Information in Mandatory and Voluntary Earnings Announcement Date Forecasts

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Abstract

We investigate whether mandatory earnings announcement date forecasts are informative to investors and the informational tradeoffs between mandatory and voluntary forecasts. We find: (i) The percentages of the quarter's earnings news conveyed by mandatory China and voluntary US forecasts are similar. (ii) Mandatory China forecasts provide information about yet-to-be-announced firm performance and convey earnings news, even for firms less likely to forecast if forecasting were voluntary and despite making the forecasts at the beginning of the reporting window. The market reacts to information in initial and revised forecasts. (iii) Voluntary US forecasts provide information primarily through the forecasted announcement date; the act of forecasting and forecast timing provide some information, but no significant incremental earnings news is conveyed by the act of forecasting or its timing. However, the majority of US firms do not issue forecasts. Information quality and yet-to-be-announced firm performance are significant in explaining voluntary forecasting. Taken together, the findings reveal that mandatory forecasts for all firms, in aggregate, provide more and earlier information to investors.

Information in Mandatory and Voluntary Earnings Announcement Date Forecasts

1. Introduction

We investigate whether mandatory earnings announcement date forecasts are informative to investors and what informational tradeoffs exist between mandatory and voluntary forecasts.[1] To investigate these questions we exploit a regulatory feature in China that mandates all firms to publicly forecast at the beginning of the reporting window the date on which the firm expects to announce that quarter's earnings.[2] To our knowledge, China is unique in having this requirement. Because all China firms have December 31 fiscal year ends, the forecasts are available at the same time for all firms. In contrast, US earnings announcement date forecasts are voluntary, both as to the act of forecasting and forecast timing. We provide evidence that mandatory China forecasts are informative to investors and, in aggregate, reveal more information to the market and with more timeliness than voluntary US forecasts.

Prior research establishes that voluntary earnings announcement date forecasts are informative about yet-to-be-announced firm performance. However, voluntary forecasts result from self-selection, e.g., firms with higher information quality may be more likely to issue a forecast that is informative of performance. Thus, inferences based on voluntary forecasts may not apply to mandatory forecasts. Mandatory forecasts could lack informativeness if firms are unable to develop informative forecasts by the mandated forecasting date, especially one that is early in the reporting window. The forecasts also could lack informativeness if firms nominally

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[1] We refer to these disclosures as "forecasts" because they relate to a future event—earnings announcement timing—with uncertainty not within the firm's control (Bagnoli, Kross, and Watts [2002]). We refer to the forecasted earnings announcement date as the "forecasted date" and the forecast issue date as the "forecast date."

[2] China firms are not required to announce earnings *per se* but are required to release publicly their quarterly financial report. We refer to this as announcing earnings because the financial report includes earnings. Haw et al. [2006] explains that in China firms do not voluntarily release quarterly earnings information prior to releasing the annual report, and there are no analyst forecasts of earnings.

satisfy the forecasting requirement, for example by selecting the last day of the reporting window to ensure they can meet the forecast, or select a forecasted date for other non-performance related reasons. Alternatively, career concerns, such as cultivating a reputation for timeliness and accuracy, could provide incentives for firms to issue informative forecasts. Thus, the informativeness of mandatory forecasts of earnings announcement dates is an open empirical question that we address.

If mandatory forecasts are informative, there are informational tradeoffs between mandatory and voluntary forecasts. Mandating earnings announcement date forecasts for all firms could increase the performance-related information available to investors for firms that would not issue such forecasts voluntarily. The majority of US firms do not issue such forecasts. Mandatory forecasts also could provide the performance-related information earlier, depending on the mandated forecast date. In China that date is essentially the last day of the quarter to which the earnings relates, which is the beginning of the reporting window. US forecasting firms, on average, issue forecasts one-third into the reporting window. However, mandatory forecasts do not convey information associated with the act of forecasting and forecast timing, which could be available from voluntary forecasts. In addition, mandatory and voluntary forecasts might convey different proportions of yet-to-be-announced earnings news. Although earlier forecasts might convey information that investors might learn later from other sources, earlier forecasts may be less accurate and, thus, less informative.

To guide our empirical tests, we develop an analytical framework of a firm that has private and public information about the firm's performance and uses that information to develop a forecast of the firm's earnings announcement date. Although the framework is simplified and not designed to capture fully firms' forecasting behavior, it guides us in constructing measures of

investors' updated expected announcement date upon observing the forecast. It also enables us to estimate forecasting information characteristics, such as the precision of the firm's private information, that are determinants of voluntary disclosure. We use these estimates to identify China firms that are less likely to forecast earnings announcement dates if forecasting were voluntary. This identification enables us to provide insights into the extent to which voluntary forecasting results in a loss of information to investors.

Our empirical analyses begin by determining whether mandatory China earnings announcement date forecasts are informative to investors. We do so because assessing informational tradeoffs between voluntary and mandatory forecasts is interesting only if mandatory forecasts provide information. We first confirm for our sample period—2004Q2 to 2013Q3—that in China later actual earnings announcement dates are associated with worse firm performance, which is the basis for predicting that forecasts of those dates convey performance information. We then test whether later forecasted announcement dates are significantly associated with more negative earnings and change in earnings, and lower return on assets. We find that they are. We also find forecast revisions to later dates are associated with worse performance, which increases confidence in our inferences.

We then test whether framework-based updates of investors' expectations regarding the earnings announcement date upon observing the forecast are associated with yet-to-be announced firm performance and whether the market reacts accordingly. As predicted, we find that updates of investors' expectations to later earnings announcement dates are associated with worse firm performance, and that the market reacts more negatively to forecasts that update expectations to later dates. However, there is evidence of a delayed market reaction, which indicates the market's initial reaction to the forecasts is incomplete. Although finding that

mandatory earnings announcement dates are informative is perhaps surprising given that firms can nominally meet the forecast requirement and the absence of regulatory penalty for subsequently revising the date, the findings suggest that incentives created by career concerns and other reputational effects are strong enough to induce informative forecasts.

To assess the informational tradeoffs between mandatory and voluntary forecasts we conduct three analyses. First, we compare the information associated with a quarter's earnings conveyed by mandatory and voluntary forecasts. We find that, on average, both types of forecasts reveal similar percentages, approximately 8% in a three-day window, of the quarterly earnings news arriving after the end of the quarter. This 8% is significantly larger than the analogous percentage for a random three-day window that is non-overlapping with the forecast issuance and earnings announcement windows. For mandatory forecasts, this information relates only to the forecasted date, whereas for voluntary forecasts the information also includes any information associated with the act of forecasting and its timing. These findings suggest that the information revealed by mandatory forecasts is similar to the combined information in voluntary forecasts. The findings also reveal that mandating forecasts be issued at the beginning of the reporting window does not necessarily come at a cost of lower informativeness.

Second, we provide evidence on the information in mandatory forecasts by firms less likely to issue forecasts if forecasting were voluntary. This information is not available in a voluntary regime. To identify such firms, based on voluntary disclosure theory, we rely on estimates of three framework-based forecast information characteristics—precisions of public and private information and earnings announcement date persistence. To validate this approach, we first show that US forecasting firms with higher forecasting information characteristics are more likely to issue a forecast, which is consistent with self-selection in voluntary forecasting.

Thus, we identify China firms as having low (high) forecast probability based on estimates of their private and public information precisions and announcement date persistence.

We conduct our forecast informativeness tests separately for forecasts by China firms with low and high forecast probability. We find that forecasts by both groups of firms are informative. We also find that the market reacts accordingly, although the market reaction to forecasts by high forecast probability firms is delayed. Perhaps surprisingly given the lower precision of information for low forecast probability firms, the quarter's earnings news reflected in forecasts of the two groups of firms is not significantly different. Taken together, we find that mandatory China forecasts are informative, even forecasts by firms less likely to forecast if forecasting were voluntary.

Third, we provide evidence on the information in forecasts by US firms associated with the act of voluntary forecasting and the timing of the forecast. This information is not available in a mandatory regime. We find each forecast attribute reflects information about yet-to-be-announced firm performance incremental to the forecasted earnings announcement date, and the market reacts to the forecast accordingly. The market reaction to the act of forecasting is immediate, but the reaction to forecast timing is delayed. We also find that the quarter's earnings news associated with the forecast largely is attributable to forecast content; the incremental associations are positive, but not significantly so, for the act of forecasting and forecast timing.

Our study contributes to the literature by establishing the following. (i) The percentages of a quarter's earnings news conveyed by mandatory and voluntary earnings announcement date forecasts are similar. (ii) Mandatory forecasts provide information about yet-to-be-announced firm performance and convey earnings news, even for firms less likely to issue a forecast if

forecasting were voluntary and despite the forecasts being issued at the beginning of the reporting window. (iii) Voluntary forecasts provide information primarily through the forecasted announcement date, and less so through the act of voluntary forecasting and forecast timing, but no significant incremental earnings news is conveyed by the act of forecasting or its timing. However, the majority of firms do not issue forecasts. Information quality and yet-to-be-announced firm performance are significant in explaining voluntary forecasting. Taken together, these findings reveal that mandatory earnings announcement date forecasts provide information about yet-to-be-announced firm performance that is similar to voluntary forecasts, but the mandatory forecasts provide this information for all firms and considerably earlier in the reporting window.

The paper proceeds as follows. Section two explains China's mandatory forecasts of earnings announcement dates and related research. Section three offers a forecasting framework to guide our empirical tests. Section four develops the research design, and section five describes the sample and data. Section six presents the findings and section seven concludes.

2. Institutional Background and Related Research

2.1 INSTITUTIONAL BACKGROUND[3]

All China firms have December 31 fiscal year ends and must release earnings within the quarterly reporting window, which for quarters ended March 31 and September 30 is 30 days, June 30 is 60 days, and December 31 is 120 days. Within a few days of quarter end, firms listed on the Shenzhen and Shanghai stock exchanges must schedule with the exchange the date on which they expect to announce that quarter's earnings.[4] Beginning in 2002, the exchanges post

[3] Information in the section is based, in part, on insights from Shen Yuan and Su Mei, senior officials at the Shanghai and Shenzhen exchanges. We are deeply indebted to them for sharing their institutional knowledge about the earnings announcement scheduling process in China, and to Wei-Guo Zhang, former Chief Accountant of the China Securities Regulatory Commission, who facilitated our access to these exchange officials.

[4] Our tests focus on the information about yet-to-be-announced earnings revealed by the forecasted date and the

on their websites a calendar of forecasted announcement dates, generally no more than a few days before, and no later than one day after, the end of the quarter.[5] The forecasted dates are publicly available on the same day for all firms listed on each exchange, although the date varies slightly between the two exchanges.

Firms forecast announcement dates using an online calendaring system. In particular, the exchange makes available a reporting window calendar and each firm selects an announcement date. The exchange plays no direct role in the firm's date selection, but the calendar identifies available dates. Each date is available until the number of firms selecting that date exceeds the maximum number the exchange allows, although the exchange can allow a firm to exceed the limit. Objectives of limiting the number of announcements on a given day include avoiding clustering of earnings announcements that results in information overload for investors and space constraints associated with the requirement that firms publish abstracts of their reports in newspapers. The limit was approximately 30 to 40 firms until 2012 when it was eliminated.[6]

Firms cannot announce earnings on a date different from the date on the exchange calendar, but the initial forecasted date need not be the earnings announcement date because a firm can revise its forecast. To revise its forecast, the firm must re-schedule its announcement

market reaction to that forecast. Although one might expect the information about earnings the market learns on the earnings announcement date in China to exceed that in the US because in China investors see the full set of financial statements on that day, not just earnings, table 5 reveals this is not the case. China (US) investors learn 22.1% (47.3%) of earnings news on the earnings announcement date. Regardless, earnings news investors learn on the earnings announcement date does not play a role in addressing our research questions.

[5] The timing of the posting varies somewhat across quarters and it is difficult to identify the date *ex post*. We base the posting window on information available to us and thank Helen Zi Wei for investigating this issue on our behalf.

