Managers' Pay Duration and Voluntary Disclosures*

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Abstract

Given the adverse impact on their welfare, managers are reluctant to disclose bad news timely. In this paper, we examine the effect of managers' pay duration on firms' voluntary disclosures of bad news. Pay duration refers to the average period that it takes for managers' annual compensation to vest. We hypothesize and find that pay durations can incentivize managers to provide more bad news earnings forecasts. This result holds after controlling for the endogeneity of pay duration. In addition, we find that the effect of pay duration is more pronounced for firms with weaker governance and for firms with poorer information environment, where the marginal benefits of additional disclosures are higher. We also find that such effects are stronger for firms facing lower litigation risks and for firms operating in more homogenous industries, where managers' *ex ante* incentives to disclose bad news are particularly weak. Overall, our paper contributes to the literature by documenting that lengthening the vesting period of managers' compensation can induce managers to be more forthcoming with bad news.

Key words: Voluntary disclosures, management forecasts, executive compensation, pay duration

JEL classification: G39, J33, M41

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1. Introduction

In this study, we examine the effect of managers' pay duration on firms' voluntary disclosures. Pay duration refers to the average period that it takes for managers' annual compensation to vest. Using management earnings forecasts to capture voluntary disclosures, we investigate whether managers with long pay durations are more likely to issue bad news earnings forecasts than those with short pay durations. We focus on bad news forecasts because managers generally disclose good news in a timely fashion, but are reluctant to disclose bad news (e.g., Kothari et al. 2009); it is thus important to understand how managers can be incentivized to disclose bad news.

Our study is motivated by the observation that the provision of stock-based compensation may fail to align managers' interest with that of shareholders if the vesting period is short. A growing number of studies document that stock-based compensation can motivate managers to pursue short-term gains at the expense of long-term firm value.[1] In the disclosure setting, while Nagar et al. (2003) find that managers' equity incentives can mitigate disclosure-related agency conflicts and increase voluntary disclosures, the findings in Kothari et al. (2009) suggest that stock-based compensation can motivate managers to withhold bad news due to their concerns about short-term stock price drops.

Some researchers argue that to address managerial short-termism, executive compensation should be linked to the firm's long-term performance. For example, Bebchuk and Fried (2010) argue that short-term pay arrangements are likely to have driven the excessive risk taking behavior exhibited by bank executives before the financial crisis and suggest that increasing the horizon of executive compensation is critical to addressing managerial myopia. A number of

[1] For examples, see Cheng and Warfield (2005), Bergstresser and Philippon (2006), Bolton et al. (2006), and Efendi et al. (2007).

executives and government officials share the same view. For example, former Treasury Secretary Timothy Geithner (2009) argued that "Companies should seek to pay top executives in ways that are tightly aligned with the long-term value and soundness of the firm."[2]

While lengthening pay duration can motivate managers to undertake long-term yet risky projects and increase the long-term value of the firm, it is also costly. The risk that executives have to bear increases with the duration over which their compensation vests, and hence risk-averse managers are likely to command higher risk premium. Consistent with this trade-off, Gopalan et al. (2014) find that pay duration is longer for firms with more growth opportunities, long-term assets, high R&D intensity, lower operating risk, and better past stock performance. Examining the determinants of the vesting terms of option grants, Cadman et al. (2013) arrive at similar conclusions.

However, despite the widespread recognition of the importance of linking executives' pay to long-term firm performance, there is little research on the effect of pay horizon on corporate decisions. In this study, we focus on voluntary disclosures of bad news. A long pay duration can motivate managers to disclose bad news for several reasons. First, a long pay duration can improve the interest alignment between shareholders and managers (Gopalan et al. 2014). To the extent that a lack of disclosure of bad news is a manifestation of disclosure-related agency problems (Nagar et al. 2003; Kothari et al. 2009), a longer pay duration can induce managers to be more forthcoming with bad news. Second, prior research finds that managers tend to sell the shares of their firms they already have in order to diversify the risk of their portfolio when they

[2] Former Federal Reserve Chairman Ben Bernanke (2009) made a similar remark, "Management compensation policies should be aligned with the long-term prudential interests of the institutions … and [should] avoid short-term payments for transactions with long-term horizons." In addition, Goldman Sachs's CEO Lloyd Blankfein (2009) urged that "An individual's performance should be evaluated over time so as to avoid excessive risk-taking. To ensure this, all equity awards need to be subject to future delivery and/or deferred exercise."

are awarded additional options/shares (Ofek and Yermack 2000). However, when the vesting period is longer, they are less likely to sell their shares given the same amount of option grants.[3] Accordingly, these managers are less sensitive to short-term stock price drops, motivating them to be more forthcoming with bad news than those with shorter pay durations. Third, Kumar et al. (2012) analytically show that bad news disclosures can improve investment efficiency and ultimately firm value in the long-run. Given that the welfare of managers with longer pay durations is more linked to the long-term value of their firms, they have stronger incentives to disclose bad news. Based on these discussions, we expect that managers with longer pay durations are more likely to disclose bad news than those with shorter pay durations.

Following Gopalan et al. (2014), we measure pay duration as the weighted average of the vesting periods of the four components of CEO compensation: salary, bonus, restricted stock grants, and stock option grants, with the weight being the relative size of each component. (The vesting period for salaries and cash bonuses is naturally zero.) The stock-based compensation measure used in prior studies *implicitly* assumes that restricted stock grants and stock option grants have equal vesting periods (e.g., Nagar et al. 2003; Kothari et al. 2009). In contrast, the measure of pay duration explicitly incorporates the length of the vesting schedules of different stock or option grants.

As discussed above, pay duration is endogenously determined (e.g., Cadman et al. 2013; Gopalan et al. 2014). It is possible that some firm characteristics might affect both the pay duration and the likelihood of bad news forecasts. We address this potential omitted correlated variable issue in several different ways. First, we control for all the important determinants of

[3] Supporting our argument, in an untabulated analysis, we find that managers' stock and option grants are significantly positively correlated with the net sales of the shares in the next year when the pay duration is short, but not when the pay duration is long.

bad news disclosure as identified in prior research. Second, we use pay duration to explain one-year-ahead bad news forecast issuance in all of the main analyses. Third, we adopt an instrumental variable approach by using the state average pay duration and the industry average pay duration as the instruments for a firm's pay duration, based on the findings in Kedia and Rajgopal (2009) and Hochberg and Lindsey (2010).

Based on a sample of 7,536 firm-year observations from Russell 3000 firms between 2006 and 2010, we examine whether managers with longer pay durations are more likely to provide bad news earnings forecasts. We find that after controlling for the level of stock-based compensation and other potential determinants of pay duration and voluntary disclosures, pay duration is positively correlated with the likelihood that a firm issues bad news earnings forecasts.[4] Consistent with our expectation, this result indicates that managers with longer pay durations are more forthcoming with bad news. This finding is obtained whether we use an annual based measure or a cumulative measure of pay duration. We further confirm that this result is robust to an alternative measure of pay duration, i.e., a measure based on options and stocks only (excluding cash and bonus). We also obtain consistent results from a change analysis; the change in pay duration is positively correlated with the change in the likelihood of issuing bad news earnings forecasts.

We then explore the circumstances under which pay duration is likely to be more effective in motivating managers to disclose bad news. Given that long pay durations motivate managers to disclose information, the marginal benefit of pay duration is likely smaller when there are other mechanisms to induce managers to disclose information or when the quality of the information environment is already high. First, prior research finds that firms with strong

[4] We find consistent results when we examine the frequency of bad news forecasts instead of the likelihood of forecast issuance (untabulated).

monitoring are more likely to disclose (e.g., Ajinkya et al. 2005). Thus the effect of pay duration should be stronger when the monitoring of managers is weaker. Using board independence and institutional ownership to capture the effectiveness of shareholder monitoring, we find that pay duration has a stronger effect for firms with lower board independence and institutional ownership. Second, using analyst coverage and share turnover to capture the quality of information environment, we find that pay duration has a stronger effect for firms with lower analyst coverage and share turnover.

Third, prior research finds that firms facing higher litigation risk are more likely to disclose bad news (e.g., Skinner 1994, 1997). As such, the incremental effect of pay duration will be greater for firms facing lower litigation risk than for other firms. Using an industry-based measure of litigation risk, we find that the effect of pay duration is more pronounced among firms operating in less litigious industries than in other industries. Lastly, prior studies suggest that managers of firms operating in more homogenous industries have greater job security concerns (Parrino 1997). As a result, these managers are likely to have stronger incentives to withhold bad news. It thus follows that the effect of pay duration on bad news disclosure will be stronger in such industries than in other industries. Using a measure of industry homogeneity adopted from Parrino (1997), we find consistent results.

We also conduct additional tests to provide further insights. First, to reconcile our findings with those of Nagar et al. (2003), we examine the effect of pay duration on all management forecasts, including both good news and bad news forecasts. We find a positive effect of pay duration on the issuance of management forecasts in general; this result is not surprising given our main results based on bad news forecasts. In addition, consistent with Nagar et al. (2003), we find that the level of stock-based compensation has a significantly positive effect on management

forecasts when we exclude pay duration, although the incremental effect of the level of stock-based compensation is insignificant when pay duration is included in the analyses. Second, using forecast accuracy to capture the quality of voluntary disclosure, we find that pay duration is positively correlated with the accuracy of bad news earnings forecasts, suggesting that pay duration improves not only the quantity but also the quality of voluntary disclosure. Lastly, we confirm that our results are not driven by alternative explanations: (1) managers with long pay durations strategically disclose bad news earlier and withhold bad news in the future, and (2) the effect of pay duration captures a non-linear relationship between stock-based compensation and disclosure.

Our study makes the following contributions to the literature. First, our findings add to the voluntary disclosure literature that links executive compensation to management earnings forecasts. While prior research has established that the level of stock-based compensation influences the incentive alignment between managers and shareholders in the setting of voluntary disclosures (e.g., Nagar et al. 2003), we extend this line of research by examining another important and distinctive feature of stock-based compensation – the length of the vesting period. Given the recent evidence that stock-based compensation can induce managers to focus on short-term performance at the expense of long-term firm value, it is important to understand whether and how lengthening managers' pay duration can improve the effectiveness of stock-based compensation in addressing disclosure-related agency problems. Our study sheds light on this issue by providing evidence that given the same level of stock-based compensation, a longer pay duration can induce managers to be more forthcoming with bad news. Note that unlike Nagar et al. (2003), who do not distinguish between good news and bad news forecasts, we focus on bad news earnings forecasts. Such a focus is important because managers generally provide good

news in a timely fashion but are reluctant to disclose bad news (Kothari et al. 2009).

Second, our study contributes to the extant literature on executive compensation by focusing on the time horizon of stock-based compensation, which has received little attention. Gopalan et al. (2014) examine the determinants of pay duration and Cadman et al. (2013) study the determinants of the vesting terms of option grants. Our study complements these studies by examining how pay duration affects voluntary disclosures. Our finding that a longer pay duration can induce managers to increase bad news disclosures should be of interest to shareholders and boards of directors given the importance of disclosures for corporate governance (e.g., Beyer et al. 2010). Note that while we document an important benefit of lengthening pay duration (i.e., incentivizing managers to disclose bad news more timely), our analyses do not imply that a longer pay duration should be adopted by all firms because we do not consider the corresponding costs. Please see Gopalan et al. (2014) and Cadman et al. (2013) for more careful analyses of the determinants of pay duration.

The remainder of this paper is organized as follows. Section 2 reviews the related prior research and develops the hypotheses. Section 3 discusses the sample and the variable measurement. Section 4 provides the main empirical results and Section 5 reports additional tests. Section 6 concludes the paper.

