The Choice between Real and Accounting Earnings Management

Jeff Z. Chen

Department of Accountancy and Taxation
C.T. Bauer College of Business
University of Houston
Houston, TX 77004
Tel: 713-743-4887
zchen4@uh.edu

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ABSTRACT

This study develops a theoretical model and presents empirical evidence on cross-sectional variation in managers’ choice of AEM and REM. In particular, it studies how AEM and REM are jointly affected by firms’ growth prospects, managers’ market-based compensation incentives, and the cost of real earnings management. The model yields several testable hypotheses. First, when the firm’s growth prospects are good, the firm will boost current period earnings through AEM, but not REM. Second, when the sensitivity of the manager’s compensation to stock price and/or value-relevance of earnings go up, the firm will use AEM, but not REM, to inflate current period earnings. Third, when the cost of REM increases, the manager will reduce opportunistic excess investment. Meanwhile, AEM decreases in the cost of REM. Firms that barely meet or beat analysts’ forecasts are used to test the model’s predictions. The results are in general consistent with the hypotheses.
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1. Introduction

There is substantial evidence that managers engage in accounting earnings management (hereafter, AEM) and/or real earnings management (hereafter, REM) to achieve certain earnings targets (Burgstahler and Dichev 1997; Burgstahler and Eames 2006; Roychowdhury 2006; Chen et al. 2008). AEM refers to managers’ opportunistic use of the flexibility allowed under General Accepted Accounting Principles (GAAP) to change reported earnings without changing the underlying cash flows. REM refers to managers’ opportunistic timing and structuring of operating, investment and financing transactions to affect reported earnings in a particular direction; it results in sub-optimal business consequences and imposes a real cost on the firm. This study develops a theoretical model and presents empirical evidence on cross-sectional variation in managers’ choice of AEM and REM. In particular, it studies how AEM and REM are jointly affected by firms’ growth prospects, managers’ market-based compensation incentives, and the cost of real earnings management.

There is relatively little analytical investigation and some mixed empirical evidence on how managers choose between AEM and REM. On the one hand, evidence from earnings distributions suggests that managers use both AEM and REM to meet earnings targets. For example, Burgstahler and Dichev (1997) find that both cash flow from operations and changes in current accruals are managed to increase earnings, and Burgstahler and Eames (2006) document that both cash flow from operations and discretionary accruals are managed upwards to avoid reporting earnings lower than analyst forecasts. On the other hand, Zang (2007) provides large sample evidence that managers trade off using AEM and REM to achieve their objectives. Relatedly, Barton (2001) and Pincus and Rajgopal (2002) present evidence that managers use derivatives and discretionary accruals as partial substitutes for smoothing earnings. While these studies attempt to examine the link between AEM and REM by correlating these two decision variables, a more thorough and comprehensive approach to investigate managers’ choice of REM and AEM is to examine their relation to exogenous firm or manager
characteristics. This study attempts to fill that void in the earnings management literature in an effort to advance our understanding of managers’ financial reporting behavior.

Earnings management decisions critically hinge on a firm’s growth prospects, management compensation incentives, and cost of real activities manipulation. Firms in different life cycle stages have different prospects for economic growth. Graham et al. (2005) report survey evidence that managers of growing firms engage in earnings management because they expect future earnings growth to offset reversals from past earnings management decisions. They also believe that if the firm’s financial condition continues to deteriorate, even small earnings management decisions can cascade and lead to negative consequences in later periods. Starting with Healy (1985), many studies argue that managers exercise their accounting discretion to maximize their compensation (e.g., Cheng and Warfield 2005; Bergstresser and Philippon 2006). However, there is little evidence on the relation between management compensation incentives and REM, and its trade-off against AEM. Zang (2007) and Ewert and Wagenhofer (2005) argue that real and accounting manipulation are substitutes in the cost of accounting manipulation. However, compared to real activities manipulation, within-GAAP discretionary accounting choices are less costly and less resource-consuming, suggesting that the cost of real manipulation is a critical element of a manager’s decision making process.

This study first develops a parsimonious model for analyzing a manager’s earnings management decisions in a capital market setting, assuming the manager is interested in both current stock price and long-term earnings growth. The model yields several testable hypotheses. First, when the firm’s growth prospects are good, the firm will boost current period earnings through AEM, but not REM. Meanwhile, it will opportunistically increase the level of investment in order to report higher future earnings. Second, when the sensitivity of the manager’s compensation to stock price and/or market pricing of earnings goes up, the firm will use AEM, but not REM, to inflate current period earnings. The manager will opportunistically increase investment in the first period to boost future earnings and dampen the adverse effect of AEM unwinding in the second period. Third, when the cost of REM is high, the manager will reduce opportunistic excess investment. Current earnings will increase as a result of the decrease in overinvestment. While it appears that the manager is cutting investment expenditure
and inflating current period earnings to boost earnings, a phenomenon consistent with using REM, AEM decreases in the cost of REM. As the manager reduces opportunistic investment in the first period, his long-term incentive to report growing earnings may result in the use of AEM to save earnings for the future.

Testing the model’s predictions requires a setting in which the incentives to deliver short-term earnings and maximize long-term firm value dominate other confounding factors that could also impact the manager’s AEM and REM choices. I use a sample of firms that barely meet or beat annual analysts’ earnings forecasts (hereafter MBE) to test the model’s predictions. The potential to garner market rewards to MBE induces managers who are concerned about short-term stock price performance to report earnings that MBE (Lopez and Rees 2002; Bartov et al. 2002; Lin et al. 2006; Chen et al. 2008). Meanwhile, managers are also interested in the firm’s long-term financial performance. If they exhaust their ability to optimistically bias earnings to achieve short-term earnings targets, the likelihood of reporting earnings that MBE in the future will decrease (Barton and Simko 2002). Concern about future performance (or MBE in the future) may partially explain why a disproportionate number of firms report only one or two cents of earnings surprise.\footnote{Earnings management induced by managers’ incentive to garner short-term stock market rewards to MBE and their interest in smoothing earnings inter-temporally also catches regulators’ attention. For example, Arthur Levitt, then SEC chief commissioner, in his 1998 “The Numbers Game” speech, stated “Increasingly, I have become concerned that the motivation to meet Wall Street earnings expectations may be overriding common sense business practices… In the zeal to satisfy consensus earnings estimates and project a smooth earnings path, wishful thinking may be winning the day over faithful representation.” (emphasis added)} Although my model does not directly examine MBE behavior per se, it has strong empirical implications in this setting.

I identify firms that meet or just beat consensus analyst forecasts, i.e., earnings surprise greater than or equal to zero, but less than 2 cents, as suspect firms because it is more likely that these firms engage in REM and AEM to achieve their earnings targets (Roychowdhury 2006). I then perform univariate portfolio analyses and multivariate regression analyses to test the model’s predictions. In general, I find empirical evidence consistent with the hypotheses. AEM increases with a firm’s growth prospects, indicating that growth firms are more likely to use AEM to boost earnings and MBE. REM decreases with a firm’s growth prospects, suggesting that firms are less likely to use REM to MBE and more interested in the long-term effect of investment. I also find strong
evidence that AEM increases with the sensitivity of a manager’s stock-based compensation to stock price and market pricing of earnings. Matsumoto (2002) reports similar findings, except that she only focuses on AEM behavior in the MBE setting. Consistent with the prediction that firms will “save” for future earnings by investing more today, I find that REM is less likely to be used to MBE (or equivalently, opportunistic investment is more likely to increase) as the sensitivity of manager’s stock-based compensation to stock price and market pricing of earnings increase. I find support for the prediction that AEM decreases with the cost of REM. However, I do not detect a significant relation between REM and its own cost. One explanation for this weak evidence is that my proxy for REM cost is too noisy.

My study contributes to the literature in the following ways. First, Graham et al. (2005) document surprising and disturbing results that the majority of managers admit to sacrificing long-term economic value, such as cutting R&D, delaying maintenance or advertising expenditure, even giving up positive NPV projects, to hit a target or to smooth short-term earnings. Why managers seem to be more reluctant to employ within-GAAP accounting discretion to meet earnings targets when it likely is less costly than the loss in economic value resulting from real earnings management remains a puzzling question. Graham et al. conjecture that the tendency to substitute real economic actions for accounting discretion might be a consequence of higher cost of accounting fraud in the post-Enron era. My model shows that other determinants such as a firm’s growth prospects and compensation sensitivity to stock price may also affect the choice of AEM and REM. In this regard, I provide some potential explanations for the puzzle documented in Graham et al. (2005).

Next, as suggested by Fields et al. (2001), examining only one earnings management technique at a time for one purpose may not explain the overall effect of earnings management activities. In particular, if managers use AEM and REM to accomplish the same objective, examining one type of manipulation in isolation may lead to an understatement of the overall level of earnings management. If managers’ use of AEM and REM is offsetting, focusing on either type of manipulation at a time for one purpose will only provide partial evidence and perhaps result in incorrect conclusions. For example, prior studies find that managers boost earnings through discretionary
accruals when their compensation is more closely tied to stock prices. However, total earnings management may not be as prominent as researchers would expect, because managers may use real activities manipulation in the opposite direction to accomplish a conflicting earnings management goal.

Third, Matsumoto (2002) examines the effect of certain firm characteristics on the likelihood of firms to MBE. Her study focuses on cross-sectional differences in the incentives to MBE, whereas my study addresses cross-sectional variation in the means of MBE. In that regard, my study can be viewed as an extension of or a complement to Matsumoto (2002).

Fourth, by studying how managers use both real and accounting manipulations to manage earnings, my paper sheds light on the implications of whether improving corporate governance or reducing accounting flexibility in GAAP might improve overall resource allocation in the capital market. As suggested by Graham et al. (2005), managers’ preference for using real activities manipulation over less costly accrual manipulation suggests a flaw in corporate governance practices. Since most recent attention on improving corporate governance only focuses on reducing accounting manipulation, my paper suggests that it is also important to improve the effectiveness of managers’ real decisions. Relying on the corporate governance mechanism alone to restrict accounting earnings management may not necessarily lead to an improvement in resource allocation in the capital market.

The paper proceeds as follows: Section 2 presents the theoretical model and its predictions. Section 3 discusses the empirical implications of the model and selection of empirical setting. Section 4 constructs the proxies for REM and AEM. Section 5 contains main empirical results. Section 6 concludes this study.

2. Model and Research Hypotheses

As discussed earlier, recent survey evidence reported in Graham et al. (2005) indicates that managers would rather take economic actions that could have negative long-term consequences than risk attracting regulatory scrutiny by making within-GAAP
accounting choices to manage earnings.\textsuperscript{2} Eighty percent of survey participants admit that they would decrease discretionary spending on R&D, advertising and maintenance to achieve desired earnings levels; fifty-five percent indicate that they would delay starting a new project to meet an earnings target, even if such a decision sacrificed firm value. Most surveyed managers acknowledge that they face a trade-off between delivering short-run earnings and making long-run optimal decisions.

In this section, I develop a model that describes how managers choose between real and accounting earnings management in a capital market setting when they face both short-run and long-run incentives. The purpose of the model is to provide a theoretical framework for analyzing the interactions between the manager’s AEM and REM decisions and the capital market’s pricing of the firm, and to generate testable implications.

The model spans two periods and includes a risk-neutral manager of a firm that operates in a competitive risk-neutral capital market. In the first period, the manager decides how much to spend on discretionary expenditures. Then, based on realized and privately observed outcomes of his real decisions, the manager makes an AEM decision and reports potentially biased earnings. The capital market prices the firm based on the reported earnings. In the second period, the earnings management effect unwinds and the firm is liquidated. In the spirit of Ewert and Wagenhofer (2005), I assume the manager is concerned about both stock price and reported earnings growth, i.e., the manager has some interest in both the short-term and the long-term effects of earnings management.

The model has several salient features. First, it focuses on the manager’s trade-off between the short-term interest in stock price and the long-term objective of earnings growth. Second, it captures the sequentiality of REM and AEM decisions (Zang 2007; Chen et al. 2008). Third, it examines the impact of key firm characteristics on earnings management decisions. Finally, the model allows the marginal benefits of REM and AEM to differ (both in the short-run and in the long-run). This differs from prior studies which assume that the marginal benefits of REM and AEM are the same (Zang 2007), a

\textsuperscript{2} Graham et al. suggest that the accounting scandals at Enron and WorldCom’s and the subsequent certification requirements imposed by the Sarbanes-Oxley Act may have changed managers’ preferences for the mix between taking accounting versus real actions to manage earnings. Another possible explanation is that managers are simply more willing to manage earnings through real decisions than through accounting decisions (Cohen et al. 2008).
limiting assumption that suppresses the key difference between real decisions and accounting decisions.³

Manager’s real decisions

I begin with the manager first deciding how much to spend on a real decision that yields a return $K$ in the first period, and $\gamma K$ in the second period ($\gamma > 0$). The parameter $\gamma$ captures the growth prospects of the firm. A larger $\gamma$ indicates stronger growth prospects and higher return in the second period. Let $cK^2/2$ denote the firm’s expenditure on $K$, where $K$ is the manager’s private information and $c$ is an exogenous and positive constant.

