Essays on the Relation between Managers' Incentives and Financial Accounting Information

By
Yanfeng Xue

B.S. Economics
Ren Min University of China, 1996

M.A. Economics
Tufts University, 1999

SUBMITTED TO THE DEPARTMENT OF MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY IN MANAGEMENT
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2004
[September 2004]

Signature of Author: _____
Sloan School of Management
June 14, 2004

Certified by: _____
S. P. Kothari
Gordon Y Billard Professor of Accounting
Thesis Supervisor

Accepted by: _____
Birger Wernerfelt
Professor of Management Science
Chair, Doctoral Program Committee

Essays on the Relation between Managers' Incentives and Financial Accounting Information

By
Yanfeng Xue

Submitted to the Sloan School of Management on
June 14, 2004 in partial fulfillment of the requirements
for the Degree of Ph.D. in Accounting

ABSTRACT

My thesis consists of two separate essays. Each essay, from different angles, examines the relation between managers' incentives and financial accounting information.

The first essay examines how a firm's choice between competing innovation strategies can be affected by the use of accounting information versus stock prices as performance measures in the firm's CEO compensation contract. Firms obtain new technology either through internal R&D or through acquisitions. These two approaches are usually labeled as "make" and "buy" strategies. In this paper, I focus on the two major differences between the "make" and "buy" strategies: risk levels and accounting treatment. I hypothesize that the high risk level and unfavorable accounting treatment associated with "make" strategy relative to "buy" strategy lead risk-averse managers to favor "buy" over "make," should they be compensated heavily using accounting-based performance measures. Stock-based compensation, especially stock options, on the other hand, should encourage managers to innovate more through "make" strategies instead of "buying" them from the outside. Using data from US high tech industries, I find evidence consistent with the above hypotheses.

The second essay examines whether managers of information-strained firms signal the firm's future performance by managing earnings to exceed thresholds. Because managers' reporting discretion is bounded by the accounting regulations, managing earnings to exceed the current period's thresholds reduces future earnings, making future earnings thresholds more difficult to attain. As a result, only firms with sufficient future earnings growth can benefit from doing so. My empirical results suggest that the earnings management activities around thresholds do convey information about a firm's future performance, firms with a higher degree of information asymmetry between the management and investors are more likely to use this signaling mechanism, and the capital market recognizes the information content of the earnings management activities and rationally incorporates it in setting prices.

Thesis Supervisor: S.P. Kothari
Title: Gordon Y Billard Professor of Accounting

Acknowledgements

I am indebted to the members of my dissertation committee, Richard Frankel, Joseph Weber, and especially S.P. Kothari (Chair), for their guidance, encouragement and patience. Their help has extended far beyond the thesis work during my four years at MIT and the impact on my development, both professionally and personally, will last a life time.

I also want to thank other current and past members of the Sloan Accounting faculty: Kin Lo, Peter Joos, George Plesko, Larry Weiss, and Peter Wysocki for their continuous support, helpful comments and inspiring discussions.

I thank my colleagues, Ying Li, Volkan Muslu, and Jieying Zhang for stimulating discussions and friendship. Their support throughout these years makes the PhD study so much easier and more enjoyable.

I thank my parents Shuyuan and Zengquan, my sister, Junfeng, and my brother-in-law, Ning, for their love and support. There is no word that can describe the amount of encouragement and support I received from them.

Finally, I want to thank my husband, Haihao. I would never be able to survive the PhD study without his encouragement, love, and belief in me. For this, I am most fortunate and grateful.

Table of Contents

Chapter Two

Chapter One:

Make or Buy New Technology: a CEO Compensation Contract's Role in a Firm's Route to Innovation

1. Introduction

In the high-tech industries, innovation is crucial to a firm's survival and growth. Companies innovate either through in-house research and development (R&D) or through external acquisitions and licensing. These two approaches to acquiring new technology (i.e., internal vs. external) are often labeled as "make" and "buy" strategies. In this paper, I examine the relation between CEO compensation contracts and firms' choice between "make" and "buy." I find evidence consistent with the hypothesis that the firms relying on "bought" technology use more accounting-based performance measures, while those firms who innovate through R&D activities skew toward stock-based pay, especially stock options.

Previous literature has long noticed the importance of managerial incentives in a firm's innovation process (e.g., Smith and Stulz 1985; Smith and Watts 1992; Cheng 2004), but the focus has been on the research and development (R&D) activities. In reality, firms view Mergers and Acquisitions (M&A) as equally important means of innovation. For example, Cisco Systems states in its 2003 annual report:

> "The markets in which we compete require a wide variety of technologies, products and capabilities. The combination of technological complexity and rapid change within our markets makes it difficult for a single company to develop all technological solutions that it desires to offer within its family of product and services. Through acquisitions, investments and alliances we are able to deliver a broader range of products and services to customers in target markets."

This paper builds on the previous literature on the relation between managerial incentives and firms' R&D investment and provides evidence that managerial incentives also influence firms' choices among various innovation strategies.

In order to succeed in innovation activities, a firm's board of directors has to depend on managers' expertise to make an optimal choice between "make" and "buy" strategies. If a manager's only task is to select between the two strategies, a flat fee will be enough to

achieve the "first best" solution for the shareholders, because there is no reason why the manager would not choose the optimal strategy.

However, managers' involvement in a firm's innovation process is much more complicated than choosing between the two strategies. No matter whether the "make" or "buy" strategy is more suitable for a firm given its characteristics and business environment, managers' efforts in managing the R&D activities and collecting information for making optimal acquisition decisions are essential to the success of the innovation process, making incentive-based pay necessary. Nevertheless, a contingent pay based on observable performance measures will affect managers' choices between "make" and "buy" due to the differential attributes of these two strategies. Recognizing the impact of the managerial incentives on firms' innovation strategies, a firm's board of directors is expected to design a compensation contract that aligns managers' incentives with those of the shareholders. In this paper, I focus on two major differences between "make" and "buy" strategies – risk levels and the accounting treatment – and study their implications for managers' incentives and how they are incorporated into the compensation contracts.