2. Literature Review and Hypothesis Development

2.1 Prior Research on Stock-based Compensation and Voluntary Disclosure

Through their involvement in their firms' operations, managers enjoy an information advantage over shareholders with respect to firm profitability. Managers' disclosures of such information can reduce the information asymmetry between managers and shareholders, thereby

increasing stock liquidity, decreasing the cost of capital, and enhancing firm value. Disclosures also enable shareholders to better monitor managers, again leading to an increase in firm value.[5] Moreover, timely disclosures of bad news can reduce litigation risk (Skinner 1994, 1997; Field et al. 2005). In a typical class-action lawsuit, plaintiffs sue managers when they believe that managers' failure to promptly disclose adverse information causes large losses due to significant equity price drops.

While disclosures can benefit shareholders, they are costly to managers. Disclosures decrease managers' information advantage and can potentially reduce insider trading profits (Baiman and Verrecchia 1996). Because disclosures can enhance investors' monitoring of managers, they can also reduce managers' consumption of perks and control over the firm. As a result, managers prefer making fewer disclosures, particularly those of bad news, because shareholders might act on such information (Shleifer and Vishny 1989). In addition, because disclosures can help the labor market to better assess the talent and capabilities of managers, managers are reluctant to disclose information if they are uncertain how the market will respond to their disclosures (Nagar 1999). The reluctance to reveal information to shareholders is referred to as disclosure-related agency problems and such problems arise when managers' interest is not aligned with that of shareholders (Nagar et al. 2003).

Prior research suggests that stock-based compensation can improve the interest alignment between shareholders and managers, thus reducing agency problems in general (Jensen and Meckling 1976; Morck et al. 1988) and disclosure-related agency problems in particular (Nagar et al. 2003). While stock-based compensation can increase the disclosure of good news because

[5] For examples, see Glosten and Milgrom (1985) and Diamond and Verrecchia (1991) for the effect of corporate disclosure on the information asymmetry between managers and shareholders, and Shleifer and Vishny (1989) and Bushman and Smith (2001) on the extent of agency costs.

it provides managers with an incentive to boost the stock price, its effect on the disclosure of bad news is less clear. Stock-based compensation may elicit the disclosure of bad news if the stock market interprets non-disclosure as a worse signal (Milgrom 1981; Verrecchia 1983; Nagar et al. 2003). However, Kothari et al. (2009) find that managers tend to withhold bad news and that this tendency is stronger when the managers' personal wealth is more closely tied to their firms' stock price. This suggests that stock-based compensation may actually dampen the issuance of bad news disclosures. Moreover, the results of Kothari et al. (2009) are consistent with recent findings that managers with stock-based compensation tend to focus more on the current stock price, rather than the long-term value of the firm, and that these managers may engage in value-decreasing activities in pursuit of short-term gains.[6]

Relatedly, prior studies find that equity-based compensation may lead to opportunistic disclosures in certain circumstances. For example, Aboody and Kasznik (2000) find that managers delay earnings forecasts of good news and accelerate forecasts of bad news before the award date of stock options. These authors interpret such disclosure behavior as opportunistic in that it can decrease the stock price on the option grant date and the exercise price for stock options, thus increasing the value of the options awards. In addition, Cheng and Lo (2006) show that managers strategically increase the number of bad news forecasts in order to reduce the stock price before they purchase the shares of their own companies. In sum, previous studies provide inconclusive evidence on the effect of equity-based compensation on managers'

[6] For example, Cheng and Warfield (2005) and Bergstresser and Philippon (2006) find that managers with higher equity incentives are more likely to engage in earnings management. Burns and Kedia (2006) and Efendi et al. (2007) document that the likelihood of accounting restatements is positively related to managers' in-the-money option holdings. These studies argue that because the managers who receive stock/option grants tend to sell their shares and thus benefit from higher stock prices, stock-based compensation can induce managers to inflate short-term earnings and stock prices. However, some recent studies have found that managers' equity incentives are not related to the incidence of accounting fraud or accounting irregularities (e.g., Erickson et al. 2006; Armstrong et al. 2010).

voluntary disclosures of bad news.

As discussed above, both researchers and practitioners suggest that the excessive focus on short-term stock prices induced by stock-based compensation can be mitigated by lengthening the vesting period of stock-based compensation. When the vesting period is longer, managers care more about the long-term value of their firms and less about the short-term stock prices. Consistent with this notion, Gopalan et al. (2014) find a negative relationship between managers' pay durations and abnormal accruals (their proxy for managers' propensity to engage in myopic behavior to boost short-term earnings performance). This result suggests that longer pay durations improve the incentive alignment between shareholders and managers. It thus follows that given the same level of stock-based compensation, the effect of stock-based compensation may vary with its duration. In this study, we examine whether long pay durations can mitigate disclosure-related agency problems and improve the voluntary disclosure of bad news.

2.2 Hypothesis Development

In this section, we develop our hypotheses by discussing the costs and benefits of voluntary disclosure and how such costs and benefits vary with pay duration. Prior analytical and empirical research has documented the costs and benefits of disclosure. While some costs and benefits, such as increased liquidity, lower cost of capital, and managers' better career outcome (i.e., reputation, employment opportunities, and compensation), may affect both short-term and long-term focused managers, other costs and benefits may vary with the managers' horizon. If managers with long pay durations enjoy greater benefits from enhanced disclosures and/or if disclosures are less costly for them, then they will be more forthcoming than those with short pay durations. Below we discuss why managers with long pay durations are more likely to disclose bad news than those with short pay durations.

First, prior research suggests that a lack of disclosure, particularly that of bad news, is a manifestation of agency problems that arise because managers' interest is not perfectly aligned with that of shareholders (Nagar et al. 2003; Kothari et al. 2009). As discussed above, Gopalan et al. (2014) argue that longer pay durations can reduce agency problems as managers with longer pay duration focus on long-term firm performance and firm value, leading to a better interest alignment between managers and shareholders. It thus follows that longer pay durations can reduce disclosure-related agency problems and managers with long pay durations are more likely to disclose forward-looking bad news than those with short pay durations.

Second, due to the longer vesting period of option/stock grants, managers with long pay durations are less likely to exercise the options and sell their shares in the short term. Prior studies find that to diversify the risk of their portfolio, managers tend to sell the shares of their firms when they receive additional stock-based compensation (Ofek and Yermack 2000; Cheng and Warfield 2005). However, when the vesting period is longer, they are less likely to sell their shares given the same amount of options grants (Ofek and Yermack 2000). In an untabulated analysis, we confirm that managers' stock and option grants are positively correlated with the net sales of the shares in the next year when the pay duration is short, but not when the pay duration is long. As such, managers with long pay durations are less sensitive to short-term stock price drops and have weaker incentives to withhold bad news than those with short pay durations.

We acknowledge that withholding bad news before insider sales is subject to litigation risk (Cheng and Lo 2006). However, we reason that managers are more likely to engage in such behavior when the potential benefits of this strategy are higher. To the extent that such benefits are higher for managers with short pay durations, as they are more likely to sell shares in the near future than those with long pay durations, we expect them to be more likely to withhold bad

news than those with long pay durations. This discussion implies that managers with long pay durations are more likely to disclose bad news than those with short pay durations.

Lastly, Kumar et al. (2012) analytically show that bad news disclosures can improve investment efficiency and ultimately firm value in the long-run. In their model, managers' disclosures in general can reduce the divergence between investors' beliefs and managers' private information on firm prospects, helping investors to make better capital allocation decisions. In particular, they argue that managers' disclosures of bad news can improve investment efficiency via more efficient resource allocation even though they may trigger a short-term stock price drop. Kumar et al. (2012) also show that relative to managers with short horizons, those with long-term stakes in their firms have a greater propensity to disclose bad news in order to improve investment efficiency because they are able to enjoy the long-term benefits arising from the enhanced efficiency.[7] As such, we expect that managers with long pay durations have greater incentives to provide more timely disclosures of bad news.[8]

The above discussion suggests that managers with long pay durations are more likely to disclose bad news than those with short pay durations. In this study, we use management earnings forecasts to capture voluntary disclosures. Thus, our first hypothesis (in the alternative form) is as follows:

H1: Ceteris paribus, managers with long pay durations are more likely to issue bad news forecasts than managers with short pay durations.

However, we may not find results consistent with H1. One might argue that managers

[7] Kumar et al. (2012) argue that although disclosures of bad news entail short-term stock price drops, for managers with long-term stakes in their firms, the long-term gains from the enhanced firm value (as a result of improved efficiency in investment) outweigh the costs of the short-term stock price drops. This is not the case for managers with short-term stakes because the effect of short-term price drops is likely to dominate.

[8] In contrast, if managers with short pay durations are more likely to engage in myopic investments (Gopalan et al. 2014), they will prefer less disclosure so that they can limit shareholders' ability to monitor them (e.g., Edlin and Stigliz 1995).

might wait for the recovery of the economic situation, instead of releasing bad news promptly, as suggested by the survey evidence in Graham et al. (2005). Furthermore, they might withhold bad news to save their reputation if they believe that they can fix the problem later. If that is the case, pay duration would not be positively associated with managers' disclosure of bad news.

Our hypotheses on the cross-sectional variation relate to the circumstances under which pay duration is likely to be more effective in motivating managers to disclose bad news. First, prior research finds that firms with better governance are more effective in monitoring managers, addressing agency problems and reducing information asymmetry, as they demand more information from their managers. Specifically, prior research finds that firms with more independent boards and firms with higher institutional ownership are more likely to disclose (e.g., Ajinkya et al. 2005). Therefore, if long pay durations also motivate managers to disclose bad news to address agency problems and reduce information asymmetry, then the marginal effect of pay duration is likely to be smaller for firms with better governance. In contrast, for firms with poor governance, the effect of pay duration is expected to be more pronounced.

Second, when the information environment of a firm is already rich, further enhancing disclosure arguably has a smaller marginal effect (e.g., Verrecchia 1990).[9] In contrast, for firms with poor information environment, the benefits of enhancing disclosure are greater and, therefore, pay duration has a stronger effect on bad news disclosures for these firms.

Third, because withholding bad news can increase litigation risk, prior studies find that firms are more likely to provide bad news when they face higher litigation risk (e.g., Skinner 1994, 1997). Given that such firms are motivated to disclose bad news timely, the incremental effect of pay duration is expected to be weaker. In contrast, for firms facing lower litigation risk,

[9] As in many prior studies, we take the quality of the existing information environment as a given and consider the incremental effect of additional disclosures.

the effect of pay duration is expected to be stronger in inducing bad news disclosures.

Lastly, Parrino (1997) argues and finds that because it is easier for firms in more homogeneous industries to find CEO candidates (i.e., executives working in the same industry and having similar experience and skills), they are more likely to replace CEOs. As such, CEOs in more homogenous industries have greater job security concerns than their counterparts in other industries. Given that disclosing bad news can exacerbate career concerns, as discussed above, managers in more homogeneous industries are less likely to disclose bad news. As a result, the effect of pay duration in motivating firms to disclose bad news is stronger in such industries than in other industries.

The above discussions lead to the following hypotheses (stated in the alternative form):

The effect of pay duration on bad news disclosures, as hypothesized in H1, is stronger for

H2: firms with weaker governance,

H3: firms with poorer information environments,

H4: firms facing lower litigation risk, and

H5: firms operating in more homogenous industries, than for other firms.

