Shareholder Investment Horizon, Management Incentive Horizon, and Real Earnings Management[1]

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Abstract

The agency paradigm is primarily concerned with compensation contracts with both short-term and long-term provisions that align the interests of top management with those of shareholders. But such alignment may be imperfect. In particular, if shareholders differ in their time-preferences, it will be impossible to find a contract that fully aligns manager interests with those of both long-term and short-term shareholders. In this study, we first theoretically examine the properties of optimal contracts when shareholders have heterogeneous time preferences about liquidating their holdings in the firm. We then show that the managerial compensation contract will create incentives for the manager to trade-off short term price increases with long term value creation. In empirical tests, we use measures of average shareholder horizon and managerial compensation horizon and identify firms where there is a misalignment between these measures. We show, both from our theoretical model and our empirical tests, that the negative impact of real earnings management arises from misalignment of managerial and investor horizons.

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Keywords: Compensation Duration, Investor Horizon, Real Earnings Management, Myopia, Investment Distortions

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Abstract

The agency paradigm is primarily concerned with compensation contracts with both short-term and long-term provisions that align the interests of top management with those of shareholders. But such alignment may be imperfect. In particular, if shareholders differ in their time-preferences, it will be impossible to find a contract that fully aligns manager interests with those of both long-term and short-term shareholders. In this study, we first theoretically examine the properties of optimal contracts when shareholders have heterogeneous time preferences about liquidating their holdings in the firm. We then show that the managerial compensation contract will create incentives for the manager to trade-off short term price increases with long term value. In empirical tests, we use measures of average shareholder horizon and managerial compensation horizon and identify firms where there is a misalignment between these measures. We show, both from our theoretical model and our empirical tests, that the negative impact of real earnings management arises from misalignment of managerial and investor horizons.

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1 Introduction

The impact of managerial and shareholder horizon on a firm's investment policy has been debated in the literature. Managerial horizon arises from the terms of the compensation contract and a concern for the market value at different points in time in the future. Components of managerial pay that depends on the value of the firm in the short-term, e.g. pay components tied to quarterly earnings or current stock price, leads to a short-term investment horizon and components of pay that depend on the long-term value of the firm, e.g. elements such as unvested restricted stock, lead to a long-term investment horizon. Shareholder horizons can also vary. Mutual fund managers can be focused on short-term returns driven by a concern about asset withdrawals that accompany poor performance of their funds. On the other hand, fund managers that manage pension investments may worry less about short-term price fluctuations and be more concerned about performance over a longer term. Researchers have shown that both shareholder horizon and managerial horizon affect a firm's investment policy. Gopalan et al. (2014) proposed a pay duration measure by calculating the weighted average duration of the four components of pay (i.e., salary, bonus, restricted stock, and stock options) and documents that longer CEO pay duration is negatively related to the extent of earnings-increasing accruals. Literature on institutional investors documents that managers cater short-term investors' preference by conducting myopic behavior that boost-up current earnings while hurting long-term value of the firm (Bushee, 1998, Bushee, 2010, Gaspar et al., 2005). We argue, however, that it is the mismatch between the horizons of the manager and shareholders that leads to investment distortions. Indeed, if the manager's horizon and the shareholders horizon dovetail, the investments pursued by the firm will match the shareholders' desired investment policy. In this paper, we present a theoretical model and empirically examine the impact of mismatched managerial and shareholder horizons on a firm's investment policy.

Our theoretical framework falls within the agency problem paradigm with two extensions reflecting our focus on the mismatch of manager and shareholder horizons. First, unlike the traditional agency model, where shareholders are assumed to be of one kind and prefer long-term value creation, we assume heterogenous time preferences of the investors. Short-term investors purse short-term gains over the short-term and long-term investors pursue gains over the long-term. Second, unlike the standard agency models, in which the management can affect the stock price only through the choice of effort (see e.g. Spence and Zeckhauser 1971, Ross 1973, Holmstrom 1979), our model assumes the manager can engage in unobservable earnings manipulation. We follow Goldman and Slezak (2006) and assume that upwardly biases disclosed information but hurts the long-term cash flows of the firm. We develop a simple three-period model, with two types of principals who liquidate their holdings at different times. The manager chooses a myopic action that can increase the short-term price. We assume, in common with the many papers on myopia, that such myopic action results in short-term earnings boost-up but long-term losses. However, our paper diverges from the myopia literature in arguing that this might be in the interests of the incumbent shareholders, and therefore, optimal.

We first work out the manager's hidden choice that maximizes the manager's payoff based on the contract that has been offered prior to the choice of the action and ownership structure. Then we take a step further to examine the optimal contract scheme by making the contract endogenously set by the current shareheolders and argue that the optimal contract should mirror the ownership structure of the firm. Using an overlapping generation model, where the original generation of short-term shareholders will sell all their holdings to the next generation. The purchasing investors will set the first period price contingent on their beliefs regarding the managers' myopic decisions and the likely long-term value of the firm. The desire of short-term compensation stems from the current shareholders' attempt to impress the future potential investors with the firms' past performance. However, drawing on behavioral economics, we assume that the purchasing investors' beliefs only partially correct the effects of managerial actions. That is to say, the current stock price is overinflated due to managerial myopia and purchasing investors cannot fully see through. In an environment populated with sophisticated arbitrageurs, the future investors could only be fooled if the market itself has some imperfections. In our model, we posit the following two frictions to the market: information asymmetry between investors and managers and short-sale restrictions. It's plausible that investors have difficulty evaluating managerial claims regarding the costs and benefits of long-term projects (Walker, 2010). Also, with presence of short-sale constraint, the market is not able to incorporate the informed investors' lower expectation of future price into the current price and the price of a stock will be driven up to the valuation of the most optimistic investor.

Both frictions could lead to an overinflated stock price at current and therefore, enable the firms to fool the future overoptimistic investors.

Our argument is in line with Bolton, Scheinkman, and Xiong (2006) in that this paper argues that more short-term holdings can lead to an intrinsic need for earnings boost-up, a further deviation from the fundamental value, and therefore, a more speculative market for the firm, which is similar to Bolton et al.'s argument that divergence of opinions among investors assures that stock prices reflect not only the fundamental value of the firm but also a short-term speculative component. However, this paper extends Bolton et al.'s model in that this paper takes the view that even though the optimal pay duration is to align with the time preference of existing investors, the optimal compensation of executives will not always be constructed in real world due to some frictions as what a rent extraction view argues. But unlike the rent extraction views where sub-optimal contracts put too much weight on short-term focused compared to the long-term oriented shareholders, we argue this sub-optimality of compensation contract can be of two directions (too short-term focused or too long-term focused) and should be summarized as the horizon misalignment between the shareholders and the management.

In Section 4, we empirically test our model prediction that short-termism is a result of misalignment. We use data from Inventive Labs to calculate executives' one-year forward pay duration. The one-year forward pay duration is calculated as the weighted average of the duration of the different components of executives' compensation grants of the following year and is our measure of managerial horizon. We use data from 13F filings to calculate the inverse of the weighted churn rate of firms' institutional investors, our measure of the investors' investment horizon. We were able to calculate horizon and duration data for a total of 5406 firm-years over the 12-year period from 2006 to 2017, which constitutes our sample.

We find a positive relationship between investors investment horizon. This positive relationship indicates that for firms that are owned by institutional shareholders who rotate their portfolios in a less timely fashion (longer investment horizon), the firms are more likely to grant their executives restricted stocks or options with more extended vesting schedule after controlling the industry fixed effect, project duration, and the firm performance and growth. Executive pay scheme in general, therefore, is determined by the ownership structure of the firm to reflect the optimal contracting. Our results add to the literature on market and managerial myopia (see e.g. Stein 1989, Cadman and Sunder 2014). by providing an evidence that the short-termism of compensation could be a result of market and shareholder myopia.