Risk levels of "make" and "buy": Performing internal R&D is more risky than acquiring ready technology (e.g., patents) externally.[1] Part of the high risk associated with R&D investment is systematic and is therefore compensated by the stock market with a higher expected return. As a result, the systematic risk difference between the "make" and "buy" strategies should not make managers' preference between the two strategies deviate from the shareholders'. However, a big portion of the R&D uncertainty represents idiosyncratic risk. We know from asset pricing theories that shareholders price only the systematic risk because they can diversify away the idiosyncratic risk. Hence, the idiosyncratic portion of the higher risk associated with R&D compared with technology

[1] See section two and Table 1 for detailed discussion of this issue.

acquisition is not compensated by the market. For a well-diversified investor, the higher idiosyncratic risk of R&D is already diversified away and should not alter his preference between "make" and "buy". However, unlike shareholders, managers typically have their human capital as well as a large portion of personal wealth invested in the same firm. As a result, they are under-diversified and exposed to the idiosyncratic risk. If managers are not otherwise compensated for bearing this relatively higher risk associated with R&D, the under-diversification can lead to risk-averse investment behavior. Managers may pass up some risky investment opportunities even if such investments are in the best interests of the shareholders. In the context of choosing between "make" and "buy" approaches to innovation, risk-averse managers may prefer "buy" over "make" even when the "make" strategy provides a higher risk-adjusted return. For example, a manager may decide to buy a certain technology with a high premium un-justified by the standard of a well-diversified investor, just to avoid the risk associated with developing it internally. To overcome this risk-aversion, stock options can be used to provide managers with risk-seeking incentives. (Smith and Stulz 1985; Guay 1999)

Accounting treatment: "Make" and "buy" approaches also differ in their accounting treatment. Because of the great uncertainty associated with the future awards from R&D outlays (Kothari, LaGuerre and Leone 2002), the US GAAP requires that firms expense their R&D expenditures as incurred. However, when acquiring technology from outside sources, firms are allowed to capitalize the acquisition costs. The differential treatment affects managers' incentives if accounting earnings are used as performance measures in the compensation contracts. The cost of R&D investment immediately reduces a firm's accounting earnings. Meanwhile, the return from R&D investment is very uncertain and if there is any return, it will not be incorporated into earnings until several years later. In contrast, for acquisition activities, accounting earnings reasonably match the costs and

benefits associated with the acquired assets under either the pooling-of-interest or the purchase method[2]. As a result, accounting-based performance measures are more likely to encourage managers to choose the "buy" strategy to obtain innovations.

Research methodology: In a complete contracting setting, a firm's board of directors is expected to recognize the "make" and "buy" strategies' implications for managers' incentives and to mitigate the agency costs while designing a compensation contract. Because both the compensation policy and the choice between "make" and "buy" strategies are a firm's choices, the two aspects are likely to be affected by the same set of economic factors. As a result, even if there were no real economic relation between the two, we would still observe a significant statistic correlation between compensation and firms' choice of "make" or "buy" due to their economic relations with the common third factor.

Another possible source of endogeneity is the simultaneous determination of the "make" and "buy" approaches to innovation. It is a much-debated issue in the corporate finance and industrial organization literature: whether "make" and "buy" strategies are complements or substitutes. The prior literature finds mixed results. Hall (1988) finds that a firm with higher R&D intensity is better at absorbing other firms' technology and suggests that "make" and "buy" strategies are complements. The findings from Blonigen and Taylor (2000) suggest that firms take internal R&D and acquisitions as substituting strategies for innovation. Whether the R&D and acquisition activities are substituting or complementing strategies, the optimal level of investment in the two could be determined simultaneously by the firm characteristics and the CEO incentives. In this paper, I address the two possible endogeneity problems using a two-stage least-squared (2SLS) framework.

[2] FASB Statement 141 and 142 recently changed the accounting treatment of mergers and acquisitions. Effective July 1 2001, the pooling-of-interest method is prohibited, and the goodwill and indefinite-lived intangible assets are no longer amortized and should be tested for impairment utilizing a new methodology. This change is likely to enhance the value relevance of the accounting measures in mergers and acquisitions, and accentuate the relation studied in this paper.

Contributions: This paper makes two contributions to the literature. First, it studies the role of managerial incentives in determining a firm's choice among various strategies of acquiring technology. Previous literature establishes the relation between compensation and managers' tendency to engage in risk-increasing activities (e.g., Jensen and Meckling 1976; Smith and Stulz 1985; Core 1999; Rajgopal and Shevlin 2002), but most of these papers focus on single investment strategies such as R&D activities. My paper extends this line of research and provides evidence that compensation contracts not only affect managers' incentives to engage in R&D investment, but also have an impact on firms' choice between internal R&D and other competing innovation strategies.

Second, this paper enhances our understanding of accounting information versus stock prices as performance measures in CEO compensation contracts. Previous research documents that accounting-based compensation leads managers to construct transactions in such a way that a favorable accounting method can be used. For example, Aboody, Kasznik and Williams (2000) find that CEOs with earnings-based pay are more likely to choose pooling and avoid the purchase method in acquisitions with large goodwill. In this paper, I also extend this line of research and provide evidence that, in addition to affecting firms' accounting choices, the use of accounting information in contracting can have a real impact on corporate investment decisions.

Outline of the paper: The rest of the paper is organized as follows. The next section develops the hypotheses by analyzing the relation between a firm's CEO compensation contract and investment decision-making process. Section three presents the factors other than compensation that could affect a firm's choice between "make" and "buy" strategies and that should be controlled in the regression analyses. Section four describes the sample selection and the research design. The empirical results are described in section five.

Section six addresses some possible concerns regarding the results. Section seven offers concluding remarks.

2. Hypothesis Development

This section analyzes how different performance measures (i.e. accounting earnings and stock prices) affect managers' incentives in a firm's innovation process, and how the board can construct an optimal compensation contract in order to motivate the desired investment behavior from the managers. The analysis focuses on two aspects: the different risk levels of "make" vs. "buy," and the contrasting accounting treatment of the two innovation methods.

2.1 Differential risk levels of "make" and "buy"

The most prominent difference between "make" and "buy" approaches is the risk levels. As alternative approaches to innovations that could lead to new marketable products, internal R&D is much more risky than acquiring ready technology (such as patents). The high-risk nature of R&D increases the volatility of both earnings and returns. Chan, Lakonishok and Sougiannis (1999) find evidence that R&D intensity is positively associated with return volatility.

The return volatilities reported in Table 1 illustrate the high riskiness of R&D compared with acquisitions. The sample is drawn from US high tech industries as defined by the SDC merger and acquisition database. The sample period is from 1992 to 2000. Dividing firm years into quartiles based on total assets, Table 1 reports the monthly stock return volatilities of firm years with acquisition activities and those with high R&D-to-sales intensity. The return volatilities of the whole sample are also provided as the benchmark. Except for the highest quartile, where the return volatilities of the two groups are almost equal, the stock returns of firm years with high R&D intensity tend to be more volatile than

the observations with acquisition activities. Table 1 also suggests that although acquisitions are in general less risky than R&D, they are more risky than average investment activities – the return volatilities of acquisition firm years are higher than the quartile average.

[Insert Table 1 here]

As discussed in the previous section, the higher risk associated with R&D contains both systematic and idiosyncratic risk. Although investors do not price the idiosyncratic risk, under-diversified managers are sensitive to the higher idiosyncratic risk associated with R&D. They may choose "make" strategy over "buy" even when the premium attached to the price of the "bought" technology cannot be justified by the standard of a well-diversified investor.

Smith and Stulz (1985) show that managers may pass up a positive net-present-value (NPV) but risk-increasing project and shareholders can mitigate this problem by using stock options or common stocks. Guay (1999) finds that by increasing the convexity of the relation between firm performance and managers' wealth, equity-based compensation packages, especially stock options, can encourage risk-increasing investment activities such as R&D.