REM implies that the manager departs from the first best decision only to alter earnings (Ewert and Wagenhofer, 2005). REM is inefficient and imposes real costs on the firm. If $K^{FB}$ is the first best level of discretionary expenditure and $K^*$ the manager’s actual choice, then the level of REM may be expressed as $b_R = K^{FB} - K^*$. I assume that the cost of REM is $\eta b_R^2/2$, where $\eta (\eta \geq 0)$ is an exogenous cost parameter.⁴ Strictly speaking, however, the cost of REM should be endogenous rather than imposed exogenously in the model. Nevertheless, following Ewert and Wagenhofer (2005), I explicitly model the cost of REM and assume it is incurred in the second period. One way of rationalizing this structure is to recognize that, in practice, the contracting process is not always complete and does not efficiently incorporate all relevant information (i.e., with respect to the costs of REM).⁵

The accounting system

The firm implements an accounting system that records transactions and events as a result of the manager’s real decisions. The unmanaged earnings in period 1, $x_1$ is assumed to be distributed uniformly within $[K - cK^2/2 - \epsilon, K - cK^2/2 + \epsilon]$, where $\epsilon > 0$. In

³ The following example highlights this difference. Assuming the marginal rate of return on an investment project is 10% and the manager makes a real decision to reduce this investment by $1, he saves $1 on expenditures but also suffers a loss in revenue of $0.10. The net impact is a $0.90 increase in earnings. On the other hand, a $1 increase in AEM results in a $1 increase in earnings.

⁴ Note that Ewert and Wagenhofer (2005) model these costs as a linear function of $b_R$. Since ex ante, I allow $b_R$ to be either positive or negative (i.e., over- or under-spending on discretionary expenditures), I model these costs as a quadratic function of $b_R$.

⁵ This incompleteness assumption is similar in spirit to the non-incorporation of off-balance sheet debt in debt contracting. As we know, off-balance sheet financing has mushroomed over the last two decades.
the second period, the manager does not make any real or accounting earnings management decisions. He privately observes \( x_2 \), which is uniformly distributed within
\[ \gamma K - \eta b_R^2 / 2 - \varepsilon, \gamma K - \eta b_R^2 / 2 + \varepsilon \], conditional on the level of REM, i.e., \( b_R \).

After the manager privately observes the realized earnings signal \( x_1 \) in period 1, he issues a public accounting report, \( m_1 \), about earnings. The report may deviate from the underlying \( x_1 \) because the manager can engage in AEM. Let \( b_A \) denote the level of AEM. The manager reports \( m_1 \) in the following way: \( m_1 = x_1 + b_A \). I do not include out-of-pocket costs of AEM in the model. However, accrual reversal against future earnings imposes nontrivial implicit costs to AEM. AEM unwinds in period 2 and the manager reports \( m_2 \) as: \( m_2 = x_2 - b_A \). Ex ante, it is not clear whether the cost of REM is greater than the cost of AEM.

**Market price**

Let \( P \) be the stock price of the firm at the end of the first period. Because I assume a competitive capital market, the stock price equals the market’s expected total cash flows generated by the firm, i.e.
\[ P = E[ x_1 + x_2 | m_1 ] . \]

**The manager’s utility**

The manager’s compensation typically includes both an annual bonus plan and a long-term incentive plan. Much of the analytical and empirical research focuses on accounting earnings and stock prices as key performance measures (Bushman and Smith 2001; Bushman et al. 1998, 2001; Core et al. 2003; Jensen and Murphy 1990; Kaplan

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6 According to Marquardt and Wiedman (2004), the costs of accounting earnings management can be classified into two groups: the costs of detected earnings management and the costs of undetected earnings management. Detected earnings management refers to instances where a firm’s use of earnings management becomes publicly known, which usually results in one or more of the following consequences: the release of SEC enforcement actions, earnings restatements, shareholder litigation, qualified audit opinion, or managers’ reputation loss. I do not include these costs in the model because I am mainly interested in earnings management within GAAP. Modeling violations of GAAP is beyond the scope of this study. The most obvious cost of undetected earnings management is its eventual reversal and its impact on future reported earnings, which I incorporate into the model. Other costs of undetected earnings management include constraints on future reporting flexibility, audit costs, perceived reduction in earnings quality, and increased probability of detection.

7 For simplicity, I do not include \( P_2 \) in the manager’s utility function. The key to the model is that, in \( t = 1 \), the manager has some interest in the long-term effects of earnings management, which I capture through the accounting report \( m_1 \) in his two-period utility. If the manager’s utility depends on \( P_2 \) but not on \( m_2 \), the results should be qualitatively unchanged as \( m_2 \) and \( P_2 \) are linearly dependent in equilibrium.
In this model, I assume the manager’s utility function depends on the firm’s market price (i.e., short-term incentive) and future earnings growth (i.e., long-term incentive). The manager’s interest in earnings growth is well documented in the literature (e.g. Myers et al. 2007; Barth et al. 1999; Beatty et al. 2002; Skinner and Sloan 2002; Burgstahler and Dichev 1997; Graham et al. 2005). The manager’s interest in the firm’s market price may stem from his intention to sell shares he owns or from an explicit stock-based incentive contract (e.g. Cheng and Warfield 2005; Bergstresser and Philippon 2006; Bartov and Mohanram 2004). The manager’s two-period utility function is specified as:

$$\begin{align*}
U = pP - \begin{cases} 
0 & \text{if } m_1 < m_2 \\
(m_1 - m_2) & \text{if } m_1 \geq m_2 
\end{cases} - \frac{K^2}{2}
\end{align*}$$

where \( p (p > 0) \) denotes the sensitivity of the manager’s compensation to the market price \( P \). I normalize the sensitivity of his compensation to earnings growth to be one.\(^8\) Thus, \( p \) can be interpreted as the weight the manager places on current market price relative to the weight on future earnings growth. The key to this utility function is that the manager has to trade off his interests in the short-term with the long-term effects of earnings management. On one hand, he has an incentive to manage \( m_1 \) upward in order to get a higher \( P_1 \); on the other hand, because of the reversal of AEM and the cost of REM in \( t = 2 \), he is also concerned about the penalty of earnings decrease. Or equivalently, he has some interest in saving \( m_1 \) in order to be able to report a higher \( m_2 \). I include \( K^2/2 \) to capture the manager’s disutility of making a real decision.\(^9\)

\(^8\) I assume \( p \) to be common knowledge, because information about the management compensation package is publicly available. In principle, there can be uncertainty with respect to \( p \). However, including uncertainty would only increase the complexity of the analysis without yielding additional insights. Also, see Davila and Penalva (2006) for a detailed discussion on the weights of firm performance measures in CEO compensation.

\(^9\) I do not include disutility of the manager’s accounting choice in his utility function. As indicated in footnote 19 in Graham et al. (2005), managers believe while it is preferable to manage earnings via real actions rather than accounting choices, it is also more difficult. They must understand the operations up and down the organization to effectively manage earnings via real actions. One CFO refers to earnings management via accounting actions as “laziness on the part of the CFO” because much more effort is necessary to understand all aspects of the business in order to manage earnings via real actions.
Figure 1 summarizes the sequence of events

![Figure 1]

**Figure 1**

**Sequence of Events**

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The manager makes a real decision about $K$</td>
<td>The firm liquidates</td>
</tr>
<tr>
<td>He privately observes $x_1$</td>
<td>He reports $m_2$</td>
</tr>
<tr>
<td>The manager chooses $b_A$ and reports $m_1$</td>
<td>He privately observes $x_2$</td>
</tr>
<tr>
<td>Market price $P$</td>
<td></td>
</tr>
</tbody>
</table>

**The first best accounting and real decisions**

It is useful to begin with the solution under the first best setting in which the capital market observes $x_t$ and there is no interest misalignment. In this setting, there is no incentive for the manager to engage in any form of earnings management. The manager will truthfully report earnings (i.e., $x_1 = m_1$) and make real decisions such that firm value is maximized.

The first best accounting decision is used as the benchmark for comparison with the level of AEM. In the model, AEM is purely opportunistic and only adds noise to $m_1$. Therefore, the first best accounting choice, $b_A^{FB}$, should be 0. Similarly, the first best real decision, $K^{FB}$, is the base for comparison with the level of REM. It is straightforward to show that $K^{FB}$ is given by $\frac{1 + \gamma}{1 + c}$.

**Equilibrium**

I now turn to the setting in which there is both information asymmetry and incentive misalignment. The manager selects AEM that maximizes his expected utility. **Lemma 1:** Given the realized $x_t$, common knowledge $c, p, \varepsilon, \gamma, \eta$, and the conjecture of the market price reaction to the reported earnings, $\hat{P}(m_t)$, the manager will choose the level of AEM, $b_A$, as:

\[10\]

All proofs are shown in the Appendix.
where \( \beta \) is \( d\hat{P}(m_i)/dm_i \) (i.e., the market pricing of earnings) and \( b_A^* \) denotes the optimal level of AEM.

**Lemma 2:** Given \( b_A^*(K) \), the manager’s real decision \( K \) and REM are based on common knowledge \( c, p, e, \gamma, \eta \), and the conjecture of the market price reaction to the reported earnings, \( \hat{P}(m_i) \). He will choose the real decision \( K^* \) and the REM level \( b_R^* \) as:

\[
K^* = \frac{p\beta \left(1 + \gamma + \eta(1 + \gamma)\right)}{2 + p\beta(\eta + e)} \quad \text{and} \quad b_R^* = K^{FB} - K^* = \left(1 + \gamma\right) \left(\frac{2 - p\beta}{2 + p\beta(\eta + e)}\right)
\]

REM is the deviation of the manager’s choice \( K^* \) from the first best decision \( K^{FB} \).

The capital market rationally conjectures the manager’s decisions and prices the firm accordingly. The price \( P \) equals the expected terminal value of the firm given the manager’s report and the conjectured managerial decisions. In equilibrium, the conjectured managerial decisions must equal the actual decisions; therefore, the market price can be derived as:

\[
P = \alpha + \beta m_i
\]

where \( \alpha = (1 - 2p)e \) and \( \beta = 2 \)

\( \beta \) is positive, indicating that the report \( m_i \) is relevant for pricing. More importantly, \( \beta \) is greater than 1. Notice that through the choice of \( m_i \) the manager is in essence shifting income from period 1 to period 2. In a rational equilibrium, the capital market will place a greater-than-one weight, \( \beta \), on the reported \( m_i \) to figure out \( x_i \).

**Comparative statics and research hypotheses**

From Lemma 2, it is easy to show that, in equilibrium, the manager will over- (under-) invest on \( K \), relative to \( K^{FB} \), if \( p \) is greater (less) than one. Since \( b_R^* \) is defined as the difference between the manager’s choice of \( K \) and \( K^{FB} \), its sign depends on the level of \( p \). More critically, the effects of exogenous firm characteristics, such as \( \gamma, p \) and \( \eta \), on \( b_R^* \) will be conditional upon the level of \( p \) as well.

For the purpose of this study, I focus on the range of \( 1 < p < \frac{\eta(1 + \gamma) + \gamma(1 + e)}{\eta(1 + \gamma) - \gamma(1 + e)(c + \eta)} \) in the following comparative statics analyses. The lower limit of \( p \) is one, indicating that the
manager’s stock-based incentives outweigh his earnings-based incentives (or equivalently, short-term incentives outweigh long-term incentives). Recall that under this condition, the equilibrium \( b^R \) is negative (i.e., the manager over-invests on \( K \)). I set an upper limit for \( p \), indicating that the manager’s stock-based incentives must be bounded; otherwise long-term incentives might become trivial. I focus my discussion of the comparative statics results over this range of \( p \). It has important implications for the MBE phenomenon that I investigate in the next section. I apply the model’s predictions in a setting in which firms meet or just beat annual analyst earnings forecasts. The incentive to MBE arises from managers’ short-term equity market considerations (Abarbanell and Lehavy 2003). Meanwhile, managers are also concerned about firms’ long-term financial performance. If they exhausted their ability to optimistically bias earnings to achieve short-run earnings targets, the likelihood of reporting earnings that MBE in the future would decrease (Barton and Simko 2002). The concern about future performance may partially explain why a disproportionate number of firms report only one or two cents of earnings surprise. Although my model does not directly examine the MBE behavior \textit{per se}, it is applicable to this setting.\(^{11}\)

If \( 1 < p < \frac{\eta(1+\gamma) + \gamma(1+c)}{\eta(1+\gamma) - \gamma(1+c)(c+\eta)} \), the following comparative statics can be derived.

