The need for speed: an intuitive approach to understanding the relationship between audit quality and management earnings forecasts

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Abstract

Purpose – The purpose of this study is to investigate whether audit quality is associated with the speed with which managers revise earnings forecasts to arrive at the actual earnings through the lens of the auditor selection theory. This study examines this relationship in a unique institutional setting, Japan, where nearly all managers disclose earnings forecasts.

Design/methodology/approach – The authors pioneer an empirical proxy to capture the speed of management forecast revisions based on well-established principles from the finance and disclosure literatures. This proxy is tested alongside other disclosure proxies (namely, accuracy, frequency and timeliness) to assess the influence of audit quality on managerial forecasting behavior.

Findings – This empirical analysis shows that forecast revision speed is higher for firms that select higher-quality auditors. While firms that select higher-quality auditors revise forecasts in a more timely fashion, these firms revise less frequently. Moreover, the authors find that the influence of audit quality on forecast revisions is asymmetric. Specifically, the analysis of downward forecast revisions shows that higher-quality auditors are associated with firms that disclose bad news via forecasts revisions faster, more frequently and in a more timely fashion. However, the analysis of upward forecast revisions shows that higher-quality auditors have no effect on the speed with which firms disclose good news via forecast revisions, even though

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they are associated with less frequent but more timely forecast revisions. These findings have important implications for prior studies that consistently document an asymmetric response of the stock market to good news and bad news.

Originality/value – The authors provide evidence on the relationship between audit quality and management earnings forecasts using a novel and intuitive measure that captures forecast revision speed. This measure speaks to the growing interest in understanding the notion of speed and timing of voluntary disclosures. This study provides a more robust and comprehensive measure of the speed with which managers revise their earnings forecasts to arrive at the actual earnings. Furthermore, this study is among the first to document an asymmetric effect of audit quality on the type of news disclosed in forecast revisions.

Keywords Audit quality, Auditor selection, Forecast revisions, Management earnings forecasts, Speed, Voluntary disclosures

Paper type Research paper

1. Introduction

Research on auditor selection suggests that managers select higher-quality auditors to signal to investors that they have favorable private information (Titman and Trueman, 1986; Datar *et al.*, 1991; Lennox, 1999). This is because higher-quality auditors are more likely to attest to the private information of the managers (Lennox, 1999). In line with this theory, several studies find that the stock market tends to react positively to firms that switch to higher-quality auditors because it assumes that the firms have favorable private information (Nichols and Smith, 1983; Eichenseher *et al.*, 1989; Lennox, 1999).

While managers could signal private information by a judicious selection of auditors, they could also signal private information via forecast revisions. As the selection of auditors precedes a forecast revision, it is reasonable to argue that the selection of auditors could have a spillover effect on the extent to which the stock market reacts to forecast revisions. Specifically, when a firm selects a higher-quality auditor (thereby providing a positive signal of favorable private information to the stock market), this positive signal may influence the stock market to react to forecast revisions subsequently announced by the firm in a more favorable way. That is, the positive signal of the firm's selection of a higher-quality auditor *affirms* the signal of forecast revisions.

We argue that the favorable stock market reaction may occur even when the firm discloses bad news via downward forecast revisions. Specifically, the stock market's favorable consideration of the firm's choice of a higher-quality auditor may lead to the stock market becoming more empathetic toward the firm that subsequently discloses bad news via downward forecast revisions. The favorable market sentiment toward bad news may result in less severe negative reactions, which may in turn induce the firm to disclose downward forecast revisions more willingly and in a more timely manner.

In this study, we draw on the principles that underpin the auditor selection model (Titman and Trueman, 1986; Datar *et al.*, 1991; Lennox, 1999) to shed light on the relationship between audit quality and management earnings forecasts. Specifically, we ask the following research question: is there a relationship between audit quality and the speed with which managers revise earnings forecasts to arrive at the actual earnings? We test three hypotheses: (*H1a*) firms that select higher-quality auditors are associated with forecast revision speed, (*H1b*) firms that select higher-quality auditors are associated with forecast revision frequency, and (*H1c*) firms that select higher-quality auditors are associated with forecast revision timeliness.

We test our hypotheses using the Japanese institutional setting. In Japan, over 90% of all managers are compelled to disclose earnings forecasts, even though there are no specific regulations requiring managers to disclose such forecasts (Hermann *et al.*, 2003; Kato *et al.*, 2009;

Ota, 2010; Ota *et al.*, 2019). This setting is beneficial for understanding our research question for several important reasons. First, we believe that the signals in management earnings forecasts are likely to be more pronounced in the Japanese setting than in other settings. This is because the large volume of communications about future earnings expectations cultivated by the sheer willingness of managers to disclose earnings forecasts would likely induce greater signals in the market. Recent evidence shows that the stock market turns to and considers the signals of multiple sources when evaluating the credibility of other signals, such as brokers' recommendations (Brown *et al.*, 2007) and open market share repurchases (Ota *et al.*, 2019). Based on this evidence, we argue that the stock market considers the signal of the selection of higher-quality auditors when it evaluates the credibility of the signals in forecast revisions.

Second, given that almost all Japanese firms disclose earnings forecasts, there is no information in the decision itself (Kato *et al.*, 2009). This is advantageous because it allows researchers to minimize endogeneity and sample selection bias that are common in voluntary disclosure research. Third, Japan is a low-litigious country, where civil lawsuits are settled through socially rooted customs rather than legal courts (Numata and Takeda, 2010). While the litigation costs of managers issuing biased earnings forecasts are likely to be relatively low in Japan compared to Western countries, reputation costs are still likely to exist in Japan that have implications on the credibility of the forecasts with market participants (Kato *et al.*, 2009). Prior studies have shown that a country's litigation environment (Dunstan *et al.*, 2011) and the degree of litigation risk (Jackson *et al.*, 2015) are important considerations when examining qualitative properties of management earnings forecasts, such as frequency and timeliness. Taken together, Japan provides a good testing ground for the effect of forecast revision speed.

To develop the forecast revision speed measure, we construct a simple characterization in which we observe how a firm's idiosyncratic forecast revision pattern during the fiscal year deviates from the straight-line pattern of forecast revisions denoted as the base case scenario. This characterization is represented by a ratio of the base case scenario to the firm's idiosyncratic forecast revision patterns of firms during the fiscal year. Next, we designate the speed of forecast revisions as the natural logarithm of one plus this ratio (denoted as *speed*). If a firm's forecast revision pattern during the fiscal year follows a convex (concave) decreasing pattern, then we expect the forecast revision speed to be higher (lower), as the ratio is larger (smaller). Finally, we relax the assumption for the base case scenario, in which we assume the information flow is constant (thereby resulting in the straight-line pattern of forecast revisions), by subtracting the mean industry-year revision speed from *speed* (denoted as *SPEED*). This is to recognize the fact that the information flow may not be constant and could vary based on the industry and year.

We test the internal validity of the speed of forecast revisions (*SPEED*). Specifically, *SPEED* is based on three factors: (1) the degree of initial management forecast accuracy, (2) the number of forecast revisions made during the fiscal year, and (3) the number of days between forecast revision dates and the earnings announcement date. If this proxy is valid, we assume that higher speed of management forecast revisions is likely to be associated with more frequent and timely management forecasts in the current period. Our univariate analysis shows that forecast revision speed increases with the number of forecast revisions and horizon, respectively, thereby confirming that higher forecast revision speed is associated with more frequent and timely management forecast revisions in the current period.

We propose that *SPEED* is a more comprehensive measure to capture the quality of management earnings forecasts. Researchers assume that accuracy, frequency and timeliness are *mutually exclusive* qualities of management earnings forecasts (Ajinkya *et al.*, 2005; Karamanou and Vafeas, 2005). Under this assumption, the quality of management earnings forecasts is determined based on a specific outcome of a single qualitative factor. For instance, more (less) accurate management earnings forecasts are interpreted as of higher (lower) quality. This interpretation could be misleading because it ignores other important indicators of forecast quality. To illustrate with an example – firm A issues more accurate (less frequent) management earnings forecasts, while firm B issues less accurate (more frequent) management earnings forecasts. Management earnings forecasts of firm A do not necessarily imply higher quality, as they are issued less frequently, even though these forecasts are more accurate. Likewise, management earnings forecasts of firm B do not necessarily imply lower quality given that they are issued more frequently, albeit less accurate. The *SPEED* measure that we construct provides a means to resolve the problem by reconciling the implications of three key indicators of forecast quality, namely: accuracy, frequency and timeliness.

Using a comprehensive sample (34,974 firm year observations) and a recent period (2001–2020), our empirical evidence yields several findings. First, we find that forecast revision speed is higher for firms that select higher-quality auditors consistent with *H1a*. This finding supports our argument that the stock market tends to react more favorably to firms that select higher-quality auditors, which creates a greater incentive for the firms to revise faster. Second, consistent with the non-directional hypotheses *H1b* and *H1c*, we find that firms that select higher-quality auditors are associated with forecast revision timeliness and frequency. Specifically, we find that while the firms that select higher-quality auditors tend to revise forecasts in a more timely manner, these firms revise their forecasts less frequently, indicating a trade-off between forecast timeliness and frequency. The result of a trade-off is intuitive because more timely forecasts closely reflect the actual earnings at the end of the fiscal year than less timely forecasts. Therefore, firms that revise forecasts in a more timely manner would be less compelled to revise these forecasts as frequently as they would if the forecasts were less timely. Our main results continue to hold after we control for several factors that affect forecast accuracy, such as firm size, firm performance, financial distress, earnings volatility, ownership structure, board structure and endogeneity.

Prior evidence consistently documents an asymmetric response to good and bad news (Skinner, 1994; Veronesi, 1999; Soroka, 2006; Kothari *et al.*, 2009; Williams, 2015). For instance, Soroka (2006) shows that public responses to negative economic information are significantly greater than they are to positive economic information. Williams (2015) finds consistent public sentiment toward the type of news that is presented, namely, the stock market systematically places more weight on bad news following shocks to the macro-economic environment. Skinner (1994, p. 39) argues that managers voluntarily disclose bad news because they assume that their firms bear larger reputational costs when the stock market is surprised by bad news, supporting the idea of the "asymmetric loss function." Given that upward (downward) forecast revisions convey good (bad) news to the stock market, it is essential to consider the *direction* of forecast revisions to understand whether and how audit quality has any important implications for the asymmetric loss function. Therefore, in our additional analysis, we partition the forecast revisions according to whether they are upward or downward revisions.

