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Abstract

We examine the effect of mandatory short interest disclosure on the disclosure decisions of managers of peer firms of short selling target firms. We focus on the Japanese market, where the Financial Services Agency of the Japanese government introduced mandatory disclosure of short interest for all stocks listed on its exchange in 2008. We find that managers under the threat of short selling increase the frequency of their forecast revisions. The result suggests that managers attempt to mitigate information asymmetry to avoid short selling through improved disclosure. We also find that managers of overpriced firms increase the disclosure of bad news (downward forecast revisions). This suggests that managers are likely to increase the disclosure of bad news in order to correct overpricing and seek to avoid short selling. The results suggest that mandatory disclosure of short interest improves the information environment of peer firms, supporting the effectiveness of the short selling disclosure regulation.

Keywords: short selling; short selling disclosure regulation; management forecasts; bad news disclosure; Japan

JEL classification: M41

1. Introduction

The purpose of this study is to examine the effect of mandatory short interest disclosure on managers' disclosure decisions. Specifically, we examine whether managers of peer firms of short selling target firms increase (1) the frequency of revisions to management forecasts to mitigate information asymmetry and (2) the disclosure of bad news (downward forecast revisions) to correct overpricing.

Short sellers, who are generally considered to be informed traders, are expected to contribute to efficient stock price formation. However, short selling can have negative effects on firms, such as lowering the stock price and sending bad signals to stakeholders (Chen et al., 2020). Therefore, we predict that under the threat of short selling, managers have a strong incentive to avoid short selling. To test this prediction, we focus on the Japanese market. In 2008, the Financial Services Agency of the Japanese government introduced mandatory disclosure of large short positions for all stocks listed on its stock exchange, requiring public disclosure of short interest above a certain threshold. This disclosure requirement allows other firms and investors to know the short interest of a short target firm. We focus on this setting to examine the effect of this short interest information on the disclosure behavior of peer firms. Using propensity scores, we select peer firms of short selling target firms, which are defined as firms that are similar to the short selling target firms and potentially exposed to the threat of short selling (treatment firms). We examine management forecast revisions for these treatment firms.

We emphasize disclosure as the most cost-effective way for managers to avoid short selling (Bourveau and Schoenfeld, 2017). Prior research suggests that short sellers consider factors such as accounting fundamentals, market capitalization, book-to-market ratio, or momentum when selecting short selling targets (Dechow et al., 2001; Drake et al., 2011; Jiang et al., 2022). However, managers cannot fully anticipate the circumstances under which short sellers will actually become interested in their firms. Even if they could, managers cannot

immediately change the fundamentals of their firms. Therefore, disclosure can be a very efficient means of avoiding short selling by reducing information asymmetry in the market.

Specifically, first, disclosure can eliminate opportunities for alpha generation and arbitrage trading by converging stock prices to their fundamental values. Short sellers target overpriced firms to gain excess returns, but improved disclosure can correct mispricing and eliminate opportunities for earning excess returns. Second, disclosure improvements serve as useful signals to existing shareholders and other investors, thereby enhancing the confidence and reputation of management. Short selling can influence the risk perception of other investors and encourage further short selling (Chen et al., 2020). Reliable disclosure is expected to deter such investor behavior. Third, short selling may also be a bad signal to other stakeholders, such as counterparties, which may worsen firm performance due to deteriorating business relationships (Goldstein and Guembel, 2008; Khanna and Mathews, 2012; Chen et al., 2020). Improved disclosure serves as a good signal to a wide range of stakeholders.

Based on the above arguments, our first analysis hypothesizes that managers facing the threat of short selling would improve disclosure, specifically increase the frequency of management forecast revisions, in order to mitigate information asymmetry. To test this hypothesis, we conduct a difference-in-differences (DID) analysis focusing on the frequency of management forecast revisions (sales, operating income, and net income) for the treatment and control samples (non-short selling target firms), using the introduction of mandatory short interest disclosure as the intervention year.

We focus on management forecasts because, first, the disclosure and revision of management earnings forecasts have been found to be the most important source of information in the Japanese stock market (Suda and Hanaeda, 2008; Kato et al., 2009; Iwasaki et al., 2023). Second, the threat of short selling cannot be avoided by regular mandatory disclosure because the threat of short selling occurs suddenly. Revisions to management forecasts can be made in a timely manner at the discretion of managers and are a valid subject of our analysis (Bourveau

and Schoenfeld, 2017). Moreover, focusing on Japanese management forecasts brings advantages to the analysis compared to the U.S. disclosure practices (Kato et al., 2009; Iwasaki et al., 2023). In Japan, almost all listed firms have a practice of disclosing their point sales and earnings forecasts for the next fiscal year on the day of the earnings announcement, as required by the stock exchanges. Such a research setting has the advantages of (1) avoiding the endogeneity problem associated with voluntary disclosure as in the U.S., (2) reducing the measurement bias of the revision variables due to differences in the timing of initial forecast disclosure, and (3) reducing the measurement error associated with range forecasts. Our results show that managers of firms threatened by short selling issue more forecast revisions than managers of firms not threatened by short selling. This is consistent with our hypothesis.

It should be noted, however, that managers may use management forecasts more to obfuscate firm values than to mitigate information asymmetry. For example, prior studies show that managers under the threat of short selling or M&A actively disclose bad news or strategically reduce its accuracy (Li and Zhang, 2015; Chen et al., 2020). Bad news disclosure increases uncertainty about firm value and makes firm valuation more difficult (Rogers et al., 2009; Peng et al., 2020; Chen et al., 2022). Thus, bad news disclosure makes it difficult for short sellers to assess whether potential target firms are undervalued or overvalued (Chen et al., 2022), thereby limiting their interest in short selling. In short, these arguments suggest that managers strategically use bad news disclosures to exacerbate the firm's information environment. This is inconsistent with our prediction.

To address this issue, our second analysis examines the relationship between firm mispricing and bad news regarding management forecasts. In this analysis, we test whether managers intentionally worsen the information environment to avoid short selling. Specifically, we focus on the frequency of bad news disclosures by overpriced firms facing the threat of short selling. If, as our hypothesis predicts, managers disclose bad news (i.e., downward forecast revisions) to mitigate information asymmetries, we expect such disclosures to be more

pronounced for overpriced firms than for underpriced firms. Managers of overpriced firms can correct overvaluation by frequently disclosing bad news, which is close to private information, to the market. This discourages short selling by reducing the potential returns to short sellers.

If the alternative prediction holds, i.e., that bad news is disclosed to make firm valuation more difficult, then the disclosure of bad news would not be limited to overpriced firms. Thus, we hypothesize that the relationship between the threat of short selling and the disclosure of bad news is more pronounced for overpriced firms. Our results suggest that managers of firms threatened by short selling are more likely to issue downward forecast revisions when they are overpriced. We do not find such a tendency for underpriced firms. These results are consistent with our hypothesis and suggest that managers attempt to mitigate information asymmetry and avoid short selling by frequently disclosing management forecast revisions.

To assess the validity of our results, we conducted several additional analyses. First, we examined the relationship between the mispricing of firms and good news disclosure. The results show that, in contrast to the results for bad news, the disclosure of good news is unrelated to mispricing. This result supports our hypothesis that the disclosure of bad news is more pronounced for overvalued firms in order to avoid short selling. Second, while our main analysis focused primarily on the "frequency" of management forecast revisions, we conducted an analysis that emphasizes the "timeliness" of the revisions. Under Japan's Financial Instruments and Exchange Act, listed firms are required to disclose any significant change in forecast sales and earnings (10% for sales and 30% for earnings) from the most recent forecast. Therefore, we assumed that if the change in the revision amount of forecasted earnings (sales) is less than 30% (10%), it is considered a timely voluntary disclosure rather than a mandatory revision. We find that firms under the threat of short selling are more likely to make voluntary revisions, and this tendency is more pronounced for firms that are overpriced, which supports our hypothesis. Third, we analyze the effect of the degree of short selling threat on management disclosure to mitigate information asymmetries is likely to be more

pronounced when the threat of short selling is stronger. We find that firms with a higher short selling threat disclose more bad news when they are overvalued. Finally, we conducted several robustness analyses, including the parallel trend confirmation and the caliper criteria for propensity score matching. The results of these analyses are generally robust.

This study makes several contributions to previous studies. First, this study contributes to the research on the impact of market pressure on peer firm disclosure by adding insights related to short selling pressure. Prior studies have shown that peer firms of target firms under market pressure, such as hostile takeovers and activism, use management forecasts to avoid the threat. For example, Bourveau and Schoenfeld (2017) focus on hedge fund activism and find that peer firms that have not yet been targeted increase the frequency of management forecasts to reduce information asymmetry. Chen et al. (2022) also show that peer firms of targeted firms in hostile takeovers have incentives to disclose bad news about management forecasts. Our study complements these previous studies by showing that the threat of short selling also affects the disclosure behavior of peer firms.

Second, this study contributes to the research on strategic disclosure of bad news. Prior studies have shown that managers strategically use the timing and frequency of bad news (or good news) disclosures according to their own and the firm's objectives. For example, prior studies show that managers make strategic disclosures depending on the incentives offered in different situations, such as share repurchases, time to management forecast announcements, CEO option exercises, career concerns, or hostile takeovers (Brockman et al. 2008; Kothari et al. 2009; Brockman et al. 2010; Baginski et al. 2018; Chen et al. 2022). This study adds to these studies by demonstrating that managers attempt to avoid the threat of short selling by disclosing bad news. Clinch et al. (2019) have already shown that firms under short selling pressure increase the frequency of bad news disclosures. Our study complements Clinch et al. (2019) by providing evidence that bad news disclosure is more pronounced for overpriced firms, in order to correct mispricing.

Third, this study contributes to the research on short selling regulations. Leuz and Wysocki (2016) argue that empirical studies on the economic consequences of disclosure are biased toward analyses focused on the United States. They then recommend that studies be conducted in other countries in order to obtain comprehensive results. We focus on the Japanese securities market, one of the largest markets in the world, to examine the economic consequences of disclosure regulations. Recent studies on short selling regulation in the United States have focused on Regulation SHO (Reg SHO) as an exogenous shock to investigate the causal relationship between short selling pressure and management forecast disclosure (Li and Zhang, 2015; Clinch et al., 2019; Chen et al., 2020; Jiang et al., 2022). However, our study differs from these studies in the following ways. First, while the research setting of previous studies brought about by Reg SHO clarifies the causal relationship between the threat of short selling and disclosure, it does not reveal the economic consequences of the introduction of short selling disclosure regulations. Focusing on disclosure regulations in Japan provides a meaningful research setting for examining the effects of short selling disclosure regulations. Similar regulations also exist in European countries, but the effects of these regulations are not as significant as in Japan because the target of the regulations is limited to a few stocks (Jones et al., 2016). In addition, the United States does not have short selling disclosure regulations similar to those in Japan and European countries. By focusing on Japan, our study examines the peer effects associated with the introduction of disclosure regulations and finds that mandatory short interest disclosure promotes disclosure by peer firms and improves the information environment.¹ Second, we mitigate the problem of previous studies, namely the endogeneity problem associated with voluntary disclosure, by focusing on Japan's unique management forecast disclosure system, in which almost all firms disclose their earnings forecasts at the

¹ The exceptions are Duong et al. (2015) and Jones et al. (2016) that examine the impact of the introduction of short interest disclosure regulation on investor behavior in the Japanese market (Duong et al., 2015) and the European market (Jones et al., 2016). However, they do not examine the impact of the introduction of the regulation on managers' disclosure behavior.

beginning of the period. Our DID analysis with disclosure regulations as an intervention effect is expected to provide important empirical evidence for a better understanding of short selling disclosure regulations.

Our results are expected to have important implications for regulators overseeing short selling. While many studies debate the pros and cons of the impact of short selling on the stock market, some of them highlight the negative impact of short selling on market efficiency (Jiang et al., 2022). While our study does not provide a conclusive stance on the pros and cons of short selling, it does suggest that mandatory short interest disclosure at least improves the information environment of peer firms. This serves as supportive evidence for the effectiveness of short selling disclosure regulations.

2. Institutional background and hypothesis development

2.1. Institutional background

2.1.1. The introduction of mandatory disclosure of short interest

In the U.S. stock market, previous studies suggest that short selling accounts for a significant portion of stock trading, about 20-31% (Diether et al., 2009; Chen et al., 2020; Jiang et al., 2022). Similarly, short interest is also high in Japan. As of December 23, 2022, the total short selling ratio on the Tokyo Stock Exchange averaged 44.4%, the highest level since 2009 (Nikkei Veritas, December 31, 2022). The importance of short selling in the stock market is growing.

