhu, 2011; Xue, 2017). By examining the behavior of affiliated analysts from the perspective of share pledge financing, we provide new evidence that the conflict of interest between analysts and listed firms can affect analyst independence. Our finding increases the understanding of analysts' behavior from the perspective of share pledges.

Our study also has significance for regulators. Our findings show that the information barrier system among securities companies is not effectively implemented in practice, and the Share Pledge Repo Transaction has become a new cause of conflicts of interest for securities companies, as it affects the independence of their affiliated analysts. Thus, our conclusions are also of value to regulators of Share Pledge Repo Transactions and securities companies. Our findings also support the evidence of Xie et al. (2016), who found that the share pledges of controlling shareholders increase the risk of stock price crashes, but they did not identify the channel through which share pledges affect such a risk. Our study shows that investors fail to identify the optimistic stock recommendations of affiliated analysts for share pledge firms in a short event window, which affects their investment decisions, thus to some extent decreasing the stock price crash risk of share pledge firms.

The remainder of this paper is organized as follows. Section 2 provides a literature review and presents our hypotheses. We describe our data and model in Section 3. The empirical results and robustness tests are provided in Section 4. Section 5 provides further analysis. Section 6 concludes the paper.

## 2. Literature review and hypothesis development

### 2.1. Literature review

#### 2.1.1. Related literature on the economic consequences of share pledge

Share pledging is a type of debt financing method in which shareholders pledge their shares to banks, trusts, or other financial institutions and obtain loans, which helps them obtain financing rapidly, on the premise of retaining control rights. However, share pledges separate the control rights and cash flow rights of shareholders, and increase the agency conflict between the controlling shareholder and other shareholders and the risk-taking of the share pledge firms (Anderson and Puleo, 2015). Shareholders are also subject to margin calls, as stock prices may fall below the desired level, thus increasing the financial pressure from insiders who may use the controlled resources of listed firms to save themselves (Chan et al., 2015). The behaviors of controlling shareholders who pledge their shares thus affect both the interests of external shareholders and the value of the firms (Dou et al., 2017; Singh, 2017).

In addition, controlling shareholders can risk losing their control rights through share pledges. If during the share pledge period, stock prices drop below the mandatory liquidation level, controlling shareholders must provide additional collateral or terminate the pledged shares early; otherwise, the pledgees are forced to sell the pledged shares and controlling shareholders can lose their control rights. Controlling shareholders are motivated by the risk of a stock price crash to influence information disclosure decisions by listed firms, to release good news, and to withhold bad news (Qian and Zhang, 2018). The motivation of controlling shareholders also drives the income smoothing and earnings management of share pledge firms (Huang and Xue, 2016). However, as these firms are supervised by creditors, they prefer real earnings management over accrual earnings management. Although the firms may use performance methods to avoid the risk of stock price crashes, they are more likely to use market value management methods, such as high stock dividends and stock repurchasing, to stabilize stock prices (Chan et al., 2015), and their motivation to address the stock price crash risk by holding cash also significantly increases.

However, these risk avoidance activities can lead to a decrease in information quality and accounting conservatism, and to prevent highly uncertain R&D investment activities from affecting their pledged shares, controlling shareholders will inhibit the innovation investment of share pledge firms (Li et al., 2018). The activities can also damage the interests of minority shareholders and affect the value of listed firms. Rational auditors will, as information authenticators, increase their audit input, charge higher risk premiums, and be more likely to issue non-standard audit reports (Zhai et al., 2017).

### 2.1.2. Related literature on the stock recommendation behavior of analysts

Analysts are important information intermediaries in the capital market and rely on their professional knowledge and ability to issue rating reports on listed firms through information collection, processing, and sorting. This increases the information transparency of listed firms and improves the allocation efficiency of the capital market. Although some access public information, most analysts use information from listed firms, which determines the quality of their rating reports. Thus, issuing preferential rating reports for listed firms benefits both parties, which can be achieved by analysts conducting conference calls or site visits with managers of the listed firms, as this provides them with superior private information about earnings (Mayew et al., 2013; Cheng et al., 2016).

Affiliated analysts have been found to be more likely to issue optimistic stock recommendations when driven by conflicts of interest (O'Brien et al., 2005; Bessler and Stanzel, 2009). They will upgrade Buy and Add recommendations significantly faster and are slower to downgrade Sell and Reduce recommendations (O'Brien et al., 2005). However, investors are more negative in their responses to optimistic stock recommendations issued by affiliated analysts (Michaely and Womack, 1999). Xue (2017) found that affiliated analysts with information superiority issue optimistic stock recommendations because of the conflict of interest between these analysts and listed firms, but non-affiliated analysts are less likely to issue optimistic stock recommendations. Gu et al. (2013) found that affiliated analysts are more inclined to issue optimistic stock recommendations to support the stocks held by institutional investors as they can gain higher commission fees. Affiliated analysts also issue optimistic recommendations for the stocks owned by their proprietary business, but the excess return for investors in their stocks is lower (Cao and Zhu, 2011).

## 2.2. Hypotheses

Although share pledging is a type of debt financing activity, it is closely related to the capital market because shares of listed firms are pledged. During the share pledge period, if the stock price drops below the mandatory liquidation level, the controlling shareholder must provide additional collateral or terminate the pledged shares early, or the shares must be sold, and the controlling shareholders can lose their control rights. Thus, share pledging increases the risk-taking of the share pledge firms (Anderson and Puleo, 2015). To avoid losing control rights, share pledge firms with controlling shareholders typically disclose strategic information, manipulate earnings, and engage in market value management activities. Qian and Zhang (2018) found that if controlling shareholders use the advantages of control rights, they create an entrenchment effect during the period of the share pledge, which affects the information disclosure behavior of share pledge firms, and they are motivated to issue good news and withhold bad news. This results in a decrease of information disclosure quality and an increase in the probability of information disclosure violations. Huang and Xue (2016) found that the share pledges of controlling shareholders increase the level of earnings management of their firms, but external creditors' supervision makes the firms more likely to conceal their real earnings management activities than to engage in accrual earnings management activities. Share pledge companies are also more likely to dynamically adjust their accounting policies for R&D expenditure projects and capitalize such projects that should have been expensed, to manipulate earnings (Xie et al., 2017). The information used becomes more opaque through these activities.

Listed firms can provide both financial and nonfinancial information to analysts who issue stock recommendations. These analysts also use other information about macro-economies, capital markets, investor sentiment, and market indexes, which unlike firms' financial information cannot be directly quantified. Stock recommendations only have the five categories of "Sell," "Reduce," "Neutral," "Add," and "Buy," so directly quantifying them is difficult, as they are highly subjective. Thus, the information collected from listed firms

directly determines the quality of the rating reports issued by analysts. However, market value management behavior reduces the information quality and increases the information opacity of share pledge firms, which to an extent hinders analysts in accessing the information of listed firms. In addition, firms only release good news and withhold bad news during the period of the share pledge so that analysts cannot reveal any bad news in time, resulting in earnings forecast bias. Securities companies that accept the pledged shares of shareholders can contribute to the development of the relationship between affiliated analysts and share pledge firms, which can help affiliated analysts break through the information barrier and enhance their ability to obtain firm information. Although the *Guidance of Information Barrier System of Securities Companies* requires securities companies to establish information barrier systems in their advisory services, underwriting, investment banking, and research, brokers have not as yet established effective isolation measures among these businesses in practice, and the firewall systems in securities companies have not been effectively implemented, so the affiliated departments can still share information (Cao and Zhu, 2011). Therefore, unlike non-affiliated analysts, affiliated analysts can use the channel provided by securities companies that accept the pledged shares of shareholders to alleviate the information asymmetry between them and the firms, thus improving the quality of their rating reports.

Sell-side analysts seek career promotions to improve their reputations and increase their compensation, and so being selected as a star analyst is important for them, and the quality of the rating reports they provide can help determine whether they should be selected. Analysts concerned about their reputation and their future careers are thus motivated to provide more accurate rating reports (Hong and Kubik, 2003) through various information channels to gain competitive advantages in the selection of star analysts. Thus, based on the hypothesis of information superiority, we assume that the association between affiliated analysts and stock recommendation is negative, and that the rating reports issued by affiliated analysts are more accurate than that of non-affiliated analysts.

H1: The stock recommendations issued by affiliated analysts are more conservative than those of non-affiliated analysts.

However, the investment rating activities of affiliated analysts can suffer from independence problems caused by conflicts of interest with listed firms. The information sources that analysts rely on for their rating reports are not only public, as they can also establish private relationships with the managers of listed firms. To maintain these relationships and gain more information in the future, analysts may issue optimistic reports to satisfy the needs of the listed firms and their managers (Francis and Philbrick, 1993; Das et al., 1998; Lim, 2001). Francis and Philbrick (1993) found that analysts are more likely to issue optimistic reports to improve their relationships with managers of listed firms, which may have been damaged due to the early issuance of adverse rating reports. Ke and Yu (2006) found that rating reports that comply with managers' requirements can provide analysts with more opportunities to ask questions in conference calls and help them gain more private information. In addition, the more optimistic the rating reports issued by analysts, the more private information they can obtain (Chen and Matsumoto, 2006; Mayew, 2008; Mayew et al., 2013). Zhao et al. (2013) found that there is demand on the stock prices of listed firms involved in IPO and SEO processes and that analysts who cooperate with them issue optimistic rating reports. They are rewarded with more private information from the firms, enabling them to issue more accurate rating reports in the future.

Control rights are important for controlling shareholders, as such rights can provide opportunities for more private interests, so they will try their best to prevent the stock price from falling below the mandatory liquidation level in an attempt to prevent the loss of their control rights. The pressure of maintaining the stock price motivates controlling shareholders to collude with affiliated analysts and encourage them to issue optimistic rating reports. The analysts are also more inclined to issue optimistic rating reports to meet the stock price demand and to obtain more private information about the listed firms in the future.