Compared to accounting-based compensation, the equity-based compensation, especially stock options, provides significantly more risk-taking incentives to managers. Therefore, if a manager's compensation is skewed toward accounting-based pay, he will favor "buy" over "make" because of the risk-aversion. On the other hand, if stock-based pay, especially stock options, dominates the manager's compensation package, he will be motivated to adopt the "make" approach.

2.2 US GAAP treatment and accounting performance measures

In addition to the risk level, two features of the U.S. GAAP exacerbate the negative impact on reported earnings from R&D (make) compared with from acquisitions (buy).

First, because of the great uncertainty associated with the return on R&D expenditures, the US GAAP requires that firms expense their R&D expenditures as incurred. Since revenues from the R&D investments are not recognized until realized, this incomplete matching of revenues and costs will reduce the firm's short-run reported earnings. Second, in contrast to R&D's negative impact on reported earnings, obtaining technology through acquisitions usually results in little effect on a firm's current period earnings. Under the pooling-of-interest method, the balance sheets of the two companies are combined and the earnings are not affected. Under the purchase method, the acquirer may amortize the cost of technology over a period of up to forty years (or, according to SFAS 142, leave the intangible assets on the balance sheet indefinitely unless the assets are impaired). As a result, an accounting-based bonus plan encourages managers to obtain technology through acquisitions rather than from internal R&D.

One way to address this problem in accounting-based pay is to shield managers from the impact of R&D investment. The problem with this solution is that managers will enjoy the benefit from R&D investment but do not bear the costs, which may induce over-investment in R&D. Dechow and Sloan (1991) document that top executives tend to reduce R&D expenditures during their final years in office, suggesting that the negative impact on earnings from R&D expenditure has significant effect on top executives' pay.

Theoretically, an equity-based incentive contract should align managers' interests with those of the investors, because in an efficient market, stock prices reflect short-term as well as long-term shareholder benefits. Stock-based pay therefore represents a better matching of revenue and cost from certain investment activities. However, stock-based compensation schemes have their own drawbacks. As a performance measure, stock prices are very noisy. The market value of a firm's equity is affected by so many factors that it

may not be sensitive to managers' efforts (Sloan 1992). This explains why the stock-based pay does not completely replace accounting-based compensation.

2.3 Summary and hypotheses

In summary, when a manager chooses between "make" and "buy" strategies to obtain technology, his compensation contract could play an important role. The main reasons are: the high-risk nature of internal R&D increases the volatility of the firm's earnings and stock returns compared with acquisitions; the differential accounting treatment lowers the reported earnings if a firm chooses to invest in R&D instead of acquisitions. A manager whose pay heavily depends on accounting performance measures will tend to acquire technology through acquisitions rather than R&D in order to avoid these negative impacts. On the other hand, a manager who holds a myriad of stock options or stocks is more likely to invest in R&D because R&D's disadvantages due to accounting treatment and managerial risk-aversion have been mitigated.

The association between a CEO compensation contract and the firm's "make" or "buy" strategies does not necessarily imply that the managers are acting opportunistically and the firm is not operating optimally. The board of directors of a firm may recognize this relation between performance measures and managers' innovation decisions and design an optimal CEO compensation contract to induce the desired investment behaviors. The correlation between CEO compensation and a firm's innovation decision may suggest that, at different optimal R&D vs. acquisition investment levels, the board of directors (the principal) and the CEO (the agent) agree on the corresponding optimal compensation schemes to alleviate the agency problem.

Because the "make or buy" strategies are usually determined at the firm level, in this paper, I only focus on the CEO compensation contracts and ignore the compensation contracts for other executives.

The following two hypotheses conclude this section:

Hypothesis 1: Ceteris paribus, the accounting-based compensation a firm's CEO receives is positively correlated with the firm's propensity to acquire and negatively correlated with the firm's investment in internal R&D.

Hypothesis 2: Ceteris paribus, the stock-based compensation granted to a firm's CEO, especially the risk-taking incentives from the stock-based compensation, are negatively correlated with the firm's propensity to acquire and positively correlated with the firm's investment in internal R&D.

3. Other Factors Determining A Firm's Choice of "Make" or "Buy"

Other than CEO compensation contracts, many firm characteristics and managers' personal attributes could affect a firm's investment decision on "make or buy." These factors should be controlled in the regression analysis. In this section, I discuss the following important factors: growth opportunity, ownership structure, cash constraints, size, R&D intensity, industry difference, market structure, and the stock market environment.

Growth Opportunity

A firm's R&D intensity is usually highly correlated with its growth opportunities. On the one hand, a firm with more opportunities naturally has more R&D spending. On the other hand, higher R&D spending leads to more growth opportunities. The market-to-book ratio (denoted by Q in the regression models) is used in the model as a proxy for this factor. The market-to-book ratio is predicted to be positively correlated with internal R&D.

Ownership Structure

In addition to CEO compensation contracts, alternative corporate governance mechanisms such as equity block holders and high management ownership could also mitigate agency problems.

Francis and Smith (1995) find that firms with a high concentration of management ownership or a significant equity block holder are more innovative, while the diffusely held firms are more intent on growing by acquisition. As evidence of agency cost, this finding

also suggests that a compensation contract as a remedy to agency cost could have different effects under various ownership structures. In a diffusely held firm, because information asymmetry between owners and managers is relatively big, managers have more leeway in extracting their private interests, while in a firm with concentrated ownership, the shareholders usually have more control over the firm's operation, and executive compensation might not be as important a factor in determining the innovation strategy.

In this paper, I use two measures as proxies for the alternative corporate governance mechanisms: the first one is a dummy variable controlling for whether the CEO's equity ownership of the firm is greater than 5% (OWN); the second variable is the institutional ownership of the firm (INST), which is equal to the percentage of the firm's shares held by institutional investors.

Information Asymmetry

The information characteristics of R&D versus acquisition may also affect firms' choices of investment. R&D activity usually involves severe information asymmetry between management and outside investors; hence it is restricted by a firm's internal financing capacity (Myers and Majluf 1984). A previous study (Himmelberg and Petersen 1994) finds an economically large and statistically significant relation between R&D investment and internal financing. A firm's acquisition activities are also restricted by cash capacity and profitability. For example, Jensen (1986) suggests that firms with more cash flow are more willing to acquire. But since R&D faces a more serious information asymmetry problem than acquisitions, the internal capital restriction on R&D is stricter.

Two variables are used to control for this effect in the regressions. The first is CASH, defined as the company's cash plus marketable securities divided by current liabilities. I also run regressions using different definitions of cash (cash plus marketable securities divided by current liabilities, or cash plus marketable securities minus current

liabilities, or just cash plus marketable securities), and find that the empirical results are not sensitive to these variations.

The second variable controlling for the information asymmetry problem is the leverage ratio (LEVERAGE), defined as the firm's total liabilities divided by its total assets.