We focus on the mandatory disclosure of large short positions introduced in Japan on November 7, 2008, which requires the disclosure of information on large short positions. The Financial Services Agency of Japan requires traders to report all short positions exceeding 0.25% of outstanding shares for all listed stocks to the exchange within 24 hours. This information is then publicly disclosed within the next 24 hours (Duong et al., 2015).² We

 $^{^2}$ This disclosure regulation was a time-limited measure that took into account the impact of the Lehman shock but was subsequently extended 12 times before becoming a permanent measure in 2013. Specifically, the 2013 short

investigate the intervention effect of mandatory short interest disclosure. Specifically, we examine the relationship between short selling pressure and the disclosure behavior of peer firms in the fiscal periods around 2008, when the disclosure regulation was introduced.

We focus on the disclosure regulation in Japan because it is desirable research setting to test the effects of short selling disclosure regulations. As noted by Jones et al. (2016), in European countries, the regulation was initially applied to only a few stocks. For example, it was initially applied to the stocks undergoing rights issues (United Kingdom) and those of financial firms (France and Spain). In Japan, on the other hand, it was applied to the stocks of *all* listed firms. In the United States, there is no regulation requiring the disclosure of large short positions held by investors.³ Therefore, Japan provides a unique setting to test the effect of the disclosure regulation, as a wide range of firms face the threat of short selling due to the introduction of the regulation, compared with the United States and European countries.

2.1.2. Management forecasts in Japan

This study focuses on the revision of management forecasts in management disclosure. The reasons for focusing on management forecasts are as follows. First, as a means for peer firms to avoid short selling, we need to focus on disclosures that have a large impact on stock prices. Disclosure of management forecasts and their revision has been found to be the most important source of information in the Japanese stock market (Suda and Hanaeda, 2008; Kato et al., 2009; Iwasaki et al., 2023). Second, because the threat of short selling occurs suddenly, regular mandatory quarterly disclosures may not be able to address it in a timely manner. Management forecast revisions are an appropriate subject of our analysis due to their high

selling regulation imposes a reporting requirement when the percentage of outstanding short sales reaches 0.2% or more and requires public disclosure when the percentage reaches 0.5% or more. For more details on Japan's short-selling disclosure regulation, see Duong et al. (2015).

³ In the United States, information of short interests (aggregated by firms) has been released once a month since January 1973 and changed to twice a month after September 7, 2009 (Edwards et al., 2024). See Edwards et al. (2024) for a literature review of academic papers on short selling regulations.

degree of discretion and timeliness.

Disclosure of management forecasts in Japan is made in accordance with the requirements of the Tokyo Stock Exchange. The management forecast disclosure system in Japan is called "kessan tanshin" and its main features can be summarized as follows (Kato et al., 2009; Iwasaki et al., 2023; Kitagawa and Shuto, 2024).

- (1) Listed firms are expected to release point forecasts of annual sales and earnings on each annual earnings announcement date. Thus, managers provide initial forecasts for year t when year t-1 sales and earnings are announced.
- (2) Managers are expected to provide forecasts for sales, operating income, income before extraordinary items and taxes, net income, earnings per share, and dividends per share.
- (3) Forecasts must be updated if there are "significant" revisions in management's estimates, defined as either a change in revenue estimates of 10% (or more) or a change in earnings estimates of 30% (or more; the "Significance Rule"), or both. While the initial forecasts are encouraged by the Listing Rules, these revisions are required by the Financial Instruments and Exchange Act of Japan. Managers release the revised estimates either on the date of the quarterly earnings announcement or at any time during the fiscal period (not on the date of the quarterly earnings announcement).

Compared with the U.S. reporting practice, where management forecast disclosure is voluntary (Li and Zhang, 2015; Clinch et al., 2019; Chen et al., 2020), focusing on Japanese management earnings forecasts has advantages for our analysis. First, such a research setting is expected to avoid the endogeneity problem associated with voluntary disclosure. Second, in Japan, earnings announcements and management forecasts are released simultaneously (bundled forecasts), which greatly reduces the measurement bias of the revision variable caused by the different timing of the disclosure of the initial forecast. Third, many U.S. firms tend to provide range forecasts, while Japanese listed firms provide point forecasts. While previous studies have

shown that range forecasts can lead to measurement error problems (Ciconte et al., 2014; Jensen and Plumlee, 2020), point forecasts in Japanese management forecast practice do not introduce such bias into the analysis. Thus, the Japanese management forecasting system provides a useful framework for analysis.

2.2. Prior studies

2.2.1. Economic consequences of short selling

While short sellers are generally considered to be informed traders and are expected to contribute to efficient stock price formation, prior studies suggest that short selling can have negative effects on firms. For example, short selling increases stock price volatility (Savor and Gamboa-Cavazos, 2011; Hong et al., 2012) and decreases stock prices (Dechow et al., 2001; Jones and Lamont, 2002; Pownall and Simko, 2005; Boehmer et al., 2008; Boehmer and Wu, 2013). In addition, short selling has a potential negative impact on the confidence of investors and other stakeholders in the firm, which in turn can negatively affect the firm's financing and operating activities (e.g., Khanna and Mathews 2012). Therefore, managers have a strong incentive to avoid short selling.

Indeed, it has been reported that the stock prices of firms targeted by short sellers can drop substantially. For instance, on July 27, 2016, activist short-seller Glaucus Research Group (hereafter Glaucus) published a report on Itochu Corporation, one of Japan's leading general trading companies, criticizing the Japanese trading company's accounting and saying its shares are poised to plunge.⁴ Glaucus wrote in its the 42-page "short-biased" report and the shares sank as much as 10 percent before paring losses to end down 6.3 percent, which was the biggest drop on the Nikkei 225 Stock Average.

Further, the negative impacts of short selling have been observed in a wide range of

⁴ https://www.bloomberg.com/news/articles/2016-07-26/short-seller-glaucus-publishes-report-critical-of-japan-s-itochu?leadSource=uverify%20wall

firms, not a few firms. Based on our sample, we observe the changes in stock prices after the disclosure of short interests. Specifically, we form portfolios based on the amount of short selling (short interests), measure buy-and-hold abnormal returns (*BHAR*) for the one month (*BHAR*[0:20]), two months (*BHAR*[0:40]), three months (*BHAR*[0:60]), four months (*BHAR*[0:80]), five months (*BHAR*[0:100]), and six months (*BHAR*[0:120]) after the disclosure date, and trace the mean trends for each group.⁵ Figure 1 shows that, for the group with the large amount of short selling, the stock price declines after one month from the disclosure date. For the group with the small amount of short selling, we also observe that the stock price declines. This is consistent with the argument that being targeted by short sellers can convey bad news to the market. At the same time, this consequence of short selling gives managers a strong incentive to avoid short selling.

(Figure 1 is about here)

2.2.2. Short selling and management forecasts

Although there is limited research investigating the relationship between short selling and management forecast disclosure, prior studies have conducted natural experiments using Reg SHOs to analyze the causal effects of short selling threats on firms' disclosure behavior (Li and Zhang, 2015; Clinch et al., 2019; Chen et al., 2020; Kubick et al., 2021). Li and Zhang (2015) show that under the threat of short selling, firms reduce the accuracy of their bad news management forecasts in order to maintain the current stock price. They also find no significant difference between treatment and control firms in terms of changes in the accuracy of good news forecasts. Clinch et al. (2019) provide evidence that short selling threats (1) promote firms' voluntary disclosure of bad news management forecasts, (2) encourage more timely earnings

⁵ For details of the analysis method, please see the note in Figure 1.

forecasts, or (3) accelerate the release of quarterly bad earnings news. In addition, Chen et al. (2020) examine the impact of short selling threats on long-term management forecasts. They find that firms under the threat of short selling issue more long-term good news forecasts, but the frequency of long-term bad news forecasts remains unchanged.

Previous studies have examined the effect of short selling on the disclosure of management forecasts by distinguishing between bad news and good news forecasts. Although some inconsistencies in the results are observed, it is difficult to draw a clear conclusion due to the different definitions of management forecasts. However, the common implication is that managers have strong incentives to change their disclosure behavior to avoid short selling.

2.3 Hypothesis development

The discussion thus far suggests, first, that short selling has negative economic consequences for managers, such as lower stock prices, and second, that managers use disclosure to avoid being shorted. Our concern is to investigate whether managers of peer firms of short selling target firms use disclosure to avoid being shorted as well, following the regulation of short interest disclosure.

In theory, managers have several strategies to avoid short selling. Previous research has shown that factors such as accounting fundamentals, market capitalization, book-to-market ratio, and momentum are associated with short selling (Dechow et al., 2001; Drake et al., 2011; Jiang et al., 2022). While managers may be able to avoid short selling by taking actions based on these factors, they may be reluctant to do so in practice. The reason is that managers cannot fully anticipate short sellers' decisions regarding their firms. Changing the aforementioned factors is costly for firms and not easily achievable (Bourveau and Schoenfeld, 2017).

One of the most cost-effective ways for managers to avoid short selling is to mitigate information asymmetry in capital markets by improving disclosures (Bourveau and Schoenfeld, 2017). Specifically, first, disclosures can eliminate opportunities for alpha generation and

arbitrage trading by converging stock prices to their fundamental values. Short sellers target mispriced firms, especially overpriced ones, in order to earn excess returns. Increasing the quantity and quality of disclosures significantly reduces information asymmetry for firms and makes them less attractive to short sellers. Second, improving disclosure serves as a useful signal to existing shareholders and other investors, thereby enhancing the confidence and reputation of managers. The implementation of short selling can influence the risk perception of other investors and potentially encourage short selling (Chen et al., 2020). Improved disclosure by managers is expected to mitigate such possibilities. Third, short selling can have adverse effects on other stakeholders, such as counterparties other than investors (Goldstein and Guembel 2008; Khanna and Mathews, 2012; Chen et al., 2020). Current or potential stakeholders may view a short position as a bad signal about future performance and reassess the business relationship. Improved disclosure serves as a good signal to stakeholders.

Based on the above discussion, we predict that managers under the threat of short selling will improve disclosures to mitigate information asymmetry. Specifically, we hypothesize that managers will increase the frequency of revisions to management forecasts.

H1: The threat of short selling is positively associated with the frequency of management forecast revisions.

However, it is important to note that managers may use management forecasts from a more strategic perspective rather than to reduce information asymmetry. Li and Zhang (2015) find that under the threat of short selling, managers strategically reduce the accuracy of bad news in order to reduce the stock price reaction to bad news. In addition, Chen et al. (2022) find that firms under the threat of corporate control, such as hostile takeovers, become more proactive in disclosing bad news. This is because the disclosure of bad news increases uncertainty about the firm's value, making it more difficult to value the firm (Rogers et al.,

2009; Peng et al., 2020; Chen et al., 2022). In other words, bad news disclosure makes it difficult for short sellers to assess whether the target firm is undervalued or overvalued (Chen et al., 2022), thereby limiting their short interest. These arguments suggest that managers strategically use bad news disclosure to worsen the information environment of firms in order to avoid short selling, which is inconsistent with our first hypothesis.⁶

To address this issue, we examine the relationship between firm mispricing and the disclosure of bad news in management forecasts. Specifically, we divide the sample into subsamples that disclose good news (upward forecast revision) and bad news (downward forecast revision) and compare the frequency of management forecast revisions in the two groups. Our main interest is in the disclosure of bad news for overpriced firms. As our hypothesis predicts, if managers disclose bad news to mitigate information asymmetry, such disclosure should be more pronounced for overpriced firms than for underpriced firms. Managers of overpriced firms can correct overvaluation by frequently communicating bad news, which is close to private information, to the market. This simultaneously eliminates the potential returns for short sellers and reduces the attractiveness as a short target.

If the alternative prediction is valid, i.e. that the disclosure of bad news makes it more difficult to assess the value of the firm, we would not observe that the disclosure of bad news is more pronounced for overpriced firms than for underpriced firms.

H2: The positive association between the threat of short selling and the frequency of bad news disclosure (downward revision of forecasts) is more pronounced for overpriced firms.

⁶ It is worth noting that these studies show that managers disclose bad news in order to avoid short selling. The disclosure of bad news by managers is expected to have the same negative economic consequences for firms as short selling. Nevertheless, managers may disclose bad news because they perceive the negative consequences of being shorted to be much greater than the negative consequences of disclosing bad news. We also regard this assumption as quite reasonable, since we confirm in Section 2.2.1 that short selling disclosure has substantial negative stock price effects on firms.

In addition, we examine the relationship between the mispricing of firms and the disclosure of good news, but we cannot make a clear prediction. If managers aim to reduce information asymmetry, one would expect underpriced firms to disclose good news more frequently. However, since our treatment sample consists of firms under short selling pressure, it is unpredictable whether they have a stronger interest in improving underpricing compared to other general firms.

