Controlling shareholders' equity pledges and properties of analysts' earnings forecasts

Controlling Shareholders' Equity Pledges and Properties of Analysts' Earnings Forecasts

Abstract

Purpose: We adopt an information risk view and argue that higher levels of pledge risk incurred by insiders incentivizes opportunistic financial disclosure and impairs the quality of information available to analysts to forecast firm performance.

Design/methodology/approach: We sample Chinese listed companies from 2010 and 2022. Following the literature, we apply established models to measure and test analysts' forecasting accuracy/dispersion related to controlling shareholders pledging equity and the amount of margin call pressure. Analyst characteristics and non-financial disclosures proxied by CSR reports are also examined as factors likely to influence the relationship between pledge risk and analysts' forecast quality.

Findings: We find that analysts' earnings predictions are less accurate and more dispersed as the proportion of shares pledged (pledge ratio) increases and in combination with greater margin call pressure. Pledge ratios are significantly associated with several information risk proxies (i.e., earnings permanence, accruals quality, audit quality, financial restatements, related party transactions, and internal control weaknesses), validating the channel through which equity pledges undermine analysts' forecast quality. The results also demonstrate that forecast quality declines for a wide variety of analysts' attributes including high and low quality analysts and analysts from small and large brokerage firms. Importantly, non-financial disclosures as proxied by CSR reporting, improve analysts' forecasts.

Originality/value: We extend the literature by demonstrating that incremental pledge risk increases non-diversifiable information risk; all non-pledging shareholders pay a premium through more diverse and less accurate earnings forecasts. Our study provides important policy implications with economically significant costs to investors associated with insider equity pledges. Our results highlight the benefits of nonfinancial disclosures in China, which has implications for the current debate on the global convergence of CSR reporting.

Keywords: Equity pledge; Analysts' forecast accuracy; Analysts' forecast dispersion; Corporate disclosures; Information risk

JEL Code: M41

1. Introduction

We examine whether the practice of controlling shareholders pledging equity influences the quality of analysts' earnings forecast properties. We adopt an *information risk* view and hypothesize that opportunistic firm disclosure related to equity pledging increases the opaqueness of financial disclosure and reduces analysts' forecast quality. Research suggests that analysts' forecast accuracy is determined by analysts' information environment (Barron *et al*., 1998; Bozanic and Thevenot, 2015; Byard *et al*., 2011). We expect that higher levels of pledge risk incurred by insiders, incentivizes opportunistic financial disclosure and impairs the quality of information available to analysts to forecast firm performance.

Equity pledging has attracted regulators' attention worldwide, with the United States (US), United Kingdom (UK), India, Singapore, and China recently mandating the disclosure of equity pledges by corporate insiders[1] (Chan *et al*., 2018). Equity pledging occurs when insider shareholders use their shares as collateral for personal loans[2] (Chan *et al*., 2018; Dou *et al*., 2019; Li *et al*., 2019). Additional financing through share-backed lending has increased its prominence in international markets. However, equity pledging can create incentives for insiders to engage in misleading financial disclosure, particularly if it limits personal wealth losses. Research has identified certain contexts where insider pledge risk impairs financial

[1] We use the term 'corporate insiders' and 'insiders' interchangeably in this paper.

[2] Internationally, it has become common practice for insiders to pledge shares because of the additional financing available through share-backed lending. Prominent firms in the US market engage in this practice, e.g., the former chief executive of Peloton Interactive incurred multiple, margin calls on share pledges in 2022 (Wall Street Journal, 2022). Over 20 percent of listed companies in India pledge equity (Press Trust of India, 2013) and the volume of pledging continues to grow in China, with over 40 percent of publicly listed Chinese firms reporting insider equity pledges (Chan et al. 2018).

disclosure. However, it is unclear whether the prevalence or magnitude of financial manipulation related to equity pledging influences earnings predictions.

Recently, Hu *et al*. (2021) identify that controlling shareholders pledging equity have a greater propensity to collude with analysts, which results in overly optimistic earnings forecasts. Their analysis indicates that equity pledging induces collusion between insiders and analysts only in certain circumstances (e.g., related analysts and less successful/prominent analysts). Distinct from Hu *et al*. (2021), we argue that increased pledge risk is associated with more opaque financial disclosure, and analysts' dependence on less reliable information reduces the quality of their earnings forecasts. Prior studies show that analysts' information environment is a primary determinant of their forecasting properties (Barron *et al*., 1998; Bozanic and Thevenot, 2015; Byard *et al*., 2011). Thus, information risk associated with equity pledging is likely to be a more generalizing and dominating factor that accentuates analysts' forecast error/dispersion than the probability of collusion as documented by Hu *et al*. (2021).

Research demonstrates that corporate insiders implement income-increasing choices as they pledge more shares (hereafter pledge ratio); positively manipulate the tone management of earnings conference calls to limit pledge risk; and conduct real earnings management by delaying corporate innovation (Bhatia *et al*., 2019; Deren and Ke, 2018; Dou *et al*., 2019; Pang and Wang, 2020; Zhao *et al*., 2019).[3] We anticipate that controlling shareholders use multiple forms of manipulative financial disclosure to limit the costs associated with share pledging.

[3] We define pledge risk as the proportion of shares pledged to equity (pledge ratio) investment in the firm, and the degree of margin call pressure on the shares pledged, which increases as the share price approaches the exercise price on the margin call.

Specifically, we expect that misleading financial disclosure becomes more prevalent as controlling shareholders' pledge ratios increase and in combination with greater margin call pressure.

Hu *et al*. (2021) identify that analysts' forecast optimism associated with equity pledging is stronger for analysts with connections to the firm, but weaker for star analysts and analysts in large brokerage firms (Hu *et al*., 2021). High quality analysts are less susceptible to collusion because of greater reputation concerns, although less precise financial disclosure likely impacts all analysts because of increases in non-diversifiable information risk (Lambert *et al*., 2007; Gray *et al*., 2009). We examine analysts' characteristics when assessing equity pledge risk and analysts' forecasting quality because their attributes likely influence how insider pledge risk coalesces into analysts' forecast quality. Overall, we predict impairment in forecasting quality irrespective of analysts' attributes or incentives.

Our main premise is that equity pledging increases the opaqueness of financial disclosure and impairs analysts' forecast quality. If this argument is credible, we are interested in examining whether analysts can obtain information from other sources to reduce the impact of misleading financial disclosure related to equity pledging. Prior studies suggest that nonfinancial disclosures improve analysts' forecasts when financial disclosure is opaque (Hope, 2003). Thus, nonfinancial CSR disclosures potentially provide complementary information (Dhaliwal *et al*., 2012) to analysts and improve their forecasts in an equity pledge setting. Therefore, we examine whether nonfinancial disclosures as proxied by CSR reports temper the hypothesized positive association between pledge risk and analysts' forecast error/dispersion.

In contrast to our assertions, equity pledging may have a trivial impact on the quality of

analysts' forecasts. Analysts are likely aware of the incentives for pledging insiders to manipulate the disclosure of firm performance and possibly account for this in their forecasts. Pledging insiders also tend to take a more conservative corporate approach (Deren and Ke, 2018), or smooth earnings (Huang and Xue, 2016) to limit pledge risk. These factors may limit the impact of pledging on analysts' forecasts. Given the frequency of share pledging internationally, and the importance of analysts' forecasts as a proxy for future firm performance, the impact of share pledging on analysts' forecasts remains an important empirical question.

We test our hypotheses using a sample of Chinese listed firms on the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) from 2010 to 2022. Over one third of Chinese listed firms pledge shares (Liu and Tian, 2022), which makes China an ideal setting to examine insider equity pledging and analysts' forecast quality. Equity pledging has become a more frequent means of corporate financing in international markets and Chinese evidence can provide insights outside China (Cheng *et al*., 2022).

Initially, cross-sectional tests are completed to examine controlling shareholders' pledge ratios, and pledge ratios combined with margin call pressure and the association with analysts' earnings forecast errors/dispersion. Analysts' attributes/incentives can provide complementary evidence and we test analysts' attributes/incentives using subsamples partitioned for independent/non-independent analysts, star/non-star analysts, large/small brokerage firms, and experienced/inexperienced analysts. Several information risk proxies are tested in relation to equity pledging to confirm our contention that less reliable financial information is associated with equity pledging. Lastly, nonfinancial disclosures are tested using the existence of a CSR report, CSR quality, and components of the CSR report to assess whether nonfinancial

disclosures temper the expected negative association between equity pledging and forecast quality.

Our empirical results yield several findings. The main results show that the pledge ratios of controlling shareholders and pledge ratios interacted with margin call pressure have significantly greater analysts' earnings forecast error and dispersion. Importantly, pledge ratios are positively, significantly associated with analysts' forecasting error/dispersion when using PSM, changes in pledge ratios from year to year, difference-in-difference (DID) analysis and firm-fixed effects. The result also holds for subsamples above and below the median for size and earnings volatility. We highlight alternative statistical approaches because of the possibility that pledging firms are inherently different and that is driving our findings, rather than the quality of financial disclosure.

Several tests validate the channel through which we propose equity pledges impair analysts' forecast accuracy. As predicted, we show significant results for proxies associated with low quality financial disclosure and controlling shareholders' pledge ratios. Pledge ratios are significantly associated with lower earnings permanence; lower accruals quality (modified Jones model); reduced audit quality (appointment of non-Big4 and non-Big10 auditors); more frequent financial restatements; related party transactions; and internal control weaknesses. These results provide a sound basis to suggest that information risk associated with equity pledging contributes to increases in analysts' forecast error/dispersion.

All analyst attributes tested report positive, significant analysts' forecast error/dispersion related to pledge ratios of controlling shareholders. Importantly, independent analysts, star analysts, large brokerage firm analysts and more experienced analysts that are less susceptible

to providing over-optimistic forecasts and exhibit a positive, significant association with forecasting error/dispersion and pledge ratios. The results for analysts' attributes and pledge ratios, combined with margin call pressure, still largely support pledge ratio results for analysts' attributes.

Non-financial disclosure results demonstrate that the existence of a CSR report and CSR disclosure quality considerably reduce the negative impact of share pledging on analysts' forecasts. The results hold for pledge ratios combined with margin call pressure. Analysis suggests that financial stakeholders and capital components (e.g., shareholders, creditors, supplier protections, and total tax payments) of the CSR report are more likely to reduce the negative impact of pledge risk on analysts' forecasts than non-capital components.