3. Research Design

3.1 Data and Sample Selection

We obtain the required data from various sources. We obtain executive compensation data from Equilar. Equilar provides detailed information on executive compensation from 2006 onward for a broad set of firms included in the Russell 3000 index. The data coverage in Equilar is comprehensive and includes data items that are not available from ExecuComp, such as the grant date fair value and the vesting schedule of each equity compensation component. Such information is pivotal to the measurement of pay duration. We collect the data on management

earnings forecasts from First Call's Company Issued Guidance file. For the control variables, we obtain financial information data from Compustat, stock price/return data from CRSP, analyst forecast data from I/B/E/S, equity offerings data from Security Data Corporation's Global New Issues database, and boards of director data from Corporate Library.

Table 1 describes our sample selection process. Because we analyze how the duration of managers' compensation awarded in year *t* influences the disclosure of earnings forecasts in year *t*+1, we require the CEO of the firm in year *t*+1 to have compensation data in year *t*.[10] This procedure results in 10,920 firm-year observations in Equilar for the five-year period from 2006 to 2010. Our sample period ends with 2010 because our management forecast data obtained from First Call stop in November 2011.[11] Note that because our research design requires a one-year lag for pay duration, our analyses focus on management earnings forecasts issued during the period beginning with 2007. Of these observations, 150 firm-years are excluded because we are unable to find information on actual earnings or earnings announcement dates from First Call. In addition, 3,234 firm-years are excluded because of missing values on the control variables. This procedure leaves us with a sample of 7,536 firm-year observations.

3.2 Measurement of Pay Duration

Pay duration is the main variable of interest in our study. It captures the time horizon of managers' incentives arising from a mix of short-term and long-term CEO compensation. Following Gopalan et al. (2014), we measure pay duration (*P_DURATION*) as the weighted

[10] We include the observations where the CEO in year *t*+1 was not the CEO in year *t* in the analyses as long as the executive works in the same firm (e.g., being the CFO).

[11] We include observations in fiscal year 2010 and corresponding management forecast data in 2011 to increase the sample size and the power of the test. However, including these observations introduces two complications. First, for year 2011, we cannot obtain actual EPS or analyst consensus forecasts from the First Call database. As a result, we obtain such data from I/B/E/S. Second, the management forecast coverage for 2011 is incomplete. However, while these complications are likely to introduce noise into the analyses, they should not bias our results. Our inference remains the same when we restrict our sample period to 2006 to 2009 (untabulated).

average of the vesting periods of the four CEO compensation components in a given year: salary, bonus, restricted stock grants, and stock option grants, with the weight being the relative size of each compensation component. Specifically, pay duration is calculated as follows:

$$P\_DURATION = \frac{\sum_{i=1}^{n_1} Restricted\ Stock_i \times t_i + \sum_{j=1}^{n_2} Option_j \times t_j}{Salary + Bonus + \sum_{i=1}^{n_1} Restricted\ Stock_i + \sum_{j=1}^{n_2} Option_j},$$

where *Salary* is the dollar value of annual salary, *Bonus* the dollar value of annual bonus, *Restricted Stock*$_i$ the grant date fair value of restricted stock grant *i* with a vesting period t_i (measured in the number of years), *Option*$_j$ the grant date fair value of stock option grant *j* with a vesting period t_j (measured in the number of years), and n_1 (n_2) is the total number of restricted stock grants (stock option grants) in a given year.[12] See Appendix A for an example of the calculation of pay duration. Note that although the vesting period is zero for salary and bonus, it is important to include them in the denominator. Pay duration is constructed to capture managers' horizons induced by their annual compensation. If managers' compensation is primarily in the form of salary and bonus, granting them a small amount of options and stocks with a very long vesting period will not induce them to act in the interests of long-term shareholders.

One complication with the calculation of *P_DURATION* is that the number of securities and their vesting schedules are sometimes contingent on future performance. For these securities, we follow Gopalan et al. (2014) and make the following assumptions in the calculation. First, when the vesting of a grant is contingent on future performance but the number of securities is fixed, we assume that this grant will vest all at once at the end of the period over which performance is measured. Second, when a grant has a performance-based vesting schedule, we

[12] When grants of restricted stocks and stock options have a graded vesting schedule, the vesting period *t* is modified as (*t*+1)/2.

assume that this grant will vest according to the initially specified vesting schedule. Third, when a grant is part of a long-term incentive plan in which the exact number of securities offered is contingent on future performance, we assume that the number of securities offered is the target number of securities and that the vesting begins after the end of the performance period.

The annual-based pay duration measure has two limitations. First, it assumes that managers exercise all of the grants once they vest. This is not necessarily true. Some managers may hold the options and stocks for an extended period after they vest. Thus, the actual horizon of CEO compensation is longer than what is indicated by the pay duration measure. However, there is no compelling reason to believe that this issue will introduce a systematic bias. Second, the measure does not incorporate the effects of existing stock and option holdings or deferred compensation, such as post-retirement benefits, for which the vesting schedules are usually unavailable. Our measure therefore only reflects the incentives arising from the current year's compensation. As a sensitivity test, we calculate a cumulative measure of pay duration by including stocks and options awarded in previous years. While the inferences based on this alternative measure remain the same, this measurement also has its own limitations; its calculation requires many additional assumptions (due to a lack of vesting data before 2006), which are likely to lead to measurement errors. Nonetheless, obtaining similar results from both measures increases our confidence in the results. Please see Section 4.2 for a detailed discussion.

3.3 Management Earnings Forecasts

Figure 1 depicts the timeline of the variable measurement. To test our hypotheses, we focus on managers' forecasts of the current period's earnings, either annual or quarterly, issued after the earnings announcement for fiscal year t but before the end of fiscal year t+1. We exclude earnings forecasts issued between fiscal period-end and the earnings announcement dates, i.e.,

pre-announcements, because managers have less discretion in such forecasts.[13]

Following prior studies (e.g., Anilowski et al. 2007; Cheng et al. 2013), we classify a forecast as a bad news forecast if the forecasted value is lower than the most recent consensus analyst forecast. However, when management forecasts are released contemporaneously with earnings announcements, the prevailing consensus analyst forecast is no longer a good proxy for the market's up-to-date expectation of future earnings. To address this problem, we adopt Rogers and Van Buskirk's (2013) procedure to calculate the conditional analyst expectations, which reflect the hypothetical analyst estimates that analysts would have issued immediately following the earnings announcement but without the effect of management forecasts. We then classify a forecast as a bad news forecast if the forecasted value is lower than this conditional analyst expectation. To test our hypotheses, we define an indicator variable, *D_MF*, which equals one for firms that issued bad news earnings forecasts at least once in a given year, and zero otherwise. Our results are similar when we do not make adjustments for bundled forecasts in defining forecast news.

3.4 Control Variables

To ensure that pay duration does not capture the effect of other factors, we control for a series of variables that prior research suggests affect voluntary disclosures. First, we include managers' stock-based compensation (*EQ_COMP*) and share ownership (*SHAREH_OWN*). Nagar et al. (2003) find that the former (latter) is positively (negatively) associated with the issuance of managers' earnings forecasts. Second, we control for the frequency of option grants in each year (*OPTION_GRANT*). Aboody and Kasznik (2000) find that managers tend to

[13] We follow previous studies (e.g., Ajinkya et al. 2005; Houston et al. 2010) in excluding pre-announcements because these forecasts are considered part of the earnings announcement strategy, not a voluntary disclosure activity. Our inferences remain the same if we include these pre-announcements in the measurement of forecast issuance (untabulated).

accelerate bad news just before option grant dates to lower the exercise price of the options. Third, we include corporate governance variables such as institutional ownership (*INST*) and board independence (*BIND*). Ajinkya et al. (2005) and Karamanou and Vefeas (2005) find that corporate governance is positively related to the issuance of management forecasts. Fourth, following prior literature on voluntary disclosures (e.g., Ajinkya and Gift 1984; Lang and Lundholm 1993; Frankel et al. 1995; Hutton 2005), we control for the number of analysts following (*AC*), analyst forecast dispersion (*DISP*), return volatility (*RVOL*), litigation (*LIT*), firm size (*SIZE*), market-to-book (*MTB*), equity issuance (*EQ_ISS*), stock performance (*RET*), and change in operating performance (*CHG_ROA*).[14] Note that we control for both *RET* and *CHG_ROA*, the proxies for firm news; firms need to have bad news in order to issue bad news forecasts. Finally, we include industry- and year-fixed effects in our regressions to control for the potential variation in disclosure activities over time and across industries. The measurement of these variables is explained in more detail in Appendix B.

3.5 Descriptive Statistics

Panel A of Table 2 reports the descriptive statistics of the variables used in our analyses. The mean of *D_MF* is 0.3511, suggesting that 35% of firm-years in our sample provide bad news earnings forecasts at least once a year. The mean of *P_DURATION* is 1.4700, suggesting that managers' total compensation in our sample on average vests in approximately one and a half years. This number might seem small, but note that we include both salary and bonus, which vest immediately, in the denominator. More importantly, we observe a large variation in pay duration: the average pay duration is 0.2093 for the bottom 25% of the sample and 2.5412 for the top 25%

[14] In the main analyses, *LIT* is measured as a dummy variable for highly litigious industries. In an untabulated analysis, we use an alternative measure based on the litigation risk model developed in Kim and Skinner (2012) and the inferences remain the same.

of the sample (not tabulated). The mean of *EQ_COMP* is 0.3912, implying that 39% of total annual compensation is in the form of options and restricted stocks. The mean of *SHARE_OWN* is 0.0362, indicating that a CEO in our sample on average owns 3.62% of the firm's shares. The mean of *OPTION_GRANT* is 0.6405, indicating that an average CEO in our sample is granted stock options approximately every other year. In addition, our sample firms on average have institutional ownership of 75% and nine analysts following, and 75% of the firms have board independence of 60% or higher. The distributions of these and other firm characteristics in our sample are similar to those in recent studies on management forecasts (e.g., Chen et al. 2008; Feng et al. 2009).

Panel B reports the Pearson correlation coefficients among the variables. Consistent with H1, *P_DURATION* is positively correlated with *D_MF*. Not surprisingly, *P_DURATION* is highly correlated with the level of stock-based compensation, *EQ_COMP* (correlation coefficient=0.71). This high correlation indicates when both *P_DURATION* and *EQ_COMP* are included in the regressions, the coefficient on *P_DURATION* only captures the incremental effect of pay duration over the level of stock-based compensation. The correlation coefficients among the control variables are relatively small, except that for analyst coverage and firm size (0.47).

4. Empirical Results

4.1 Determinants of Pay Duration

To the extent that some unobservable firm characteristics affect both pay duration and bad news disclosure, our analysis can be subject to an omitted correlated variable bias. To mitigate this concern, we conduct a two-stage instrumental variable analysis. In the first stage, we

examine the determinants of pay duration, with right-hand side variables including a set of determinants of pay duration introduced by prior research along with control variables used in the second stage regression.[15] In the second stage analysis, we use the predicted value of pay duration estimated from the first stage to explain the variations in bad news disclosure across firms.

Gopalan et al. (2014) and Cadman et al. (2013) find that pay duration and option grant vesting terms are endogenously determined. For example, both studies argue that the firms with high growth potential tend to invest in long-term projects. Thus, they are more likely to offer CEOs longer-duration pay contracts, aligning their investment horizon with CEOs' incentive horizon. Using the market-to-book ratio (*MTB*) as the proxy for growth and long-term investment opportunities, the two studies find consistent evidence. On the cost side, the two studies argue that managers tend to demand higher risk premium for longer pay duration and this cost likely increases with the risk of the firm. Thus, riskier firms tend to offer shorter pay duration. Using return volatility (*RVOL*) as a proxy for firm risk, they find consistent results.