In addition, affiliated analysts also face conflicts of interest with securities companies, which are responsible for reducing the risk of share pledge payment. Due to the special status of controlling shareholders, the shares they hold are generally restricted and can only be sold under special conditions. Therefore, the liquidity of pledged shares by controlling shareholders is relatively lower. Even if there is a risk of the stock price dropping below the mandatory liquidation level, they must be disposed of through lawsuits, auctions, or OTC transactions. The *Guideline of the CSRC on the Reduction of Shares Held by Shareholders, Directors, Supervisors and Senior Executives* also requires the new regulation on the reduction of controlling shareholders' shares to be



implemented if the shares of controlling shareholders are sold due to the implementation of the share pledge agreement. This new rule means that the number of controlling shareholders' shares that can be sold in the capital market is far lower than the number for mandatory liquidation. Thus, securities companies that want to force the selling of shares that are subject to mandatory liquidation are more cautious due to concerns about financial security and customer relationships. If a large number of shares are sold in the capital market, the stock price will fall, and selling more will result in the price dropping more, which leads to systematic financial risks. The behavior of forced selling will damage the interests of securities companies, shareholders, listed firms, and other stakeholders. Thus, in practice securities companies generally continue to hold the pledged shares whose stock prices drop below the mandatory liquidation level and write down impairment, instead of conducting direct forced selling of shares. The potential risk of share pledging is essentially transferred to financial institutions such as securities companies. To avoid the loss caused by share pledges, securities companies are motivated to require their affiliated analysts to issue optimistic rating reports to manage the market value of share pledge firms and meet the demands of the stock price.

In addition, the internal conflicts of interest in securities companies prompt affiliated analysts to issue biased rating reports. Although the risk in the share pledge business is generally higher and the return lower, the share pledge financing business of securities companies is booming, mainly because it is the key to cooperation between securities companies and listed firms, and thus conducive to the expansion of investment banking, M&A, asset management, brokerage businesses, and other activities of securities companies. The lack of internal firewall systems in securities companies means that the independence of the analysts' research conflicts with the profit-creating businesses of securities companies such as underwriting, M&A, asset management, and brokerage. The limited resources of the securities market means that these companies face the pressure of competition. To maintain the relationship between securities companies and share pledge firms, affiliated analysts issue optimistic rating reports for share pledge firms at the request of the securities companies that wish to extend their business. Thus, they issue more optimistic reports due to the internal pressure to build a stable customer relationship and obtaining more business resources (Lin and McNichols, 1998; Mola and Guidolin, 2009; Ljungqvist et al., 2009). The affiliated analysts then face double the conflicts of interest from the internal securities companies reducing the risk of share pledge repayment and extending their business resources. Thus, based on the conflict of interest hypothesis, we assume that the stock recommendations issued by affiliated analysts for share pledge firms are more optimistic.

H2: The stock recommendations issued by affiliated analysts are more optimistic than those of non-affiliated analysts.

### 3. Research design

#### 3.1. Data and sample selection

Our sample consists of all of the firms listed in the Shanghai and Shenzhen Stock Exchanges over the period of 2013 to 2017. The *Guidelines on Share Pledge Repo Transaction, Registration and Settlement*, which came into effect in May 2013, allow securities companies to engage in share pledging in China's capital market. In our study, securities companies constitute the pledgees and we must match them with their affiliated analysts, so the starting year of our sample is 2013. The data are at the analyst level. However, one analyst may issue more than one rating report for a listed firm in one year. We retain only the latest rating reports and drop other data because analysts will update their reports based on the information obtained over time, and only the latest reports fully reflect the behavior of analysts. After excluding financial firms and firms with missing financial information, our final sample consists of 122,110 analyst-firm-year observations.

The share pledge data in our study are derived from the Wind database, and the analyst data from the RESSET database. The data for analysts' site visits are hand-collected from the information disclosure platform of the Shenzhen Stock Exchange, and other data are obtained from the China Stock Market and Accounting Research (CSMAR) database. All continuous variables are Winsorized at the 1% and 99% levels.

### 3.2. Model

We examine the stock recommendation behavior of affiliated analysts in a (order) probit model in Equation (1).

$$\begin{aligned} Rec = & \alpha + \beta_1 Affiliated\_Analyst + \beta_2 Analyst\_Num + \beta_3 Institution + \beta_4 Age \\ & + \beta_5 Size + \beta_6 Lev + \beta_7 ROA + \beta_8 MB + \beta_9 Turnover + \beta_{10} Experience \\ & + \beta_{11} Brokersize + \beta_{12} Day + Brokerfixedeffect + Yearfixedeffect + \varepsilon \end{aligned} \quad (1)$$

*Rec* is the placeholder for the two explanatory variables capturing stock recommendations. The stock recommendations are divided into the five categories of Sell, Reduce, Neutral, Add, and Buy. We define the indicator variable *Rec*<sub>1</sub> and assign the values of *Rec*<sub>1</sub> as 5, 4, 3, 2, and 1, to represent the stock recommendations of Buy, Add, Neutral, Reduce, and Sell, respectively. The larger the *Rec*<sub>1</sub> value, the more optimistic the stock recommendations. We then combine the Buy and Add rating reports into a positive rating reports category, and the Neutral, Reduce, and Sell reports into a negative rating reports category. We use the indicator variable *Rec*<sub>2</sub>, which takes the value of 1 if a rating report is positive and 0 otherwise.

*Affiliated\_Analyst* is an explanatory variable that equals 1 if shares of a listed firm are pledged by controlling shareholder to securities companies, and their analysts issue rating reports on the firms, and 0 otherwise. For example, the controlling shareholder of Orient Landscape (Stock Code 002310), Ms. Qiaonv He, pledged 17.83 million shares, accounting for 1.60% of the shares she held, to the Industrial Securities company using the Share Pledge Repo Transaction in April 2017. Jie Meng, an analyst for the Industrial Securities company, issued a rating report for Orient Landscape on October 26, 2017, and the stock recommendation was to Buy. Thus, Jie Meng is connected to Orient Landscape through the Share Pledge Repo Transaction business of the Industrial Securities company. We define Jie Meng as an affiliated analyst during the period of the share pledge by the controlling shareholder of Orient Landscape. Our data show that 26.9% of analysts were affiliated between 2013 and 2017. Table 1 summarizes the sample of affiliated analysts and reports the sample distribution of stock recommendation by year.

To eliminate the interference from any information asymmetry between affiliated analysts with share pledge firms, we use site visits, geographic proximity, star analysts, and information environment to measure such asymmetry, and we examine whether affiliated analysts with more private information about share pledge firms provide less optimistic stock recommendations. If an analyst visits a listed firm, the value of *Visiting* is 1, and 0 otherwise. If the workplaces of affiliated analysts are located in the same provinces as the share pledge companies, they have easier access to private information and issue more accurate earnings forecasts. The value of *Location* is thus 1, and 0 otherwise. If analysts are listed as star analysts, the value of *Star* is 1 and

Table 1  
Sample distribution.

Panel A: Distribution of Affiliated Analysts by year					
Year	Full Sample	No. of Affiliated Analysts		%	
2013	29,648	2703		9.1	
2014	25,759	6036		23.4	
2015	26,494	8438		31.9	
2016	19,306	7366		38.2	
2017	20,903	8258		39.5	
Total	122,110	32,801		26.9	
Panel B: Distribution of Stock Recommendations by year					
Year	Buy	Add	Neutral	Reduce	Sell
2013	10,092	17,622	1860	15	59
2014	10,606	13,781	1280	13	79
2015	14,185	11,412	820	9	68
2016	10,350	8553	359	3	41
2017	12,110	8539	252	0	2
Total	57,343	59,907	4571	40	249

0 otherwise. We also use the earnings quality, calculated by the DD model (Dechow and Dichev, 2002), as the proxy variable of information transparency (*AQ*).

We use control variables previously identified in the stock recommendations literature (Lin and McNichols, 1998; Michaely and Womack, 1999; Barber et al., 2006; O'Brien and Tan, 2015). We include the natural logarithm of the firm's total assets at the end of year  $t$  (*Size*) to capture the effects of size. Firm age (*Age*) captures the maturity level of the firm, and we use the natural logarithm of the number of years since the firm has been publicly traded. *Lev* captures the financial leverage of the firm and is measured as the ratio of total debt to total assets. *ROA* proxies for the financial performance, calculated as the income before extraordinary items scaled by total assets at year  $t$ . Market value-to-Book value (*MB*) captures the growth of the firm and we use the ratio of market value to book value of equity as the measurement. *Turnover* captures the turnover rate of stock in the capital market and is measured as the ratio of the trading shares to tradable shares. *Analyst\_Num* proxies for the demand from information intermediaries and is measured as the logarithm of the number of analysts who provide earnings forecasts for year  $t$  plus 1. We include institutional ownership (*Institution*), measured as the ratio of shares by investors to total shares, to capture the demand for information by investors. *Brokersize* is a variable that captures the effects of the size of securities companies and is measured by the natural logarithm of the size. *Experience* proxies for the work experience of analysts and is calculated as the relative work experience of all analysts. *Day* captures the analyst forecast days and is measured by the natural logarithm of the days between the date the rating report was issued and the date the annual report was released. We also include the broker and year fixed effects to remove the influences of broker and year on the estimation of the coefficients on the affiliated analyst variable. All of the variables are defined in Table 2.

Table 2  
Variable definitions.

Variable	Definition
Rec <sub>1</sub>	A discrete numeric value variable equal to 5, 4, 3, 2, or 1, which represents that the stock recommendation is Buy, Add, Neutral, Reduce, or Sell, respectively
Rec <sub>2</sub>	A dummy variable equal to 1 for an analyst that issues a Buy or Add rating report and 0 indicates that the stock recommendation is Neutral, Reduce, or Sell
CAR(−2, +2)	The cumulative excess return in a short-term window (−2, +2)
CAR(+3, +60)	The cumulative excess return in a long-term window (+3, +60)
Affiliated_Analyst	A dummy variable that equals 1 if a firm's shares are pledged by a controlling shareholder to securities companies and their analyst issues a rating report on the share pledge firm, and 0 otherwise
Visiting	A dummy variable that equals 1 if an analyst visits the listed firm, and 0 otherwise
Location	A dummy variable that equals 1 if an analyst's workplace is located in the same province as the share pledge company, and 0 otherwise
Star	A dummy variable that equals 1 if an analyst is listed as a star analyst, and 0 otherwise
AQ	The earnings quality calculated by the DD model
Analyst_Num	The log (1+ the number of analysts who issue earnings forecasts for the firm at year $t$ )
Institution	The ratio of total shares held by institutional investors
Age	The natural logarithm of the number of years from the beginning of year $t$ since the firm's A-shares were publicly traded in the Chinese exchanges
Size	The natural logarithm of total assets
Lev	The ratio of total debt to total assets
ROA	Income before extraordinary items divided by total assets
MB	The ratio of the market value of equity to the book value of equity
Turnover	The ratio of total trading volume scaled by total tradable shares
Brokersize	The natural logarithm of securities companies' size
Experience	The relative work experience among all analysts
Day	The natural logarithm of the days between the date the rating report was issued and the date the annual report was released

## 4. Empirical results

### 4.1. Descriptive statistics

Table 3 provides the descriptive statistics for our variables. Panel A reports the summary statistics. Among the rating reports issued by analysts, 96.0% have the value of 1 for the  $Rec_2$  variable, and the mean value of  $Rec_1$  is 4.425, suggesting that 96.0% of stock recommendations in rating reports are Buy and Add in our sample, which shows that analysts are more likely to issue Buy and Add stock recommendations rather than negative rating reports such as Sell or Reduce.