Our study contributes to the literature in several ways. First, we extend the equity pledging literature and provide evidence that forecasting earnings is impaired through opaque financial disclosure associated with equity pledge risk. Prior studies tend to focus on collusion between insiders and analysts, with Hu *et al*. (2021) providing evidence that low quality or related analysts issue over-optimistic forecasts for firms with higher pledge ratios. We demonstrate that opaque financial disclosure impairs the information environment for a broad range of analysts, with even the most skilled and experienced analysts yielding greater forecasting error/dispersion. It appears that misleading financial disclosure related to equity pledging is more pervasive than collusion because it impacts high- and low-quality analysts, rather than low quality or related analysts as identified by *Hu et al*. (2021).

Second, we inform regulators of the far-reaching impact of pledge risk on earnings predictions, with negative consequences for a wide variety of analyst attributes. Research has

yet to examine how analysts' attributes impact the relationship between pledge risk and forecasting accuracy/dispersion. Our findings inform regulators that analysts with the greatest influence over capital market allocations (e.g., star analysts, experienced) are not immune to increases in forecasting errors related to information quality and equity pledging.

Third, we contribute to the literature by identify multiple measures (e.g., lower earnings permanence, lower accruals quality, reduced audit quality) of financial disclosure quality that indicate a positive association between information risk and equity pledge risk. Research, to date, has not outlined a clear link that provides a reasonable explanation for the decline in earnings forecast quality for firms with higher pledge ratios and greater margin call pressure. Additionally, prior studies (e.g., Hua and Sun, 2017; Wang *et al.*, 2019; Ye *et al.*, 2021; Zhang and Diao, 2021; Zhang and Qian, 2022), do not consider the impact of margin call pressure in combination with insiders' pledge ratios and analysts' forecast accuracy/dispersion. We demonstrate that the probability of a margin call on equity pledges also reduces the accuracy of analysts' forecasts.

Finally, we provide new evidence that nonfinancial disclosures as proxied by CSR disclosure and CSR quality, provide additional information to analysts that improves their forecasts. We inform international investors that they can use the existence of a CSR report as a heuristic that is likely to indicate more accuracy and less dispersion in analysts' forecasts. We provide preliminary evidence that the capital stakeholder components of the CSR report are more useful to analysts' forecasts than non-capital stakeholders, social and environmental components in the context of equity pledging financing by insiders. These findings contribute to the current debate on the global convergence of CSR reporting (Cheng *et al*., 2022).

The remainder of this paper is organized as follows. In section 2 we outline our theoretical background and hypotheses. Section 3 describes our study sample and research design. Our results are discussed in section 4 and section 5 concludes.

2. Literature review, theoretical analysis, and hypotheses

Research has identified various actions taken by insiders to limit potential losses related to equity pledges. An optimal approach for insiders to avoid margin calls on share pledges is to improve short-term operating performance, although this objective is not necessarily achievable. The substantial cost burden on insiders when margin calls occur creates strong incentives for insiders to limit share price volatility. Pang and Wang (2020) suggest that firms avoid large share price declines and engage in margin call avoidance by delaying corporate innovation. Specifically, they find a negative association between corporate innovation and quality for controlling shareholders who pledge shares and the percentage of their shares pledged.

Dou *et al*. (2019) argue that insiders pledging shares are more likely to manage firm specific risk through implementing risk averse corporate policy. Insiders alleviate ex-ante risks of equity pledging through conservative operations thus reducing exposure to share price crashes. Share price crashes risk the loss of insiders' voting rights and significant wealth losses (Hong *et al*., 2017; Kim *et al*., 2021). Price crashes generally occur when a forced sale of shares is made because the insider/controlling shareholder cannot make the margin call payment on the equity pledge. Forced sales of shares frequently lead to share price crashes because a firm's performance is usually in decline before the insider receives the margin call.

Smoothing earnings is another risk-averse strategy that pledging firms implement to

manage share price volatility; Deren and Ke (2018) and Huang and Xue (2016) find support for this approach. Risk aversion strategies by insiders appear effective in certain settings, although circumstances exist when conservative corporate policies are likely to increase the probability of insiders receiving margin calls. The stifling of corporate innovation and strategic risk-taking could lead non-pledging shareholders to liquidate their shares and move to other, more attractive, investment opportunities. Importantly, risk aversion strategies implemented by insiders pledging shares are unlikely to help firms exhibiting poor growth or firms that are at risk of a margin call on a short-term horizon.

Distinct from risk aversion strategies, research suggests that controlling shareholders manipulate firm disclosures to convey current and future performance in an overly positively manner (Kao *et al*., 2007; Wang and Chou, 2018; Zhao *et al*., 2019). For example, Kao and Chen (2007) examined Taiwanese firms and find that the size of income-increasing choices is positively associated with the magnitude of shares pledged by directors. Zhao *et al*. (2019) report a significantly greater positive tone management of earnings conference calls by Chinese firms when controlling shareholders pledge equity. Insiders even collude with analysts to elevate forecasted earnings (Hu *et al*., 2021). All these strategies are implemented with margin call avoidance as the critical outcome for insiders pledging shares.

The equity pledging studies identify various forms of manipulative disclosure related to pledge risk (Hu *et al*., 2021; Kao and Chen, 2007; Zhao *et al*., 2019). Intuitively, it seems likely that controlling shareholders manipulate financial disclosure simultaneously using more than one means of written and/or verbal communication. Variations in analysts' forecasts are associated with historical earnings (Abarbanell and Bushee, 1997; Schipper, 1991); earnings

management is just one form of manipulative disclosure that is likely to reduce the reliability of the information used by analysts. We expect that controlling shareholders with relatively more pledge risk manipulate disclosure using multiple mediums and this creates an opaque view of firm performance and reduces analysts' forecast accuracy.

Analysts are likely aware of firms with insiders under pledge risk and are cognizant of the incentives to manage perceived performance. For example, Chan *et al*. (2018) demonstrate that the market recognizes when controlling shareholders buy back shares to prevent margin calls on pledges, with less positive reactions to these types of repurchase programs. Analysts potentially endeavor to compensate for impairment in information quality by scrutinizing financial statements more closely or lower earnings forecasts. However, research indicates that information risk is non-diversifiable (Gray *et al*., 2009). Therefore, inferior firm disclosure related to insiders' pledge risk cannot be compensated for by other information sources.

We predict that analysts' forecasting accuracy declines when controlling shareholders pledge risk is heightened because of incentives to misrepresent firm performance. Analysts' forecast quality is expected to decline when they rely on low quality financial disclosure. Specifically, analysts' forecast accuracy is predicted to fall as controlling shareholders pledge ratios increase and for the interaction between pledge ratios and the proximity of the share price to the exercise price on margin calls.[4] Therefore, Hypotheses 1a and 1b are:

HYPOTHESIS 1a. *Higher controlling shareholders' pledge ratios are associated with less accurate analysts' earnings forecasts.*

[4] We recognize that firm specific attributes are likely to influence the relative risk of insiders pledging shares. We are specifically discussing risk components of pledging in this context.

HYPOTHESIS 1b. *Controlling shareholders' pledge ratios combined with margin call pressure are associated with less accurate analysts' earnings forecasts.*

Analysts' forecast dispersion reflects a greater divergence in analysts' opinions (Barron *et al*., 2008; Diether *et al*., 2002; Johnson, 2004). Diether *et al*. (2002) argue that analysts' forecast dispersion reduces stock returns because of information asymmetry. Alternatively, Johnson (2004) claims that uncertainty increases the option value of a firm and, on average, reduces stock returns. Barron *et al*. (2008) provide evidence supporting Johnson (2004) in finding that variations in forecast dispersion are primarily reflected by uncertainty and are not because of information asymmetry. Research suggests forecast dispersion is an appropriate proxy for the uncertainty of expected earnings before earnings announcements (Imhoff and Lobo, 1992).

More precise information regarding future earnings is likely to create less dispersion in analysts' forecasts (Herrmann and Thomas, 2005). Therefore, we predict that the information environment is more uncertain when controlling shareholders are under greater pledge risk and this increases analysts' forecast dispersion. Like Hypotheses 1a and 1b, we examine the same two contexts where pledge risk is expected to be higher. Thus, Hypotheses 2a and 2b are:

HYPOTHESIS 2a. *Controlling shareholders' pledge ratios are positively associated with analysts' forecast error.*

HYPOTHESIS 2b. *Controlling shareholders' pledge ratios combined with margin call pressure are positively associated with analysts' forecast dispersion.*

3. Research design

3.1 Sample selection and data source

Our initial sample includes all companies listed on the Chinese A-share market from 2010 to 2022. We collect data for equity pledges by controlling shareholders, analysts' earnings

forecasts, and CSR disclosures using the China Stock Market and Accounting Research (CSMAR) database. Our sample selection criteria are as follows. First, companies in the financial industry are removed because of their different business and reporting requirements. Second, we exclude firms identified as special treatment (ST and *ST), which refers to firms reporting negative profits for two or three consecutive years, respectively.[5] Third, when an analyst publishes multiple earnings forecasts for the same listed company in the same year, only the most recent earnings forecast is retained (Hong and Kacperczyk, 2010). Finally, companies with missing data are deleted and we winsorize the dependent and independent variables at the 1 and 99 percent levels (Pang and Wang, 2020). The final sample consists of 22,128 firm-year observations.

3.2 Models and measurement of variables

We estimate model (1) to test Hypotheses 1a and 2a, and the association between controlling shareholders' pledge ratios and analysts' earnings forecast error and dispersion. Robust standard errors are clustered at the firm-level to correct for heteroskedasticity and within-group autocorrelation among firms. We also include year and industry fixed effects to control for variation in industry-specific and time-period characteristics (Ertimur *et al*., 2011). Model (1) is:

$$ERROR\ (DISPERSION)_{it} = \alpha + \beta_1 PLR_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 LISTAGE_{it} + \beta_5 MB_{it} + \beta_6 GROWTH_{it} + \beta_7 LOSS_{it} + \beta_8 INS_{it} + \beta_9 StdRet_{it} + \beta_{10} FOLLOW_{it} + \beta_{11} HORIZON_{it} + \beta_{12} STAR_{it} + \beta_{13} EXPERIENCED_{it} + \beta_{14} NON\_INDEPENDENT_{it} + \beta_{15} LOCAL_{it} + \beta_{16} BKSIZE_{it} + IndustryFE + YearFE + \varepsilon_{it} \quad (1)$$

[5] ST stands for special treatment and refers to listed firms with negative net profits for two consecutive years; *ST refers to listed firms with negative net profits for three consecutive years and thus have a high probability of being delisted from the stock exchange.