3. Sample selection and research design

3.1. Sample selection

The sample composition is summarized in Figure 2. Our sample consists of three components: target firms, peer firms, and non-matched firms. The target firms are firms that are actually shorted. The peer firms are defined as firms for which short sellers do not have large short positions, but which have similar characteristics to the target firms. These are the firms that face the threat of short selling, which is our primary concern. As shown in Panel A of Figure 2, to identify peer firms, we perform a propensity score matching analysis using both target and non-target firms, and non-target firms matched to target firms are considered peer firms. We also define non-matched firms as firms for which short sellers do not have large short positions, but which do not have similar characteristics with target firms. These non-matched firms are firms that do not face the threat of short selling and are defined as firms that are not peer firms among non-target firms. As shown in Panel B, to test hypotheses 1 and 2, we compare peer firms as the treatment sample and non-matched firms as the control sample (target firms are not used to test the hypotheses).

(Figure 2 is about here)

To collect information on large short positions, we use the QUICK workstation, which provides

historical data on short selling.⁷ This database provides the following contents: (1) the name of the short sellers (both abbreviations and official names), (2) the ticker of the firms targeted by the short sellers (targeted firms), (3) the name of the targeted firms, (4) the date on which the reporting obligation arose, (5) the date on which the short sellers reported information on the balance of large short positions, (6) the balance of large short positions (the number of stocks), (7) the percentage balance of large short positions, and (8) the number of shares outstanding.

Our sample selection procedure for propensity score matching can be summarized as follows. First, we identify our initial sample using data from the Nikkei NEEDS Financial QUEST.⁸ Our initial sample for propensity score matching consists of 2,765 firms whose fiscal year ends in March 2008.⁹ Second, to estimate equation (1), we obtain market data from daily return data for Japanese listed stocks (provided by Financial Data Solutions, Inc.),¹⁰ financial data from the Nikkei NEEDS Financial QUEST, and analyst consensus data from the IFIS Consensus.¹¹ We eliminate firms based on data availability. Specifically, firms are delated for missing data on actual earnings surprise (72 firms), forecast earnings surprise (126 firms), and total accruals (3 firms), book-to-market ratio (5 firms). In addition, firms are dropped for delisting or changing the fiscal period after the implementation date of the regulation (158 firms). Our final propensity score matching sample consists of 628 target firms and 1,737 non-target firms.

⁷ As we explained above, the TSE publishes information on large short positions on its website (https://www.jpx.co.jp/english/markets/public/short-selling/01.html). However, we cannot access the original data for periods prior to the most recent year on the website. In contrast, QUICK corp. provides the historical data through QUICK workstation.

⁸ The Nikkei is one of the business media in Japan, and the Nikkei NEEDS Financial QUEST is widely used by researchers to collect financial data. See https://finquest.nikkeidb.or.jp/ver2/online/index_en.htm for details.

⁹ To ensure that the assumptions of a DID analysis are met, we focus on firms whose fiscal year ends in March. In a DID analysis, it is necessary to assume that "no other events affecting outcomes have occurred between the pre- and post-intervention periods, or if they have occurred, they are shocks common to all firms". If the fiscal years differ between firms, the common shock assumption is more likely to be violated, so the fiscal years of the firms in the analysis are aligned. In Japan, since about 70% of firms end their fiscal year in March, we decided to restrict a DID analysis to firms with a fiscal year ending in March.

¹⁰ See https://www.fdsol.co.jp/academic/acproduct-list/data01/ for details.

¹¹ IFIS Japan is a data vendor of financial data in Japan. See https://www.ifis.co.jp/en/investment/consensus_data.php for details.

Similarly, our sample selection procedure for hypotheses 1 and 2 is summarized as follows. Our initial sample consists of 1,108 peer firms and 426 non-matched firms, which are selected based on the matching procedure explained in the next section. For each group, we need data both before and after the implementation date of the regulation. In the pre-period, the independent variables are measured in the fiscal year ending March 2007. Similarly, in the post-period, they are measured in the fiscal year ending March 2009. As well as propensity score matching, we obtain financial data from the Nikkei NEEDS Financial QUEST, market data from the Nikkei Portfolio Master, and analyst consensus data from the IFIS Consensus. We drop observations based on data availability. Specifically, we drop firms without management forecasts in either the pre- or post-period (49 observations). In addition, we drop observations with missing values of actual earnings surprise (62 observations), book-to-market ratio (3 observations), and management forecast revisions in the prior year (1 observation). Finally, we drop firms with missing observations in either the pre- or post-period (64 observations). The final sample consists of 1,016 matched firms and 397 non-matched firms.

3.2. Research design

3.2.1. Propensity score matching

Equation (1) is a propensity score matching specification for the disclosure of large short positions. Table 1 presents the variable definitions. To perform propensity score matching, we first identify target firms. Target firms in this study are firms whose large short positions were disclosed by the TSE in the period immediately following the implementation of the mandatory disclosure regulation. Therefore, we set *BlanceInfo*, which is the variable that takes 1 if information on large short positions is disclosed at least once in the period of about one year immediately after the implementation of the mandatory disclosure rule (from June 1, 2009 to one day before the earnings announcement date), and 0 otherwise. The period for measuring *BlanceInfo* coincides with the period for examining the management disclosure behavior of peer

firms after the implementation date of the regulation in testing the hypotheses 1 and 2. The details of the timeline are explained in section 3.2.2. The subscript i in the equation represents each firm.¹²

$$Logit(Pr [BalanceInfo_{i} = 1|X])$$

$$= \beta_{0} + \beta_{1}AES_{i} + \beta_{2}FES_{i} + \beta_{3}TA_{i} + \beta_{4}Log(MVE)_{i} + \beta_{5}E/P_{i}$$

$$+ \beta_{6}B/M_{i} + \beta_{7}Turnover_{i} + \beta_{8}SalesGrowth_{i}$$

$$+ \beta_{9}PriceMomentum_{i} + \beta_{10}PriorForecastRevisions_{i}$$

$$+ \beta_{11}ForeignOwnership_{i} + \beta_{12}Log(AnaCov)_{i}$$

$$+ \sum_{j=0}^{n} \gamma_{j}MarketDummies_{i}$$

$$(1)$$



As mentioned above, previous studies have shown that factors such as accounting fundamentals, market capitalization, market-to-book ratio, and momentum are associated with short seller activities (Dechow et al., 2001; Drake et al., 2011; Jiang et al., 2022). Following the explanations of Drake et al. (2011), we include the following variables as independent variables in equation (1): accounting variables, valuation variables, and momentum variables. The determinants of *BalanceInfo* are measured during the fiscal year ending in March 2008, because this period is the last fiscal year ending in March before the implementation date of the regulation.

The accounting variables are actual earnings surprise (*AES*), forecast earnings surprise (*FES*), and total accruals (*TA*). Previous studies show that *AES* and *FES* are positively related to

¹² In the following analysis, variables are winsorized at the 1st and 99th percentiles of their values. Exceptions are binary variables and variables that are log-transformed.

future stock returns (e.g., Ball and Brown 1968; Bernard and Thomas 1989; Ng and Verdi 2013), while *TA* is negatively related to future stock returns (e.g., Sloan 1996). Therefore, since negative *AES* and *FES* (positive *TA*) are indicators of negative future stock returns and short sellers have incentives to short these firms, we predict that *AES* and *MFS* (*TA*) are negatively (positively) related to *BalanceInfo*.

The valuation variables are the log of the market value of equity (Log(MVE)), the earnings to price ratio (E/P), the book to market ratio (B/M), and the stock turnover (Turnover). Dechow et al. (2001) argue that firms with low ratios of fundamentals (such as earnings and book values) to market values are known to have systematically lower future stock returns. Based on this, we predict that lower E/P and B/M are related to lower future stock returns and that they are negatively related to *BalanceInfo*. In contrast, it is difficult to present the empirical predictions for Log(MVE) and Turnover because these variables capture different aspects of firm valuation, such as the information environment and stock liquidity. As mentioned in Drake at al. (2011), it is reasonable to assume that short sellers invest considerable time and resources in analyzing firms and put their own capital at risk. In general, short sellers should prefer firms: the information environment is rich and the risks associated with short selling (trading costs) are low. Therefore, we predict that Log(MVE) and Turnover are positively related to *BalanceInfo*.

The growth variable is the annual sales growth (*SalesGrowth*). Lakonishok et al. (1994) show that firms with high past sales growth earn lower subsequent stock returns. Based on this, we predict that *SalesGrowth* is positively related to *BalanceInfo*.

The momentum variables are *PriceMomentum* and *PriorForecastRevisions*. As suggested by Lakonishok et al. (1994), if past stock returns are positively related to future stock returns, short sellers predict lower future stock returns when past stock returns are low. Also, assuming that management forecast revisions are positively related to future stock returns, downward revisions of management forecasts in the prior year would send negative signals (lower future stock returns) to short sellers. Therefore, *PriceMomentum* and

PriorForecastRevisions are predicted to be negatively related to BalanceInfo.

In addition, we include the percentage of foreign ownership (*ForeignOwnership*) as a variable for ownership structure, the log of analyst coverage (Log(AnaCov)) as a variable for information environment, and the listing section dummies (*MarketDummies*) as variables to control for factors related to listing sections. As with Log(MVE) and *Turnover*, it is difficult to present empirical predictions in advance. However, assuming that these variables are related to the information environment, it can be assumed that higher analyst coverage and higher foreign ownership are positively related to the information environment. Moreover, it is reasonable to assume that the information environment differs by listing section. Therefore, it is possible that *ForeignOwnership* and Log(AnaCov) are positively related to *BalanceInfo* and *MarketDummies* are a determinant of *BalanceInfo*.

Table 2 shows the descriptive statistics of the variables used in equation (1) for firms with information on large short positions (*BalanceInfo*=1) and those without (*BalanceInfo*=0). Compared to the firm with *BalanceInfo*=0, the firms with *BalanceInfo*=1 have the following characteristics: their market value of equity is large (Log(MVE)), their book-to-market ratio is small (*B/M*), their stock turnover is high (*Turnover*), and their foreign ownership is large (*ForeignOwnership*).

(Table 2 is about here)

Table 3 shows the estimation result of equation (1). The result shows that the probability of disclosing information about large short positions is higher for firms with larger accruals (*TA*), larger market value of equity (*Log(MVE)*), smaller earnings to price ratios (*E/P*), higher trading turnover (*Turnover*), downward stock price trends (*PriceMomentum*), upward management forecast revisions (*PriorForecastRevisions*), higher foreign ownership (*ForeignOwnership*), and more analyst coverage (*Log(AnaCov*)). The signs of the estimated

coefficients are consistent with our predictions, except for *Log(MVE)* and *PriorForecastRevisions*.

(Table 3 is about here)

After obtaining the propensity score for each firm, we match each target firm with firms with *BalanceInfo*=0 for the following procedures.¹³ First, for each target firm, we keep firms with *BalanceInfo*=0 in the same industry. Second, we compute the difference in propensity scores between each target firm and firms with *BalanceInfo*=0 in the same industry. Third, for each target firm, we keep firms whose difference in propensity scores is within the caliper (the value of 0.2 times the standard deviation of the propensity scores),¹⁴ assuming that firms whose difference in the propensity scores is within the caliper face the threat of short selling from the disclosure of information on large short positions.¹⁵ We repeat these procedures for each target firm, and the firms that were selected as peer firms at least once in the series of steps constitute the final sample of peer firms.¹⁶ As a result, the number of peer firms is 1,108 and the number of non-matched firms (firms that are not selected as peer firms) is 426.

3.2.2. Hypotheses 1 and 2

To test hypotheses 1 and 2, we conduct a DID analysis to examine the effect of mandatory disclosure of large short positions on management disclosure behavior. Figure 3 illustrates the timeline for hypotheses 1 and 2. As explained above, we restrict the initial sample to firms

¹³ When selecting peer firms, we exclude firms outside common support.

¹⁴ The caliper is the upper limit of the difference in the propensity score when matching based on the propensity score. Robustness tests show the effect of changing the caliper criteria on the results of the analysis.

¹⁵ Compared to the common method of *one-to-one* matching based on propensity scores, our method selects more firms as peers. The reason for using this method is based on the more realistic assumption that there may be more than one firm that perceives a threat when it sees a competitor being shorted.