[6] The earnings announcement requirements have changed over time. Prior to 1998, as in the US, firms were not required to schedule earnings announcements (Haw, Qi, and Wu [2000]). Beginning in 1998 firms were required to schedule announcements subject to a daily limit of 10 announcements. The exchanges approved firms' date requests after giving priority to firms with higher total assets by moving firms with smaller total assets to earlier dates as necessary to avoid exceeding the daily limit (Haw et al. [2006]), but the scheduled dates were not made public. Beginning in 2002, the daily limit increased to about 30 announcements and firms could select a date from dates not yet at the limit. Importantly, also beginning in 2002, the calendar of dates was posted on the exchange website. Beginning in 2012, the daily limit was removed, but other aspects of the process continued.

date at least five days before the previously scheduled date and one day before the announcement.[7] Each day, the exchange posts revisions to the earnings announcement calendar. Firms can revise their forecasts more than once, but revising more than twice is rare. During our sample period, only 14.3% of initial forecasts were revised.[8] Although there is no regulatory penalty associated with revisions, there could be indirect costs. For example, if investors and others view forecast accuracy or earnings announcement timeliness as indications of managerial talent, then managers could suffer reputational costs from issuing inaccurate forecasts or delaying earnings announcement dates to avoid forecast revisions (Trueman [1986], Holmstrom [1999]). Our tests focus on initial forecasts, but we consider forecast revisions in section 6.2.

In contrast, for US firms forecasts of earnings announcement dates are voluntary with respect to the decision to forecast and its timing. That is, firms can publicly forecast their announcement date, revise the forecast at any time, or remain silent. Untabulated statistics for our sample reveal that 51% of US firms do not forecast earnings announcement dates, 29% forecast them in some but not all quarters, and 20% forecast them every quarter.

2.2 RELATED RESEARCH AND CONTRIBUTION

Our study extends the literature on the association between earnings announcement timing and firm performance and contributes to the literatures on the informativeness of earnings announcement date forecasts and the informational tradeoffs between voluntary and mandatory disclosure.

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[7] For example, a firm with an initial forecast of day 7 cannot announce earnings on day 6 without scheduling by at least day 2 a revision to day 6. Alternatively, the firm cannot remain silent on day 7 and simply announce earnings on day 9. When the firm realizes it will not announce earnings on day 7, at least by day 2 the firm must revise its scheduled announcement date. Consistent with this procedure, all sample firms announced earnings at least one day after the exchange's website revealed a revised forecast date.

[8] The exchanges generally allow a firm to revise its forecast, even to a date on which the number of scheduled announcements was at the limit when such limits existed. This is because the exchange wanted to avoid forcing a firm to withhold information from the market, which reduces the risk of trading by exchange employees with information about the upcoming earnings announcement.

2.2.1. Earnings Announcement Timing and Firm Performance. Theoretical studies addressing the timing and information content of disclosure predict that firms disclose bad news later than good news. Dye [1985] and Jung and Kwon [1988] model the manager as privately informed with some probability, and the firm as unable to credibly communicate whether the manager is informed. Thus, investors do not know whether the manager is withholding bad news or does not have information to disclose and, as a result, are unable to infer news-related information from an absence of disclosure. In these models, the optimal strategy is for the firm to disclose more bad news the more likely the manager is informed. Assuming the manager's information increases over time, this suggests firms disclose worse news later. Relatedly, Acharya, DeMarzo, and Kremer [2011] shows firms delay disclosure of bad news hoping to obtain better news later.

Several US-based studies offer potential, non-mutually exclusive reasons for later earnings announcements being associated with poor firm performance. These reasons include: later announcements give managers additional time to manage earnings or other reported accounting amounts (Givoly and Palmon [1982]), bad news firms could encounter scheduling conflicts for key management and stakeholders and could require additional time to account for unusually complex transactions (Kross and Schroeder [1984]), when earnings is bad firms need additional time to develop responses to anticipated investor questions and concerns (Begley and Fischer [1988]), and firms with bad news select later earnings announcement dates to avoid the greater investor attention associated with earlier announcements (deHaan, Shevlin, and Thornock [2015]). These studies also find that stock returns are consistent with a good news early, bad news late relation. This prior research does not identify a dominant reason for announcing bad news later than good news, and firms could delay announcements for reasons unrelated to bad

earnings news. However, these studies establish that firm performance is significant in explaining announcement timing.

Two studies examine whether these findings apply to China firms and provide evidence that they do. Based on a sample from 1994 to 1997, Haw, Qi, and Wu [2000] finds that China firms with good news release earnings earlier than those with bad news. Haw et al. [2003] links qualified audit opinions for China firms from 1995 to 1999 with decreases in annual earnings and later earnings announcements. Haw et al. [2006] extends Haw, Qi, and Wu [2000] by assessing the relation from 1994 to 1999 because of a 1998 change in earnings announcement procedures (see footnote 6). Haw et al. [2006] finds that after 1998 firms report earnings earlier and announcements are less clustered, but good news firms still announce earnings earlier than bad news firms. However, these studies do not examine the information in earnings announcement date forecasts because the sample periods predate the 2002 requirement that China firms publicly forecast the dates (see footnote 6). Thus, we begin our analyses by confirming that the previously documented association between actual earnings announcement dates and firm performance applies in China during our sample period.

2.2.2. Voluntary Forecasts of Earnings Announcement Dates. Motivated by finding that later earnings announcement dates are associated with worse firm performance, prior research studies forecasts of earnings announcement dates. This research largely is based on voluntary forecasts by US firms. Bagnoli, Kross, and Watts [2002] finds that missed forecasted dates are negatively associated with firm performance, and the market reaction to missed dates is negative and remains negative until the actual announcement date. Bagnoli, Kross, and Watts [2002] interprets these findings as investors inferring from the missed announcement date that performance is more negative than prior expectations. Boulland and Dessaint [2017] and Livnat

and Zhang [2015] examine revisions to later forecasted announcement dates and find that the revisions convey information consistent with delaying bad news, but the market reaction to the revisions is incomplete. deHaan, Shevlin, and Thornock [2015] and Boulland and Dessaint [2017] find that firms issue their announcement date forecasts earlier if they have better performance so investors are more likely to pay attention at the actual announcement date.

A closely related study is Johnson and So [JS, 2018], which shows that US firms' voluntary earnings announcement date forecasts are predictive of yet-to-be-announced firm performance.[9] JS finds that forecasts of later-than-expected earnings announcement dates foreshadow worse performance. We find the same result for mandatory forecasts. JS finds no immediate market reaction to the firm performance information revealed by the forecasts, but finds a delayed market reaction. We find a significant market reaction to the firm performance information revealed by mandatory forecasts, as well as a delayed reaction.[10]

The key difference between our study and JS is that the forecasts JS studies are voluntary, whereas the forecasts we study are mandatory. Although JS establishes that voluntary forecasts are informative, firms issuing voluntary forecasts have unidentified incentives to do so, which precludes inferring that findings based on voluntary forecasts apply to mandatory forecasts. This difference enables us to make two incremental contributions. First, we establish that mandatory forecasts reveal information about yet-to-be-announced firm performance and the market reacts accordingly. Second, we provide evidence on the informational tradeoffs between mandatory and voluntary forecasts, which JS cannot provide because that study is based on only voluntary

[9] JS refers to these disclosures as "scheduling" the earnings announcement even though firms need not announce earnings on the forecasted date.

[10] JS obtains the pre-forecast expected announcement date from a proprietary data vendor. As section 3 explains, we construct it based on the firm's history of earnings announcement dates. However, JS reports that its inferences are unchanged if the expected announcement date is the firm's announcement date for the same quarter in the prior year.

forecasts. In addition, we are the first to show that information quality and yet-to-be-announced firm performance are determinants of voluntary earnings announcement date forecasting.

2.2.3. Informational Tradeoffs of Mandatory and Voluntary Disclosure. Our study also relates to the literature investigating the informational tradeoffs between mandatory and voluntary disclosure. Both voluntary and mandatory earnings announcement date forecasts can be informative of yet-to-be-announced firm performance. Prior research discussed in section 2.2.2 finds that this is the case for voluntary forecasts.

However, mandatory disclosure does not necessarily reveal information when firms can take actions to avoid the requirements (Matthews and Postlewaite [1985]). Bushee and Leuz [2005] shows that firms delist from the Over-The-Counter Bulletin Board (OTCBB) to avoid disclosure, Gao, Wu, and Zimmerman [2009] shows that firms deliberately remain small to avoid size-based Sarbanes-Oxley regulations, and Huang et al. [2017] finds that China firms, which must issue a forecast of the subsequent year's earnings when they report an earnings decrease in the current year greater than 50%, manipulate earnings to avoid this requirement.[11] Other studies find that firms manage mandated disclosures. Dranove et al. [2003] shows that hospitals avoid treating sicker patients to boost their ratings in mandatory hospital report cards, and Musto [2002] shows that money market managers reallocate holdings to safer assets just before mandated portfolio disclosure dates. In the context of our study, China firms cannot avoid issuing a forecast. However, they can satisfy the forecast requirement without revealing information, for example, by forecasting an arbitrary date, which they can subsequently revise,

[11] Untabulated findings reveal our inferences are unaffected if we exclude firms subject to mandatory earnings forecasting or observations from the fourth quarter, when such forecasting and financial statement audits occur. Regardless, releasing earnings news before the announcement date forecast would bias against finding results consistent with our predictions.

or by selecting the last day of the reporting window to ensure they can meet the forecast.[12]

The additional potential information in mandatory forecasts is the firm performance information reflected in forecasts by firms that would not issue a forecast if forecasting were voluntary (Grossman [1981], Coffee [1984]). The additional potential informativeness of voluntary disclosure is firm performance information reflected in the act of voluntarily forecasting and its timing. One reason the act of forecasting and its timing can be informative is that they can be interpreted as favorable signals of the firm's ability to anticipate or control its activities (Spence [1973], Trueman [1986], Lev and Penman [1990]). Because China forecasts are mandatory and released simultaneously at quarter-end, there is no information contained in the act or the timing of the forecast. We contribute to this literature by providing estimates of these informational tradeoffs (Teoh and Hwang [1991]), which prior research does not provide.[13]

3. Forecasting Framework

3.1 OVERVIEW AND LINK TO EMPIRICAL TESTS

We develop an analytical framework to guide our empirical tests. In section 4, we use the framework to determine investors' expectations of the firm's earnings announcement date before and after observing the firm's date forecast to test whether such forecasts are informative to investors. In section 6, we use the framework to test the informational tradeoffs between mandatory and voluntary forecasts. In particular, we use estimates of the framework forecasting information characteristics to identify China firms with a low probability of forecasting

[12] Kato, Skinner, and Kunimura [2009] documents the reverse strategy, whereby firms in Japan initially announce optimistic earnings forecasts and subsequently revise downward the forecasts.

[13] Barth, Landsman, and Taylor [2017] examines the Jumpstart Our Business Startups Act, which made voluntary previously mandatory disclosures for some Initial Public Offering firms. Barth, Landsman, and Taylor [2017] finds that the reduced mandatory disclosure is associated with higher information uncertainty for these firms. However, that study is not designed to provide evidence on the informational tradeoffs between mandatory and voluntary disclosure, such as those associated with the act of voluntarily reducing disclosure or its timing.

voluntarily to provide insights into the information that would be lost if forecasting were voluntary.

Although the framework is stylized, it includes the key features of our setting. In particular, the framework assumes the firm has public and private information about its upcoming earnings announcement date and uses that information to develop an announcement date forecast. We focus on the information in forecasts of earnings announcement dates about actual announcement dates because prior research discussed in section 2.2 indicates that this is the channel through which the forecasts potentially have information content. This section summarizes the framework. See Appendix A for details.

3.2 FORECASTING FRAMEWORK

Because investors and the firm observe prior announcement dates, the framework characterizes these dates as public information. We follow prior research finding that prior announcement dates are predictive of the current announcement date (Givoly and Palmon [1982], Kross and Schroeder [1984], Begley and Fischer [1998]), by specifying the firm's announcement dates, *X*, as following a seasonal AR(1) process.

$$X_t = \gamma + \rho X_{t-1} + \eta_t, \quad \eta_t \sim N\left(0, 1/h_\eta\right). \tag{1}$$

Equation (1) implies that based on public information, investors' expectation of X_t, $E(X_t \mid X_{t-1})$, equals $\gamma + \rho X_{t-1}$. ρ captures the extent to which the firm's earnings announcement date for the same quarter in the prior year predicts the current announcement date and h_η is the precision of public information.

The framework allows the firm to have private information, *S*, regarding its quarter *t* earnings announcement date. Prior research described in section 2.2 suggests that *S* could reflect, for example, information about additional time the firm needs when the earnings

announcement will reveal bad news to (i) manage earnings or other reported accounting amounts, (ii) resolve scheduling conflicts for key management and stakeholders, (iii) determine how to account for unusually complex transactions, (iv) develop responses to anticipated investor questions and concerns, and (v) finalize audits with qualified opinions. Firms with bad news also might select later earnings announcement dates to avoid greater investor attention associated with earlier announcements.