**Result 1:**

\[
\begin{align*}
\frac{db_k}{d\gamma} &< 0 \\
\frac{db_*}{d\gamma} &> 0
\end{align*}
\] (1)

When the firm’s growth prospects are stronger, it is natural to expect an increase in the first-best choice of investment level (\( K^{FB} \)). However, it is not clear how the manager’s (optimal) choice of investment level (\( K^* \)) will change in the presence of information asymmetry and interest misalignment. My model predicts that both the first-best and the manager’s (optimal) choice of investment level will increase in the firm’s growth prospects. More importantly, as Equation (1) shows, the increase in the manager’s

\(^{11}\) Comparative statics results under the assumption that \( 0 < p < 1 \) are available upon request. A less-than-one \( p \) implies that the incentive to keep earnings growing outweighs the incentive to meet short-term earnings targets. Myers et al. (2007) document evidence on firms that report long strings of consecutive increases in earnings. They also show that managers of these firms use various earnings management tools to help their firms sustain and extend these strings.
(optimal) choice of investment level exceeds the increase in the first-best choice, which leads to a decrease in \( b_R \). It appears that, for growth firms, the high future return to the manager’s current excessive investment dominates his concern about reporting a lower level of current earnings and the cost of deviating from the first best investment level, which will manifest in the future. It implies that growth firms are less likely to use REM to boost short-term earnings. Their opportunistic investment decisions are more likely to be driven by the incentive to sustain or extend earnings growth, even though they may sacrifice current earnings.

Turning to AEM, Equation (1) shows that it increases in the firm’s growth prospects. One intuitive explanation is that, because of the firm’s improved future performance, the manager is less concerned about accrual reversal, which leads to a decrease in future reported performance. Therefore, the manager is likely to engage in more AEM today to achieve short-term goals. This is consistent with Graham et al. (2005)’s survey evidence that interviewed majority of the CFOs interviewed indicate that in a growing firm managers expect future earnings growth to offset reversals from past accounting earnings management decisions. A less obvious explanation is that current earnings are likely to decrease as a result of the manager’s decision to increase investment. To balance his short-term incentive, he will use AEM to boost earnings.

The above analyses lead to my first hypothesis:

**H1a:** Ceteris paribus, firms with high growth prospects exhibit more AEM than firms with low growth prospects.

**H1b:** Ceteris paribus, firms with high growth prospects exhibit less REM than firms with low growth prospects.

Result 2:

\[
\begin{align*}
\frac{db_r}{dp} &< 0 \\
\frac{db_A}{dp} &> 0
\end{align*}
\]
When the manager’s short-term incentives (i.e., sensitivity of compensation to stock price \( p \) and market pricing of earnings \( \beta \)) become more pronounced relative to his long-term incentives, it is reasonable to expect that the manager will engage in some form of earnings management in order to report more favorable short-term performance. Prior studies document that the use of discretionary accruals to manipulate reported earnings is more pronounced at firms whose manager’s potential compensation is more closely tied to the value of stock and option holdings (Cheng and Warfield 2005; Bergstresser and Philippon 2006). However, these studies only focus on the manager’s AEM decision. It is not clear how the manager will use REM in such a context and more importantly, how REM affects the manager’s choice of AEM. Result 2 sheds light on these issues.

In particular, Result 2 confirms that the manager will boost earnings by engaging in AEM in the current period when his short-term incentives are stronger. However, accrual reversals in the second period impose nontrivial cost on the manager, because he is still interested in earnings growth, although to a lesser degree. Result (2) establishes that the manager is likely to boost second period earnings by investing more in the current period, which leads to a decrease in \( b_R \). However, excessive investment in the first period is not without cost. First, it is possible that the first period earnings will decrease because all the investment costs are expensed upfront. Second, there is explicit cost in the second period because the manager’s investment decision deviated from the first best choice. Nevertheless, this may still result in higher earnings if the future return on the investment exceeds the cost of today’s excessive investment. In sum, when the manager’s short-term incentives become more pronounced, he is likely to boost short-term earnings through AEM, but not REM.

The above analyses lead to the following hypotheses:

**H2a:** Ceteris paribus, firms with high compensation sensitivity to stock price exhibit more AEM than firms with low compensation sensitivity to stock price.
**H2b:** Ceteris paribus, firms with high compensation sensitivity to stock price exhibit less REM than firms with low compensation sensitivity to stock price.

**H3a:** Ceteris paribus, firms with high market pricing of earnings exhibit more AEM than firms with low market pricing of earnings.

**H3b:** Ceteris paribus, firms with high market pricing of earnings exhibit less REM than firms with low market pricing of earnings.

Result 3:

\[
\begin{align*}
\frac{db_A}{d\eta} &> 0 \\
\frac{db_R}{d\eta} &< 0
\end{align*}
\]  

(4)

When the cost of REM increases, it is natural for the manager to reduce the deviation of his choice of investment level from the first best choice. Result 3 confirms this intuition. \(b_R\) increases with \(\eta\), suggesting that as the cost of REM increases, the manager will shrink the level of excessive investment in the first period. In other words, the manager will reduce the level of over-investment in the first period to save the cost of REM incurred in the second period. However, the manager will also forgo some future return to the (excessive) investment. In the short run, cutting investment may result in higher earnings.\(^{12}\)

Result 3 also establishes that \(b_A\) decreases in \(\eta\). There are two explanations. First, as the manager cuts some excessive investment in the first period due to his concern about the second period cost of REM, future earnings will decrease. So the manager is likely to save some earnings from the first period to boost next period’s earnings by reducing \(b_A\). Second, cutting investment in the first period will likely increase short-term earnings. Therefore, the manager is less concerned about short-term performance and it may be in his best interest to reduce AEM to save for tomorrow.

Given the above reasoning, I propose the following hypotheses:

**H4a:** Ceteris paribus, firms with large cost of REM exhibit less AEM than firms with low cost of REM.

\(^{12}\) Notice that if \(0 < p < 1\), i.e., the manager is more interested in keeping earnings growing than delivering desired earnings in the current period, the prediction will go in the opposite direction such that the manager will increase investment on \(K\) or reduce the level of insufficient investment as the cost of REM increases.
**H4b:** Ceteris paribus, firms with large cost of REM exhibit more REM than firms with low cost of REM.

Zang (2007) argues that a substitutive relation between REM and AEM is manifest by a positive relation between the level of one earnings management technique and the cost of the other because managers trade off the two until the marginal costs are equal. My model yields an opposite prediction for the relation between AEM and the cost of REM. The key, which causes the difference in the predictions, is that I do not assume or restrict the marginal benefits of AEM and REM to be the same. If the marginal benefits of AEM and REM are different, it is not clear, ex ante, whether one will be a substitute for the other with respect to the other’s cost.

3. **Empirical Setting and Selection of Suspect Firms**

The analytical model is parsimonious but general enough to apply to a variety of settings in which managers have to trade off between the short-term need to deliver desired earnings and the long-term objective of making value maximizing investment decisions. However, there are some stylized assumptions that may cause potential concerns about its empirical implications. For example, the model assumes a two-period setting, in which the manager only makes AEM and REM decisions in the first (but not the second) period and the effects of AEM and REM on the firm only occur in the second (but not the first) period. In reality, firms, for various reasons, engage in AEM and REM on a continuous basis. Their choices of AEM and REM are also likely to be influenced by their past accounting and real decisions. Given the model’s stylized assumptions, tests of its predictions in a general empirical setting will likely lack power. Therefore, it is critical to find an empirical setting in which the incentives to deliver short-term earnings and maximize long-term firm value are sufficiently pronounced that they dominate other confounding factors that could also impact AEM and REM behavior.

I choose to focus on firms that barely meet or beat annual analysts’ earnings forecasts. Research indicates an increasing trend of firms reporting earnings that meet or beat analysts’ earnings expectations over the last twenty years (Bartov et al. 2002; Lopez and Rees 2002; Matsumoto 2002). Strikingly, the distributions of annual earnings surprises contain an unusually high frequency of zero and small positive surprises.
(Burgstahler and Eames 2006). The incentive of firms to MBE arises from the market’s rewards to such behavior (Kasznik and McNichols 2002; Bartov et al. 2002; Lopez and Rees 2002; Brown and Caylor 2005; Rees and Sivaramakrishnan 2007). Studies show that despite a market discount for the use of earnings management, there is still some residual equity premium to MBE (see, for example, Bartov et al. 2002; Lin et al. 2006; Chen et al. 2008). Interestingly, it seems that the market does not discriminate between the use of AEM and REM to MBE, even though REM has arguably more pronounced long-term cash flow consequences than AEM (Chen et al. 2008). The potential to garner such market rewards induces managers who are concerned about short-term stock price performance to report earnings that MBE.

My analytical model has strong implications for managers’ choices between AEM and REM in the MBE setting. Essentially, the incentive to MBE arises from managers’ short-term equity market considerations (Abarbanell and Lehavy 2003). Meanwhile, managers are also concerned about the firm’s long-term financial performance. If they exhaust their ability to optimistically bias earnings to achieve short-run earnings targets, the likelihood of reporting earnings that MBE in the future will decrease (Barton and Simko 2002).

Figure 1 groups firm-years into intervals based on earnings surprise over the range -0.15 to 0.15, where earnings surprise is defined as the difference between the reported earnings and the most recent consensus analyst forecast. Each interval is of width 0.01. The histogram in Figure 1 is similar to that documented by prior studies, with an obvious shift in the frequency of firm-years going from the left of zero to the right. It is likely that firm-years in the interval just right of zero manage their earnings to report earnings surprise just above zero (Roychowdhury 2006; Burgstahler and Eames 2006). Chen et al. (2008) find that firms engaging in earnings management to meet forecasts are rewarded in that they avoid the significant penalty associated with missing forecasts. Their study mostly indicates that the market does not fully discriminate between REM and AEM, which creates incentives for managers to engage in earnings management to meet or beat earnings benchmarks.

(Insert Figure 1 here)
I concentrate on firm-years in the two intervals to the immediate right of zero. These firm-years have earnings surprise less than two cents. Focusing on these firm-years has two advantages. First, firm-years in these two intervals are more likely than others to be subject to earnings management to meet or beat the analyst forecast. This increases the power of the tests to detect AEM and REM and examine cross-sectional variation in firms’ earnings management behavior. Second, and more critically, the analytical model is developed under the assumption that managers are concerned about both current stock price and long-term earnings growth. Comparative statics are derived given that managers place relatively larger weight on current stock price than long-term earnings growth. Firm-years with earnings surprise in the zero to two cents range fit the model’s setting properly in two respects. On the one hand, these firms obviously have strong incentives to garner the market’s reward to meeting or beating the analyst forecast. On the other hand, they are concerned about, probably to a lesser extent, future earnings growth in that they do not exhaust all their earnings management tools in the current period. They report less than two cents earnings surprise with the hope that their earnings management, if any, will not severely reduce their capability of keeping earnings growing in the future (or of continuing to meet future earnings targets).

There are two caveats concerning the focus on these suspect firm-years. First, to the extent that these firm-years are systematically different from firm-years in other intervals, it may restrict the inferences from generalizing to the population. Second, it is possible that firms that meet or just beat analysts’ forecasts are not the only ones that are interested in achieving this benchmark through AEM and REM. Focusing only on firm-years in this small range to the right of zero earnings surprise could potentially leave out certain firms that have engaged in AEM and/or REM but failed to achieve the target. In that regard, focusing on these suspect firms may restrict the power of my test. Nevertheless, I do not include other intervals in the suspect category, as these intervals are likely to contain a higher proportion of firm-years that did not manipulate earnings at all (Roychowdhury 2006).
4. Variable Measurement

R&D management

I focus on managers’ real manipulation of R&D expenditures for two reasons: (1) recent survey evidence reported by Graham et al. (2005) indicates that most managers would decrease discretionary spending on R&D to meet short-term earnings targets; and (2) my analytical model is intended to describe managers’ investment decisions which have both short-run and long-run impacts on earnings. When managers make R&D decisions, they face a trade-off between the short-term need to deliver earnings and the long-term objective of making value-maximizing investment decisions.\(^\text{13}\)

Following Berger (1993), Gunny (2005), Zang (2007) and Wang and D’Souza (2006), I estimate the normal level of R&D expenditures as:

\[
\frac{RD}{A_t - 1} = \alpha_0 + \alpha_1 \frac{RD_{t-1}}{A_t - 1} + \alpha_2 \frac{Funds}{A_t - 1} + \alpha_3 \frac{TobinsQ}{A_t - 1} + \alpha_4 \frac{CapitalExp}{A_t - 1} + \epsilon \tag{5}
\]

where,

- \(RD = \) R&D expense = Compustat Data 46;
- \(A = \) Total assets = Data6;
- \(Funds = \) Internal funds = IBEI + R&D + Depreciation = Data18 + Data46 + Data14
- \(TobinsQ = \) (MVE + Book value of preferred stock + long-term debt + short-term debt) / Total assets = (Data199 * Data25 + Data130 + Data9 + Data34) / Data6;
- \(CapitalExp = \) Capital expenditures = data128.

The regression is estimated for each industry and year. I measure the abnormal level of R&D expenditures \((AB\_RD)\) as \(-1\) multiplied by the residual from Eq. (5). Thus, higher values of \(AB\_RD\) indicate a higher probability that the manager cuts R&D expenditure to boost reported earnings.