Size and R&D Intensity

A firm's size and original R&D-intensity may also affect its "make" versus "buy" strategies. Hall (1988) models takeover activity as a response to changes in states of the world (such as technology shocks), which make some assets less productive in their current use. Synergy generated in takeovers solves this non-optimality problem. A firm with more assets will have a greater potential for synergy with another firm's assets because of market power and economies of scale. A firm's ability to absorb acquired technology also depends on its own R&D intensity. Hall finds that the shadow price for the R&D intensity of the target is an increasing function of the size and the R&D intensity of the bidding firm. She also finds that firms of like size and R&D intensity are more likely to merge. The logarithm of a firm's market value of equity at the fiscal year-end is used to control for the firm size (SIZE), while R&D-intensity is defined as the R&D expenditures divided by sales (RD).

Industry and Market Structure

A firm's choice between "make" and "buy" may also differ across industries. On the one hand, firms in different industries have different capacities in absorbing new technology; on the other hand, the existing industry organization may alter a firm's competition strategy. Gans and Stern (2000) build a patent race model starting with an incumbent firm and an entrant firm. They find that in a market where the incumbent has monopoly power, both firms benefit more from licensing/acquisition than from duopoly competition. The finding suggests that in a certain market environment, the best strategy for an incumbent firm is to acquire any new firm with superior technology. Dummy variables constructed based on the

two-digit SIC code are used in the regressions to control for these industry specific effects (INDUST).

Stock Market

Stock market valuation may also play a role in a firm's investment decision-making process. In the late 1990s, the US as well as the world economies experienced a strong wave of mergers and acquisitions. Unlike the 1920s "mergers for oligopoly" (Stigler, 1968), the conglomerate mergers in the 1960s, and the hostile takeovers in 1980s, the parties involved in a merger and acquisition activity in the 1990s were usually in the same industry, and the medium of payment was often stock rather than cash (Shleifer and Vishny 2003). Also, a big percentage of this wave of mergers and acquisitions happened in the high tech industry. These phenomena suggest that more and more technology is acquired through takeovers. This trend coincided with the stock market boom in the 1990s. As evidenced by the market downturn in 2000, many tech stocks were overvalued in the late 1990s. This may abet firms' willingness to acquire using stocks as opposed to investing in R&D using cash. But on the other hand, since many small high-tech firms were also over-valued, the final decision to "make" or "buy" could be determined by the relative valuation of the firms.

One could argue that over-valued firms can also invest in R&D by raising money through equity issuance. In reality, firms seldom issue equity for R&D funding purposes, while stock becomes the major medium of payments in acquisition transactions. There are at least two reasons. First, because R&D is an on-going activity requiring steady streams of investment and the funding needs for each period are not high, it may not be economically efficient for firms to raise money whenever there is a need for R&D investment. Second, equity issuances for R&D and in acquisitions are quite different. In acquisitions, the new equities are issued to the owners of the target firms. If a firm wants to raise money for R&D, the new issuances are going to be sold to the general public. The information asymmetry

problem is more severe in the latter case, and therefore the costs are higher.

Because it is difficult to control precisely for the under- or over-valuation of specific firms by the stock market for specific firms, the fiscal year dummy variables are used in the regression models trying to capture this effect (Yrdum). An alternative measure is market-to-book ratio or P/E ratio, but because these two measures are highly correlated and the Market-to-book ratio was already used to control for firms' growth opportunity, in this paper, I only use the year dummies to control for the market condition.

4. Sample Selection and Research Design

4.1 Definition of the Key Variables

The most important variable in the regression models is ACCT. It measures the proportion of accounting-based incentive pay in the CEO's total compensation (ACCT). It is defined as the current period's bonus divided by the CEO's total pay that is comprised of the following: salary, bonus, other annual pay, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other compensations. This variable captures the relative importance of accounting-based incentive pay in the firm's total compensation. Because by construction, this variable should be negatively correlated with the firm's stock-based compensation, the correlation coefficients on this variable in the regressions reveal not only the impact of accounting-based pay, but also the effect of stock-based compensations on firms' choice of innovation strategies.

An ideal measure of accounting-based compensation should be the incentive coming from the accounting-based pay, such as the coefficient in a time-series bonus-earnings regression. However, because of the data limitation (Execucomp only started coverage in 1992), I use the above measure to capture the relative importance of the accounting-based

pay to the CEO's total pay. Alternative measures could be total value of accounting-based pay scaled by some proxies of the CEO's wealth. According to Murphy (1999), firm size (measured by total assets value or market value of equity) should be highly correlated with CEO wealth. The unreported analyses show that the results are not sensitive to the alternative definition of accounting-based pay.

In this paper, I also construct two measures to control for the incentives coming from stock-based compensation. The stock-based pay is usually composed of two parts: stock holdings and stock options. They provide two types of incentives: the pay-for-performance incentives (STKPPS) and the risk-taking incentives (STKRI). The focus of this study is on STKRI. The risk-taking incentive from stock-based pay encourages managers to engage in R&D investment instead of M&A activities in order to obtain new technology. I measure the pay-for-performance incentive by calculating the sensitivity of the CEO wealth to the changes of stock prices. The variable STKPPS is equal to the logarithm of the dollar change in CEO stock and option holdings for 1% change in stock prices. The variable (STKRI) is constructed to measure the risk-taking incentives provided by stock-based pay. STKRI is defined as the logarithm of value change in the CEO option holdings corresponding to 1% increase in the stock price volatility. The coefficient on STKRI is designed to capture the impact on CEO incentives from the different risk levels of "make" and "buy". I calculate the stock-based compensation measures using the total stock and option holdings as of the previous fiscal year end. There are two reasons why I do not use the new grants in the current year instead: first, the whole holdings, not just the new grants, are providing incentives to CEOs; second, accounting performance measures may play a role in determining the new grants and therefore bias the regression results.

The R&D intensity (RD) is measured as a firm's R&D expenditure divided by total sales. I assume a firm's R&D intensity as zero if its R&D expenditure data are missing.

This is a reasonable assumption because insignificant amount of R&D spending is the main reason why the data are missing for many firms. The measure AQ is equal to the total M&A transaction value divided by the firm's fiscal year beginning market value of equity. Table 2 describes the definitions of all the variables used in my regression models.

[Insert Table 2 here]

4.2 The in-process R&D expenditures.

After an acquisition transaction, the acquirer firm sometimes expenses a large amount of the acquisition cost as the target firm's in-process R&D. The in-process R&D expenditure is a part of the acquisition costs. It is allocated to the R&D projects of the target firms which have not yet developed a product ready for sale. Instead of capitalizing this cost as goodwill, the acquirer firms can expense this part of the acquisition cost as in-process R&D charges.

The Compustat database, from which I obtained my data for R&D expenditures, includes in-process R&D in the measure of acquirers' R&D expenditure. However, the impact on managers' incentives from expensing in-process R&D could be very different from expensing the regular R&D expenses. Because non-recurring items such as in-process R&D charges are usually excluded from earnings in valuation and contracting, many acquirer firms expense a large amount of in-process R&D to enhance future years' earnings; this is the so-called "big bath" approach.

Because a firm's compensation policy is relatively stable through time, if a CEO receives high accounting-based pay today, accounting performance measures tend to continue being important in the CEO's future compensation. Therefore, CEOs with more accounting-based pay today has a bigger incentive to use in-process R&D after acquisitions to boost the future accounting performance in order to receive more accounting-based compensation in the future. This incentive introduces a positive correlation between the

current period's accounting-based incentive pay and in-process R&D expenses. Regressing R&D intensity without excluding in-process R&D on a CEO's current period accounting-based compensation may decrease the power of the test and even bias the coefficient against finding results consistent with my hypotheses.