With respect to the downward revision sample, we find that higher audit quality is associated with firms that revise their forecasts downward faster, more frequently and in a more timely manner. These results are consistent with prior studies. Specifically, given that higher-quality auditors invest heavily on their own reputation (DeAngelo, 1981; Craswell *et al.*, 1995), higher-quality auditors may incur greater reputational costs if their client firms failed to disclose bad news in a timely manner. Because of the unfavorable reputational consequences, higher-quality auditors would be more concerned with the way in which bad news are disclosed by their client firms.

With respect to upward revisions, however, higher audit quality is not associated with forecast revision speed, although it is associated with less frequent but more timely forecast revisions. These results lend further support for our arguments about downward forecast revisions. That is, upward forecast revisions do not result in adverse stock market reactions and incur reputational costs in the same way as downward forecast revisions, as these revisions convey good news. Because of the more favorable reputational consequences of upward forecast revisions, higher-quality auditors would not be as concerned with these revisions as they would with downward forecast revisions. This rationale is a plausible explanation for why higher audit quality is not associated with the speed of upward forecast revisions. To our knowledge, our study is the first to document the existence of the asymmetry phenomenon in the influence of audit quality on forecast revisions.

We test the robustness of our findings by performing two types of sensitivity analysis. First, given that the extent to which managers revise their earnings forecasts depends on how accurate their initial management earnings forecasts are, we investigate whether our main findings are sensitive to different cutoff points of initial forecast accuracy. Our results of this analysis show that our main findings are robust and not sensitive to the different cutoff points of initial forecast accuracy. The second sensitivity analysis involves estimating auditor industry specialization (*AISPEC*) as an alternative measure of audit quality and then estimating the regressions of forecast revision speed using *BIGN* and *AISPEC*. The results do not provide evidence to suggest that auditor industry specialization influences the forecast revision speed.

Our study contributes to the auditing and disclosure literature in several important ways. First, this study paves the way for future research on the relatively unexplored notion of the speed with which managers revise their earnings forecasts to arrive at the actual earnings of their firms. There has been a growing interest in the economics of the speed construct (Coulton *et al.*, 2016; Taylor and Tong, 2020; Chen *et al.*, 2021). In a recent study by Taylor and Tong (2020), for instance, a new empirical measure is constructed to capture the speed with which sell-side analysts' forecasts reflect the flow of earnings information to arrive at earnings outcomes. Chen *et al.* (2021) investigate how macro-economic uncertainty resulting from the severity of local COVID-19 spread influences the speed with which managers disclose favorable and unfavorable forecasts. Our study contributes to the literature by being the first to design an intuitive alternative proxy to capture the speed with which managers revise their earnings forecasts based on several well-established indicators of forecast quality (i.e. accuracy, frequency and timeliness).

Second, this is the first study to critically examine the influence of audit quality on management earnings forecasts through the lens of the auditor selection model (Lennox, 1999). There has been a general lack of interest in research on how auditors might play a role in forecast revisions, probably because auditors are not required to verify management earnings forecasts in most domains with the exception of Canada. In Canada, however, auditors are required to provide assurance level audit of management forecasts disclosed in initial public offerings (McConomy, 1998; Clarkson, 2000). Because of the lack of theoretical support for the influence of audit quality on forecast revisions, the focus of these Canadian studies has largely been restricted to the influence of audit quality on the properties of the unrevised forecasts (namely, the accuracy and bias of the initial management forecasts). Our study provides a notable contribution to the literature by proposing intuitive and compelling theoretical arguments to establish the relationship between audit quality and forecast revisions based on the auditor selection model.

Finally, this study provides early evidence on the effect of audit quality on the asymmetric loss function in the type of news. While prior studies have documented that the market response to good and bad news is asymmetric, very little evidence currently exists on whether and how audit quality plays a role in this asymmetry. To our knowledge, our study is the first to examine the implications of audit quality for the asymmetric loss function in the type of news.

Our paper is organized as follows. Section 2 describes the Japanese institutional setting *vis-à-vis* management forecasts in more detail and develops the conceptual framework on which the hypotheses are based. Section 3 describes the research design and variables (including the econometrics behind the forecast revision speed measure). Section 4 specifies the sample and reports the results of our univariate and multivariate analyses. Section 5 presents the results of our sensitivity analysis. Section 6 concludes.

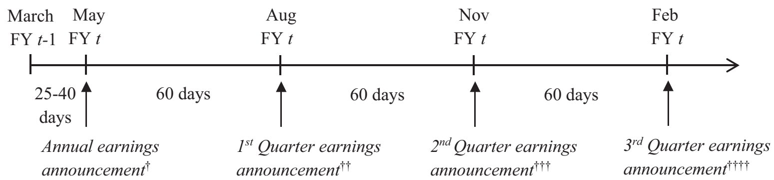
2. Institutional background and hypothesis development

2.1 Institutional background

The Financial Instruments and Exchange Act (the Act) in Japan stipulates the requirements for the disclosure and financial reporting practices of firms listed on Japanese stock exchanges (namely, Fukuoka, JASDAQ, Nagoya, Osaka, Sapporo and Tokyo). In addition, listed firms are required to comply with the Timely Disclosure Rules (the Rules), which aim to minimize the time delay in the release of detailed financial and economic information in annual securities reports (*Yuka Shoken Hokokusho*).

Under the Rules, listed firms are required to provide summarized financial statements (*Kessan-Tanshin*) upon the approval by the board of directors. These summarized financial statements contain financial results for the current period (e.g., sales, net income, earnings per share and dividends per share), as well as earnings forecasts for the next period. This information is released at the annual earnings announcement, which usually takes place 25–40 trading days after the fiscal year-end (Ota, 2010). Figure 1 provides a timeline of the disclosures and financial reporting for Japanese firms with a March fiscal year-end.

At each annual earnings announcement date, listed firms are expected to provide initial forecasts of earnings for the next fiscal year, as well as forecast revisions at each quarterly earnings announcement date. Managers are expected to provide forecasts of Sales, Earnings Before Extraordinary Items and Taxes, Net Income, Earnings Per Share and Dividends Per Share (DPS). Except for forecasts of DPS, which could be in the form of a range, forecasts are provided in point form. Although there are no legal or regulatory requirements for firms to provide initial management forecasts, nearly all firms in Japan choose to provide the



Notes: Earnings announcement indicated by †, ††, ††† and †††† contain initial forecasts of earnings for FY *t* and financial results for FY *t*-1, first quarterly forecast revisions, second quarterly forecast revisions and third quarterly forecast revisions, respectively.

Figure 1.
Timeline for management earnings forecasts in Japan

forecasts. Hence, prior studies refer to these forecasts as "effectively mandated," even though these forecasts are still considered to be voluntary disclosures (Kato *et al.*, 2009).

The Ministry of Finance prescribes the "Significance Rule" that requires firms to make an announcement of revised forecasts immediately in the event of a significant change in previously published forecasts. A significant change is defined as being changes in Sales estimates of ± 10% and/or changes in Earnings Before Extraordinary Items and Taxes and Net Income estimates of ± 30%. In regard to DPS, the changes in the estimates are ± 20%. Therefore, forecast revisions can be announced at any time other than at the quarterly earnings announcement dates.

The practice of managers revising earnings forecast revisions is prevalent in Japan because of the abundance of initial management forecasts. Kato *et al.* (2009) find that during the fiscal year, managers of firms in Japan tend to revise their initial earnings forecasts downward to reverse their initial optimism. Therefore, by the end of the year, investors' expectations are, on average, aligned with subsequent realizations. Kato *et al.* (2009) also provide evidence that forecast revisions are more informative than initial earnings forecasts.

2.2 Hypothesis development

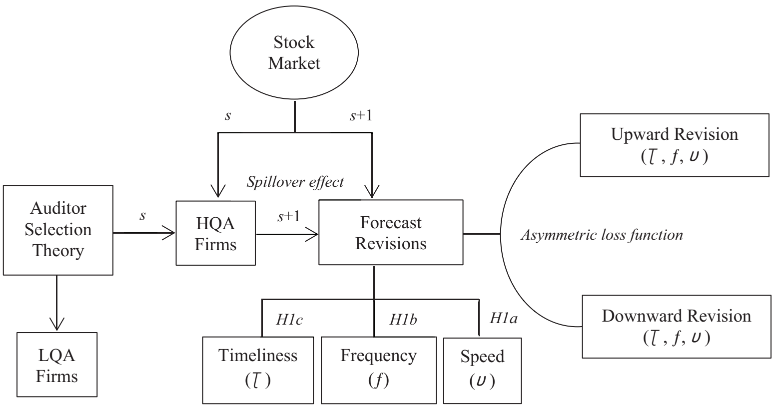
Corporate governance has been shown to have a positive influence on the quality of management earnings forecasts (Ajinkya *et al.*, 2005; Karamanou and Vafeas, 2005; Chapple *et al.*, 2018). Ajinkya *et al.* (2005), for instance, find that firms with more outside directors and greater institutional ownership tend to issue forecasts more frequently. In addition, these firms tend to issue less optimistically biased and more specific and accurate forecasts. Karamanou and Vafeas (2005) find that firms with stronger corporate governance (more effective board and audit committee structures) are more likely to update earnings forecasts, and their forecasts tend to be precise, more accurate and elicit a more favorable market response. Given that auditing is an integral part of corporate governance (Cohen *et al.*, 2002) and firms with stronger corporate governance tend to select higher-quality auditors (Abbott and Parker, 2000; Beasley and Petroni, 2001), it is likely that higher-quality audits would have a positive influence on the quality of management earnings forecasts. This is despite the fact that auditors are not required to provide audit-level assurance of the private information in management earnings forecasts [1].

Research on auditor selection provides a viable theory to support the relationship between audit quality and the quality of management earnings forecasts albeit unaudited. Specifically, this stream of research suggests that managers have a greater incentive to select a higher-quality auditor because it *signals* to the stock market that they have favorable private information (Titman and Trueman, 1986; Datar *et al.*, 1991). Moreover, Lennox (1999, p. 217) argues that the incentive of firms to select a higher-quality auditor is driven by the stock market perception that (i) the higher-quality auditor tends to be more "accurate"; and (ii) the more accurate auditor is likely to attest to the private information of the firm. Several studies have tested these theories by examining how the stock market reacts to an auditor switch by firms whose managers have favorable private information (Nichols and Smith, 1983; Eichenseher *et al.*, 1989). They generally find support that the stock market tends to react more favorably when firms with favorable private information switch to higher-quality auditors than to lower-quality auditors.