Lagged \(RD\) proxies for the firm’s innovation opportunity; \(\alpha_1\) is predicted to be positive. \(Funds\) is included because expanding R&D investment is cheaper for firms with

\(^{\text{13}}\) Managers can also manipulate operating activities such as price discounts to temporarily increase sales, overproduce to report lower cost of goods sold, and reduce discretionary expenditure to improve reported margins (Roychowdhury 2006). It is not clear whether the analytical model developed in this paper has any implication for manipulation of operating activities. Gunny (2005) and Zang (2007) investigate another type of manipulation of investment activities – asset sales. Although theoretically it might fit the analytical model, Zang (2007) shows that current empirical technologies do not capture real manipulation. Graham et al. (2006) also report little evidence that managers use timing of asset sales to manage earnings. Consistent with Zang (2007), I do not include manipulation of asset sales in the empirical analyses.
more internal funds since external funds are more expensive for R&D projects than internal funds; $\alpha_2$ is expected to be positive. $TobinsQ$ measures the firm’s growth potential, which is predicted to be positively correlated with R&D investment. 

$CapitalExp$ represents the firm’s investing activities in the current year; $\alpha_4$ is predicted to be positive.

**Accrual management**

Accrual manipulation (i.e., abnormal accruals) with no direct cash flow consequences is the most pervasive means of accounting earnings management. Following Dechow, Richardson and Tuna (2003), I estimate the normal level of total accruals as:

$$
\frac{TAC}{A_{i,t}} = \beta_0 + \beta_1 \frac{1}{A_{i,t-1}} + \beta_2 \frac{(1+k)\Delta S - \Delta REC}{A_{i,t-1}} + \beta_3 \frac{PPE}{A_{i,t-1}} + \beta_4 \frac{TAC_{i,t-1}}{S_{i,t}} + \epsilon,
$$

where,

- $TAC = \text{Total accruals} = \text{Data123} - \text{Data308}$;
- $\Delta S = \text{Change in sales} = \Delta \text{Data12}$;
- $\Delta REC = \text{Change in accounts receivable} = \Delta \text{Data2}$;
- $k = \text{Estimated slope coefficient from a regression of } \Delta REC \text{ on } \Delta S \text{ for each industry-year (i.e., } \Delta REC = a + k \Delta S + \epsilon)$,
- $PPE = \text{Gross amount of property, plant and equipment} = \text{Data7}$

I measure abnormal accruals ($AB\_ACC$) as the residual from Eq. (6), which is estimated for each industry and year. A higher value of $AB\_ACC$ implies that managers are more likely to engage in income-increasing AEM.

Dechow et al., (2003) improve the modified Jones model by including additional variables that, at an intuitive level, are expected to vary with normal accruals. $k$ captures the expected change in accounts receivable for a given change in sales. The modified Jones model classifies this expected change in accounts receivable as an abnormal accrual, whereas Eq. (6) classifies it as a normal accrual. Accruals by definition reverse through time. Therefore, some proportion of accruals is predictable based on previous accruals. Eq. (6) includes the lagged value of total accruals to capture the predictable (or reversal) component. Accruals are also forward looking and vary with a firm’s growth.
prospects (see also McNichols 2000). Dechow et al. (2003) include future sales growth to identify this aspect of accruals.

**Classification of firm life cycle stages**

A firm’s life cycle stage or growth prospects affects managers’ real and accounting decisions. Prior research shows a firm’s fundamental economic operating decisions change over the stages of its life cycle (e.g., Spence 1977, 1979; Wernerfelt 1985). Zhang (2007) argues that accrual properties vary with changes in a firm’s growth prospects. Liu (2006) demonstrates that there is a predictable relation between a firm’s life cycle and widely used abnormal accruals models. My model also reveals that a firm’s life cycle affects both AEM and REM decisions, consistent with Graham et al. (2005)’s survey evidence which indicates that managers’ AEM and REM decisions critically hinge on a firm’s growth prospects. I follow the procedures of Anthony and Ramesh (1992), Kanagaretnam et al. (2007) and Liu (2006) to classify firm-years into three life-cycle stages: growth, maturity and decline.

I jointly use five variables to classify firms into different life cycle stages. The first variable is net investment (NetInv), defined as capital expenditure (Compustat data #128) plus R&D expenditure (#46) minus depreciation and amortization (#14), scaled by beginning total assets (#6). Depreciation and amortization are excluded because I want to capture new investment in excess of replacement or deterioration of current investment. Firms in the growth stage are more likely to invest more financial resources in long-term assets.

The second variable that I use to identify a firm’s life cycle stage is growth in sales (ΔSales; #12). Spence (1979) suggests that a firm’s growth phase can be characterized by “rapid and accelerating growth in sales.” Anthony and Ramesh (1992) argue that a firm’s growth in sales is likely to be higher for growing firms and lower for declining firms. I use ΔSales to capture overall expansion of a firm’s business operation. Firms in the growth stage are more likely to have larger ΔSales.

My third variable used to classify firms into life cycles is retained earnings to total equity (RE/EQT; #36 / #60) (DeAngelo et al. 2006). It measures the extent to which the firm is self-financing or reliant on external capital. Firms with low retained earnings to
total equity tend to be in the capital infusion stage, whereas firms with high retained earnings to total equity tend to be more mature with ample cumulative profits that make them largely self-financing. I multiply $RE/EQT$ by -1 so that larger $RE/EQT$ indicates a higher probability that a firm is in the growth stage.

The fourth variable I use is the number of years the firm has been in existence, i.e., a firm’s age ($Age$). Anthony and Ramesh (1992) consider young firms to be “growing” firms and older ones to be “stagnant”. Firm age is not subject to manipulation, thus providing an unbiased measure of the firm’s operational progress and development over time. I multiply $Age$ by -1 so that larger $Age$ indicates a higher probability that a firm is in the growth stage.

The last variable to identify a firm’s life cycle stage is a firm’s cash flow from financing intensity, or $CFF$. Liu (2006) argues that a young firm is likely to obtain more cash from financing activities, rather than operating or investing activities, whereas a mature firm, with lower needs for cash from financing activities, will be more likely to liquidate its assets in order to return cash to its shareholders and/or creditors. I use the difference between cash flow from financing activities (#311) and cash flow from operating activities (#308), scaled by beginning total assets, to measure $CFF$. Growth firms are more likely to have larger $CFF$.

In each industry-year, I rank firms into ten equal-sized groups (from 0 to 9) along each of these five dimensions. I then combine ranks for all five dimensions into a composite variable $LifeCycle$ ranging from 0 to 45. Growth firms are more likely to have a larger value of $LifeCycle$. Firm-years with ranks from 0-14, 15-30, and 31-45 are classified as being in the Decline, Maturity and Growth life cycle stages, respectively. To use $LifeCycle$ as a variable in my multiple regression analysis, I divide it by 45 to create a scaled variable $LifeCycle_S$ ranging from 0 to 1.

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14 Following Liu (2006), I measure firm age as the number of years the firm first appears on either Compustat or CRSP, whichever is larger.
Market based incentives

Following Bergstresser and Philippon (2006), I measure a CEO’s equity-based compensation sensitivity to stock price by the dollar change in the value of his stock and options holdings that would result from a one percentage point increase in the stock price:

\[ ONEPCT_{i,t} = 0.01 \times PRICE_{i,t} \times (SHARES_{i,t} + OPTIONS_{i,t}) \]

where \( PRICE \) is the company share price, \( SHARES \) is the number of shares held by the CEO, and \( OPTIONS \) is the number of options held by the CEO. \( ONEPCT \) is then normalized in a way that captures the share of a hypothetical CEO’s total compensation that would result from a one percentage point increase in the value of the equity of his company as follows:

\[ INC\_RATIO_{i,t} = \frac{ONEPCT_{i,t}}{(ONEPCT_{i,t} + SALARY_{i,t} + BONUS_{i,t})} \]

The second market-based incentive of interest is the market pricing of reported earnings. Matsumoto (2002) finds that, conditional on meeting or exceeding analysts’ expectations, firms with high market pricing of earnings are more likely to exhibit positive abnormal accruals. I use two measures to capture the market pricing of earnings. The first measure is the beginning price to earnings ratio (\( LAGPE \)). The second measure, following Francis et al. (2004), is based on the explained variability from the following regression of returns on the level and change in earnings:

\[ RET_{j,t} = \tau_{0,j} + \tau_{1,j} EARN_{j,t} + \tau_{2,j} \Delta EARN_{j,t} + \zeta_{j,t} \]

where:
\( RET_{j,t} \) = firm j’s 15-month return ending three months after the end of fiscal year \( t \);
\( EARN_{j,t} \) = firm j’s income before extraordinary items in year \( t \) (\( NIBE \)), scaled by market value at the end of year \( t-1 \);
\( \Delta EARN_{j,t} \) = change in firm j’s \( NIBE \) in year \( t \), scaled by market value at the end of year \( t-1 \).

I estimate this equation for each firm over a rolling ten-year window. Larger adjusted \( R^2 \) indicates more value relevant earnings (\( RELEVANCE \)).

Cost of REM

I identify several proxies for the cost of REM from the prior literature and use these proxies to compute a cost score for each firm.
The first proxy is the firm’s market share \((MSHARE_t)\), measured as the percentage of the firm’s sales to the total sales of its industry. This measure is employed to capture the firm’s leadership in the industry. Within an industry, different firms likely face different levels of competition. Therefore, when firms deviate from their first-best real decisions, market leaders may perceive these suboptimal decisions as less costly than market followers (Zang 2007). In other words, market leaders can afford relatively more REM. I multiply \(MSHARE\) by \(-1\) so that larger \(MSHARE\) implies higher cost of REM.

For firms in financial distress, the marginal cost of deviating from the optimal business strategy is likely to be high (Zang 2007). I use a modified Altman Z-score to proxy for a firm’s financial health:

\[
ZSCORE_t = 3.3 \frac{NI_t}{Assets_t} + 1.0 \frac{Sales_t}{Assets_t} + 1.4 \frac{Retained Earnings_t}{Assets_t} + 1.2 \frac{Working\ Capital_t}{Assets_t} + 0.6 \frac{Stock\ Price \times \ \text{Shares\ Outstanding}_t}{Assets_t}
\]

I multiply \(ZSCORE\) by \(-1\) so that larger \(ZSCORE\) implies higher cost of REM.

Firms with more lines of business are more complex and diverse. Business complexity increases the costs that firms have to bear if they deviate from optimal business decisions. Following Bhushan (1989), I use number of lines of business as a proxy for the operational complexity of firms \((COMX)\). A larger value of \(COMX\) implies higher costs of REM.

To calculate a composite cost score \((RM\_COST)\), I first normalize \(MSHARE\), \(ZSCORE\), and \(COMX\) within each industry-year and then sum them up.

5. Empirical Results

Sample size

I start with the population of the COMPUSTAT database from 1988 to 2006, when statement of cash flow data are available. Financial institutions (SIC 6000-6999) and regulated industries (SIC 4400-5000) are excluded. The sample size reduces to 34,288 firm-year observations after firms with insufficient data to calculate \(AB\_ACC\) and \(AB\_RD\) are deleted. Of this sample, 6,240 firm-years are identified as suspect firm-years (i.e., with earnings surprise greater than or equal to zero but less than 2 cents). There are 6,028 firm-years with sufficient data to calculate \(LifeCycle\) and conduct the test of H1,
2,737 firm-years with sufficient compensation data to calculate \( INC\_RATIO \) and conduct the test of H2, and 5,989 firm-years with sufficient data to calculate \( RM\_COST \) and conduct the analysis of H4. Note that I do not require all firms to have all independent variables in the univariate tests. Therefore, the number of observations varies across the univariate tests. The final sample used in the regression analysis has 1,834 firm-years.

**Estimation models and summary statistics for abnormal R&D and accruals**

Table 1 reports the regression coefficients for normal levels of R&D expenditures and total accruals. I estimate these two models using the entire Compustat sample of 47,682 and 66,195 firm-years, respectively. The table reports the mean, median, Q1 and Q3 coefficients across industry-years and t-statistics calculated using the standard error of the mean across industry-years.

(Insert Table 1 here)

Panel A reports the estimation results for the normal level of R&D expenditures. All the mean coefficients, except \( FUNDS \) are significant and have the expected sign. Average \( R^2 \) is 79.56%, indicating substantial explanatory power for this model. The estimation results are consistent with Zang (2007). Panel B reports the estimation results for the normal level of total accruals. All the mean coefficients are significant and consistent with expectations. The average \( R^2 \) of 28.68% suggests reasonable explanatory power for Dechow et al. (2003)’s model.

Panel C presents summary statistics for abnormal R&D and abnormal accruals. Mean and median abnormal accruals are 0.43% and 1.04% of beginning total assets, respectively. In comparison, mean and median abnormal R&D expenditures are 0.16% and 0.15% of beginning total assets, respectively. Abnormal accruals capture a firm’s aggregate AEM behavior, whereas abnormal R&D measures only one of many REM activities that a firm can engage in. This could explain why there is a significant difference between the levels of these two measures.

Zang (2007) and Gunny (2005) examine the consequence of REM and find negative performance-matched operating performance for firms that they identify as real
manipulators for years subsequent to the REM behavior. As a validity test of my measure of abnormal R&D expenditures, I examine its correlation with changes in ROA and CFO for the subsequent two years. The results are reported in Panel D. I find significantly negative correlations between abnormal R&D expenditures and subsequent changes in ROA and CFO, indicating high levels of R&D manipulation are leading indicators of adverse future performance. This result lends a degree of confidence for the measure of abnormal R&D expenditures.