The cumulative abnormal return ( $CAR$ ) of stock recommendations issued by analysts in a short-term window  $[-2, +2]$  is 0.011, and the  $CAR$  value in a long-term window  $[+3, +60]$  is  $-0.060$ , which indicates that the rating reports can bring abnormal positive returns in the short-term window, but the returns in the long-term window are significantly negative.

We find that 26.9% of sample have the value of 1 for the  $Affiliated\_Analyst$  variable, which is thus the percentage of affiliated analysts in our sample, suggesting sufficient variation in our explanatory variables for the empirical tests. Of the listed firms in the Shenzhen Stock Exchange, 71.2% are visited by analysts. The workplaces of 11.0% of analysts are located in the same province as their share pledge firms. In the New Fortune selection, 19.6% of analysts are selected as star analysts.

Panel B presents the results of our univariate tests. The sample is divided into the two sub-samples of affiliated and non-affiliated analysts. The mean and median values of the main test variables in the two groups are

Table 3  
Descriptive statistics.

Panel A: summary statistics								
Variable	N	Mean	Min	25th	Median	75th	Max	Std
$Rec_1$	122,110	4.425	1	4	4	5	5	0.588
$Rec_2$	122,110	0.960	0	1	1	1	1	0.195
$CAR(-2, +2)$	107,913	0.011	-0.483	-0.031	0.003	0.044	0.634	0.078
$CAR(+3, +60)$	107,884	-0.060	-2.674	-0.243	-0.048	0.131	1.712	0.335
$Affiliated\_Analyst$	122,110	0.269	0	0	0	1	1	0.442
Visiting	80,699	0.712	0	0	1	1	1	0.448
Local	122,110	0.110	0	0	0	0	1	0.320
Star	122,110	0.196	0	0	0	0	1	0.389
AQ	122,110	0.060	0.001	0.020	0.043	0.080	0.290	0.057
Size	122,110	22.771	20.488	21.792	22.540	23.478	26.999	1.357
Lev	122,110	0.428	0.069	0.270	0.421	0.580	0.848	0.198
ROA	122,110	0.063	-0.060	0.032	0.056	0.089	0.211	0.048
Age	122,110	2.174	0.693	1.609	2.197	2.773	3.178	0.645
MB	122,110	2.445	0.182	1.070	1.938	3.224	9.757	1.955
Turnover	122,110	4.567	0.458	2.174	3.672	6.025	16.007	3.232
Return	122,110	0.319	-0.488	-0.089	0.198	0.579	2.485	0.569
Brokersize	122,110	3.628	1.609	3.258	3.738	4.043	4.682	0.631
Experience	122,110	-0.183	-2.794	-1.654	-0.650	1.289	3.339	1.715
Day	122,110	5.361	4.369	5.030	5.357	5.778	6.116	0.425
Institution	122,110	0.080	0.004	0.032	0.059	0.095	0.570	0.087
Analyst_Num	122,110	2.561	1.099	2.197	2.639	2.944	3.526	0.540
Panel B: univariate tests								
Variable	Affiliated analysts group			Non-affiliated analysts group			T-value	Z-value
	N	Mean	Median	N	Mean	Median		
$Rec_1$	32,801	4.499	5	89,309	4.439	4	26.60***	24.43***
$Rec_2$	32,801	0.981	1	89,309	0.953	1	22.35***	22.31***

This table presents the descriptive statistics. Panel A reports the summary statistics of all variables. Panel B presents the results of univariate tests. The t-statistics (z-statistics) are based on difference tests of mean value (median value) in the affiliated vs. non-affiliated analyst groups. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels.

given and the differences are calculated and tested. The mean value of stock recommendations issued by affiliated analysts is 4.499, and that of those issued by non-affiliated analysts is 4.439, suggesting that stock recommendations are significantly higher at the 1% level in the affiliated analysts group than in the non-affiliated analysts group. In our sub-sample, 98.1% of stock recommendations in the rating reports issued by affiliated analysts are Buy and Add, compared to only 95.3% of those issued by non-affiliated analysts. Thus, a significant difference between the two groups is found at the 1% level. The results of our univariate tests show that the stock recommendations issued by affiliated analysts are more optimistic than those of non-affiliated analysts.

## 4.2. Results

### 4.2.1. The effect of affiliated analysts on stock recommendations

Table 4 reports the estimation results of Equation (1). The affiliated analyst variable is significantly positively associated with the two stock recommendation variables. In column (1), the coefficient on *Affiliated\_Analyst* is 0.101 with a z statistic of 4.35, and thus strongly significantly positive in a two-tailed test at the 1% level. Column (2) shows that the coefficient on *Affiliated\_Analyst* is 0.220, with a z statistic of 4.30, which is significantly positively associated with stock recommendation at the 1% level. The marginal effect of affiliated analysts

Table 4  
The effect of affiliated analysts on stock recommendations.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		Sub-sample 1		Sub-sample 2	
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.101*** (4.35)	0.220*** (4.30)	0.088*** (2.94)	0.189*** (3.14)	0.122*** (4.61)	0.249*** (4.41)
Size	0.006 (0.40)	-0.074*** (-2.68)	0.027 (1.01)	-0.063 (-1.29)	0.014 (0.83)	-0.057** (-1.97)
Lev	0.436*** (5.14)	0.742*** (4.40)	0.246** (2.22)	0.443* (1.75)	0.392*** (4.12)	0.658*** (3.42)
ROA	4.131*** (12.31)	7.874*** (11.20)	3.321*** (7.58)	5.951*** (6.21)	4.355*** (11.38)	8.485*** (10.21)
Age	-0.057** (-2.54)	-0.096** (-2.13)	-0.049 (-1.58)	-0.022 (-0.38)	-0.059** (-2.35)	-0.106** (-2.04)
MB	-0.034*** (-3.71)	-0.050*** (-2.70)	-0.021 (-1.60)	-0.024 (-0.78)	-0.043*** (-4.62)	-0.069*** (-3.71)
Turnover	0.007* (1.76)	0.018** (2.04)	-0.001 (-0.15)	0.007 (0.64)	0.010** (2.18)	0.027*** (2.68)
Return	0.186*** (9.33)	0.268*** (5.71)	0.113*** (4.06)	0.186** (2.57)	0.189*** (8.49)	0.265*** (5.19)
Brokersize	0.284*** (7.68)	0.221*** (2.62)	0.248*** (4.30)	0.233* (1.86)	0.283*** (6.91)	0.237** (2.44)
Experience	-0.008* (-1.92)	-0.006 (-0.67)	-0.008 (-1.23)	-0.018 (-1.33)	-0.006 (-1.34)	-0.001 (-0.08)
Day	-0.226*** (-13.60)	-0.231*** (-6.91)	-0.220*** (-9.31)	-0.187*** (-3.49)	-0.219*** (-11.46)	-0.243*** (-6.29)
Institution	0.172 (1.03)	0.168 (0.55)	1.141*** (3.64)	2.552*** (3.72)	0.092 (0.54)	-0.025 (-0.08)
Analyst_Num	0.194*** (8.25)	0.318*** (7.41)	0.141*** (4.30)	0.262*** (4.25)	0.203*** (7.83)	0.344*** (7.04)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	122,110	122,110	59,675	59,675	95,236	95,236
Pseudo R <sup>2</sup>	0.190	0.340	0.202	0.352	0.191	0.349

This table reports the effects of affiliated analysts on stock recommendations. Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

is an increase in the likelihood of a Buy or Add stock recommendation of 7.7%. Given the average rate of 26.9% for affiliated analysts, their effects are economically significant. These results show that affiliated analysts are more likely to issue optimistic rating reports to help share pledge firms implement market value management and maintain stock price. Our finding supports the hypothesis of conflicts of interest.

To further examine the relationship between affiliated analysts and stock recommendations, we divided our sample into two sub-samples. The first consists of listed firms in which the shares are pledged by controlling shareholders and affiliated analysts are defined as those with affiliated securities companies that are pledgees of share pledge firms, so the value of *Affiliated\_Analyst* then equals 1, and 0 otherwise. The second sub-sample consists of non-share pledge firms and share pledge firms that have relationships with listed firms. The definition of affiliated analyst is the same as the variable definition of *Affiliated\_Analyst* in Table 2. Columns (3) to (6) in Table 4 show that the coefficients of *Affiliated\_Analyst* are all significantly positive and significant at a 1% level in both sub-samples. These results show that the stock recommendations of affiliated analysts are more optimistic when these affiliated securities companies are pledgees of share pledge firms. The findings further confirm that the affiliated analysts lose their independence due to conflicts of interest and issue optimistic rating reports for share pledge firms.

#### 4.2.2. The effect of the dynamic adjustment behavior of affiliated analysts on stock recommendations

The above findings suggest that affiliated analysts issue more optimistic rating reports for share pledged firms. If this is caused by the conflict of interest behavior of affiliated analysts, will their optimistic behavior regarding stock recommendations be weakened before (after) the relationship formed (dissolved) between them and share pledge firms? We provide more evidence for our conflict of interest hypothesis by examining the dynamic adjustment behavior of affiliated analysts in terms of stock recommendations.

We use a sample in which the shares of listed firms are only pledged once by controlling shareholders between 2013 and 2017 as the experimental group, and non-share pledge firms as the control group. We define two variables, *Pre* and *Post*, in Eq. (1). The variable of *Pre* represents the year before the relationship between affiliated analysts and share pledge firms was formed, and *Post* represents the year after the relationship between affiliated analysts and share pledge firms dissolved. Table 5 reports the results of the dynamic adjustment behavior of affiliated analysts on stock recommendations. In column (1), the coefficient on *Affiliated\_Analyst* is 0.097 with a z statistic of 3.17, and is significant at the 1% level. The coefficient on *Pre* is positive, but it fails to pass the significance test. This shows that the rating reports issued by the analysts without interference from outside pressure are more objective before the year that the relationship was formed. The coefficient on *Post* is positive, but also fails to pass the significance test. This suggests that these affiliated analysts are less likely to issue optimistic rating reports after the year that the relationship dissolved. We obtain the same finding when we use *Rec<sub>2</sub>*, our other measurement of stock recommendation, which suggests that there is a dynamic adjustment of the stock recommendation behavior of affiliated analysts, and they are faced with less conflict of interest before the year that the relationship was formed and after the year that it was dissolved. Thus, we provide more evidence for the conflict of interest hypothesis.