¹⁶ Once a firm is selected as a peer firm, it is also used to select a peer firm for the next target firm (restoration extraction), so it can be selected as a peer firm multiple times in the matching process.

whose fiscal year ends in Match. We analyze management disclosure behavior during windows before and after the implementation date of the regulation. To identify the effect of short selling threat on management disclosure behavior, we focus on management forecast revisions. As we explained above, managers release sales and earnings forecasts on the earnings announcement date and subsequently revise them. After the implementation date, managers release their forecasts from April 1 to May 15 initially according to the requirements of the TSE.¹⁷ In order to align the time period for analyzing management disclosure behavior across firms, we focus on management forecast revisions from June 1 to one day before the earnings announcement date.¹⁸ Therefore, in a DID analysis, we define the pre-period (the post-period) as the period from June 1, 2007 (2009) to one day before the next earnings announcement date.¹⁹

(Figure 3 is about here)

We estimate the coefficients of equation (2) by using a firm fixed effects regression. The dependent variable of equation (2) is the number of management forecast revisions (*#Revisions*). We focus on management forecasts for sales, ordinary income and net income and analyze the subsequent revisions after their release.²⁰ The subscript *i* represents each firm and *t* represents each period (the pre-period and the post-period). Table 4 illustrates a case where a

¹⁷ The TSE requires listed firms to make earnings announcements within 45 days after the fiscal year. Accordingly, firms whose fiscal year ends in March make earnings announcements by mid-May.

¹⁸ Note that this research design has some limitations: we cannot exclude the possibility that short sellers had large short positions for peer firms and non-matched firms during the period from the earnings announcement date to May 31. However, considering that a firm announces its earnings on May 15, 2009, the period during which we cannot determine whether there is information about large short positions for the firm is about 10 days. In reality, it would be quite rare for managers to revise during this period because it is just after the earnings announcement date. Our inability to analyze short selling for the month of May 2009 is due to the limited availability of short selling data. The QUICK workstation we used only contains data from June 1, 2009. In addition, as mentioned above, the TSE has already removed historical short selling information from its website.

¹⁹ We exclude the period from June 1, 2008 to one day before the next earnings release because this period includes both the pre-implementation and post-implementation periods.

²⁰ In addition, operating income forecasts are also disclosed at the time of the earnings release, but the data for the forecasts are only available for the period after September 30, 2007. Therefore, they are excluded from the analysis in this study.

firm revises management forecasts three times during a given period. Based on this case, we explain how to count the number of management forecast revisions for each firm. On the first announcement date (date 1), the sales and ordinary income forecasts are revised. On the second announcement date (date 2), the sales forecast is revised. On the third announcement date (date 3), the sales, ordinary income and net income forecasts are revised. Therefore, in this case, the number of management forecast revisions (*#Revisions*) is six.

$$\begin{aligned} \#Revisions_{it} &= \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 AES_{it} + \beta_4 FES_{it} \end{aligned} \tag{2} \\ &+ \beta_5 TA_{it} + \beta_6 Log(MVE)_{it} + \beta_7 E/P_{it} + \beta_8 B/M_{it} + \beta_9 Turnover_{it} \\ &+ \beta_{10} SalesGrowth_{it} + \beta_{11} PriceMomentum_{it} \\ &+ \beta_{12} PriorForecastRevisions_{it} + \beta_{13} ForeignOwnership_{it} \\ &+ \beta_{14} Log(AnaCov)_i + \varepsilon_{it} \end{aligned}$$

(Table 4 is about here)

The variable of interest is *PeerFirms*Post*, where *Post* is a variable that takes 1 if the period is after the implementation date of the regulation and 0 otherwise, and *PeerFirms* is a variable that takes 1 if the firm is a peer firm and 0 otherwise. According to hypothesis 1, the expected sign of the coefficient on *PeerFirms*Post* is positive because the threat of short selling increases the frequency of management disclosure.

The other independent variables are identical to those in equation (1), except that market dummies are not included. In hypotheses 1 and 2, we present empirical predictions about the relationship between management forecast revisions and control variables, assuming that managers have an incentive to reduce information asymmetry between managers and outside stakeholders.

The first is information asymmetry. Managers have an incentive to reduce information

asymmetry when it is large (e.g., Ajinkya and Gift 1984). Previous studies report that information asymmetry is smaller for firms with a large market value of equity than for firms with a small market value of equity (e.g., Frankel and Li 2004). In addition, analyst ratings of disclosure quality are associated with greater analyst following, greater institutional ownership, and greater stock liquidity (Healy et al. 1999), suggesting that information asymmetry is low for firms with these characteristics. Therefore, we expect that managers of firms with low market value of equity, no analyst coverage, low foreign ownership, and low stock turnover have strong incentives to mitigate information asymmetry between managers and outside stakeholders. Therefore, *Log(MVE)*, *Log(AnaCov)*, *ForeignOwnership*, and *Turnover* are negatively related to *#Revisions*.

The second is firms' growth opportunities. Here, we consider how firms' growth opportunities are related to managers' incentives to mitigate information asymmetry between managers and outside stakeholders. Previous studies show that firms with growth opportunities have a strong incentive to seek external financing (e.g., Frankel et al. 1995). For these firms, voluntary disclosure is an effective way to reduce information asymmetry because voluntary disclosure is expected to lower the cost of capital. Therefore, we expect that *AES*, *FES*, *TA*, *E/P*, *B/M*, *SalesGrowth*, *PriceMomentum*, and *PriorForecastRevisions* capture some aspects of firms' growth opportunities. Specifically, negative *E/P* and *B/M* (positive *AES*, *FES*, *TA*, *SalesGrowth*, *PriceMomentum*, and *PriorForecastRevisions*) indicate that firms have growth opportunities. Given these assumptions, we predict that *E/P* and *B/M* (*AES*, *FES*, *TA*, *SalesGrowth*, *PriceMomentum*, and *PriorForecastRevisions*) are negatively (positively) related to *#Revisions*. In addition, *MarketDummies* would capture some aspect of firms' growth opportunities.

In hypothesis 2, we focus on the behavior of managers releasing bad news to correct equity overpricing. We estimate the coefficients of equation (3) using a firm fixed effects regression.

$$#BadNews_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 Overpriced_{it}$$
(3)
+ $\beta_4 PeerFirms_{it} * Post_{it} * Overpriced_{it} + \beta_5 AES_{it} + \beta_6 FES_{it}$
+ $\beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it}$
+ $\beta_{11} Turnover_{it} + \beta_{12} SalesGrowth_{it} + \beta_{13} PriceMomentum_{it}$
+ $\beta_{14} PriorForecastRevisions_{it} + \beta_{15} ForeignOwnership_{it}$
+ $\beta_{16} Log(AnaCov)_i + \varepsilon_{it}$

The dependent variable of equation (3) is the number of bad news announcements (*#BadNews*). In Table 5, we show the procedure for identifying whether a management forecast revision announced on a given date is bad news. We illustrate a case where a given firm revises its forecast three times during a given period. To determine whether managers are announcing bad news, we focus on whether there are more downward revisions than upward revisions on each revision date. On the first announcement date (date 1), the news is not bad news because there is one upward and one downward revision. On the second and third announcement dates (dates 2 and 3), there are more downward revisions than upward revisions, indicating that the news is bad. Therefore, the number of bad news announcements (*#BadNews*) in this case is two.

(Table 5 is about here)

To test hypothesis 2, we focus on whether a stock is overpriced in the market. *Overpriced* takes 1 if the first principal component for a firm is above the median, and 0 otherwise. The first principal component is obtained from the principal component analysts. As often pointed out, it is not clear a priori what is desirable as a measure of mispricing (Gu and Lev, 2011). Therefore, in this study, we define a mispricing variable by integrating several variables related to equity mispricing. Specifically, we conduct a principal component analysis using these variables: abnormal accruals (*AbnormalAccruals*), industry-adjusted book-to-market ratio (*Adj-B/M*), and industry-adjusted earnings-to-price ratio (*Adj-E/P*).²¹ We estimate a CFOadjusted Jones model for each industry and period and obtain abnormal accruals. We compute the industry-adjusted book-to-market ratio and the industry-adjusted earnings-to-price ratio by subtracting the median value for each industry from the value for each firm. As we stated in hypothesis 2, if overpriced peer firms have more incentive to disclose bad news than the other peer firms, the estimated coefficient of *PeerFirms*Post*Overpriced* is expected to be positive.

As mentioned above, we assume that managers have an incentive to revise their forecasts especially when firms' information asymmetry is high. Based on this assumption, we predict that *Log(MVE)*, *Log(AnaCov)*, *ForeignOwnership*, and *Turnover* are negatively related to *#BadNews*. In contrast, we consider that *AES*, *FES*, *TA*, *E/P*, *B/M*, *SalesGrowth*, *PriceMomentum*, and *PriorForecastRevisions* are variables related to firms' growth opportunities, but the empirical predictions are somewhat different from those in equation (1). Specifically, when managers have a negative outlook on firms' growth opportunities, managers are more likely to announce bad news to reduce information asymmetry between managers and outside stakeholders. Therefore, we predict that *E/P* and *B/M* (*AES, FES, TA, SalesGrowth, PriceMomentum*, and *PriorForecastRevisions*) are positively (negatively) related to *#BadNews*.

Table 6 shows the descriptive statistics of the variables used in equations (2) and (3). To confirm the changes in the variables from the pre-period to the post-period, we show four descriptive statistics by each group (*PeerFirms*=1 and *PeerFirms*=0) and period (*Post*=1 and *Post*=0). In summary, the number of management forecast revisions (*#Revisions*) increases from the pre-period to the post-period for both peer and non-matched firms, but the magnitude of the increase is greater for peer firms. Specifically, a comparison of Panels A and B shows that *#Revisions* of peer firms increase by 0.827 (4.575-3.747), which is larger than the 0.048 (4.343-

²¹ In addition to peer and non-matched firms, target firms are also included in the principal components analysis. Previous studies have used several variables to capture the degree of overpricing. For example, Gu and Lev (2011) use three variables of overpricing: industry-adjusted price-to-earnings ratio, abnormal accruals, and financing through equity issuance, and integrate these variables into a principal components analysis as in this study. Dong et al. (2012) use book-to-market and price-to-earnings ratios.

4.259) of non-matched firms shown in Panels C and D. The number of bad news announcements (*#BadNews*) decreases at the same level from the pre-period to the post-period for both peer and non-matched firms. The changes in accounting and stock price performance (*AES*, *SalesGrowth*, and *PriceMomentum*) worsen from the pre-period to the post-period for both peer firms and non-matched firms. As for other characteristics, peer firms tend to have higher foreign ownership (*ForeignOwnership*) and higher analyst coverage (*Log(AnaCov)*) than non-matched firms.

(Table 6 is about here)

4. Main Results

4.1. Hypothesis 1

Table 7 reports the estimation result of equation (2) to test hypothesis 1. The result shows that the estimated coefficient of *PeerFirms*Post*, 0.0617, is significantly positive at the 1% level, indicating that in the period following the implementation of the regulation, peer firms (firms facing the threat of short selling) increase the frequency of management forecast revisions. Based on hypothesis 1, we interpret the result as peer firms improving their disclosure in order to reduce information asymmetry between managers and outside stakeholders.

As for the control variables on firms' growth opportunities, the estimated coefficient of *TA* is significantly positive at the 5% level. On the other hand, regarding the control variables on information asymmetry, the signs of the estimated coefficients of *Log(MVE)*, *ForeignOwnership*, and *Log(AnaCov)* are consistent with our prediction, but they are not statistically significant. Contrary to our prediction, *Turnover (SalesGrowth)* is positively (negatively) related to *#Revisions*.

(Table 7 is about here)

4.2. Hypothesis 2

As we stated above, if managers disclose bad news to mitigate equity overpricing and avoid short selling, such disclosure is more pronounced for overpriced firms than the other peer firms. Table 8 presents the estimation result of equation (3) to test hypothesis 2. The result shows that the estimated coefficient of *PeerFirms*Post*Overpriced*, 0.233, is significantly positive at the 1% level, indicating that overpriced peer firms increase bad news disclosure in the period following the implementation of the regulation. The result suggests that the overpriced peer firms frequently disclose bad news in order to correct equity overpricing and reduce the likelihood of being targeted by short sellers.

Consistent with our prediction, *AES*, *SalesGrowth*, and *PriceMomentum* are negatively related to *#BadNews*, suggesting that managers who have a negative outlook on firms' growth opportunities release bad news to reduce information asymmetry between managers and external stakeholders. Similar to equation (1), the estimated coefficients of *Turnover* and *ForeignOwnership* (information asymmetry variables) are negative but not statistically significant.

(Table 8 is about here)

5. Additional analyses

5.1. The disclosure of good news

In hypothesis 2, we interpret bad news disclosures by overpriced peer firms as correcting stock overpricing and reducing the possibility that short sellers will target them. If this interpretation is correct, overpriced peer firms should not have a strong incentive to frequently disclose good news. This is because the disclosure of good news increases the potential excess returns for short sellers. Table 9 presents the estimation result of the regression with the number of good news disclosures (*#GoodNews*) as the dependent variable. The result shows that the estimated

coefficient for *PeerFirms*Post*Overpriced*, -0.082, is not statistically significant, indicating that whether they are overpriced or underpriced does not explain management disclosure of good news.