We also find that, in practice, an optimal contract may not always be constructed, which can lead to a horizon misalignment between the managers and the shareholders. We constructed a measure to quantify such sub-optimality, We begin by sorting the firms into terciles based on pay duration of the CEO and terciles based on investors investment horizon. We use the double sort to identify a mismatch between the duration of the manager's compensation and the investment horizon of institutional investors. Specifically, we develop a 0/1 dummy variable that takes a value equal to 1 either when the duration of the manager's compensation is long and the shareholder's investment horizon is short or the duration of the manager's compensation is short and the shareholder's investment horizon is long. Of the 5,406 firm-years in our sample, 1,200 firms are have a misalignment dummy equal to one, i.e. are marked as having a discrepancy between the horizons of the manager and investors.

We then examine the negative effect of misaligned horizons. We find that the coefficient on the misalignment dummy is positive and statistically significant. The degree of misalignment thus increases the level of real earnings management by firms. We next examine the impact of real management on the firm's future Return on Assets (ROA) and Cash Flows from Operations (CFO) in a subsample of firms where misalignment dummy is zero and the subsample of firms where misalignment dummy is one. We find that the impact of real management is positive and significant for both ROA and CFO in the subsample of firms where the misalignment dummy is equal to zero, but that the impact of real management is not significant when the degree of misalignment is one. Thus, real management has a detrimental effect on future cash flows only when the manager's compensation horizon is misaligned with the horizon of investors.

Our work makes several contributions. First we show that short-termism embedded in compensation structures comes from the market's being myopic. Secondly, we show that the earnings management arising from managerial investment horizon need not be suboptimal. When the shareholder horizon matches that of the manager, the impact of earnings management on future ROA and CFO is positive. Third, our measure of misalignment serves as a measure of agency problems in the firm.

The rest of the paper is as follows. Section 2 reviews the literature. Section 3 presents our model and Section 4 presents the details on how we determine the manager's pay-duration, the investors horizon, and the mismatch in these horizons and Section 5 presents the results of our empirical tests. Section 5 concludes.

2 Literature Review

We review the relevant literature relating to optimal contraction, the relationship between investor horizon and managerial myopia and the relationship between managerial horizon and managerial myopia.

2.1 Agency Theory and Optimal Contracting

Agency problem arises when there is a separation of ownership and control (see e.g. Jensen and Meckling 1976) It refers to the conflict of interest inherent in the relationship where the agency (hired by the principal) is expected to act in the principal's best interests. In corporate finance instance, the shareholders (principal) hire the management (agency) to help with running the firm due to their lack of skills and/or time. The managers are expected to take actions on behalf of the shareholders. However, managers may not always act in shareholders' best interests since their interests may not be perfectly aligned with the shareholders due to different utility functions. Managers may take private actions that are beneficial to themselves while hurting the shareholders. The condition under which the agency problem, more precisely moral hazard problem can happen is that managers' actions are private. By private, it means that the managers' actions are not fully observable to the shareholders. If the management's actions can be otherwise fully observed and hence contracted upon, the first-best solution will be able to achieve, which means the management will always take proper actions that are in the best interests of shareholders. However, fully observation of actions by investing into monitoring may be impossible or prohibitively costly in general situations (see e.g. Holmstrom 1979).

However, although not fully eliminable, agency problem can be minimized by altering the structure of compensation contracts of the managers. By implementing optimal risk-sharing rules, shareholders can maximize their utility and also enable managers to maximize their utility while choosing proper actions. In this case of only outcomes are jointly observable, instead of directly setting on managers' actions, the compensation contracts will be set on the outcomes of the actions, such as industry adjusted earnings, stock returns, etc. The actions that managers take can alter the probability distribution of the outcomes, which enables shareholders to use the outcomes as imperfect estimators to infer managers' actions. A second-best solution can be achieved through optimal contracting to align the interests of shareholders and managers. Therefore, a discussion on what an optimal executive compensation contract looks like has raged on since the 1980s, especially after Jensen and Murphy (1990) argued that what matters in CEOs' pay is not how much they are paid but *how* they are paid.

Most of the studies on optimal compensation stem from the Harris and Raviv (1979)'s argument that the risk-aversion levels for managers and shareholders are different, which creates a conflict of interests. We extend this stream of research by arguing that a misalignment of the the manager and investor horizons also cause conflicts of interest. Indeed, we argue that it is neither the manager's horizon alone or the investor's horizon alone, but the difference between the two that is a cause for the managerial-shareholder agency problems. For example, a managerial compensation package with a short-horizon can be optimal if a firm's shareholders also have a short horizon. Compensation contract of managers is the device used to mitigate the conflict of interest between managers and shareholders in optimal contracting literature. By implementing optimal risk-sharing rules in executive compensation, the interests of the two parties can be better aligned. However, Although previous studies stressed the need to link executive pay to performance, they did not devote much attention to one important element of incentive pay plans: the optimal time-frame for evaluating executives' performance (Bebchuk and Fried, 2010). As a characteristic of compensation contract, the optimal horizon of executive's compensation to mitigate the conflicts of interests has recently attracted much of researchers' attention in the corporate finance area. On the one side of the debate, some researchers criticize the executive pay is based too much on short-term performance and could lead to myopic managerial behavior (. Bebchuk and Fried 2010) Gopalan, Milbourn, Song, and Thakor (2014) document that longer duration of executive compensation is negatively related to the extent of earnings- increasing accruals, which is harmful to the firm's long-term value. Longer duration of executive compensation can restrain managers from engaging such misbehavior. On the other side of the debate, Bolton, Scheinkman, and Xiong (2006) point out that an emphasis on short-term stock performance may be optimal from the perspective of the firm's existing shareholders in a speculative market where some investors may be over-optimistic, and the stock price may deviate from the fundamentals. Our paper provides evidence in settling the debate by arguing that when examining what optimal horizon of executive pay to a firm, we need to consider what the constitute of the shareholders' investment horizon is.

There are distinctions among shareholders within a firm whose preference over short-term or long-term benefits may differ. Due to various risk aversion levels or different information sets, shareholders exhibit different investment horizons. That is, long-term shareholders hold stocks for a more extended period, pursuing long-term value-increasing of the firm, while short-term shareholders trade on stocks to gain short-term gains Bushee (1998). In this case, long-term and short-term shareholders may prefer different corporate decisions. Some acceptable level of earnings boost-up to meet earnings expectation, as an example, can be desired by short-term shareholders since it may inflate the stock price, so that enable the short-term shareholders to realize their returns at a higher price.

On the other hand, earnings boost-up is not desired by long-term shareholders since it doesn't increase the firm's long-term cash flows but will reverse or even hurt the firm's long-term benefits. Therefore, not all of the shareholders prefer long-term value-increasing corporate decisions as previous literature assumed. In fact, different preferences exist among different types of shareholders. Motivated by this argument, we developed a model, in which firms are held by shareholders with different horizons (short-term or long-term) to examine given different executive compensation duration and shareholders' investment horizons of a firm, what will be management's optimal choice on myopic behavior in a normal-operated financial market. Then taking a step further and making the compensation endogenously determined, we predict that the boards, representing shareholders' interest, should set up a compensation scheme that maximize the existing shareholders' overall benefit and therefore, a compensation scheme that mirrors the firm's ownership structure.