For simplicity, we specify *S* as:

$$S_t = X_t + \varepsilon_t, \quad \varepsilon_t \sim N\left(0, 1/h_\varepsilon\right). \tag{2}$$

Importantly, equation (2) includes the precision of private information, h_ε, which prior research identifies as a determinant of voluntary disclosure (Dye [1985], Jung and Kwon [1988], Verrecchia [1990]).[14] h_ε is the precision of the firm's private information.

If the firm employs a linear forecasting strategy (Ottaviani and Sorensen [2006]) in public and private information, X_{t-1} and *S*, perhaps with bias, β, the forecast is:

$$F_t = \beta + (1-\alpha)(\gamma + \rho X_{t-1}) + \alpha S_t. \tag{3}$$

If the firm develops the forecast to minimize mean squared forecast error, the weight on X_{t-1} is $(1-\alpha)\rho = \dfrac{h_\eta}{h_\eta + h_\varepsilon}\rho$ and the weight on *S* is $\alpha = \dfrac{h_\varepsilon}{h_\eta + h_\varepsilon}$.

After observing the forecast, *F*, investors' expectation of the announcement date, *X*, is $E(X_t \mid X_{t-1}, F_t)$ which can be expressed as the following regression equation:

$$X_t = \theta_0 + \theta_1 F_t + \theta_2 X_{t-1} + v_t, \tag{4}$$

where θ_0, θ_1, and θ_2 are functions of other framework parameters. If the forecast minimizes

[14] For example, in Verrecchia [1990] as the precision of information increases, the market becomes more skeptical of non-disclosure, which results in more disclosure in equilibrium.

mean squared forecast error, then $E(X_t \mid X_{t-1}, F_t) = F_t - \beta$, i.e., the forecast minus any bias. If this is the case, then $\theta_0 = -\beta$, $\theta_1 = 1$, and $\theta_2 = 0$. If the forecast is based on an unmodeled objective function, e.g., strategic or uninformed forecasting, this will not be the case.

Equation (1) implies $\hat{X}^{pre} = \hat{\gamma} + \hat{\rho} X_{t-1}$ is investors' pre-forecast expectation of X_t and equation (4) implies $\hat{X}^{post} = \hat{\theta}_0 + \hat{\theta}_1 F_t + \hat{\theta}_2 X_{t-1}$ is investors' post-forecast expectation of X_t. Thus, $\hat{X}^{post} - \hat{X}^{pre}$ is the information about X_t that investors learn from F. We estimate equations (1) and (4) firm-by-firm to obtain estimates of $\hat{X}^{post} - \hat{X}^{pre}$.

4. Research Design

4.1 ARE MANDATORY EARNINGS ANNOUNCEMENT DATE FORECASTS INFORMATIVE?

4.1.1. Are Forecasted Earnings Announcement Dates Associated with Firm Performance? Finding that mandatory forecasts of later earnings announcement dates are associated with worse firm performance is key to the forecasts having the potential to be informative to investors regarding yet-to-be-announced firm performance. As section 2.2 explains, prior research establishes that voluntary US forecasts of later earnings announcement dates are associated with worse firm performance. However, prior research does not establish this relation for mandatory forecasts, and the relation cannot be inferred from evidence based on voluntary forecasts.

Thus, we estimate equation (5):

$$\begin{aligned} F_t = {} & \beta_0 + \beta_1 negative\ EPS_t + \beta_2 negative\ \Delta EPS_t + \beta_3 roa_t \\ & + \beta_4 size_t + \beta_5 market\text{-}to\text{-}book_t + \upsilon_t. \end{aligned} \tag{5}$$

F is the forecasted date. We scale F by the reporting window length so that it ranges from zero to one, where zero (one) indicates the earliest (latest) possible announcement date because, as

section 2.1 explains, the window varies across fiscal quarters. Equation (5), and all subsequent equations unless otherwise noted, include firm and quarter fixed effects and test statistics for coefficients are based on residual standard errors clustered by firm and quarter (Gow, Ormazabal, and Taylor [2010]). Variable definitions are in Appendix B.

Equation (5) includes three firm performance measures available for China firms (Kross and Schroeder [1984], Begley and Fischer [1998]). *negative EPS* (*negative ΔEPS*) is an indicator variable that equals one if earnings per share (change in earnings per share from the same quarter in the prior year) is negative, and zero otherwise; and *roa*, return on assets, is net income scaled by end-of-period total assets.[15] Prior research (Haw, Qi, and Wu [2000], Haw et al. [2006]) leads us to expect that later earnings announcement dates are associated with worse firm performance. Thus, if F predicts earnings announcement dates, we predict $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$. The control variables, *size* and *market-to-book*, are deciles of equity market value and the market-to-book ratio, both at quarter end; we have no predictions for their coefficients.

4.1.2. Are Mandatory Forecasts Informative to Investors? To test whether mandatory forecasts are informative to investors, we require a measure of the information revealed by the forecast. As section 3.2 explains, we construct our measure, $\hat{X}^{post} - \hat{X}^{pre}$, by estimating versions of equation (4) firm-by-firm. To establish the relations underlying this measure, we estimate versions of equation (4) cross-sectionally. As with the forecasted date, F, we normalize X by the reporting window length. The first version includes only the firm's earnings announcement date for the same quarter of the prior year, X_{t-1}, as an explanatory variable. If firms tend to announce

[15] Even though we interpret equation (5) as testing whether F helps predict yet-to-be-announced firm performance, we include the firm performance measures as explanatory variables because there are three of them to capture different dimensions of performance. Equation (5) also includes an indicator for Q4 observations and its interaction with each explanatory variable. Untabulated findings reveal our inferences are unaffected if we interact the explanatory variables with Q1 through Q4 fiscal quarter indicator variables.

earnings on the same date each year, we expect X_{t-1}'s coefficient is positive. The second includes only the forecasted announcement date, F. If the forecast helps predict the earnings announcement date, we predict F's coefficient is positive.

The third includes both X_{t-1} and F as explanatory variables, which permits us to gain insights into information in the forecasted date about the actual date. Specifically, finding a significant positive coefficient on the forecasted date reveals the forecast reflects information about the actual date that is not reflected in the firm's history of announcement dates. Finding a significant positive coefficient on the prior year's actual date reveals the forecast does not fully reflect the information about the actual date reflected in the firm's prior actual date. Finding the intercept significantly differs from zero reveals the forecast potentially is biased. Together, finding $\theta_0 \neq 0$, $\theta_1 > 0$, and $\theta_2 \neq 0$ supports $\hat{X}^{post} - \hat{X}^{pre}$ as a measure of investors' updated expected announcement date upon observing the forecast.[16]

Our test of whether mandatory earnings announcement date forecasts are informative to investors proceeds in two steps. First, to support using $\hat{X}^{post} - \hat{X}^{pre}$ as a measure of investors' updated expectations about yet-to-be-announced firm performance upon observing the forecast, we estimate equation (5) with $\hat{X}^{post} - \hat{X}^{pre}$ as the dependent variable.

$$(\hat{X}^{post} - \hat{X}^{pre})_t = \beta_0 + \beta_1 negative\ EPS_t + \beta_2 negative\ \Delta EPS_t + \beta_3 roa_t + \beta_4 size_t + \beta_5 market\text{-}to\text{-}book_t + \upsilon_t. \quad (6)$$

If the forecast reflects firm performance information not available from the firm's announcement date history, i.e., the forecast reflects some private information, and later earnings announcement

[16] When estimating firm-level regressions to obtain $\hat{X}^{pre}$ and $\hat{X}^{post}$, we require at least six observations per firm and, because we assume the framework parameters are time-invariant firm characteristics, we use all sample data to estimate them. Untabulated results reveal that our inferences are insensitive to using $F - X_{t-1}$, which is observable by the current quarter, instead of $\hat{X}^{post} - \hat{X}^{pre}$.

dates are associated with worse firm performance, we predict $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$.

Second, we test whether and when the market reacts to the information in the forecasts by estimating equation (7).

$$FCAR[A,B]_t = \beta_0 + \beta_1(\hat{X}^{post} - \hat{X}^{pre})_t + \beta_2 size_t + \beta_3 market\text{-}to\text{-}book_t + \upsilon_t. \quad (7)$$

$FCAR$, cumulative abnormal stock return around the forecast date, is the firm's return minus the CSMAR market return, which is the value-weighted return with dividends reinvested based on all Shanghai and Shenzhen listed firms. A (B) denotes the day the return accumulation period begins (ends). We use two. The first is $[-1,+1]$ and the second is $[+3, End]$, where 0 is the day the exchange posts the forecast to its website and *End* is the end of the reporting window, which includes the earnings announcement.[17] If the market reacts negatively to later forecasted announcement dates, we predict $\beta_1 < 0$ when $FCAR[-1,+1]$ is the dependent variable. If the market reaction is delayed as it is with US forecasts, we predict $\beta_1 < 0$ when $FCAR[+3, End]$ is the dependent variable.

4.2 INFORMATIONAL TRADEOFFS BETWEEN MANDATORY AND VOLUNTARY FORECASTS

We provide insights into three informational tradeoffs between mandatory and voluntary forecasts. First, we compare the earnings news conveyed at the forecast date for mandatory and voluntary forecasts. Second, we provide insights into information in mandatory forecasts by firms less likely to issue forecasts if forecasting were voluntary. This information is not available in a voluntary regime. Third, we provide insights into information in voluntary

[17] As section 2.1 explains, the posting date generally occurs no more than a few days before and no more than one day after quarter end, but varies somewhat quarter to quarter. Thus, we re-estimated equation (7) using $FCAR[-4,+1]$ and $FCAR[-2,+2]$. The untabulated findings reveal the same inferences as those revealed by the tabulated findings. Another possible concern is firms disclosing the forecasted date prior to the exchange posting it. Although the exchange approval process likely precludes this possibility, such pre-announcements or other forecast date mismeasurement would bias against finding a significant market reaction on the exchange posting date.

forecasts associated with the act of voluntary forecasting and forecast timing. This information is not available in a mandatory regime.

4.2.1. Earnings News Conveyed by Mandatory and Voluntary Forecasts. To compare earnings news conveyed by mandatory and voluntary forecasts, we estimate versions of equation (8).

$$CAR_t = \beta_0 + \beta_1 earnings\text{-}surprise_t + \beta_2 CAR[EA+2,-2]_t + v_t. \quad (8)$$

CAR is one of three return measures. $QCAR[-1,+60]$ is the return beginning (ending) one day before quarter end (60 trading days later), $FCAR[-1,+1]$ is the three-day return beginning one day before the forecast date, and $XCAR[-1,+1]$ is the three-day return beginning one day before the earnings announcement date, all in excess of the market return. *earnings-surprise* is the decile of unexpected earnings based on a seasonal random walk. The ratio of β_1 when *FCAR* $[-1,+1]$ ($XCAR[-1,+1]$) is the dependent variable to β_1 when $QCAR[-1,+60]$ is the dependent variable is an estimate of the percentage of a quarter's earnings news that is conveyed when the forecast is issued (earnings is announced). We refer to these as ERC ratios, which are the focus of our tests based on equation (8).[18]

Equation (8) includes $CAR[EA+2,-2]$, the return beginning (ending) two days after the prior quarter earnings announcement (two days before the end of the quarter) as a control for earnings news reflected in returns prior to quarter end. Omitting this control could attenuate β_1 when $QCAR[-1,+60]$ is the dependent variable, thereby affecting our inferences based on

[18] We base equation (8) on the approach in Ball and Shivakumar [BS, 2008], but modified to our research question. BS's question is how much of the variation in annual returns is explained by quarterly earnings announcements and, thus, the focus is on the explanatory power of earnings announcement returns. Our question is how much of the quarter's earnings news is revealed on the forecast date and, thus, the focus is on the *earnings-surprise* coefficient. Following BS, equation (8) excludes firm and quarter fixed effects.

comparing β_1 across estimations.[19]

4.2.2. Information Gained by Mandatory Forecasts. The challenge to providing evidence on the information gained by mandatory forecasting is that although we observe mandatory forecasts by all China firms, we do not observe which firms would not issue a forecast if it were voluntary. Analogously, we observe forecasts for US firms that forecast voluntarily, but do not observe forecasts by firms that do not issue forecasts. Thus, to develop our evidence, we rely on the forecasting framework in section 3 to identify China firms having a low or high probability of voluntarily forecasting. This involves three steps.