(Table 9 is about here)

5.2. Timely disclosure

The main analysis focuses on the frequency of management forecast revisions and the disclosure of bad news. Here, we examine how timely managers revise forecasts and disclose bad news. As mentioned above, according to Japan's Financial Instruments and Exchange Act, listed firms are required to disclose any change of 30% or more (10% for sales) in their forecast earnings compared to their most recent forecast. Therefore, we assume that managers revise forecasts within the threshold when they have a strong incentive to reduce information asymmetry between managers and outside stakeholders.

Table 10 shows the estimation results, which indicate that the estimated coefficient of *PeerFirms*Post*, 0.381, is significantly positive when the frequency of timely forecast revisions (*#Timely_Revisions*) is the dependent variable. Similarly, the estimated coefficient of *PeerFirms*Post*Overpriced*, 0.185, is significantly positive when the number of timely bad news announcements (*#Timely_BadNews*) is the dependent variable. These results support our predictions; peer firms revise sales and earnings forecasts to reduce information asymmetry, and overpriced peer firms release bad news to correct stock overpricing and reduce the likelihood that short sellers will target them.

(Table 10 is about here)

5.3. The degree of short selling threat

In the main analyses, we predict that peer firms face the threat of short selling when information on large short positions is disclosed. If this prediction is valid, management disclosure to mitigate information asymmetry should be more pronounced the greater the threat of short selling. Here, we assume that the threat of peer short selling is greater when target firms are shorted by active short sellers, such as hedge funds.

To test this prediction, we define "active short sellers" as follows. First, for each short seller and target firm, we calculate the average short interest (short interest is measured as short volume divided by the number of shares outstanding) during the post-period. It reflects how much a short seller, on average, shorts a firm during the post-period. Second, for each short seller, we calculate the sum of the average short interest (hereafter the activeness of short sellers). It indicates the extent to which a short seller has positions in his portfolio. Third, we sort the short sellers based on the activeness of short sellers and identify "active short sellers".

Figure 4 shows the result of the ranking of the activeness of short sellers. In summary, Morgan Stanley is ranked first, and Goldman Sachs is ranked second. The activeness of Morgan Stanley is 13.69% and that of Goldman Sachs is 12.57%. Citigroup, on the other hand, ranks third and that of Citigroup is 5.93%, which is less than half that of Morgan Stanley and Goldman Sachs. Therefore, we assume that Morgan Stanley and Goldman Sachs are active short sellers.

(Figure 4 is about here)

In this section, we use two variables on the impact of active short sellers. First, *AS* takes 1 if target firms are shorted by active short sellers and 0 otherwise. Second, *IAS* takes 1 if AS takes 1 and peer firms are in industries where active short sellers (both Morgan Stanley and Goldman Sachs) actively engage in short selling, and 0 otherwise. The second variable assumes that the threat of short selling to peer firms is more pronounced when active short sellers short

other firms in the same industry as the peer firms.

$$\begin{aligned} \#Revisions_{it} &= \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} \end{aligned} \tag{4} \\ &* AS_{it} + \beta_3 AES_{it} + \beta_4 FES_{it} + \beta_5 TA_{it} + \beta_6 Log(MVE)_{it} + \beta_7 E/P_{it} \\ &+ \beta_8 B/M_{it} + \beta_9 Turnover_{it} + \beta_{10} SalesGrowth_{it} \\ &+ \beta_{11} PriceMomentum_{it} + \beta_{12} PriorForecastRevisions_{it} \\ &+ \beta_{13} ForeignOwnership_{it} + \beta_{14} Log(AnaCov)_i + \varepsilon_{it} \end{aligned}$$

$$#BadNews_{it} = \beta_{0} + \beta_{1}Post_{it} + \beta_{2}PeerFirms_{it} * Post_{it} + \gamma_{0}PeerFirms_{it} * Post_{it}$$
(5)

$$* AS_{it} + \beta_{3}Overpriced_{it} + \beta_{4}PeerFirms_{it} * Post_{it} * Overpriced_{it}$$

$$+ \gamma_{1}PeerFirms_{it} * Post_{it} * Overpriced_{it} * AS_{it} + \beta_{5}AES_{it}$$

$$+ \beta_{6}FES_{it} + \beta_{7}TA_{it} + \beta_{8}Log(MVE)_{it} + \beta_{9}E/P_{it} + \beta_{10}B/M_{it}$$

$$+ \beta_{11}Turnover_{it} + \beta_{12}SalesGrowth_{it} + \beta_{13}PriceMomentum_{it}$$

$$+ \beta_{14}PriorForecastRevisions_{it} + \beta_{15}ForeignOwnership_{it}$$

$$+ \beta_{16}Log(AnaCov)_{i} + \varepsilon_{it}$$

Panel A in Table 11 shows the estimation results of equation (4) for hypothesis 1. In summary, when we use *AS* as the variable of short selling threat, the estimated coefficient of *PeerFirms*Post*AS*, 0.324, is not statistically significant. Even when we use *IAS*, the result shows the similar pattern. Panel B in Table 11 is the estimation result of equation (5) for hypothesis 2. The estimated coefficient of *PeerFirms*Post*Overpriced*AS*, 0.126, is not statistically significant, while the estimated coefficient of *PeerFirms*Post*Overpriced*IAS*, 0.376, is statistically significantly positive at the 5% level.

(Table 11 is about here)

The estimation results in Table 11 suggest the following. First, peer firms increase the frequency of management forecast revisions regardless of whether target firms are shorted by active short sellers or not. Second, peer firms are more likely to disclose bad news when target firms are shorted by active short sellers and these active short sellers are actively shorting firms in the same industry as the peer firms. Note, however, that this effect is only observed when overpriced peer firms disclose bad news to mitigate information asymmetry. Taken together, the prediction that the threat of short selling is stronger when short sellers are actively involved in short selling is partially supported (only for hypothesis 2).

6. Robustness tests

6.1. The confirmation of parallel trends

In a DID analysis, it is necessary to assume that the outcome variable indicates a parallel trend in the period preceding the economic event of interest. Therefore, we check whether the frequency of management forecast revisions shows a parallel trend for both peer and nonmatched firms in the period from the fiscal year ending March 2006 to that ending March 2008 (the three years prior to the disclosure regulation).²² First, we confirm this assumption graphically in Figure 4. The solid line is the mean of *#Revisions* for peer firms, while the dotted line is that for non-matched firms. The figure shows that before the implementation date of the regulation (2006-2008), the frequency of management forecast revisions generally shows the similar trend. Furthermore, after the implementation date of the regulation, we can see that the frequency of revisions of peer firms increases sharply.

(Figure 4 is about here)

²² We exclude the fiscal year ending in March 2009 because this period includes the period before the implementation date and that after the implementation date.

$$\begin{aligned} \#Revisions_{it} &= \beta_0 + \beta_1 FY2007_{it} + \beta_2 FY2008_{it} + \beta_3 FY2010_{it} + \beta_4 PeerFirms_{it} \\ &* FY2007_{it} + \beta_5 PeerFirms_{it} * FY2008_{it} + \beta_6 PeerFirms_{it} \\ &* FY2010_{it} + \varepsilon_{it} \end{aligned}$$
(6)

Second, we test this assumption statistically in Table 12. In equation (6), we regress *#Revisions* on *PeerFirms*, indicator variables for years (*FY2007*, *FY2008*, and *FY2010*), and these interaction terms.²³ If the estimated coefficients of *Peer*Firms*FY2007* and *Peer*Firms*FY2008* are significantly different from zero, it indicates that the frequency of management forecast revisions shows a different trend between peer firms and non-matched firms in the pre-period. The result in Table 12 shows that the estimated coefficients of *Peer*Firms*FY2007* and *Peer*Firms*FY2008* are not statistically significant, indicating that there are no major problems in assuming a parallel trend in the frequency of management forecast revisions in the pre-period.

(Table 12 is about here)

6.2. The caliper criteria for propensity score matching

In the main analysis, we use the value of 0.2 times the standard deviation of the propensity score as the caliper and match target firms with peer firms. However, it is not clear a priori what value to set as the caliper. Here, we examine the results when the caliper is set to 0.1 times the standard deviation of the propensity score. Table 13 shows the results when we use the value of 0.1 times the standard deviation of the propensity score as the caliper. The estimated coefficients related to the hypotheses show similar patterns to the main analyses, indicating that the main results are robust to the choice of matching criterion.

²³ Year dummies are defined as follows. *FY2007* equals 1 if a management forecast is for the fiscal year ending March 2007, 0 otherwise; *FY2008* equals 1 if a management forecast is for the fiscal year ending March 2008, 0 otherwise; *FY2010* equals 1 if a management forecast is for the fiscal year ending March 2010, 0 otherwise.

(Table 13 is about here)

7. Summary and Conclusion

We examine the effect of mandatory short interest disclosure on management forecast revisions of peer firms of short selling target firms. We find that managers under the threat of short selling increase the frequency of revisions to their earnings forecasts. We also find that managers of overpriced firms increase the disclosure of bad news (downward forecast revisions). These results suggest that managers attempt to mitigate information asymmetries and avoid short selling by revising their forecasts.

Our study has several limitations. First, disclosure regulations on short interest were introduced shortly after the financial crisis. Since disclosure regulations and the financial crisis may simultaneously affect managers' disclosure behavior, we used a DID analysis to mitigate the effects. However, the effects of the financial crisis may not have been completely removed (Leuz and Wysocki, 2016). Second, although we show that managers of firms threatened by short selling change their disclosure behavior, we do not test whether they were successful in avoiding short selling. Such an analysis is the subject of future research.

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Figure 1: Stock price reactions to the disclosure of short interests

Note: Figure 1 shows stock price reactions to the disclosure of short interests. The sample in Figure 1 consists of firms that were targeted by short sellers from June 2, 2009, to one day before the next EA date. We exclude firms that were already targeted by short sellers on June 1, 2009, because we cannot identify the initial impact of the disclosure of short interests for these firms. First, we calculate the balance of short selling by each firm-month. The procedures are as follows. For each short seller, we calculate the mean of the shorted volume by each month. For each firm, we aggregate the mean of the shorted volume by each month and refer to it as "the balance of short selling for each firm-month". In detail, we sort firms by "the balance of short selling for each firm-month" in the month when firms were initially targeted by short sellers (P5: highest, P1: lowest). Third, for each firm, we measure buy-and-hold abnormal returns (*BHAR*[0:80]), five months (*BHAR*[0:100]), and six months (*BHAR*[0:120]) after the disclosure date. We use TOPIX returns as the benchmark returns for measuring *BHAR*. Finally, we calculate the mean of *BHAR* for each group.





Note: Figure 2 summarizes the sample composition for each analysis in this study. Panel A shows the propensity score matching sample, which consists of (a) target firms and (b) non-target firms. Target firms are firms that are actually shorted, and non-target firms are other firms. Panel B shows the sample for hypotheses 1 and 2, which consists of (b-1) peer firms and non-matched firms. Through propensity score matching using these two groups of firms in Panel A, we define firms matched with target firms as peer firms. Non-matched firms are defined as non-target firms that are not peer firms. To test hypotheses 1 and 2, we compare peer firms as the treatment sample and non-matched firms as the control sample.



Figure 3: Timeline for hypothesis 1 and 2

Note: Figure 3 shows the timeline for hypotheses 1 and 2. The implementation date of mandatory short interest disclosure is September 7, 2008. The pre-period (the post-period) is from June 1, 2007 (2009) to before the EA date in the fiscal year ending March 2008 (2010).



Figure 4: The activeness of short sellers

Note: Figure 4 graphically depicts the activeness of short sellers. We define "active short sellers" as follows. First, for each investor and their target firms, we calculate the average short interest (short interest is measured as the shorted volume divided by the number of shares outstanding) during the post-period. It reflects how much an investor shorts a firm on average during the post-period. Second, for each investor, we calculate the sum of the average short interest (hereafter "the activeness of short sellers"). It indicates the extent to which an investor has short positions in his portfolio. Third, we sort investors on the activeness of short sellers and identify "active short sellers".



Figure 4: The assumption of parallel trend

Note: Figure 4 graphically illustrates the parallel trend assumption. We test whether the frequency of management forecast revisions shows a parallel trend for both peer firms and non-matched firms over the period from the fiscal year ending March 2006 to the fiscal year ending March 2008 (the three years prior to the disclosure regulation). For each group (peer firms and non-matched firms), we calculate the mean of *#Revisions* by year. The solid line is the result for peer firms, while the dashed line is the result for non-matched firms.