Univariate tests

Panel A of Table 2 reports descriptive statistics of firms at different life cycle stages. I identify 1,365, 4,211 and 452 firm-years in decline, maturity and growth stages, respectively. Compared to declining firms, growth firms have more net investment (0.193 vs. 0.057), exhibit stronger growth in sales (0.748 vs. 0.073), and rely more on external financing (1.474 vs. -0.787). In addition, growth firms have on average 5.358 years in existence in Compustat or CRSP, whereas declining firms have on average 26.933 years of data available in Compustat or CRSP. Growth firms have more cash flows from financing activities than cash flows from operation activities (0.028), indicating they are likely to obtain more cash from financing activities rather than operating or investing activities. In contrast, declining firms report more cash flows from operating activities than cash flows from financing activities (-0.285). Clearly, growth firms are systematically different from declining firms along all these five dimensions. Turning to the differences in earnings management behavior between growth and declining firms, I find that growth firms have mean and median $AB_{ACC}$ of 0.042 and 0.039, respectively, compared to declining firms which have mean and median $AB_{ACC}$ of 0.009 and 0.009, respectively. $t$ and $z$ statistics show that growth firms have significantly larger mean and median $AB_{ACC}$ than declining firms. However, declining firms report significantly larger mean and median $AB_{RD}$ than growth firms (0.017 vs. -0.018; 0.012 vs. -0.002).

(Insert Table 2 here)
Panel B of Table 2 presents correlations between the variables. Consistent with the univariate comparisons, \( AB\_ACC \) is positively correlated with \( LifeCycle\_S \), and \( AB\_RD \) is negatively correlated with \( LifeCycle\_S \). To further investigate the five dimensions that constitute \( LifeCycle \), I find that \( AB\_ACC \) is positively related to sales growth (\( \Delta Sales \)) and the cash flow from financing intensity (\( CFF \)). It is, however, negatively related to net investment (\( NetInv \)). \( AB\_RD \) is negatively related to all the dimensions except \( CFF \). Correlations among the five dimensions are generally positive, except those between \( CFF \) and \( NetInv \) and between \( CFF \) and \( \Delta Sales \). All the correlation coefficients among the five dimensions are less than 0.5. It indicates that these five variables complement each other in measuring a firm’s life cycle stage, and each represents a unique aspect of the growth prospect. Overall, the univariate comparisons and correlation analyses indicate a strong positive relation between \( AB\_ACC \) and firm’s growth prospects and a negative relation between \( AB\_RD \) and firm’s growth prospects, consistent with H1a and H1b.

Table 3 reports univariate tests of H2a and H2b. In Panel A, I group firms into four equal-size portfolios based on the magnitude of \( INC\_RATIO \) for each industry-year. Portfolio 1 (4) includes firms in the lowest (highest) quartile, implying that managers of these firms are least (most) interested in boosting current stock price. I find that for firms in the lowest quartile, the mean and median \( AB\_ACC \) are 0.003 and 0.007, respectively. For firms in the highest quartile, the mean and median \( AB\_ACC \) are 0.011 and 0.009, respectively. The mean \( AB\_ACC \) of firms in the highest quartile is marginally significantly larger than that of firms in the lowest quartile at conventional levels (\( t = 1.65 \)). The difference in median \( AB\_ACC \) between the firms in these two portfolios is not significantly different from zero. Turning to \( AB\_RD \), the mean monotonically decreases across the four portfolios. For firms in the lowest quartile, the mean and median \( AB\_RD \) are -0.002 and -0.001, respectively. In comparison, for firms in the highest quartile, the mean and median \( AB\_RD \) are -0.012 and -0.004, respectively. The differences between both the means and the medians are highly significant at conventional levels. Panel A of Table 3 also reports descriptive statistics for several other proxies for equity-based incentives used in prior studies (e.g., Cheng and Warfield 2005). Comparing firms in the highest \( INC\_RATIO \) quartile with those in the lowest quartile, I find that they grant more
options during the year (OPT\_GNT), have less exercisable options on hand (OPT\_EXE), and more stock shares held by the managers (STK\_OWN).

(Insert Table 3 here)

Panel B reports correlations among AB\_ACC, AB\_RD, and various stock-based incentive variables. AB\_ACC is positively correlated with INC\_RATIO, but only significant under Pearson correlation. AB\_RD is negatively correlated with INC\_RATIO as predicted. My main stock-based incentive variable, INC\_RATIO, is positively correlated with STK\_OWN, but negatively correlated with OPT\_UNE and OPT\_EXE. Overall, the univariate analyses lend strong support to H2b, but relatively weak support to H2a.

Panel A of Table 4 reports correlations among AB\_ACC, AB\_RD, and various proxies for the cost of REM. I do not find a significant correlation between AB\_ACC and RM\_COST. AB\_RD shows weak positive correlation with RM\_COST. The results of correlations among AB\_ACC, AB\_RD, and individual components of the cost of REM are also mixed. AB\_ACC is negatively correlated with ZSCORE, consistent with the prediction. However, it also shows weakly positive correlation with MSHARE. AB\_RD is positively correlated with MSHARE and ZSCORE, as expected. However, it is negatively related to COMX.

(Insert Table 4 here)

Panel B of Table 4 reports descriptive statistics of firms with different levels of the cost of REM. I group sample firms into four portfolios of equal size based on the magnitude of RM\_COST by year and industry. Group 1 (4) includes firms with the smallest (largest) cost of REM. I find that Group 4 firms have smaller AB\_ACC and larger AB\_RD, consistent with H4a and H4b. However, the relation between AB\_ACC, AB\_RD and RM\_COST is not monotonic. It seems that firms in the middle groups (Group 2 and 3) have larger AB\_ACC and AB\_RD than firms in the top and bottom groups
(Group 1 and 4), which could partially explain why the univariate correlation between $AB\_ACC$ and $RM\_COST$ is insignificant.

**Regression analyses**

A potential drawback of univariate analyses is that it fails to control for other contemporaneous factors that could also affect firms’ earnings management behavior. The hypothesized relations between AEM/REM and the firm characteristics of interest are derived based on comparative statics in the analytical model, which indicates that these relations should hold under the *ceteris paribus* conditions. Therefore, more convincing evidence should be obtained in the multivariate analyses. I test H1-H4 using the following recursive system model following Zang (2007):

$$
\begin{align*}
AB\_RD_t &= \gamma_0 + \gamma_1 LifeCycle\_S_t + \gamma_2 INC\_RATIO_t + \gamma_3 LAGPE_t + \gamma_4 RM\_COST + \gamma_5 NOA_t + \\
& \quad + \gamma_6 BIG8_t + \gamma_7 LEV_t + \gamma_8 ROA_t + \sum Year\ Controls + \sum Industry\ Controls + \mu_t \\
\text{(7a)}
\end{align*}
$$

$$
\begin{align*}
AB\_ACC_t &= \beta_0 + \beta_1 AB\_RD_t + \beta_2 LifeCycle\_S_t + \beta_3 INC\_RATIO_t + \beta_4 LAGPE_t + \\
& \quad + \beta_5 RM\_COST + \beta_6 NOA_t + \beta_7 BIG8_t + \beta_8 LEV_t + \beta_9 ROA_t + \\
& \quad + \sum Year\ Controls + \sum Industry\ Controls + \nu_t \\
\text{(7b)}
\end{align*}
$$

System Eq. (7a) and (7b) capture sequentiality of REM and AEM. When managers make accounting choices, they observe the realized outcome of their real decisions. By the time AEM comes around, the REM is pre-determined and thus not correlated with the errors of Eq. (7b)\textsuperscript{15}. This fully recursive model may be consistently estimated using equation-by-equation OLS (Greene, 2003).\textsuperscript{16}

Several control variables are included which, although not explicitly incorporated in the theoretical model, have been shown by prior literature to be correlated with managers’ earnings management decisions. The first control variable is employed to capture the mechanical reversal of abnormal accruals in the short-run. Marquardt and

\textsuperscript{15} Zang (2007) performs Hausman (1978) test for simultaneity vs. sequentiality of real and accounting earnings management. Consistent with sequentiality, Hausman test fails to reject the exogeneity of REM in the regression of which AEM is the dependent variable. In contrast, Hausman test rejects the exogeneity of AEM in the regression of which REM is the dependent variable, which means AEM is correlated with REM’s error term. Her tests confirm that REM and AEM are determined sequentially, with REM preceding AEM.

\textsuperscript{16} As a sensitivity test, I will adopt two-stage least squares (2SLS) method which uses the predicted value of $AB\_RD$ from the first equation as an instrument in the second equation. In the absence of heteroscedasticity or autocorrelation, 2SLS produces the most efficient instrument variable estimator (Greene, 2003). The results are qualitatively the same.
Wiedman (2004) argue that the most obvious potential cost of undetected accounting earnings management is its eventual reversal and its impact on reported earnings in the future. In the analytical model, accrual reversal is also a nontrivial implicit cost of accounting earnings management. One can also view accrual reversal as a constraint that accounting earnings management places on future reporting flexibility. Managers’ biased estimates and judgments in one period reduce their ability to manage earnings in subsequent periods (Barton and Simko, 2002; Hunt et al., 1996). Following Barton and Simko (2002), I use a balance sheet measure of previous accounting choice (NOA), i.e., lagged net operating assets scaled by sales, to capture the accumulated effect of abnormal accruals in previous periods. The rationale is that because of the articulation between the income statement and the balance sheet, previous abnormal accruals reflected in past earnings are also reflected in net assets.\(^{17}\) Larger NOA implies less flexibility for managers to manipulate earnings through discretionary accounting choice in the current period.

Prior literature documents that Big Eight accounting firms restrict accounting earnings management (Becker et al., 1998; Francis et al., 1999). The audit firm’s reputation risk increases with size. To maintain its high reputation and competitive advantage in the audit market, a Big Eight firm is more likely to constrain its clients’ accounting earnings management so that their audited financial reports are more faithful representations of the underlying economic reality. I include a dummy variable (BIG8) which equals one if the firm’s auditor is one of the Big Eight, and zero otherwise, to capture the effect of the auditor’s intervention in accounting earnings management.

McNichols (2000) finds that abnormal accruals are correlated with return on assets (ROA). I include ROA as a control variable. Positive accounting theory (Watts and Zimmerman, 1986) predicts that managers are more likely to engage in income-increasing earnings management if debt/equity ratio is high and more likely to engage in income-decreasing earnings management if firms’ political costs are larger. I include LEV (debt/equity) and SIZE (log of market value of equity) as additional control variables.

\(^{17}\) Hunt et al. (1996) and Zang (2007) use firm-specific estimation of current accruals’ first-order autocorrelation as a proxy for the reversal rate of accruals. This method requires a long time series of firm-specific current accruals and is likely to reduce sample size significantly.
Industry dummies and year dummies are included to control for industry-wide and time-wide effects that could potentially explain some variation of firms’ earnings management behavior across different industries and across different time periods.

Table 5 presents the results of system Eq. (7a) and (7b). H1a predicts a positive coefficient on LifeCycle_S in Eq. (7b). Consistent with this, \( \beta_2 \) is 0.0533 and significant at the 1\% level.\(^{18}\) H1b predicts that the coefficient on LifeCycle_S should be negative in Eq. (7a). Consistent with this hypothesis, \( \gamma_1 \) is -0.0583 and significant at 1\% level. These results suggest that for firms that barely meet or beat analysts’ forecasts, as their growth prospects become rosier, they are more likely to use AEM to boost earnings and achieve the MBE target, but not REM. Their investment activities are more likely to be driven by the incentive to report better performance in the future or keep earnings growing.

H2a predicts that the coefficient on INC_RATIO is positive in Eq. (7b). I find strong evidence in support of this hypothesis. \( \beta_3 \) is 0.0175 and significant at 1\% level. This finding is also consistent with Bergstresser and Philippon (2006). However, they do not control for REM when they examine the relation between AEM and INC_RATIO, nor do they explicitly examine the relation between REM and INC_RATIO. H2b predicts that the coefficient on INC_RATIO is negative in Eq. (7a). The result lends strong support to this hypothesis; \( \gamma_2 \) is -0.0085 and significant at 1\% level.

H3a predicts that firms with higher value relevance of earnings exhibit higher AEM; therefore, the coefficient on LAGPE should be positive in Eq. (7b). Consistent with expectation, \( \beta_4 \) is 0.0003 and significant at 1\% level. H3b predicts that firms with higher value relevance of earnings exhibit lower REM, i.e., the coefficient on LAGPE should be negative in Eq. (7a). Consistent with this hypothesis, I find \( \gamma_3 \) is significantly less than zero at the 5\% level. When I use RELEVANCE as an alternative proxy for value relevance or market pricing of earnings, I lose 237 observations due to the requirement of a long series of data. The coefficient on RELEVANCE (not tabulated) is significant at the

\(^{18}\) Throughout all the regression analyses, t-statistics are based on Newey and West’s (1987) heteroscedasticity and autocorrelation consistent standard error estimates. All p values are based on one-tailed t tests when the coefficient sign is predicted, and based on two-tailed t tests otherwise.
5% level in Eq. (7b) and significant at the 10% in Eq. (7a). In sum, as the manager’s short-term stock-based incentives become more pronounced, the interest in garnering the stock market reward to MBE induces more AEM to inflate earnings and achieve the MBE target. To balance the long-term objective to maintain earnings momentum or continue to MBE in the future, the manager is likely to opportunistically invest more in the current period.