2.2 Investors' Investment Horizons and Management Myopia

Previous decades from the 1960s to 2000s have seen significant changes in the manner of how corporate stocks are traded. Due to the advances in communications technology, investors can buy and sell a company's stock in a much convenient way, which leads to much higher turnover rates compared to the 1960s. At the 2000s, researchers argue that shorter horizons for stockholders lead inevitably to shorter horizons for managers when they evaluate investment opportunities Froot, Perold, and Stein (1992). For example, using weighted average institutional shareholders' historical portfolio turnover ratio as a measure of shareholder investment horizon, Gaspar, Massa, and Matos (2005) documents that short-term shareholders have weaker monitoring power and could allow managers to proceed with value-reducing acquisitions or to bargain for personal benefit at the expense of shareholder returns. Bushee (1998) classify the institutional investors into three categories – transient, quasi-indexer and dedicated – based on their investment patterns. Firms with more "transient" institutional investors are more likely to engage in myopic R&D investment behavior. Firms engage in earnings management to cater the "transient" investors. However, this stream of literature fails to incorporate management compensation into consideration. It is managers who make those myopic decisions. Without taking incentives of the decision makers would lead to incomplete conclusions.

2.3 Management Incentive Horizon and Management Myopia

The literature has developed a link between management compensation and their myopic behavior by arguing that managers do earnings management in fear of negative earnings surprise since their compensation is tied with the price (Healy and Wahlen 1999, Roychowdhury 2006). It's rational to assume managers make decisions to maximize their own benefits. If managers' compensations are mostly based on short-term performance, the compensations are of short-term. While if managers' compensations mostly consist of equity incentive plans, pensions or other long-term incentives, the compensations are of long-term. However, what the market reaction to their decisions depends on the market participants–shareholders. For example, long-term pay duration doesn't necessarily lead to higher returns, long-term payd duration will lead to higher returns only if the shareholders are also long-term. On the other side, short-term pay duration doesn't necessarily lead to negative returns, unless shareholders are long-term (misaligned). Without understanding a firms' shareholder structure, incomplete conclusions may be drawn as well. In this paper, we'd like to develop a model to take a closer look at the whole price change, compensation, and decision-making system. When the managers determine what real activities to do to influence the reported earnings, they should consider how their compensations are aligned with the S-T and L-T shareholders' interests.

2.4 Management Incentive Horizon and Investors' Investment Horizon

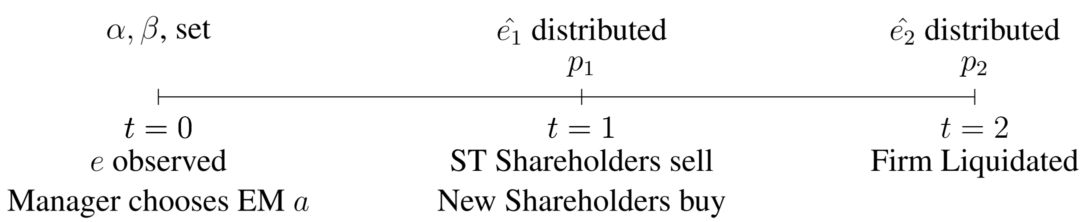
Bolton, Scheinkman, and Xiong (2006) point out that emphasis on short-term stock performance can be optimal to existing shareholders in a speculative market. In a speculative market, incumbent shareholders of "overconfidence" are willing to pay more than what they believe to be the stock's long-run fundamental value because they think they may be able to sell their shares in the short term to other investors with more optimistic beliefs. With the overconfidence, the optimal executives' compensation will be designed to base more heavily on short-term stock price performance and induce CEOs to take myopic decisions. Their model establishes a direct link between heterogeneity in investor beliefs and the CEO's compensation. Our paper extends Bolton, Scheinkman, and Xiong (2006) theoretically and empirically. In their paper, they assume that all the shares the short-term investors are willing to sell will be able to sell at the desired price. In our model, we allow the first-period price to vary with how many shares are to be sold. If a firm's shares don't have enough buyers, the firm faces a risk of price falling and therefore creates an inherent need for earnings embellishment. Taking the view that even though the optimal pay duration is to align with existing investors' time preference, the optimal compensation of executives will not always be constructed in real world due to some frictions, we constructed a measure to quantify the suboptimality of the compensation contract and examine the negative effects of misaligned horizons for both misaligned directions.

3 Model Framework

As in Bolton, Scheinkman, and Xion (2006), we consider an optimal contracting problem in a two-period principal - agent model similar to that of Holmstrom and Tirole (1993). The agent is a risk-averse CEO who chooses some costly hidden actions and manages earnings. The managers actions affects both the long-run fundamental value of the firm and its short run stock valuation. We focus on the action of earnings management, which undermines firm's long-term value but inflate its short-term stock valuation. We also assume that we have two types of shareholders, short-term shareholders who hold shares for 1-period and long-term shareholders who hold shares till liquidation.

3.1 Model Time Line

At $t = 0$, β fraction of the firm's shareholders are short-term (ST) and $(1 - \beta)$ fraction of shareholders are long-term shareholders (LT). At $t = 1$, short-term shareholders liquidate their holdings and the shares are purchased by a new set of short-term shareholders (NS). Earnings of the firm are reported and distributed at $t = 1$ and $t = 2$ and the manager can manage the level of reported earnings through real earnings management at $t = 0$ to influence shareholders' trading decision and so that the market-clearing price at $t = 1$ and the long-term value of the firm at $t = 2$ as well. [2]. Figure 1 shows the time line and the details of our two-period, three-date model framework.



[2] We use real earnings managemnet instead of accural earnings management since real earnings management can affect firm's cash flows and therefore long-term value while accural earnings management only shifts the accrual part of earnings without directly influencing firm's cash flows

3.2 Model Parameters

At $t = 0$, shareholders set the manager's compensation contract. The level of equity incentives is linear in firm value and is such that it induces optimal effort. For risk-diversification reasons the optimal linear CEO compensation scheme has both a short-run and a long-run stock participation component. In our model, we assume that shareholders have solved for the level of equity pay and only focus on the proportion of compensation that depends on the short-term value of the firm and the proportion that depends on the firm's long-term value. Specifically, we model a parameter α, that determines the fraction of the manager's compensation that is based on the short-term value of the firm and $(1 - \alpha)$ fraction is based on the long-term value of the firm.

The manager's optimal choice of (deleted: hidden action and) effort at $t = 0$ determines the level of earnings of the firm $e \in N(E[e], \sigma_e)$. The manager privately observes the level of earnings e, but shareholders only know the distribution. At $t = 1$, the manager reports earnings, $\hat{e_1}$. The manager has the option to manage earnings that reflects real earnings management by the manager and manages the distribution of earnings between time $t = 1$ and $t = 2$. Earnings management augments the level of earnings at $t = 1$ by a. The reported earnings at $t = 1$, is, $\hat{e_1} = e + a$ and the reported earnings at $t = 2$ is $\hat{e}_2 = e - a$. While the manager observes e and a, shareholders only form expectations of $E[\hat{e}_2]$.

Shareholders expect that the liquidation value of the firm at $t = 2$ to be,

$$E[\hat{p_2}] = KE[\hat{e}_2] \tag{1}$$

where K represents the Investors have to take into account that higher $\hat{e_1}$ could be because of either higher true earnings e or higher earnings management a. The weight α on p_1 in the manager's compensation contract gives the manager an incentive to manage earnings. Therefore the positive impact of reported earnings is mitigated by α due to investors' suspicion. Specifically, we assume the following regularity conditions: $\frac{\partial E[\hat{e}_2]}{\partial \hat{e_1}} > 0$; $\frac{\partial^2 E[e_2]}{\partial \hat{e_1}^2} < 0$ and $\frac{\partial^2 E[e_2]}{\partial \alpha \, \partial \hat{e_1}} < 0$.

Short-term shareholders trade at $t = 1$ and sell their holdings to a new set of short-term investors who hold shares till $t = 2$. The market clearing price, p_1, will be a function of the expectations for future earnings, the number of shares traded and the risk exposure to future prices.

Investors form expectations of future earnings and prices as a function of reported earnings $\hat{e_1}$. In forming expectations of the level of earnings at $t = 2$, a high level of reported earnings ($\hat{e_1}$) has a positive effect on the shareholders' expectations of future earnings $E[\hat{e}_2]$.