In addition, Gopalan et al. (2014) and Cadman et al. (2013) find a positive association between pay duration and stock performance (*RET*), suggesting that firms are likely to offer longer-duration pay contract to retain executives with strong performance. Longer duration can increase the cost of voluntary departure to executives because they typically lose unvested stock and option grants upon leaving the firm. Further, Gopalan et al. (2014) find that pay duration is negatively associated with non-executive director ownership and the extent of takeover threat, but positively associated with board independence (*BIND*). That is, the evidence on the

[15] The primary objective of the analysis is to control for the endogeneity of pay duration, not to replicate the prior research. The results are qualitatively similar when we replicate the analyses in Gopalan et al. (2014). (Note that our sample differs from that in Gopalan et al. (2014) in terms of sample period and coverage.)

association between pay duration and other governance mechanisms is mixed.[16] Finally, Cadman et al. (2013) find that the vesting period of option grants is negatively correlated with CEO ownership (*SHARE_OWN*).

Our instruments for pay duration are state average pay duration (*STATE_P_DURATION*) and industry average pay duration (*IND_P_DURATION*). Previous studies suggest that a firm's compensation design can be affected by industry practices and/or by geographical areas in which the firm's headquarters is located. In particular, a corporate practice in the same geographic area affects an individual firm through the competition in local labor market or the influence of fixed-agent peers (Hochberg and Lindsey 2010). Kedia and Rajgopal (2009) find empirical evidence supporting this idea with respect to option grants. Therefore, we expect *STATE_P_DURATION* and *IND_P_DURATION* to be significantly correlated with a firm's current pay duration (*P_DURATION*) in year *t*. However, there is no good reason to believe that *STATE_P_DURATION* and *IND_P_DURATION* in the current year have a direct impact on a specific firm's future disclosure (i.e., the disclosure of bad news in year *t+1*).[17]

Based on the above discussions, we use the following model for the first stage regression:

$$\begin{aligned} P\_DURATION_{i,t} = {} & \beta_0 + \beta_1 EQ\_COMP_{i,t} + \beta_2 SHARE\_OWN_{i,t} + \beta_3 OPTION\_GRANT_{i,t+1} + \beta_4 INST_{i,t} \\ & + \beta_5 AC_{i,t} + \beta_6 DISP_{i,t} + \beta_7 RVOL_{i,t+1} + \beta_8 BIND_{i,t} + \beta_9 LIT_{i,t} + \beta_{10} SIZE_{i,t} \\ & + \beta_{11} MTB_{i,t} + \beta_{12} EQ\_ISS_{i,t} + \beta_{13} RET_{i,t+1} + \beta_{14} CHG\_ROA_{i,t+1} \\ & + \beta_{15} STATE\_P\_DURATION_{i,t} + \beta_{16} IND\_P\_DURATION_{i,t} + Industry\ Dummies \\ & + Year\ Dummies + \zeta_{i,t} \end{aligned} \quad (1)$$

Table 3 reports regression results.[18] All p-values are based on standard errors adjusted for

[16] The negative (positive) association implies that pay duration is a substitution (complement) of corporate governance under an implicit assumption that *ceteris paribus* a longer pay duration is preferable for shareholders.
[17] We obtain the same inferences if we exclude firms in the same industry when calculating state average pay duration.
[18] Unlike Cadman et al. (2013) and Gopalan et al. (2014), we measure some of the right-hand side variables in the year of management forecast, i.e., one year ahead of pay duration measurement because they are used as control variables in the second stage where the dependent variable is management forecast. The inferences remain the same if we use lagged values.

firm- and year-clustering to address the potential correlation across observations (within the same firm and within the same year). In Column (1) when the instrumental variables are not included, we find that the coefficients on *BIND*, *SIZE*, and *MTB* are significantly positive, consistent with Cadman et al. (2013) and Gopalan et al. (2014). Further, we observe that pay duration is positively correlated with *EQ_COMP* and is negatively correlated with *SHARE_OWN*.

When we add instrumental variables in Column (2), we find that both of our instruments are significantly correlated with pay duration as expected: the coefficients on *STATE_P_DURATION* and *IND_P_DURATION* are significantly positive ($p < 0.001$ in both cases). We conduct the diagnostic tests, as suggested in Larcker and Rusticus (2010), and find that these instruments are powerful. The F-test for the joint explanatory power of the instruments is 435.42, which is above the suggested value of 11.59 for two instruments.

4.2 Pay Duration and Management Forecasts: Test of H1

We use the following regression to test H1:

$$\begin{aligned} D\_MF_{i,t+1} = {} & \alpha_0 + \alpha_1 P\_DURATION_{i,t} + \alpha_2 EQ\_COMP_{i,t} + \alpha_3 SHARE\_OWN_{i,t} \\ & + \alpha_4 OPTION\_GRANT_{i,t+1} + \alpha_5 INST_{i,t} + \alpha_6 AC_{i,t} + \alpha_7 DISP_{i,t} + \alpha_8 RVOL_{i,t+1} \\ & + \alpha_9 BIND_{i,t} + \alpha_{10} LIT_{i,t} + \alpha_{11} SIZE_{i,t} + \alpha_{12} MTB_{i,t} + \alpha_{13} EQ\_ISS_{i,t+1} \\ & + \alpha_{14} RET_{i,t+1} + \alpha_{15} CHG\_ROA_{i,t+1} + Industry\ Dummies + Year\ Dummies \\ & + \varepsilon_{i,t+1} \end{aligned} \quad (2)$$

Given that *D_MF* is a binary variable, we use the Probit model to estimate this equation.[19]

Table 4 presents the regression results. P-values are one-sided for the coefficient on *P_DURATION* and two-sided otherwise. In Column (1), *P_DURATION* is the predicted value of pay duration obtained from the first-stage regression as reported in Table 3. We find that the coefficient on *P_DURATION* is significantly positive (one-sided $p = 0.001$), suggesting that

[19] The inferences remain the same when we estimate this equation using a linear probability model.

CEOs with longer pay durations are more likely to issue bad news earnings forecasts. The marginal effect is 9.7% when pay duration increases from the first to the third quartile of the sample distribution while holding other independent variables at their respective means. This marginal effect is economically significant given that only 35% of the firm-years have bad news earnings forecasts. None of the other variables have the marginal effect greater in magnitude than that of *P_DURATION*.

As discussed in Section 3.2, the annual measure of pay duration focuses on the stock and option grants awarded in the current year but overlooks the duration of the stock and option grants awarded in the previous years. Thus, we construct a cumulative measure of pay duration that incorporates the stock and option grants awarded in the current year as well as those awarded in previous years. Although the cumulative measure better captures managers' incentives conceptually, they have their own limitations. Because Equilar provides detailed information about individual stock and option grants starting from 2006 when the new regulations on executive compensation became effective, to calculate this cumulative measure of pay duration, we can only incorporate stock and option grants awarded in previous years from 2006 onwards.[20] For example, the cumulative measure for a CEO in 2008 includes options and stocks granted in 2006, 2007, and 2008 that are still held by the CEO. Note that this cumulative measure is based on more years' option and stock grants in the later part of the sample period (i.e., 2009 and 2010) than in the earlier part of the sample period (i.e., 2007 and 2008). In an untabulated analysis, we find that the main measure of pay duration and the cumulative measure

[20] When constructing this measure, the values of previously awarded unvested stocks and options grants are re-estimated at the end of each year. Stock values are calculated as (the closing price × the number of shares), and option values are calculated using the Black-Sholes formula. For the options that are awarded as part of long-term incentive plans, Equilar does not provide the exercise price and expiration date. Therefore, for these options, we assume that their values stay the same as their grant date present value, as provided in Equilar, throughout the vesting period. Excluding these options does not affect our inference.

of pay duration are highly correlated in the later years of our sample period (correlation coefficient = 0.87 in 2009 and 0.85 in 2010), suggesting that our main measure of pay duration based on annual compensation is a valid proxy for the cumulative pay duration.[21]

We re-estimate Equation (2) using the predicted value of the cumulative measure of *P_DURATION* and report the results in Column (2). As in Column (1), the predicted value is obtained by estimating Equation (1) with *P_DURATION*, *STATE_P_DURATION*, and *IND_P_DURATION* being replaced with corresponding cumulative measures. The inferences based on the results reported in Column (2) are the same. The coefficient on *P_DURATION* is significantly positive (one-sided p = 0.031).

The results for the control variables are largely consistent with those in previous studies (e.g., Ajinkya et al. 2005; Feng et al. 2009). We find that the likelihood of bad news forecasts is positively correlated with the frequency of option grants (*OPTION_GRANTS*), institutional ownership (*INST*), analyst coverage (*AC*), board independence (*BIND*), and firm size (*SIZE*), and is negatively correlated with manager ownership (*SHARE_OWN*), forecast dispersion (*DISP*), return volatility (*RVOL*), market-to-book ratio (*MTB*), equity issuance (*EQ_ISS*), and change in firm performance (*CHG_ROA*). The coefficient on litigation risk (*LIT*) is insignificant because it is largely embedded in the industry dummies.[22] We find that the coefficient on *EQ_COMP* is significantly negative in Column (1) but insignificant in Column (2). While this result may appear to be inconsistent with Nagar et al. (2003), Nagar et al. (2003) do not separately examine bad news forecasts and do not control for pay duration.[23] We reconcile our results with those of

[21] The mean of the alternative measure of pay duration is 1.4237, which is close to 1.4648, the mean of our main measure of pay duration.
[22] While the litigation variable is based on four-digit SIC codes, industry dummies are based on two-digit SIC codes.
[23] The significantly negative coefficient on *EQ_COMP* in Column (1) for bad news forecasts is consistent with the argument and finding in Kothari et al. (2009) that managers with higher equity-based compensation are less likely to disclose bad news.

Nagar et al. (2003) when we examine the likelihood of all management forecasts, including both good news and bad news forecasts, in Section 5.1.

In sum, these reported results are consistent with H1 that managers with long pay durations are more likely to issue bad news forecasts than those with short pay durations.[24] These results hold for both the annual and the cumulative measure of pay duration. To ensure that the results are robust, we present the results based on both measures of pay duration for the following tests.

4.3 Robustness Tests for H1

In this section, we investigate the robustness of the results using an alternative measure of pay duration and conducting a change analysis. First, we alternatively measure pay duration as the weighted average of the vesting periods of equity-based compensation (i.e., option and stock grants). As discussed above, it is important to include salary and bonus to measure the overall horizon of CEO incentives. At the same time, it is also interesting to see whether our results are robust to this narrower version of pay duration.[25] Table 5 reports the regression results.[26] The coefficient on *P_DURATION* is significantly positive in both Columns (1) and (2) (one-sided p = 0.002 and 0.011, respectively).

Second, as an alternative way to alleviate the endogeneity concern, we conduct a change analysis. The advantage of the change analysis is that it uses the same firm as its own control and thus controls for time-invariant firm characteristics. Specifically, we examine whether the change in pay duration is associated with the change in the likelihood of issuing bad news earnings forecasts. Table 6 presents the results from the estimation of ordered Probit regression.

[24] The inferences remain the same when we use raw value, instead of predicted value of pay duration in all analyses relating to H1 through H5.
[25] The measure is set as zero for observations without equity-based compensation.
[26] The predicted value of pay duration is obtained by estimating Equation (1), with *P_DURATION*, *STATE_P_DURATION*, and *IND_P_DURATION* being replaced with corresponding alternative measures of pay duration.

Results in Columns (1) and (2) show that the coefficient on $\Delta P\_DURATION$ is positive and marginally significant (one-sided p = 0.078 and 0.080, respectively). This weaker result is not surprising as a firm' forecasting behavior is not expected to change by a large extent over two years.