H4a predicts that the coefficient on *RM_COST* should be negative in Eq. (7b). Consistent with the prediction, $\beta_5$ is -0.0026 and significant at the 5% level. It suggests that AEM decreases with the cost of REM. As the cost of REM becomes more of a concern to the firm, it is less likely to use AEM to achieve the MBE target. AEM is used in a way to prevent future earnings from decreasing. H4b predicts that the coefficient on *RM_COST* should be positive in Eq. (7a). I do not find evidence in support of this prediction. $\gamma_4$ is -0.0002 but not statistically significant.

The coefficient on *AB_RD* ($\beta_1$) in Eq. (7b) is positive and significant at 1% level. This result is different from Zang (2007)’s findings. The difference may arise due to differences in sample selection and research design. Consistent with the expectation that high quality auditors constrain AEM, I find the coefficient on *BIG8* to be significantly negative in Eq. (7b). It is possible that firms facing more scrutiny from a Big 8 auditor will resort to REM to achieve earnings targets. Consistent with this prediction, the coefficient on *BIG8* is positive and significant at the 1% level in Eq. (7a). I also find that *AB_RD* is negatively correlated with NOA, ROA and SIZE.

The above analyses use an aggregate measure, *RM_COST*, to proxy for the cost of REM. A potential drawback of this measure is that it assigns equal weights to each of its components. To address this potential concern, I repeat the regression analyses using individual components instead of the composite measure. The results are reported in Table 6.

(Insert Table 6 here)

Panel A reports regression results when *AB_ACC* is the dependent variable. In Model 1, only *MSHARE* is included as a proxy for the cost of REM. The coefficient on
MSHARE is negative, but insignificant. In Model 2, only ZSCORE is included as a proxy for the cost of REM. Consistent with prediction, the coefficient on ZSCORE is -0.0056 and significant at the 1% level. In Model 3, only COMX is included as a proxy for the cost of REM in the regression model. I find a significantly negative relation between AB_ACC and COMX, consistent with the prediction that firms with more complex business, which are likely to suffer more penalty from engaging in REM, will engage in less AEM. Model 4 includes all three proxies at the same time in the regression model. The coefficients on all the three proxies are now significantly negative, consistent with H4a. The coefficients on the other variables also exhibit the expected signs. For brevity, I do not repeat my discussion here.

Panel B presents regression results when AB_RD is the dependent variable. In Model 1, only MSHARE is included as a proxy for the cost of REM. I find that AB_RD is positively related to MSHARE, indicating that firms which are market followers will engage in more R&D manipulation than firms which are market leaders. In Model 2, where only ZSCORE is used as a proxy for the cost of REM, I find a significantly negative correlation between AB_RD and ZSCORE. This result is contradictory to my prediction. In Model 3, only COMX is included. Consistent with my prediction, there is a positive relation between AB_RD and COMX. However, when all the three proxies are included in Model 4, the significant correlations between AB_RD and MSHARE and COMX disappear. There is, however, still a negative relation between AB_RD and ZSCORE. Overall, the results do not fully support H4b.

6. Conclusions

In this study, I first analytically model a risk-neutral manager’s earnings management decisions in a capital market setting, assuming he is interested in both current stock price and long-term earnings growth. The key to the model is the manager’s trade-off between the short-term need to deliver desired earnings and the long-term objective of making value-maximizing investment decisions. The model generates several testable hypotheses: first, AEM (REM) increases (decreases) with firm’s growth prospects; second, AEM (REM) increases (decreases) with the sensitivity of manager’s stock based compensation to stock price; third, AEM (REM) increases (decreases) with
the market’s pricing of earnings; and fourth, AEM (REM) decreases (increases) with the cost of REM.

I test these hypotheses using a sample of suspect firms that meet or just beat consensus analyst forecasts. Firms that report earnings slightly above the benchmark set by analysts are more likely to engage in earnings management. By focusing on these firms, I am able to increase the power of the analyses. This setting is also closely aligned with the model’s assumptions. The empirical results are generally consistent with the model’s predictions, except that I do not detect a significant relation between REM and its own cost.

It would be interesting to further investigate how the market reacts to suspect firms that engage in AEM and REM. Chen et al. (2008) provide some evidence on the equity premium assigned to firms that appear to use AEM and/or REM to meet or beat analysts’ expectations. However, they do not control for those cross-sectional determinants that could explain a firm’s choice of AEM and REM to meet or beat earnings forecasts. Research that incorporates cross-sectional variation in a firm’s choice of AEM and REM should lead to a more complete understanding of the incentive to meet earnings targets, the extent of AEM and REM, and the economic consequences of different earnings management behavior.
REFERENCES


APPENDIX

1. Optimal level of AEM: \( b_A \)

\[
\max_{b_A} \, \ p\hat{P}_1(m_1) - \begin{cases} 
0 & \text{if } m_1 < m_2 \\
(E(m_1) - E(m_2)) & \text{if } m_1 \geq m_2 
\end{cases}
\]

Let \( P = \alpha + \beta \) \( m_1 \) be the manager’s conjectured market price.

\[
\Leftrightarrow \max_{b_A} \, \ p\left[ \alpha + \beta (x_1 + b_A) \right] - \int_{x_1 + 2b_A}^{x_1 + 2b_A} \frac{1}{2e} (x_1 + 2b_A - x_2) \, dx_2
\]

\[
\Rightarrow \max_{b_A} \, \ p\left[ \alpha + \beta (x_1 + b_A) \right] - \frac{1}{4e} \left[ x_1 + 2b_A - \gamma K + \frac{\eta}{2} b_R^2 + \varepsilon \right]^2
\]

The necessary first-order condition for a maximum is:

\[
p \frac{\partial \hat{P}_1}{\partial b_A} - \frac{1}{e} \left[ x_1 + 2b_A - \gamma K + \frac{\eta}{2} b_R^2 + \varepsilon \right] = 0
\]

Let \( \beta = \frac{d\hat{P}}{dm_1} \), I then obtain:

\[
b_A^* = \frac{1}{2} \left( p\beta - x_1 + \gamma K - \frac{\eta}{2} b_R^2 - \varepsilon \right)
\]

The optimal level of earnings management \( b_A = b_A^* - b_A^FB = b_A^* \).

2. Optimal level of REM: \( b_R \)

\[
\max_{K} \, \ p\hat{P}_1(E(m_1)) - \begin{cases} 
0 & \text{if } m_1 > m_2 \\
(E(m_1) - E(m_2)) & \text{if } m_1 \leq m_2 
\end{cases} - \frac{K^2}{2}
\]

\[
\max_{K} \, \ p\left[ \alpha + \beta(K - \frac{C}{2} K^2 + E(b_A^*|K)) \right] - \frac{1}{4e} \left[ x_1 + 2b_A - \gamma K + \frac{\eta}{2} b_R^2 + \varepsilon \right]^2 - \frac{K^2}{2}
\]

Plug \( b_A^* \) into the above program:

\[
\Leftrightarrow \max_{K} \, \ p\left[ \alpha + \beta(K - \frac{C}{2} K^2 + E(b_A^*|K)) \right] - \frac{1}{4e} (p\beta)^2 - \frac{1}{2} K^2
\]

The necessary first order condition for a maximum is:

\[
p\beta \left[ 1 - cK + \frac{dE(b_A^*|K)}{dK} \right] = K = 0
\]
Note that

\[ E(b^*_A|K) = \frac{1}{2} \left[ p\beta\epsilon + (\gamma - 1)K + \frac{c}{2}K^2 - \frac{\eta}{2}(K_{FB} - K)^2 - \epsilon \right] \]

The optimal level of \( K \) can be derived as:

\[ K^* = \frac{p\beta \left( 1 + \gamma + \frac{\eta(1 + \gamma)}{1 + c} \right)}{2 + p\beta(\eta + c)} \]

To derive \( K_{FB} \), I maximize the following program:

\[ \max_k (1 + \gamma)K - \frac{c}{2}K^2 - \frac{1}{2}K^2 \quad \Rightarrow \quad K_{FB} = \frac{1 + \gamma}{1 + c} \]

By definition, \( b_R \) is the deviation of \(-K^*\) from \(-K_{FB}\).

Thus, \( b_R = -K^* - (-K_{FB}) = \left( \frac{1 + \gamma}{1 + c} \right) \left[ \frac{2 - p\beta}{2 + p\beta(\eta + c)} \right] \)

3. The market price \( P_1 \)

The market price is the expected terminal value of the firm conditional on the manager’s report, the conjectured reporting strategy and all publicly available information such as \( p, \gamma, \epsilon, \eta \) and \( c \). In equilibrium, the conjectures must equal the actual functions. Suppose the market’s conjecture of \( x_1 \) and \( b_R \) is:

\[ \hat{x}_1 = 2m_1 - 2p\epsilon - \gamma \left( \frac{1 + \gamma}{1 + c} - \hat{b}_R \right) + \frac{\eta}{2}\hat{b}_R^2 + \epsilon \]

\[ \hat{b}_R = \left( \frac{1 + \gamma}{1 + c} \right) \left[ \frac{1 - p}{1 + p(\eta + c)} \right] \]

Then,

\[ P_1 = E[x_1 + x_2|m_1] = 2m_1 - 2p\epsilon - \gamma \left( \frac{1 + \gamma}{1 + c} - \hat{b}_R \right) + \frac{\eta}{2}\hat{b}_R^2 + \epsilon + \gamma \left( \frac{1 + \gamma}{1 + c} - \hat{b}_R \right) - \frac{\eta}{2}\hat{b}_R^2 \]

\[ \Leftrightarrow \quad P_1 = \epsilon(1 - 2p) + 2m_1 \]

To verify whether the market’s conjecture is equal to the actual functions, I examine \( m_1 \) reported by the manager:

\[ m_1 = x_1 + b^*_A = \frac{1}{2} \left( 2p\epsilon + x_1 + \gamma K - \frac{\eta}{2}\hat{b}_R^2 - \epsilon \right) \]
\[ x_1 = 2m_1 - 2p\varepsilon - \gamma \left( \frac{1 + \gamma}{1 + c} - b_R \right) + \frac{\eta}{2} b_R^2 + \varepsilon \]

This confirms the market’s conjecture of \( x_1 \).
Fig. 1. Number of firm years by earnings surprise (unscaled): 114,087 firm-years over the period 1976-2007 are classified into earnings surprise (unscaled) over the range -0.15 to +0.15, where earnings surprise (unscaled) is defined as the difference between the reported earnings and the most recent consensus analyst forecast. Each interval is of width 0.01, with category 16 including firm-years with earnings surprise great than or equal to zero and less than or equal to 0.01. The figure is truncated at the two ends and includes 72,900 firm-years.
Table 1 Estimation of normal levels of R&D expenditures and total accruals

Panel A: Estimation of normal level of R&D expenditures (No. of industry-years = 456)

\[ RD_{jt}^{*} = \alpha_0 + \alpha_1 RD_{jt-1}^* + \alpha_2 FUNDS_{jt} + \alpha_3 TQ_{jt} + \alpha_4 CAPEXP_{jt} + \alpha_5 A_{jt-1} + \varepsilon_{jt} \]

<table>
<thead>
<tr>
<th>Coeff.</th>
<th>Pred. Sign</th>
<th>Mean</th>
<th>T statistic</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_0 )</td>
<td>?</td>
<td>0.0011</td>
<td>1.66</td>
<td>-0.0054</td>
<td>-0.0002</td>
<td>0.0069</td>
</tr>
<tr>
<td>( \alpha_1 )</td>
<td>+</td>
<td>0.8678</td>
<td>46.00</td>
<td>0.6963</td>
<td>0.8706</td>
<td>1.0414</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>+</td>
<td>0.0043</td>
<td>1.60</td>
<td>-0.0156</td>
<td>0.0035</td>
<td>0.0287</td>
</tr>
<tr>
<td>( \alpha_3 )</td>
<td>+</td>
<td>0.0034</td>
<td>10.01</td>
<td>-0.0000</td>
<td>0.0020</td>
<td>0.0060</td>
</tr>
<tr>
<td>( \alpha_4 )</td>
<td>+</td>
<td>0.1035</td>
<td>11.00</td>
<td>-0.0004</td>
<td>0.0423</td>
<td>0.1808</td>
</tr>
<tr>
<td>( R^2 )</td>
<td></td>
<td>0.7956</td>
<td></td>
<td>0.6858</td>
<td>0.8395</td>
<td>0.9388</td>
</tr>
</tbody>
</table>