At $t = 2$, all uncertainty is resolved and the firm is liquidated. Earnings, as reported, are distributed to shareholders. Shareholders and the manager receive the pro-rated earnings and the proceeds of liquidation. Proceeds on liquidation is equal to $p_2 = K * e_2$, which is the capitalized value of the firms earnings after $t = 2$.[3] We additionally assume that the manager also receives the dividend and that the discount rate is zero. The manager's expected compensation, therefore, is a function of prices p_1 and p_2 and earnings payout $+\hat{e_1}$ and $+\hat{e_2}$. That is,

$$C = E_0 \left[\alpha(p_1 + \hat{e_1}) + (1 - \alpha)(p_2 + \hat{e_1} + \hat{e_2})\right]$$

Substituting for p_2,

$$C = E_0 \left[\alpha(p_1 + \hat{e_1}) + (1 - \alpha)(\hat{e_1} + (K + 1)\hat{e_2})\right] \tag{2}$$

The manager chooses the level of reported earnings, $\hat{e_1}$, to maximize compensation as given by her payoff function.

We next determine the market clearing price p_1^* given the managerial compensation contract and the manager's choice of reported earnings $\hat{e_1}$.

3.3 Shareholder trading

At $t = 1$, short-term investors sell all their shares to new investors. The supply of shares is equal to βQ, where Q is the number of shares outstanding and β is the fraction owned by short-term shareholders. New shareholders maximize their expected utility by setting prices appropriately for the quantity traded. The trade price maximizes investors' expected utility of expected future cash flows and clears the market. Investors' expectation on future earnings $E[e_2]$, and liquidation value

[3] We assume that the shareholders contract contingent on observing a at $t = 2$. For example, shareholders cannot impose a penalty at $t = 2$ if a is positive. Extending the time line to an additional date $t = 3$ when information is resolved increases the complexity of the model and our simplifying assumption preserves mathematical tractability.

$E[p_2] = K * E[e_2]$ will determine the market clearing price at $t = 1$. All expectations are formed after observing the reported earnings $\hat{e_1}$.

New shareholders buy shares Q_{NS} at a price p_1 and expect proceeds of $E[e_2] + E[p_2] = (K+1)E[e_2]$ to when the firm is liquidated at $t = 2$. The expected utility of the new shareholders (NS), is

$$E[U_{NS}(-Q_{NS}\, p_1 + Q_{NS}\, ((K+1)\hat{e_2})] = E[U_{NS}\, \{Q_{NS}\, ((K+1)\hat{e_2} - p_1)\}] \tag{3}$$

Using a Taylor series expansion of Equation 3 at $(K+1)\hat{e_2} = p_1$:

$$E[U_{NS}(0)] + U'(0)Q_{NS}E[(K+1)\hat{e_2} - p_1] + \frac{U''_{NS}(0)Q^2_{NS}}{2}E[(K+1)\hat{e_2} - p_1]^2 \tag{4}$$

Substituting $E[U_{NS}(0)] = 0$, $E[(K+1)\hat{e}_2 - p_1] = (K+1)E[\hat{e}_2] - p_1$ and $E[(K+1)\hat{e}_2 - p_1]^2 = \sigma^2 + ((K+1)E[\hat{e}_2] - p_1)^2$ in equation 4 we get,

$$U'_{NS}(0)Q_{NS}(E[(K+1)\hat{e}_2 - p_1) + \frac{U''_{NS}(0)Q^2_{NS}}{2}(\sigma^2 + (E[(K+1)\hat{e}_2] - p_1)^2) \tag{5}$$

Investor's choose to trade such that their expected utility is maximized. The first order condition for the maximization with respect to the quantity of shares traded is:

$$U'_{NS}(0)((K+1)E[\hat{e}_2] - p_1) + (\sigma^2 + ((K+1)E[\hat{e}_2] - p_1)^2)U''_{NS}(0)Q_{NS} = 0 \tag{6}$$

Denote the risk aversion level $\left(-\frac{U''_{NS}(0)}{U'_{NS}(0)}\right)$ as γ. The market clearing price p_1^* for quantity of shares traded Q_{NS}, therefore, is given by,

$$p_1^* = E[(K+1)\hat{e}_2] - \frac{\frac{1}{\gamma Q_{NS}} - \sqrt{(\frac{1}{\gamma Q_{NS}})^2 - 4\sigma^2}}{2} \tag{7}$$

Simplifying further,

$$p_1^* = E[(K+1)\hat{e}_2] - \frac{1}{2\,\gamma\, Q_{NS}}\left\{1 - \sqrt{1 - 4\sigma^2(Q_{NS})^2\gamma^2}\right\} \tag{8}$$

Markets clear when the quantity of shares purchased by new shareholders is equal to the number of shares sold by the initial short-term shareholders, i.e. when $Q_{NS} = \beta Q$. Therefore,

$$p_1^* = E[(K+1)\hat{e}_2] - \frac{1}{2\,\gamma\,\beta\,Q}\left\{1 - \sqrt{1-(2\gamma\beta\,Q\,\sigma)^2}\right\} \tag{9}$$

Equation 9 shows that the market-clearing price, p_1^*, is related to investors' expectation about the terminal value of the firm and a risk adjustment factor. The second term in the equation is positive except when there is no risk ($\sigma^2 = 0$) or the purchasing shareholders are risk-neutral ($\gamma = 0$), when it is equal to zero. Therefore,

$$\begin{cases} p_1^* = (K+1)E[\hat{e}_2] & \sigma^2 = 0 \text{ or } \gamma = 0 \\ p_1^* < (K+1)E[\hat{e}_2] & \sigma^2 \neq 0 \text{ and } \gamma \neq 0 \end{cases} \tag{10}$$

We next turn to the manager's incentive maximization problem given the optimal p_1^* as a solution to the shareholders' investment problem.

3.4 Compensation maximization

The manager chooses a to determine the optimal level of reported earnings. The optimal choice of a maximizes her compensation, subject to shareholder trading at $t = 1$ and the market clearing price $\hat{p}_1^*$. The manager's problem is:

$$\max_a \qquad C = \alpha(\hat{e}_1 + p_1) + (1-\alpha)(\hat{e}_1 + \hat{e}_2 + p_2) \tag{11}$$

subject to:

$$p_1 = p_1^* \tag{12}$$

The manager chooses a after privately observing the level of earnings e. From the manager's perspective, therefore, first period earnings are $e + a$, second period earnings are $e - a$ and the liquidation value when all information is revealed is $K * (e - a)$. Substituting these values in the manager's objective function, we get

$$\max_{a} \qquad C = (e + a) + \alpha p_1 + (1 - \alpha)\{(K + 1)(e - a)\} \tag{13}$$

subject to:

$$p_1 = p_1^* \tag{14}$$

Substituting for $p_1 = p_1^*$, we get:

$$\begin{aligned} \max_{a} C &= \{(K+2)e - Ka\} - \left\{ \frac{1 - \sqrt{1 - (2\sigma\beta Q\gamma)^2}}{\gamma\,\beta Q} \right\} \\ &\quad + \alpha(K+1)\{E[\hat{e}_2] - (e - a)\} \end{aligned} \tag{15}$$

Differentiating the objective function with respect to a, we get,

$$\frac{\partial C}{\partial a} = -K + \alpha(K+1)\frac{\partial E[\hat{e}_2]}{\partial \hat{a}} + \alpha(K+1) = 0 \tag{16}$$

Therefore, $\hat{e_1} = \hat{e_1}^*$ is such that,

$$\frac{\partial E[\hat{e}_2]}{\partial a} = \frac{K}{\alpha(K+1)} - 1 \tag{17}$$

The optimal choice of earnings management is reached when the amount of new shareholders being fooled by one additional unit of earnings management ($\frac{\partial E[\hat{e}_2]}{\partial a}$) is offset by the negative impact of doing additional earnings management as captured by the right hand side of the equation. The negative impact of earnings management a on managers' compensation is therefore a function of the manager's horizon and the tradeoff between current and future earnings as captured by the capitalization factor K.