Because the Compustat database does not disclose in-process R&D as a separate item, I hand collect the in-process R&D expenditures from the 10K filings of those firms who have acquisition activities in my research period. I then deduct the in-process R&D from the total R&D as reported by Compustat to obtain the true internal R&D expenses.

4.3 Research Design

As discussed before, there are two possible endogneity problems in the research setting: the one between firms' compensation and innovation policies, and simultaneous determination of "make" and "buy". To address the endogeneity problems, I apply a two-stage-least-squared regression (2SLS) framework.

In designing the compensation contracts that best align managers' and shareholders' interests, the board of directors have to take into consideration the elements that are important in a firm's innovation decisions. Meanwhile, the board also often references the industry benchmarks and adjusts for firm size while constructing the contract (Murphy, 1999). Managers' personal characteristics are also important factors affecting their compensation. Therefore, it's reasonable to use industry average compensation measures, CEO tenure (years served as the CEO for the firm), CEO age, and the variables' squared terms and interactive terms as instrumental variables for the compensation variables.

Because the choice of "make" and "buy" are likely to be simultaneously determined, a firm's R&D investment and acquisitions activities may be closely correlated. However, there are other factors that have direct impact on the level of one investment activity but not on the other. As discussed before, because of the information asymmetry in the financial

market, a firm's R&D expenditure is restricted by the firm's internal financial capability (Himmelberg and Petersen 1994). Because firms can use stocks in acquisition transactions, the constraint on acquisitions from internal cash flow should not be as significant. In the 2SLS regression, I use the measures of financial constraints (CASH, LEV), industry average R&D intensity (RD), and the squared terms of the variables as the instrumental variables. For the acquisition activities, I use the industry average acquisition values (AQ) and its squared term as the instrumental variables.

The first step of the 2SLS regression models are as follows:

First stage:

ACCT = F (Industry average ACCT, CEO tenure, CEO age, squared terms of the variables, interactive terms of the two variables)

STKPPS = F (Industry average STKPPS, CEO tenure, CEO age, squared terms of the variables, interactive terms of the variables)

STKRI = F (Industry average STKRI, CEO tenure, CEO age, squared terms of the variables, interactive terms of the variables)

AQ = F (Industry average AQ, squared term of the variable)

RD = F (Industry average RD, squared term of industry average RD, CASH, LEV)

In the second step, the fitted values from the first step OLS regressions (ACCT, STKPPS, STKRI, AQ, RD) are used as the independent variables.

Second stage:

Model 1.

$$AQ_{it} = \beta_0 + \beta_1 ACCT_{it} + \beta_2 STKPPS_{i,t-1} + \beta_3 STKRI_{i,t-1} + \gamma_1 RD_{it} + \gamma_2 SIZE_{it} + \gamma_3 OWN_{it} + \gamma_4 INST_{it} + \gamma_5 Q_{it} + \gamma_6 ACCT \bullet OWN + \gamma_7 STKPPS \bullet OWN + \gamma_8 STKRI \bullet OWN + \gamma_9 ACCT \bullet INST + \gamma_{10} STKPPS \bullet INST + \gamma_{11} STKRI \bullet INST + Yrdum + INDUST + \varepsilon_{it}$$

Model 2.

$$RD_{it} = \phi_0 + \phi_1 ACCT_{it} + \phi_2 STKPPS_{i,t} + \phi_3 STKRI_{i,t} + \lambda_1 AQ_{it} + \lambda_2 SIZE_{it} + \lambda_3 OWN_{it} + \lambda_4 INST_{it} + \lambda_5 CASH_{it} + \lambda_6 LEV_{it} + \lambda_7 Q_{it} + \lambda_8 ACCT \bullet OWN + \lambda_9 STKPPS \bullet OWN + \lambda_{10} STKRI \bullet OWN + \lambda_{11} ACCT \bullet INST + \lambda_{12} STKPPS \bullet INST + \lambda_{13} STKRI \bullet INST + Yrdum + INDUST + \eta_{it}$$

I test my two hypotheses by examining the signs on β_1, β_3, ϕ_1, and ϕ_3. Both H1 and H2 imply that $\beta_1>0$ and $\phi_1<0$, that is, accounting-based pay encourages acquisitions but depresses R&D intensity, and stock-based compensation lead firms to innovate more through internal R&D instead of acquiring technologies from the outside. H2 also implies that $\beta_3<0$ and $\phi_3>0$, i.e. the risk-taking incentives from stock-based pay should encourage a firm to acquire technology from R&D but reduce the firm's propensity to engage in M&A activities. The variable STKPPS is included in the regression models to control for the impact of pay-for-performance incentive from stock-based pay. The theory does not predict a decisive sign on this variable. If the compensation contract best aligns manager's incentives with those of the shareholders', the relation between this variable and the "make" and "buy" strategies should be zero and the coefficients on this variable in both models should also be zero.

In the face of high CEO ownership or institutional holdings, agency problems in a firm's innovation process may be less severe; therefore, the need for incentives provided by compensation contracts is reduced. Six interactive terms between CEO ownership, Institutional holdings and the compensation variables are included in each regression model to examine these effects. Since CEO and institutional block ownership could diminish the impact from the CEO compensation contract, the signs of the interactive terms should be opposite to the signs of the corresponding compensation variables, that is, $\text{sign}(\beta_1) = -\text{sign}(\gamma_6) = -\text{sign}(\gamma_9)$, $\text{sign}(\beta_2) = -\text{sign}(\gamma_7) = -\text{sign}(\gamma_{10})$, $\text{sign}(\beta_3) = -\text{sign}(\gamma_8) = -\text{sign}(\gamma_{11})$, $\text{sign}(\phi_1) = -\text{sign}(\lambda_8) = -\text{sign}(\lambda_{11})$, $\text{sign}(\phi_2) = -\text{sign}(\lambda_9) = -\text{sign}(\lambda_{12})$, and $\text{sign}(\phi_3) = -\text{sign}(\lambda_{10}) = -\text{sign}(\lambda_{13})$.

4.4 Sample Selection and Summary Statistics

Since the focus of this paper is firms' innovation processes, I sample US firms in the high-tech industries as defined by the SDC mergers and acquisitions database, including

biotech, computer equipment, electronics, communications, and others. Because firm's innovation decisions are usually made from the top level, I only examine the compensation contracts of CEOs, instead of including lower level executives. The data are from the following four different sources: Compustat for financial data, Standard and Poor's Execucomp for compensation data, SDC mergers and acquisitions database for the data of mergers and acquisitions transactions, and Thomson Financial's Spectrum for the institutional ownership.