### 4.3. Exclusivity testing

#### 4.3.1. Eliminating the influence of information asymmetry

Our above findings may be due to information asymmetry between affiliated analysts and share pledge firms. In this section, we use the following methods to measure the information asymmetry and examine whether affiliated analysts who have more private information about share pledge firms produce less optimistic stock recommendations.

First, site visits are an important method of acquiring information for analysts, as they can communicate and interact with managers face to face, which can enable them to obtain more private information about listed firms. Thus, corporate site visits can help affiliated analysts alleviate the information asymmetry with share pledge firms and improve the quality of their rating reports (Cheng et al., 2016).

In 2009, the Shenzhen Stock Exchange stated that listed firms must disclose information about analysts' site visits. We use these data to examine whether affiliated analysts who have more private information about share pledge firms produce less optimistic stock recommendations after visiting the firms. The results of

Table 5  
Dynamic adjustment behavior of affiliated analysts in stock recommendations.

	(1) Rec <sub>1</sub>	(2) Rec <sub>2</sub>
Pre	0.022 (0.59)	0.016 (0.20)
Affiliated_Analyst	0.097*** (3.17)	0.205*** (2.86)
Post	0.049 (1.47)	0.082 (1.15)
Size	0.001 (0.07)	−0.094*** (−2.75)
Lev	0.428*** (4.37)	0.612*** (2.80)
ROA	4.140*** (10.50)	8.551*** (9.46)
Age	−0.052* (−1.79)	−0.085 (−1.36)
MB	−0.022** (−2.18)	−0.046** (−2.00)
Turnover	0.006 (1.32)	0.021* (1.86)
Return	0.143*** (5.67)	0.180*** (2.94)
Brokersize	0.117** (2.08)	0.198 (1.49)
Experience	−0.007 (−1.28)	−0.022* (−1.81)
Day	−0.211*** (−9.69)	−0.186*** (−4.16)
Institution	0.172 (0.78)	0.217 (0.56)
Analyst_Num	0.188*** (6.50)	0.286*** (4.72)
Year fixed effects	Yes	Yes
Broker fixed effects	Yes	Yes
N	68,193	68,193
Pseudo R <sup>2</sup>	0.195	0.373

This table reports the results of the dynamic adjustment behavior of affiliated analyst on stock recommendations. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

column (1) and (2) in Table 6 show that the coefficients on *Affiliated\_Analyst\*Visiting* are non-significant, suggesting that affiliated analysts who have visited share pledge firms do not issue less optimistic stock recommendations for them. Thus, affiliated analysts cannot improve the quality of their rating reports although the site visits can help them obtain more private information, and thus the hypothesis of information asymmetry does not hold.

Second, according to the new theory of economic geography, geographic proximity affects the efficiency of information transmission between companies. The proximity of analysts and firms can affect the costs that analysts incur for access to the information of listed firms. Geographically proximate analysts possess an information advantage over others, and thus their earnings forecasts are more accurate (Malloy, 2005; Bae et al., 2008; O'Brien and Tan, 2015). Affiliated analysts whose workplaces are located in the same provinces as share pledge companies have easier access to private information and thus issue more accurate earnings forecasts. The results of columns (3) and (4) in Table 6 show that the coefficients on *Location* are −0.055 and −0.111, with z statistics of −1.71 and −1.86, and are significant at the 10% level. Thus, when analysts' workplaces are located in the same province as the listed firms, they can reduce optimistic bias due to the

Table 6  
Effect of information asymmetry on stock recommendations of affiliated analysts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Site Visit		Location		Star Analyst		AQ	
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.080*** (2.61)	0.194*** (3.17)	0.092*** (3.78)	0.223*** (4.17)	0.090*** (3.68)	0.213*** (3.98)	0.134*** (4.22)	0.220*** (3.16)
Affiliated_Analyst*IS	0.081 (1.22)	-0.069 (-0.46)	0.099 (0.90)	0.019 (0.16)	0.062* (1.75)	0.058 (0.52)	-0.050 (-0.08)	-0.010 (-0.01)
IS	-0.074 (-1.30)	-0.209 (-1.53)	-0.055* (-1.71)	-0.111* (-1.86)	-0.021 (-1.04)	-0.053 (-1.05)	0.013** (2.31)	0.011 (0.03)
Size	0.027 (1.02)	-0.065 (-1.34)	0.006 (0.35)	-0.078*** (-2.82)	0.007 (0.41)	-0.073*** (-2.67)	0.007 (0.45)	-0.074*** (-2.68)
Lev	0.244** (2.21)	0.437* (1.74)	0.437*** (5.15)	0.753*** (4.46)	0.435*** (5.13)	0.739*** (4.38)	0.412*** (4.83)	0.741*** (4.36)
ROA	3.332*** (7.61)	5.987*** (6.28)	4.143*** (12.35)	7.906*** (11.27)	4.128*** (12.29)	7.866*** (11.19)	4.093*** (12.21)	7.874*** (11.24)
Age	-0.045 (-1.46)	-0.013 (-0.22)	-0.055** (-2.44)	-0.092** (-2.04)	-0.057** (-2.54)	-0.097** (-2.15)	-0.057** (-2.50)	-0.096** (-2.13)
MB	-0.021 (-1.63)	-0.026 (-0.85)	-0.034*** (-3.76)	-0.051*** (-2.78)	-0.034*** (-3.70)	-0.050*** (-2.69)	-0.036*** (-3.90)	-0.050*** (-2.67)
Turnover	-0.001 (-0.16)	0.007 (0.60)	0.007* (1.73)	0.018** (1.99)	0.007* (1.76)	0.018** (2.04)	0.006 (1.57)	0.018** (2.05)
Return	0.113*** (4.03)	0.183** (2.53)	0.185*** (9.30)	0.265*** (5.67)	0.186*** (9.34)	0.268*** (5.72)	0.186*** (9.35)	0.268*** (5.71)
Brokersize	0.250*** (4.34)	0.237* (1.90)	0.285*** (7.71)	0.224*** (2.64)	0.284*** (7.70)	0.216** (2.57)	0.284*** (7.69)	0.222*** (2.62)
Experience	-0.008 (-1.23)	-0.018 (-1.28)	-0.008* (-1.92)	-0.005 (-0.63)	-0.008* (-1.88)	-0.006 (-0.68)	-0.008* (-1.94)	-0.006 (-0.67)
Day	-0.220*** (-9.33)	-0.186*** (-3.49)	-0.225*** (-13.59)	-0.230*** (-6.87)	-0.226*** (-13.60)	-0.230*** (-6.87)	-0.226*** (-13.62)	-0.231*** (-6.90)
Institution	1.132*** (3.59)	2.537*** (3.64)	0.162 (0.97)	0.143 (0.47)	0.172 (1.04)	0.167 (0.55)	0.172 (1.04)	0.168 (0.55)
Analyst_Num	0.143*** (4.35)	0.265*** (4.30)	0.196*** (8.33)	0.321*** (7.50)	0.194*** (8.24)	0.318*** (7.42)	0.196*** (8.31)	0.318*** (7.41)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	80,699	80,699	122,110	122,110	122,110	122,110	122,110	122,110
Pseudo R <sup>2</sup>	0.203	0.342	0.190	0.338	0.190	0.338	0.190	0.338

This table reports the results of information asymmetry on the stock recommendation behavior of affiliated analysts. *IS* represents the variables of *Visiting*, *Location*, *Star*, and *AQ*, respectively. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

geographical advantage, which helps them obtain more information about the listed firms. The coefficient on *Affiliated\_Analyst\*Location* is positive, but it does not pass the significance test, suggesting that affiliated analysts in geographical proximity to the share pledge firms do not issue less optimistic stock recommendations for these firms. They cannot improve the quality of their rating reports even though they have advantage of geographic proximity, and the hypothesis of information asymmetry therefore does not hold.

Third, star analysts are able to better grasp useful information from public or private sources and can thus provide more accurate rating reports. They can also maintain independence under the constraint of the reputation mechanism and thus are not affected by the share pledge firms' pressure to improve the quality of their reports (Stickel, 1992; Jackson, 2005). If an analyst is one of the "top five analysts" in New Fortune's list, the value of *Star* is 1 and 0 otherwise. The result in column (5) of Table 6 shows that the coefficient on *Affiliated\_Analyst\*Star* is 0.062, with a z statistic of 1.75, and is significant at the 10% level. Using *Rec<sub>2</sub>*, the other measurement of stock recommendation, does not produce a significant result. Thus, a star-affiliated analyst cannot issue more circumspect rating reports for a listed firm because of the conflict of interest.



Last, the information environment provided by listed firms determines the difficulty of obtaining information from them by analysts. The higher the information transparency of share pledge firms, the more easily affiliated analysts can acquire information from them, which reduces information asymmetry. The earnings quality, calculated by the DD model, is used as the proxy variable of information transparency ( $AQ$ ). As shown in column (7) of Table 6, the coefficient on  $AQ$  is 0.013, with a z statistic of 2.31, and is significant at the 5% level, suggesting that analysts issue more optimistic rating reports for firms with lower information transparency. However, the coefficient on  $Affiliated\_Analyst * AQ$  is negative but does not pass the significance test, suggesting that affiliated analysts do not issue less optimistic stock recommendations for firms with higher levels of information transparency.

Overall, our findings in this section show that the optimistic stock recommendations issued by affiliated analysts do not decrease, even if they have visited the share pledge firms, work in the same location as the firms, or are star analysts according to New Fortune's "top five analysts" list, or if the information transparency of share pledge firms is higher. These results also support our conflict of interest hypothesis.

#### 4.3.2. Eliminating the influence of the extra connections of affiliated analysts

In addition to the possible interference of information asymmetry, our finding that affiliated analysts issue optimistic stock recommendations when their securities companies engage in share pledging and are pledgees of the share pledge firms may also be due to the connections between securities companies' other businesses and share pledge firms. To eliminate this possibility, we remove from our data the sample consisting of share pledge firms that have relationships with affiliated analysts via investment banking, sub-warehouse commissions, and the proprietary businesses of securities companies.