The stock market tends to discern information related to the selection of higher-quality auditors to be more credible (Teoh and Wong, 1993; Gul *et al.*, 2002), to have lower information asymmetry (Clinch *et al.*, 2012) and to be more informative (Mascarenhas *et al.*, 2010) among others. These findings imply that the favorable stock market perception about the firm's selection of a higher-quality auditor could have a spillover effect on the firm's subsequent disclosures of earnings information. Specifically, when a firm revises an earnings forecast, the stock market may turn to and consider the signal of the firm's auditor selection to evaluate the credibility of the signal in the forecast revision (Ota *et al.*, 2019). The stock market may consider the positive signal of the firm's selection of a higher-quality auditor to affirm the signal of the forecast revisions. The stock market's favorable reaction to the forecast revisions may, in turn, induce managers to revise their forecasts more willingly and in a more timely manner. These arguments imply higher forecast revision speed, higher forecast revision frequency and greater forecast revision timeliness.

Prior work documents an asymmetric loss function in the type of news released in the firm's choice of voluntary disclosure policies (Skinner, 1994; Soroka, 2006; Williams, 2015). That is, managers tend to act as if they bear large costs when the stock market is surprised by bad news rather than good news (Skinner, 1994). Furthermore, Skinner (1994, p. 39) argues that "managers may incur reputational costs if they fail to disclose bad news in a timely manner." Because higher-quality auditors invest heavily on their reputation (DeAngelo, 1981; Craswell *et al.*, 1995), higher-quality auditors may incur greater reputational costs if their client firms fail to disclose bad news in a timely manner.

Arguably, the favorable stock market reaction may occur even when the firm announces bad news via downward forecast revisions. This is because when the stock market evaluates the signal of bad news in downward forecast revisions, its favorable consideration of the selection of a higher-quality auditor may cause the stock market to be more empathetic to the firm for the bad news. This may, in turn, result in the market to be less willing to punish the firm for the bad news by reacting less negatively to the downward forecast revisions. Hence, while a negative stock market reaction may still occur when the firm revises the forecasts downward, the magnitude of the negative stock market reaction is likely to be smaller for firms that select higher-quality auditors than firms that select lower-quality auditors. Given that the stock market is less willing to punish the firm that selects a higher-quality auditor, the firm may be more forthcoming with downward forecast revisions, even though these revisions deliver bad news. Figure 2 summarizes our arguments and develops the theoretical model upon which the hypotheses for our study are based.



Note: HQA and LQA denote higher quality audit and lower quality audit, respectively. The time in which the firm selects the auditor is indicated by s. Hence, $s + 1$ denotes the time after the selection of auditors. Forecast revision timeliness, frequency and speed are denoted by τ, f and υ, respectively.

Figure 2.
Theoretical model for hypothesis (*H1*)

Our non-directional hypotheses are:

H1a. Firms that select higher-quality auditors are associated with forecast revision speed.

H1b. Firms that select higher-quality auditors are associated with forecast revision frequency.

H1c. Firms that employ higher-quality auditors are associated with forecast revision timeliness.

3. Research methodology

3.1 Empirical model

The choice of auditor creates a sample selection concern that could confound the coefficient estimates of the explanatory variables in the main tests. To address this concern, we conduct the Heckman (1979) two-step procedure. In the first step, we estimate a selection model using a probit regression and obtain the inverse Mills ratio (*INVMILLS*).[2] In the second step, we include *INVMILLS* in the main tests of the hypotheses as a control variable to correct for the potential selection bias. The following probit model estimated by the maximum likelihood method is used in the Heckman first step to explain what motivates firms to select a higher-quality auditor (i.e. a Big N auditor):

$$\begin{aligned} BIGN_{i,t} = {} & \varphi_0 + \varphi_1 SIZE_{i,t-1} + \varphi_2 LOSS_{i,t-1} + \varphi_3 ROA_{i,t-1} + \varphi_4 LEVERAGE_{i,t-1} \\ & + \varphi_5 LIQUIDITY_{i,t-1} + \varphi_6 NEWISSUE_{i,t-1} + \varphi_7 REPORTLAG_{i,t-1} \\ & + \boldsymbol{\gamma}\, Year\ Dummies + \boldsymbol{\delta}\, Industry\ Dummies + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variable in the selection model is *BIGN*, which equals 1 if a firm employs a Big Four/Three auditor and 0 otherwise. The composition of Big N auditors in Japan changed in 2006 following a major accounting scandal with Kanebo Corporation, which led to the collapse of ChuoAoyama (the PwC affiliated audit firm) (Skinner and Srinivasan, 2012). To reflect this compositional change in Big N auditors in Japan, we code observations as 1 for firms whose auditor is a Big Four auditor (Azusa, Chuo-Aoyama, Shin-Nihon and Tohmatsu) in the period 2001–2006 and 0 otherwise; and 1 for firms whose auditor is a Big Three auditor (Azusa, Shin-Nihon, and Tohmatsu) in the period 2007–2020 and 0 otherwise [3],[4].

We include the following independent variables in Equation (1), given prior studies show that these factors affect auditor choice ((Lennox *et al.*, 2012): the natural logarithm of the market value of equity (*SIZE*), an indicator variable that takes the value of 1 if net income is negative, and 0 otherwise (*LOSS*), the ratio of net income to total assets (*ROA*), the ratio of total liabilities to total assets (*LEVERAGE*), the current ratio (*LIQUIDITY*), an indicator variable that is 1 if a firm's shares outstanding or total long-term debt increase by 10%, and 0 otherwise (*NEWISSUE*), and the lag between the fiscal year-end and the earnings announcement date (*REPORTLAG*).

Year and industry indicators are also included to control for systematic variations in years and industries. Consistent with firms' selection of auditors, all independent variables (except for the year and industry indicators) in Equation (1) are measured at the end of year $t-1$.

The inverse Mills ratio (*INVMILLS*) is a function of the explanatory variables in the selection model. Because of collinearity and functional misspecification issues (Lennox *et al.*, 2012), the variables that are irrelevant in explaining the dependent variable of the second stage model are treated as the exclusion restrictions. Specifically, *LEVERAGE*, *LIQUIDITY*, *NEWISSUE* and *REPORTLAG* in Equation (1) are the exclusion restrictions because there is a lack of evidence to suggest that these variables explain how quickly a firm revises their earnings forecasts.

To empirically test our hypotheses, we estimate the following equation using an ordinary least squares (OLS) regression:

$$\begin{aligned} REVISION_{i,t} = {} & \beta_0 + \beta_1 BIGN_{i,t} + \beta_2 MFACC_{i,t} + \beta_3 ABSDA_{i,t} + \beta_4 SIZE_{i,t} \\ & + \beta_5 ROA_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 ROA_{i,t} \times LOSS_{i,t} + \beta_8 DISTRESS_{i,t} \\ & + \beta_9 NUMSUB_{i,t} + \beta_{10} EARNVOL_{i,t} + \beta_{11} BODSIZE_{i,t} \\ & + \beta_{12} OUTDIR_{i,t} + \beta_{13} OWNOFF_{i,t} + \beta_{14} OWNCORP_{i,t} \\ & + \beta_{15} OWNBNK_{i,t} + \beta_{16} OWNFRGN_{i,t} + \beta_{17} INVMILLS_{i,t} \\ & + \boldsymbol{\gamma} Year\ Dummies + \boldsymbol{\delta} Industry\ Dummies + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where the dependent variable (*REVISION*) in Equation (2) is forecast revision speed (*SPEED*), forecast revision frequency (*REVFRQ*) or forecast revision timeliness (*TIMELY*). We discuss how each dependent variable is estimated in turn.

3.2 Variable measurement

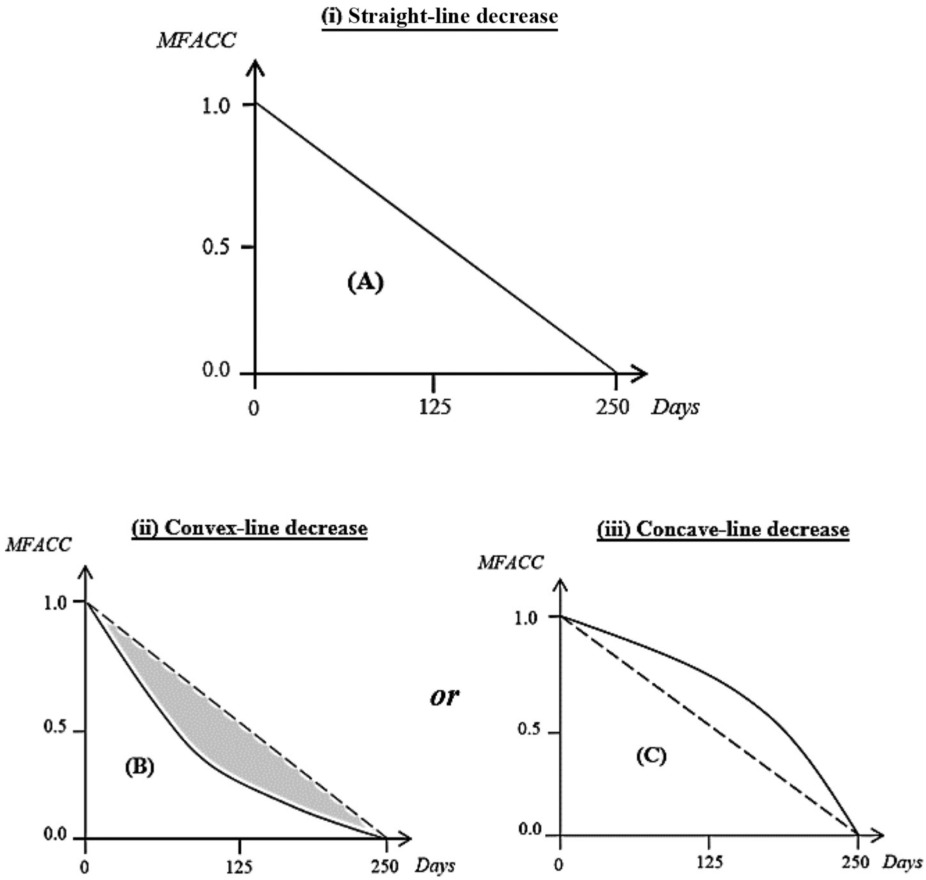
Figure 3 graphically depicts the principles under which *SPEED* is constructed. We start with a basic assumption that the information a manager receives over the forecast period is constant and monotonous. Based on this assumption, the base case scenario [shown in Figure 3(i)] represents the triangular region of forecast revisions that follows a straight-line decrease – region (A). The triangular region of (A) is formally expressed as:

$$Region\ (A) = 0.5 \times MFACC \times NDAYS$$

where *MFACC* is management forecast accuracy, calculated by the absolute value of the initial management forecast of earnings for firm i at year t minus realized earnings for firm i at year t, deflated by market value of equity for firm i at year t -1. *NDAYS* represents the number of days from the release of the initial earnings forecast to the earnings announcement date. Therefore, Region (A) for firms with *MFACC* of 1.0 and *NDAYS* of 250 is calculated to be 125 (i.e., 0.5 × 1.0 × 250).