First, for each China firm and US forecasting firm we estimate the precisions of private and public information, h_ε and h_η, and announcement date persistence, ρ. For US non-forecasting firms, we estimate the precision of public information and announcement date persistence; we are unable to estimate the precision of private information.[20] Appendix A explains our estimation procedures.

Second, we estimate equation (9) using ordered logit to test whether these forecasting information characteristics are significant in explaining forecast frequency for US firms.

$$Forecast\ Frequency_i = \theta_0 + \theta_1 h_{\varepsilon i} + \theta_2 h_{\eta i} + \theta_3 \rho_i + \theta_4 controls_i + v_i. \quad (9)$$

Forecast Frequency equals zero, one, or two if the US firm is a Never, Sometimes, or Always

[19] To avoid the potential for overlapping dependent variables in equation (8), we use a [–1,+60] return window for all observations. However, doing so requires us to exclude observations if the earnings announcement does not occur within 60 trading days of quarter end, which eliminates 4,650 China Q4 observations with April earnings announcements. Including in equation (8) *CAR*[*EA*+2,–2] requires us to eliminate 5,706 China Q1 observations for which the [*EA*+2,–2] return window ends before it begins. This occurs when the preceding Q4 earnings announcement is after March 26, in which case the window ends on March 29, i.e., two days before the end of Q1, and begins on March 28, i.e., two days after the Q4 earnings announcement. Untabulated findings reveal that estimating equation (8) omitting *CAR*[*EA*+2,–2] does not alter our inferences, regardless of whether we include or exclude the 6,714 observations with missing or undefined *CAR*[*EA*+2,–2]. Including (excluding) these observations, and omitting *CAR*[*EA*+2,–2], results in an ERC ratio of 9.2% (9.9%). These percentages are somewhat higher than the 8.1% based on equation (8), which is consistent with *CAR*[*EA*+2,–2] being a control for other earnings news.

[20] We include firms with at least 16 forecasts, winsorize parameter estimates at the 1% and 99% levels, and standardize the estimates to have unit variance.

Forecaster, i.e., in our sample period the firm forecasts its earnings announcement date never, in some but not every quarter, or in every quarter.[21] As in equation (5), *controls* comprises *size* and *market-to-book*; in equation (9), these equal the firm's mean over the sample period.

Third, presuming the findings from equation (9) validate that our estimates of the forecasting information characteristics explain forecast frequency for US firms, we use estimates of the characteristics for China firms to identify China firms that have a low probability of voluntarily forecasting. Specifically, based on the terciles of the distributions of these characteristics for China firms, we identify a China firm as having Low (High) forecasting probability if the sum of its tercile memberships of private and public information precisions and announcement date persistence is 3 to 5 (6 to 9). Tercile membership equals 1 in the lowest tercile and 3 in the highest. We then estimate equations (5) to (8) separately for low and high forecast probability firms.[22]

4.2.3. Information Gained by Voluntary Forecasting. To provide insights into the information in forecasts associated with the act of voluntary forecasting and forecast timing, we first test whether these forecast attributes reflect information about yet-to-be-announced firm performance. To do this, we estimate versions of equation (5) using all US firms and with *Voluntary*, $\hat{X}^{post} - \hat{X}^{pre}$, and *Time After FP* as dependent variables.[23] *Voluntary*, an indicator

[21] Because private information precision does not exist for non-forecasting firms, we follow Koh and Reeb [2015] and for these firms assign this variable a value of –1, which is fixed and outside of the normal range of the non-existent variable. We include in the regression, but do not tabulate, an indicator variable that equals one for these firms and zero otherwise. This "dummying out" technique yields interpretable, incremental coefficients on all explanatory variables other than h_ε.

[22] Untabulated findings reveal that partitioning China firms based on membership in the lowest and highest tercile of each forecasting information characteristic does not alter our inferences.

[23] As in the China sample, for US firms we scale *X* and *F* by the reporting window, which is 45 days for Q1 to Q3 and 90 days for Q4. Using alternative windows because of changes during our sample period in Forms 10-Q and 10-K filing deadlines does not affect our inferences. To reduce measurement error in *X*, we follow Dellavigna and Pollet [2009] and Barth and So [2014] and use the earlier of the IBES and Compustat earnings announcement dates and eliminate observations if the difference in the two dates exceeds five days.

variable that equals one if the firm forecasts its earnings announcement date, and zero otherwise, reflects the act of forecasting. $\hat{X}^{post} - \hat{X}^{pre}$ reflects the information content of the forecast. *Time After FP*, the portion of the reporting window that has elapsed when the forecast is issued, reflects the timing of the forecast.[24]

When estimating equation (5) using each of these forecast attributes as dependent variables, we include the other two attributes as control variables. This specification permits us to test for the association between firm performance and each forecast attribute that is incremental to the other two attributes.[25] For example, to test whether the act of voluntary forecasting is associated with yet-to-be-announced firm performance, we estimate equation (10).

$$\begin{aligned} Voluntary_t = {} & \beta_0 + \beta_1 negative\ EPS_t + \beta_2 negative\ \Delta EPS_t + \beta_3 roa_t \\ & + \gamma_1(\hat{X}^{post} - \hat{X}^{pre}) + \gamma_2 Time\ After\ FP + \beta_4 size_t + \beta_5 market\text{-}to\text{-}book_t + \upsilon_t. \end{aligned} \quad (10)$$

If the act of forecasting is associated with yet-to-be-announced firm performance, incremental to the information content of the forecast and forecast timing, we predict $\beta_1 < 0$, $\beta_2 < 0$, and $\beta_3 > 0$.

To test whether the market reacts to the performance information reflected in the act, content, and timing of voluntary forecasts we estimate versions of equation (7) based on forecasts by US firms. For this test, we modify equation (7) by including *Act* and *Timing* as additional explanatory variables. *Act* is an indicator variable that equals one if the firm did not issue a forecast in the same fiscal quarter of the prior year, and zero otherwise. *Timing* is *Time*

[24] If the firm forecasts the earnings announcement date before the end of the quarter, we set *Time After FP* to zero. Noh, So, and Verdi [2019] suggests using firms' patterns over four consecutive quarters of earnings announcement day of the week to isolate timing effects. However, few US firms exhibit such patterns and even fewer China firms do. Noh, So, and Verdi [2019] reports that 16% of US firms evidence such patterns, and the frequency for China firms is only 0.5%. Thus, we use the timing of the earnings announcement date forecast.

[25] Because $\hat{X}^{pre} - \hat{X}^{post}$ (*Time After FP*) does not exist for non-forecasting quarters, we assign these observations a value of –5 (100), which is fixed and outside of the normal range of the non-existent variable. We also include in the regression, but do not tabulate, an indicator variable that equals one for these observations and zero otherwise. This technique yields interpretable, incremental coefficients on all explanatory variables other than $\hat{X}^{pre} - \hat{X}^{post}$ and *Time After FP*. See footnote 21.

After FP in quarter *t* minus *Time After FP* in quarter $t-1$.[26] Assuming investors' expectations of whether firms will issue forecasts and, if so, when are based on firms' recent past practice, *Act* reflects unexpected forecasting and *Timing* reflects unexpected forecast timing, which are those more likely to convey information. If the market reaction to information in the forecasting act, content, and timing are immediate (delayed), we predict the coefficients on $Act > 0$, $\hat{X}^{post} - \hat{X}^{pre} < 0$, and $Timing < 0$ when $FCAR[-1,+1]$ ($FCAR[+3,+End]$) is the dependent variable.

To provide insights into the earnings news associated with the act, content, and timing of voluntary forecasts, we estimate equation (11), which is a modified version of equation (8) using forecasts by US firms.

$$\begin{aligned} FCAR[-1,+1]_t = {} & \beta_0 + \beta_1 earnings\text{-}surprise_t + \beta_{1A} earnings\text{-}surprise_t \times Act_t \\ & + \beta_{1T} earnings\text{-}surprise_t \times Timing_t + \beta_2 Act_t + \beta_3 Timing_t \\ & + \beta_4 CAR[EA+2,-2]_t + v_t \end{aligned} \tag{11}$$

If the information in the act of forecasting and forecast timing are associated with incremental earnings news, we predict β_{1A} and $\beta_{1T} > 0$.

5. Sample, Data, and Descriptive Statistics

Our analyses require data from China and US firms. The China sample includes A-share-traded China firms listed on the Shenzhen and Shanghai stock exchanges from 2004Q2 to 2013Q3.[27] Beginning with 2004Q2, we collect from the exchanges' websites the forecasted and actual earnings announcement dates, *F* and *X*, because that is when these data become available. We obtain other data from the Chinese Stock Market Accounting Research (CSMAR) dataset available through Wharton Research Data Services (WRDS). Our China sample comprises

[26] Recall that $t-1$ is the same fiscal quarter in the prior year. If the firm did not issue a forecast in that quarter, we set *Timing* equal to $Time\ After\ FP_t$.

[27] A-shares (B-shares) are held by Chinese (non-Chinese) investors. We focus on firms trading A-shares because A-shares are more liquid than B-shares during much of our sample period (Chan, Menkveld, and Yang [2008]).

44,489 quarterly observations for 2,464 firms.

To mirror the China sample, the US sample begins in 2004Q2 and includes firms with calendar fiscal years; the sample ends in 2012Q3 because that is when CapitalIQ stopped providing the forecast data. We obtain forecasted earnings announcement dates in firms' press releases from CapitalIQ, and other US data from CRSP and Compustat.[28] We eliminate US forecasts prior to the end of the quarter and fewer than five days before the earnings announcement. Our US sample comprises 29,821, 47,042, and 36,524 observations for 1,478, 2,217, and 3,832 Always, Sometimes, and Never Forecasters. Data requirements, particularly those requiring estimates of forecasting framework parameters, yield different sample sizes in some analyses.

Table 1 presents descriptive statistics for variables used in our analyses. Panel A presents distributional statistics and reveals that, on average, forecasted earnings announcement dates are slightly earlier than actual dates. For China firms, the mean forecasted (actual) date, F (X), is 0.767 (0.771), which indicates the mean forecasted (actual) date is 76.7% (77.1%) of the reporting window. For US forecasting firms the analogous statistics are 65.3% and 65.5%. Panel A also reveals that for China firms the means of *negative EPS*, *negative ΔEPS*, and *roa* are 0.147, 0.420, and 0.022, which indicate that 14.7% (42.0%) of firm-quarters have negative earnings (change in earnings), and the mean return on assets is 2.2%. The analogous statistics reveal that US forecasting firms have worse performance: 29.3% (44.6%) have negative earnings (change in earnings) and the mean return on assets is –0.6%. The mean of *Voluntary* is 0.864, which indicates that US forecasting firms forecast announcement dates 86.4% of the time, and the mean of *Time After FP* is 0.336, which indicates that US forecasts are issued, on average,

[28] Livnat and Zhang [2015] and Johnson and So [2018] obtain forecasts from a proprietary data vendor, but observe that press releases likely are the most accurate forecast source.

33.6% into the reporting window. All China forecasts are issued at quarter end, i.e., 0.0% into the reporting window.

Table 1, panels B and C, presents correlation matrices for the two sets of firms. For China firms, panel B reveals a correlation between F and X of 0.90, which is consistent with the closeness between forecasted and actual announcement dates reported in panel A. For US forecasting firms, panel C reveals the analogous statistic is 0.99, which is even higher and consistent with the closeness between forecasted and actual announcement dates in panel A, and with prior US research (e.g., Bagnoli, Kross, and Watts [2002]). The correlation between X_t and X_{t-1} of 0.39 for China firms in panel B is lower than that of 0.86 for US forecasting firms in panel C, which reveals that earnings announcement dates for China firms are less persistent than those for US forecasting firms.

6. Findings

6.1 INFORMATIVENESS OF MANDATORY FORECASTS

Before conducting our tests of mandatory forecasts, we confirm that later earnings announcement dates in China are associated with worse firm performance. As section 2.2 explains, confirmation is necessary because this relation is the basis for forecasts of these dates having the potential to be informative to investors regarding yet-to-be-announced firm performance. Thus, we estimate equation (5) with earnings announcement dates, X, as the dependent variable, and predict $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$.

Table 2, panel A (panel B), presents regression summary statistics from estimating equation (5) with X (F) as the dependent variable. Each panel presents statistics for four versions of equation (5), one for each of the three firm performance measures separately and one with all three included. Panel A reveals that the coefficients on all three performance measures have

predicted signs and significantly differ from zero in all estimations (t-stats. range from 2.89 to 8.68 in absolute value), and the F-statistic in the fourth specification confirms that the measures are jointly significant (p-value = 0.000).[29] Thus, the panel A findings confirm for our sample period the findings of prior research that later earnings announcement dates in China are associated with worse firm performance.