Overall, the results in this section suggest that our inference on the effect of pay duration on bad new disclosures is robust to alternative measures of pay duration variable and to controlling for time-invariant unobservable firm characteristics.

4.4 Cross-Sectional Variation in the Effect of Pay Duration: Tests of H2, H3, H4, and H5

To test each of the cross-sectional hypotheses (i.e., H2, H3, H4, and H5), we construct an indicator variable for each situation under which we expect the effect of pay duration to be stronger and then add to Equation (2) the indicator variable and its interaction with pay duration. Below we report the results when we test each hypothesis separately, but inferences are the same when we test all the hypotheses at the same time by including all of the cross-sectional variables in one regression (untabulated).

H2 predicts that the effect of pay duration on bad news earnings forecasts is stronger for firms with weaker monitoring than for other firms. We use two proxies to capture the effectiveness of corporate monitoring: board independence and institutional ownership. Both proxies are widely used in the literature to capture the effectiveness of the monitoring of managers (e.g., Ajinkya et al. 2005). Specifically, we follow Chen et al. (2008) and construct an indicator variable, *LOW_BIND*, for firms with less independent boards, which equals one if less than 60% of the firm's directors are independent, and zero otherwise. Similarly, we construct another indicator variable, *LOW_INST*, for firms with lower institutional ownership, which equals one if the firm's institutional ownership (*INST*) is below the sample median, and zero

otherwise.[27]

Table 7 reports the regression results, with Panel A for board independence and Panel B for institutional ownership. In Panel A, the coefficient on the interaction of *P_DURATION* with *LOW_BIND* is significantly positive in both Columns (1) and (2) (one-sided p = 0.001 in both columns). Similarly, in Panel B, the coefficient on the interaction of *P_DURATION* with *LOW_INST* is also significantly positive in both columns (one-sided p = 0.000 and 0.001, respectively). Overall, these results are consistent with H2 that the effect of pay duration on bad news disclosure is greater for firms with weak corporate monitoring.

H3 predicts that the effect of pay duration on bad news earnings forecasts is stronger for firms with poorer information environment than for other firms. To test H3, we use two proxies to capture the quality of information environment: analyst coverage and share turnover. It is well established in the literature that analyst coverage is positively correlated with the quality of the information environment, as financial analysts tend to follow firms with rich information environments and they also help to increase the amount of information available to investors (e.g., Healy and Palepu 2001). Similarly, a large number of studies document that trading volume increases when information asymmetry decreases as a result of public disclosures (e.g., Leuz and Verrecchia 2000; Lo et al. 2004). Specifically, we construct an indicator variable, *LOW_AC*, which equals one if a firm's analyst coverage (*AC*) is below the sample median, and zero otherwise. Similarly, we construct another indicator variable, *LOW_TO,* which equals one if the firm's share turnover (calculated as the median daily trading volume scaled by the total number of shares outstanding) is below the sample median, and zero otherwise.

[27] Because we include the indicator variable for lower levels of board independence (*LOW_BIND*) in the cross-sectional analysis, we drop the original control variable of *BIND* from the regression model. We do the same for institutional ownership (*INST*), analyst coverage (*AC*), and litigation risk (*LIT*) in the respective cross-sectional tests.

Table 8 reports the regression results, with Panel A for analyst coverage and Panel B for share turnover. In Panel A, the coefficient on the interaction of *P_DURATION* and *LOW_AC* is significantly positive in both Columns (1) and (2) (one-sided p = 0.038 and 0.064, respectively). Similarly, in Panel B, the coefficient on the interaction of *P_DURATION* and *LOW_TO* is significantly positive in both columns (one-sided p = 0.001 in both columns). Overall, these results are consistent with H3 that the effect of pay duration on bad news disclosure is stronger for firms with poorer information environment.

H4 predicts that the effect of pay duration on bad news earnings forecasts is stronger for firms facing lower litigation risk than for other firms. To test H4, we construct an indicator variable for firms facing lower litigation risk, *LOW_LIT*, and it equals one for firms not operating in litigious industries (i.e., SIC code *not* within 2844-2836, 3570-3577, 7370-7374, 3600-3674, 5200-5961, and 8731-8734), and zero otherwise. Table 9 reports the regressions results.[28] We find that the coefficient on the interaction of *P_DURATION* and *LOW_LIT* is significantly positive in both Columns (1) and (2) (one-sided p < 0.001 in both columns). That is, consistent with H4, pay duration is more effective in eliciting bad news disclosures for firms facing lower litigation risk, i.e., those with lower *ex ante* incentives to disclose bad news.

H5 predicts that the effect of pay duration on bad news earnings forecasts is stronger for firms operating in more homogeneous industries than for other firms. To test H5, we construct an indicator variable for firms operating in more homogenous industries, *IND_HOMOGENEITY*, and it equals one for firms operating in an industry whose degree of industry homogeneity is above the sample median, and zero otherwise. We follow Parrino (1997) to measure industry

[28] Because the indicator variable for firms facing low litigation risk is defined based on the industry membership, we do not include industry fixed effects in Table 9. We do the same for the test of H5 (industry homogeneity) in Table 10.

homogeneity. Specifically, we first calculate, for each firm in an industry (based on two-digit SIC industry), the percentage of the variation in monthly stock returns that is explained by an equal-weighted industry index over the previous ten years. We then measure the industry homogeneity as the median across all firms in the industry. Table 10 reports the regressions results. We find that the coefficient on the interaction of *P_DURATION* and *IND_HOMOGENEITY* is significantly positive in both Columns (1) and (2) (one-sided p = 0.006 and 0.001, respectively). That is, consistent with H5, pay duration is more effective in eliciting bad news disclosures when firms operate in more homogeneous industries in which managers have lower incentives to disclose bad news due to more severe career concerns.

5. Additional Analyses

5.1 The Effect of Pay Duration on All Management Forecasts

As noted earlier in Section 4.2, we find that the level of equity-based compensation (*EQ_COMP*) is not positively correlated with the likelihood of bad news forecasts when pay duration is included in the analyses. This result is not necessarily inconsistent with the results in Nagar et al. (2003) because they examine the issuance of all management forecasts, including both good news and bad news forecasts. To reconcile our findings with those of Nagar et al. (2003), we re-estimate Equation (2) after replacing the dependent variable with an indicator variable for any management forecast; it equals one for firms that issue at least one earnings forecast (regardless of the nature of news) in a given year, and zero otherwise. Table 11 reports the results. In both Columns (1) and (2), we find that the coefficient on *P_DURATION* is significantly positive. These results are not surprising given the results for bad news forecasts

earlier.[29] The coefficient on *EQ_COMP* is significantly negative in Columns (1) and (2). However, because *P_DURATION* and *EQ_COMP* are highly correlated with each other, the common effect is not captured by either variable when both are included in the regression. As such, in Column (3), we drop *P_DURATION* from the regression. We find that the coefficient on *EQ_COMP* is significantly positive, as documented in Nagar et al. (2003). Therefore, while the incremental effect of the level of stock-based compensation over pay duration is negative, its total effect on the likelihood of management forecasts is positive when pay duration is not included.

5.2 The Effect of Pay Duration on Forecast Accuracy

The analyses thus far focus on the effect of pay duration on the *quantity* of management earnings forecasts. However, pay duration can also affect the quality of management forecasts if longer pay durations motivate managers to exert more effort in discovering high quality information and/or to spend more time analyzing and interpreting the newly acquired information. To investigate whether this is the case, we examine the effect of pay duration on the accuracy of management earnings forecasts. We define *MF_Accuracy* as negative one times the average forecast error of bad news earnings forecasts issued in a given year. Forecast error is calculated as the absolute value of the difference between forecasted earnings and actual earnings, scaled by the stock price at the beginning of the fiscal year. We then regress *MF_Accuracy* on pay duration and the control variables using the following specification:

[29] We also examine the effect of pay duration on the likelihood of good news forecasts for completeness. Untabulated results show that the coefficient on pay duration is significantly positive for good news forecasts.

$$MF\_Accuracy_{i,t+1} = \gamma_0 + \gamma_1 P\_DURATION_{i,t} + \gamma_2 EQ\_COMP_{i,t} + \gamma_3 SHARE\_OWN_{i,t} + \gamma_4 OPTION\_GRANTT_{i,t+1} + \gamma_5 INST_{i,t} + \gamma_6 AC_{i,t} + \gamma_7 DISP_{i,t} + \gamma_8 RVOL_{i,t+1} + \gamma_9 BIND_{i,t} + \gamma_{10} LIT_{i,t} + \gamma_{11} SIZE_{i,t} + \gamma_{12} MTB_{i,t} + \gamma_{13} EQ\_ISS_{i,t} + \gamma_{14} RET_{i,t+1} + \gamma_{15} LOSS_{i,t+1} + \gamma_{16} CHG\_ROA_{i,t+1} + \gamma_{17} MF\_HORIZON_{i,t+1} + \gamma_{18} MF\_SURPRISE_{i,t+1} + \gamma_{19} IMR_{i,t+1} + Industry\ Dummies + Year\ Dummies + \mu_{i,t+1} \quad (3)$$

Because *MF_Accuracy* is available only for firms that issue management earnings forecasts, the analysis is based on the 2,633 firm-year observations that issue management earnings forecasts (in the form of either point or range estimates). To address the potential selection bias, we include the inverse Mills ratio (*IMR*) calculated from Equation (2) as an additional control variable. In addition to the control variables included in Equation (2), we follow prior studies and control for the existence of performance loss (*LOSS*), managers' forecast horizon (*MF_HORIZON*), and forecast surprise (*MF_SURPRISE*). See the note to Table 12 for the measurement of these variables.

Table 12 reports the regression results. As shown in the table, the coefficient on *P_DURATION* is significantly positive in both Columns (1) and (2) (two-sided p <0.001), suggesting that managers with longer pay durations provide more accurate bad news earnings forecasts. These results suggest that longer pay durations improve not only the quantity but also the quality of bad news forecasts.

5.3 Alternative Explanations for the Effect of Pay Duration on Bad News Disclosure

One alternative explanation for the positive effect of pay duration on bad news disclosure is that managers with long pay durations *opportunistically* issue bad news earnings forecasts earlier when they are constrained to sell their newly awarded stock options/shares but later issue good news and/or withhold bad news when the previously awarded stock options/shares are vested. We do not believe that this alternative explanation is plausible. First, we obtain the same inferences when we use the cumulative measure of pay duration that includes the stock and

option grants awarded in previous years. If the current options/stock grants are positively associated with bad news forecasts in the next year, but negatively associated with bad news forecasts in the following years, we would not have observed the results for the effect of the cumulative measure (i.e., duration of options/stock granted in the past few years as well as in the current year) on the issuance of bad news forecasts. Second, in an untabulated analysis, we include lagged pay duration as an additional independent variable. We find that while lagged pay duration is significantly positively associated with the likelihood of bad news forecast issuance, it is not associated with the likelihood of good news forecast issuance. This result is inconsistent with the alternative explanation that managers with longer pay durations opportunistically release bad news earlier and disclose good news later.

Another alternative explanation for our main results is that the effect of pay duration may capture a non-linear relation between equity-based compensation and disclosure. To address this concern, in an untabulated analysis, we re-estimate Equation (2) after including the squared term of *EQ_COMP* and find that the coefficient on *P_DURATION* is still significantly positive. That is, even after controlling for the non-linear relationship between the level of equity-based compensation and disclosure, our inferences on pay duration remain the same.