Variable	Definition
BalanceInfo	The variable that takes 1 if information on large short positions is disclosed at least one
	time during the period from June 1, 2009 to one day before the date of earnings
	announcement, and 0 otherwise
#Revisions	The number of management forecast revisions for the pre- and post-period (The detail is
	explained in section 3.3 and Table 2)
#Bad	The number of bad news disclosures for the pre- and post-period (The detail is explained in section 3.4)
PeerFirms	The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained
	in section 3.2)
Post	The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is
	explained in section 3.1)
AES	Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1
	Net income forecast for year t+1 minus net income for year t, divided by the market
FES	value of equity at the end of year t
TA	Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1
Log(MVE)	The log of the market value of equity at the end of year t
E/P	Net income per share for year t, divided by the closing price at the end of year t
B/M	The book value of equity, divided by the market value of equity at the end of year t
Turnover	The average of share turnovers for year t
SalesGrowth	The percentage change of annual sales from year t-1 to year t
PriceMomentum	The cumulative row returns for year t
Prior Forgest Povisions	The sum of the revisions of net income forecasts for year t, divided by the market value
r norr orecusikevisions	of equity at the end of year t
ForeignOwnership	The percentage of share ownership by foreign investors at the end of year t
Log(AnaCov)	The log of analyst coverage at the end of year t

Table 1: Variable definitions

Note: Table 1 presents the definitions of the variables. In equation (1), the dependent variables are measured in year t, which is the fiscal year ending March 2008. In equations (2) and (3), the dependent variables in the pre-period and the post period are measured in the fiscal year ending March 2007 and the fiscal year ending March 2009, respectively.

Table 2: Descriptive statistics (*BalanceInfo=1* and *BalanceInfo=0*)

Panel A: BalanceInfo=1

	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
AES	628	0.003	0.099	-0.481	-0.208	-0.052	-0.021	0.000	0.012	0.044	0.609	0.609
FES	628	0.031	0.146	-0.206	-0.157	-0.037	-0.008	0.004	0.023	0.078	0.785	1.277
TA	628	-0.026	0.060	-0.293	-0.167	-0.087	-0.058	-0.031	0.002	0.033	0.216	0.216
Log(MVE)	628	11.052	1.541	7.219	7.819	9.082	9.949	10.994	12.123	13.119	14.588	15.728
E/P	628	0.036	0.152	-1.219	-0.636	-0.040	0.029	0.059	0.090	0.129	0.271	0.312
B/M	628	1.048	0.605	0.145	0.145	0.420	0.637	0.947	1.309	1.807	3.153	3.847
Turnover	628	0.007	0.006	0.000	0.001	0.002	0.003	0.006	0.009	0.014	0.031	0.031
SalesGrowth	628	0.069	0.147	-0.346	-0.269	-0.066	-0.005	0.051	0.116	0.223	0.730	0.730
PriceMomentum	628	-0.295	0.248	-0.783	-0.726	-0.564	-0.459	-0.337	-0.188	0.043	0.473	0.473
PriorForecastRevisions	628	-0.038	0.137	-1.277	-0.604	-0.104	-0.036	-0.002	0.004	0.020	0.103	0.129
ForeignOwnership	628	0.166	0.121	0.001	0.004	0.023	0.065	0.152	0.247	0.328	0.485	0.485
Log(AnaCov)	628	1.192	1.007	0.000	0.000	0.000	0.000	1.099	2.079	2.565	2.996	3.135

Panel B: BalanceInfo=0

	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
AES	1,737	-0.008	0.119	-0.481	-0.481	-0.081	-0.030	-0.003	0.013	0.051	0.516	0.609
FES	1,737	0.060	0.203	-0.206	-0.206	-0.035	-0.006	0.007	0.040	0.161	1.277	1.277
TA	1,737	-0.032	0.066	-0.293	-0.293	-0.099	-0.059	-0.029	0.000	0.035	0.168	0.216
Log(MVE)	1,737	9.203	1.650	5.660	6.385	7.386	8.132	8.918	9.911	11.258	14.652	16.657
E/P	1,737	0.024	0.216	-1.219	-1.219	-0.117	0.027	0.069	0.111	0.158	0.312	0.312
B/M	1,737	1.449	0.777	0.145	0.190	0.558	0.874	1.327	1.911	2.510	3.847	3.847
Turnover	1,737	0.002	0.004	0.000	0.000	0.000	0.000	0.001	0.003	0.005	0.021	0.031
SalesGrowth	1,737	0.041	0.136	-0.346	-0.346	-0.088	-0.017	0.031	0.086	0.167	0.649	0.730
PriceMomentum	1,737	-0.297	0.210	-0.783	-0.783	-0.560	-0.434	-0.300	-0.166	-0.047	0.299	0.473
PriorForecastRevisions	1,737	-0.069	0.205	-1.277	-1.277	-0.174	-0.054	-0.005	0.003	0.027	0.129	0.129
ForeignOwnership	1,737	0.070	0.096	0.000	0.000	0.000	0.004	0.029	0.099	0.196	0.454	0.485
Log(AnaCov)	1,737	0.313	0.691	0.000	0.000	0.000	0.000	0.000	0.000	1.386	2.890	3.178

Note: Table 2 presents descriptive statistics of the variables used in equation (1) for firms whose large short positions are disclosed (*BalanceInfo*=1) and those that are not (*BalanceInfo*=0). Panel A (Panel B) are descriptive statistics for firms with *BalanceInfo*=1 (*BalanceInfo*=0). We use these variables to estimate equation (1) and define them as follows (these variables are measured in year t, which is the fiscal year ending in March 2008):

BalanceInfo= The variable that takes 1 if information on large short positions is disclosed at least one time during the period from June 1, 2009 to one day before the date of earnings announcement, and 0 otherwise

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts during year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

Dep. Var.=BalanceInfo	Coef.	z-statistics
AES	0.025	(0.036)
FES	-1.164	(-1.085)
TA	3.400***	(3.190)
Log(MVE)	0.149**	(2.255)
E/P	-3.647***	(-3.698)
B/M	-0.085	(-0.807)
Turnover	178.683***	(10.307)
SalesGrowth	0.800	(1.625)
PriceMomentum	-0.744**	(-2.248)
PriorForecastRevisions	2.738***	(3.268)
ForeignOwnership	1.018	(1.359)
Log(AnaCov)	0.345***	(3.332)
MarketDummies	Included	
Constant	-2.944***	(-4.313)
Obs.	2,340	
Pseudo R-squared	0.355	

Table 3: Estimation result for propensity score matching

Note: Table 3 is the estimation result for propensity score matching. The numbers in parentheses are z-values using standard errors clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression model is as follows:

 $Logit(Pr [BalanceInfo_i = 1|X])$

 $= \beta_0 + \beta_1 AES_i + \beta_2 FES_i + \beta_3 TA_i + \beta_4 Log(MVE)_i + \beta_5 E/P_i + \beta_6 B/M_i + \beta_7 Turnover_i + \beta_8 SalesGrowth_i + \beta_9 PriceMomentum_i + \beta_{10} PriorForecastRevisions_i + \beta_{11} ForeignOwnership_i + \beta_{12} Log(AnaCov)_i + \sum_{j=0}^{n} \gamma_j MarketDummies_i$

Variable definitions are as follows (these variables are measured in the fiscal year ending in March, 2008):

BalanceInfo= The variable that takes 1 if information on large short positions is disclosed at least one time during the period from June 1, 2009 to one day before the date of earnings announcement, and 0 otherwise

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1 FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1 Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts during year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Table 4: The procedure for measuring the frequency of management forecast revis	sions

	Date 1	Date 2	Date 3
Sales forecast	Yes	Yes	Yes
Ordinary income forecast	Yes	No	Yes
Net income forecast	No	No	Yes
The number of revisions by each announcement date	2	1	3
#Revisions		6	

Note: Table 4 summarizes the procedure for measuring the frequency of management forecast revisions using a hypothetical case. We focus on management forecasts for sales, ordinary income, and net income for each year. For example, at time 1, managers revise the sales forecast and ordinary income, which indicates that the number of revisions is two. Similarly, the number of revisions on Date 2 is one and the number on Date 3 is three. In this case, we measure #Revisions as six.

Table 5: The procedure for identifying bad news disclosures

_	Date 1	Date 2	Date 3
Sales forecast	Yes (Upward)	Yes (Downward)	Yes (Downward)
Ordinary income forecast	Yes (Downward)	No	Yes (Downward)
Net income forecast	No	No	Yes (Upward)
Whether managers disclose bad			
news or not by each	0	1	1
announcement date			
#BadNews		2	

Note: Table 5 summarizes the procedure for measuring bad news disclosures using a hypothetical case. As well as *#Revisions*, we focus on management's forecasts for sales, ordinary income, and net income for each year. In measuring *#BadNews*, we consider the following case in which managers announce bad news. Specifically, we assume that managers are releasing bad news if the number of downward revisions is greater than the number of upward revisions. For example, at time 1, managers revise sales forecast upward while they revise ordinary income downward, indicating that the news at time 1 is neutral. In contrast, managers revise the sales forecast downward while there are no revisions to the other forecasts, implying that the news at time 2 is bad. Similarly, the news at time 3 is bad. Taken together, in this case we measure *#BadNews* as two.

Table 6: Descriptive statistics (PeerFirms=1 and PeerFirms=0)

Panel A: PeerFirms=1 and Post==0												
	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
#Revisions	934	3.747	2.523	0.000	0.000	0.000	2.000	3.000	6.000	7.000	10.000	10.000
#BadNews	934	0.822	0.881	0.000	0.000	0.000	0.000	1.000	1.000	2.000	3.000	3.000
AES	934	0.011	0.095	-0.402	-0.384	-0.031	-0.008	0.004	0.018	0.056	0.455	0.541
FES	934	0.026	0.113	-0.104	-0.089	-0.017	-0.004	0.004	0.013	0.042	0.768	0.855
TA	934	-0.024	0.056	-0.250	-0.208	-0.082	-0.051	-0.024	0.003	0.030	0.138	0.280
Log(MVE)	934	10.162	1.658	6.516	7.227	8.400	9.040	9.884	10.885	12.233	15.346	17.121
E/P	934	0.033	0.118	-0.818	-0.738	0.004	0.035	0.052	0.073	0.096	0.170	0.186
B/M	934	0.937	0.469	0.087	0.156	0.405	0.575	0.865	1.220	1.559	2.304	2.532
Turnover	934	0.003	0.004	0.000	0.000	0.000	0.001	0.002	0.003	0.006	0.020	0.059
SalesGrowth	934	0.075	0.135	-0.299	-0.177	-0.040	0.009	0.054	0.114	0.192	0.545	1.149
PriceMomentum	934	-0.122	0.238	-0.778	-0.732	-0.412	-0.255	-0.129	0.003	0.150	0.609	0.797
PriorForecastRevisions	934	-0.023	0.112	-0.881	-0.736	-0.050	-0.011	0.000	0.006	0.019	0.084	0.084
ForeignOwnership	934	0.093	0.103	0.000	0.000	0.002	0.015	0.056	0.137	0.236	0.453	0.496
Log(AnaCov)	934	0.484	0.821	0.000	0.000	0.000	0.000	0.000	0.693	1.792	2.944	3.091
Overpriced	926	0.511	0.500	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000
Panel B: <i>PeerFirms</i> =1 and <i>Post</i> ==1												
	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
#Revisions	934	4.575	2.728	0.000	0.000	1.000	3.000	4.000	6.000	9.000	12.000	12.000
#BadNews	934	0.747	0.822	0.000	0.000	0.000	0.000	1.000	1.000	2.000	3.000	3.000
AES	934	-0.055	0.190	-1.157	-0.734	-0.212	-0.096	-0.033	-0.001	0.035	0.817	0.817
FES	934	0.107	0.388	-0.325	-0.274	-0.064	-0.015	0.011	0.082	0.337	1.749	4.931
TA	934	-0.047	0.059	-0.382	-0.265	-0.112	-0.074	-0.041	-0.013	0.015	0.113	0.113
Log(MVE)	934	9.417	1.730	4.949	6.118	7.578	8.291	9.135	10.257	11.752	14.530	16.191
E/P	934	-0.060	0.424	-5.223	-1.775	-0.286	-0.044	0.039	0.087	0.141	0.322	0.349
B/M	934	1.888	1.096	0.124	0.240	0.742	1.134	1.676	2.345	3.336	5.802	6.142
Turnover	934	0.002	0.003	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.015	0.029
SalesGrowth	934	-0.054	0.132	-0.571	-0.370	-0.208	-0.127	-0.046	0.012	0.072	0.348	0.605
PriceMomentum	934	-0.251	0.244	-0.869	-0.781	-0.562	-0.429	-0.257	-0.098	0.052	0.425	0.527
PriorForecastRevisions	934	-0.173	0.401	-5.577	-1.836	-0.419	-0.179	-0.057	-0.009	0.000	0.108	0.122
ForeignOwnership	934	0.076	0.094	0.000	0.000	0.001	0.008	0.040	0.109	0.212	0.410	0.454
Log(AnaCov)	934	0.418	0.778	0.000	0.000	0.000	0.000	0.000	0.693	1.792	2.890	3.219
Overpriced	919	0.541	0.499	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000