Investment banking is an important source of income for brokers. The rating reports issued by their affiliated analysts have become an important strategic resource for brokers. They strive to maintain relationships with their customers in a competitive environment with limited securities resources. The relationship between the investment banking business of securities companies and listed firms has been found to affect the conflicts of interest between their affiliated analysts and the listed firms. Their analysts issue more optimistic rating reports than other analysts to help their securities companies obtain the investment banking business (Lin and McNichols, 1998). Thus, we delete the sample in which the securities companies of affiliated analysts are underwriters of the IPO and SEO of listed firms. The results in columns (1) and (2) of Table 7 show that our conclusions remain valid after excluding this sample.

Second, institutional investors are the main customers of analysts' rating reports, and their commission fees are the most important source of income for securities companies. Analysts have been found to be more likely to track listed firms whose shares are held by institutional investors, and they issue more optimistic rating reports on stocks held by these investors because they obtain more commission fees from them (Firth et al., 2013; Gu et al., 2013). According to New Fortune, commission fees from public funds are the main source of income for securities companies, and the voting rights in firms with shares held by public funds that select star analysts remain at around 60%. Thus, we exclude listed firms in which the shares are mostly held by public funds to reduce the influence of sub-warehouse commission fees from public funds, which represent the main customers of brokers, on analysts' behavior. The results in columns (3) and (4) of Table 7 show that our conclusions are still valid after excluding these firms.

Last, Cao and Zhu (2011) found that analysts are more optimistic about the stocks held by their proprietary businesses, and thus they issue more optimistic stock recommendations for these listed firms. We further exclude the sample of firms in which the shares are mostly held by the proprietary businesses of securities companies. We derive the same finding in columns (5) and (6) of Table 7 after excluding the sample in which stocks are held by the affiliated analysts' brokers.

Our conclusions hold when we also remove the sample in which conflicts of interest are caused by the relationships between investment banking, sub-warehouse commissions, and proprietary business. Our tests shows that the connections between other businesses of securities companies and share pledge firms does not influence our findings, and illustrates that the conflict of interest caused by share pledge financing affects the independence of affiliated analysts and leads to optimistic stock recommendations for share pledge firms.

Table 7

Eliminating the influence of extra connections of affiliated analysts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Excluding the sample of investment banking		Excluding the sample of sub-warehouse commission		Excluding the sample of proprietary business		Excluding the sample of three connections	
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.100*** (4.18)	0.222*** (4.18)	0.110*** (4.34)	0.236*** (4.22)	0.103*** (4.45)	0.220*** (4.29)	0.110*** (4.25)	0.239*** (4.12)
Size	0.009 (0.55)	-0.080*** (-2.75)	0.024 (1.43)	-0.045 (-1.61)	0.007 (0.46)	-0.073*** (-2.66)	0.027 (1.56)	-0.052* (-1.74)
Lev	0.421*** (4.87)	0.694*** (4.00)	0.428*** (4.67)	0.702*** (3.83)	0.435*** (5.14)	0.744*** (4.41)	0.412*** (4.40)	0.646*** (3.41)
ROA	4.124*** (12.17)	7.639*** (10.76)	4.004*** (11.20)	7.527*** (10.04)	4.132*** (12.31)	7.849*** (11.17)	3.998*** (11.08)	7.222*** (9.61)
Age	-0.053** (-2.31)	-0.082* (-1.76)	-0.047* (-1.93)	-0.080 (-1.63)	-0.058** (-2.56)	-0.096** (-2.12)	-0.043* (-1.73)	-0.066 (-1.29)
MB	-0.036*** (-3.92)	-0.054*** (-2.85)	-0.024** (-2.26)	-0.041* (-1.92)	-0.033*** (-3.64)	-0.049*** (-2.66)	-0.026** (-2.41)	-0.045** (-2.08)
Turnover	0.008* (1.88)	0.016* (1.80)	0.009** (2.13)	0.024** (2.55)	0.007* (1.73)	0.018** (2.03)	0.010** (2.23)	0.023** (2.39)
Return	0.188*** (9.25)	0.267*** (5.42)	0.167*** (7.08)	0.269*** (4.97)	0.184*** (9.26)	0.266*** (5.67)	0.165*** (6.84)	0.261*** (4.58)
Brokersize	0.299*** (7.97)	0.211** (2.43)	0.242*** (5.79)	0.184** (2.03)	0.289*** (7.78)	0.221*** (2.62)	0.263*** (6.16)	0.173* (1.85)
Experience	-0.007* (-1.67)	-0.005 (-0.57)	-0.007 (-1.54)	-0.006 (-0.67)	-0.008* (-1.86)	-0.006 (-0.65)	-0.006 (-1.28)	-0.007 (-0.69)
Day	-0.224*** (-13.16)	-0.238*** (-6.85)	-0.199*** (-10.64)	-0.201*** (-5.70)	-0.225*** (-13.57)	-0.230*** (-6.87)	-0.196*** (-10.19)	-0.206*** (-5.63)
Institution	0.192 (1.11)	0.232 (0.67)	0.021 (0.12)	-0.066 (-0.23)	0.173 (1.04)	0.165 (0.54)	0.029 (0.16)	-0.032 (-0.10)
Analyst_Num	0.185*** (7.70)	0.315*** (7.04)	0.203*** (7.97)	0.326*** (7.19)	0.193*** (8.22)	0.319*** (7.41)	0.193*** (7.44)	0.324*** (6.86)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	115,548	115,548	99,195	99,195	121,542	121,542	93,255	93,255
Pseudo R <sup>2</sup>	0.187	0.336	0.191	0.341	0.190	0.338	0.188	0.338

This table reports the results of eliminating the influence of extra connections of affiliated analysts on their stock recommendations. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

#### 4.4. Supplementary analysis

The above findings show that affiliated analysts issue optimistic rating reports due to conflicts of interest rather than due to information superiority or other business relationships. In this section, we further examine whether the stock recommendation behavior of affiliated analysts differs in different situations.

##### 4.4.1. The effect of the share pledge ratio on the stock recommendations of affiliated analysts

We divide our sample into high ratio vs. low ratio pledged shares groups and expect the influence of affiliated analysts' stock recommendation behavior to vary. Controlling shareholders who pledge most of their shares to securities companies are typically subject to more pressure from margin calls, as the stock prices may fall below the desired level, and the shares that they hold are not sufficient to make up the drop in stock price (Chan et al., 2015). We expect the stock recommendation behavior of affiliated analysts to be more optimistic and radical in the high share pledge ratio sample than in the low ratio sample.

We use the number of shares pledged by controlling shareholders to securities companies over the total number of shares held by these shareholders to measure an alternative variable of the share pledge ratio (*Ratio*). Table 8 presents the effect of affiliated analysts' stock recommendations in different scenarios. Columns (1) and (2) show that the coefficient on *Affiliated\_Analyst\*Ratio* is significantly positively associated with stock recommendation at the 5% level. Our empirical results show that a higher share pledge ratio increases the conflict of interest between affiliated analysts and share pledge firms, and the likelihood that stock recommendations are issued by affiliated analysts for high share pledge ratio firms is significantly higher than that for low ratio firms.

##### 4.4.2. Effect of the downward pressure of stock price on the stock recommendations of affiliated analysts

Share pledge firms are faced with the challenge of maintaining stock prices under the downward pressure of China's capital market, which can prompt affiliated analysts to issue optimistic rating reports and help the share pledge firms effectively manage the market value. Thus, we further test the effect of the downward pressure of stock prices on affiliated analysts' stock recommendation behavior.

Following the stock market cycle measurement method of Kao et al. (1998), we define the upward and downward trend of stock prices as follows. If the monthly average stock return in the past 12 months is greater than 0, the stock price is rising in that year, which is defined as an upward trend. If the monthly average is less than 0, it is defined as a downward trend. We expect the stock recommendation behavior of affiliated analysts is more optimistic when the stock price is defined as having a downward trend. Columns (3) and (4) show that the coefficient on *Affiliated\_Analyst\*Pressure* is significantly positively associated with stock recommendation at 5% or 10% levels. Our empirical results show that the association between affiliated analysts and the likelihood of stock recommendation is stronger when the stock price is following a downward rather than an upward trend, which shows that the downward pressure of stock price increases conflicts of interest for affiliated analysts.

#### 4.5. Robustness tests

##### 4.5.1. Difference-in-differences model

The *Guidelines on Share Pledge Repo Transaction, Registration and Settlement* came into effect in May 2013 and allows securities companies to engage in share pledging in China's capital market. The share pledge business was mainly conducted by banks, trusts, or other financial institutions before this year. Thus, the implementation of the *Share Pledge Repo Transaction* policy in 2013 can be viewed as an exogenous shock, which provides us with an opportunity to test our problem using the difference-in-differences model.

In our sample, the securities companies accept the pledged shares of shareholders at different times, and many of the pledged shares are released after the expiration or just before the expiration, and then the pledge procedures are recompleted, so the share pledge repo transaction business of securities companies is a multiple exogenous shock. We thus use Eq. (1) as the difference-in-differences model, and the sample is from 2008 to 2017, which includes securities companies that accept the pledged shares of listed firms, and analysts also issue rating reports for these firms. The value of *Affiliated\_Analyst* is thus 1, and 0 otherwise.

Table 8  
Effect of affiliated analysts on stock recommendations in different scenarios.

	(1) Share Pledge Ratio		(3) Downward Pressure of Stock Price	
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.122*** (3.35)	0.261*** (2.89)	0.091*** (3.48)	0.191*** (3.15)
Affiliated_Analyst*Ratio/Pressure	0.271** (2.28)	0.501** (2.14)	0.038* (1.95)	0.104** (2.09)
Ratio/Pressure	0.206 (1.31)	0.380 (1.42)	-0.037 (-1.28)	-0.048 (-0.85)
Size	0.009 (0.56)	-0.068** (-2.47)	0.007 (0.44)	-0.072*** (-2.60)
Lev	0.424*** (4.88)	0.711*** (4.12)	0.437*** (5.15)	0.746*** (4.42)
ROA	4.135*** (12.34)	7.881*** (11.23)	4.090*** (12.11)	7.836*** (11.04)
Age	-0.057** (-2.55)	-0.095** (-2.11)	-0.057** (-2.53)	-0.096** (-2.12)
MB	-0.034*** (-3.70)	-0.049*** (-2.69)	-0.033*** (-3.56)	-0.048** (-2.55)
Turnover	0.007* (1.77)	0.018** (2.04)	0.007* (1.68)	0.018** (1.98)
Return	0.185*** (9.30)	0.267*** (5.72)	0.175*** (7.89)	0.251*** (4.64)
Brokersize	0.284*** (7.68)	0.220*** (2.60)	0.284*** (7.68)	0.222*** (2.63)
Experience	-0.008* (-1.91)	-0.006 (-0.68)	-0.008* (-1.93)	-0.006 (-0.68)
Day	-0.226*** (-13.63)	-0.232*** (-6.94)	-0.225*** (-13.55)	-0.231*** (-6.92)
Institution	0.185 (1.11)	0.189 (0.62)	0.164 (0.99)	0.157 (0.51)
Analyst_Num	0.194*** (8.17)	0.317*** (7.37)	0.194*** (8.24)	0.318*** (7.43)
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	122,110	122,110	122,110	122,110
Pseudo R <sup>2</sup>	0.188	0.339	0.190	0.338

This table reports the effects of affiliated analysts on stock recommendations in different scenarios. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The regression results in Table 9 show that there are still optimistic stock recommendations in the rating reports of affiliated analysts for the share pledge firms when using the difference-in-differences model, which is consistent with our conclusion when using the non-difference-in-differences model.