More importantly for our research question, table 2, panel B, reveals, as predicted, that later mandatory forecasted earnings announcement dates are associated with worse performance. The coefficients on all three performance measures have predicted signs and significantly differ from zero (t-statistics range from 2.40 to 9.26 in absolute value), and the F-statistic in the fourth specification confirms that the measures are jointly significant (p-value = 0.000). These findings reveal that mandatory forecasts contain information about yet-to-be-announced firm performance.

Table 3 presents the findings relating to the informativeness of updated investor expectations of earnings announcement dates. Panel A presents regression summary statistics from estimating three versions of equation (4). The first version reveals the prior year's announcement date is informative for predicting the current announcement date in that the X_{t-1} coefficient is significantly positive (t-stat. = 24.39). However, the adjusted R^2 is only 0.150 and untabulated statistics reveal the coefficient, 0.374, is significantly less than one, both of which

[29] As footnote 6 explains, from 2002 to 2012 the exchanges limited the number of firms scheduling earnings announcements on a single date. This limitation likely reduced the informativeness of forecasts for firms unable to schedule their preferred date. To provide evidence on whether this is the case, we classify announcement days into limit days, i.e., those on which 30 or more firms announced earnings; days near limit days, i.e., those within 3 days of limit days; and other days. We assume firms forecasting on limit days scheduled their preferred date, those on days near limit days did not, and those on other days are a mixture of the two. Thus, we expect the correlations between firm performance and forecasts of limit days to be the strongest, days near limit days to be the weakest, and other days to be in between. Untabulated findings support these expectations in that limit day, near limit day, and other day forecasts are significantly associated with all three, none, and two—*negative ΔEPS* and *roa*—of the firm performance measures. The t-statistics associated with the three (two) significant coefficients for limit (other) days are 3.03, 3.20, and –3.75 (4.58 and –6.34).

confirm low persistence of earnings announcement dates in China as revealed in table 1, panel B.

More importantly for our research question, the second version reveals that forecasted earnings announcement dates are informative for predicting actual announcement dates. The coefficient on F_t is significantly positive (t-stat. = 82.69). In addition, this coefficient is substantially larger than the coefficient on X_{t-1} in the first version (0.908 versus 0.374), and the adjusted R^2 is substantially higher (0.819 versus 0.150). These findings indicate that mandatory forecasts of earnings announcement dates contain information about the upcoming earnings announcement date, which establishes a channel through with the forecasts contain the information about yet-to-be announced firm performance revealed by table 2, panel B.

The third version reveals the forecasted date, F, and the prior year's announcement date, X_{t-1}, both have significant incremental power in predicting the current year's announcement date (t-stats. = 77.60 and 6.03). The finding relating to F reveals that the forecasted date contains information about the upcoming earnings announcement date that is not contained in the history of announcement dates, which suggests firms have private information about the date. The finding relating to X_{t-1} indicates that the firm's history of announcement dates contains information about the upcoming earnings announcement date that is not contained in the forecast. In terms of our framework, this suggests the forecasted date is not selected to minimize forecast error. In addition, the intercept is significantly positive (t-stat. = 5.92), which suggests the forecasted dates, on average, are earlier than actual dates.

Table 3, panel B, presents regression summary statistics from estimating equation (6), which relates investors' updated expectations about the announcement date, $\hat{X}^{post} - \hat{X}^{pre}$, and yet-to-be-announced firm performance. As predicted, the findings reveal that updated expectations to later announcement dates are significantly associated with all three performance

measures (t-stats. = 3.81, 7.30, and –5.80) in the direction indicating worse performance. These findings indicate that the difference between pre- and post-forecast expectations contains information about yet-to-be-announced firm performance.

Table 3, panel C, presents estimates from estimating equation (7), which tests for a market reaction to the updated information in the forecast. The first column reveals that when $FCAR[-1,+1]$ is the dependent variable, the coefficient on $\hat{X}^{post} - \hat{X}^{pre}$ is significantly negative (t-stat. = −2.29). This finding indicates the market reacts negatively to forecasts for firms whose investors' post-forecast expected announcement date is later than their pre-forecast expectation. The second column reveals that some of the market reaction to the forecast is delayed. The coefficient on $\hat{X}^{post} - \hat{X}^{pre}$ is significantly negative (t-stat. = −4.21) and equals –0.040, which is almost four times the coefficient in the first column, –0.011. These findings indicate that almost four-fifths of the total market reaction between the date of forecast and the end of the reporting period associated with the forecast is delayed.[30]

Taken together, the findings in table 3 reveal that mandatory forecasts of earnings announcement dates are predictive of actual earnings announcement dates, thereby reflecting information about yet-to-be-announced firm performance, and the market reacts to this information. However, as with voluntary US forecasts, some of the reaction is delayed. Thus, the findings establish that mandatory earnings announcement date forecasts are informative to investors. These findings are perhaps surprising given that firms can nominally meet the forecast requirement and the absence of regulatory penalty for subsequently revising the date. However, the findings suggest that incentives created by career concerns and other reputational effects are

[30] We also estimated equation (7) using the table 4, panel A, specifications, but with *XCAR*[–1,+1] as the dependent variable and including *earnings-surprise* as an additional control variable. Untabulated findings reveal no evidence of a relation between the forecast-based explanatory variables and the earnings announcement return.

strong enough to induce informative forecasts.

6.2 FORECAST REVISIONS

As section 2.1 explains, firms can revise their expected announcement dates, but a firm cannot announce earnings on a date different from the ultimately revised date. Comparison of the initial forecasted date and the earnings announcement date for our 44,489 firm-quarter observations reveals that 6,361 initial forecasts, 14.3%, were revised. The exchanges post revised forecasts on their websites and we have data for 1,875 forecast revisions to use in our tests.[31] Finding results for revisions that are consistent with our initial forecasted date results would increase confidence in our inferences. Thus, we estimate equations (5) and (7) using the difference between the new and old forecasted dates, scaled by the reporting window length, $F^{new} - F^{old}$, in place of $F(\hat{X}^{post} - \hat{X}^{pre})$ in equation (5) (equation (7)).[32] When we estimate equation (7), we use $RCAR[-1,+1]$ and $RCAR[+3, End]$ as the dependent variable, where day 0 is the date the exchange posts the forecast revision.

Table 4 presents regression summary statistics relating to forecast revisions. Panel A reveals that revisions to later dates are associated with worse firm performance. The coefficients on all three performance measures have predicted signs when considered separately (t-stats. range from 1.96 to 2.40 in absolute value). However, when all three are considered together, only *negative ΔEPS*'s coefficient is incrementally significantly different from zero (t-stat. = 1.86) and the F-test indicates the three performance measures jointly provide insignificant explanatory

[31] When a firm revises its forecasted earnings announcement date, the prior forecasted date is changed on the exchange's earnings announcement calendar, but the date on which the revision occurred is not reported. To determine this date, beginning in Q4 2010 we download daily snapshots of the earnings announcement calendars.
[32] We omit firm fixed effects and firm standard error clusters from the forecast revisions estimations because most firms revise their forecast at most once. We include only revisions made at least one day before the actual earnings announcement date to avoid including forecasts almost concurrent with the earnings announcement. For our sample, only approximately 1% of forecasts are revised within one day of the actual earnings announcement.

power (p-value = 0.116). Panel B reveals that when $RCAR[-1,+1]$ is the dependent variable, the coefficient on $F^{new} - F^{old}$ is significantly negative (t-stat. = −2.45), which indicates the market reacts more negatively to forecasts revised to later dates. When $RCAR[+3, End]$ is the dependent variable, the coefficient on $F^{new} - F^{old}$ also is significantly negative (t-stat. = −3.01), which indicates that, as with initial forecasts, the market reaction to forecast revisions is delayed.

6.3. INFORMATIONAL TRADEOFFS BETWEEN MANDATORY AND VOLUNTARY FORECASTS

6.3.1. Earnings News Conveyed by Mandatory and Voluntary Forecasts. Table 5, panel A (panel B), presents regression summary statistics from estimating equation (8) for mandatory China (voluntary US) forecasts. Regarding mandatory forecasts, the first column in panel A reveals that the coefficient on *earnings-surprise* is 0.660, which reflects the earnings news during the [–1,+60] window. In the second column it is 0.053, which reflects the earnings news during the three-day forecast date window. The ratio of these coefficients, the ERC ratio, is 0.080 (0.053/0.660), which indicates that 8.0% of the earnings news arriving after the end of the quarter is conveyed at the forecast date. In the third column the coefficient is 0.146, which implies an ERC Ratio of 0.221 (0.146/0.660) and indicates 22.1% of the earnings news is conveyed at the earnings announcement. Regarding voluntary forecasts, panel B reveals that the ERC Ratios are 0.088 and 0.473, which indicate that 8.8% (47.3%) of the earnings news is conveyed at the forecast (earnings announcement) date.[33]

As a benchmark, the fourth column in each panel presents statistics for a random three-day window during the [–1, +60] window that overlaps with neither $FCAR[-1,+1]$ nor $XCAR[-1,+1]$. The statistics reveal that for voluntary (mandatory) forecasts in panel A (B), the

[33] Using windows of [–4,+1] and [–2,+2] for *FDCAR* and [–3,+3] for *EACAR* does not alter our inferences.

earnings-surprise coefficient is 0.030 (0.035), which implies an ERC Ratio of 4.5% (3.3%), which is substantially smaller than the ERC Ratio associated with the forecast date, 8.0% (8.8%), or the earnings announcement date, 22.1% (47.3%). Untabulated statistics reveal that these differences are significant (p-values < 0.05).[34]

Strikingly, the percentage of earnings news conveyed at the forecast date is similar for mandatory and voluntary forecasts—8.0% versus 8.8%—and untabulated statistics reveal that these percentages are not significantly different (t-stat. = –0.57).

6.3.2. Information Gained by Mandatory Forecasts. Table 6 presents statistics regarding the three forecasting information characteristics—precisions of private and public information and announcement date persistence—for US firms. We use these characteristics to identify China firms with a low probability of forecasting. Panel A presents means of these characteristics for the full sample and by forecasting frequency, i.e., Never, Sometimes, and Always Forecasters. All three characteristics increase in forecast frequency. For example, announcement date persistence is 0.23, 0.38, and 0.43 for Never, Sometimes, and Always Forecasters, and the differences in means between Sometimes and Never, Always and Sometimes, and Always and Never Forecasters are significant (t-stats. = 13.85, 4.38, and 16.05).

Panel B reveals the correlations between announcement date persistence and public and private information precisions are 0.24 and 0.31, and the correlation between public and private information precisions is 0.47. All correlations are significantly positive. Panel C presents regression summary statistics from estimating equation (9) and reveals that private and public

[34] One might expect forecasts by firms with more variable earnings announcement dates to convey more information. Thus, we estimated a version of equation (8) including an indicator variable that equals one for firms in the upper 25% of standard deviation of *X*, and zero otherwise, and its interaction with *earnings-surprise*. The untabulated findings reveal that the interaction coefficient is significantly positive for mandatory China forecasts, as expected, but it is not significantly different from zero for voluntary US forecasts.

information precisions are significantly positively incrementally associated with forecast frequency (t-stats. = 3.75 and 5.05), but announcement date persistence is not (t-stat. = –1.25). Taken together, the findings in table 6 support using the three forecasting characteristics to identify firms that are less likely to forecast if forecasting were voluntary.

Table 7, panel A, presents descriptive statistics for the three forecasting information characteristics for China firms. Comparing the statistics in the first column with those in table 6, panel A, reveals that all means are smaller than for US firms, and untabulated statistics indicate that these differences in means are significant (t-stats. range from –14.53 to –34.08).[35] Recall that we identify firms as having Low and High forecasting probability based on the sum of the firm's tercile memberships for the three characteristics. Untabulated statistics reveal the mean of each characteristic is significantly lower (higher) for firms in the bottom (top) tercile of the characteristic (t-stats. range from –24.38 to –60.64). For example, the untabulated mean of private information precision is 21.35 in the bottom tercile and 153.86 in the top. More importantly for our research design, panel A reveals that means of all three characteristics are significantly lower (higher) for Low and High forecasting probability firms (t-stats. are –19.03, –89.85, and –23.07), which supports using this approach to identify China firms as having low and high probability of forecasting voluntarily.