Panel B: Estimation of normal level of total accruals (No. of industry-years = 570)

\[ ACC_{jt}^{*} = \alpha_0 + \alpha_1 A_{jt-1} + \alpha_2 1 + \alpha_3 (1+k) \Delta S_{jt} - \Delta REC_{jt} + \alpha_4 PPE_{jt-1} + \alpha_5 ACC_{jt-2} + \alpha_6 S_{jt-1} + \varepsilon_{jt} \]

<table>
<thead>
<tr>
<th>Coeff.</th>
<th>Pred. Sign</th>
<th>Mean</th>
<th>T statistic</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_0 )</td>
<td>?</td>
<td>-0.0415</td>
<td>-18.79</td>
<td>-0.0672</td>
<td>-0.0364</td>
<td>-0.0115</td>
</tr>
<tr>
<td>( \alpha_1 )</td>
<td>?</td>
<td>-0.1503</td>
<td>-4.65</td>
<td>-0.2264</td>
<td>-0.0713</td>
<td>0.0333</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>+</td>
<td>0.0297</td>
<td>6.85</td>
<td>-0.0210</td>
<td>0.0316</td>
<td>0.0815</td>
</tr>
<tr>
<td>( \alpha_3 )</td>
<td></td>
<td>-0.0432</td>
<td>-9.70</td>
<td>-0.0963</td>
<td>-0.0412</td>
<td>0.0174</td>
</tr>
<tr>
<td>( \alpha_4 )</td>
<td></td>
<td>0.2216</td>
<td>21.33</td>
<td>0.0923</td>
<td>0.1917</td>
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<tr>
<td>( \alpha_5 )</td>
<td></td>
<td>0.0298</td>
<td>7.55</td>
<td>-0.0167</td>
<td>0.0228</td>
<td>0.0714</td>
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<tr>
<td>( R^2 )</td>
<td></td>
<td>0.2868</td>
<td></td>
<td>0.1482</td>
<td>0.2362</td>
<td>0.3775</td>
</tr>
</tbody>
</table>

The regressions are estimated cross-sectionally within each industry-year. Fama-French 48 industry grouping is used to define industries. Industry-years with less than 15 firms are eliminated from the sample. Numbers of observations used to estimate normal level of R&D expenditures and normal level of total accruals are 47,682 and 66,195, respectively, over 1988-2005. The table reports the mean, median, Q1 and Q3 coefficients across all industry-years and t statistics calculated using the standard error of the mean across industry-years. The table also reports the mean, median, Q1, and Q3 R²’s across industry-years for each regression.

Variable definitions: \( RD = \) R&D expense (Compustat Data46); \( A = \) Total assets (Data6); \( FUNDS = \) Internal funds = IBEI + R&D + Depreciation (Data18 + Data46 + Data14); \( TQ = \) Tobin’s Q = (MVE + Book value of preferred stock + long-term debt + short-term debt) / Total assets = (Data199×Data25 + Data25 + Data130 + Data9 + Data34)/Data6; \( CAPEXP = \) capital expenditures (data128); \( ACC = \) Total accruals (Data123 – Data308); \( \Delta S = \) Change in sales (ΔData12); \( \Delta REC = \) Change in accounts receivable (ΔData2); \( k = \) Estimated slope coefficient from a regression of \( \Delta REC \) on \( \Delta S \) for each industry-year, i.e., \( \Delta REC = \gamma + k \Delta S +\epsilon; \) \( PPE = \) Gross amount of property, plant and equipment (Data7).
Panel C: Summary statistics of abnormal R&D expenditures and abnormal accruals
(N = 22,007)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev</th>
<th>Q1</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB_ACC</td>
<td>0.0043</td>
<td>0.0104</td>
<td>0.1210</td>
<td>-0.0403</td>
<td>0.0607</td>
</tr>
<tr>
<td>AB_RD</td>
<td>0.0016</td>
<td>0.0015</td>
<td>0.0562</td>
<td>-0.0052</td>
<td>0.0170</td>
</tr>
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</table>

Panel D: Correlation among abnormal R&D expenditures and future performance
(N = 22,007)

<table>
<thead>
<tr>
<th></th>
<th>AB_RD_t</th>
<th>ΔROA_{t+1}</th>
<th>ΔROA_{t+2}</th>
<th>ΔCFO_{t+1}</th>
<th>ΔCFO_{t+2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB_RD_t</td>
<td>-0.0263***</td>
<td>-0.1597***</td>
<td>-0.0217***</td>
<td>-0.0334***</td>
<td>-0.0328***</td>
</tr>
<tr>
<td>ΔROA_{t+1}</td>
<td>-0.0256***</td>
<td>-0.2769***</td>
<td>0.5478***</td>
<td>-0.1030***</td>
<td></td>
</tr>
<tr>
<td>ΔROA_{t+2}</td>
<td>-0.0256***</td>
<td>-0.1621***</td>
<td>0.0941***</td>
<td>0.5199***</td>
<td></td>
</tr>
<tr>
<td>ΔCFO_{t+1}</td>
<td>0.0146**</td>
<td>0.3799***</td>
<td>0.0115*</td>
<td>-0.0350***</td>
<td></td>
</tr>
<tr>
<td>ΔCFO_{t+2}</td>
<td>-0.0239***</td>
<td>-0.0567***</td>
<td>0.3765***</td>
<td>-0.2985***</td>
<td></td>
</tr>
</tbody>
</table>

***, ** and * represent significance at 1%, 5% and 10%, respectively.

Variable definitions:

AB_ACC: residual from the model of normal level of total accruals; AB_RD: residual from the model of normal level of R&D expenditures, multiplied by -1; ΔROA: change in ROA, ROA is measured as earnings before extraordinary items (Data123) divided by beginning total assets (Data6); ΔCFO: change in CFO, CFO is measured as cash flows from operating activities (Data308) divided by beginning total assets (Data6).
Table 2 Univariate tests of H1

Panel A: Descriptive statistics of firms at different life cycle stages

<table>
<thead>
<tr>
<th>LifeCycle</th>
<th>NetInv</th>
<th>ΔSales</th>
<th>RE/EQT</th>
<th>Age</th>
<th>CFF</th>
<th>AB_ACC</th>
<th>AB_RD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decline Stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=1,365)</td>
<td>Mean</td>
<td>11.338</td>
<td>0.057</td>
<td>-0.787</td>
<td>-26.933</td>
<td>-0.285</td>
<td>0.009</td>
</tr>
<tr>
<td>Median</td>
<td>12.000</td>
<td>0.044</td>
<td>0.072</td>
<td>-0.767</td>
<td>-25.000</td>
<td>-0.254</td>
<td>0.009</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>2.211</td>
<td>0.061</td>
<td>0.173</td>
<td>0.741</td>
<td>14.800</td>
<td>0.190</td>
<td>0.066</td>
</tr>
<tr>
<td>Maturity Stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=4,211)</td>
<td>Mean</td>
<td>21.595</td>
<td>0.110</td>
<td>0.225</td>
<td>-12.684</td>
<td>-0.254</td>
<td>0.012</td>
</tr>
<tr>
<td>Median</td>
<td>21.000</td>
<td>0.084</td>
<td>0.154</td>
<td>-0.321</td>
<td>-8.000</td>
<td>-0.214</td>
<td>0.014</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>4.304</td>
<td>0.113</td>
<td>0.540</td>
<td>1.545</td>
<td>11.760</td>
<td>0.284</td>
<td>0.098</td>
</tr>
<tr>
<td>Growth Stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=452)</td>
<td>Mean</td>
<td>33.783</td>
<td>0.193</td>
<td>0.748</td>
<td>1.474</td>
<td>5.358</td>
<td>0.028</td>
</tr>
<tr>
<td>Median</td>
<td>33.000</td>
<td>0.154</td>
<td>0.384</td>
<td>0.536</td>
<td>4.000</td>
<td>0.022</td>
<td>0.039</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>2.785</td>
<td>0.158</td>
<td>2.266</td>
<td>2.294</td>
<td>3.903</td>
<td>0.441</td>
<td>0.144</td>
</tr>
</tbody>
</table>

Comparison between firms in the growth stage and firms in the decline stage

<table>
<thead>
<tr>
<th>LifeCycle</th>
<th>NetInv</th>
<th>ΔSales</th>
<th>RE/EQT</th>
<th>Age</th>
<th>CFF</th>
<th>AB_ACC</th>
<th>AB_RD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth - Decline</td>
<td>Mean</td>
<td>22.445</td>
<td>0.136</td>
<td>0.675</td>
<td>2.261</td>
<td>21.575</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>21.000</td>
<td>-0.071</td>
<td>0.312</td>
<td>0.536</td>
<td>21.000</td>
<td>0.276</td>
</tr>
</tbody>
</table>

Panel B: Correlation among AB_ACC, AB_RD and life cycle stages

<table>
<thead>
<tr>
<th>AB_ACC</th>
<th>AB_RD</th>
<th>LifeCycle_S</th>
<th>NetInv</th>
<th>ΔSales</th>
<th>RE/EQT</th>
<th>Age</th>
<th>CFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB_ACC</td>
<td>0.253</td>
<td>-0.221</td>
<td>-0.372</td>
<td>0.224</td>
<td>-0.013</td>
<td>0.019</td>
<td>0.220</td>
</tr>
<tr>
<td>AB_RD</td>
<td>0.137</td>
<td>-0.302</td>
<td>0.372</td>
<td>0.222</td>
<td>-0.041</td>
<td>-0.091</td>
<td>-0.001</td>
</tr>
<tr>
<td>LifeCycle_S</td>
<td>0.095</td>
<td>-0.199</td>
<td>0.224</td>
<td>0.233</td>
<td>0.265</td>
<td>-0.136</td>
<td>-0.226</td>
</tr>
<tr>
<td>NetInv</td>
<td>0.053</td>
<td>-0.026</td>
<td>0.083</td>
<td>0.123</td>
<td>0.274</td>
<td>0.275</td>
<td>-0.039</td>
</tr>
<tr>
<td>ΔSales</td>
<td>0.065</td>
<td>0.379</td>
<td>0.241</td>
<td>0.085</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE/EQT</td>
<td>0.048</td>
<td>-0.092</td>
<td>0.637</td>
<td>0.282</td>
<td>0.485</td>
<td>-0.039</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.052</td>
<td>-0.147</td>
<td>0.300</td>
<td>0.485</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFF</td>
<td>0.280</td>
<td>-0.046</td>
<td>0.247</td>
<td>0.281</td>
<td>-0.013</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sample period: 1989 – 2004. Pearson (Spearman) correlations are presented above (below) the diagonal. ***, ** and * represent significance at 1%, 5% and 10%, respectively.

Variable definitions:
NetInv: capital expenditure (Compustat Data128) plus R&D expenditure (Data46) minus depreciation and amortization (Data14) scaled by beginning total assets (Data6); ΔSales: growth in sales (Data12); RE/EQT: retained earnings (Data36) divided by total equity (Data60), multiplied by (-1); Age: the number of years the firm first appears on either Compustat or CRSP, whichever is longer, multiplied by (-1); CFF: the difference between cash flow from financing activities (Data311) and cash flow from operating activities (Data308), scaled by beginning total assets (Data6). AB_ACC: residual from the model of normal level of total accruals; AB_RD: residual from the model of normal level of R&D expenditures, multiplied by -1. LifeCycle: the total ranks for NetInv, ΔSales, RE/EQT, Age, and CFF. LifeCycle_S is defined as LifeCycle scaled by 45.
### Table 3 Univariate tests of H2

**Panel A: Descriptive statistics of firms with different levels of stock-based compensation sensitivity to stock price**

<table>
<thead>
<tr>
<th>INC_RATIO_RANK</th>
<th>AB_ACC</th>
<th>AB_RD</th>
<th>INC_RATIO</th>
<th>OPT_GNT</th>
<th>OPT_UNE</th>
<th>OPT_EXE</th>
<th>RST_GNT</th>
<th>STK_OWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC_RATIO_RANK = 1 (Smallest), N = 684</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.003</td>
<td>-0.002</td>
<td>0.027</td>
<td>0.170</td>
<td>0.595</td>
<td>0.943</td>
<td>0.055</td>
<td>0.225</td>
</tr>
<tr>
<td>Median</td>
<td>0.007</td>
<td>-0.001</td>
<td>0.029</td>
<td>0.097</td>
<td>0.427</td>
<td>0.599</td>
<td>0.000</td>
<td>0.114</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.084</td>
<td>0.029</td>
<td>0.015</td>
<td>0.244</td>
<td>0.817</td>
<td>1.043</td>
<td>0.391</td>
<td>0.414</td>
</tr>
<tr>
<td>INC_RATIO_RANK = 2 , N = 684</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.008</td>
<td>-0.006</td>
<td>0.077</td>
<td>0.252</td>
<td>0.549</td>
<td>0.807</td>
<td>0.039</td>
<td>0.454</td>
</tr>
<tr>
<td>Median</td>
<td>0.010</td>
<td>-0.004</td>
<td>0.074</td>
<td>0.170</td>
<td>0.387</td>
<td>0.559</td>
<td>0.000</td>
<td>0.221</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.080</td>
<td>0.034</td>
<td>0.016</td>
<td>0.291</td>
<td>0.579</td>
<td>0.945</td>
<td>0.102</td>
<td>0.701</td>
</tr>
<tr>
<td>INC_RATIO_RANK = 3 , N = 685</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.006</td>
<td>-0.007</td>
<td>0.172</td>
<td>0.334</td>
<td>0.622</td>
<td>0.881</td>
<td>0.036</td>
<td>1.360</td>
</tr>
<tr>
<td>Median</td>
<td>0.011</td>
<td>-0.003</td>
<td>0.162</td>
<td>0.171</td>
<td>0.419</td>
<td>0.512</td>
<td>0.000</td>
<td>0.540</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.082</td>
<td>0.040</td>
<td>0.047</td>
<td>0.533</td>
<td>0.678</td>
<td>1.174</td>
<td>0.234</td>
<td>2.526</td>
</tr>
<tr>
<td>INC_RATIO_RANK = 4 (Largest) , N = 684</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.011</td>
<td>-0.012</td>
<td>0.594</td>
<td>0.274</td>
<td>0.529</td>
<td>0.804</td>
<td>0.033</td>
<td>8.365</td>
</tr>
<tr>
<td>Median</td>
<td>0.009</td>
<td>-0.004</td>
<td>0.586</td>
<td>0.085</td>
<td>0.285</td>
<td>0.347</td>
<td>0.000</td>
<td>4.736</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.081</td>
<td>0.043</td>
<td>0.212</td>
<td>0.536</td>
<td>0.787</td>
<td>1.437</td>
<td>0.326</td>
<td>9.409</td>
</tr>
</tbody>
</table>