3.5 Optimal Compensation Horizon

The total value of the shareholdings of is equal to the sum of the value of the holdings of short-term shareholders, βQ, and the value of the holdings of long-term shareholders, $(1 - \beta)Q$. The value of the shares held by short term shareholders is equal to the value they receive for selling their shares ar $t = 1$ plus the earnings distributions at $t = 1$. That is,

$$\text{Short-term shareholder Value} = \beta Q(p_1^* + \hat{e_1}) \tag{18}$$

and

$$\text{Long-term shareholder Value} = (1-\beta)Q(E[p_2] + \hat{e_1} + \hat{e_2}) \tag{19}$$

The total value for all shareholders is therefore,

$$\text{Shareholder Value} = Q\left\{\beta(p_1^* + \hat{e_1}) + R(1-\beta)(E[p_2] + 2e)\right\} \tag{20}$$

Normalizing by Q, the Shareholder value on a per-share basis is:

$$\text{Shareholder Value} = \beta(p_1^* + \hat{e_1}) + R(1-\beta)(E[p_2] + 2e) \tag{21}$$

The manager's objective function is maximized at p_1^* and $\hat{e_1}^*$ and $\hat{e_2}^*$. From equation [11], therefore, the maximum value per share given a weight of α on the short-term cash flows and $(1-\alpha)$ on the long-term cash flows is:

$$Value\_Max = \left[\alpha q(p_1^* + \hat{e_1^*}) + (1-\alpha)q(p_2 + \hat{e_1^*} + \hat{e_2^*})\right] \tag{22}$$

It is therefore, clear that for any β, the value of the weighted average of short-term and long-term cash flows is maximized at at p_1^* and $\hat{e_1}^*$ and $\hat{e_2}^*$.

Comparing with the managerial compensation under the optimal real management policy p^*, the valuation gap between the value of the firm from the manager's perspective and the value of the firm from the shareholder's perspective, which we call the *Value Gap*, is equal to:

$$Value\ Gap = RQ\left\{(\alpha-\beta)(p_1^* + \hat{e_1}) + R(\beta-\alpha)(E[p_2] + 2e)\right\} \tag{23}$$

The difference between α and β is the degree of misalignment between the horizons of the shareholders and managers. We note that the value gap is positive at the optimal $\hat{e_1}$ whether $\alpha > \beta$ or $\alpha < \beta$, i.e. a misalignment in either direction results in the manager's optimal choice of a to differ from the level of a that maximizes shareholder value. In the next section, we take our theoretical analysis to the data and examine the impact of impact of a mismatch between pay-duration and investor-horizon on real earnings management and its impact on the firm's future performance.

4 Data and Variable Construction

To provide evidence on optimal contracting, we empirically examine the composition of compensation contracts, shareholder investment horizon, and real earnings management. In this section we describe the data we use and the mechanics of the construction of relevant variables.

Data for estimating $PayDuration$ is from the Incentive Lab database of the Institution Shareholder Services (ISS). Data on institutional ownership need for estimating $Investor\ Horizon$ is from the 13F filing data from the Thomson Reuters 13F Institutional Ownership Database. Data for estimating $Real\ Earnings\ Management$ is from the CRSP and COMPUSTAT database. We match data across all three databases to generate our sample. We also exclude banks and financial institutions (SIC codes between 6000 and 6500) and firms in utility industries (SIC codes between 4400 and 5000) since accounting rules in highly regulated industries differ from other sectors. We also require that at least ten firms are required in each two-digit SIC industry-year grouping to generate measures for real earnings management. Our final sample after we match data and drop the observations with missing values of the variables is 5,406 firm-year observations.

4.1 Pay Duration

We extend the methodology used by Gopalan, Milbourn, Song, and Thakor (2014) in developing a measure of pay duration by calculating the weighted average duration of the components of CEO pay. Gopalan, Milbourn, Song, and Thakor (2014) calculate the weighted average duration using four components of pay, specifically, salary, bonus, restricted stock, and stock options. We augment this with cash awards as well since cash payments are not necessarily only rewards for short-term performance.

ISS Incentive Lab compiles detailed compensation data from proxy statements (DEF 14A) for the CEO and named executive officers of more than 2,000 largest market capitalization firms (see e.g. Bettis, Bizjak, Coles, and Kalpathy 2018). Incentive Labs report data for stock grants, option grants, and cash awards, including data on the vesting schedule, the grant date fair value and the performance period for performance based awards. We retrieve all grant-level data for the CEO needed to estimate $PayDuration$.

[*Insert Table 1 Here*]

Table 1 presents the distributions of the plan-based components of the CEO pay Restricted Stock Units, option grants and cash awards that are tied to performance. As shown in the table, most cash awards (more than 97%) are contingent on performance since after FAS123R in 2006, the performance-related proportion of bonus need to be separated out as cash awards and the residual part is left as bonus. Although previous literature documents a rising trend of performance-contingent vesting provision used in equity awards (20 to 70 percent from 1998 to 2012), most of the option grants remain time-based vesting (94.18%), suggesting a more significant change from time-based to performance-based vesting is happening for grants of RSU. The number of RSU granted through the year of 2006 to 2017 with performance-based versus time-based vesting provisions are relatively balanced (49.66% vs. 49.71%).

Therefore, our measure for pay duration includes the cash awards into Gopalan, Milbourn, Song, and Thakor (2014) et al.'s measure as well and have five components (i.e., salary, bonus, cash awards, restricted stock, and stock options):

$$PayDuration = \frac{\sum_{i=1}^{n_c} \text{Cash award}_i \times t_i + \sum_{j=1}^{n_s} \text{Restricted stock}_j \times t_j + \sum_{k=1}^{n_o} \text{Option}_k \times t_k}{\text{salary} + \text{bonus} + \sum_{i=1}^{n_c} \text{Cash award}_i + \sum_{j=1}^{n_s} \text{Restricted stock}_j + \sum_{k=1}^{n_o} \text{Option}_k}$$

where $Salary$ and $Bonus$ are the dollar values of annual salary and bonus of each executive, $Cashaward_i$ is the target payment of non-equity incentive of the ith cash reward with performance evaluation period t_i, $Restrictedstock_j$ is the grant date fair value of the j^{th} grant of restricted stocks with vesting period t_j (in years), and $Option_k$ is the grant date fair value of the k^{th} grant of stock options with vesting period t_k (in years). In each the year t, an executive may be awarded multiple non-equity or equity grants with different vesting periods, and n_c, n_s and n_o are the total number of each type of grants respectively.

Our descriptive statistics in Table 2 shows an average $PayDuration$ of 1.638 years for CEOs, which is longer than the 1.44 years in Gopalan et al. (2014). The reason could be twofold. The first is that the time period for Gopalan's sample is only from 2006 to 2009 and the PayDuration increases through the years. The second is that instead of assign zero duration to cash awards, our measure consider cash awards with different duration according to their performance period, during which the executive's performance is evaluated. Therefore, our time span from 2006 to 2016 has a relatively longer average $PayDuration$ than Gopalan et al (2014)'s.

4.2 Investor Horizon

For the shareholders' investment horizon, we follow Gaspar, Massa, and Matos (2005) and use the inverse of the weighted average of institutional investors' turnover ratio to proxy for shareholder investment horizon of a firm. Short-term investors are defined as investors that exhibit high portfolio turnover while long-term investors are defined as the ones that exhibit low portfolio turnover. If a firm's stock is held mainly by short-term investors, its weighted average turnover would be higher and the corresponding investment horizon will be lower.