Regions (B) and (C) (shown in Figures 3(ii) and 3(iii), respectively) represent two possible idiosyncratic forecast revision patterns. Specifically, Region (B) represents the region of a convex-line decrease, and Region (C) represents the region of a concave-line decrease. To calculate these regions, we take the sum of *MFACC* of each day over 250 days. Finally, we compare Region (A) with Regions (B) or (C) to determine the speed of forecast revisions for a specific firm. If a firm's forecast revision pattern is roughly represented as Region (B), then the ratio of (A) to (B) will be greater than 1, as Region (B) is smaller than Region (A). Similarly, if a firm's forecast revision pattern is roughly represented as Region (C), then the ratio of (A) to (C) will be less than 1, as Region (C) is larger than Region (A).

We compare the three regions shown in Figure 3 using the following ratio, where Region (A) is the numerator and Regions (B) or (C) is the denominator:



Notes: Region (A) is the triangular area under the straight-line decrease which is "the base case scenario". The base case scenario is the numerator of the *Ratio*. Regions (B) or (C) approximate firms' idiosyncratic forecast revision patterns. Specifically, region (B) approximates a firm's forecast revision pattern that follows a convex-line decrease, while region (C) approximates a firm's forecast revision pattern that follows a concave-line decrease. For example, if a firm's forecast revision pattern is roughly represented by region (B) [region (C)], then the *Ratio* is greater (smaller) than 1, implying faster (slower) forecast revision speed.

Figure 3. Scenarios to illustrate the principles behind the *Ratio*

$$Ratio_{i,t} = \frac{Base\ case\ scenario}{Idiosyncratic\ forecast\ revision\ pattern} = \frac{MFACC_{i,t}^{d=0} \times 0.5 \times NDAYS_{i,t}}{\sum_{d=0}^{NDAYS_{i,t}} MFACC_{i,t}^{d}}$$

To eliminate the effect of extreme values, we transform the ratio by taking the natural logarithm of one plus the ratio (*speed*). Furthermore, to test the validity of the assumption about the constant information flow in the base case scenario, we adjust *speed* for the revision speed of firms that are in the same industry and year. Hence, *SPEED* is formally represented as follows [5]:

$$speed_{i,t} = \ln(Ratio_{i,t} + 1)$$

$$SPEED_{i,t} = speed_{i,t} - \textit{industry-year average speed}$$

REVFRQ is the natural logarithm of the number of forecast revisions plus one. We compute forecast timeliness (*TIMELY*) based on forecast horizon, which can be represented as follows:

$$TIMELY_{i,t} = \ln\left(\frac{\textit{sum of horizon}_{i,t}}{\textit{number of revisions}_{i,t}}\right)$$

where *horizon* is the number of trading days between the forecast revision dates and the earnings announcement date.

Control variables are also included in the model to capture other factors that influence management forecast revisions. Given that forecast revisions are made during year *t*, we measure these control variables at year *t*. We discuss these control variables in turn.

First, we control for *MFACC* given that the extent of forecast revisions depends on the initial forecast accuracy. That is, managers with lower initial forecast accuracy would need to revise their forecasts to a larger extent than would managers with higher initial forecast accuracy. The extent of forecast revisions will, in turn, determine the speed, frequency and timeliness of the revisions.

As the extent to which managers revise their forecasts is highly correlated with management forecast accuracy, we include similar variables to control for factors that influence *MFACC*. Barton and Simko (2002) find that managers' ability to manage current earnings to meet earnings targets depends on the extent to which previous earnings are manipulated. Chen (2004) finds that managers are more likely to miss their own forecasts when they have less accounting flexibility to engage in upward earnings management. To control for this factor, we include previous earnings management (*ABSDA*), which is measured by taking the absolute value of discretionary accruals for year *t*-1 estimated using the cross-sectional modified Jones (1991) model.

We control for firm size because prior studies have shown that managers of larger firms tend to issue more accurate forecasts (Jaggi, 1980; Ota, 2006; Zhang, 2012), which may influence the extent of forecast revisions. We measure firm size (*SIZE*) by taking the natural logarithm of the market value of equity at year *t*-1.

Kato *et al.* (2009) find that firms' past operating performance is a determinant of changes in forecast errors. Specifically, they find that firms with stronger operating performance in the previous year are associated with less optimistic forecasts. Similarly, we expect that firms with stronger past operating performance are associated with more accurate forecasts. We measure past operating performance (*ROA*) as the ratio of net income for year *t*-1 to total assets at year *t*-1.

Loss-making firms are likely to have less informative earnings and are less inclined to meet or beat analysts' earnings expectations (Hayn, 1995). Baik *et al.* (2011) find that loss-making firms are associated with less accurate management forecasts. We include *LOSS*, which is coded 1 if the firm's net income for year *t*-1 is negative and 0 otherwise.

Prior studies (Frost, 1997; Koch, 2002; Ota, 2006) find that earnings forecasts for financially distressed firms exhibit greater upward bias. Koch (2002) finds that management earnings forecasts issued by financially distressed firms are less credible than similar forecasts issued by non-financially distressed firms. Chen *et al.* (2021) show that financially distressed firms tend to issue unfavorable forecasts when the COVID-19 pandemic worsens. Behn *et al.* (2008) find that financial analysts' forecasts for financially distressed firms are less accurate. Following Behn *et al.* (2008), we measure financial distress (*DISTRESS*) based on Zmijewski's (1984) financial distress score. We argue that financially distressed firms are likely to be associated with less accurate forecasts (i.e. a positive coefficient).

Management forecast accuracy decreases with complexity in firms. Following Chou and Lee (2003), we measure complexity of firms by taking the natural logarithm of one plus the number of subsidiaries (*NUMSUB*). Similarly, management forecast accuracy decreases with earnings uncertainty (Behn *et al.*, 2008; Baik *et al.*, 2011). Consistent with Behn *et al.* (2008), we measure earnings uncertainty (*EARNVOL*) by taking the standard deviation of return-to-equity over the previous five years.

Several studies find that corporate governance and ownership structure are determinants of the quality of management earnings forecasts (Ajinkya *et al.*, 2005; Karamanou and Vafeas, 2005; Kato *et al.*, 2009). To measure corporate governance, we take natural logarithm of the total number of directors on the board (*BODSIZE*) and the ratio of outside directors to total directors (*OUTDIR*). We capture ownership structure using *OWNOFF*, *OWNCORP*, *OWNBNK* and *OWNFRGN*, which are the percentage ownership interest of management and board members, other companies (excluding financial institutions), financial institutions and foreign investors, respectively. We make no prediction for the sign of the coefficients on these variables as prior evidence on the relation between corporate governance, ownership structure and management earnings forecasts in Japan is mixed.

We include fixed effects for years as Kato *et al.* (2009) show management forecasts in Japan systematically vary across years. Further, we include fixed effects for industries in Equation (2) to control for systematic variations across industries.

4. Sample and results

4.1 Sample

We collect our data for our test variables for the fiscal years 2001–2020 from the Nikkei Financial Quest (NEEDS) database. We only consider forecasts of net income (including non-routine earnings forecasts) because forecasts of other financial statement items are incomplete. Given that 80% of Japanese firms have fiscal year-ends in March, and to be consistent with prior studies (Muramiya and Takada, 2010; Ota, 2010; Aman, 2011), our sample only includes firms with a March fiscal year-end. Our sample covers firms listed on six stock exchanges. We exclude financial services, securities and insurance firms, as these firms are subject to stricter and more rigorous regulations, which could have a confounding effect on our findings (Chung *et al.*, 2004; Karamanou and Vafeas, 2005; Rogers and Stocken, 2005; Ota, 2010). These initial requirements resulted in a sample of 57,943 firm-year observations. We further remove firms with missing financial data from NEEDS (6,834), industries with less than ten firms because of insufficient data to calculate discretionary accruals (6,107), missing observations because of the inclusion of lagged variables (6,685) and firms with irregular accounting periods (168). We begin the period of analysis to test our hypotheses from 2003 because this was when quarterly release of forecasts and reporting for Japanese firms commenced. We remove the top 10% of initial forecast accuracy because *SPEED* has little meaning for these firms. After applying these selection requirements, the final samples to test *H1* consist of 34,974, 34,974 and 28,347 firm-year observations for forecast revision speed, frequency and timeliness, respectively. Table 1 summarizes the sample selection procedure.

4.2 Univariate relation between frequency and timeliness with forecast revision speed

Figure 4 plots the univariate relation between the disclosure proxies. Figures 4(a) and 4(b) show the relation between *SPEED* with the values of *REVFRQ* and the deciles of *TIMELY*,

Panel A: Sample selection		
Annual management earnings forecasts for fiscal years 2001 to 2020		57,943
Less: Missing financial data from NEEDS		(6,834)
Less: Industries with less than 10 firms are excluded in the calculation of discretionary accruals		(6,107)
Less: Dropped observations because of the inclusion of lagged variables		(6,685)
Less: Irregular accounting period and others		(168)
Initial sample		38,148
Final samples to test *H1*:		
Forecast revision speed (*SPEED*)		34,974
Forecast revision frequency (*REVFRQ*)		34,974
Forecast revision timeliness (*TIMELY*)		28,347
Panel B: Sample distribution		
Forecast year	Number of firm-years	(%)
2003	2,229	5.84
2004	2,222	5.82
2005	2,245	5.88
2006	2,245	5.88
2007	2,260	5.92
2008	2,271	5.95
2009	2,292	6.01
2010	2,247	5.89
2011	2,187	5.73
2012	1,785	4.68
2013	2,073	5.43
2014	2,054	5.38
2015	2,032	5.33
2016	2,014	5.28
2017	2,005	5.26
2018	2,007	5.26
2019	1,996	5.23
2020	1,984	5.20
	38,148	100.00