**Difference b/w firms with the largest INC_RATIO and the smallest INC_RATIO**

<table>
<thead>
<tr>
<th>AB_ACC</th>
<th>AB_RD</th>
<th>INC_RATIO</th>
<th>OPT_GNT</th>
<th>OPT_UNE</th>
<th>OPT_EXE</th>
<th>RST_GNT</th>
<th>STK_OWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.008*</td>
<td>-0.010**</td>
<td>0.567***</td>
<td>0.104***</td>
<td>-0.066</td>
<td>-0.139**</td>
<td>-0.022</td>
</tr>
<tr>
<td>Median</td>
<td>0.002</td>
<td>-0.003***</td>
<td>0.557***</td>
<td>-0.012</td>
<td>-0.142***</td>
<td>-0.252***</td>
<td>0.000***</td>
</tr>
</tbody>
</table>
## Panel B: Correlation among $AB\_ACC$, $AB\_RD$ and stock-based compensation incentives

<table>
<thead>
<tr>
<th></th>
<th>$AB_ACC$</th>
<th>$ABN_RD$</th>
<th>$INC_RATIO$</th>
<th>$OPT_GNT$</th>
<th>$OPT_UNE$</th>
<th>$OPT_EXE$</th>
<th>$RST_GNT$</th>
<th>$STK_OWN$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AB_ACC$</td>
<td></td>
<td>-0.279***</td>
<td>0.039**</td>
<td>-0.089***</td>
<td>-0.002</td>
<td>0.021</td>
<td>-0.012</td>
<td>0.066***</td>
</tr>
<tr>
<td>$AB_RD$</td>
<td>-0.169***</td>
<td></td>
<td>-0.100***</td>
<td>0.043**</td>
<td>0.037</td>
<td>0.034</td>
<td>0.007</td>
<td>-0.053***</td>
</tr>
<tr>
<td>$INC_RATIO$</td>
<td>0.030</td>
<td></td>
<td>-0.113***</td>
<td>0.011</td>
<td>-0.062***</td>
<td>-0.075***</td>
<td>-0.036</td>
<td>0.647***</td>
</tr>
<tr>
<td>$OPT_GNT$</td>
<td>-0.015</td>
<td>0.067***</td>
<td>0.023</td>
<td>0.620***</td>
<td>0.282***</td>
<td>0.013</td>
<td>-0.023</td>
<td></td>
</tr>
<tr>
<td>$OPT_UNE$</td>
<td>0.005</td>
<td>0.064***</td>
<td>-0.103***</td>
<td>0.627***</td>
<td></td>
<td>0.336***</td>
<td>0.057***</td>
<td>-0.037</td>
</tr>
<tr>
<td>$OPT_EXE$</td>
<td>0.017</td>
<td>0.093***</td>
<td>-0.151***</td>
<td>0.337***</td>
<td>0.445***</td>
<td></td>
<td>0.008</td>
<td>-0.019</td>
</tr>
<tr>
<td>$RST_GNT$</td>
<td>-0.014</td>
<td>-0.004</td>
<td>-0.139***</td>
<td>-0.028</td>
<td>-0.020</td>
<td>-0.056***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$STK_OWN$</td>
<td>0.045**</td>
<td>-0.007</td>
<td>0.661***</td>
<td>-0.042**</td>
<td>-0.015</td>
<td>0.090***</td>
<td>-0.105***</td>
<td></td>
</tr>
</tbody>
</table>

Number of observations: 2,737. Sample period: 1992-2004. Pearson (Spearman) correlations are presented above (below) the diagonal. ***, ** and * represent significance at 1%, 5% and 10%, respectively.

Variable definitions:

- $AB\_ACC$: residual from the model of normal level of total accruals; $AB\_RD$: residual from the model of normal level of R&D expenditures, multiplied by -1.
- $INC\_RATIO$: constructed as \( \frac{\text{ONEPCT}}{(\text{ONEPCT} + \text{SALARY} + \text{BONUS})} \). \( \text{ONEPCT} \) is the dollar change in the value of CEO stock and option holdings coming from a one percent increase in the firm’s stock price.
- $OPT\_GNT$: option grants scaled by total outstanding shares of the firm, multiplied by 100; $OPT\_UNE$: unexercisable options (excluding option grants) scaled by total outstanding shares of the firm, multiplied by 100; $OPT\_EXE$: exercisable options scaled by total outstanding shares of the firm, multiplied by 100; $RST\_GNT$: restricted stock grants scaled by total outstanding shares of the firm, multiplied by 100; $STK\_OWN$: total shares held by the manager scaled by total outstanding shares of the firm, multiplied by 100.
Table 4 Univariate tests of H4

Panel A: Correlation among $AB_{ACC}$, $AB_{RD}$ and the cost of REM

<table>
<thead>
<tr>
<th></th>
<th>$AB_{ACC}$</th>
<th>$AB_{RD}$</th>
<th>MSHARE</th>
<th>ZSCORE</th>
<th>COMX</th>
<th>RM_COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AB_{ACC}$</td>
<td></td>
<td>-0.2735***</td>
<td>0.0206*</td>
<td>-0.1260***</td>
<td>0.0044</td>
<td>-0.0092</td>
</tr>
<tr>
<td>$AB_{RD}$</td>
<td>-0.1344***</td>
<td></td>
<td>0.0299**</td>
<td>0.0722***</td>
<td>-0.0532***</td>
<td>0.0151*</td>
</tr>
<tr>
<td>MSHARE</td>
<td>0.1134***</td>
<td>0.0744***</td>
<td></td>
<td>0.0431***</td>
<td>-0.4672***</td>
<td>0.3992***</td>
</tr>
<tr>
<td>ZSCORE</td>
<td>-0.0402***</td>
<td>0.0962***</td>
<td>0.1759***</td>
<td></td>
<td>0.0395***</td>
<td>0.3936***</td>
</tr>
<tr>
<td>COMX</td>
<td>-0.0141</td>
<td>-0.0941***</td>
<td>-0.3961***</td>
<td>0.1020***</td>
<td></td>
<td>0.3899***</td>
</tr>
<tr>
<td>RM_COST</td>
<td>0.0022</td>
<td>0.0244*</td>
<td>0.2177***</td>
<td>0.5165***</td>
<td>0.4599***</td>
<td></td>
</tr>
</tbody>
</table>

Panel B: Descriptive statistics of firms with different level of the cost of REM

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (smallest)</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4 (largest)</th>
<th>Group 4 vs. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>Std.</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>$AB_{ACC}$</td>
<td>0.015</td>
<td>0.010</td>
<td>0.083</td>
<td>0.018</td>
<td>0.017</td>
</tr>
<tr>
<td>$AB_{RD}$</td>
<td>-0.008</td>
<td>-0.004</td>
<td>0.041</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td>MSHARE</td>
<td>-0.027</td>
<td>-0.004</td>
<td>0.055</td>
<td>-0.008</td>
<td>-0.001</td>
</tr>
<tr>
<td>COMX</td>
<td>2.474</td>
<td>1.000</td>
<td>3.612</td>
<td>1.773</td>
<td>1.000</td>
</tr>
<tr>
<td>RM_COST</td>
<td>-1.827</td>
<td>-1.382</td>
<td>1.324</td>
<td>-0.797</td>
<td>-0.745</td>
</tr>
</tbody>
</table>

# of obs. | 1,497 | 1,497 | 1,497 | 1,497 | 1,498 |

Number of observations: 5,989. Sample period: 1989-2004. Pearson (Spearman) correlations are presented above (below) the diagonal. ***, ** and * represent significance at 1%, 5% and 10%, respectively.

Variable definitions:
- $MSHARE$: firm’s market share, measured as the percentage of the firm’s sales to the total sales of its industry, multiplied by -1;
- $ZSCORE$: firm’s z-score, measured as $3.3 \times (\text{Net Income}/\text{Assets}) + 1.0 \times (\text{Sales} / \text{Assets}) + 1.4 \times (\text{Retained Earnings} / \text{Assets}) + 1.2 \times (\text{Working Capital} / \text{Assets}) + 0.6 \times (\text{Stock Price} \times \text{Shares Outstanding} / \text{Assets})$, multiplied by -1.
- $COMX$: firm’s business complexity, measured as the number of line of business;
- $RM\_COST$: the sum of the normalized $MSHARE$, $ZSCORE$, and $COMX$.  

50
Table 5: Regression analyses

\[
AB\_ACC_t = \beta_0 + \beta_1 AB\_RD_t + \beta_2 LIFECYCLE\_S_t + \beta_3 INC\_RATIO_t + \beta_4 LAGPE_t \\
+ \beta_5 RM\_COST_t + \beta_6 NOA_t + \beta_7 BIG8_t + \beta_8 LEV_t + \beta_9 ROA_t + Year \ Controls \\
+ Industry \ Controls + \varepsilon_t
\]

\[
AB\_RD_t = \gamma_0 + \gamma_1 LIFECYCLE\_S_t + \gamma_2 INC\_RATIO_t + \gamma_3 LAGPE_t + \gamma_4 RM\_COST_t \\
+ \gamma_5 NOA_t + \gamma_6 BIG8_t + \gamma_7 LEV_t + \gamma_8 ROA_t + Year \ Controls \\
+ Industry \ Controls + \varepsilon_t
\]

<table>
<thead>
<tr>
<th></th>
<th>Pred. Sign</th>
<th>AB_ACC Coeff.</th>
<th>p value</th>
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Number of observations: 1,834. Sample period 1992 to 2004.
T-statistics are based on Newey and West’s (1987) heteroscedasticity and autocorrelation consistent standard error estimates. All p values are based on one-tailed t tests when the coefficient sign is predicted, and based on two-tailed t tests otherwise.

Variable definitions:
AB\_ACC: residual from the model of normal level of total accruals; AB\_RD: residual from the model of normal level of R&D expenditures, multiplied by -1. INC\_RATIO: constructed as ONEPCT \/(ONEPCT + SALARY + BONUS). LifeCycle\_S: defined as LifeCycle scaled by 45, where LifeCycle is the total ranks for NetInv, ΔSales, RE\_EQT, Age, and CFF. LAGPE: price to earnings ratio at the beginning of the period. RM\_COST: the sum of the normalized MSHARE, ZSCORE, and COMX. NOA: lagged net operating assets scaled by sales. BIG8: 1 if the firm is audited by a Big 8 auditor; 0 otherwise. LEV: debt/equity. ROA: return on assets. SIZE: log of market value of equity.
Table 6 Regression analysis using individual components of RM_COST

Panel A Dependent variable = AB_ACC

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Year Dummies: YES
Industry Dummies: YES
Adj. R²: 7.05% 7.58% 7.88% 8.15%
Panel B Dependent variable = AB_RD

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Number of observations: 1,834. Sample period 1992 to 2004.
T-statistics are based on Newey and West’s (1987) heteroscedasticity and autocorrelation consistent standard error estimates. All p values are based on one-tailed t tests when the coefficient sign is predicted, and based on two-tailed t tests otherwise.

Variable definitions:

- **MSHARE:** firm’s market share, measured as the percentage of the firm’s sales to the total sales of its industry, multiplied by -1.
- **ZSCORE:** firm’s z-score, measured as 3.3 *(Net Income/Assets) + 1.0 *(Sales / Assets) + 1.4 *(Retained Earnings / Assets) + 1.2 *(Working Capital / Assets) + 0.6 *(Stock Price * Shares Outstanding / Assets), multiplied by -1.
- **COMX:** firm’s business complexity, measured as the number of line of business; See Table 5 for definitions of other variables.