The analysis units are firm (*i*) and year (*t*). Forecast error (*ERROR*) is calculated as the absolute value of realized earnings per share (*EPS*) minus consensus analysts' forecast (EPS_t), divided by the absolute value of EPS_t (Crichfield *et al*., 1978). We also examine forecast dispersion (*DISPERSION*), which is defined as the standard deviation of the latest earnings forecast issued by all analysts following firm *i* (Li *et al*., 2019). Forecast dispersion captures uncertainty or disagreement about underlying future earnings (Diether *et al*., 2002; Johnson, 2004). Our variable of interest is *PLR*, which is calculated as the amount of equity pledged by the controlling shareholder of company *i,* divided by the total equity of the company at the end of year *t* (Chan *et al*., 2018). We predict that a higher proportion of equity pledged by controlling shareholders as a percentage of total equity increases analysts' earnings forecast error and dispersion.

We control for the following firm-specific, analyst, and broker characteristics that are likely to influence analysts' earnings forecasts. Research demonstrates that firm size (*SIZE*), firm leverage (*LEV*), growth firms (*GROWTH* and *MB*), return volatility (*StdRet*) and analyst following (*FOLLOW*) are associated with firm level information risk (Barth *et al*., 2001; Behn *et al*., 2008; Hutton *et al*., 2012; Karamanou, 2011; Liu and Natarajan, 2012) and, thus, influence analysts' forecast error and dispersion. Firm age (*LISTAGE*) and institutional ownership (*INS*) tend to increase analysts' optimism, leading to less accurate forecasts (Ackert and Athanassakos, 2003; Muslu *et al*., 2019). Firms with accounting losses (*LOSS*) are inherently more difficult to forecast (Dhaliwal *et al*., 2012; Hutton *et al*., 2012) and analysts' forecast error increases with the length of forecast horizon (*HORIZON*) (Karamanou, 2011). At an analyst-level, studies indicate that star analysts (*STAR*), non-independent analysts (*NON-*

INDEPENDENT), experienced analysts (*EXPERIENCED*), local analysts (*LOCAL*) and brokerage size (*BKSIZE*) are associated with analysts' forecasts' properties (Clement, 1999; Hodgkinson, 2001; Kerl and Ohlert, 2015; Li *et al.*, 2019). Definitions of all variables in this study are summarized in Appendix A.

Model (2) examines Hypotheses 1b and 2b and the combined influence of margin call pressure and pledge ratios of controlling shareholders and their association with analysts' earnings forecast error and dispersion. The variable of interest in model (2) is the interaction term for pledge ratio multiplied by margin call pressure. Model (2) is:

$$ERROR\ (DISPERSION)_{it} = \alpha + \beta_1 PLR_{it} + \beta_2 MarginCall_{it} + \beta_3 PLR_{it} \times MarginCall_{it} + \sum \beta_k\ Control_{it} + IndustryFE + YearFE + \varepsilon_{it} \quad (2)$$

Margin calls on share pledges are more likely to be triggered when firms have recently experienced poor stock return performance (Chan *et al*., 2018). *MarginCall* is a dummy variable equal to one if the prior three-month buy-and-hold stock return is lower than negative 15 percent, and zero otherwise.[6] Control variables in model (2) match model (1).

3.3 Analyst attributes/incentives

Analysts' attributes/incentives are likely to temper or accentuate the relationship between pledge risk and analysts' forecast quality. Therefore, we examine analyst attributes/incentives to further test equity pledging and analysts' earnings forecast properties. Each analyst incentive/attribute tested is partitioned above and below the median based on the analyst proxy

[6] Results are robust when we use different thresholds (e.g., negative 10 percent and negative 5 percent) to define prior three-month buy-and-hold stock returns.

identified for each analyst attribute. We examine analyst attributes and pledge ratios (model 1) and pledge ratios combined with margin call pressure (model 2).

The first variable is non-independent analysts (*NON-INDEPENDENT*) affiliated with a brokerage firm that participates in activities including share pledging, IPOs, and seasoned equity offerings of company *i*. *NON-INDEPENDENT* is measured as the number of non-independent analysts that issued earnings forecasts for company *i* in year *t* divided by the total number of analysts that issued earnings forecasts for company *i* in year *t*. The second variable is *STAR*, which is calculated as the percentage of star analysts (number of star analysts divided by the total number of analysts) that issued earnings forecasts for company *i* in year *t*. *STAR* analysts are those who won awards from "*New Fortune*" magazine in year *t-1*. Third, we define brokerage size (*BKSIZE*) as the proportion of analysts affiliated with large-sized brokerage firms (number of analysts from large brokerage firms divided by total number of analysts) who issued earnings forecasts for company *i* in year *t*. The brokers are grouped above and below the median for each year. If the number of analysts of a brokerage firm is above the median, it is defined as a large brokerage firm, otherwise it is a small brokerage firm. Last, we use the number of prior firm quarters in which an analyst has issued a forecast as a proxy for analyst experience (*EXPERIENCED*). At the firm-level, analysts' experience is calculated as the natural logarithm of one plus the average number of quarters for all analysts who issued earnings forecasts for company *i* in year *t*.

4. Empirical results and analysis

4.1 Descriptive statistics

The descriptive statistics of the main variables are reported in Table I. The average analysts'

earnings forecast error (*ERROR*) is 0.594, compared with realized earnings. This indicates a large deviation between analysts' forecast earnings and firms' actual earnings. The mean forecast dispersion is 0.588 with a standard deviation of 1.060, suggesting a significant variation in earnings forecasts between different analysts. On average, the pledge ratio (*PLR*) of controlling shareholders is 21.0 percent and the proportion of firms with controlling shareholders pledging equity (*PLD*) in the Chinese market is 41.1 percent, demonstrating that equity pledging occurs frequently for Chinese listed firms. For the margin call measure, 17.5 percent of sample firms report a three-month buy-and-hold stock returns that are smaller than negative 15 percent. Chinese firms that disclose CSR reports account for approximately 33.2 percent of the total sample. Overall, the descriptive statistics for the control variables in our study are comparable to existing pledge literature.

[Insert Table I about here]

4.2 Regression results and analysis

4.2.1 Testing Hypotheses 1 and 2

Table II presents the results for the association between the pledge ratios of controlling shareholders and analysts' earnings forecast error and dispersion. The results in Table II, Column (1), support Hypothesis 1a, with a positive, significant association between analyst *ERROR* ($\beta = 0.191$, $p \leq 0.01$) and *PLR*. Hypothesis 2a is also supported with a positive, significant increase in *DISPERSION* ($\beta = 0.240$, $p \leq 0.01$) associated with *PLR* by controlling shareholders.[7]

[7] Robustness tests were completed by replacing the independent variable of pledge ratio (*PLR*) with a dummy variable *PLD* equal to one (zero) for firms with controlling shareholders pledging (not pledging) shares. We re-

The initial findings are consistent with expectations that higher proportions of shares pledged by controlling shareholders are associated with increased analysts' forecast error and dispersion. The positive association between shares pledged by controlling shareholders and *ERROR* and *DISPERSION* appears economically significant. Multiplying the coefficient for *PLR* by one standard deviation translates into a 10.13 percent increase in analysts' forecast error and a 12.86 percent increase in forecast dispersion.[8]

The results for the control variables in Table II are consistent with prior analyst forecasts literature. Firm size (*SIZE*) (β = -0.029, $p \leq 0.01$), market-to-book ratio (*MB*) (β = -0.009, $p \leq 0.05$), company growth (*GROWTH*) (β = -0.068, $p \leq 0.01$), institutional ownership ratio (*INS*) (β = -0.416, $p \leq 0.01$), analyst following (*FOLLOW*) (β = -0.067, $p \leq 0.01$) and analyst experience (*EXPERIENCED*) (β = -0.031, $p \leq 0.05$) are associated with less analyst earnings forecast error. Firm leverage (*LEV*) (β = 0.265, $p \leq 0.01$), loss companies (*LOSS*) (β = 1.515, $p \leq 0.01$), earnings volatility (*StdRet*) (β = 0.104, $p \leq 0.01$), analysts' forecast span (*HORIZON*) (β = 0.069, $p \leq 0.01$), and non-independent analysts (*NON-INDEPENDENT*) (β = 0.027, $p \leq 0.10$) are positively associated with forecast error. The coefficients of the independent variables for dispersion are qualitatively similar.

[Insert Table II about here]

run model (1). Untabulated results show a significant, positive association between our pledge dummy variable and analysts' earnings forecast error and dispersion.

[8] The economic significance for analysts' error is calculated as 0.191 multiplied by 0.315, divided by 0.594, which equals 10.13 percent; where, 0.191 is the coefficient estimate of *PLR* in Table II, Column (2); 0.315 is the standard deviation of *PLR* and 0.594 is the mean value of forecast error (*ERROR*) for the full sample reported in Table I. The economic significance for forecast dispersion is calculated as 0.240 multiplied by 0.315, divided by 0.588, which equals 12.86 percent.

Table III reports the results for the pledge ratios of controlling shareholders and interactions with margin call pressure ($PLR \times MarginCall$), and analysts' earnings forecast error and dispersion. The results in Table III, Columns (1) and (2), support Hypotheses 1b and 2b, with $PLR \times MarginCall$ significantly, positively associated with analysts' earnings forecast error ($\beta = 0.132$, $p \leq 0.05$) and dispersion ($\beta = 0.153$, $p \leq 0.05$). *MarginCall* is a dummy variable equal to one if the prior three-month buy-and-hold stock return is lower than negative 15 percent, and zero otherwise. The results in Table III support our contention that pledge ratios combined with margin call pressure is associated with opaque or manipulative financial disclosure and significantly increases analysts' earnings forecast error and dispersion. Our findings are economically significant; increases in analysts' forecast error and dispersion by share pledging firms are 22.22 percent and 26.02 percent higher, respectively, when firms experience margin call pressure combined with pledge ratios.