(continued on next page)

Panel C: PeerFirms=0 and Post==0

	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
#Revisions	370	4.259	2.633	0.000	0.000	0.000	3.000	3.500	6.000	8.000	10.000	10.000
#BadNews	370	0.965	0.949	0.000	0.000	0.000	0.000	1.000	2.000	2.000	3.000	3.000
AES	370	0.015	0.102	-0.402	-0.241	-0.050	-0.015	0.003	0.026	0.087	0.541	0.541
FES	370	0.021	0.096	-0.104	-0.104	-0.033	-0.009	0.004	0.020	0.057	0.376	0.855
TA	370	-0.019	0.069	-0.250	-0.242	-0.084	-0.054	-0.023	0.009	0.041	0.280	0.280
Log(MVE)	370	9.216	1.202	6.923	7.063	7.858	8.450	9.089	9.787	10.737	13.448	14.429
E/P	370	0.044	0.106	-0.818	-0.367	-0.015	0.030	0.059	0.087	0.117	0.186	0.186
B/M	370	1.116	0.528	0.125	0.201	0.486	0.716	1.051	1.444	1.809	2.532	2.532
Turnover	370	0.002	0.004	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.019	0.043
SalesGrowth	370	0.060	0.155	-0.299	-0.276	-0.081	-0.008	0.046	0.108	0.180	0.865	1.063
PriceMomentum	370	-0.152	0.216	-0.778	-0.653	-0.402	-0.272	-0.165	-0.053	0.086	0.531	0.797
PriorForecastRevisions	370	-0.021	0.096	-0.881	-0.392	-0.057	-0.020	0.000	0.009	0.030	0.084	0.084
ForeignOwnership	370	0.049	0.071	0.000	0.000	0.000	0.001	0.020	0.070	0.131	0.332	0.496
Log(AnaCov)	370	0.157	0.402	0.000	0.000	0.000	0.000	0.000	0.000	0.693	1.792	2.485
Overpriced	367	0.490	0.501	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000

Panel D: PeerFirms=0 and Post==1

	Obs.	Mean	SD	Min	p1	p10	p25	p50	p75	p90	p99	Max
#Revisions	370	4.343	2.713	0.000	0.000	0.000	3.000	4.000	6.000	8.000	12.000	12.000
#BadNews	370	0.830	0.856	0.000	0.000	0.000	0.000	1.000	1.000	2.000	3.000	3.000
AES	370	-0.083	0.239	-1.157	-1.131	-0.350	-0.137	-0.039	0.007	0.075	0.727	0.817
FES	370	0.212	0.669	-0.325	-0.325	-0.086	-0.012	0.026	0.173	0.592	4.931	4.931
TA	370	-0.062	0.076	-0.382	-0.382	-0.146	-0.085	-0.050	-0.019	0.009	0.102	0.113
Log(MVE)	370	8.457	1.325	4.997	6.093	6.895	7.577	8.271	9.160	9.948	12.861	13.751
E/P	370	-0.170	0.709	-5.223	-5.223	-0.675	-0.123	0.033	0.091	0.183	0.349	0.349
B/M	370	2.227	1.260	0.124	0.124	0.867	1.273	1.992	2.854	4.042	6.142	6.142
Turnover	370	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.015	0.029
SalesGrowth	370	-0.048	0.138	-0.571	-0.514	-0.191	-0.112	-0.040	0.016	0.095	0.398	0.605
PriceMomentum	370	-0.260	0.250	-0.869	-0.812	-0.583	-0.440	-0.259	-0.097	0.059	0.324	0.527
PriorForecastRevisions	370	-0.293	0.710	-5.577	-5.577	-0.715	-0.285	-0.080	0.000	0.026	0.122	0.122
ForeignOwnership	370	0.037	0.063	0.000	0.000	0.000	0.001	0.007	0.048	0.112	0.292	0.400
Log(AnaCov)	370	0.102	0.347	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.946	2.485
Overpriced	360	0.408	0.492	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000

Note: Table 6 presents descriptive statistics of the variables used to estimate equations (2) and (3). The variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending March 2007, while those in the post-period are measured in the fiscal year ending March 2009):

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1 *FES*=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

*PriorForecastRevisions=*The sum of the revisions of net income forecasts during year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

Dep. Var.=#Revisions	Coef.	t-values
Post	-0.442*	(-1.955)
PeerFirms*Post	0.617***	(3.134)
AES	-1.553***	(-3.109)
FES	-0.950	(-1.307)
TA	2.246**	(2.001)
Log(MVE)	-0.400	(-1.116)
E/P	1.236	(1.425)
B/M	0.146	(1.028)
Turnover	53.707***	(2.595)
SalesGrowth	-1.188**	(-2.505)
PriceMomentum	-0.243	(-0.713)
PriorForecastRevisions	-1.085	(-1.280)
ForeignOwnership	-1.710	(-0.825)
Log(AnaCov)	-0.344	(-1.109)
Constant	7.918**	(2.191)
Obs.	2,608	
Adjusted R-squared	0.0953	

Table 7: Hypothesis 1

Note: Table 7 is the estimation result of equation (2) for hypothesis 1. The numbers in parentheses are t-values with standard errors clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression model is as follows:

 $\#Revisions_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} * AS_{it} + \beta_3 AES_{it} + \beta_4 FES_{it} + \beta_5 TA_{it} + \beta_6 Log(MVE)_{it} + \beta_7 E/P_{it} + \beta_8 B/M_{it} + \beta_9 Turnover_{it}$

 $+ \beta_{10} Sales Growth_{it} + \beta_{11} Price Momentum_{it} + \beta_{12} Prior Forecast Revisions_{it}$

+ β_{13} ForeignOwnership_{it} + β_{14} Log(AnaCov)_i + ε_{it}

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Revisions=The number of management forecast revisions for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Table 8: Hypothesis 2

Dep. Var.=#BadNews	Coef.	t-values
Post	0.022	(0.273)
PeerFirms*Post	-0.125	(-1.466)
Overpriced	-0.048	(-0.783)
PeerFirms*Post*Overpriced	0.233***	(2.609)
AES	-0.476**	(-2.234)
FES	0.350	(1.301)
TA	1.181**	(2.272)
Log(MVE)	0.319**	(2.480)
E/P	0.507	(1.381)
B/M	0.020	(0.381)
Turnover	-1.618	(-0.141)
SalesGrowth	-0.501***	(-2.703)
PriceMomentum	-0.502***	(-4.470)
PriorForecastRevisions	-0.001	(-0.002)
ForeignOwnership	-0.636	(-0.883)
Log(AnaCov)	0.056	(0.565)
Constant	-2.281*	(-1.769)
Obs.	2,572	
Adjusted R-squared	0.0710	

Note: Table 8 is the estimation result of equation (3) for hypothesis 2. The numbers in parentheses are t-values with standard errors clustered by firms. ***, **, ** indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression model is as follows:

 $#BadNews_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 Overpriced_{it} + \beta_4 PeerFirms_{it} * Post_{it} \\ * Overpriced_{it} + \beta_5 AES_{it} + \beta_6 FES_{it} + \beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it}$

 $+ \beta_{11} Turnover_{it} + \beta_{12} SalesGrowth_{it} + \beta_{13} PriceMomentum_{it}$

+ β_{14} PriorForecastRevisions_{it} + β_{15} ForeignOwnership_{it} + β_{16} Log(AnaCov)_i + ε_{it}

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#BadNews=The number of bad news disclosures for the pre- and post-period (The detail is explained in section 3.4)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of vear t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Dep. Var.=#GoodNews Coef. t-values -0.164** Post (-2.037)PeerFirms*Post 0.226*** (2.754)0.021 (0.332)Overpriced PeerFirms*Post*Overpriced -0.082(-0.898)0.014 AES (0.077)FES -0.646*** (-2.893)TA -0.819* (-1.707)-0.409*** Log(MVE) (-3.326)E/P -0.164 (-0.640)B/M 0.056 (1.119)Turnover 13.510 (1.555)SalesGrowth 0.131 (0.726)PriceMomentum 0.330*** (2.734)-0.252 **PriorForecastRevisions** (-1.318)ForeignOwnership -0.213(-0.341)-0.191* Log(AnaCov) (-1.826)4.636*** Constant (3.734)2,572 Obs. 0.108 Adjusted R-squared

Table 9: Good news disclosures

Note: Table 9 is the estimation result of equation (4) for good news disclosures. The figures in parentheses are t-values using standard errors clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression model is as follows:

 $#GoodNews_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 Overpriced_{it} + \beta_4 PeerFirms_{it} * Post_{it}$

* $Overpriced_{it} + \beta_5 AES_{it} + \beta_6 FES_{it} + \beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it}$

 $+ \beta_{11} Turnover_{it} + \beta_{12} Sales Growth_{it} + \beta_{13} Price Momentum_{it}$

 $+ \beta_{14}$ *PriorForecastRevisions*_{it} $+ \beta_{15}$ *ForeignOwnership*_{it} $+ \beta_{16}$ *Log*(*AnaCov*)_i $+ \varepsilon_{it}$

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#GoodNews=The number of good news disclosures for the pre- and post-period (The detail is explained in section 5.1)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t

Turnover=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Table 10: Timely disclosure

	(1)		(2)	
-	(1)		(2) Den Von -#Timely BadNaus	
—	Dep. var.=#11	mely_ <u>Revisions</u>	$\frac{Dep. var.=#11}{C}$	mety_baalvews
_	Coer.	t-values	Coef.	t-values
Post	-0.525***	(-3.048)	0.027	(0.369)
PeerFirms*Post	0.381***	(2.585)	-0.130*	(-1.680)
Overpriced			-0.040	(-0.721)
PeerFirms*Post*Overpriced			0.185**	(2.292)
AES	0.282	(0.814)	-0.131	(-0.761)
FES	0.910*	(1.787)	0.264	(1.225)
TA	1.280	(1.607)	0.628*	(1.664)
Log(MVE)	-0.076	(-0.322)	0.237**	(2.126)
E/P	1.233**	(2.509)	0.597**	(2.364)
B/M	-0.010	(-0.101)	-0.032	(-0.700)
Turnover	18.344	(1.222)	-7.037	(-0.814)
SalesGrowth	-0.026	(-0.082)	-0.303**	(-2.001)
PriceMomentum	0.514**	(2.246)	-0.345***	(-3.435)
PriorForecastRevisions	-0.330	(-0.919)	-0.190	(-0.822)
ForeignOwnership	-1.532	(-0.959)	0.481	(0.839)
Log(AnaCov)	-0.222	(-0.998)	0.047	(0.533)
Constant	3.607	(1.535)	-1.647	(-1.471)
Obs.	2,608		2,572	
Adjusted R-squared	0.0316		0.0662	

Note: Table 10 is the estimation result of equation (5) for timely disclosure. The figures in parentheses are t-values using standard errors clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression models are as follows:

*#Timely_Revisions*_{it}

 $= \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} * AS_{it} + \beta_3 AES_{it}$

 $+\beta_{4}FES_{it} + \beta_{5}TA_{it} + \beta_{6}Log(MVE)_{it} + \beta_{7}E/P_{it} + \beta_{8}B/M_{it} + \beta_{9}Turnover_{it} + \beta_{10}SalesGrowth_{it} + \beta_{11}PriceMomentum_{it} + \beta_{12}PriorForecastRevisions_{it}$

+ β_{13} ForeignOwnership_{it} + β_{14} Log(AnaCov)_i + ε_{it}

#Timely_BadNews_{it}

 $= \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 Overpriced_{it} + \beta_4 PeerFirms_{it} * Post_{it}$ $* Overpriced_{it} + \beta_5 AES_{it} + \beta_6 FES_{it} + \beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it}$ $+ \beta_{11} Turnover_{it} + \beta_{12} Sales Growth_{it} + \beta_{13} Price Momentum_{it}$

+ β_{14} PriorForecastRevisions_{it} + β_{15} ForeignOwnership_{it} + β_{16} Log(AnaCov)_i + ε_{it}

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March,

2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Timely_Revisions=The number of timely management forecast revisions for the pre- and post-period (The detail is explained in section 5.2)

#Timely_BadNews=The number of timely bad news disclosures for the pre- and post-period (The detail is explained in section 5.2)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

(Continued on next page)