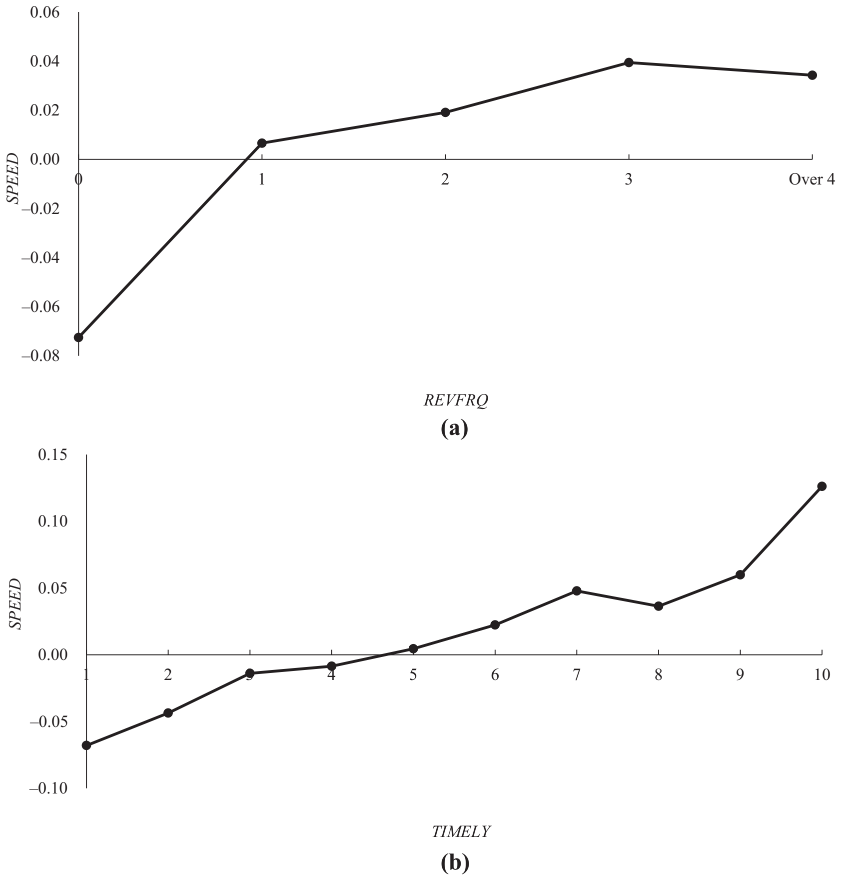
Notes: Panel A of this table summarizes the sample selection procedure for the main tests. The final samples for *SPEED*, *REVFRQ* and *TIMELY* are derived from the initial sample that comprises of annual management earnings forecasts available on NEEDS and covers period 2001–2020. The sample selection procedure yields an initial sample of 38,148 management earnings forecasts, from which the samples for *SPEED* (34,974), *REVFRQ* (34,974) and *TIMELY* (28,347) are derived. Panel B presents distribution properties for the sample of 38,148 management earnings forecasts released in the period 2001–2020. Around 5% of the total sample of management forecasts are reported in each year.

Table 1.
Sample selection and distribution

respectively. The figures show forecast revision speed is positively related to both forecast revision frequency and timeliness. Forecast revision speed monotonically increases in revision frequency from 0 to 3 revisions but decreases slightly after three revisions. Forecast revision speed also monotonically increases in the first seven deciles of *TIMELY* but decreases in decile eight, before increasing sharply thereafter. Overall, Figure 4 is consistent with our expectations that higher forecast revision speed is associated with more frequent and timely forecast revisions.

4.3 Univariate relation between forecast revision and audit quality

We test the possibility that the propensity of managers to estimate actual earnings more accurately is because of the forecast horizon rather than audit quality. That is, a manager's



Notes: Figure 4(a) plots the average of *SPEED* across firm-years grouped based on *REVFRQ*, while Figure 4(b) plots the average of *SPEED* based on *TIMELY*. The sample firm-years are grouped based on the possible values for the discrete variable *REVFRQ* (the number of forecast revisions), and into deciles for the continuous variable *TIMELY*. The figures plot the mean *SPEED* for each of the groups.

Figure 4. Relation between forecast revision speed and management forecast frequency and timeliness

propensity for more accurate forecasts might not be because of higher-quality audits but because of the manager becoming more certain and definitive about actual earnings as the firm approaches year end. To test this possibility, Figure 5 plots the forecast accuracy over the number of days subsequent to the release of the initial forecasts at Day 0 for the Big N, non-Big N and the full sample during the fiscal year. The *y*-axis represents forecast accuracy measured by the absolute value of forecast errors deflated by the lagged market value of equity (i.e. forecast accuracy decreases as the *y*-axis value increases). The *x*-axis represents the number of days following the release of the initial management forecasts at Day 0.

Figure 5 shows forecast accuracy for firms audited by non-Big N auditors is systematically lower than firms audited by Big N auditors throughout the forecast period. These results suggest that initial earnings forecasts issued by firms with higher audit

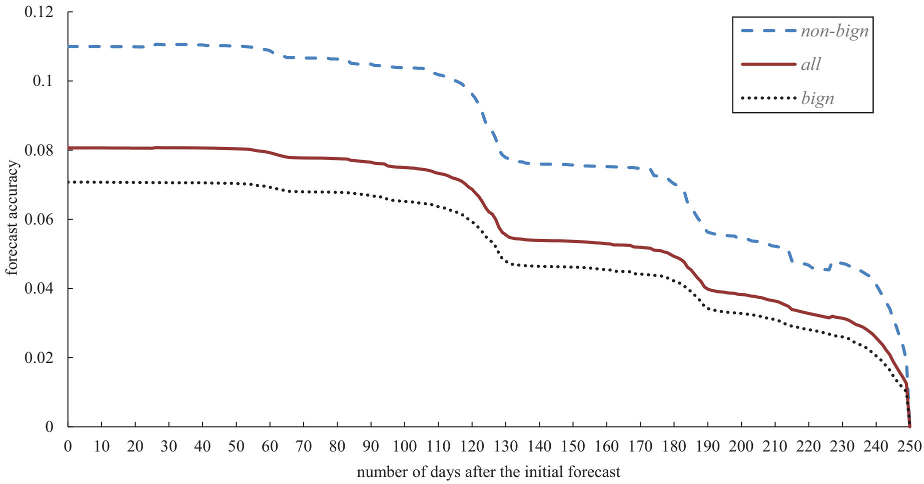


Figure 5. Changes in forecast accuracy during the fiscal year for clients of Big N, non-Big N auditors and the entire sample

Notes: The number of observations for the entire sample is 38,148. The figure plots the average values for the three samples. If firms' trading days are shorter or longer than the 250 trading days, then the trading days are standardized to 250 days.

quality are more accurate than those issued by firms with lower audit quality. Figure 5 identifies that major forecast revisions typically occur around 120, 190 and 240 days during the fiscal year, indicating that managers tend to revise forecasts at quarters two, three and after fiscal year-end.

4.4 Descriptive statistics and univariate correlations

Panel A of Table 2 presents the descriptive statistics of the regression variables for our main model. *MFACC* indicates that the initial management forecasts deviate from realized earnings by 6.0% of lagged market value of equity. The mean values of *SPEED*, *REVFRQ* and *TIMELY*, are −0.001, 0.761 and 4.143, respectively. *BIGN* suggests that 73% of our sample firm-year observations are clients of a Big N auditor. *FINN* indicates that the deviation between initial management forecasts and realized earnings for year *t*-1 is 6.5% of lagged market value of equity on average. *ABSDA*, the proxy for previous earnings management, has a mean value of 0.037. The mean *SIZE* is 9.802. The *ROA* variable suggests that on average net income is 2.0% of total assets. The mean *DISTRESS* is −1.547 and 15.6% of the sample observations report a loss. The mean *NUMSUB* is around two and the standard deviation of earnings (*EARNVOL*) is 0.115. With respect to the corporate governance variables, the average number of directors on the board of Japanese firms (*BODSIZE*) is eight ($e^{2.061}$ = 7.85), while the ratio of outside directors to total directors (*OUTDIR*) is 14.5% on average. The means of the four ownership variables show that the ownership by other companies (excluding financial institutions) (*OWNCORP*) is the largest compared to other types of ownership. Consistent with Kato *et al.* (2009), ownership by financial institutions (*OWNBNK*) is large relative to insider ownership (*OWNOFF*) and foreign ownership (*OWNFRGN*).

Panel B of Table 2 provides the correlations between the dependent variables in Equation (2) and *MFACC*. All Pearson and Spearman correlations except for the Spearman correlation between *MFACC* and *TIMELY* are positive and significant at the

Panel A: Descriptive statistics

Variables	N	Mean	SD	Lower quartile	Median	Upper quartile
MFACC	38,148	0.060	0.124	0.007	0.020	0.053
SPEED	34,974	−0.001	0.111	−0.069	−0.022	0.059
REVFRQ	34,974	0.761	0.441	0.693	0.693	1.099
TIMELY	28,347	4.143	0.949	4.119	4.363	4.796
BIGN	38,148	0.729	0.444	0.000	1.000	1.000
FINN	38,148	0.065	0.159	0.006	0.016	0.045
ABSDA	38,148	0.037	0.038	0.011	0.026	0.049
SIZE	38,148	9.802	1.749	8.517	9.568	10.877
ROA	38,148	0.020	0.053	0.008	0.023	0.044
LOSS	38,148	0.156	0.363	0.000	0.000	0.000
DISTRESS	38,148	−1.547	1.259	−2.513	−1.536	−0.617
NUMSUB	38,148	2.020	1.255	1.099	1.946	2.773
EARNVOL	38,148	0.115	0.313	0.018	0.035	0.082
BODSIZE	38,148	2.061	0.378	1.792	2.079	2.303
OUTDIR	38,148	0.145	0.155	0.000	0.125	0.250
OWNOFF	38,148	0.065	0.109	0.003	0.013	0.073
OWNCORP	38,148	0.285	0.190	0.128	0.254	0.411
OWNBNK	38,148	0.192	0.132	0.085	0.169	0.281
OWNFRGN	38,148	0.088	0.107	0.007	0.043	0.136

Panel B: Pearson and Spearman correlation

	MFACC	*SPEED*	*REVFRQ*	*TIMELY*
MFACC		0.244***	0.330***	−0.082***
SPEED	0.120***		0.133***	0.497***
REVFRQ	0.240***	0.090***		0.039***
TIMELY	0.038***	0.372***	0.237***	

Notes: Panel A of the table presents descriptive statistics for the variables of Equation (2). Panel B reports Pearson and Spearman correlation matrices between *MFACC, SPEED, REVFRQ* and *TIMELY*. Correlation indicated by *** indicates significance at the 1% level. *MFACC* indicates forecast accuracy and is defined as the absolute value of the initial management earnings forecast minus realized earnings deflated by lagged market value of equity. *SPEED* measures forecast revision speed and is calculated by subtracting the industry-year average revision speed from speed (estimated by the natural logarithm of the ratio of the base case scenario of forecast revision pattern to firms' forecast revision pattern during the fiscal year plus one). *REVFRQ* denotes forecast revision frequency and is the natural logarithm of the number of forecast revisions plus one. *TIMELY* denotes forecast revision timeliness and is the natural logarithm of the sum of the number of trading days between forecast revision and the earnings announcement dates divided by the number of forecast revisions. *BIGN* captures audit quality and equals 1 if a firm is audited by a Big N auditor and 0 otherwise. *FINN* denotes forecast innovation and is computed as the absolute value of forecast earnings minus prior realized earnings deflated by lagged market value of equity. *ABSDA* captures the absolute magnitude of earnings management through abnormal accruals and is estimated using the cross-sectional Jones (1991) model. *SIZE* denotes firm size and is the natural logarithm of lagged market value of equity. *ROA* is the ratio of net income to total assets. *LOSS* is 1 if the firm's net income is negative and 0 otherwise. *DISTRESS* denotes financial distress estimated by Zmijewski's (1984) financial distress index. *NUMSUB* is the natural logarithm of the number of subsidiaries plus one. *EARNVOL* denotes earnings volatility and is defined as the standard deviations of return-to-equity over the previous five years. *BODSIZE* is the natural logarithm of the total number of directors on the board. *OUTDIR* is the ratio of outside directors to total directors. *OWNOFF, OWNCORP, OWNBNK* and *OWNFRGN* are the percentage ownership interest of management and board members, other companies (excluding financial institutions), financial institution and foreign investors, respectively.