While using the SDC database, I code firm-years with no record in the database as having no acquisition activities. Because not all SDC records report the M&A transaction value, I exclude from the sample those firm-years with acquisition activities according to SDC but with the transaction values missing. By using M&A transaction values to measure firms' use of "buy" strategy, I assume that all acquisitions in the high-tech industries are for technology purpose. To reduce the noise introduced by this assumption, I require the acquirer firms own at least 5% of the target after the acquisition transactions. The reason of this procedure is that a firm usually needs to have a certain level of control of another firm in order to make use of the firm's technology. My sample period is from 1992 to 2000. The original sample contains 1,414 firm-years of observations with no missing values.

Since the industry average compensation and innovation investment levels are used as instrumental variables in the two-stage-least-squared regressions, to avoid the average being driven by a small amount of firms, I drop all firms in the industries (according to two-digit SIC code) where there are less than 10 observations over my sample period, leaving 1,302 observations in the sample. Because firms in the industry "computer programming, data processing" (three-digit SIC code 737) have the choice of capitalizing their costs of software development under SFAS 86 (FASB 1985), firms in this industry are excluded from the sample in order to increase the power of my analysis. This step leaves 1,198 firm-

year observations in the sample. Because small firms usually don't have the ability to acquire other firms, I also drop all firms with fiscal year-end capital stock less than $100 million, leaving 1,175 observations in the sample. To avoid the results being driven by a handful of outliers, I also delete observations with extreme values in AQ, RD, Q, and CASH (0.5% from each tail).

The final dataset contains 1,140 firm-years of observations representing 356 firms and 358 different CEOs from 23 industries (by two-digit SIC code). In this sample, 286 observations have acquisition transactions recorded in the SDC database. As mentioned before, for these 286 firm-years, I hand-collect the in-process R&D expenses from the firms' 10K filings in order to calculate the true internal R&D expenditures. Among the 286 firm-years, 47 report in-process R&D in its 10K filings. For the 47 firm-years with non-zero in-process R&D, the average in-process R&D as a percentage of total R&D is 24%, ranging from 0.7% to 74%.

One thing worth noticing is the coverage of the SDC database. If SDC does not cover all the acquisition activities, defining AQ as zero when there is no record in SDC will be problematic. I first checked the coverage criteria of the SDC database. According to Thomson Financial, the provider of SDC, the database is very comprehensive in terms of coverage. The sources are: "*over 200 English and foreign language news sources, SEC filings and their international counterparts, trade publications, wires and proprietary surveys of investment banks, law firms and other advisors*". During my research period, which is from 1992 to 2000, deals of any value are covered and both public and private transactions are included.

Second, I checked the change in the goodwill account provided by the Compustat database. In addition to the 286 observations with record in SDC, there are 145 firm-years recording an increase in goodwill. Because the increases in goodwill are usually due to

acquisition activities, this result indicates that SDC misses some acquisition transactions. However, the transactions missed tend to be very small. The average value of SDC-reported acquisitions in my sample is $734 million. For firm-years with an increase in goodwill but no record in the SDC database, the average annual cash outflows related to acquisitions is only $167 million, suggesting that the acquisition transactions not included by SDC are very small ones. Ignoring these small acquisitions introduces errors into the variable AQ, but the errors appear to be random and are not correlated with the research questions. The random errors in the dependent variable AQ should only reduce the power of the test but do not introduce any biases. Therefore, it should be appropriate to use SDC to identify the acquisition transactions.

To construct the variable controlling for institutional ownership (INST), I use the Spectrum database and code firms with no record in this database as having zero institutional ownership. Spectrum database reports stock holdings by financial institutions and the primary source of the database is the institutional investment managers' 13f filings. According to current SEC rules, all institutional investment managers with over $100 million under their control are required to file 13f form. Therefore, the firms that are coded as having zero institutional ownership may be held by small institutional investors (managed asset value under $100 million). As a variable to control for alternative corporate governance mechanism, ignoring these small institutional investors in constructing INST should not create much problem.

The summary statistics for the whole sample is reported in table 3. Also reported in table 3 are the summary statistics of firms adopting "make" and "buy" strategies. I define firms having acquisitions according to the SDC database as in the "buy" group and firms with R&D intensity (R&D to sales ratio) greater than the industry average (industry classification according to the two-digit SIC code) as in the "make" group. From the table,

we can see that, compared with the "buy" firms, the "make" firms use less accounting-based compensation (ACCT), are smaller in size, have more growth opportunity (Q), and are significantly less constrained in terms of internal cash flows (CASH, LEV).

[Insert Table 3 here]

Table 4 provides the Pearson correlation coefficients of the variables. The correlation between the importance of accounting-based incentive pay (ACCT) and the risk-taking incentives from stock-based compensation is negative, and this is in line with the research purpose of studying the relative importance of accounting-based and stock-based pay to CEOs. Bigger firms are less R&D intensive and depend more on incentive-based pay in their CEO compensations – all three incentive-based pay measures (ACCT, STKPPS and STKRI are significantly positively correlated with SIZE).

[Insert Table 4 here]

As mentioned above, the sample contains 356 firms but only 358 different CEOs. Because the sample period spans 9 years, the sample seems to have an unreasonably low CEO turnover. After examining the data selection process, I find that the low CEO turnover is driven by the requirement of the CEO age data. CEO age is used in my 2SLS regression models as an instrumental variable for the compensation measures (ACCT, STKRI, and STKPPS). In the Execucomp database, the age data item is missing for many executives. It is rare for the database to report the age of all CEOs of the same firm.

Standard and Poors does not disclose the criteria they use to record CEO age in the Execucomp database. To examine whether or not this data selection procedure biases my results, I compare the characteristics (accounting-based compensation, stock-based compensation, number of years served for the same company, etc.) of CEOs having the age data with those of CEOs with the age data missing and do not find significant difference. The exclusion of CEOs without the age data item does not correlate with my research

question and will not create significant problem. As a robustness check, I also conduct the 2SLS regression analysis using a dataset where CEO age is not required. Instead of including CEO age as an instrumental variable, in this regression, the only instrumental variables used are CEO tenure and the industry-average compensation measures. This new dataset contains 3,050 firm-year observations, representing 789 firms and 1032 different CEOs. Among the 3,050 firm-years, there are 463 with acquisitions according to the SDC database.

5. Empirical Results

The empirical findings from the 2SLS regressions are consistent with the first hypothesis – more accounting-based compensation tends to encourage technology acquisition activities and depress R&D intensity. Table 5 presents the empirical results from the second stage of the regressions. Results from both the regressions controlling for the industry fixed effect (including industry dummies) and the ones not controlling for the industry effect are reported. Consistent with H1, the correlation coefficient on ACCT in Model 1 are significantly negative and the coefficient on ACCT in model 2 are positive and statistically significant.

[Insert Table 5 here]

The coefficients on ACCT also provide evidence regarding the stock-based compensation. As discussed before, ACCT is by construction negatively correlated with the stock-based compensation a CEO receives. The negative sign in Model 1 and positive sign in Model 2 of ACCT are consistent with Hypothesis 2 that stock-based compensation encourages internal R&D but reduce a firm's propensity to obtain technologies through acquisitions. However, the empirical results regarding the risk-seeking incentives provided by stock options only partially support Hypothesis 2. The risk-seeking incentives from

stock-based compensation are positively correlated with both R&D and acquisition activities. The findings indicate that the risk-seeking incentives from stock-based pay are important in motivating managers to obtain technology from both the "make" and "buy" approaches.