[Insert Table III about here]

4.2.2 Endogeneity tests

To establish a more distinct causal relationship and address endogeneity concerns, we conduct several robustness tests related to equity pledging and analysts forecast properties. Initially, we implement DID analysis. In 2013, Chinese capital market regulators, the Shanghai Stock Exchange, the Shenzhen Stock Exchange, and China Securities Depository and Clearing Corporation, implemented deregulation of share pledging. Post 2013, shareholders of listed companies in China could now attain loans secured by shares through trading platforms. This regulatory change stimulated share pledging activity, with almost a 40 percent rise in A-share listed firms exhibiting share-backed lending (Zhu *et al*., 2021). This regulation change provides

an exogenous shock and enables us to identify treatment and control groups to conduct a DID test. Following Zhu *et al*. (2021), we rely on the number of local brokerages to separate the treatment and control samples. Deregulation allows market participants to engage in equity pledging activity predominantly through brokerages. Therefore, firms located in regions with more brokerages are expected to exhibit a greater increase in share pledging than firms in regions with fewer brokerages, and are less likely to be impacted by the regulation change.

We create an indicator variable, *Treat*, that equals one for the treatment group and zero for the control group. The treatment (control) group includes firms in 2012 located in regions where the number of brokerages is above (below) the median number of brokerages across all provinces. PSM matching is used to generate comparable treatment and control groups, which creates a sample of 18,532 observations (Zhu *et al*., 2021). An indicator variable is created for *Post* that equals one for the years during and after 2013, and zero for pre-regulation years before 2013. The key variable of interest is the interaction variable, *Treat* × *Post*, that captures the net effect of the exogenous change in controlling shareholders' equity pledges on analysts' forecast properties.

Table IV, Panel A, presents the results for the DID analysis. The coefficient estimates for the variable of interest, *Treat* × *Post,* are positively, significantly associated with analysts' forecast error ($\beta = 0.066$, $p \leq 0.10$) and forecast dispersion ($\beta = 0.089$, $p \leq 0.05$). This result supports our main findings reported in Table II, with DID analysis suggesting a causal relationship between equity pledging and analysts' forecast quality. That is, increased equity pledges lead to lower financial analysts' forecast quality (i.e., higher forecast errors and more dispersion).

We also plot the parallel trends graph for DID over multiple periods. Figure 1 is consistent with the results in Table IV, Panel A. Specifically, we find that the difference in analysts' forecasts between the control and treated groups is non-significant before the event. However, in the post-regulation period, treatment firms experience a significantly larger increase in forecast error and dispersion relative to years t-1. This suggests that it is unlikely that our findings are explained by a pre-existing trend in analysts' forecast accuracy and dispersion.

[Insert Figure 1]

We then re-run the tests in Tables 2 and 3 using PSM to confirm that sample selection bias is not influencing our results. Companies with (without) a controlling shareholder pledging equity are identified as the experimental (control) group. The control variables in model (1) are used to produce a matched sample using one-to-one matching without replacement, and a caliper value of 0.01. The PSM results in Table IV, Panel B, support our initial findings in Tables 2 and 3. Controlling shareholders' pledge ratios are positively associated with analysts' earnings forecast *ERROR* ($\beta = 0.217$, $p \leq 0.01$) and *DISPERSION* ($\beta = 0.232$, $p \leq 0.01$). The $PLR \times MarginCall$ term is positively, significantly associated with forecast properties for *ERROR* ($\beta = 0.203$, $p \leq 0.01$) and *DISPERSION* ($\beta = 0.193$, $p \leq 0.05$).

Third, we control for endogeneity concerns by using change analysis to control for omitted company-level variables. Specifically, we examine whether our results vary when companies increase or release their equity pledges. We expect that negative (positive) annual percentage changes in pledge ratios of controlling shareholders will reduce (increase) analysts' forecasts error and dispersion. This test strengthens the proposition that equity pledging creates less accurate analysts' forecasts and greater dispersion, rather than other firm characteristics.

Dummy variables are created for annual percentage increases (*PLR_INCREASE*) and decreases (*PLR_RELEASE*) in the amounts of equity pledged by controlling shareholders. *PLR_RELEASE* equals one (zero) for negative (positive) annual percentage changes in equity pledges from year *t-1* to year *t*. *PLR_INCREASE* equals one (zero) for positive (negative) annual percentage changes in equity pledges from year *t-1* to year *t*.

The results in Table IV, Panel C, demonstrate that firms with negative annual percentage changes in equity pledge ratios (*PLR_RELEASE*) have significantly fewer analysts' earnings *ERROR*s (β = -0.040, $p \leq 0.05$) and significantly less forecast *DISPERSION* (β = -0.055, $p \leq 0.05$). Firms with positive annual percentage changes in equity pledge ratios (*PLR_INCREASE*) are associated with significantly more earnings forecast *ERROR* ($\beta = 0.106$, $p \leq 0.01$) and significantly greater forecast *DISPERSION* ($\beta = 0.143$, $p \leq 0.01$).

[Insert Table IV about here]

We repeat our main analyses using fixed effects to mitigate concerns relating to unobserved time-invariant firm characteristics that might influence equity pledging and analysts' forecast outcomes. Table IV, Panel D, reports results using fixed effects regression. We continue to find that *PLR* is positively associated with *ERROR* ($\beta = 0.065$, $p \leq 0.10$) and *DISPERSION* ($\beta = 0.108$, $p \leq 0.05$). Further, the *PLR*×*MarginCall* term is also associated with reduced analysts' forecast accuracy ($\beta = 0.091$, $p \leq 0.10$) and increased forecast dispersion ($\beta = 0.163$, $p \leq 0.05$).

Additionally, we partition subsamples above and below the median for firm size (total assets) and earnings volatility (standard deviation of earnings t, t-1 and t-2 divided by total assets) to ensure that earnings quality or information asymmetry are not driving the positive

association between pledge risk and analysts' forecast error/dispersion. Generally, less information is available for small firms, with a smaller analyst following (Bhushan, 1989) and higher level of information asymmetry (Bhushan, 1989; Glosten and Milgrom, 1985). Research indicates that pledging firms' smooth earnings to avoid margin calls (Deren and Ke, 2018; Huang and Xue, 2016). We confirm that our main findings hold for firms with stable or volatile earnings.

Untabulated results support our main findings, with small firms ($\beta = 0.234$, $p \leq 0.01$) and large firms ($\beta = 0.131$, $p \leq 0.01$) both reporting a significant, positive association between *PLR* and forecast *ERROR.* Small firms ($\beta = 0.307$, $p \leq 0.01$) and large firms ($\beta = 0.166$, $p \leq 0.01$), report a significant, positive relationship for *PLR* and forecast *DISPERSION.*

Untabulated earnings volatility results show significant, positive associations between *PLR* and analysts' forecast *ERROR* for firms with low earnings volatility ($\beta = 0.181$, $p \leq 0.01$) and high earnings volatility ($\beta = 0.194$, $p \leq 0.01$). Similarly, *DISPERSION* is positively, significantly associated with *PLR* for low earnings volatility ($\beta = 0.224$, $p \leq 0.01$) and high earnings volatility ($\beta = 0.253$, $p \leq 0.01$). These results demonstrate that firm level information risk because of share pledging negatively impacts analysts' forecasts irrespective of a firm's firm size or earnings volatility.

Overall, the robustness test results reported in 4.2.2 strongly support our main findings and suggest that endogeneity or self-selection bias are not driving our results.

4.3 Additional analyses

4.3.1 The role of analysts' incentives

Assuming that opaque financial disclosure is associated with firms that yield greater insider

pledge risk, we expect to observe less accurate earnings forecasts for top performing analysts and low-quality analysts alike. Poor quality disclosure negatively influences the information set available to all analysts (Easley and O'Hara, 2004; Francis *et al*., 2005; Gray *et al.,* 2009; Lambert *et al*., 2007). Therefore, we predict reduced earnings accuracy for a wide variety of analyst characteristics.

Hu *et al*. (2021) find that analysts are more likely to collude with insiders pledging shares when analysts have closer connections to a firm, but this is less likely for analysts from large brokerages or more reputable analysts. Similarly, we expect that analyst incentives moderate the relationship between pledge risk and analysts' forecast quality. However, we predict greater forecasting errors/dispersion for high- and low-quality analysts (i.e., experienced and non-experienced) because of a poor information environment common to all analysts.

We examine the following analyst attributes/incentives: non-independent and independent analysts[9]; star and non-star analysts[10]; analysts from small and large brokerages[11]; and

[9] Non-independent or related analysts often share close social networks with managers (Bae *et al*., 2008; Hu *et al*., 2021) and have better access to information because of these connections, leading to less information asymmetry (Bae *et al*., 2008). However, a close relationship between analysts and managers can induce analysts to collude with managers and make optimistic forecasts in exchange for private benefits (Chan *et al*., 2007; Hu *et al*., 2021; Kolasinski and Kothari, 2008; Wang *et al*., 2017). Hu *et al*. (2021) find that non-independent analysts are more likely to collude when insiders pledge shares.

[10] Star analysts yield better stock performance and more accurate earnings forecasts (Desai *et al*., 2000). They are also associated with reduced stock return synchronicity and are less likely to issue biased earnings forecasts because of reputation concerns and superior human capital (Bradley *et al*., 2017; Desai *et al*. 2000; Fang and Yasuda, 2009; Jackson, 2005; Xu *et al.,* 2013).

[11] The size of a brokerage firm is a characteristic previously used to proxy for the importance of an analyst's reputation and competency (Hu *et al*., 2021). Hu *et al*. (2021) find that analysts from large brokerage firms are less likely to issue optimistic forecasts when controlling for shareholders pledging shares.

experienced and non-experienced analysts.[12]

Table V reports the findings for analysts' incentives/attributes and the associations between controlling shareholders pledge ratios and pledge ratios combined with margin call pressure, and earnings forecast errors and dispersion. Initially, we discuss the pledge ratio results in Table V related to analysts' incentives and forecasting error/dispersion.

Table V, Panel A, presents the results for the independent and non-independent analyst groups; both groups report significant, positive associations between pledge ratios and analysts' forecast errors and dispersion. Independent analysts report positive, significant analysts' forecast *ERROR*s ($\beta = 0.141$, $p \leq 0.01$) and *DISPERSION* ($\beta = 0.182$, $p \leq 0.01$) with pledge ratios. Similarly, non-independent analysts report significant, positive associations with pledge ratios of controlling shareholders and analysts' forecast *ERROR*s ($\beta = 0.394$, $p \leq 0.01$), and *DISPERSION* ($\beta = 0.412$, $p \leq 0.01$).