Table 2.
Descriptive statistics

1% level. The Spearman correlation between *MFACC* and *TIMELY* is negative and significant at the 1% level, suggesting that more accurate management earnings forecasts may not necessarily be more timely. Consistent with our expectations, *SPEED* is positively correlated with *REVFRQ* and *TIMELY*. These results are also consistent with the univariate analyses in Figure 4 on the relation between forecast revision speed and frequency and timeliness.

4.5 Multivariate regressions

4.5.1 Heckman first-stage analysis

In the first step of the Heckman procedure, we use a probit regression to estimate Equation (1) and to derive the inverse Mills ratio (*INVMILLS*). We include *INVMILLS* in the OLS pooled regressions of Equation (2) as a control variable to correct the potential sample selection bias [6]. Panel A of Table 3 reports the summary statistics of the independent variables included in the probit regression estimation of Equation (1) and compares Big N clients with non-Big N clients. The results show client firms of Big N auditors are larger (mean difference = 0.700) and are more profitable (mean differences in *LOSS* and

Panel A: Summary statistics

	BigN firm-years (N = 27,810)		Non-BigN firm-years (N = 10,338)		Difference (BigN – Non-BigN)	
	Mean	Median	Mean	Median	Mean	Median
SIZE	9.985	9.737	9.285	9.092	0.700***	0.646***
LOSS	0.155	0.000	0.218	0.000	−0.063***	0.000***
ROA	0.022	0.023	0.009	0.019	0.013***	0.004***
LEVERAGE	0.518	0.524	0.522	0.525	−0.004*	−0.001
LIQUIDITY	2.040	1.563	2.084	1.621	−0.044***	−0.058***
NEWISSUE	0.272	0.000	0.285	0.000	−0.013***	0.000***
REPORTLAG	42.203	43.000	43.341	44.000	−1.138***	−1.000***

Panel B: Estimation results of the 1st stage probit model

	Predicted Sign	Coefficient	z-statistic
Intercept	?	−0.5346	−2.42**
SIZE	+	0.1370	9.33***
LOSS	–	−0.0239	−0.77
ROA	+	1.4527	5.30***
LEVERAGE	–	0.1108	0.79
LIQUIDITY	+	0.0132	0.80
NEWISSUE	+	−0.0332	−1.73*
REPORTLAG	–	−0.0106	−4.09***
Pseudo-R^2 (%)	6.3		
Observations	47,452		

Note: Panels A and B of the table present the summary statistics and estimation results of the following equation, respectively:

$$BIGN_{i,t} = \varphi_0 + \varphi_1 SIZE_{i,t-1} + \varphi_2 LOSS_{i,t-1} + \varphi_3 ROA_{i,t-1} + \varphi_4 LEVERAGE_{i,t-1}$$

$$+ \varphi_5 LIQUIDITY_{i,t-1} + \varphi_6 NEWISSUE_{i,t-1} + \varphi_7 REPORTLAG_{i,t-1}$$

$$+ \boldsymbol{\gamma} Year\ Dummies + \boldsymbol{\delta} Industry\ Dummies + \varepsilon_{i,t} \quad (1)$$

BIGN captures audit quality and equals 1 if a firm is audited by a Big N auditor and 0 otherwise. *SIZE* denotes firm size and is the natural logarithm of lagged market value of equity. *LOSS* is 1 if net income is negative and 0 otherwise. *ROA* is the ratio of net income to total assets. *LEVERAGE* is the ratio of total liabilities to total assets. *LIQUIDITY* is the current ratio. *NEWISSUE* is 1 if a firm's shares outstanding or total long-term debt increase by 10% and 0 otherwise. *REPORTLAG* is the lag between the fiscal year-end and the earnings announcement date. Year and industry fixed effects are included. * and *** indicate significance at the 10 and 1% levels, respectively (two-tailed).

Table 3.
Heckman first-stage analysis

ROA = −0.063 and 0.013, respectively) than client firms of non-Big N auditors. Also, firms audited by Big N auditors have lower financial leverage (mean difference = −0.004) and shorter reporting lag (mean difference = −1.138) than firms audited by non-Big N auditors.

Panel B of Table 3 presents the results for the probit regression estimation of Equation (1). The coefficients on *SIZE* (φ_1 = 0.1370, *z*-statistic = 9.33) and *ROA* (φ_3 = 1.4527, *z*-statistic = 5.30) are positive and significant at the 1% level, consistent with the predictions that larger firms and firms with stronger financial performance are more likely to employ a higher-quality auditor. The coefficient on *REPORTLAG* is significantly negative (φ_7 = −0.0106, *z*-statistic = −4.09), suggesting that firms that employ a higher-quality auditor have shorter reporting lag.

4.5.2 Main results

Table 4 presents the OLS regression estimation results of Equation (2) for the individual forecast revision qualities – *SPEED*, *REVFRQ* and *TIMELY* in the period 2001–2020. Specifically, Panels A, B and C of Table 4 report the estimation results of Equation (2) for the individual forecast revision qualities for three samples, respectively: full revision sample (Panel A), downward revision sample (i.e., the sample only includes observations for which the initial forecast errors are greater than 0) (Panel B), and upward revision sample (i.e., the sample only includes observations for which the initial forecast errors are less than 0) (Panel C).

We winsorize all continuous variables at the 1st and 99th percentiles and use cluster-robust standard errors by firm to obtain the *t*-statistics (Petersen, 2009).

We predict that firms that select higher-quality auditors are associated with forecast revision speed (*H1a*), forecast revision frequency (*H1b*) and forecast revision timeliness (*H1c*). These predictions imply that the coefficient on *BIGN* (β_1) in Equation (2) is significant.

Panel A of Table 4 shows that *BIGN* is positive and significant at the 1% level (β_1 = 0.0545, *t*-statistic = 3.71) when *SPEED* is the dependent variable, suggesting that firms that select higher-quality auditors are associated with higher forecast revision speed. When *TIMELY* is the dependent variable, *BIGN* is positive and significant at the 1% level (β_1 = 0.8010, *t*-statistic = 5.36), indicating that firms that select higher-quality auditors are associated with greater forecast revision timeliness. Interestingly, when *REVFRQ* is the dependent variable, *BIGN* is significantly negative at the 1% level (β_1 = −0.1922, *t*-statistic = −3.04), suggesting that firms that select higher-quality auditors are associated with less frequent forecast revisions. Overall, our multivariate results are consistent with our three hypotheses.

With respect to the control variables, the coefficient on *MFACC* in all the regressions is positive and significant at the 1% level, suggesting that initial forecast accuracy is an important determinant of forecast revision behavior. The coefficients on *SIZE* and *LOSS* are significantly positive at the 1% level in all the regressions, suggesting that larger and loss-making firms tend to revise their forecasts faster, more frequently and in a more timely fashion. The coefficient on *DISTRESS* in all the regressions is significantly negative at the 1% level, indicating that forecast revisions are slower and less timely and frequent for financially distressed firms.

Panel B of Table 4 reports the results from the downward forecast revision sample. *BIGN* is positive and significant at the 1% level across the regressions of *SPEED* (β_1 = 0.1782, *t*-statistic = 9.64), *REVFRQ* (β_1 = 0.3287, *t*-statistic = 4.42) and *TIMELY* (β_1 = 0.7704, *t*-statistic = 4.59), suggesting that firms that select higher-quality auditors tend to revise their forecasts downward faster, more frequently and in a more timely fashion. These results lend support to our argument for the influence of stock market sentiment on forecast revision behaviors. Specifically, the favorable market sentiment toward bad news disclosed by firms that select higher-quality auditors may result in less severe negative reactions,