Table 7, panel B, presents ERC ratios analogous to those in table 5, panel A, for Low and High forecasting probability China firms, and reveals no evidence that earnings announcement date forecasts of Low firms reflect less earnings news than those of High firms. Based on estimating equation (8) separately for each group, the percentage of earnings news for Low firms

[35] Untabulated statistics also reveal that, as for US firms in table 6, panel B, the three characteristics are significantly positively correlated for China firms; the correlation between public and private information precision is 0.75, and that between private (public) information precision and announcement date persistence is 0.39 (0.37).

is 10.8% and 9.0% for High firms, which are not significantly different (p-value = 0.600). Panel C presents findings analogous to those in table 2 and table 3, panel B. It reveals that the tables 2 and 3 findings that later earnings announcement dates, later forecasted dates, and later updated expected announcement dates are associated with worse yet-to-be-announced firm performance applies to both Low and High forecasting probability firms. Panel D presents findings analogous to those in table 3, panel C. It reveals that the significant immediate market reaction to forecasts in table 3 largely is attributable to forecasts by Low forecasting probability firms (t-stats. –2.27 for Low firms versus –0.65 for High firms), and the delayed reaction to forecasts is attributable to both groups (t-stats. –2.85 and –1.86). Thus, panels B and C provide no evidence that forecasts by Low forecasting probability firms are uninformative.

Taken together, table 7 reveals mandatory forecasts of earnings announcement dates provide information about yet-to-be-announced firm performance, even by firms less likely to forecast voluntarily. These findings reveal information gained when forecasting is mandatory.

6.3.3. Information Gained by Voluntary Forecasts. Table 8 presents findings relating to information gained by voluntary forecasting. Panel A presents findings from estimating modified equation (10), which relates each forecasting attribute—act, content, and timing—to yet-to-be-announced performance incremental to the other two attributes. It reveals that all three attributes are significantly related to firm performance, as predicted. In particular, voluntary forecasters have significantly higher *roa* (t-stat. = 4.52), firms forecasting later-than-expected earnings announcement dates are significantly more likely to have *negative ΔEPS* and significantly lower *roa* (t-stats. = 4.00 and –4.06), and firms issuing forecasts later are significantly more likely to have *negative EPS* and have significantly lower *roa* (t-stats. = 2.57 and –2.37). In all three columns, the F-tests indicate the performance measures provide

significant joint explanatory power (p-value < 0.000).

Panel B presents findings from estimating modified equation (7). It reveals that the market reaction is significantly more positive if the forecast was unexpected (t-stat. = 1.78) and significantly more negative if the firm forecasts a later-than-expected announcement date (t-stat. = –2.41). There is no significant reaction if the forecast was issued later than expected (t-stat. = 0.56). Panel B reveals a significant delayed market reaction to forecast content and timing, but not the act of forecasting (t-stats. = –1.74, –3.55, and 0.19).

Panel C presents regression summary statistics from estimating equation (11). It reveals that the forecast reflects significant earnings news, and there is no significant incremental news reflected in the act of forecasting or its timing. Specifically, the *earnings-surprise* coefficient is significantly positive (t-stat. = 5.75) and the *earnings-surprise* × *Act* and *earnings-surprise* × *Timing* coefficients are not significantly different from zero (t-stats. = 0.29 and –0.58). These findings, together with the panel B finding of a significant positive market reaction associated with the act of forecasting, indicate that the act conveys positive information about the firm that is not associated with the current quarter's earnings.

Taken together, these findings reveal that forecast content, the act of voluntarily forecasting, and forecast timing each reflects incremental information about yet-to-be-announced firm performance. The market reacts accordingly, although some of the reaction to content and all of the significant reaction to timing are delayed. However, there is no evidence that the act of forecasting or forecast timing conveys incremental earnings news.

7. Conclusion

This study investigates whether mandatory forecasts of earnings announcement dates are informative to investors and what informational tradeoffs exist between mandatory and

voluntary forecasts. To investigate these questions we exploit a regulatory feature in China that mandates all firms simultaneously provide, at the beginning of the reporting window, a public forecast of the date on which they will announce that quarter's earnings. In contrast, US earnings announcement date forecasts are voluntary.

Although prior research establishes that voluntary US forecasts are informative, firms issuing mandatory and voluntary disclosures have different incentives, which precludes inferring that findings relating to voluntary disclosures apply to mandatory disclosures. Thus, we contribute to the disclosure literature by finding that mandatory earnings announcement date forecasts and investors' updated expectations of the dates are predictive of yet-to-be-announced firm performance. In particular, forecasted dates later in the reporting window are associated with worse firm performance. Consistent with investors understanding this information, we find more negative market reactions to later forecasted dates and dates later than expected, although some of the market reaction is delayed. We also establish that information quality and yet-to-be-announced firm performance are significant in explaining voluntary forecasting.

Providing evidence on the informational tradeoffs between mandatory and voluntary disclosure also cannot be inferred from findings based only on voluntary disclosures. Thus, we contribute to the disclosure literature by providing evidence on these tradeoffs in the context of earnings announcement date forecasts. We find that, on average, the percentages of the quarter's earnings news conveyed by mandatory and voluntary forecasts are similar, approximately 8%. This finding is noteworthy because the mandatory forecasts are issued at the beginning of the reporting window, whereas the voluntary forecasts are, on average, issued about one-third into the reporting window.

Regarding additional information in mandatory forecasts, we find that announcement

date forecasts are informative, even for firms that are less likely to issue a forecast if forecasting were voluntary. This information is not available in a voluntary regime; the majority of US firms in our sample do not issue these forecasts. Regarding additional information in voluntary forecasts, we find the act of forecasting and its timing provide performance-related information incremental to the forecasted announcement date, although neither is significantly incrementally associated with the quarter's earnings news as reflected in returns. This information is not available for mandatory forecasts. Together, the findings reveal that forecasts that are mandatory for all firms provide, in aggregate, more and earlier information to investors than voluntary forecasts.

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APPENDIX A

Forecasting Framework

A.1 FORECAST HISTORY EXAMPLES

The forecasting framework allows managers to deviate from informed, non-strategic forecasting when forecasting earnings announcement dates. We do so because we observe such forecasting behavior for some firms.

Figure A1 presents earnings announcement forecast histories for two China firms, both of which are inconsistent with informed, non-strategic forecasting in the context of our framework. Example 1 is Shenzhen Fountain Corporation (SHZ: 000005). For each Q4 from 2004 to 2010, the absolute forecast error would have been smaller had the firm used the prior year's actual earnings announcement date as the forecasted date. That is, $|F_t - X_t|$ is larger than $|X_{t-1} - X_t|$ in every Q4. Example 2 is Chang Jiang Runfa Machinery Co (SHZ: 002435). For each Q4 from 2010 to 2012, in contrast to Shenzhen Fountain Corporation, there is almost no variation in the forecasted earnings announcement date, but there is substantial variation in the actual date. This pattern is consistent with the firm predicting an arbitrary, and therefore uninformative, date. In the context of the framework, Shenzhen Fountain Corporation over-weights the private information, S, and under-weights the public information, X_{t-1}. Chang Jiang Runfa Machinery Co over-weights the private information, S, by not adjusting the forecast to reflect the firm's history of not announcing earnings on the initial forecasted date.

A.2 PARAMETER IDENTIFICATION

Based on the basic setup in section 3, if the manager uses a linear forecasting strategy (Ottaviani and Sorensen [2006]) with a potential bias, β, the forecast is:

$$\begin{aligned} F_t &= \beta + (1-\alpha)E_{t-1}[X_t] + \alpha S_t \\ &= \beta + (1-\alpha)(\gamma + \rho X_{t-1}) + \alpha S_t. \end{aligned} \tag{A1}$$

If the manager minimizes mean squared forecast error, $\frac{h_\eta}{h_\eta + h_\varepsilon}$ is the weight on the public information, $\gamma + \rho X_{t-1}$, and $\frac{h_\varepsilon}{h_\eta + h_\varepsilon}$ is the weight on the private information, S_t. This setup results in six parameters of interest: β, α, γ, ρ, h_ε, and h_η. We estimate these six parameters using the seven moment conditions in (A2) to improve estimation efficiency:

$$
\begin{aligned}
A \equiv Var(F_t) &= \frac{\rho^2}{(1-\rho^2)h_\eta} + \alpha^2\left(\frac{1}{h_\varepsilon + h_\eta}\right) \\
B \equiv Var(F_t - X_t) &= \frac{(\alpha-1)^2}{h_\eta} + \frac{\alpha^2}{h_\varepsilon} \\
C \equiv Var(X_t) &= \frac{1}{(1-\rho^2)h_\eta} \\
D \equiv Cov(F_t - X_{t-1}, X_t - X_{t-1}) &= \frac{(\rho-1)^2}{(1-\rho^2)h_\eta} + \frac{\alpha}{h_\eta} \\
E \equiv E(F_t - X_t) &= \beta \\
F \equiv E(X_t) &= \frac{\gamma}{1-\rho} \\
G \equiv \frac{Cov(X_t, X_{t-1})}{Var(X_t)} &= \rho.
\end{aligned}
\qquad \text{(A2)}
$$

The identification is as follows. E identifies β as the difference between the mean forecast date X_t and actual announcement date X_t. G identifies ρ as the coefficient on X_t in equation (4) when X_t is the only explanatory variable. F identifies γ as the intercept in equation (4) when X_t is the only explanatory variable. C, together with ρ, identifies h_η using the variance of X_t. A, B, and D, together with ρ and h_η, identify α and h_ε. To estimate the equations in (A2) we use the generalized methods of moments. We calculate standard errors based on the two-step optimal weighting matrix and the delta method when appropriate (Hansen [1982]).

A.3 INVESTOR EXPECTATIONS AND MARKET REACTION FRAMEWORK

Prior to observing *F*, investors have the following expectation of X_t:

$$E(X_t \mid X_{t-1}) = \gamma + \rho X_{t-1}. \tag{A3}$$

After observing *F*, investors can unravel the firm's private information as

$S_t = \dfrac{F_t - \beta - (1-\alpha)(\gamma + \rho X_{t-1})}{\alpha}$ and form a conditional expectation of X_t as:

$$\begin{aligned} E(X_t \mid X_{t-1}, F_t) &= \frac{h_\eta(\gamma + \rho X_{t-1}) + h_\varepsilon S_t}{h_\eta + h_\varepsilon} \\ &= \frac{h_\eta(\gamma + \rho X_{t-1}) + h_\varepsilon\left(\dfrac{F_t - \beta - (1-\alpha)(\gamma + \rho X_{t-1})}{\alpha}\right)}{h_\eta + h_\varepsilon} \\ &= \delta_1\beta + \delta_2\gamma + \delta_3 F_t + \delta_4 X_{t-1}, \text{where} \end{aligned} \tag{A4}$$

$$\begin{aligned} \delta_1 &= -\frac{h_\varepsilon}{\alpha(h_\varepsilon + h_\eta)} = -\frac{BW}{\alpha} \\ \delta_2 &= \frac{(\alpha-1)h_\varepsilon + \alpha h_\eta}{\alpha(h_\varepsilon + h_\eta)} = 1 - \frac{BW}{\alpha} \\ \delta_3 &= \frac{h_\varepsilon}{\alpha(h_\varepsilon + h_\eta)} = \frac{BW}{\alpha} \\ \delta_4 &= \frac{((\alpha-1)h_\varepsilon + \alpha h_\eta)\rho}{\alpha(h_\varepsilon + h_\eta)} = \rho\left(1 - \frac{BW}{\alpha}\right). \end{aligned} \tag{A5}$$

$BW = \dfrac{h_\varepsilon}{h_\varepsilon + h_\eta}$ is the Bayesian updating weight on S. When investors know the parameters and believe the manager minimizes mean squared forecast error, the conditional expectation is

$E(X_t \mid X_{t-1}, F_t) = F_t - \beta$ because $\alpha = \dfrac{h_\varepsilon}{h_\varepsilon + h_\eta}$ and $\delta_1 = -1$, $\delta_2 = 0$, $\delta_3 = 1$, and $\delta_4 = 0$.

Equation (4), $X_t = \theta_0 + \theta_1 F_t + \theta_2 X_{t-1} + v_t$, maps into the following parameters:

$$\theta_0 = \left(1 - \frac{BW}{\alpha}\right)\gamma - \frac{BW}{\alpha}\beta$$
$$\theta_1 = \frac{BW}{\alpha} \qquad \text{(A6)}$$
$$\theta_2 = \rho\left(1 - \frac{BW}{\alpha}\right).$$

Minimum squared error forecasting implies $\theta_0 = -\beta$, $\theta_1 = 1$, and $\theta_2 = 0$.