Table V, Panel B, presents the results for the star and non-star analyst groups. Star analysts report positive, significant associations between pledge ratios and forecast *ERROR*s ($\beta = 0.135$, $p \leq 0.01$), and *DISPERSION* ($\beta = 0.163$, $p \leq 0.01$). Non-star analysts also show positive, significant associations between pledge ratios and forecast *ERROR*s ($\beta = 0.222$, $p \leq 0.01$), and *DISPERSION* ($\beta = 0.291$, $p \leq 0.01$).

The results in Table V, Panel C, report greater forecasting error and dispersion for analysts from large and small brokerage firms, and pledge ratios. Analysts from large brokerage firms

[12] Analysts' experience is a key factor in determining forecast accuracy (Brown, 2001). Mikhail *et al*. (1997) report a strong association between analysts' experience and the accuracy of their earnings forecasts. Clement (1999) and Sorescu and Subrahmanyam (2009) show that analysts' firm-specific and general experience is positively associated with forecast accuracy.

have greater forecasting *ERROR*s (β = 0.158, p ≤ 0.01) and *DISPERSION* (β = 0.241, p ≤ 0.01) related to pledge ratios. Small brokerage firm analysts also report significantly more *ERROR*s (β = 0.217, p ≤ 0.01) and *DISPERSION* (β = 0.239, p ≤ 0.01) associated with pledge ratios.

Table V, Panel D, presents the results for experienced and inexperienced analysts. Consistent with prior analyst attributes in Table V, experienced analysts report significant, positive *ERROR*s (β = 0.170, p ≤ 0.01) and *DISPERSION* (β = 0.172, p ≤ 0.01) with pledge ratios. Inexperienced analysts also report positive, significant *ERROR*s (β = 0.207, p ≤ 0.01) and *DISPERSION* (β = 0.297, p ≤ 0.01) associated with controlling shareholders pledge ratios

The pledge ratio results support our information risk view; all analyst groups tested show significantly greater earnings error and dispersion related to controlling shareholders pledge ratios. Highly competent analysts' attributes (e.g., star, experience, independent, and large brokerages) that are least likely to collude with controlling shareholders show significantly more forecasting error and dispersion.

Table V also presents the results for analysts' incentives and the interactions of $PLR \times MarginCall$ and analysts' earnings predictions. The results in Table V generally show that the $PLR \times MarginCall$ term significantly increases analyst forecast *ERROR* and *DISPERSION*. Overall, six of the eight analyst groups tested report positive, significant relationships between $PLR \times MarginCall$ and analysts' forecast ERRORs. Four of the eight analyst incentive groups tested report positive, significant relationships with $PLR \times MarginCall$ and *DISPERSION*.

Table V reports positive, significant associations between $PLR \times MarginCall$ and forecasting *ERROR* for independent analysts (β = 0.154, p ≤ 0.01), star analysts (β = 0.139, p

≤ 0.05), non-star analysts (β = 0.119, p ≤ 0.05), small brokerage analysts (β = 0.191, p ≤ 0.01), experienced (β = 0.112, p ≤ 0.10) and inexperienced analysts (β = 0.155, p ≤ 0.01). Non-independent analysts and large brokerage analysts show insignificant relationships between $PLR \times MarginCall$ and forecasting *ERROR*.

Table V's results for the interactions of $PLR \times MarginCall$ and analysts' forecast *DISPERSION* show significantly greater *DISPERSION* for independent analysts (β = 0.172, p ≤ 0.01), star analysts (β = 0.284, p ≤ 0.01), small brokerage analysts (β = 0.182, p ≤ 0.05) and inexperienced analysts (β = 0.185, p ≤ 0.05). $PLR \times MarginCall$ and analyst *DISPERSION* interaction shows insignificant associations for non-independent analysts, non-star analysts, large brokerage analysts, and experienced analysts.

In summary, the results are robust for the pledge ratios of controlling shareholders and greater analysts' earnings prediction error/dispersion for each analyst incentive group examined. Subsample results for analyst incentives and forecasting error/dispersion are not as consistent when shares pledged are combined with margin call pressure. When testing $PLR \times MarginCall$, margin call pressure is identified by three-month buy-and-hold stock returns of less than negative 15 percent in our sample. Effectively, we are focusing on firms that are inherently difficult to forecast (Brown, 2001; Gu and Wu, 2003; Hwang *et al*., 1996). Therefore, we reason that the results are not as consistent for $PLR \times MarginCall$ and analysts' forecasting properties because these firms are already more difficult to forecast, without the additional information risk of low-quality disclosure related to share pledging.

[Insert Table V about here]

4.3.2 Information risk proxies and equity pledging

We submit that the positive relationship between equity pledging and analysts' earnings forecast error/dispersion is related to opportunistic financial disclosure, with controlling shareholders incentivized to manipulate the perception of a firm's performance. To confirm this view, we examine whether pledge ratios are associated with proxies for information risk including earnings permanence, discretionary accruals quality, auditor quality (Big4 and Big10), financial restatements, related party transactions, and internal control effectiveness. Prior research has frequently used accrual quality measures as a proxy for information risk (Dhaliwal *et al*., 2012; Hope, 2003). The proxies for information risk are defined in Appendix A.

Table VI reports the results for information risk proxies and their relationships to controlling shareholders pledge ratios. The table shows a significant, negative association between the pledge ratios of controlling shareholders and earnings permanence (β = -0.014, $p \leq 0.01$), the appointment of Big4 auditors (β = -1.010, $p \leq 0.01$), Big10 auditors (β = -0.263, $p \leq 0.01$), and internal control effectiveness (β = -0.134, $p \leq 0.01$). Firms with a high ratio of pledged shares report significantly higher discretionary accruals (β = 0.009, $p \leq 0.05$). This result aligns with significantly lower earnings permanence because of reversal in accruals manipulation. Restatements of earnings (β = 0.443, $p \leq 0.01$) are significantly, positively associated with pledge ratios and engagement in related party transactions ($\beta = 0.057$, $p \leq 0.01$). Collectively, these findings suggest that equity pledging yields greater firm-level information risk, supporting our argument.

[Insert Table VI about here]

4.3.3 Non-financial disclosures, equity pledging, and analysts' forecasts

Our main results suggest that margin call avoidance by insiders induces manipulative financial disclosure to the extent that it reduces the quality of analysts' earnings forecasts. This is consistent with the view that opaque financial disclosure reduces analysts' forecast accuracy (Hope, 2003). We conduct additional analyses to examine whether non-financial disclosures improve analysts ex-ante forecasts when financial information is less informative because of manipulated financial disclosure arising from equity pledging. Dhaliwal *et al.* (2012) note that non-financial disclosures as proxied by CSR reports provide complementary information to analysts when financial disclosure is poor, which improves analysts' forecast accuracy. Consistent with this view, we predict that, in the presence of high pledge risk, non-financial disclosure through CSR reports mitigates the negative impact on analysts' earnings forecast errors and dispersion. However, the alternative possibility is that corporate insiders manipulate both financial disclosures and non-financial disclosures, issuing CSR reports that are less credible and contain only limited information for analysts. Thus, whether non-financial disclosures improve analysts' forecasts when the risk of equity pledging is high remains an important issue for investors and regulators.

Models (3) and (4) below test the likely mitigating influence of CSR disclosure on pledge ratios and the pledge ratio combined with margin call pressure and analysts' forecast error/dispersion.

$$ERROR\ (DISPERSION)_{it} = \alpha + \beta_1 PLR_{it} + \beta_2 CSR_{it} + \beta_3 PLR_{it} \times CSR_{it} + \sum \beta_k\ Control_{it}\ + IndustryFE + YearFE + \varepsilon_{it} \quad (3)$$

$$ERROR\ (DISPERSION)_{it} = \alpha + \beta_1 PLR_{it} + \beta_2 CSR_{it} + \beta_3 MarginCall_{it} + \beta_4 PLR_{it} \times CSR_{it} + \beta_5 PLR_{it} \times MarginCall_{it} + \beta_6 MarginCall_{it} \times CSR_{it} + \beta_7 PLR_{it} \times MarginCall_{it} \times CSR_{it} +$$

$$\sum \beta_k \, Control_{it} + IndustryFE + YearFE + \varepsilon_{it} \quad (4)$$

CSR is a dummy variable equal to one if the firm issues a CSR report and zero otherwise. We predict that the coefficient for $PLR \times CSR$ in model (3) and $PLR \times MarginCall \times CSR$ in model (4) will be significantly negative, with CSR disclosure alleviating the adverse effect of controlling shareholders' equity pledges on analysts' forecast accuracy and dispersion.

4.3.4 Existence of CSR report, equity pledging, and analysts' forecasts

Table VII, Panel A, reports the results for the existence of a CSR report and pledge ratios of controlling shareholders, and pledge ratios combined with margin call pressure and analysts' earnings forecast error and dispersion. Table VII, Panel A (Columns 1 and 2) show that CSR disclosure significantly reduces analysts' forecast *ERROR* and *DISPERSION* related to controlling shareholders pledge ratios. The variable of interest, $PLR \times CSR$ (β = -0.095, $p \leq 0.05$), shows a negative, significant relationship with analysts' forecast *ERROR*. $PLR \times CSR$ (β = -0.206, $p \leq 0.01$) is negatively, significantly associated with analysts' forecast *DISPERSION*. Economically, these results indicate a considerable improvement in analysts' forecasts with a 15.99 percent reduction in forecast error and 35.03 percent reduction in forecast dispersion for pledging firms that disclose CSR reports.[13]

The results in Columns 3 and 4 show that $PLR \times MarginCall \times CSR$ is significantly negatively associated with analysts' forecast *ERROR* (β = -0.342, $p \leq 0.01$) and *DISPERSION* (β = -0.368, $p \leq 0.01$). These findings indicate that CSR disclosure provides complementary

[13] The economic significance of analysts' error is calculated as -0.095 divided by 0.594, which equals 15.99 percent, where -0.095 is the coefficient estimate for *PLR*×*CSR* in Table VII, Panel A, column (1) and 0.594 is the mean value of analyst forecast error (*ERROR*) reported in Table I. The economic significance for analysts' dispersion is calculated as -0.206 divided by 0.588, which equals 35.03 percent.

information to analysts leading to more accurate, less dispersed earnings forecasts under margin call pressure for share pledges.[14]

[Insert Table VII about here]

4.3.5 CSR quality, equity pledging, and analysts' forecasts

In addition to the existence of a CSR report, we predict that superior CSR quality as proxied by completeness of CSR disclosures improves analysts' earnings predictions when controlling shareholders incur pledge risk. The completeness of CSR reports is a salient characteristic indicating better quality CSR disclosure beyond the existence of a CSR report (Kothari *et al*., 2009; Merkl-Davies *et al*., 2011; Michelon *et al*., 2015; O'Dwyer and Unerman, 2007, 2008; Simnett *et al*., 2009). Completeness refers to companies disclosing a wide range of CSR activities. Zahller *et al*. (2015) state that more complete CSR reporting suggests firms are less likely to use CSR reporting as a means of impression management (i.e., not simply ''cherry picking'' areas with the greatest visibility or best performance). Thus, CSR quality is expected to provide useful information to analysts and improve their earnings forecasts.