Let the set of companies held by investor i be denoted by F. The churn rate of investor i at quarter t is

$$CR_{i,t} = \frac{\sum_{j\in F} |N_{j,i,t}P_{j,t} - N_{j,i,t-1}P_{j,t-1} - N_{j,i,t-1}\Delta P_{j,t}|}{\sum_{j\in F} \frac{N_{j,i,t}P_{j,t} + N_{j,i,t-1}P_{j,t-1}}{2}}$$

where $P_{j,t}$ and $N_{j,i,t}$ represent the price and the number of shares, respectively, of company j held by institutional investor i at quarter t. We use the level and the quarterly change in the number of shares held by institutions to estimate the turnover rate each quarter.

We then construct an investor turnover for firm k for quarter t by calculating the weighted average of the portfolio churn rate of its investors. Denote by S the set of shareholders in company

k and by $w_{k,i,t}$ the weight of investor i in the total percentage held by institutional investors at quarter t:

$$InvestorTO_{k,t} = \sum_{i \in S} w_{k,i,t} CR_{i,t}$$

As all other measures of firm characteristics are on a firm-year basis, we estimate a yearly investor turnover rate by averaging out the four quarters' investor turnover rate. We then reverse the $Annual\ InvestorTO_{k,t}$ to get the investors' investment horizon measure in years:

$$InvestorHRZ_{k,t} = 1/Annual\ InvestorTO_{k,t}$$

[*Insert Table 2 Here*]

Table 2 shows the summary statistics for $InvestorHRZ$. The mean of $InvestorHRZ$ is around 2.16, which is longer than the mean for $PayDuration$. This may help explaining the general concern from investors that the CEOs' incentives do not tie enough to the long-term performance of the firm.

[*Insert Figure 1 and 2 Here*]

Figure 1 shows the time-series line plot for the changes in the median of CEO pay duration ($PayDuration$) and the investor investment horizon (InvestorHRZ) through the years. We can see that both horizon variables have increased over the years especially after the financial crisis in 2008. Figure 2 plots the industry median for $PayDuration$ and $InvestorHRZ$ using industry classifications based on the Fama-French 48 industry definition. We can see that generally, industries that have longer (shorter) median of $InvestorHRZ$ also have a longer (shorter) median of $PayDuration$.

4.3 Real Management

To measure the level of earnings manipulation through real activities, we follow Roychowdhury (2006) and use discretionary production costs (RM_{PROD}) and abnormal discretionary expenses (RM_{DISEXP}) to proxy for levels of real earning management. Managers sometime overproduce to spread the fixed cost among more units to manually increase earnings, which leads to extraordinary higher level of production costs. To measure RM_{PROD}, Roychowdhury estimates the normal production costs from the following industry-year regression:

$$\frac{PROD_t}{A_{t-1}} = \alpha_0 + \frac{\alpha_1}{A_{t-1}} + \beta_1 \frac{S_t}{A_{t-1}} + \beta_2 \frac{\Delta S_t}{A_{t-1}} + \beta_3 \frac{\Delta S_{t-1}}{A_{t-1}} + \varepsilon_t$$

The residual term ε_t is used as the measure for discretionary production costs RM_{PROD}. A Higher magnitude of RM_{PROD} refers to a higher level of real earnings management the firm has engaged. Positive RM_{PROD} means earnings boost-up manipulation while negative numbers means the opposite.

Similar to production costs, normal discretionary expenses are estimated using the following regression for every industry and year:

$$\frac{DISEXP_t}{A_{t-1}} = \alpha_0 + \frac{\alpha_1}{A_{t-1}} + \beta \frac{S_{t-1}}{A_{t-1}} + \varepsilon_t$$

The residual is the abnormal discretionary expense for each firm each year. Contrary to RM_{PROD}, a negative number of residual refers to earnings boost-up manipulation. Since in this paper, the direction of the manipulation is essential, so I follow the previous literature and multiply the residuals by -1 (denoted as RM_{DISEXP}) such that higher values indicate higher amounts of discretionary expenditures cut by firms to boost earnings. We then aggregate the two real activities manipulation measures into one proxy, RM, by taking their sum.[4]he reason why the residual measures for real earnings management do not have zero mean is that we generated the residuals using COMPUSTAT full sample before merging with CRSP and and Incentive Lab data.

$$RM = RM_{PROD} + RM_{DISEXP}$$

4.4 Horizon Misalignment

We use double-sorting approach to define the misalignment between CEO pay duration and investors investment horizon. Specifically, we first sort the sample based on investment horizon measure $InvestorHRZ$ and generate terciles which stands for the short/medium/long investment

[4]T

horizon groups of observations. Then within each short/medium/long investment horizon group, we sort the CEO pay duration $PayDuration$ into terciles which stands for short/medium/long pay duration of CEOs. We generate the indicator variable $D_Misalign$ which equals to one if $PayDuration$ is in a shorter tercile than $InvestorHRZ$, equals to zero if the horizons are in the tercile, and equals to negative one if $PayDuration$ is in a longer tercile than $InvestorHRZ$. Tables 3 presents the frequency of the observations falls into each category and shows the construction of the misalignment variable.

[*Insert Table 3 Here*]

Appendix A summarizes the definitions of the main variables use in our analysis, e.g. including the categories of incentive horizon of top managers, investment horizon of investors, horizon misalignment level, market reaction, real earnings management and future performances, and the details of their calculations.

5 Empirical Results

This section presents the results of our empirical tests on relating CEO pay-duration, investment horizon, and real earnings management.

5.1 Optimal contracting

We first examine the relationship between the shareholders' investment horizon and the future pay duration of CEOs. A positive relationship between the investors' investment horizon and future pay duration of the executives after controlling for industry fixed effect and firm performance is consistent with the optimal contracting view and indicates that selling incentives of controlling shareholders influence explicit horizon incentives for managers Cadman and Sunder (2014).

[*Insert Table 4 Here*]

Table 4 presents the regression results for two models. Model 1 presents the univariate results and Model 2 presents the multivariate results. For the main variable of interest, InvestorHRZ, our result show that *InvestorHRZ* and future year's *PayDuration* have a significant positive relationship. We control for firm fixed effect to eliminate the effects of omitted firm specific time-invariant variables. The result is consistent with the prediction of optimal contracting theory, i.e. short-term shareholders will induce a short-term focus in managerial pay in order to increase the speculative component in the current stock price. The coefficient estimates for $InvestorHRZ$ is also economically significant.

Our result suggests that when the shareholders are short-term oriented, the compensation scheme works as a tool to align the managers' incentive with the shareholders' and creates an *explict* incentive for managers to engage in myopic behavior as suggested by Bolton et al. (2006) rather than a tool to mitigate the short-term incentives induced by a transient investor base as suggested by Dikolli et al. (2009).

The multivariate results presented in Table 4, are consistent with Gopalan (2014), with respect to both the signs and magnitude of coefficients, for all the control variables that were identified to be related with the pay duration of CEOs. Specifically, the pay duration for executives is higher for firms with larger size ($SIZE$), higher growth opportunity (MTB), higher stock return ($Return$) and lower standard deviation of return ($Volatility$).

5.2 Misalignment, Real Earnings Management & Future Performance

To test whether horizon misalignment is associated with real earnings management, controlling for other variables that explain real earnings management, we estimate the following regression:

$$\begin{aligned} RM_t = \; & \beta_0 + \beta_1 D\_Misalign_t + \beta_2 PIH_t + \beta_3 SIZE_t + \\ & \beta_4 MtB_t + \beta_5 MKTshare_t + \beta_6 Zscore_t + \varepsilon_t \end{aligned}$$

Table 5 shows the estimation result for three subsample of firms based on whether $D_M isalign_t$ is equal to minus one, zero, or one. When $D_M isalign_t$ is equal to 1, $PayDuration$ is shorter than $InvestorHRZ$ and the firm will have higher level of real earnings management boosting up current earnings. This is consistent with the conjecture that when the CEO has a shorter horizon than investors, the firm's investment policy is myopic and serves to maximize the CEO's shorter-term interests.