	Predicted Sign	*SPEED* Coefficient	*SPEED* *t*-statistic	*REVFRQ* Coefficient	*REVFRQ* *t*-statistic	*TIMELY* Coefficient	*TIMELY* *t*-statistic
Panel A: Full revision sample							
Intercept	?	−0.1333	−3.22***	0.7875	6.43***	2.8878	14.88***
BIGN	+	0.0545	3.71***	−0.1922	−3.04***	0.8010	5.36***
MFACC	+	0.2196	23.60***	0.8432	24.79***	0.5280	8.57***
ABSDA	?	0.0727	4.30***	0.6309	9.48***	0.0747	0.45
SIZE	+	0.0085	7.96***	0.0280	5.70***	0.0495	4.29***
ROA	+	0.0523	1.66*	−1.4744	−10.96***	3.3974	10.70***
LOSS	−	0.0275	11.63***	0.1879	24.30***	0.1368	7.06***
$LOSS_t \times ROA$	?	0.1495	3.35***	2.7994	15.32***	−4.7226	−11.74***
DISTRESS	−	−0.0031	−4.21***	−0.0116	−3.27***	−0.0332	−3.94***
NUMSUB	−	−0.0059	−6.35***	0.0052	1.18	−0.0281	−2.64***
EARNVOL	−	−0.0119	−4.71***	0.0012	0.11	−0.0533	−2.13**
BODSIZE	?	−0.0036	−1.69*	−0.0303	−3.06***	0.0205	0.84
OUTDIR	+	0.0119	2.26**	0.0856	3.52***	0.0268	0.42
OWNOFF	?	−0.0006	−0.08	−0.0761	−1.99**	−0.0540	−0.52
OWNCORP	?	−0.0028	−0.57	−0.0751	−3.18***	0.2236	3.70***
OWNBNK	?	0.0159	1.79*	0.0370	0.91	0.4415	4.48***
OWNFRGN	?	−0.0057	−0.57	−0.0081	−0.18	0.2858	2.50**
INVMILLS		−0.0313	−3.57***	0.1147	3.04***	−0.4775	−5.52***
Adjusted R^2 (%)		5.3		20.1		10.1	
N		34,974		34,974		28,347	
Panel B: Downward revision subsample (initial forecast error > 0)							
Intercept	?	−0.1108	−2.21**	0.4417	3.47***	3.2952	17.12***
BIGN	+	0.1782	9.64***	0.3287	4.42***	0.7704	4.59***
MFACC	+	0.1431	15.20***	0.4684	14.81***	0.3242	4.87***
ABSDA	?	0.0381	1.67*	0.503	6.10***	−0.1857	−0.89
SIZE	+	−0.0013	−0.95	−0.0046	−0.80	0.0176	1.37
ROA	+	−0.5257	−10.61***	−3.6769	−17.47***	2.8816	6.15***
LOSS	−	0.0224	8.54***	0.1816	21.43***	0.1001	4.70***
$LOSS_t \times ROA$	?	0.6042	10.51***	4.3525	18.33***	−4.2948	−8.12***
DISTRESS	−	−0.0058	−6.36***	−0.0174	−4.41***	−0.0306	−3.33***
NUMSUB	−	−0.0052	−4.38***	0.0107	2.07**	−0.0258	−2.16**
EARNVOL	−	−0.0072	−2.34**	0.0125	0.99	−0.0312	−1.16
BODSIZE	?	−0.0037	−1.31	−0.0263	−2.29**	0.0200	0.73
OUTDIR	+	0.0082	1.22	0.0854	3.09***	0.0570	0.80
OWNOFF	?	0.0084	0.84	−0.0229	−0.53	−0.0658	−0.60
OWNCORP	?	−0.0023	−0.36	−0.0588	−2.17**	0.1636	2.39**
OWNBNK	?	0.0233	2.06**	0.0994	2.12**	0.5099	4.84***
OWNFRGN	?	0.0247	1.90*	0.1175	2.24**	0.3508	2.78***
INVMILLS		−0.1039	−9.41***	−0.1954	−4.41***	−0.4601	−4.69***
Adjusted R^2 (%)		5.9		25.7		7.7	
N		18,243		18,243		15,262	
Panel C: Upward revision subsample (initial forecast error < 0)							
Intercept	?	−0.2077	−14.76***	0.0440	0.78	2.7320	14.12***
BIGN	+	−0.0262	−1.15	−0.4787	−5.25***	0.7630	3.27***
MFACC	+	0.3889	17.13***	1.7181	18.92***	1.0113	7.39***
ABSDA	?	0.0878	3.52***	0.6697	6.88***	0.3537	1.37

(*continued*)

Table 4.
The relationship between audit quality and management forecast revision speed, frequency and timeliness

	Predicted Sign	*SPEED* Coefficient	*SPEED* t-statistic	*REVFRQ* Coefficient	*REVFRQ* t-statistic	*TIMELY* Coefficient	*TIMELY* t-statistic
SIZE	+	0.0175	11.21***	0.0543	8.41***	0.0916	5.47***
ROA	+	0.3264	7.49***	−0.6364	−3.48***	3.9398	8.96***
LOSS	–	0.0182	2.68***	0.1491	6.64***	0.0936	1.61
$LOSS_t \times ROA$	?	−0.1263	−1.28	1.9542	5.07***	−5.9417	−7.79***
DISTRESS	–	0.0000	0.00	−0.0054	−1.15	−0.0343	−2.82***
NUMSUB	–	−0.0078	−5.96***	−0.0042	−0.79	−0.0339	−2.32**
EARNVOL	–	−0.0220	−5.37***	−0.0299	−1.84*	−0.1133	−2.61***
BODSIZE	?	−0.0037	−1.25	−0.0338	−2.65***	0.0184	0.53
OUTDIR	+	0.0145	1.86*	0.0694	2.09**	−0.0009	−0.01
OWNOFF	?	−0.0122	−1.02	−0.1340	−2.51**	−0.0818	−0.50
OWNCORP	?	−0.0017	−0.25	−0.0860	−2.77***	0.2878	3.38***
OWNBNK	?	0.0134	1.12	−0.0078	−0.15	0.3880	2.78***
OWNFRGN	?	−0.0285	−2.01**	−0.0749	−1.25	0.1661	1.01
INVMILLS		0.0153	1.13	0.2838	5.20***	−0.4542	−3.36***
Adjusted R^2 (%)		9.7		17.2		13.7	
N		16,715		16,715		13,072	

Notes: Panels A, B, and C of the table report estimates from the following equation using the entire forecast revision sample, downward revision sample, and upward revision sample, respectively:

$$
\begin{aligned}
REVISION_{i,t} = {} & \beta_0 + \beta_1 BIGN_{i,t} + \beta_2 MFACC_{i,t} + \beta_3 ABSDA_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 ROA_{i,t} \\
& + \beta_6 LOSS_{i,t} + \beta_7 ROA_{i,t} \times LOSS_{i,t} + \beta_8 DISTRESS_{i,t} + \beta_9 NUMSUB_{i,t} \\
& + \beta_{10} EARNVOL_{i,t} + \beta_{11} BODSIZE_{i,t} + \beta_{12} OUTDIR_{i,t} + \beta_{13} OWNOFF_{i,t} \\
& + \beta_{14} OWNCORP_{i,t} + \beta_{15} OWNBNK_{i,t} + \beta_{16} OWNFRGN_{i,t} \\
& + \beta_{17} INVMILLS_{i,t} + \gamma \, Year\ Dummies + \delta \, Industry\ Dummies + \varepsilon_{i,t} \qquad (2)
\end{aligned}
$$

where *REVISION* indicates *SPEED*, *REVFRQ* or *TIMELY*. *SPEED* measures forecast revision speed and is calculated by subtracting the industry-year average revision speed from speed (estimated by the natural logarithm of the ratio of the base case scenario of forecast revision pattern to firms' forecast revision pattern during the fiscal year plus one). *REVFRQ* denotes forecast revision frequency and is the natural logarithm of the number of forecast revisions plus one. *TIMELY* denotes forecast revision timeliness and is the natural logarithm of the sum of the number of trading days between forecast revision and the earnings announcement dates divided by the number of forecast revisions. *BIGN* captures audit quality and equals 1 if a firm is audited by a Big N auditor and 0 otherwise. *MFACC* indicates forecast accuracy and is defined as the absolute value of the initial management earnings forecast minus realized earnings deflated by lagged market value of equity. *ABSDA* captures the absolute magnitude of earnings management through abnormal accruals and is estimated using the cross-sectional Jones (1991) model. *SIZE* denotes firm size and is the natural logarithm of lagged market value of equity. *ROA* is the ratio of net income to total assets. *LOSS* is 1 if the firm's net income is negative and 0 otherwise. *DISTRESS* denotes financial distress estimated by Zmijewski's (1984) financial distress index. *NUMSUB* is the natural logarithm of the number of subsidiaries plus one. *EARNVOL* denotes earnings volatility and is defined as the standard deviations of return-to-equity over the previous five years. *BODSIZE* is the natural logarithm of the total number of directors on the board. *OUTDIR* is the ratio of outside directors to total number of directors. *OWNOFF, OWNCORP, OWNBNK* and *OWNFRGN* are the percentage ownership interest of management and board members, other companies (excluding financial institutions), financial institution and foreign investors, respectively. Year and industry fixed effects are included. *, ** and *** denote significance at the 10, 5 and 1% levels, respectively (two-tailed). Outliers at or beyond the 1st and 99th percentiles of the distributions of all continuous variables have been winsorized. All the *t*-statistics are based on cluster-robust standard errors by firm.

Table 4.

which may in turn induce these firms to disclose downward forecast revisions more willingly.

Panel C of Table 4 reports the results from the upward forecast revision sample. The coefficient on *BIGN* with the upward forecast revision sample is mixed. In particular, the results show that the coefficient on *BIGN* for the *REVFRQ* regression is significantly negative at the 1% level ($\beta_1 = -0.4787$, *t*-statistic = −5.25) and significantly positive at the 1% level for the *TIMELY* regression ($\beta_1 = 0.7630$, *t*-statistic = 3.27), suggesting that firms that select higher-quality auditors revise upward less frequently but in a more timely fashion. However, when *SPEED* is the dependent variable, the sign of the coefficient on *BIGN* is negative (i.e. lower forecast revision speed) and is no longer significant. These results lend further support for our arguments for the influence of stock market sentiment on forecast revision behaviors. That is, upward forecast revisions do not carry the same ramifications as downward forecast revisions in terms of stock market reactions and reputational costs. Hence, higher-quality auditors are not as apprehensive about upward forecast revisions as they would with downward forecast revisions. This rationale provides a plausible explanation for the mixed findings in the upward revision sample.

Overall, these results are interesting for several reasons. First, the results provide some important implications of audit quality for the asymmetric loss function in the type of news. Second, the results highlight the importance of considering the direction of forecast revisions when investigating the association between audit quality and management forecast revisions.

5. Sensitivity tests

5.1 Sample variations on the degree of forecast accuracy

The extent to which managers revise forecasts depends on the degree of accuracy in the initial management earnings forecasts. Specifically, if the initial management earnings forecasts are less accurate, then the managers would revise their forecasts to a greater extent than they would if the initial management earnings forecasts are more accurate. Our first sensitivity analysis is to test this possibility.

We remove observations from the main sample based on different degrees of initial forecast accuracy and derive three subsamples: (1) the top 5% of initial forecast accuracy removed (subsample one for *SPEED* [N = 36,942], *REVFRQ* [N = 36,942], and *TIMELY* [N = 29,228]); (2) the top 15% of initial forecast accuracy removed (subsample two for *SPEED* [N = 32,990], *REVFRQ* [N = 32,990], and *TIMELY* [N = 27,368]); and (3) the top 20% of initial forecast accuracy removed (subsample three for *SPEED* [N = 31,042], *REVFRQ* [N = 31,042], and *TIMELY* [N = 26,313]).