The following summarizes investors' expectation of the announcement date, X_t, when the initial forecast, F, is observed. We estimate $\hat{X}^{pre}$ and $\hat{X}^{post}$ and use $\hat{X}^{post} - \hat{X}^{pre}$ as the measure of investors' information updating upon observing F.

Timing	Expectation	Description
$t-1$	$E(X_t \mid X_{t-1}) = \gamma + \rho X_{t-1} \equiv \hat{X}^{pre}$	Pre-forecast expectation
t	$E(X_t \mid X_{t-1}, F_t) = \theta_0 + \theta_1 F_t + \theta_2 X_{t-1} \equiv \hat{X}^{post}$	Post-forecast expectation

Figure A1. Forecasting Examples

Example 1: Varying Forecasted Date, Similar Actual Date (SHZ: 000005)

Period	Initial Date	Actual Date	$\lvert F_t - X_t \rvert$	$\lvert X_{t-1} - X_t \rvert$
2004Q4	4/23/2005	4/24/2005	1	
2005Q4	4/21/2006	4/28/2006	7	4
2006Q4	4/19/2007	5/1/2007	12	3
2007Q4	3/29/2008	4/26/2008	28	5
2008Q4	4/17/2009	4/28/2009	11	2
2009Q4	4/21/2010	4/30/2010	9	2
2010Q4	4/27/2011	4/30/2011	3	0

Example 2: Similar Forecasted Date, Varying Actual Date (SHZ: 002435)

Period	Initial Date	Actual Date	$\lvert F_t - X_t \rvert$	$\lvert X_{t-1} - X_t \rvert$
2010Q4	4/20/2011	3/25/2011	26	
2011Q4	4/19/2012	3/1/2012	49	23
2012Q4	4/19/2013	4/2/2013	17	32

Example 1 illustrates a firm that forecasts varying dates, but has similar actual announcement dates. Example 2 illustrates a firm that forecasts similar dates, but has varying actual announcement dates. Neither firm's forecasts evidence minimizing mean squared forecast error as the objective.

APPENDIX B

Variable Definitions

Name	Definition
F	Earnings announcement date forecast, i.e., the number of days after the end of the fiscal period the firm expects to announce earnings for the quarter, scaled by the length of the reporting window, which is the portion of the reporting window that will have elapsed
X	Earnings announcement date i.e., the number of days after the end of the fiscal period the firm announced earnings for the quarter, scaled by the length of the reporting window, which is the portion of the reporting window that has elapsed
X_{t-1}	Earnings announcement date, same fiscal quarter in prior year
$\hat{X}^{post} - \hat{X}^{pre}$	Update to investors' expected earnings announcement date after observing F, where $\hat{X}^{post}$ ($\hat{X}^{pre}$) is the fitted value from a firm-level estimation of equation (4) (using only X_{t-1} as an explanatory variable)
negative EPS	Indicator variable that equals one if the quarter's earnings is negative, and zero otherwise
negative ΔEPS	Indicator variable that equals one if the quarter's earnings is less than earnings for the same quarter in the prior year, and zero otherwise
Roa	Return on assets, i.e., net income scaled by end-of-period total assets
Size	Decile of equity market value at quarter end
market-to-book	Decile of the equity market-to-book ratio at quarter end
earnings-surprise	Decile of unexpected earnings based on a seasonal random walk, i.e., net income for the quarter minus net income for the same quarter of the prior year
$F^{new} - F^{old}$	Earnings announcement date forecast revision, where F^{new} (F^{old}) is the new (old) forecasted date, scaled by the reporting window length
Forecast Frequency	Indicator variable that equals zero, one, or two if the firm is a Never, Sometimes, or Always Forecaster, i.e., the firm voluntarily forecasts its earnings announcement date never, some but not every quarter, or in every quarter in our sample period; applies to US firms only
Voluntary	Indicator variable that equals one if the firm voluntarily issues an earnings announcement date forecast in the quarter, and zero otherwise; applies to US firms only
Act	Indicator variable that equals one if the firm did not issue a forecast in the same quarter in the prior year, and zero otherwise; applies to US forecasting firms only

APPENDIX B (continued)

Variable Definitions

Time After FP	Portion of the reporting window that has elapsed when the firm voluntarily forecasts its earnings announcement date, i.e., the number of days after the end of the quarter, scaled by the length of the reporting window; it equals zero (missing) if the forecast is made before the end of the quarter (the firm does not issue a forecast); applies to US firms only
Timing	*Time After FP* minus *Time After FP* in same quarter in prior year; if the firm did not issue a forecast in that quarter, we set *Timing* equal to $Time\ After\ FP_t$; applies to US firms only
$FCAR[-1,+1]$	Three-day cumulative market-adjusted return, which is the firm's return minus the value-weighted market index, centered on the earnings announcement date forecast is issued
$FCAR[+3, End]$	Cumulative market-adjusted return beginning three days after the earnings announcement date forecast is issued and ending at the end the reporting window
$RCAR[-1,+1]$	Three-day cumulative market-adjusted return, centered on the date the earnings announcement date forecast revision is issued
$RCAR[+3, End]$	Cumulative market-adjusted return beginning three days after the earning announcement date forecast revision is issued and ending at the end the reporting window.
$QCAR[-1,+60]$	Cumulative market-adjusted return beginning one day prior to the end of the quarter and ending 60 trading days later
$XCAR[-1,+1]$	Cumulative market-adjusted return beginning (ending) one day prior to (after) the earnings announcement date
$CAR[EA+2,-2]$	Cumulative market-adjusted return beginning two days after the prior quarter earnings announcement and ending two trading days before the end of the quarter
$RanCAR[-1,+1]$	Cumulative market-adjusted return beginning (ending) one day prior to (after) a random date during the [–1, +60] window that does not overlap with $FCAR[-1,+1]$ or $XCAR[-1,+1]$
h_ε	Private information precision, which is the precision of the error term in equation (2)
h_η	Public information precision, which is the precision of the error term in equation (1)
ρ	Announcement date persistence, which is the AR(1) persistence parameter on X_{t-1} in equation (1)

Table 1. Descriptive Statistics

Panel A: Distributional Statistics

	China Firms		US Forecasting Firms	
	Mean	Std. Dev.	Mean	Std. Dev.
F_t	0.767	0.152	0.653	0.184
X_t	0.771	0.153	0.655	0.190
X_{t-1}	0.765	0.156	0.651	0.193
$\hat{X}^{post} - \hat{X}^{pre}$	0.000	0.101	–0.002	0.085
negative EPS	0.147	0.354	0.293	0.455
negative ΔEPS	0.420	0.494	0.446	0.497
roa	0.022	0.042	–0.006	0.064
size	5.671	2.804	6.238	2.707
market-to-book	5.655	2.813	5.634	2.801
earnings-surprise	5.469	2.798	5.526	2.833
Voluntary	na	na	0.864	0.342
Time After FP	na	na	0.336	0.313

Panel B: Correlation Matrix China Firms

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	F_t									
(2)	X_t	**0.90**								
(3)	X_{t-1}	**0.39**	**0.39**							
(4)	$\hat{X}^{post} - \hat{X}^{pre}$	**0.71**	**0.67**	0.00						
(5)	*negative EPS*	**0.09**	**0.10**	**0.06**	**0.05**					
(6)	*negative ΔEPS*	**0.09**	**0.09**	0.00	**0.07**	**0.29**				
(7)	*roa*	**–0.12**	**–0.14**	**–0.10**	**–0.03**	**–0.57**	**–0.34**			
(8)	*size*	**0.02**	**0.02**	0.00	–0.01	**–0.24**	**–0.12**	**0.31**		
(9)	*market-to-book*	**–0.10**	**–0.10**	**–0.09**	**–0.03**	0.00	**–0.14**	**0.18**	0.01	
(10)	*earnings-surprise*	**–0.04**	**–0.04**	**0.04**	**–0.06**	**–0.26**	**–0.72**	**0.28**	**0.07**	**0.08**

Table 1. Descriptive Statistics (continued)

Panel C: Correlation Matrix US Forecasting Firms

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	F_t											
(2)	X_t	**0.99**										
(3)	X_{t-1}	**0.86**	**0.86**									
(4)	$\hat{X}^{post} - \hat{X}^{pre}$	**0.27**	**0.28**	**–0.03**								
(5)	*negative EPS*	**0.23**	**0.26**	**0.22**	**0.06**							
(6)	*negative ΔEPS*	**0.04**	**0.04**	0.00	**0.05**	**0.25**						
(7)	*roa*	**–0.19**	**–0.22**	**–0.18**	**–0.04**	**–0.58**	**–0.19**					
(8)	*size*	**–0.37**	**–0.36**	**–0.34**	**0.00**	**–0.37**	**–0.03**	**0.33**				
(9)	*market-to-book*	**–0.10**	**–0.10**	**–0.08**	–0.02	**–0.13**	**–0.10**	**0.08**	**0.30**			
(10)	*earnings-surprise*	**–0.09**	**–0.09**	**–0.05**	**–0.04**	**–0.24**	**–0.27**	**0.18**	**0.09**	**0.07**		
(11)	*Voluntary*	.	**–0.04**	**–0.03**	.	**–0.05**	0.00	0.08	**0.19**	**0.07**	**0.02**	
(12)	*Time After FP*	**0.62**	**0.61**	**0.55**	**0.16**	**0.24**	**0.04**	**–0.22**	**–0.43**	**–0.09**	**–0.08**	.

See Appendix B for variable definitions. Sample is 44,489 (76,863) quarterly observations from 2,464 (3,605) China (US forecasting) firms from 2004Q2 to 2013Q3 (2012Q3). Amounts in **bold** are significantly different from zero at the 5% level.

Table 2. Informativeness of Mandatory Forecasts of Earnings Announcement Dates

Panel A: Actual Announcement Dates, *X*, and Firm Performance

	Pred.	*X*			
negative EPS	+	0.036***			0.011***
		(6.92)			(2.89)
negative ΔEPS	+		0.023***		0.013***
			(7.28)		(5.46)
roa	–			–0.538***	–0.434***
				(–8.68)	(–6.86)
size		0.000	–0.001	0.002	0.002
		(0.34)	(–0.82)	(1.58)	(1.63)
market-to-book		–0.005***	–0.004***	–0.004***	–0.003***
		(–5.03)	(–4.41)	(–4.52)	(–4.14)
Adjusted R^2		0.224	0.224	0.230	0.232
p-value for F-test					0.000

Panel B: Forecasted Announcement Dates, *F*, and Firm Performance

	Pred.	*F*			
negative EPS	+	0.032***			0.009**
		(6.99)			(2.40)
negative ΔEPS	+		0.021***		0.011***
			(7.80)		(6.12)
roa	–			–0.492***	–0.404***
				(–9.26)	(–7.19)
size		–0.000	–0.002	0.001	0.001
		(–0.38)	(–1.46)	(0.88)	(0.91)
market-to-book		–0.005***	–0.004***	–0.004***	–0.003***
		(–5.18)	(–4.52)	(–4.64)	(–4.19)
Adjusted R^2		0.235	0.235	0.241	0.242
p-value for F test					0.000

Panels A and B present regression summary statistics from estimating equation (5), with actual and forecasted earnings announcement dates, *X* and *F*, as dependent variables. Both equations include firm and quarter fixed effects. The p-value for the F test is associated with testing whether the three performance measures' coefficients jointly equal zero. See Appendix B for variable definitions. Sample is 44,489 quarterly observations for 2,464 China firms from 2004Q2 to 2013Q3. Standard errors are clustered by firm and quarter. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 3. Informativeness of Updated Expectations of Earnings Announcement Dates

Panel A: Predicting Actual Announcement Dates, *X*

	X_t		
F_t		0.908***	0.893***
		(82.69)	(77.60)
X_{t-1}	0.374***		0.037***
	(24.39)		(6.03)
Constant	0.486***	0.074***	0.057***
	(43.32)	(7.84)	(5.92)
Adjusted R^2	0.150	0.819	0.820

Panel B: Updated Expectations, $\hat{X}^{post} - \hat{X}^{pre}$, and Firm Performance

	Pred.	$\hat{X}^{post} - \hat{X}^{pre}$
negative EPS	+	0.009***
		(3.81)
negative ΔEPS	+	0.010***
		(7.30)
roa	–	–0.177***
		(–5.80)
size		0.001
		(1.39)
market-to-book		–0.003***
		(–4.40)
Adjusted R^2		0.047
p-value for F test		0.000