Prior studies testing CSR quality primarily used a scoring method (a checklist of items disclosed) to measure the completeness of CSR disclosures, with a higher disclosure score indicating better CSR quality (Cho and Patten, 2007; Gao *et al*., 2016; Patten, 2002). We use a checklist to create a CSR index (*CSRIndex*) to proxy for CSR quality. We assign a one (zero) value to each of 13 items disclosed (not disclosed) in the CSR reports of Chinese listed

[14] We also used a PSM approach to confirm that this result is not influenced by sample selection bias. Companies with (without) a CSR report are identified as the experimental (control) group. The results reported in Table VI are robust when PSM matching is used.

companies. We download these CSR disclosure data from the CSMAR database and create a CSR index score ranging from 0 to 13 for each firm (see Appendix B for the full list of items). We examine the interaction between CSR quality and pledge ratios and pledge ratios combined with margin call pressure with analysts' forecast properties (accuracy and dispersion). We re-run models (3) and (4) and replace the original independent variable of CSR disclosure (*CSR*) with CSR Index (*CSRIndex*).

Table VII, Panel B, reports the results for CSR quality and analysts' earnings forecast error/dispersion and their relationship to the pledge ratios of controlling shareholders. CSR quality improves analysts' forecasting when examining pledge ratios, with *PLR* × *CSRIndex* having a negative, significant relationship with analysts' forecasting *ERROR* (β = -0.011, $p \leq 0.05$) and *DISPERSION* (β = -0.024, $p \leq 0.01$). Table VII, Panel B, shows a negative relationship for *PLR*×*MarginCall*×*CSRIndex* and analysts' forecast *ERROR* (β = -0.034, $p \leq 0.05$) and *DISPERSION* (β = -0.040, $p \leq 0.05$). Consistent with prior CSR results, the quality of CSR disclosure mitigates the negative impact on analysts' forecast quality associated with equity pledging by controlling shareholders.

4.3.6 Components of CSR disclosure, equity pledging and analysts' forecasts

We further examine whether the components disclosed in CSR reports provide differentially important information in predicting analysts' earnings forecast error and dispersion. We download the data from the CSMAR database including information for eight different stakeholder dimensions disclosed in CSR reports by Chinese listed firms: (1) protection of shareholders; (2) safeguarding creditors; (3) employee protection; (4) supplier protection; (5) customer protection; (6) environmental protection; (7) social donations; and (8) tax payments

(see Appendix B, the first eight items).

We create eight separate dummy variables, equal to one (zero) based on whether a company discloses (does not disclose) information in its CSR report related to the eight stakeholder dimensions. We re-estimate model (3) including a dummy variable for each CSR stakeholder group[15] (i.e., 8 dummy variables) that is interacted with *PLR*, and we test the associated analyst forecast *ERROR* and *DISPERSION*.

Table VIII, Panels A and B, show that shareholder protection and creditor protection interact with pledge ratios (*Shareholder*×*PLR* and *Creditor*×*PLR*) and produce significant, negative coefficients with analysts' earnings forecast errors/dispersion. Specifically, the CSR component *Shareholder*×*PLR* is negatively related to *ERROR* (β = -0.170, $p \leq 0.01$) and *DISPERSION* (β = -0.249, $p \leq 0.01$), and *Creditor*×*PLR* is negatively related to *ERROR* (β = -0.140, $p \leq 0.05$) and *DISPERSION* (β = -0.360, $p \leq 0.01$). CSR disclosures for capital stakeholders are directly related to a company's earnings, shareholders' interests, and debt risk, and likely assist analysts to improve the accuracy of forecasting future earnings of equity pledge firms.

There is evidence that supplier protection and tax payments interacted with pledge ratios (*Supplier*×*PLR* and *Tax*×*PLR*) also report negative, significant relationships with analysts' earnings forecast accuracy and dispersion. China's weak institutions are characterized by a low level of creditor protection (Jiang and Kim, 2015) and suppliers providing credit are vulnerable

[15] We do not include all CSR dimensions in one regression as the model suffers from multicollinearity. To mitigate the issue of selection bias (e.g., differences between firms that disclose or do not disclose a certain dimension of CSR), PSM is used. Thus, the subsamples reported in Table VII are slightly different.

to controlling shareholders' opportunistic behaviors. A high level of equity pledges can considerably influence a company's ability to repay short-term financing. Hence, it appears that supplier protection disclosures in CSR reports provide additional information for analysts to assess a company's performance (Jiang *et al*., 2021). Total tax payments are also positively related to analysts' forecast accuracy, with tax payments representing a direct reflection of a company's financial performance and internal financing ability (Francis *et al*., 2019). The results in Table VIII provide new evidence that CSR components are differentially useful in improving analysts' forecast accuracy and reducing forecast dispersion relating to pledge risk.

[Insert Table VIII about here]

5. Conclusion

Controlling shareholders pledging equity become more incentivized to misrepresent firm performance as they incur additional pledge risk. Our evidence indicates that analysts' earnings predictions are less accurate and more dispersed as the pledge ratios of controlling shareholders increase and in combination with greater margin call pressure. Analysts' reliance on opaque financial disclosure contributes to the decline in their forecasting quality, with multiple information risk proxies associated with the pledge ratios of controlling shareholders.

Analysts' attributes moderate our findings, although even analysts with relatively high reputation costs continue to report lower quality forecasts related to pledge ratios and margin call pressure. Prior research suggests that insiders engage in margin call avoidance by delaying innovation, manipulating disclosure and/or collusion with analysts. We extend the literature by demonstrating that incremental pledge risk increases non-diversifiable information risk. Thus,

all non-pledging shareholders pay a premium through more diverse, less accurate earnings forecasts.

Our study has important policy implications for governance practices because equity pledges have grown considerably. Our findings suggest that, regardless of analysts' specific attributes, they cannot overcome increases in information risk and thus provide less accurate forecasts associated with equity pledging. Therefore, governance committees and regulators should motivate and encourage greater disclosure of equity pledges (e.g., corporate pledging policies) because our findings suggest that market participants (proxied by analysts) likely benefit from improved transparency of insider pledging activity and related policy disclosures. The results suggest that nonfinancial information disclosures complement low quality financial information and assist analysts in improving their ex-ante forecasts. These results highlight the critical role of nonfinancial disclosures in China and have implications for the current debate on the global convergence of CSR reporting.

Altogether, we provide evidence on the influences of equity pledging, quality of financial disclosure and impairments in analysts' earnings forecasts' properties. However, additional opportunities exist to examine the impact of equity pledging and analysts' forecasts in other markets such as India, Singapore, UK, and the US. Research opportunities also exist to further examine how other firm-specific factors or insider attributes temper or accentuate the impact of equity pledging and analysts' ex-ante forecasts.

Appendix A

Definitions of the variables

ERROR	Analysts' forecast errors: the absolute value of realized earnings per share (*EPS*) minus consensus analysts' forecasts (*EPSt*) divided by the absolute value of *EPSt*.
DISPERSION	Analysts' forecast dispersion: the standard deviation of the latest earnings forecasts issued by all analysts following the firm.
PLR	Equity pledge ratio calculated as the number of equity pledges held by the controlling shareholder of the company divided by the total equity of the company at year end.
PLD	A dummy variable equal to one when the controlling shareholder of company has an equity pledge at the end of the financial year, and zero otherwise.
MarginCall	A dummy variable equal to one if the prior three-month buy-and-hold stock return is less than minus 15 percent, and zero otherwise.
CSR	A dummy variable equal to one if the company issues a CSR report, and zero otherwise.
CSRIndex	CSR disclosure index ranging from 0-13
SIZE	Natural logarithm of total assets
LEV	Total liabilities divided by total assets
LISTAGE	Years since IPO
MB	Sum of total market value and total liabilities divided by total assets
GROWTH	Percentage of operating income divided by operating income of the previous year.
LOSS	A dummy variable equal to one if the company records a loss for the year, and zero otherwise.
INS	The percentage of institutional investor shareholdings
StdRet	The standard deviation of firm *i*'s daily returns for the calendar year
FOLLOW	The natural logarithm of (1+analysts following) (Firm-level)
HORIZON	The average horizon of all analysts following firm *i* in each period *t* (firm-level variable). Horizon for *each analyst* is calculated as one plus the number of days between an analyst's forecast for firm *i* and firm *i*'s fiscal year-end.
STAR	The number of star analysts who issued earnings forecasts for company *i* in year *t* divided by the total number of all analysts who issued earnings forecasts for company *i* in year *t*. (Firm-level) Star analysts are those who won awards from "*New Fortune*" magazine in year *t-1*.
EXPERIENCED	The natural logarithm of (1+ average number of quarters that all analysts who issued earnings forecasts). (Firm-level）
NON-INDEPENDENT	The number of non-independent analysts who issued earnings forecasts for company *i* in year *t* divided by the total number of all analysts who issued earnings forecasts for company *i* in year *t*. (Firm-level) Non-independent analyst is affiliated with a brokerage firm that participates in activities such as share pledging of listed companies, IPOs, seasoned equity offerings, and so on.
LOCAL	The number of local analysts who issued earnings forecasts for company *i* in year *t* divided by the total number of all analysts who issued earnings forecasts for company *i* in year *t.* (Firm-level) LOCAL is an analyst whose brokerage firm and the headquarters of the company are located in the same city.
BKSIZE	The proportion of analysts affiliated with large-sized brokerages (number of analysts from large brokerage firms divided by total number of analysts) who issued earnings forecasts for company *i* in year *t*. Brokers are grouped by the median for each year. If the number of analysts of the brokerage firm is above the median, it is defined as a large brokerage firm, otherwise it is a small brokerage firm.
Earnings permanence	Earnings permanence is measured by the change in earnings scaled by market value of equity.
DisAcc	Discretionary accruals measured by the modified Jones model.
Big4/Big10	A dummy variable equal to one if the external auditor is big4/big 10 auditor, and zero otherwise.
Restatement	A dummy variable equal to one if the company had a financial restatement, and zero otherwise.