In sum, our results are not consistent with the opportunistic view that managers with long pay durations strategically provide more bad news forecasts or with the possibility that pay duration captures a non-linear relationship between equity-based compensation and disclosure.

6. Conclusion

In this study, we investigate the effect of managers' pay duration on voluntary disclosures. We hypothesize that managers with longer pay durations are more likely to issue bad news

earnings forecasts because their interest is better aligned with that of shareholders, their welfare is less sensitive to short-term stock price drops, and they benefit more from enhanced disclosures. Consistent with our main hypothesis, we find that managers with long pay durations are more likely to issue bad news earnings forecasts than those with short pay durations. This result holds after we control for the endogeneity of pay duration using an instrumental variable approach. We obtain the same inference whether we use an annual-based measure or a cumulative measure of pay duration. We further find that the positive effect of pay duration on bad news disclosure is more pronounced for firms with weaker monitoring (i.e., those with less independent boards of directors or lower institutional ownership) and for firms with poorer information environment (i.e., those with lower analyst coverage or lower share turnover). These results suggest that pay duration plays a more important role in inducing managers to disclose bad news when the marginal benefits of additional disclosure are greater. Moreover, we find that the positive effect of pay duration is greater for firms facing less litigation risk and for firms operating in more homogenous industries, where the *ex ante* incentive to disclose bad news is relatively weak.

In the additional analyses, we find that our results are robust to an alternative measure based on options and stocks only. We also find that our results are robust to a change specification. Furthermore, we find that forecasts issued by managers with longer pay durations are more accurate, suggesting that longer pay durations improve not only the quantity but also the quality of bad news forecasts. Additional tests indicate that our results are not driven by the alternative explanations that (1) managers with long pay durations strategically disclose bad news earlier and withhold bad news later or (2) pay duration captures the potential non-linear relationship between equity-based compensation and disclosure.

We acknowledge that our analyses are subject to several limitations. First, it is possible that our results can still be affected by the potential endogeneity even though we address the issue in a couple of different ways and the endogeneity cannot explain the results from all the cross-sectional analyses. Second, while we obtain the same inferences using alternative measures, pay duration is not perfect in capturing managers' horizon. Third, management forecasts are only a part of the overall disclosure activities of a firm. They are unlikely to capture the other aspects of voluntary disclosure practice and the particular type of managers' private information that some of disclosure theory consider (e.g., Kumar et al. 2012), such as managers' private information about the firm's prospect. As such, readers should interpret our results with some cautions.

Despite the above limitations, our results indicate that increasing pay duration, i.e., lengthening the vesting period of stock-based compensation, can effectively mitigate disclosure-related agency problems and motivate managers to convey bad news more promptly. The importance of increasing pay duration is particularly salient for firms in which there is a greater need for improving voluntary disclosures.

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Appendix A Example of the Calculation of Pay Duration

To illustrate the computation of the pay duration variable, let us suppose that in a year, two CEOs are awarded compensation packages with identical dollar amounts but different vesting requirements, as described in the following table. It is further assumed that there is no other type of compensation. Note that these numbers are used only for illustration purposes. We assume that the total amount of compensation is the same for the two CEOs to show that we control for the level of compensation in the regression analyses.

	CEO A	CEO B
1. Salary ($)	730,000	730,000
2. Bonus ($)	320,000	320,000
3. Restricted Stocks ($)	1,700,000	1,700,000
- Vesting Schedule	(i) $850,000 will vest immediately	(i) $850,000 will vest after three years
	(ii) $850,000 will vest after one year	(ii) $850,000 will vest after five years
4. Stock Options ($)	1,250,000	1,250,000
- Vesting Schedule	(i) $500,000 will vest after one year (ii) $750,000 will vest after three years	(i) $500,000 will vest after three years (ii) $750,000 will vest after five years
Total Pay ($)	4,000,000	4,000,000

The two compensation packages have the same dollar value of total pay at $4,000,000. The level of the stock-based compensation (i.e., restricted stocks and stock options) scaled by the total compensation is also the same for both packages, 74%, as calculated below:

$$= \frac{1{,}700{,}000 + 1{,}250{,}000}{730{,}000 + 320{,}000 + 1{,}700{,}000 + 1{,}250{,}000} = 0.74$$

However, the two compensation packages have different vesting schedules. Specifically, CEO B's restricted stock and option grants have longer vesting periods than CEO A's. As shown below, CEO A's pay duration is 0.90 years, while CEO B's pay duration is 3.01 years.

(i) CEO A's pay duration is

$$= \frac{(850{,}000 \times 0 + 850{,}000 \times 1) + (500{,}000 \times 1 + 750{,}000 \times 3)}{730{,}000 + 320{,}000 + 1{,}700{,}000 + 1{,}250{,}000} = 0.90$$

(ii) CEO B's pay duration is

$$= \frac{(850{,}000 \times 1 + 850{,}000 \times 3) + (500{,}000 \times 3 + 750{,}000 \times 5)}{730{,}000 + 320{,}000 + 1{,}700{,}000 + 1{,}250{,}000} = 3.01$$

Appendix B Variable Description

Variable		Definition
D_MF	=	Indicator variable that equals one if the firm issues bad news earnings forecasts at least once in the year, and zero otherwise.
P_DURATION	=	Pay duration, measured as the weighted average of the vesting periods of the four components of executive compensation, i.e., salary, bonus, restricted stock grants, and stock option grants, with the weight being the relative size of each compensation component. The vesting periods of salary and bonus are set to be zero.
EQ_COMP	=	The sum of the value of stock option grants and the value of restricted stock grants, divided by total compensation, where the value of option grants and restricted stock grants is the grant-date fair value.
SHARE_OWN	=	The share ownership of a CEO, measured as the number of shares of held by the CEO divided by the total number of shares outstanding for a firm.
OPTION_GRANT	=	The number of separate dates when an option grant is awarded
INST	=	Institutional ownership, measured as the fraction of total outstanding shares held by institutional investors.
AC	=	Analyst coverage, defined as the number of analysts who issue annual earnings forecasts for the firm.
DISP	=	Analyst forecast dispersion, defined as the standard deviation of analyst earnings forecasts divided by the absolute value of the mean analyst forecast (using the summary statistics calculated last before the fiscal-year end in IBES).
RVOL	=	Return volatility, measured as the standard deviation of the firm's daily stock returns measured over the fiscal year.
BIND	=	Board independence, which equals one if more than 60% of the firm's directors are independent, and zero otherwise.
LIT	=	Indicator variable for high litigation industries. This variable takes a value of one if the SIC code is within 2844-2836, 3570-3577, 7370-7374, 3600-3674, 5200-5961, and 8731-8734, and zero otherwise.
SIZE	=	Firm size, measured as the natural logarithm of total assets.
MTB	=	Market-to-book ratio, measured as the firm's market value of common equity divided by the book value of common equity.
EQ_ISS	=	Indicator variable that equals one if the firm issues any equity offering during the year, and zero otherwise.

Appendix B (Cont'd)

Variable		Definition
RET	=	Market-adjusted annual stock returns, measured as the annual stock returns minus the value-weighted annual market returns.
CHG_ROA	=	Change in return on assets (ROA) from the previous year to the current year, where ROA is measured as the income before extraordinary items divided by lagged total assets.

Figure 1 Timeline of Compensation Award and Earnings Forecasts

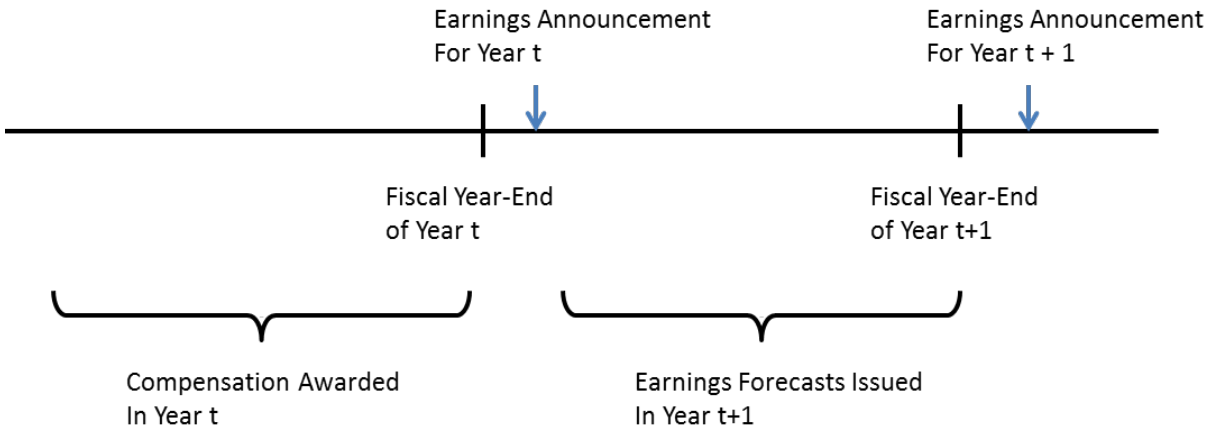

Table 1 Sample Selection

This table reports the sample selection process.

Criteria		Number of Observations
Number of firm-years in Equilar in the 2006-2010 period		10,920
Less:		
Number of firm-years without earnings data on the Actual files form from First Call	150	
Number of firm-years without data from I/B/E/S, 13F, Corporate Library, SDC, Compustat, or CRSP	3,234	
Final Sample		7,536

Table 2 Descriptive Statistics

This table reports the descriptive statistics for the variables used in our analyses. See Appendix B for variable definitions. All continuous variables are winsorized at the 1% and 99% levels.

Panel A: Descriptive Statistics on Management Forecasts and Firm Characteristics

Variable	N	Mean	STD	Q1	Median	Q3
D_MF	7,536	0.3511	0.4774	0.0000	0.0000	1.0000
P_DURATION	7,536	1.4700	0.9112	0.8357	1.6000	2.0682
EQ_COMP	7,536	0.3912	0.2685	0.2003	0.3888	0.5810
SHARE_OWN	7,536	0.0362	0.0778	0.0044	0.0113	0.0283
OPTION_GRANT	7,536	0.6405	0.7802	0.0000	1.0000	1.0000
INST	7,536	0.7474	0.2199	0.6389	0.7949	0.9140
AC	7,536	9.4179	6.4455	4.0000	8.0000	13.0000
DISP	7,536	0.0725	0.1878	0.0101	0.0208	0.0517
RVOL	7,536	3.1342	1.4760	2.0790	2.7965	3.8088
BIND	7,536	0.7549	0.4302	1.0000	1.0000	1.0000
LIT	7,536	0.2877	0.4527	0.0000	0.0000	1.0000
SIZE (in million) *	7,536	9,252	23,507	624	1,990	6,266
MTB	7,536	2.9901	3.1646	1.3386	2.0342	3.3202
EQ_ISS	7,536	0.0882	0.2837	0.0000	0.0000	0.0000
RET	7,536	0.0390	0.4069	-0.2104	-0.0135	0.2053
CHG_ROA	7,536	-0.0034	0.0943	-0.0215	-0.0003	0.0182

* We use the natural logarithm of this variable in the correlation table and regression analyses.