[*Insert Table 5 Here*]

Gunny (2010) documents a negative relationship between real earnings management and subsequent operating performance measured by industry-adjusted return on asset. Gunny (2010) argues that a negative association between future operating performance of firms and RM is consistent with managers opportunistically using operational discretion to influence the output of the accounting system for managerial rent extraction and a positive association is consistent with managers using operational discretion to just meet benchmarks in an effort to: (a) attain benefits that allow the firm to perform better in the future or (b) signal future firm value. Following Gunny (2010), we further test whether the impact of real earnings management differs for firms with misalignment and firms with no misalignment. Specifically, we examine the impact of RM on future industry-adjusted ROA for subsample where $PayDuration$ is in shorter/longer/same tercile as $InvestorHRZ$, i.e. based on the value of $D_Misalign$. We run the following regression:

$$
\begin{aligned}
AdjROA/CFO_{t+1} \quad = \quad & \beta_0 + \beta_1 RM_t + \beta_2 PIH_t + \beta_3 SIZE_t + \\
& \beta_4 MtB_t + \beta_5 MKTshare_t + \beta_6 Zscore_t + \epsilon_t
\end{aligned}
$$

Regression results are shown in Table 6. We find that the negative relationship between future industry-adjusted ROA and RM only exist in the subsample with horizon mislignment between CEO pay duration and investor investment horizon. When there is no such misalignement, real earnings management is actually optimal and is a result of efficient contracting rather than opportunistic behavior.

[*Insert Table 6 Here*]

6 Conclusion

In this paper, we argue that heterogeneity in investor time preferences plays an important role in setting managerial compensation contracts. In the presence of both short-term and long-term investors, we show that it is not clear that giving manager's to focus on short-term firm value or long-term market value are both suboptimal. We develop the concept of *misalignment* to capture the degree of mismatch between managerial and shareholder investment horizons.

We present both a theoretical model to show that real earnings management by the manager is only suboptimal when there is a misalignment of managerial and investor horizons. Theoretically, we show that there exists a value gap between the optimal level of earnings management implemented by the manager and the degree of earnings management desired by shareholders.

We also take our model to the data. We develop a measure of misalignment based on the extreme terciles of CEO pay duration and investor horizon. We find that real earnings management is positively correlated with real earnings management and that real earnings management results in future poor performance only when CEO and investor horizons are misaligned.

Our paper thus extends our understanding of real earnings management and the impact of distortions in firms' investment policy. Prior work, focusing only on the impact of managerial compensation contracts on real earnings management has concluded that real earnings management results in a loss of firm performance. Our results, to the contrary, indicate that the optimal investment strategy may require some degree of real earnings management. When managerial horizon and shareholder horizon are aligned, real earnings management can be optimal and leads to no loss in future firm performance.

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Appendix A - Variable Definition

Definition	Measurements
$PayDuration$ (Executive pay duration in years)	Weighted duration of salary, bonus, cash award, restricted stock and option grants
$InvestorHRZ$ (Institutional shareholders' investment horizon in years)	1 / Weighted average Churn Rates of the institutions holding
$D\_Misalign$	=1 if tercile of $PayDuration < InvestorHRZ$, =0 if tercile of $PayDuration = InvestorHRZ$, =-1 if tercile of $PayDuration > InvestorHRZ$
RM_{PROD} (Real earnings boost-up through overproduction)	residual from $\frac{PROD_t}{A_{t-1}} = \alpha_0 + \frac{\alpha_1}{A_{t-1}} + \beta_1 \frac{S_t}{A_{t-1}} + \beta_2 \frac{\Delta S_t}{A_{t-1}} + \beta_3 \frac{\Delta S_{t-1}}{A_{t-1}} + \varepsilon_t$
RM_{DISEXP} (Real earnings boost-up through discretionary expense)	residual from $\frac{DISEXP_t}{A_{t-1}} = \alpha_0 + \frac{\alpha_1}{A_{t-1}} + \beta \frac{S_{t-1}}{A_{t-1}} + \varepsilon_t$
RM (Real earnings boost-up)	$RM_{PROD} - RM_{DISEXP}$
$AdjROA$	Firm specific ROA - the median ROA for the same year and industry (two-digit SIC)
$AdjCFO$	Firm specific CFO - the median CFO for the same year and industry (two-digit SIC)
Control Variables	
PIH	Total institutional owenership / Total shares outstanding
$Size$	natural logarithm of total asset
MtB	Market value of equity divided by Book value
ROA	Income before extraordinary items divided by lagged totol asset
$LTasset$	Book value of property, plant, and equity / total assets
RD_AT	R&D / book value of total assets. Missing values of R&D coded zero
$Volatility$	Standard error of daily return over one year
$Return$	Cumulated daily return over one year

Figure 1 Annual Median of CEO $PayDuration$ and $InvestorHRZ$

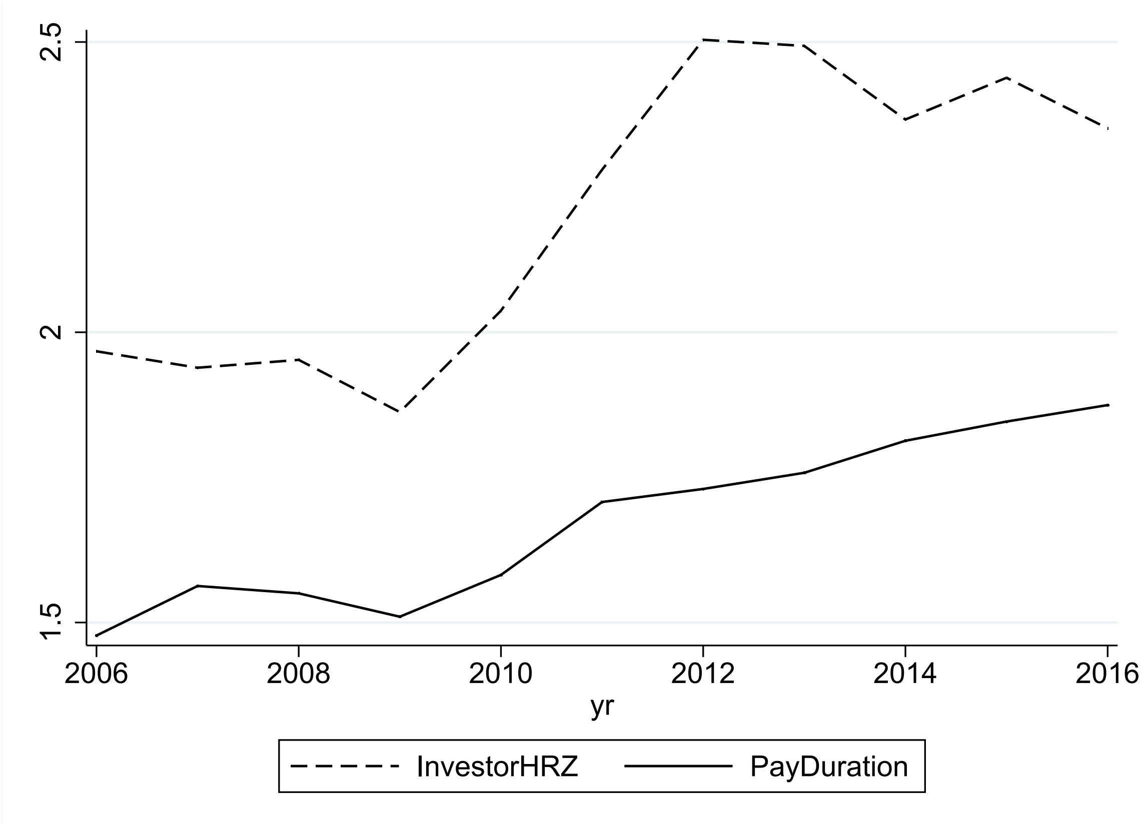

Figure 2 Industry Median of CEO $PayDuration$ **and** $InvestorHRZ$

Table 1: Distributions of Stock, Option Grants, and Cash Awards

This table presents the distributions of restricted stock, option grants and cash awards in our sample covered by Incentive Lab for the period 2006 to 2017.