#### 4.5.2. Controlling the fixed effects of analysts and firms

We further control the fixed effects of analysts and firms in our model (1) to alleviate the influence of endogeneity at the individual level. The results shown in columns (1) and (2) of Table 10 suggest that the association between affiliated analysts and the likelihood of stock recommendation is also stronger when we control for the fixed effects of analysts. Columns (3) and (4) of Table 10 show that the coefficient on *Affiliated\_Analyst* is significantly positively associated with stock recommendation at the 1% or 5% level after controlling for the fixed effects of firms. Our conclusion is thus robust when we control for the fixed effects of both firms and analysts.

Table 9  
Effect of affiliated analysts on stock recommendations using the difference-in-differences model.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		Sub-sample 1			
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.135*** (6.30)	0.301*** (6.49)	0.097*** (3.57)	0.223*** (3.99)	0.165*** (6.76)	0.345*** (6.81)
Size	-0.039*** (-3.11)	-0.081*** (-4.94)	-0.009 (-0.42)	-0.121*** (-3.70)	-0.036*** (-2.71)	-0.070*** (-3.99)
Lev	0.396*** (5.72)	0.568*** (4.89)	0.233** (2.48)	0.474** (2.36)	0.362*** (4.66)	0.507*** (3.97)
ROA	4.131*** (15.85)	6.617*** (15.51)	3.422*** (9.37)	6.107*** (8.37)	4.253*** (14.33)	6.789*** (13.83)
Age	0.012 (0.67)	0.001 (0.04)	0.009 (0.35)	0.045 (1.09)	0.009 (0.47)	-0.005 (-0.15)
MB	-0.047*** (-6.40)	-0.059*** (-4.90)	-0.033*** (-3.02)	-0.049** (-2.41)	-0.054*** (-6.86)	-0.070*** (-5.34)
Turnover	-0.001 (-0.19)	-0.007 (-1.20)	-0.006 (-1.20)	-0.016 (-1.53)	0.001 (0.20)	-0.003 (-0.45)
Return	0.157*** (10.67)	0.175*** (6.65)	0.136*** (5.30)	0.200*** (3.81)	0.154*** (9.59)	0.168*** (5.89)
Brokersize	0.051*** (2.67)	0.116*** (3.45)	0.099*** (2.81)	0.129** (2.03)	0.043** (2.03)	0.127*** (3.33)
Experience	-0.006* (-1.91)	-0.004 (-0.86)	-0.008 (-1.63)	-0.009 (-0.93)	-0.004 (-1.33)	-0.004 (-0.66)
Day	-0.217*** (-18.56)	-0.249*** (-12.67)	-0.210*** (-10.62)	-0.232*** (-5.90)	-0.218*** (-16.28)	-0.257*** (-11.58)
Institution	1.146*** (4.92)	1.677*** (3.90)	0.807** (2.06)	0.659 (0.70)	1.284*** (5.07)	2.042*** (4.69)
Analyst_Num	0.192*** (9.71)	0.326*** (11.47)	0.143*** (5.25)	0.282*** (6.42)	0.209*** (9.47)	0.352*** (10.95)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	211,761	211,761	80,848	80,848	165,624	165,624
Pseudo R <sup>2</sup>	0.162	0.262	0.178	0.300	0.165	0.268

This table reports the effects of affiliated analysts on stock recommendations using the difference-in-differences model. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

#### 4.5.3. The method of propensity score matching

We also examine our problem using the Propensity Score Matching method. The affiliated and non-affiliated analysts are matched 1:1 by firm size, financial leverage, the nature of the ultimate ownership, and other criteria, and we obtain a sample of 88,869 after matching. The regression using the matched sample shows that the stock recommendations issued in the rating reports of affiliated analysts are more optimistic than those of non-affiliated analysts, and our conclusion remains robust (see Table 11).

#### 4.5.4. The instrumental variable method

To alleviate any problems of endogeneity in our results, we further use the instrumental variable method to examine our problem. We use the mean value of industry pledged shares and the mean value of province pledged shares as two instrumental variables of share pledge and use the two estimated values of share pledge as proxy variables. We find that the stock recommendations issued in the rating reports of affiliated analysts are more optimistic than those of non-affiliated analysts. Thus, our conclusion is also robust when we consider the endogeneity problem (see Table 11).

Table 10  
Controlling the fixed effects of analysts and firms.

	(1) Rec <sub>1</sub>	(2) Rec <sub>2</sub>	(3) Rec <sub>1</sub>	(4) Rec <sub>2</sub>	(5) Rec <sub>1</sub>	(6) Rec <sub>2</sub>
Affiliated_Analyst	0.076*** (3.25)	0.145*** (3.08)	0.069*** (2.96)	0.136** (2.87)	0.060*** (2.81)	0.125** (2.52)
Size	0.012 (0.83)	0.017 (0.56)	0.009 (0.78)	0.011 (0.48)	0.007 (0.69)	0.009 (0.42)
Lev	0.264*** (3.24)	0.365*** (2.96)	0.232*** (2.85)	0.312** (2.29)	0.218*** (2.74)	0.286** (2.10)
ROA	4.424*** (14.30)	5.276*** (9.45)	4.022*** (11.62)	4.957*** (8.16)	3.968*** (10.65)	4.415*** (7.78)
Age	-0.004 (-0.18)	-0.018 (-0.45)	-0.004 (-0.14)	-0.013 (-0.38)	-0.003 (-0.12)	-0.011 (-0.30)
MB	-0.053*** (-6.04)	-0.036*** (-5.28)	-0.048*** (-4.89)	-0.028*** (-4.75)	-0.040*** (-4.20)	-0.024*** (-4.56)
Turnover	-0.002 (-0.64)	-0.008 (-0.93)	-0.001 (-0.55)	-0.006 (-0.86)	-0.001 (-0.50)	-0.005 (-0.82)
Return	0.168*** (8.84)	0.153*** (4.54)	0.156*** (6.58)	0.129*** (3.99)	0.139*** (6.02)	0.117*** (3.75)
Brokersize	-0.089*** (-2.80)	-0.056* (-1.84)	-0.075** (-2.43)	-0.047* (-1.67)	-0.068** (-2.30)	-0.042 (-1.55)
Experience	0.013** (2.30)	0.002* (1.87)	0.009** (2.01)	0.001 (1.58)	0.007* (1.92)	0.001 (1.21)
Day	-0.294*** (-16.35)	-0.163*** (-5.67)	-0.248*** (-14.46)	-0.135*** (-5.10)	-0.197*** (-12.85)	-0.107*** (-4.87)
Institution	0.027 (0.18)	0.033 (0.27)	0.025 (0.13)	0.030 (0.19)	0.022 (0.11)	0.028 (0.18)
Analyst_Num	0.270*** (12.39)	0.305*** (6.70)	0.233*** (9.86)	0.275*** (5.89)	0.219*** (7.91)	0.254*** (5.43)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Analyst fixed effects	Yes	Yes	No	No	Yes	Yes
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
N	122,110	122,110	122,110	122,110	122,110	122,110
Pseudo R <sup>2</sup>	0.289	0.413	0.315	0.448	0.485	0.506

This table reports the effects of affiliated analysts on stock recommendations using the difference-in-differences model. The Z-statistics computed with robust standard errors clustered at firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at 1%, 5%, and 10% levels, respectively.

#### 4.5.5. Deleting firms with exclusively affiliated or non-affiliated analysts

Some affiliated analysts may only work with specific listed firms, which could also affect our results. To avoid uncertainty and to obtain a corresponding sample between affiliated and non-affiliated analysts in a listed firm, we ensure at least one affiliated and one non-affiliated analyst issue rating reports on a listed firm, and then we examine the difference in the stock recommendations of the two types of analysts. Our results remain robust when we delete the sample in which all the analysts in a listed firm are either affiliated or non-affiliated.

## 5. Further analysis

### 5.1. Effect of affiliated analysts on earnings forecasts

The stock recommendations in our above analysis only have the five categories of Sell, Reduce, Neutral, Add, and Buy, and are thus too subjective to quantitatively explain the behavior of affiliated analysts. Thus, we further examine the stock recommendation behavior of affiliated analysts from a quantitative perspective.