Table 2 (Cont'd)

Panel B: Person Correlation Coefficients

Correlation coefficients significant at the 5% level or lower are in boldface.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	*D_MF*															
(2)	*P_DURATION*	**0.14**														
(3)	*EQ_COMP*	**0.09**	**0.71**													
(4)	*SHARE_OWN*	**-0.07**	**-0.23**													
(5)	*OPTION_GRANT*	**0.07**	**0.12**	**0.13**	**-0.09**											
(6)	*INST*	**0.17**	**0.20**	**0.22**	**-0.17**	**0.07**										
(7)	*AC*	**0.14**	**0.28**	**0.24**	**-0.10**	**0.13**	**0.15**									
(8)	*DISP*	**-0.15**	**-0.07**	-0.01	**0.03**	-0.02	**-0.08**	**-0.11**								
(9)	*RVOL*	**-0.14**	**-0.11**	0.01	**0.07**	0.01	**-0.07**	**-0.19**	**0.18**							
(10)	*BIND*	**0.09**	**0.15**	**0.10**	**-0.18**	**0.06**	**0.15**	**0.07**	**-0.02**	0.00						
(11)	*LIT*	**0.10**	**0.04**	**0.12**	**0.05**	**0.07**	**0.07**	**0.17**	-0.02	0.02	**-0.01**					
(12)	*SIZE*	**0.04**	**0.27**	**0.12**	**-0.19**	**0.06**	**-0.03**	**0.47**	**-0.06**	**-0.21**	0.13	**-0.22**				
(13)	*MTB*	0.01	**0.07**	**0.06**	**0.03**	**0.08**	**0.03**	**0.15**	**-0.06**	**-0.04**	-0.01	**0.16**	**-0.16**			
(14)	*EQ_ISS*	**-0.12**	-0.01	0.00	-0.02	**-0.03**	**-0.09**	**-0.08**	**0.07**	**0.15**	**-0.03**	**-0.07**	**0.03**	-0.01		
(15)	*RET*	0.00	0.00	**0.02**	0.02	**0.03**	0.01	-0.02	**0.03**	**0.04**	-0.01	**0.06**	**-0.06**	**-0.02**	**0.05**	
(16)	*CHG_ROA*	**-0.04**	0.00	0.00	-0.02	0.00	-0.02	-0.01	**0.05**	**-0.10**	0.00	0.01	-0.01	**0.06**	0.01	**0.24**

Table 3 Determinants of Pay Duration

This table reports the results from the OLS regression of *P_DURATION*. Columns (1) and (2) present the results without and with the two instrumental variables, respectively. The two instrumental variables are defined as follows:

STATE_P_DURATION = The state average pay duration, measured as the average of pay duration for all firms in the same state in which the firm's headquarters is located for the year.

IND_P_DURATION = The industry average pay duration, measured as the average of pay duration for all firms in the same industry (two-digit SIC industry) as the firm for the year.

See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. All p-values are two-sided and are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)		(2)	
	Coefficient	p-value	Coefficient	p-value
EQ_COMP	2.2203***	0.000	2.1704***	0.000
SHARE_OWN	-0.6199***	0.000	-0.5976***	0.000
OPTION_GRANT	0.0191	0.400	0.0192	0.396
INST	0.0562	0.478	0.0586	0.442
AC	0.0040	0.208	0.0043	0.167
DISP	-0.1758***	0.000	-0.1699***	0.000
RVOL	-0.0250*	0.087	-0.0264*	0.080
BIND	0.0886***	0.000	0.0910***	0.000
LIT	-0.1214***	0.001	-0.1197***	0.001
SIZE	0.0938***	0.000	0.0915***	0.000
MTB	0.0115***	0.000	0.0111***	0.000
EQ_ISS	0.0365	0.337	0.0356	0.317
RET	-0.0103	0.592	-0.0077	0.713
CHG_ROA	-0.0478	0.222	-0.0648*	0.065
STAGE_P_DUARTION			0.3244***	0.000
IND_P_DURATION			0.4915***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Adjusted R^2	0.5696		0.5782	
Joint F-test for *STATE_P_DURATION* and *IND_P_DURATION*			435.42	0.000

Table 4 Pay Duration and Bad News Management Forecasts

This table reports the results from the Probit regression of the likelihood of the issuance of bad news forecasts. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on *P_DURATION* and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. The marginal effect is calculated as the change in the probability of issuing a bad news forecast when *P_DURATION* changes from the 1st to the 3rd quartile (or from 0 to 1 for the dummy variables) and other variables are held at the corresponding means. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*			(2) Cumulative *P_DURATION*		
	Coefficient	p-value	Marginal Effect	Coefficient	p-value	Marginal Effect
P_DURATION (H1: +)	0.2743***	0.001	0.097	0.2215**	0.031	0.063
EQ_COMP	-0.4759***	0.007	-0.063	-0.2612	0.252	-0.035
SHARE_OWN	-0.5993**	0.036	-0.005	-0.5987**	0.038	-0.005
OPTION_GRANT	0.0604***	0.006	0.021	0.0648***	0.003	0.023
INST	0.6123***	0.000	0.059	0.6110***	0.000	0.059
AC	0.0116**	0.019	0.036	0.0119**	0.013	0.037
DISP	-1.0041***	0.000	-0.015	-1.0354***	0.000	-0.015
RVOL	-0.0807***	0.001	-0.049	-0.0828***	0.001	-0.050
BIND	0.0800*	0.099	0.000	0.0922**	0.047	0.000
LIT	0.0449	0.664	0.016	0.0439	0.680	0.015
SIZE	0.0279	0.194	0.023	0.0393*	0.057	0.032
MTB	-0.0222***	0.008	-0.015	-0.0203**	0.014	-0.014
EQ_ISS	-0.1649**	0.018	0.000	-0.1698**	0.016	0.000
RET	-0.0221	0.646	-0.003	-0.0264	0.586	-0.004
CHG_ROA	-0.6059***	0.000	-0.008	-0.6208***	0.000	-0.009
Industry Dummies	Included			Included		
Year Dummies	Included			Included		
N	7,536			7,536		
Pseudo R^2	0.1783			0.1783		

Table 5 Pay Duration and Bad News Management Forecasts: Alternative Measures of Pay Duration

This table reports the results from the Probit regressions of the likelihood of the issuance of bad news forecasts using an alternative measure of pay duration, which is the weighted average of the vesting periods of the restricted stocks and stock options. For firms with no CEO equity-based compensation, this variable takes a value of zero. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3, except that the corresponding alternative pay duration measure is used. See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on *P_DURATION* and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION (H1: +)	0.1993***	0.002	0.1333**	0.011
EQ_COMP	-0.2887**	0.043	-0.1105	0.353
SHARE_OWN	-0.4689	0.124	-0.5032*	0.065
OPTION_GRANT	0.0544**	0.020	0.0651***	0.003
INST	0.6295***	0.000	0.6081***	0.000
AC	0.0140***	0.003	0.0136***	0.004
DISP	-1.0045***	0.000	-1.0720***	0.000
RVOL	-0.0818***	0.001	-0.0811***	0.002
BIND	0.0849*	0.076	0.0985**	0.035
LIT	0.0698	0.497	0.0310	0.762
SIZE	0.0475**	0.019	0.0588***	0.004
MTB	-0.0183**	0.024	-0.0178**	0.022
EQ_ISS	-0.1664**	0.017	-0.1737**	0.015
RET	-0.0219	0.647	-0.0311	0.546
CHG_ROA	-0.6212***	0.000	-0.5956***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1786		0.1777	

Table 6 Pay Duration and Bad News Management Forecasts: A Change Analysis

This table reports the results from the ordered Probit regression of the changes in the likelihood of issuing bad news earnings forecast on the changes in pay duration. The dependent variable Δ*D_MF* refers to the change in the indicator variable for the issuance of bad news earnings forecast from year *t* to *t*+1. Δ*P_DURATION* is the change in pay duration from year *t*-1 to *t*. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. The other explanatory variables are also measured as the changes from year *t*-1 to year *t* (or from year *t* to *t*+1). See Appendix B for the variable definitions. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on Δ*P_DURATION* and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
Δ*P_DURATION (H1: +)*	0.0435*	0.078	0.0505*	0.080
Δ*EQ_COMP*	-0.1902**	0.042	-0.1727**	0.042
Δ*SHARE_OWN*	-0.4761	0.606	-0.4447	0.630
Δ*OPTION_GRANT*	0.0116	0.668	0.0113	0.677
Δ*INST*	0.1658	0.341	0.1641	0.345
Δ*AC*	0.0109*	0.076	0.0112*	0.067
Δ*DISP*	-0.1099	0.163	-0.1143	0.145
Δ*RVOL*	-0.0085	0.469	-0.0095	0.416
Δ*BIND*	-0.1442***	0.008	-0.1451***	0.007
Δ*LIT*	0.4702*	0.081	0.4676*	0.081
Δ*SIZE*	0.3307***	0.000	0.3304***	0.000
Δ*MTB*	-0.0012	0.910	-0.0007	0.943
Δ*EQ_ISS*	0.0608	0.202	0.0605	0.205
Δ*RET*	-0.0950***	0.005	-0.0961***	0.005
Δ*ROA*	-0.6409***	0.003	-0.6364***	0.003
N	5,248		5,248	
Pseudo R^2	0.0116		0.0116	

Table 7 Cross-Sectional Analysis of the Effect of Pay Duration: Corporate Monitoring

This table reports the results from the Probit regression of the likelihood of the issuance of bad news forecasts to test the cross-sectional variation in the effect of pay duration with corporate monitoring. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) Panels A and B report the results when the effectiveness of corporate monitoring is proxied for by board independence and institutional ownership, respectively. *LOW_BIND* is an indicator variable that equals one if less than 60% of directors are independent, and zero otherwise. *LOW_INST* is an indicator variable that equals one if the firm's institutional ownership is below the sample median, and zero otherwise. See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficients on the interaction terms and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Board Independence

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.2157***	0.006	0.1514	0.180
LOW_BIND	-0.3896***	0.000	-0.4658***	0.000
P_DURATION × LOW_BIND (H2: +)	0.2234***	0.001	0.2745***	0.001
EQ_COMP	-0.4784***	0.006	-0.2656	0.238
SHARE_OWN	-0.5445*	0.061	-0.5293*	0.068
OPTION_GRANT	0.0604***	0.007	0.0649***	0.003
INST	0.6038***	0.000	0.6015***	0.000
AC	0.0112**	0.021	0.0115**	0.016
DISP	-1.0127***	0.000	-1.0426***	0.000
RVOL	-0.0811***	0.001	-0.0829***	0.001
LIT	0.0447	0.668	0.0435	0.687
SIZE	0.0325	0.128	0.0435**	0.033
MTB	-0.0219***	0.009	-0.0202**	0.015
EQ_ISS	-0.1680**	0.013	-0.1722**	0.012
RET	-0.0209	0.670	-0.0253	0.608
CHG_ROA	-0.6074***	0.000	-0.6222***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1799		0.1799	

Table 7 (Cont'd)

Panel B: Institutional Ownership

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.2760***	0.000	0.1973	0.140
LOW_INST	-0.4344***	0.000	-0.4559***	0.000
P_DURATION × LOW_INST (H2:	0.1828***	0.000	0.2060***	0.001
EQ_COMP	-0.6410***	0.001	-0.3608	0.151
SHARE_OWN	-0.5337*	0.055	-0.5285*	0.059
OPTION_GRANT	0.0571**	0.011	0.0629***	0.004
AC	0.0118**	0.014	0.0122***	0.010
DISP	-1.0040***	0.000	-1.0442***	0.000
RVOL	-0.0833***	0.001	-0.0867***	0.001
BIND	0.0888*	0.071	0.1053**	0.027
LIT	0.0529	0.609	0.0519	0.627
SIZE	0.0134	0.531	0.0289	0.155
MTB	-0.0230***	0.006	-0.0205**	0.012
EQ_ISS	-0.1760**	0.012	-0.1836**	0.010
RET	-0.0201	0.680	-0.0261	0.596
CHG_ROA	-0.6024***	0.000	-0.6237***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1769		0.1766	