Stock Grants		
	Freq.	Percent
Time-based vesting	58,050	49.71%
Performance-based vesting	3,186	2.73%
Performance-contingent with time-based vesting	54,802	46.93%
Other grants	733	0.63%
Total restricted stock grants	116,771	
Option Grants		
Time-based vesting	49,079	94.18%
Performance-based vesting	901	1.73%
Performance-contingent with time-based vesting	1,908	3.66%
Other grants	226	0.43%
Total option grants	52,114	
Short-term Cash Awards		
Time-based vesting	154	0.21%
Performance-based vesting	1,588	2.18%
Performance-contingent with time-based vesting	71,082	97.46%
Other grants	108	0.15%
Total short-term cash awards	72,932	
Long-term Cash Awards		
Time-based vesting	104	1.53%
Performance-based vesting	147	2.17%
Performance-contingent with time-based vesting	6,475	95.45%
Other grants	58	0.85%
Total long-term cash awards	6,784	

Table 2: Summary Statistics

This table presents the summary statistics for firms in our sample. All variables are defined in Appendix A.

Variables	Obs	Mean	Std. Dev.	25%	Median	75%
Pay Duration and Investor Horizon						
PayDuration	5406	1.638	0.794	1.235	1.717	2.051
InvestorHRZ	5406	2.160	0.530	1.785	2.102	2.481
Firm Characteristics						
PIH	5406	0.787	0.215	0.713	0.834	0.921
SIZE	5406	8.239	1.349	7.400	8.195	9.047
MtB	5406	3.711	6.124	1.721	2.753	4.355
ROA	5406	0.063	0.115	0.031	0.070	0.113
LTasset	5406	0.493	0.362	0.214	0.389	0.703
RD_AT	5406	0.037	0.063	0	0.012	0.050
Volatility	5406	0.024	0.013	0.015	0.021	0.028
Return	5406	0.173	0.596	-0.101	0.122	0.348
MKTshare	5406	0.099	0.195	0.004	0.018	0.087
Zscore	5406	4.257	5.765	2.109	3.247	4.939
Real earnings management						
absRM	5406	0.278	0.262	0.088	0.199	0.392
Operating performance						
fAdjROA	5406	-0.006	0.109	-0.034	0	0.038
fAdjCFO	5406	0.003	0.089	-0.036	0	0.042

Table 3 Definition of Misalignment and Univariate Comparison

This table presents the classification of firm-years into three groups with different misalignment directions (Panel A) and compares the mean values of some firm characteristics across the three subsamples with D_Misalign=-1/0/1 (Panel B). In each SIC 2-digit industry-fiscal year, firms are first sorted into three groups based on their institutional investors' investment horizon, and then within each group, firms are further ranked into three groups based on their CEO's pay duration calculated using their new grants' vesting schedules (double-sorting approach). The terciles represent different lengths of investor horizon or pay duration of the CEOs. The observations fall into the groups on the diagonal line are firm-years with no horizon misalignment. The three groups on the upper right corners are firm-years with PayDuration longer than InvestorHRZ, while the three groups on the bottom left corners are firm-years with PayDuration shorter than InvestorHRZ. The sample period ranges from 2006 to 2017.

Panel A: Number of Observations

	Short PAY	*Mid PAY*	*Long PAY*
Short HRZ	775 (D_Misalign=0)	628 (D_Misalign=-1)	515 (D_Misalign=-1)
Mid HRZ	724 (D_Misalign=1)	597 (D_Misalign=0)	481 (D_Misalign=-1)
Long HRZ	685 (D_Misalign=1)	556 (D_Misalign=1)	445 (D_Misalign=0)

Panel B: Univariate Comparison

	D_Misalign=-1	*D_Misalign=0*	*D_Misalign=1*
RM	-0.056	-0.039	-0.033
Size	8.061	8.255	8.371
MtB	4.101	3.730	3.371
ROA	0.053	0.059	0.076

Table 4: The Relationship Between Pay Duration and Investor Horizon

This table reports the positive association between CEO pay duration and institutional investors' investment horizon. Definitions of other variables are provided in Appendix A. z-statistics are presented in parentheses. Standard errors are corrected for heteroscedasticity and are clustered at the firm level. *, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

	(1)	(2)
InvestorHRZ	0.235***	0.129***
	(5.99)	(4.15)
PIH		0.053
		(0.59)
Size		0.076**
		(2.04)
MtB		0.003*
		(1.94)
ROA		0.101
		(0.92)
LTasset		0.090
		(1.04)
RD_at		-0.324
		(-1.11)
Volatility		-4.738***
		(-5.11)
Return		0.033**
		(2.58)
constant	1.174***	0.794**
	(14.16)	(2.46)
Firm FE	No	Yes
Clustering by firm	Yes	Yes
Adj_R2	0.027	0.031
N	5,406	5,406

Table 5: Misalignment and real Earnings Management

This table reports the relationship between misalignment and real earnings management. Definitions of other variables are provided in Appendix A. *z*-statistics are presented in parentheses. Standard errors are corrected for heteroscedasticity and are clustered at the firm level. *, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

DV=RM	(1)	(2)
D_Misalign	0.012***	0.008*
	(2.66)	(1.92)
PIH		0.022
		(0.99)
Size		0.074***
		(3.94)
MtB		-0.001
		(-1.13)
ROA		-0.458***
		(-5.00)
MKTShare		-0.004
		(-0.27)
ZSCORE		-0.006*
		(-1.67)
constant	-0.043***	-0.588***
	155.70)	(-3.73)
Year FE	No	Yes
Firm FE	Yes	Yes
Clustering by Firm	Yes	Yes
Adj_R2	0.002	0.106
N	5,406	5,406

Table 6: Real earnings management, Misalignment and Future Operating Performance

This table reports the relationship between real earnings management and firms' future operating performance for three subsamples of firm-years with different directions of misalignment between the pay duration of the CEO and investors' investment horizon (D_Misalign =-1/0/1). Definitions of other variables are provided in Appendix A. z-statistics are presented in parentheses. Standard errors are corrected for heteroscedasticity and are clustered at the firm level. *, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
	DV = fAdjROA		
	D_Misalign=-1	*D_Misalign=0*	*D_Misalign=1*
RM	-0.033*	-0.014	-0.037**
	(-1.71)	(-0.95)	(-2.56)
PIH	0.027	-0.003	-0.001
	(1.34)	(-0.19)	(-0.08)
Size	-0.040***	-0.041***	-0.043***
	(-3.37)	(-4.02)	(-3.28)
MtB	0.001	0.001**	0.000
	(1.15)	(2.41)	(1.15)
ROA	0.119***	0.122***	0.102**
	(3.46)	(3.60)	(1.97)
MKTShare	-0.004	0.016**	-0.007
	(-0.48)	(2.12)	(-0.90)
ZSCORE	0.002	0.000	0.004***
	(1.57)	(0.51)	(3.19)
constant	0.263***	0.303***	0.326***
	(2.85)	(3.96)	(3.11)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Clustering by firm	Yes	Yes	Yes
Adj_R2	0.107	0.099	0.103
N	1,624	1,817	1,965