An explanation of the positive correlation between the risk-seeking incentives provided by stock-based compensation (STKRI) and a firm's acquisition activities (AQ) could be that, although acquisitions are in general less risky than internal R&D, they are still means of innovation and therefore relatively risky compared with other operation. As illustrated by Table 1, the return volatilities of firm-years with acquisitions are higher than the sample averages across quartiles. This implies that, although less risky than R&D investment, acquisitions are on average risk-increasing activities. The risk-taking incentives from stock options encourage the managers to seek innovation, resulting in more investments in both acquisitions and internal R&D.

Because a CEO's compensation has an impact on both the level of total investments in innovation and the allocation of these investments, and the first impact could be greater than the latter, running simple regressions like Model 1 and 2 cannot capture the two effects at once. To detect a firm's preference for R&D or acquisitions, we need a model controlling a firm's target level of investment in innovation.

To examine the impact from the alternative governance mechanisms such as CEO ownership and institutional holdings, I also include the interactive terms of the compensation measures and the proxies for these alternative mechanisms. The regressions for Model 2 achieve almost no result. For Model 1, the results imply that these two alternative mechanisms (OWN and INST) significantly reduce the importance of compensation contracts in a firm's decision to acquire other firms. The correlation coefficients on the interactive terms are significantly and of the opposite sign of the coefficients on the

corresponding compensation measures. These results provide further evidence that the CEO compensation contract is deigned to mitigate agency problems in a firm's innovation process.

Table 6 presents the regression results using a dataset where CEO age is not required. In these regressions, the instrumental variables used for compensation measures (STKPPS and STKRI) are the industry average compensation measures and CEO tenure. The results are qualitatively the same as the ones in the Table 5. The only difference is that the correlation coefficient on ACCT in Model 2 (RD is the dependent variable) becomes statistically insignificant when the industry dummies are included in the regression. The decreased significance can be attributed to the dropping of CEO age as an instrumental variable. Losing CEO age as an instrumental variable significantly reduces the R-squared of the first stage regressions in the 2SLS framework. The lowered R-squared decreases the power of the tests and therefore reduces the statistical significance of the correlation coefficients in the second stage.

[Insert Table 6 here]

6. R&D financing organizations

This section addresses the possible concern regarding the empirical results with the existence of R&D financing organizations. First employed in the mid 1970s, R&D financing organizations (RDFO) become a new approach to funding R&D investments by R&D-intensive firms.[3] This approach allows a firm (the sponsor firm) to form a separate organization in order to finance part or all of its R&D activities. Although the new organization is a separate entity, it is totally controlled by the sponsor firm's management. After the new technology is developed by the RDFO, it is sold to the sponsor firm.

[3] The detail about this type of organizations can be found in Beatty, Berger and Magliolo (1995).

This RDFO approach offers tax and financial reporting benefits to the investors and the sponsor firm respectively. The tax benefit is realized by transferring the tax shield of R&D from low marginal tax rate (MTR) firms to high MTR taxpayers. The financial reporting benefits are reflected in a lower level of on-balance-sheet liabilities and higher net income during the technology-development period. These financial reporting benefits may offset the negative impact from R&D (make) with respect to acquisitions (buy) on a manager's accounting-based pay due to the US GAAP treatment. If firms can freely eliminate the GAAP treatment effect on "make or buy" strategies by forming RDFOs, ignoring RDFO formed by the sample firms may pose problems on my regression results. However, these financial reporting benefits don't come without costs. The transaction cost of forming a RDFO may be very high and unjustified by the financial benefits generated through the process, and this high cost can discourage the use of RDFO (Shevlin 1987; Beatty, Berger and Magliolo 1995).

Shevlin (1987) finds support for the tax motivation of forming a RDFO but very little support for other purposes. Beatty, Berger and Magliolo (1995) find that the formations of RDFO are mainly driven by debt-related concerns instead of financial reporting benefits. The findings of these two papers imply that the in-house R&D and RDFO are not perfect substitutes and that the financial reporting considerations around RDFOs are not an important element affecting a firm's decision to finance its R&D activities. In addition, my sample period is from 1992 to 2000, and Beatty, Berger and Magliolo (1995) show that the RDFO formations are concentrated in the early 1980s and became less popular later, partly because the Tax Reform Act of 1986 eliminated most of the tax benefits from the RDFOs. The above evidence suggests that the availability of the RDFO approach to carry out internal R&D would not pose serious questions about my empirical results.

7. Conclusions

By examining the relation between CEO compensation contracts and a firm's choice of obtaining new technology (make or buy), this paper studies a firm's innovation process in a principal-agency framework. The main conclusion is that the various performance measures on which the compensation contract is built play very different roles in determining a firm's approach to innovation. CEOs receiving relatively more accounting-based compensation tend to acquire technology externally instead of growing it internally through R&D; in contrast, when CEO compensation contracts are skewed toward stock-based pay, firms pursue innovation through both approaches.

The accounting performance measures' impact on firms' innovation choices is robust after several sensitivity analyses. The relation between stock-based compensation and firms' choices of "make or buy" is still somewhat unsettled – the risk-taking incentives from stock-based pay seem to motivate both internal R&D investment and acquisition activities. As discussed in section five, to further address this issue, we need a model estimating the cross-sectional variation in firms' target level of investment in innovation, and then we can study the allocation of this investment between "make" and "buy".

This study assumes that all acquisitions made by high-tech firms are for technology purposes. This assumption is likely to introduce noise into the regression analyses. More access to firm-level acquisition data may help to solve this problem.

There has been huge literature trying to explain a firm's innovation process from various angles such as organizational behavior, technology learning process, and risk versus managers' motivation. It would be interesting to further this research in the context of financial market. As discussed in section three, stock market valuation could alter a firm's investment choice. If managers believe that their firm's stocks are relatively over-valued, they might want to get new technology by acquiring other firms using stocks, instead of

investing in internal R&D where they have to pay cash. In their recent paper, Shleifer and Vishny (2003) present a model of mergers and acquisitions based on stock market mis-valuation. One of the key predications of the model is that a firm tends to use stocks as the medium of payment when its stocks are overvalued and cash when undervalued. The further research on the subject could be to extend the model into a firm's innovation process. We may find that when a firm's stocks are relatively undervalued, in addition to switching the medium of payment in acquisitions from stocks to cash, high-tech firms put more effort in growing by R&D investment as opposed to acquisitions.