Log(MVE)=The log of the market value of equity at the end of year t *E/P*=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t *Turnover*=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Table 11: The degree of short selling threat

Panel A: Hypothesis 1

	(1)		(2)	
	Dep. Var.=#Revisions			
_	Coef.	t-values	Coef.	t-values
Post	-0.436*	(-1.928)	-0.441*	(-1.939)
PeerFirms*Post	0.422*	(1.794)	0.614***	(3.025)
PeerFirms*Post*AS	0.324	(1.466)		
PeerFirms*Post*IAS			0.018	(0.060)
AES	-1.538***	(-3.075)	-1.550***	(-3.096)
FES	-0.893	(-1.233)	-0.947	(-1.296)
TA	2.288**	(2.047)	2.247**	(2.002)
Log(MVE)	-0.388	(-1.084)	-0.398	(-1.110)
E/P	1.305	(1.506)	1.238	(1.424)
B/M	0.149	(1.048)	0.146	(1.028)
Turnover	52.373**	(2.532)	53.677***	(2.589)
SalesGrowth	-1.197**	(-2.534)	-1.186**	(-2.491)
PriceMomentum	-0.209	(-0.613)	-0.242	(-0.712)
PriorForecastRevisions	-1.116	(-1.313)	-1.085	(-1.279)
ForeignOwnership	-1.619	(-0.777)	-1.709	(-0.825)
Log(AnaCov)	-0.368	(-1.188)	-0.344	(-1.110)
Constant	7.806**	(2.163)	7.905**	(2.184)
Obs.	2,608		2,608	
Adjusted R-squared	0.0965		0.0950	

Note: Panel A of Table 11 is the estimation result of equation (4) for hypothesis 1. The numbers in parentheses are t-values using standard errors clustered by firms. ***, **, indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression models are as follows:

 $#Revisions_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} * AS_{it} + \beta_3 AES_{it}$

 $+\beta_4 FES_{it} + \beta_5 TA_{it} + \beta_6 Log(MVE)_{it} + \beta_7 E/P_{it} + \beta_8 B/M_{it} + \beta_9 Turnover_{it}$

 $+ \beta_{10} Sales Growth_{it} + \beta_{11} Price Momentum_{it} + \beta_{12} Prior Forecast Revisions_{it}$

 $+ \beta_{13}$ ForeignOwnership_{it} $+ \beta_{14}$ Log(AnaCov)_i $+ \varepsilon_{it}$

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Revisions=The number of management forecast revisions for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

#BadNews=The number of bad news disclosures for the pre- and post-period (The detail is explained in section 3.4)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

AS=The variable takes 1 if target firms are shorted by active short sellers, and 0 otherwise (Th detail is explained in section 5.3)

IAS=The variable takes 1 if *AS* takes 1 and peer firms are in industries where active short sellers (both Morgan Stanley and Goldman Sachs) actively participate in short selling, and 0 otherwise (Th detail is explained in section 5.3)

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

(Continued on next page)

Log(MVE)=The log of the market value of equity at the end of year t *E/P*=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t *Turnover*=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Panel B: Hypothesis 2

v 1	(1)		(2	2)
-	Dep. Var.=#		#BadNews	/
_	Coef.	t-values	Coef.	t-values
Post	0.020	(0.258)	0.031	(0.389)
PeerFirms_Post	-0.100	(-0.948)	-0.122	(-1.378)
PeerFirms*Post*AS	-0.042	(-0.388)		
PeerFirms*Post*IAS			-0.005	(-0.035)
Overpriced	-0.047	(-0.777)	-0.046	(-0.763)
PeerFirms*Post*Overpriced	0.156	(1.282)	0.157*	(1.669)
PeerFirms*Post*Overpriced*AS	0.126	(0.890)		
PeerFirms*Post*Overpriced*IAS			0.376**	(2.118)
AES	-0.480**	(-2.255)	-0.467**	(-2.192)
FES	0.357	(1.326)	0.362	(1.343)
TA	1.195**	(2.297)	1.220**	(2.357)
Log(MVE)	0.314**	(2.437)	0.326**	(2.554)
E/P	0.511	(1.385)	0.497	(1.361)
B/M	0.019	(0.353)	0.021	(0.398)
Turnover	-1.637	(-0.143)	-2.536	(-0.223)
SalesGrowth	-0.504***	(-2.715)	-0.475**	(-2.576)
PriceMomentum	-0.498***	(-4.401)	-0.483***	(-4.302)
PriorForecastRevisions	0.002	(0.006)	0.009	(0.025)
ForeignOwnership	-0.606	(-0.838)	-0.624	(-0.865)
Log(AnaCov)	0.052	(0.527)	0.040	(0.403)
Constant	-2.230*	(-1.726)	-2.344*	(-1.830)
Obs.	2,572		2,572	
Adjusted R-squared	0.0709		0.0770	

Note: Panel A of Table 11 is the estimation result of equation (5) for hypothesis 2. The numbers in parentheses are t-values using standard errors clustered by firms. ***, **, indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression models are as follows:

 $\#BadNews_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} * AS_{it} + \beta_3 Overpriced_{it}$

 $+ \beta_4 PeerFirms_{it} * Post_{it} * Overpriced_{it} + \gamma_1 PeerFirms_{it} * Post_{it} * Overpriced_{it} * AS_{it}$

 $+\beta_5 AES_{it} + \beta_6 FES_{it} + \beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it} + \beta_{11} Turnover_{it}$

 $+ \beta_{12}SalesGrowth_{it} + \beta_{13}PriceMomentum_{it} + \beta_{14}PriorForecastRevisions_{it}$

 $+ \beta_{15}ForeignOwnership_{it} + \beta_{16}Log(AnaCov)_i + \varepsilon_{it}$

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Revisions=The number of management forecast revisions for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

#BadNews=The number of bad news disclosures for the pre- and post-period (The detail is explained in section 3.4)

Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1) *PeerFirms*=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

Overpriced= The variable that takes 1 if the first principal component for a firm is above median, and 0 otherwise. The first principal component is obtained from the principal component analysts, which is based on abnormal accruals, industry-adjusted book-to-market ratio, and industry-adjusted earnings-to-price ratio (The detail is explained in section 3.2.2)

AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1

FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

(*Continued on next page*)

Log(MVE)=The log of the market value of equity at the end of year t

E/P=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t *Turnover*=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts for year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange

Dep. Var.=#Revisions	Coef.	t-values
FY2007	-0.092	(-0.613)
FY2008	0.247	(1.542)
FY2010	0.354**	(2.124)
PeerFirms*FY2007	-0.020	(-0.111)
PeerFirms*FY2008	-0.248	(-1.337)
PeerFirms*FY2010	0.371*	(1.880)
Constant	3.843***	(73.660)
Observations	5,833	
Adjusted R-squared	0.0223	

Table 12: The assumption of parallel trend

Note: Panel A of Table 12 is the estimation result of equation (6) to confirm the parallel trend assumption. The figures in parentheses are t-values using standard errors clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression models are as follows: $#Revisions_{it} = \beta_0 + \beta_1 FY2007_{it} + \beta_2 FY2008_{it} + \beta_3 FY2010_{it} + \beta_4 PeerFirms_{it} * FY2007_{it} + \beta_5 PeerFirms_{it} * FY2008_{it} + \beta_6 PeerFirms_{it} * FY2010_{it} + \varepsilon_{it}$

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Revisions=The number of management forecast revision for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2)

FY2007=The variable that takes 1 if management forecasts are those for fiscal year 2007, and 0 otherwise

FY2008=The variable that takes 1 if management forecasts are those for fiscal year 2008, and 0 otherwise

FY2010=The variable that takes 1 if management forecasts are those for fiscal year 2010, and 0 otherwise

	(1) Dep. Var.=# <i>Revisions</i>		(2) Dep. Var.=#BadNews	
	Coef.	t-values	Coef.	t-values
Post	-0.392*	(-1.865)	0.032	(0.443)
PeerFirms*Post	0.689***	(3.773)	-0.139*	(-1.678)
Overpriced			-0.036	(-0.603)
PeerFirms*Post*Overpriced			0.240**	(2.556)
AES	-1.553***	(-3.103)	-0.472**	(-2.213)
FES	-1.029	(-1.418)	0.365	(1.340)
TA	2.417**	(2.156)	1.180**	(2.266)
Log(MVE)	-0.410	(-1.149)	0.319**	(2.494)
E/P	1.232	(1.404)	0.516	(1.403)
B/M	0.127	(0.900)	0.019	(0.353)
Turnover	52.090**	(2.537)	-1.396	(-0.122)
SalesGrowth	-1.142**	(-2.406)	-0.507***	(-2.725)
PriceMomentum	-0.272	(-0.804)	-0.502***	(-4.475)
PriorForecastRevisions	-1.149	(-1.330)	0.004	(0.010)
ForeignOwnership	-1.763	(-0.844)	-0.623	(-0.863)
Log(AnaCov)	-0.324	(-1.050)	0.055	(0.552)
Constant	8.036**	(2.234)	-2.292*	(-1.786)
Obs.	2,608		2,572	
Adjusted R-squared	0.0986		0.0708	

Table 13: The caliper criteria for propensity score matching

Note: Table 13 is the estimation result of equation (1) and (2) for hypothesis 1 and 2. The regression models are the same as the main analyses, but the sample for estimating these models is different. Specifically, here we select peer firms using the value of 0.1 times the standard deviation of the propensity score as a caliper. The numbers in parentheses are t-values using the standard error clustered by firms. ***, **, * indicate statistical significance at 1%, 5%, and 10% (two-tailed), respectively. The regression models are as follows:

 $\# Revisions_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \gamma_0 PeerFirms_{it} * Post_{it} * AS_{it} + \beta_3 AES_{it} + \beta_4 FES_{it} + \beta_5 TA_{it} + \beta_6 Log(MVE)_{it} + \beta_7 E/P_{it} + \beta_8 B/M_{it} + \beta_9 Turnover_{it} + \beta_{10} SalesGrowth_{it} + \beta_{11} PriceMomentum_{it} + \beta_{12} PriorForecastRevisions_{it} + \beta_{13} ForeignOwnership_{it}$

 $+ \beta_{14} Log(AnaCov)_i + \varepsilon_{it}$ #BadNews_{it} = $\beta_0 + \beta_1 Post_{it} + \beta_2 PeerFirms_{it} * Post_{it} + \beta_3 Overpriced_{it} + \beta_4 PeerFirms_{it} * Post_{it}$

* $Overpriced_{it} + \beta_5 AES_{it} + \beta_6 FES_{it} + \beta_7 TA_{it} + \beta_8 Log(MVE)_{it} + \beta_9 E/P_{it} + \beta_{10} B/M_{it} + \beta_{11} Turnover_{it} + \beta_{12} SalesGrowth_{it} + \beta_{13} PriceMomentum_{it} + \beta_{14} PriorForecastRevisions_{it} + \beta_{15} ForeignOwnership_{it} + \beta_{16} Log(AnaCov)_i + \varepsilon_{it}$

Variable definitions are as follows (these variables in the pre-period are measured in the fiscal year ending in March, 2007, while those in the post-period are measured in the fiscal year ending in March, 2009):

#Revisions=The number of management forecast revisions for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

#BadNews=The number of bad news disclosure for the pre- and post-period (The detail is explained in section 3.4) Post=The variable that takes 1 if a period is the post-period, and 0 otherwise (The detail is explained in section 3.1) PeerFirms=The variable that takes 1 if a firms is peer firms, and 0 otherwise (The detail is explained in section 3.2) #Revisions=The number of management forecast revisions for the pre- and post-period (The detail is explained in section 3.3 and Table 2)

#BadNews=The number of bad news disclosure for the pre- and post-period (The detail is explained in section 3.4) AES=Net income for year t minus net income for year t-1, divided by the market value of equity at the end of year t-1 FES=Net income forecast for year t+1 minus net income for year t, divided by the market value of equity at the end of year t

TA=Net income for year t minus cash flow from operating activities, divided by total assets at the end of year t-1

(Continued on next page)

Log(MVE)=The log of the market value of equity at the end of year t *E/P*=Net income per share for year t, divided by the closing price at the end of year t

B/M=The book value of equity, divided by the market value of equity at the end of year t *Turnover*=The average of share turnovers for year t

SalesGrowth=The percentage change of annual sales from for year t-1 to year t

PriceMomentum=The cumulative row returns for year t

PriorForecastRevisions=The sum of the revisions of net income forecasts during year t, divided by the market value of equity at the end of year t

ForeignOwnership=The percentage of share ownership by foreign investors at the end of year t

Log(AnaCov)=The log of analyst coverage at the end of year t

MarketDummeis=Industry dummies based on the 33-industry classification provided by the Tokyo Stock Exchange