Table 8 Cross-Sectional Analysis of the Effect of Pay Duration: Information Environment

This table reports the results from the Probit regression of the likelihood of the issuance of bad news forecasts to test the cross-sectional variation in the effect of pay duration with the quality of information environment. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) Panels A and B report the results when information environment quality is proxied for by analyst coverage and share turnover, respectively. *LOW_AC* is an indicator variable that equals one if the firm's analyst coverage (*AC*) is below the sample median, and zero otherwise. *LOW_TO* is an indicator variable that equals one if the firm's share turnover (measured as the median daily trading volume scaled by the total number of shares outstanding) is below the sample median, and zero otherwise. See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on the interaction terms and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Analyst Coverage

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.2206**	0.021	0.1705	0.164
LOW_AC	-0.3605***	0.001	-0.3639***	0.002
P_DURATION × LOW_AC (H3: +)	0.0917**	0.038	0.0955*	0.064
EQ_COMP	-0.4784**	0.017	-0.2737	0.226
SHARE_OWN	-0.6006**	0.031	-0.5964**	0.034
OPTION_GRANT	0.0588***	0.009	0.0629***	0.004
INST	0.5698***	0.000	0.5703***	0.000
DISP	-1.0120***	0.000	-1.0425***	0.000
RVOL	-0.0814***	0.001	-0.0835***	0.001
BIND	0.0791	0.118	0.0906*	0.057
LIT	0.0458	0.648	0.0451	0.663
SIZE	0.0231	0.275	0.0338*	0.084
MTB	-0.0235***	0.005	-0.0216***	0.009
EQ_ISS	-0.1692**	0.010	-0.1737***	0.009
RET	-0.0223	0.637	-0.0265	0.582
CHG_ROA	-0.6086***	0.000	-0.6237***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1805		0.1805	

Table 8 (Cont'd)

Panel B: Share Turnover

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.1778**	0.015	0.1107	0.379
LOW_TO	-0.0788	0.444	-0.1076	0.301
P_DURATION × LOW_TO (H3: +)	0.1388***	0.001	0.1636***	0.001
EQ_COMP	-0.3818**	0.012	-0.1764	0.469
SHARE_OWN	-0.6166**	0.030	-0.6198**	0.035
OPTION_GRANT	0.0602***	0.007	0.0642***	0.003
INST	0.6688***	0.000	0.6690***	0.000
AC	0.0144***	0.007	0.0146***	0.005
DISP	-1.0023***	0.000	-1.0301***	0.000
RVOL	-0.0719***	0.005	-0.0739***	0.004
BIND	0.0862*	0.067	0.0978**	0.030
LIT	0.0529	0.606	0.0510	0.631
SIZE	0.0257	0.264	0.0365	0.101
MTB	-0.0218***	0.008	-0.0201**	0.013
EQ_ISS	-0.1661**	0.030	-0.1697**	0.028
RET	-0.0209	0.643	-0.0240	0.603
CHG_ROA	-0.6080***	0.000	-0.6231***	0.000
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1810		0.1810	

Table 9 Cross-Sectional Analysis of the Effect of Pay Duration: Litigation Risk

This table reports the results from the Probit regression of the likelihood of the issuance of bad news forecasts to test the cross-sectional variation in the effect of pay duration with litigation risk. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) *LOW_LIT* is an indicator variable that equals one for firms operating in less litigious industries (i.e., SIC codes *not* within 2844-2836, 3570-3577, 7370-7374, 3600-3674, 5200-5961, and 8731-8734), and zero otherwise. See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on *P_DURATION* ×*LOW_LIT* and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.8792***	0.000	0.6595***	0.001
LOW_LIT	-0.6133***	0.000	-0.7042***	0.000
P_DURATION × LOW_LIT (H4: +)	0.2340***	0.000	0.2969***	0.000
EQ_COMP	-2.1220***	0.000	-1.3369***	0.000
SHARE_OWN	0.1458	0.647	0.1265	0.702
OPTION_GRANT	0.0418	0.113	0.0574**	0.022
INST	0.6708***	0.000	0.6527***	0.000
AC	0.0132***	0.004	0.0138***	0.003
DISP	-0.9898***	0.000	-1.0836***	0.000
RVOL	-0.1193***	0.000	-0.1335***	0.000
BIND	0.0712	0.127	0.1199***	0.008
SIZE	-0.1268***	0.000	-0.0857***	0.000
MTB	-0.0310***	0.000	-0.0240***	0.003
EQ_ISS	-0.3901***	0.000	-0.4241***	0.000
RET	0.0240	0.732	0.0170	0.816
CHG_ROA	-0.5631***	0.000	-0.6385***	0.000
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.0997		0.0972	

Table 10 Cross-Sectional Analysis of the Effect of Pay Duration: Industry Homogeneity

This table reports the results from the Probit regression of the likelihood of the issuance of bad news forecasts to test the cross-sectional variation in the effect of pay duration with industry homogeneity. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) *IND_HOMOGENEITY* is an indicator that equals one if the firm operates in an industry whose measure of industry homogeneity is above the sample median, and zero otherwise. To measure industry homogeneity, we follow Parrino (1997) and first calculate, for each firm in a particular industry (based on the two-digit SIC code), the percentage of the variation in monthly stock returns that is explained by an equal-weighted industry index over the previous ten years. Then, we measure industry homogeneity as the median across all firms in the industry. See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. P-values are one-sided for the coefficient on *P_DURATION* × *IND_HOMOGENEITY* and two-sided otherwise. P-values are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.8413***	0.000	0.6789***	0.000
IND_HOMOGENEITY	-0.5102***	0.000	-0.6088***	0.000
P_DURATION × *IND_HOMOGENEITY (H5:+)*	0.1831***	0.006	0.2443***	0.001
EQ_COMP	-1.8872***	0.000	-1.2287***	0.000
SHARE_OWN	-0.0701	0.819	-0.0868	0.783
OPTION_GRANT	0.0325	0.226	0.0449*	0.078
INST	0.6344***	0.000	0.6105***	0.000
AC	0.0124***	0.006	0.0127***	0.007
DISP	-0.9719***	0.000	-1.0496***	0.000
RVOL	-0.1175***	0.000	-0.1297***	0.000
BIND	0.0867*	0.076	0.1294***	0.006
LIT	0.2100***	0.000	0.2177***	0.000
SIZE	-0.0968***	0.000	-0.0598***	0.002
MTB	-0.0309***	0.000	-0.0248***	0.004
EQ_ISS	-0.3508***	0.000	-0.3792***	0.000
RET	0.0233	0.747	0.0169	0.820
CHG_ROA	-0.5537***	0.001	-0.6210***	0.000
Year Dummies	Included		Included	
N	7,536		7,536	
Pseudo R^2	0.1030		0.1015	

Table 11 Pay Duration and Management Forecasts (Including both Good News and Bad News)

This table reports the results from the Probit regression of the likelihood of issuance of all management forecasts, including both good news and bad news forecasts In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) See Appendix B for the definitions of other variables. All continuous variables are winsorized at the 1% and 99% levels. All p-values are two-sided and are calculated based on standard errors adjusted for firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*		(3) Exclusion of *P_DURATION*	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
P_DURATION	0.2264***	0.008	0.4114***	0.000		
EQ_COMP	-0.2791*	0.097	-0.4902**	0.021	0.2176***	0.002
SHARE_OWN	-0.3195	0.366	-0.4305	0.232	-0.6968**	0.041
OPTION_GRANT	0.0791***	0.000	0.0686***	0.001	0.0770***	0.000
INST	0.7039***	0.000	0.6468***	0.000	0.6354***	0.000
AC	0.0172***	0.006	0.0176***	0.008	0.0193***	0.002
DISP	-1.0789***	0.000	-1.2133***	0.000	-1.2731***	0.000
RVOL	-0.1464***	0.000	-0.1468***	0.000	-0.1477***	0.000
BIND	0.2098***	0.000	0.1447***	0.009	0.1653***	0.003
LIT	0.1479	0.244	0.1361	0.297	0.0653	0.607
SIZE	0.0467*	0.081	0.0284	0.285	0.0603**	0.020
MTB	-0.0168*	0.056	-0.0198**	0.014	-0.0171**	0.034
EQ_ISS	-0.2201**	0.014	-0.2595***	0.001	-0.2400***	0.002
RET	0.0141	0.841	0.0185	0.745	0.0195	0.730
CHG_ROA	-0.1093	0.160	-0.1507*	0.071	-0.1125	0.151
Industry Dummies	Included		Included		Included	
Year Dummies	Included		Included		Included	
N	7,536		7,536		7,673	
Pseudo R^2	0.2695		0.2576		0.2558	

Table 12 Pay Duration and Management Forecast Accuracy

This table reports the results from an OLS regression of forecast accuracy (*MF_Accuracy*) on pay duration and control variables. In Column (1), *P_DURATION* is the annual measure of pay duration, and in Column (2), *P_DURATION* is the cumulative measure of pay duration, which incorporates the stock and option grants awarded in the current and previous years. In both columns, the pay duration variable is predicted value estimated from the first-stage regression, as reported in Table 3. (The predicted value of cumulative *P_DURATION* is based on a similar model.) See Appendix A for variable definitions. The additional variables used in this table are defined as follows:

MF_Accuracy	=	The average of management forecast accuracy, which are measured as negative one times the absolute value of the difference between bad news earnings forecast and the actual earnings, divided by the stock price at the beginning of the year.
LOSS	=	Indicator variable that takes a value of one if the firm reports negative income before extraordinary item, and zero otherwise.
MF_HORIZON	=	The natural logarithm of one plus the number of days between the management forecast date and the earnings announcement date.
MF_SURPRISE	=	Management earnings forecast minus conditional analyst expectation, divided by the stock price at the beginning of the year. Conditional analyst expectation is calculated following Rogers and Buskirk's (2013) procedure.
IMR	=	Inverse Mills ratio calculated from Equation (2).

All continuous variables are winsorized at the 1% and 99% levels. All p-values are two-sided and are based on standard errors adjusted for firm and year clustering. ***, **, * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively.

	(1) Annual *P_DURATION*		(2) Cumulative *P_DURATION*	
	Coef.	p-value	Coef.	p-value
P_DURATION	0.0100***	0.000	0.0070***	0.000
EQ_COMP	-0.0178***	0.000	-0.0079***	0.004
SHARE_OWN	-0.0111	0.317	-0.0119	0.269
OPTION_GRANT	0.0023***	0.001	0.0025***	0.000
INST	0.0185***	0.005	0.0187***	0.004
AC	0.0004***	0.002	0.0004***	0.001
DISP	-0.0352***	0.001	-0.0367***	0.001
RVOL	-0.0044***	0.000	-0.0045***	0.000
BIND	0.0024**	0.027	0.0030***	0.008
LIT	0.0019*	0.094	0.0017	0.120
SIZE	-0.0002	0.766	0.0003	0.442
MTB	-0.0004*	0.061	-0.0003	0.124
EQ_ISS	-0.0036**	0.021	-0.0037**	0.017
RET	-0.0041***	0.000	-0.0043***	0.000
CHG_ROA	-0.0187**	0.037	-0.0048***	0.000
LOSS	-0.0048***	0.000	-0.0194**	0.031
MF_HORIZON	-0.0063***	0.000	-0.0063***	0.000
MF_SURPRISE	-0.6083***	0.000	-0.6093***	0.000
IMR	0.0431***	0.002	0.0433***	0.002
Industry Dummies	Included		Included	
Year Dummies	Included		Included	
N	2,633		2,633	
Adjusted R^2	0.3315		0.3313	