RPT	The number of related party transactions divided by total assets.
Incontrol	Internal control quality index downloaded from DIB database.
PLR_Release	A dummy variable equal to one if the equity pledge of the company is released during the year *t* (i.e., the percentage of equity pledged by the company in year *t* is less than the previous year *t-1*), and zero otherwise.
PLR_Increase	A dummy variable equal to one if the percentage of equity pledged by the company in year *t* increased compared with that of the previous year *t-1*, and zero otherwise.

Appendix B:

The dimensions of the CSR disclosure index

Item	**Content**
1	Whether the firm discloses total taxes
2	Whether the firm discloses social donations
3	Whether the firm discloses the protection of shareholders' rights
4	Whether the firm discloses creditors' rights protection
5	Whether the firm discloses employee rights protection
6	Whether the firm discloses supplier rights protection
7	Whether the firm discloses customer and consumer rights protection
8	Whether the firm discloses environment and sustainable development
9	Whether the firm discloses public relations and social welfare
10	Whether the firm discloses the construction of the social responsibility system and improvement measures
11	Whether the firm discloses safety production content
12	Whether the firm is verified by a third-party organization
13	Whether the firm discloses deficiencies in the company

Note: Each CSR disclosure item is worth 1 point and the CSR index is calculated using these 13 listed CSR disclosure items.

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TABLE I

The descriptive statistics of the variables

Variable	Obs.	Mean	SD	Min	P25	Median	P75	Max
ERROR	22,128	0.594	0.862	0.000	0.143	0.299	0.621	5.824
DISPERSION	22,128	0.588	1.060	-0.592	0.068	0.274	0.663	8.621
PLR	22,128	0.210	0.315	0.000	0.000	0.000	0.400	1.000
PLD	22,128	0.411	0.492	0.000	0.000	0.000	1.000	1.000
CSR	22,128	0.332	0.471	0.000	0.000	0.000	1.000	1.000
CSRIndex	22,128	2.793	4.052	0.000	0.000	0.000	8.000	13.000
MarginCall	22,128	0.175	0.380	0.000	0.000	0.000	0.000	1.000
SIZE	22,128	22.518	1.349	20.143	21.537	22.305	23.288	26.859
LEV	22,128	0.418	0.199	0.045	0.257	0.413	0.569	0.841
LISTAGE	22,128	2.038	0.857	0.000	1.386	2.197	2.773	3.367
MB	22,128	2.427	1.692	0.813	1.318	1.867	2.890	10.700
GROWTH	22,128	0.234	0.476	-0.608	-0.004	0.131	0.326	3.569
LOSS	22,128	0.057	0.232	0.000	0.000	0.000	0.000	1.000
INS	22,128	0.093	0.090	0.000	0.028	0.068	0.132	0.570
StdRet	22,128	1.750	1.635	0.013	0.031	2.026	2.878	9.653
FOLLOW	22,128	2.160	0.839	0.693	1.386	2.197	2.833	3.989
HORIZON	22,128	5.771	0.771	2.303	5.533	5.736	6.267	7.056
STAR	22,128	0.158	0.162	0.000	0.000	0.139	0.289	0.778
EXPERIENCED	22,128	2.979	0.617	0.049	2.486	3.133	3.440	4.193
NON-INDENPENDENT	22,128	0.277	0.437	0.000	0.000	0.000	1.000	1.000
LOCAL	22,128	0.069	0.155	0.000	0.000	0.000	0.059	1.000
BKSIZE	22,128	0.469	0.356	0.018	0.182	0.213	0.875	1.000

Notes: This table reports the descriptive statistics of variables for the sample spanning 2010–2017. All variables are defined in Appendix A.

TABLE II
Equity pledge and analysts' forecast properties

Variable	(1)	(2)
	ERROR	DISPERSION
PLR	0.191***	0.240***
	(8.60)	(8.11)
SIZE	-0.029***	-0.072***
	(-4.07)	(-7.48)
LEV	0.265***	0.527***
	(6.18)	(8.59)
LISTAGE	0.003	-0.011
	(0.35)	(-1.03)
MB	-0.009**	-0.008
	(-2.10)	(-1.62)
GROWTH	-0.068***	-0.121***
	(-5.34)	(-7.19)
LOSS	1.515***	0.536***
	(31.64)	(12.33)
INS	-0.416***	-0.407***
	(-6.95)	(-4.05)
StdRet	0.104***	0.072***
	(8.11)	(4.97)
FOLLOW	-0.067***	-0.046***
	(-8.23)	(-4.24)
HORIZON	0.069***	0.076***
	(9.96)	(10.36)
STAR	-0.033	-0.000
	(-0.90)	(-0.01)
EXPERIENCED	-0.031**	-0.043*
	(-2.06)	(-1.93)
NON-INDENPENDENT	0.027*	-0.003
	(1.80)	(-0.09)
LOCAL	0.044	0.094*
	(1.08)	(1.96)
BKSIZE	-0.038	-0.056
	(-0.85)	(-0.65)
Intercept	0.711***	1.770***
	(4.11)	(7.17)
Year effect	Yes	Yes
Industry effect	Yes	Yes
N	22,128	22,128
Adj. R^2	0.234	0.071

Notes: This table presents the results of estimating Model (1) based on the full sample. The dependent variable is *ERROR* or *DISPERSION*. The test variable is *PLR*. Year and industry fixed effects are included in models. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE III
Equity pledges and analysts' forecast properties: The moderating role of margin call pressure

Variable	(1)	(2)
	ERROR	DISPERSION
PLR × MarginCall	0.132**	0.153**
	(2.50)	(2.27)
MarginCall	0.106***	0.145***
	(5.74)	(6.32)
PLR	0.159***	0.202***
	(6.84)	(6.50)
SIZE	-0.027***	-0.068***
	(-3.67)	(-7.08)
LEV	0.264***	0.526***
	(6.19)	(8.60)
LISTAGE	0.002	-0.013
	(0.22)	(-1.16)
MB	-0.006	-0.005
	(-1.50)	(-0.97)
GROWTH	-0.066***	-0.118***
	(-5.18)	(-7.07)
LOSS	1.505***	0.523***
	(31.39)	(11.99)
INS	-0.383***	-0.365***
	(-6.44)	(-3.64)
StdRet	0.096***	0.062***
	(7.52)	(4.28)
FOLLOW	-0.070***	-0.051***
	(-8.65)	(-4.65)
HORIZON	0.068***	0.074***
	(9.87)	(10.24)
STAR	-0.035	-0.003
	(-0.96)	(-0.06)
EXPERIENCED	-0.031**	-0.044**
	(-2.13)	(-1.99)
NON-INDENPENDENT	0.031**	0.001
	(2.01)	(0.04)
LOCAL	0.043	0.093*
	(1.06)	(1.95)
BKSIZE	-0.038	-0.055
	(-0.85)	(-0.64)
Intercept	0.678***	1.725***
	(3.93)	(7.01)
Year effect	Yes	Yes
Industry effect	Yes	Yes
N	22,128	22,128
Adj. R^2	0.238	0.075

Notes: This table presents the results of estimating Model (2) based on the full sample. The dependent variable is *ERROR* or *DISPERSION*. The test variable is the interaction variable *PLR×MarginCall*. Year and industry fixed effects are included in models. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE IV
Endogeneity tests
Panel A: Controlling shareholders' share pledging and analysts' forecast properties: Difference-in-difference analysis

Variable	(1) ERROR	(2) DISPERSION
Treat*Post	0.066*	0.089**
	(1.88)	(2.33)
Treat	-0.260	0.155
	(-1.16)	(1.26)
Controls	Yes	Yes
Year effect	Yes	Yes
Industry effect	Yes	Yes
Province effect	Yes	Yes
N	18,532	18,532
Adj. R^2	0.251	0.064

Panel B: Propensity score matching

	ERROR	DISPERSION	ERROR	DISPERSION
PLR	0.217***	0.232***	0.171***	0.186***
	(7.49)	(6.23)	(5.56)	(4.60)
MarginCall			0.087***	0.139***
			(3.21)	(3.97)
PLR×MarginCall			0.203***	0.193**
			(2.77)	(2.15)
Controls	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
N	10,687	10,687	10,687	10,687
Adj. R^2	0.251	0.075	0.255	0.080

Panel C: Change analysis

	ERROR	DISPERSION	ERROR	DISPERSION
PLR_Increase	0.106***	0.143***		
	(7.88)	(8.37)		
PLR_Release			-0.040**	-0.055**
			(-2.51)	(-2.44)
Controls	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
N	22,128	22,128	13,760	13,760
Adj. R^2	0.235	0.072	0.240	0.069

Panel D: Firm fixed effects

	ERROR	DISPERSION	ERROR	DISPERSION
PLR	0.065*	0.108**	0.045	0.073
	(1.73)	(2.08)	(1.16)	(1.37)
MarginCall			0.090***	0.117***
			(4.56)	(4.75)
PLR×MarginCall			0.091*	0.163**
			(1.67)	(2.39)
Controls	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
N	22,128	22,128	22,128	22,128
Adj. R^2	0.212	0.035	0.218	0.042

Notes: This table presents the results from the ordinary least squares regression of the impact of equity pledge

change on analysts' forecast error and dispersion using a DID analysis (Panel A), PSM sample (Panel B), change analysis (Panel C) and firm fixed effects (Panel D). Control variables and fixed effects are included, but the coefficients are suppressed for brevity. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE V

Equity pledge, margin call pressure and analysts' forecast properties: the role of analysts' characteristics

Panel A: Non-independent versus independent analysts

	Non-independent	Independent	Non-independent	Independent	Non-independent	Independent	Non-independent	Independent
	ERROR	ERROR	DISPERSION	DISPERSION	ERROR	ERROR	DISPERSION	DISPERSION
PLR	0.394***	0.141***	0.412***	0.182***	0.417***	0.107***	0.442***	0.143***
	(6.19)	(7.75)	(6.22)	(7.14)	(6.07)	(5.33)	(6.18)	(5.09)
MarginCall					0.302***	0.087***	0.353***	0.124***
					(4.16)	(4.83)	(4.68)	(4.90)
PLR×MarginCall					-0.161	0.154***	-0.197	0.172***
					(-1.21)	(3.63)	(-1.43)	(2.89)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,027	17,101	5,027	17,101	5,027	17,101	5,027	17,101
Adj. R^2	0.188	0.251	0.189	0.066	0.197	0.254	0.193	0.069
T-test (Prob > Chi2)	0.001***		0.002***		0.058**		0.038**	