Untabulated results show that the coefficients on *BIGN* across all subsamples are significant at the 1% level consistent with Panel A of Table 4, suggesting that our main findings are robust and not sensitive to the different cutoff points of initial forecast accuracy.

5.2 Auditor industry specialization

Behn *et al.* (2008) find that the effect of auditor size on forecasting performance of financial analysts depends on auditor industry specialization. This is because an auditor develops industry specialization by having a broader client base in the same industry. In our second sensitivity test, we examine whether the interaction effect between auditor size and industry specialization extends to forecasting performance of managers using the following equation:

$$SPEED_{i,t} = \beta_0 + \beta_1 BIGN_{i,t} + \beta_2 AISPEC_{i,t} + \beta_3 BIGN_{i,t} \times AISPEC_{i,t} + \boldsymbol{\delta}\, Control\ Variables + \varepsilon_{i,t} \quad (3)$$

where *AISPEC* is measured as the sum of total sales of all clients of the auditor in an industry over the sum of the total sales of all clients of all auditors in an industry. All other dependent and independent variables are defined in Equation (2). Table 5 reports the estimation results with *SPEED* being the dependent variable. The table has three columns reporting the results for alternative specifications of the audit quality variables in the model. Specifically, Column (i) reports the results for the first-order effect of *BIGN*, Column (ii) reports the results for the first-order effect of *BIGN* and *AISPEC* and Column (iii) reports the results for the first- and second-order effects of *BIGN* and *AISPEC*.

Table 5 shows that *BIGN* is positive and significant at the 1% level in Columns (i) (β_1 = 0.0545, *t*-statistic = 3.71), Column (ii) (β_1 = 0.0536, *t*-statistic = 3.61) and Column (iii) (β_1 = 0.0534, *t*-statistic = 3.59), consistent with *H1a*. However, no statistically significant results are shown on the coefficients on *AISPEC* and *BIGN* × *AISPEC*. The sum of the coefficients on *AISPEC* and *BIGN* × *AISPEC* (i.e. $\beta_2 + \beta_3$) in Column (iii) is not significantly different from 0 (*F*-statistic = 0.10), suggesting that auditor industry specialization does not affect the speed of management forecast revisions for the clients of Big N auditors. Overall, the results suggest that audit quality inferred from industry specialist auditors does not affect the speed at which managers revise their forecasts during the fiscal period.

6. Conclusion

The purpose of this study is to shed light on the relationship between audit quality and management earnings forecast revisions through the lens of the auditor selection model. We present evidence consistent with the hypothesis that managers' forecast revision behaviors are influenced by the selection of a higher-quality auditor. Based on the auditor selection theory, we conceive that the stock market tends to react more favorably to forecast revisions

	(i)		(ii)		(iii)	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
BIGN	0.0545	3.71***	0.0536	3.61***	0.0534	3.59***
AISPEC			0.0026	0.43	0.0096	0.50
BIGN×*AISPEC*					−0.0075	−0.37
Control variables	Included		Included		Included	
$(\beta_2 + \beta_3) = 0$					*F*-statistic = 0.10	
Adjusted R^2 (%)	5.3		5.3		5.3	
N	34,974		34,974		34,974	

Notes: This table presents the estimation results for the following equations:

$$SPEED_{i,t} = \beta_0 + \beta_1 BIGN_{i,t} + \beta_2 AISPEC_{i,t} + \beta_3 BIGN_{i,t} \times AISPEC_{i,t} + \boldsymbol{\delta}\, Control\ Variables + \varepsilon_{i,t} \quad (3)$$

where *AISPEC* is measured as the sum of total sales of all clients of the auditor in an industry over the sum of the total sales of all clients of all auditors in an industry. *BIGN* captures audit quality and equals 1 if a firm is audited by a Big N auditor, and 0 otherwise. We include the same vectors of control variables as Equation (2). ** and *** denote statistical significance at the 5 and 1% levels, respectively (two-tailed).

Table 5. Audit quality proxied by industry specialization

of firms that select higher-quality auditors because the market assumes that these firms have more favorable private information than firms that select a lower-quality auditor. Such favorable stock market reaction is inducive to forecast revisions.

Moreover, we present evidence suggesting that managers of firms that select higher-quality auditors are more willing to revise their forecasts downward, even though these revisions convey bad news to the market. We argue that such behavior is consistent with the stock market being less willing to punish these firms for the bad news because of its favorable consideration of the selection of a higher-quality auditor by these firms.

Based on well-established theories from the disclosure literature, we pioneer an empirical proxy to capture the speed with which managers revise their earnings forecasts to arrive at the actual earnings, a relatively unexplored construct of management forecast quality. We apply a simple rationale to develop a measure for forecast revision speed, in which we compare the base case scenario of forecast revision pattern (i.e. a straight-line decrease from the day when the initial management forecast is disclosed to the actual earnings announcement date) with the various idiosyncratic patterns of forecast revisions by firms during the fiscal year. That is, the base case scenario is the numerator of the ratio, while the various forecast revision patterns are the denominator of this ratio. If a firm's forecast revision during the fiscal year (i.e. the denominator of the ratio) follows a convex (concave) decreasing pattern, then we interpret the forecast revision speed for the firm to be higher (lower). This measure is also adjusted for the possibility that the base case scenario may not be a straight line, given that the information flow may not be constant.

Using a comprehensive forecast sample stemming from the unique Japanese setting, where managers are compelled to provide earnings forecasts, we provide empirical evidence consistent with our hypotheses. In particular, we find that the initial forecast accuracy and forecast revision speed are both higher for firms that select higher-quality auditors. We also find that although firms that select higher-quality auditors are associated with more timely forecast revisions, these firms tend to revise their forecasts less frequently. These results continue to hold after we control for other variables such as firm size, firm performance, financial distress, earnings volatility, ownership structure and endogeneity.

In our additional analyses, we partition the forecast revisions according to whether they are upward or downward revisions. Our analysis of the downward revision sample shows that firms that select higher-quality auditors are associated with more frequent, timely and faster downward forecast revisions. Our analysis of the upward revision sample, however, shows that firms that select higher-quality auditors have no association with management forecast revision speed, even though they are associated with less frequent but more timely management forecast revisions. These additional analyses highlight the importance of considering the direction of forecast revisions because it has implications for prior evidence that consistently documents an asymmetric response to good news and bad news (i.e. the market responses to bad news are significantly greater than good news).

There have been several research attempts to investigate the relationship between audit quality and management earnings forecasts in settings where the forecasts are audited. However, scant evidence still exists on how audit quality influences *unaudited* management forecasts and how audit quality influences forecast revision behaviors and the speed with which managers revise their forecasts. Our study addresses some of the limitations in earlier studies as well as providing an intuitive approach in understanding the relationship between audit quality and management earnings forecasts.

Our evidence should, however, be interpreted with caution given the limitations of our study. In particular, our study does not perform a stock market reaction test. We do not perform such a test because it has been argued that the stock market reaction often captures noise or other signals that may potentially confound the effect of audit quality (Lennox, 1999). While the absence of a stock market reaction test is a potential limitation of our study, we leave this interesting avenue for future research.

Notes

1. Nevertheless, prior studies have investigated the influence of audit quality on management earnings forecasts in a setting where the forecasts are audited (McConomy, 1998; Clarkson, 2000).
2. The mathematical expression of the inverse Mills ratio is $\varphi(z)/\Phi(z)$ where z is the fitted value of the probit regression model; φ and Φ represent the density function and the cumulative distribution function for a standard normal distribution, respectively.
3. Under the Japanese regulations, international audit firms are not allowed to operate in Japan directly with their own brand identities. Consequently, the international audit firms would have to establish affiliations with large external audit firms to exist in Japan (Saito and Takeda, 2014). Specifically, Azusa is affiliated with KPMG, ShinNihon is affiliated with Ernst & Young and Tohmatsu is affiliated with Deloitte Touche Tohmatsu. From 2007, ChuoAoyama (the PwC affiliated audit firm) does not have a presence in Japan following its collapse in 2006.
4. We perform additional tests to ensure our main results are not confounded by this compositional change. Specifically, we exclude the period during which PwC ChuoAoyama existed from the regression analysis (i.e. 2001–2006), and in a separate analysis, we recoded *BIGN* to exclude PwC ChuoAoyama for the entire sample period 2001–2020. Untabulated results of these additional analyses are qualitatively similar to the main results.
5. It should be noted that *SPEED* is an all-inclusive measure of management forecast accuracy because we first calculate forecast accuracy in regular daily intervals throughout the entire forecast period, and we then weight the derived accuracies based on the number of days in the forecast period. Evidently, *SPEED* adapts the "time-weighted principle" that has been commonly used in finance to capture, for example, time-weighted rate of return.
6. We also include *INVMILLS* in the following model in which *MFACC* is the dependent variable:

$$
\begin{aligned}
MFACC_{i,t} = {} & \alpha_0 + \alpha_1 BIGN_{i,t} + \alpha_2 FINN_{i,t} + \alpha_3 ABSDA_{i,t-1} + \alpha_4 SIZE_{i,t-1} \\
& + \alpha_5 ROA_{i,t-1} + \alpha_6 LOSS_{i,t-1} + \alpha_7 ROA_{i,t-1} \times LOSS_{i,t-1} \\
& + \alpha_8 DISTRESS_{i,t-1} + \alpha_9 NUMSUB_{i,t-1} + \alpha_{10} EARNVOL_{i,t-1} \\
& + \alpha_{11} BODSIZE_{i,t-1} + \alpha_{12} OUTDIR_{i,t-1} + \alpha_{13} OWNOFF_{i,t-1} \\
& + \alpha_{14} OWNCORP_{i,t-1} + \alpha_{15} OWNBNK_{i,t-1} + \alpha_{16} OWNFRGN_{i,t-1} \\
& + \alpha_{17} INVMILLS_{i,t} + \boldsymbol{\gamma} Year\ Dummies + \boldsymbol{\delta} Industry\ Dummies + \varepsilon_{i,t}
\end{aligned}
$$

NEWISSUE and REPORTLAG variables in Equation (1) are the exclusion restrictions for the model of *MFACC* because there is no evidence from prior studies to suggest that these variables affect initial forecast accuracy directly. Untabulated results show that the coefficient on *BIGN* is significantly negative at the 1% level (α_1 = −0.1868, *t*-statistic = −9.44), suggesting that the absolute value of forecast errors decreases (i.e. initial forecast accuracy increases) for firms that employ higher-quality auditors. The coefficient on *INVMILLS* is significant at the 1% level (α_{17} = 0.1099, *t*-statistic = 9.57), confirming the importance of correcting for sample selection bias associated with auditor choice.

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