Panel C: Market Reaction to Updated Expectations, $\hat{X}^{post} - \hat{X}^{pre}$

	Pred.	$FCAR[-1,+1]$	$FCAR[+3, End]$
$\hat{X}^{post} - \hat{X}^{pre}$	–	–0.011**	–0.040***
		(–2.29)	(–4.21)
size		0.001	–0.027***
		(1.06)	(–7.34)
market-to-book		0.000	–0.002
		(0.18)	(–0.50)
Adjusted R^2		0.061	0.137

Panels A to C present regression summary statistics from estimating equations (4), (6), and (7). All specifications include firm and quarter fixed effects. The panel B p-value for the F test is associated with testing whether the three performance measures' coefficients jointly equal zero. See Appendix B for variable definitions. Sample is 38,075 (37,265) quarterly observations for 2,547 China firms from 2004Q2 to 2013Q3 in panel(s) A (B and C). Standard errors are clustered by firm and quarter. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 4. Forecast Revisions, Firm Performance and Market Reactions

Panel A: Forecast Revisions, $F^{new} - F^{old}$, and Firm Performance

	Pred.	$F^{new} - F^{old}$			
negative EPS	+	0.032*			0.025
		(1.96)			(1.22)
negative ΔEPS	+		0.020**		0.015*
			(2.40)		(1.86)
roa	–			–0.180*	–0.005
				(–1.99)	(–0.05)
size		0.000	0.001	0.001	–0.002
		(0.59)	(1.23)	(1.03)	(–1.17)
market-to-book		–0.002	–0.002	–0.002	0.001
		(–1.25)	(–1.55)	(–1.27)	(1.03)
Adjusted R^2		0.062	0.061	0.060	0.062
p-value for F-test					0.116

Panel B: Market Reaction to Forecast Revisions, $F^{new} - F^{old}$

	$RCAR[-1,+1]$	$RCAR[+3, End]$
$F^{new} - F^{old}$	–0.013**	–0.061**
	(–2.45)	(–3.01)
size	–0.001***	–0.004
	(–3.36)	(–1.51)
market-to-book	0.000	0.002
	(1.09)	(0.82)
Adjusted R^2	0.005	0.035

Panels A and B present regression summary statistics from estimating equations (5) and (7) based on revisions to forecasted earnings announcement dates. Both equations include quarter fixed effects. In panel A, the p-value for the F test is associated with tests of whether the performance measures' coefficients jointly equal zero. See Appendix B for variable definitions. Sample is 1,875 revisions from 1,034 China firms from 2010Q4 to 2013Q3. Standard errors are clustered by quarter. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 5. Earnings News in Forecasts of Earnings Announcement Dates

Panel A: Mandatory Forecasts

	Pred.	$QCAR[-1,+60]$	$FCAR[-1,+1]$	$XCAR[-1,+1]$	$RanCAR[-1,+1$
earnings-surprise	+	0.660***	0.053***	0.146***	0.030**
		(7.19)	(3.01)	(5.33)	(2.09)
$CAR[EA+2,-2]$		–5.790	2.889***	–0.192	–0.853*
		(–1.23)	(2.33)	(–0.29)	(–1.70)
Constant		–0.962	–0.230	–0.900***	0.021
		(–0.69)	(–0.71)	(–3.27)	(0.14)
ERC Ratio			0.080	0.221	0.045
Adjusted R^2		0.013	0.009	0.007	0.001

Panel B: Voluntary Forecasts

	Pred.	$QCAR[-1,+60]$	$FCAR[-1,+1]$	$XCAR[-1,+1]$	$RanCAR[-1,+1$
earnings-surprise	+	1.064***	0.094***	0.503***	0.035**
		(9.33)	(5.74)	(18.61)	(2.32)
$CAR[EA+2,-2]$		–0.208	0.131	0.109	–0.093
		(–0.06)	(0.47)	(0.22)	(–0.30)
Constant		–4.167***	–0.519***	–2.861***	–0.080
		(–3.05)	(–3.26)	(–13.28)	(–0.41)
ERC Ratio			0.088	0.473	0.033
Adjusted R^2		0.014	0.002	0.021	0.000

Panels A and B present regression summary statistics from estimating equation (7) for mandatory China and voluntary US forecasts. ERC Ratio is the ratio of the coefficient on *earnings-surprise* in the second column to that in the first column. See Appendix B for variable definitions. Sample of 28,546 (49,813) forecasts by 2,457 (3,538) China (US forecasting) firms from 2004Q2 to 2013Q3 in panel A (B). Standard errors are clustered by firm and quarter. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 6. Forecasting Information Characteristics and Forecasting Probability for US Firms

Panel A: Characteristics by Forecast Frequency

	Mean				t-stat. for mean diff.		
	Full	Never	Sometimes	Always	S – N	A – S	A – N
h_ε, Private Info. Precision	157.21	na	113.43	162.81	na	6.59	na
h_η, Public Info. Precision	130.21	141.96	151.35	185.05	1.42	5.59	5.36
ρ, Ann. Date Persistence	0.35	0.23	0.38	0.43	13.85	4.38	16.05
Firms	4,664	1,240	2,268	1,156			

Panel B: Correlation Matrix

		(1)	(2)
(1)	h_ε, Private Info. Precision		
(2)	h_η, Public Info. Precision	0.47	
(3)	ρ, Ann. Date Persistence	0.31	0.24

Panel C: Probability of Forecasting

	Forecast Frequency
h_ε, Private Info. Precision	0.118***
	(3.75)
h_η, Public Info. Precision	0.160***
	(5.05)
ρ, Ann. Date Persistence	–0.036
	(–1.25)
size	–0.013
	(–0.43)
market-to-book	–0.014
	(–0.77)
Pseudo R^2	0.536
Observations	4,664

Panel A presents means of framework parameters for all US firms, Never, N, Sometimes, S, and Always, A, Forecasters, and t-statistics for tests of differences in means. Panel B presents correlations between parameters for all US firms; the correlations with private information precision are based on US forecasting firms. All correlations are significant. We use robust standard errors to calculate t-statistics in panel B. Panel C presents regression summary statistics from equation (9). See Appendix B for variable definitions. Sample of 4,664 US firms from 2004Q2 to 2012Q3. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 7. Information in Forecasts by Low and High Forecast Probability China Firms

Panel A: Means of Forecasting Information Characteristics

		Forecasting Probability		
	All	Low	High	Diff. t-stat.
h_{ε}, Private Info. Precision	76.52	30.10	113.13	–19.03
h_{η}, Public Info. Precision	93.68	47.97	129.73	–89.85
ρ, Ann. Date Persistence	0.26	0.08	0.40	–23.07
Firms	1,118	493	625	

Panel B: Earnings News in Forecasts of Earnings Announcement Dates

	Forecasting Probability		
ERC Ratio	Low	High	Diff p-value
Forecast Date	0.108	0.090	0.600
Earnings Announcement Date	0.162	0.239	0.046
Observations	7,530	9,294	

Table 7. Information in Forecasts by Low and High Forecast Probability China Firms (continued)

Panel C: Actual Announcement Dates, *X*, Forecasts, F, and Updated Expectation, $\hat{X}^{post} - \hat{X}^{pre}$, and Firm Performance

		X		F		$\hat{X}^{post} - \hat{X}^{pre}$	
		Forecasting Probability		Forecasting Probability		Forecasting Probability	
	Pred.	Low	High	Low	High	Low	High
negative EPS	+	0.017**	0.015**	0.011	0.012**	0.007	0.007***
		(2.49)	(2.35)	(1.56)	(2.02)	(1.54)	(2.99)
negative ΔEPS	+	0.015***	0.005	0.013***	0.004	0.013***	0.007***
		(3.26)	(1.38)	(3.17)	(1.00)	(4.89)	(3.49)
roa	–	–0.507***	–0.447***	–0.493***	–0.412***	–0.157***	–0.039*
		(–6.26)	(–5.66)	(–5.81)	(–5.92)	(–3.37)	(–1.70)
Adjusted R^2		0.069	0.082	0.082	0.090	0.046	0.034
Observations		12,085	14,496	12,085	14,496	10,107	12,037

Panel D: Market Reaction to Updated Expectation, $\hat{X}^{post} - \hat{X}^{pre}$

		$FCAR[-1,+1]$		$FCAR[+3, End]$	
		Forecasting Probability		Forecasting Probability	
	Pred.	Low	High	Low	High
$\hat{X}^{post} - \hat{X}^{pre}$	–	–0.012**	–0.004	–0.034***	–0.037*
		(–2.27)	(–0.65)	(–2.85)	(–1.86)
Adjusted R^2		0.083	0.059	0.146	0.139
Observations		9,818	11,799	9,818	11,799

Panels A to D present statistics analogous to those in table 6, panel A; table 5 panel A; table 2; and table 3, panels B and C, for Low (High) forecasting probability China firms, i.e., firms whose sum of its terciles of private and public information precisions and announcement date persistence are 3 to 5 (6 to 9). In panels B and C, the untabulated p-value is 0.000 for the F-test of joint significance of the three performance variables. Panels B to D present only statistics for main variables. See Appendix B for variable definitions. Sample of 1,118 China firms from 2004Q2 to 2013Q3. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 8. Information in Act, Content, and Timing of Voluntary US Forecasts

Panel A: Firm Performance

	Pred. (1) and (2)/(3)	*Voluntary*	$\hat{X}^{post} - \hat{X}^{pre}$	*Time After FP*
negative EPS	–/+	–0.001	0.003	0.592**
		(–0.77)	(0.35)	(2.57)
negative ΔEPS	–/+	–0.000	0.021***	0.190
		(0.16)	(4.00)	(1.32)
roa	+/–	0.044***	–0.231***	–5.842**
		(4.52)	(–4.06)	(–2.37)
Voluntary			–0.054***	–14.947***
			(3.68)	(7.57)
$\hat{X}^{post} - \hat{X}^{pre}$		–0.110***		34.006***
		(–14.59)		(19.11)
Time After FP		0.003***	0.000	
		(11.49)	(1.00)	
size		0.012***	–0.008***	–0.657***
		(8.46)	(–2.58)	(–5.30)
market-to-book		–0.001**	–0.010***	–0.002
		(–2.15)	(–5.06)	(–0.04)
Adjusted R^2		0.830	0.911	0.854
p-value for F-test		0.000	0.000	0.000
Observations		76,863	76,863	76,863

Panel B: Market Reaction

	Pred.	$FCAR[-1,+1]$	$FCAR[+3,+End]$
Act	+	0.230*	0.001
		(1.78)	(0.19)
$\hat{X}^{post} - \hat{X}^{pre}$	–	–1.552***	–0.025*
		(–3.46)	(–1.74)
Timing	–	0.114	–0.017***
		(0.56)	(–3.55)
size		–0.428***	–0.026***
		(–4.38)	(–4.65)
market-to-book		–0.035	–0.003***
		(–1.33)	(–3.22)
Adjusted R^2		0.012	0.032
Observations		48,346	48,346

Table 8. Information in Act, Content, and Timing of Voluntary Forecasts (continued)

Panel C: Earnings News

	Pred.	$FCAR[-1,+1]$
earnings-surprise	+	0.095***
		(5.75)
earnings-surprise × *Act*	+	0.015
		(0.29)
earnings-surprise × *Timing*	–	–0.034
		(–0.58)
Act		0.081
		(0.24)
Timing		0.263
		(0.63)
$CAR[EA+2,-2]$		0.137
		(0.50)
Constant		–0.537
		(–3.39)
ERC Ratio for *earnings-surprise*		0.089
Adjusted R^2		0.002
Observations		49,813

Panels A to C present regression summary statistics from estimating equation (10), modified equation (7), and equation (11). In panel A, the p-value for F test is associated with testing whether the three performance measures' coefficients jointly equal zero. In panel C, ERC Ratio is the ratio of the coefficient on *earnings-surprise*, 0.095, to 1.064, which is the coefficient on *earnings-surprise* in table 5, panel B, when $QCAR[-1,+60]$ is the dependent variable. We do not calculate ERC ratios for the interaction variables because their coefficients are not significantly different from zero. Specifications in panels A and B include firm and quarter fixed effects. See Appendix B for variable definitions. Samples of 3,605, 3,511, and 3,538 US firms from 2004Q2 to 2012Q3 in panels A to C. Standard errors are clustered by firm and quarter. ***, **, and * denote significance at the 1%, 5%, and 10% levels.