Panel B: Star analysts versus non-star analysts

	Star	Non-Star	Star	Non-Star	Star	Non-Star	Star	Non-Star
	ERROR	ERROR	DISPERSION	DISPERSION	ERROR	ERROR	DISPERSION	DISPERSION
PLR	0.135***	0.222***	0.163***	0.291***	0.102***	0.193***	0.099**	0.270***
	(4.78)	(10.04)	(4.43)	(9.46)	(3.29)	(7.91)	(2.44)	(7.94)
MarginCall					0.116***	0.103***	0.150***	0.146***
					(4.22)	(4.44)	(4.18)	(4.50)
PLR×MarginCall					0.139**	0.119**	0.284***	0.077
					(2.11)	(2.34)	(3.31)	(1.08)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8,997	13,131	8,997	13,131	8,997	13,131	8,997	13,131
Adj. R^2	0.201	0.260	0.082	0.066	0.205	0.263	0.088	0.069
T-test (Prob > chi2)	0.033**		0.018**		0.849		0.124	

Panel C: Analysts from large versus small brokerage firms

	Large Brokerage	Small Brokerage	Large Brokerage	Small Brokerage	Large Brokerage	Small Brokerage	Large Brokerage	Small Brokerage
	ERROR	ERROR	DISPERSION	DISPERSION	ERROR	ERROR	DISPERSION	DISPERSION
PLR	0.158***	0.217***	0.241***	0.239***	0.143***	0.174***	0.214***	0.196***
	(6.01)	(9.28)	(6.71)	(7.61)	(4.95)	(6.73)	(5.42)	(5.64)
MarginCall					0.150***	0.074***	0.175***	0.125***
					(5.53)	(3.14)	(4.73)	(3.94)
PLR×MarginCall					0.046	0.191***	0.101	0.182**
					(0.76)	(3.55)	(1.21)	(2.51)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,731	12,397	9,731	12,397	9,731	12,397	9,731	12,397
Adj. R^2	0.241	0.229	0.076	0.067	0.245	0.232	0.080	0.070
T-test (Prob > chi2)	0.138		0.973		0.159		0.554	

Panel D: Experienced analysts versus inexperienced analysts

	Experienced	Inexperienced	Experienced	Inexperienced	Experienced	Inexperienced	Experienced	Inexperienced
	ERROR	ERROR	DISPERSION	DISPERSION	ERROR	ERROR	DISPERSION	DISPERSION
PLR	0.170***	0.207***	0.172***	0.297***	0.144***	0.1468***	0.145***	0.250***
	(6.89)	(8.36)	(5.11)	(8.92)	(5.33)	(6.19)	(1.29)	(6.83)
MarginCall					0.122***	0.089***	0.165***	0.125***
					(4.85)	(3.55)	(4.80)	(3.69)
PLR×MarginCall					0.112*	0.155***	0.111	0.185**
					(1.92)	(2.76)	(1.40)	(2.44)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,056	11,072	11,056	11,072	11,056	11,072	11,056	11,072
Adj. R^2	0.243	0.230	0.061	0.087	0.247	0.233	0.065	0.153
T-test (Prob > chi2)	0.361		0.023**		0.673		0.585	

Notes: This table presents the results of estimating Models (1) and (2) based on the sub-samples portioned by the analyst characteristics. The dependent variable is *ERROR* or

DISPERSION. The test variable is *PLR* and *PLR*×*MarginCall*. Reported in parentheses are t values, based on robust standard errors clustered by firm. Year and industry fixed effects are included in models; ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE VI
Equity pledge and information risk

	Earnings Permanence	DisAcc	Big4	Big10	Restate	RPT	Incontrol
PLR	-0.014***	0.009**	-1.010***	-0.263***	0.443***	0.057***	-0.134***
	(-10.41)	(2.43)	(-3.45)	(-2.96)	(6.01)	(8.94)	(-4.13)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18,702	20,799	22,128	22,128	19,998	22,128	21,256
Adj. R^2	0.096	0.065	0.280	0.036	0.114	0.110	0.162

Notes: This table presents the results from the ordinary least squares regressions of the impact of equity pledges on different proxies of information risk. The dependent variables are *earnings permanence, discretionary accrual (DisAcc), auditor choices (Big10 and Big4), financial restatements (Restate), related party transactions (RPT)* and *internal control effectiveness (Incontrol)*. The test variable is *PLR*. Control variables and fixed effects are included, but the coefficients are suppressed for brevity. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE VII

Equity pledges and analysts' forecast properties: The moderating role of CSR disclosure

Panel A: The presence of a CSR report

	(1) ERROR	(2) DISPERSION	(3) ERROR	(4) DISPERSION
PLR×CSR	-0.095**	-0.206***	-0.022	-0.129**
	(-2.11)	(-3.76)	(-0.45)	(-2.11)
CSR	-0.012	-0.034*	-0.010	-0.036*
	(-0.78)	(-1.65)	(-0.62)	(-1.67)
PLR	0.211***	0.282***	0.165***	0.229***
	(8.23)	(8.18)	(6.14)	(6.29)
MarginCall			0.117***	0.149***
			(5.21)	(5.64)
PLR×MarginCall×CSR			-0.342***	-0.368***
			(-2.86)	(-2.68)
PLR× MarginCall			0.182***	0.205***
			(3.00)	(2.61)
MarginCall×CSR			-0.029	-0.002
			(-0.75)	(-0.04)
Controls	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
N	22,128	22,128	22,128	22,128
Adj. R^2	0.237	0.075	0.241	0.079

Panel B: CSR disclosure quality

	(1) ERROR	(2) DISPERSION	(3) ERROR	(4) DISPERSION
PLR×CSRIndex	-0.011**	-0.024***	-0.003	-0.016**
	(-2.08)	(-3.74)	(-0.62)	(-2.21)
CSRIndex	-0.001	-0.003	-0.001	-0.003
	(-0.38)	(-1.24)	(-0.20)	(-1.28)
PLR	0.211***	0.282***	0.167***	0.231***
	(8.25)	(8.20)	(6.25)	(6.37)
MarginCall			0.118***	0.149***
			(5.28)	(5.69)
PLR×MarginCall×CSRIndex			-0.034**	-0.040**
			(-2.38)	(-2.50)
PLR× MarginCall			0.169***	0.197**
			(2.81)	(2.54)
MarginCall×CSRIndex			-0.004	-0.001
			(-0.80)	(-0.02)
Controls	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
N	22,128	22,128	22,128	22,128
Adj. R^2	0.236	0.075	0.240	0.079

Notes: This table presents the results of estimating Models (3) and (4). The dependent variable is *ERROR* or *DISPERSION*. The test variables are *PLR×CSR* and *PLR×MarginCall×CSR* (panel A); *PLR×CSRIndex* and *PLR×MarginCall×CSRIndex* (panel B). Control variables and fixed effects are included, but the coefficients are suppressed for brevity. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

TABLE VIII
CSR disclosure dimensions, equity pledges, and analysts' forecast accuracy
Panel A: Analysts' forecast error

	(1) ERROR	(2) ERROR	(3) ERROR	(4) ERROR	(5) ERROR	(6) ERROR	(7) ERROR	(8) ERROR
Shareholder×PLR	-0.170***							
	(-2.66)							
Creditor×PLR		-0.140**						
		(-1.96)						
Supplier×PLR			-0.187***					
			(-2.71)					
Customer×PLR				-0.054				
				(-0.82)				
Environment×PLR					-0.027			
					(-0.44)			
Staff×PLR						-0.038		
						(-0.60)		
Donation×PLR							0.073	
							(0.94)	
Tax×PLR								-0.212***
								(-2.73)
Shareholder	0.014							
	(0.68)							
Creditor		0.060***						
		(2.85)						
Supplier			0.014					
			(0.66)					
Customer				-0.010				
				(-0.50)				
Environment					-0.004			
					(-0.18)			
Staff						0.008		
						(0.40)		
Donation							-0.035	
							(-1.42)	
Tax								0.032

								(1.43)
PLR	0.322***	0.277***	0.289***	0.202***	0.178***	0.219***	0.147***	0.265***
	(6.76)	(5.30)	(5.63)	(4.22)	(3.96)	(4.89)	(2.58)	(4.25)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7,874	6,861	7,368	7,737	7,605	7,728	5,022	4,656
Adj. R^2	0.270	0.263	0.255	0.248	0.235	0.244	0.233	0.255

Panel B: Analysts' forecast dispersion

	(1) DISPERSION	(2) DISPERSION	(3) DISPERSION	(4) DISPERSION	(5) DISPERSION	(6) DISPERSION	(7) DISPERSION	(8) DISPERSION
Shareholder×PLR	-0.249***							
	(-2.97)							
Creditor×PLR		-0.360***						
		(-3.47)						
Supplier×PLR			-0.288***					
			(-3.27)					
Customer×PLR				-0.144				
				(-1.58)				
Environment×PLR					-0.099			
					(-1.14)			
Staff×PLR						-0.048		
						(-0.55)		
Donation×PLR							-0.165	
							(-1.48)	
Tax×PLR								-0.294**
								(-2.50)
Shareholder	-0.017							
	(-0.64)							
Creditor		0.034						
		(1.19)						
Supplier			0.031					
			(1.12)					
Customer				-0.030				
				(-1.08)				
Environment					-0.019			

					(-0.69)			
Staff						-0.024		
						(-0.90)		
Donation							-0.002	
							(-0.05)	
Tax								0.006
								(0.17)
PLR	0.393***	0.444***	0.355***	0.293***	0.262***	0.298***	0.273***	0.386***
	(5.86)	(5.00)	(4.99)	(4.12)	(3.86)	(4.33)	(3.05)	(3.81)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7,874	6,861	7,368	7,737	7,605	7,728	5,022	4,656
Adj. R^2	0.076	0.072	0.067	0.080	0.079	0.076	0.085	0.096

Notes: This table presents the results from the ordinary least squares regression of the impact of CSR disclosure dimensions on the association between equity pledges and analysts' forecast error and dispersion. The dependent variable is *ERROR* (panel A) and *DISPERSION* (panel B). The test variable is the interaction variable *PLR×CSR* Dimension. Control variables and fixed effects are included, but the coefficients are suppressed for brevity. Reported in parentheses are t values, based on robust standard errors clustered by firm; ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A.

Figure 1

Parallel trends graph for DID test