Table 11  
Robustness tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		PSM		IV1		IV2	Special Sample	
	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>	Rec <sub>1</sub>	Rec <sub>2</sub>
Affiliated_Analyst	0.087*** (3.60)	0.194*** (3.70)	0.027*** (2.61)	0.022** (2.36)	0.025** (2.46)	0.017** (2.01)	0.086* (1.92)	0.139 (1.36)
Size	0.018 (0.97)	-0.073** (-2.08)	0.012 (0.71)	-0.002 (-0.98)	0.008 (0.65)	-0.001 (-0.73)	0.011 (0.29)	-0.087 (-1.21)
Lev	0.327*** (3.64)	0.489*** (2.59)	0.284** (2.48)	0.425** (2.01)	0.236** (2.08)	0.382** (2.32)	0.336* (1.88)	0.216 (0.59)
ROA	3.856*** (10.78)	7.097*** (9.26)	3.358*** (8.64)	6.842*** (8.02)	3.02*** (7.63)	5.202*** (7.02)	4.191*** (5.63)	7.322*** (4.94)
Age	-0.052** (-2.15)	-0.074 (-1.62)	-0.046 (-1.31)	-0.065 (-1.42)	-0.038** (-1.07)	-0.053 (-1.22)	-0.102** (-2.05)	-0.089 (-0.92)
MB	-0.030** (-2.98)	-0.051** (-2.40)	-0.016** (-2.13)	-0.032* (-1.84)	-0.010** (-2.06)	-0.024 (-1.56)	-0.025 (-1.24)	-0.071* (-1.82)
Turnover	0.000 (0.02)	0.006 (0.65)	0.000 (0.65)	0.002 (0.37)	0.000 (0.45)	0.001 (0.32)	0.011* (1.72)	0.021 (1.35)
Return	0.158*** (7.10)	0.207*** (3.80)	0.123*** (6.06)	0.156*** (3.32)	0.100*** (5.24)	0.109*** (3.21)	0.192*** (3.94)	0.239** (2.25)
Brokersize	0.263*** (5.78)	0.223** (2.22)	0.230*** (4.25)	0.198** (2.05)	0.164** (2.30)	0.091* (1.91)	0.200** (2.22)	-0.177 (-0.85)
Experience	-0.006 (-1.27)	-0.009 (-0.85)	-0.002 (-1.01)	-0.005 (-0.77)	-0.000 (-1.16)	-0.001 (-0.52)	-0.025*** (-2.68)	-0.048** (-2.26)
Day	-0.206*** (-10.86)	-0.221*** (-5.12)	-0.192*** (-8.84)	-0.132*** (-6.07)	-0.105*** (-2.97)	0.092*** (-2.68)	-0.219*** (-6.17)	-0.222*** (-2.88)
Institution	0.961*** (4.65)	2.363*** (4.71)	0.632** (2.21)	1.246** (2.42)	0.458** (2.01)	1.024** (2.18)	1.500*** (3.22)	3.445*** (3.11)
Analyst_Num	-0.001 (-0.85)	-0.002** (-2.40)	-0.061 (-0.64)	-0.052 (-0.76)	-0.032 (-0.32)	-0.029 (-0.55)	0.125*** (2.78)	0.329*** (3.58)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	88,869	88,869	122,110	122,110	122,110	122,110	21,214	21,214
Pseudo R <sup>2</sup>	0.203	0.352	0.223	0.323	0.252	0.364	0.195	0.306

This table reports the results of the robustness tests. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 12  
Effects of affiliated analysts on earnings forecasts.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		Sub-sample 1		Sub-sample 2	
	Bias	Error	Bias	Error	Bias	Error
Affiliated_Analyst	0.002*** (2.69)	0.002*** (3.07)	0.001** (2.38)	0.001*** (2.58)	0.002*** (3.46)	0.003*** (3.92)
Size	0.001 (1.47)	0.001*** (3.21)	0.001 (1.64)	0.002*** (3.21)	0.000 (0.92)	0.001** (2.48)
Lev	0.010*** (4.31)	0.011*** (5.10)	0.014*** (4.20)	0.014*** (4.57)	0.009*** (3.34)	0.010*** (4.14)
ROA	-0.134*** (-10.86)	-0.102*** (-8.53)	-0.148*** (-8.10)	-0.125*** (-7.15)	-0.131*** (-9.78)	-0.095*** (-7.25)
Age	-0.002*** (-3.46)	-0.001** (-2.33)	-0.002*** (-2.86)	-0.001** (-2.12)	-0.002*** (-3.15)	-0.001** (-2.06)
MB	0.001*** (4.58)	0.001** (2.56)	0.001*** (4.17)	0.001*** (3.07)	0.001*** (3.52)	0.000* (1.72)
Turnover	-0.001*** (-4.91)	-0.000*** (-4.01)	-0.001*** (-5.01)	-0.001*** (-4.26)	-0.001*** (-4.68)	-0.000*** (-3.89)
Return	-0.010*** (-17.22)	-0.009*** (-16.53)	-0.010*** (-11.83)	-0.009*** (-10.86)	-0.009*** (-15.08)	-0.009*** (-14.61)
Brokersize	0.000 (0.31)	0.000 (0.26)	-0.000 (-0.16)	-0.000 (-0.26)	0.000 (0.06)	0.000 (0.11)
Experience	-0.000 (-1.23)	-0.000 (-0.94)	-0.000 (-0.85)	-0.000 (-0.75)	-0.000 (-1.56)	-0.000 (-1.42)
Day	0.010*** (22.33)	0.011*** (25.91)	0.010*** (18.02)	0.011*** (20.57)	0.009*** (18.73)	0.010*** (21.98)
Institution	-0.012*** (-3.57)	-0.012*** (-3.78)	-0.032*** (-4.09)	-0.032*** (-4.37)	-0.009*** (-2.70)	-0.010*** (-2.87)
Analyst_Num	0.001 (1.32)	-0.001 (-1.18)	0.001 (0.68)	-0.000 (-0.65)	0.000 (0.66)	-0.001* (-1.86)
_cons	-0.038*** (-4.19)	-0.055*** (-6.62)	-0.056*** (-3.49)	-0.078*** (-5.59)	-0.029*** (-3.09)	-0.047*** (-5.30)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	122,110	122,110	59,675	59,675	95,236	95,236
Adj.R <sup>2</sup>	0.157	0.168	0.180	0.192	0.149	0.160

This table reports the effects of affiliated analysts on earnings forecasts. The T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

We use the following model in Eq. (2) to examine the effect of affiliated analysts on earnings forecast quality.

$$\begin{aligned}
 \text{Forecast} = & \alpha + \beta_1 \text{Affiliated\_Analyst} + \beta_2 \text{Analyst\_Num} + \beta_3 \text{Institution} + \beta_4 \text{Age} \\
 & + \beta_5 \text{Size} + \beta_6 \text{Lev} + \beta_7 \text{ROA} + \beta_8 \text{MB} + \beta_9 \text{Turnover} + \beta_{10} \text{Experience} \\
 & + \beta_{11} \text{Brokersize} + \beta_{12} \text{Day} + \text{Brokerfixedeffect} + \text{Yearfixedeffect} + \varepsilon
 \end{aligned} \tag{2}$$

*Forecast* is the placeholder for the explanatory variables of analyst earnings forecast quality. We use bias and accuracy to measure the earnings forecast quality. The EPS forecast by analysts minus the value issued by listed firms in annual reports divided by stock price at the beginning year is defined as the variable *Bias*, and the absolute value of the EPS forecast by analysts minus the value issued by listed firms in annual reports divided by stock price at the beginning year is the variable *Error*. Larger values of *Bias* and *Error* mean a larger bias and a lower accuracy, which suggests that the quality of analysts' earnings forecasts are lower. All other variables are defined in Table 2.

Our further analyses in Table 12 show that the coefficients on *Affiliated\_Analyst* are significantly positively associated with *Bias* and *Error* at a 1% level, suggesting that the quality of earnings forecasts issued by affil-



Table 13  
Effects of affiliated analysts on stock recommendation revisions.

	(1) Full sample Revision	(2) Sub-sample 1 Revision	(3) Sub-sample 2 Revision
Affiliated_Analyst	0.080* (1.87)	0.041* (1.73)	0.109** (2.35)
Size	-0.004 (-0.20)	0.014 (0.27)	0.008 (0.34)
Lev	0.422*** (3.24)	0.332 (1.62)	0.337** (2.23)
ROA	2.707*** (4.70)	2.118** (2.50)	3.003*** (4.76)
Age	-0.074** (-2.28)	-0.078 (-1.42)	-0.078** (-2.11)
MB	-0.021 (-1.39)	-0.017 (-0.71)	-0.029* (-1.77)
Turnover	-0.007 (-1.04)	-0.001 (-0.07)	-0.006 (-0.77)
Return	0.269*** (5.77)	0.241*** (3.51)	0.256*** (4.92)
Brokersize	-0.056 (-0.66)	-0.112 (-0.89)	-0.050 (-0.51)
Experience	-0.005 (-0.55)	0.001 (0.11)	-0.003 (-0.34)
Day	-0.202*** (-5.45)	-0.194*** (-3.61)	-0.203*** (-4.73)
Institution	0.440* (1.80)	2.105** (2.31)	0.277 (1.23)
Analyst_Num	0.067* (1.83)	0.039 (0.67)	0.087** (2.11)
_cons	3.505*** (5.40)	6.656*** (5.78)	3.108*** (4.36)
Year fixed effects	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes
N	99,430	47,615	77,426
Pseudo R <sup>2</sup>	0.079	0.091	0.083

This table reports the results of the effects of affiliated analysts on stock recommendation revisions. The Z-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

iated analysts is lower, the bias of earnings forecasts is higher, and the accurate is lower. From a quantitative perspective, our results show that affiliated analysts' optimistic behaviors are due to conflicts of interest and that they issue optimistic rating reports for share pledge firms.

## 5.2. The effect of affiliated analysts on stock recommendation revisions

In this section, we further examine the influence of affiliated analysts on stock recommendation revisions to provide more evidence for our conflict of interest hypothesis.

Stock recommendation revision occurs when analysts use new information to judge and upgrade, downgrade, or maintain the original stock recommendations for listed firms. The literature suggests that analysts are unlikely to downgrade stock recommendations due to the negation of pre-rating reports and are more likely to upgrade or maintain their recommendations (Barber et al., 2006). We expect that affiliated analysts are more likely to upgrade or maintain stock recommendations for share pledge firms and less likely to downgrade their recommendations in rating reports. We use the Probit model to examine this, and if analysts

upgrade or maintain the stock recommendations in their rating reports, the value of *Revision* equals 1, and if they downgrade their recommendations, the value equals 0. The results shown in Table 13 show that the optimistic behavior of affiliated analysts makes them more likely to upgrade or maintain rather than downgrade their stock recommendations for share pledge firms.

### 5.3. Market reaction to the stock recommendations of affiliated analysts

In this section, we examine whether investors can identify the optimistic stock recommendations of affiliated analysts. We apply the model used by Lin and McNichols (1998) and Gu et al. (2013) in Eq. (3) and examine the effect of affiliated analysts' optimistic stock recommendations on market reaction.

$$CAR = \alpha + \beta_1 Rec(5) + \beta_2 Rec(4) + \beta_3 Rec(3) + \beta_4 Rec(2, 1) + \beta_5 Rec(5) * Affiliated\_Analyst + \beta_6 Rec(4) * Affiliated\_Analyst + \beta_7 Rec(3) * Affiliated\_Analyst + \beta_8 Rec(2, 1) * Affiliated\_Analyst + Brokerfixedeffect + Yearfixedeffect + \varepsilon \quad (3)$$

We select a short-term window  $[-2, +2]$  and a long-term window  $[+3, +60]$  as the event windows and compute the cumulative excess returns in the short-term  $[-2, +2]$  and long-term windows  $[-2, +2]$ . The coefficients of  $\beta_1, \beta_2, \beta_3,$  and  $\beta_4$  represent market reaction to Buy, Add, Neutral, Reduce, and Sell stock recommendations issued by non-affiliated analysts, and the coefficients of  $\beta_5, \beta_6, \beta_7,$  and  $\beta_8$  represent market reaction on Buy, Add, Neutral, Reduce, and Sell stock recommendations issued by affiliated analysts, respectively.

The results in Table 14 show that the Buy stock recommendations issued by non-affiliated and affiliated analysts can bring cumulative excess returns in the short event window. However, the cumulative excess returns of Buy stock recommendations issued by affiliated analysts are significantly negative in the long-

Table 14  
Market reaction to the stock recommendations of affiliated analysts.

	(1)		(2)		(3)		(4)		(5)		(6)	
			Event window $[-2,+2]$						Event window $[+3,+60]$			
	Full sample	Sub-sample 1	Sub-sample 2	Full sample	Sub-sample 1	Sub-sample 2	Full sample	Sub-sample 1	Sub-sample 2	Full sample	Sub-sample 1	Sub-sample 2
	CAR $(-2,+2)$	CAR $(-2,+2)$	CAR $(-2,+2)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$	CAR $(+3,+60)$
Rec(5)	0.018** (2.47)	0.030** (2.57)	0.020** (2.51)	0.068** (2.31)	0.112** (2.35)	0.083** (2.54)						
Rec(4)	0.007 (0.99)	0.019* (1.65)	0.009 (1.14)	0.072** (2.46)	0.111** (2.34)	0.089*** (2.75)						
Rec(3)	-0.002 (-0.30)	0.009 (0.73)	-0.000 (-0.05)	0.094*** (3.17)	0.118** (2.37)	0.113*** (3.45)						
Rec( $\leq 2$ )	-0.001 (-0.10)	-0.017 (-0.65)	0.008 (0.66)	0.111** (2.00)	0.045 (0.30)	0.155*** (2.79)						
Rec(5)*Affiliated_Analyst	0.003 (1.35)	0.005* (1.84)	0.002* (1.79)	-0.022*** (-2.73)	-0.022** (-2.09)	-0.022*** (-2.58)						
Rec(4)*Affiliated_Analyst	0.003** (1.97)	0.003 (1.23)	0.004** (2.16)	-0.011 (-1.41)	-0.005 (-0.51)	-0.014* (-1.71)						
Rec(3)*Affiliated_Analyst	-0.007 (-1.09)	-0.005 (-0.60)	-0.008 (-1.18)	-0.058* (-1.89)	-0.040 (-1.19)	-0.063** (-2.02)						
Rec( $\leq 2$ )*Affiliated_Analyst	-0.003 (-0.10)	0.025 (0.69)	-0.010 (-0.33)	-0.010 (-0.08)	0.088 (0.52)	-0.037 (-0.33)						
_cons	-0.005 (-0.35)	-0.036* (-1.67)	-0.006 (-0.40)	-0.153** (-2.53)	-0.257** (-2.57)	-0.170** (-2.53)						
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes						
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes						
N	108,549	52,475	84,564	108,520	52,446	84,564						
Adj.R <sup>2</sup>	0.015	0.019	0.014	0.012	0.014	0.011						

This table reports the results of the market reaction to the stock recommendations of affiliated analysts. The T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

term event window and significantly lower than the cumulative excess returns brought by Buy stock recommendations issued by non-affiliated analysts, which are also positive in the long-term window. These findings show that investors cannot recognize the optimistic stock recommendation behavior of affiliated analysts in a short event window, and the independence of affiliated analysts can only be identified after long-term market correction.

#### 5.4. The effect of affiliated analysts' stock recommendations on the stock price crash risk

Our hypothesis is based on the assumption that affiliated analysts issue optimistic stock recommendations to help the share pledge firms avoid a stock price crash risk. Therefore, we use the model in Eq. (4) and further examine whether their optimistic stock recommendations can decrease the stock price crash risk of share pledge firms.

$$\begin{aligned} Crash = & \alpha + \beta_1 Affiliated\_Analyst + \beta_2 Size + \beta_3 Lev + \beta_4 ROA + \beta_5 MB + \beta_6 Volatility \\ & + \beta_7 Turnover + \beta_8 Ret + \beta_9 Analyst\_Num + \beta_{10} Institution + \beta_{11} Big4 + \beta_{12} DA \\ & + Yearfixedeffect + Brokerfixedeffect + \varepsilon \end{aligned} \quad (4)$$

Table 15  
Effects of affiliated analysts' stock recommendations on stock price crash risk.

	(1) Ncskew	(2) Duvol	(3) Ncskew	(4) Duvol
Affiliated_Analyst	-0.001** (-2.04)	-0.036** (-2.21)	-0.060 (-1.30)	-0.064* (-1.93)
Affiliated_Analyst*Rec			-0.013** (-2.31)	-0.229* (-1.87)
Rec			-0.007* (-1.71)	-0.017 (-0.29)
Size	0.015*** (2.87)	0.039 (0.45)	0.015*** (2.86)	0.038 (0.44)
Lev	-0.024 (-0.65)	0.351 (0.82)	-0.025 (-0.67)	0.354 (0.83)
ROA	0.352** (2.48)	-3.376** (-2.21)	0.334** (2.34)	-3.421** (-2.20)
MB	-0.002 (-0.38)	0.178*** (3.58)	-0.001 (-0.32)	0.179*** (3.59)
Turnover	0.007*** (3.81)	0.294*** (9.11)	0.007*** (3.82)	0.294*** (9.11)
Ret	-0.030** (-2.44)	1.424*** (10.09)	-0.030** (-2.48)	1.424*** (10.11)
Volatility	19.171 (0.96)	-5.203*** (-12.04)	17.858 (0.89)	-5.132*** (-11.99)
Analyst_Num	0.009 (0.91)	0.311** (2.44)	0.008 (0.83)	0.309** (2.42)
Institution	0.010 (0.17)	0.842* (1.88)	0.009 (0.15)	0.840* (1.87)
Big4	-0.025** (-2.23)	-0.034 (-1.07)	-0.017*** (-1.91)	-0.026 (-0.65)
DA	-0.011 (-0.13)	0.233 (0.22)	-0.011 (-0.14)	0.227 (0.21)
_cons	-0.247** (-2.05)	2.060 (1.06)	-0.266** (-2.19)	2.185 (1.15)
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	122,110	122,110	122,110	122,110
Adj.R <sup>2</sup>	0.914	0.814	0.914	0.814

This table reports the effects of stock recommendations issued by affiliated analysts on stock price crash risk. *Rec* is measured with *Rec<sub>t</sub>*. The T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

*Crash* is the placeholder for the two explanatory variables capturing the stock price crash risk. We use the negative coefficient of skewness (*Ncskew*) and the down-to-up volatility (*Duvol*) to measure the stock price crash risk (Chen et al., 2001, Kim et al., 2011).

Table 15 reports the effects of stock recommendations issued by affiliated analysts on the stock price crash risk. In columns (1) and (2), the coefficients on *Affiliated\_Analyst* are both significantly negative at the 5% level, suggesting that affiliated analysts can reduce the stock price crash risk of share pledge firms. In columns (3) and (4), the coefficients on *Affiliated\_Analyst\*Rec* are both significantly negative at the 10% level. Thus, the optimistic stock recommendations issued by affiliated analysts can decrease the stock price crash risk for share pledge firms. This finding corroborates to an extent the suggestion that the optimistic stock recommendations issued by affiliated analysts are aimed at avoiding any stock price crash risk for share pledge firms and at ensuring the security of the pledged shares and the interests of both parties.

## 6. Conclusion

In our study, we examine the association between affiliated analysts whose securities companies engage in share pledge business and their stock recommendation behavior for share pledge firms in the context of the Share Pledge Repo Transaction. Using a sample of Chinese A-share listed companies from 2013 to 2017, we find that the stock recommendations of affiliated analysts are more optimistic than those of non-affiliated analysts, and the affiliated analysts are more likely to issue Buy and Add recommendations. We also find a dynamic adjustment in the stock recommendation behavior of these analysts. The probability of affiliated analysts issuing optimistic stock recommendations is significantly reduced before and after the years in which the affiliated relationship between securities companies and share pledge firms begins and ends. If the affiliated analysts have visited the share pledge firms, work in the same location as these firms, are star analysts in New Fortune's "top five analysts" list, or if the information transparency is higher, the stock recommendations they issue are also more optimistic. Our findings support the conflict of interest hypothesis. Further analysis shows that the stock recommendation behavior of affiliated analysts is more optimistic and radical in our high share pledge ratio sample than in the low ratio sample. The association between affiliated analysts and the likelihood of stock recommendation is also stronger when the stock price follows a downward rather than an upward trend. We further examine the stock recommendation behavior of affiliated analysts from a quantitative perspective and find that the earnings forecast quality is lower, the bias of earnings forecasts is higher, and the accuracy is lower. In addition, the optimistic behavior of affiliated analysts makes them more likely to upgrade or maintain the stock recommendations of share pledge firms than downgrade their recommendations. The Buy recommendations issued by non-affiliated and affiliated analysts can bring cumulative excess returns in the short-term event window. However, the cumulative excess returns of Buy recommendations issued by affiliated analysts are significantly negative in the long-term event window and significantly lower than those issued by non-affiliated analysts. The optimistic stock recommendations of affiliated analysts can also significantly decrease the stock price crash risk of share pledge firms.

Our findings suggest that affiliated analysts issue optimistic rating reports because of their conflicts of interest with share pledge firms. This conclusion reveals the economic consequences of share pledging and improves our understanding of the behavior of affiliated analysts in a conflict of interest situation from the perspective of share pledges. Our findings have policy implications, as regulators should establish a dynamic regulatory mechanism for share pledging, issue specific guidance, and set a silence period to regulate the behavior of affiliated analysts. In addition, a comprehensive quality evaluation system should be established for rating reports issued by affiliated analysts to prevent them from exploiting the superiority of an information intermediary to collude with listed firms and mislead investors. Regulators should also increase the supervision of the information barrier systems of securities companies, which can avoid them becoming formalistic wall systems. Our study contributes to the accounting literature concerning share pledges and the behavior of analysts.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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