References

Aboody, D., R. Kasznik and M. Williams, 2000, Purchase versus pooling in stock-for-stock acquisitions: why do firms care? *Journal of Accounting and Economics*, 29, 261-286

Baker, G. P., 1992, Incentive Contracts and Performance Measurement, *Journal of Political Economy*, volume 100, no.3

Beatty, A., P.G. Berger and J. Magliolo, 1995, Motives for forming research & development financing organizations, *Journal of Accounting and Economics*, 19, 411-442

Blonigen, B. and C. Taylor, 2000, R&D intensity and acquisitions in high-technology industries, *The Journal of Industrial Economics*, volume XLVIII, 47-70

Chan, L., J. Lakonishok and T. Sougiannis, 1999, The Stock Market Valuation of Research and Development Expenditures, SSRN Working Paper Series

Core, J and W. Guay, 1999, The use of equity grants to manage optimal equity incentive levels, *Journal of Accounting and Economics,* 28, 151-184

Cheng, S.J., 2004, R&D expenditures and CEO compensation, *The Accounting Review*, Vol. 79, No. 2, 305-328

Francis, J. and A. Smith, 1995, Agency Costs and Innovation: Some Empirical Evidence, *Journal of Accounting and Economics*, 19, 383-409

Gans, J. S. and S. Stern, 2000, Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction, *Journal of economics and management strategy*

Guay, W., 1999, The sensitivity of CEO wealth to equity risk: an analysis of the magnitude and determinants, *Journal of Financial Economics*, 53, 43-71

Hall, B. H., 1988, The effect of takeover activity on corporate research and development", in Auerbach, Alan, J. (ed.) *Corporate Takeovers: Causes and Consequences* (University of Chicago Press for NBER, Chicago)

Healy, P.M., 1985, The Effect of Bonus Schemes on Accounting Decisions, *Journal of Accounting and Economics* 7 (1985): 85-107

Healy, P.M., S.C. Myers and C.D. Howe, 2002, R&D Accounting and the Tradeoff between Relevance and Objectivity, *Journal of Accounting Research 40*, No. 3

Himmelberg, C. P. and B. C. Peterson, 1994, R&D and Internal Finance: A Panel Study of Small Firms in High-tech Industries, *Review of Economics and Statistics*, 76, 38-51

Holmstrom, B., 1989, Agency Costs and Innovation, *Journal of Economic Behavior and Organization*, 12

Jensen, M. C., 1986, Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, 323-29

Jensen, M.C. and R. Ruback. 1983, The market for corporate control: the scientific evidence, *Journal of Financial Economics* 11, 5-50

Jensen, M.C., and W. H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305-360

Kothari, S.P., T.E. LaGuerre and A.J. Leone, 2002, Capitalization versus expensing: Evidence on the uncertainty of future earnings from current R&D investments, *Review of Accounting Studies,* 7, 355-382

Lambert, R., 2001, Contracting theory and accounting, *Journal of Accounting and Economics,* 32 (2001), 3-87

Lambert, R., and D. Lacker, 1987, An analysis of the use of accounting and market measures of performance in executive compensation contracts, *Journal of Accounting Research,* Vol. 25, Supplement 1987

Milgrom, P., and J. Roberts, 1992, *Economics, Organization, and Management.* Prentice-Hall Inc., Englewood Cliffs, NJ.

Murphy, K., 1999, Executive Compensation, in Orley Ashenfelter and David Card (eds.), *Handbook of Labor Economics,* Vol. 3, North Holland

Myers, S. C. and N. S. Majluf, 1984, Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not, *Journal of Financial Economics,* 13, 187-221

Rajgopal, S. and T. Shevlin, 2002, Empirical evidence on the relation between stock option compensation and risk taking, *Journal of Accounting and Economics,* 33, 145-172

Shevlin, T., 1987, Taxes and off-balance-sheet financing: Research and development limited partnerships, *The Accounting Review* 62, 480-508

Shleifer, A., and R. Vishny, 2003, Stock market driven acquisitions, *Journal of Financial Economics,* December 2003

Sloan, R.G., 1992, Accounting earnings and top executive compensation, *Journal of Accounting and Economics,* 16, 55-100

Smith, C.W. and R.M. Stulz, 1985, The Determinants of Firms' Hedging Policies, *Journal of Financial and Quantitative Analysis,* 20, 391-405

Smith, C.W. and R.L.Watts, 1992, The investment opportunity set and corporate financing, dividend and compensation policies, *Journal of Financial Economics,* 32, 263-292

Watts, R.L., and J.L. Zimmerman, 1986, *Positive Accounting Theory,* Prentice-Hall Inc., Englewood Cliffs, New Jersey

Table 1. Monthly return volatilities of firm years with acquisitions versus firm years with high R&D intensity.

The sample is drawn from the high tech industries as defined by the SDC database. Firms with total assets less than 10 million dollars are excluded. The sample period is from 1992 to 2000. The sample used in this table is significant larger than the one used in the regressions. The reason is that this sample does not require compensation data.

The observations are divided into quartiles based on total assets. For each quartile, this table reports the monthly stock return volatilities of firm years with acquisitions versus those with high R&D to sales intensity. The return volatilities of the whole sample are also provided as the benchmark.

Return volatility is defined as the standard deviation of monthly stock returns in a year.

A firm year is classified as having acquisition activities if any one of the following conditions is met in the year: i) it has one or more acquisition transactions recorded in the SDC database, ii) the firm's goodwill account balance increases, iii) the firm's cash outflow related to acquisitions is positive.

A firm year is classified as having high R&D intensity if its R&D to sales intensity is higher than the average R&D intensity of the same quartile. Firm years with missing value in R&D investment are treated as having zero R&D intensity.

Quartile (Based on total assets)	Whole Sample			Firm years with high R&D intensity		Firm years with acquisitions	
	No.of obs.	Avg. Total Assets (MM$)	Avg. Return Volatility	No. of obs.	Avg. Return Volatility	No. of obs.	Avg. Return Volatility
1	2,951	102	13.8%	79	21.6%	533	14.4%
2	2,952	479	10.2%	559	13.1%	661	12.4%
3	2,951	1,824	9.7%	561	12.8%	736	11.6%
4	2,952	25,618	8.9%	693	10.0%	724	10.2%

Table 2. Description of the variables

Dependent variables:	**RD**: Ratio of R&D spending (excluding acquired in-process R&D) to total sales in the current year. **AQ:** The firm's total value of acquisitions in the current fiscal year divided by the fiscal year beginning market value of equity.
Independent variables:	**ACCT:** Proportion of accounting-based incentive pay in the CEO's total compensation. Measured as bonus divided by the total compensation comprised of the following: Salary, Bonus, Other Annual Pay, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Others in the current year. **STKPPS:** The pay-for-performance incentive provided by stock-based compensation. The variable STKPPS is equal to the logarithm of the dollar change in CEO stock and option holdings for 1% change in stock prices. **STKRI:** The risk incentive provided by stock-based compensation. Measured by the logarithm of dollar value change in the CEO's total equity holdings corresponding to 1% increase in the stock price volatility (using Black-Scholes model).
Other variables:	**SIZE**: Logarithm of market value (in millions) at the fiscal year-end. **OWN**: A dummy variable. Equal to 1 if the percentage of the company's common stock owned by the CEO at the beginning of the year is greater than or equal to 5%, 0 otherwise. **TENURE:** CEO tenure. It is equal to the number of years the executive has served as the firm's CEO. **INST:** Institutional ownership. It is equal to the percentage of the company's stock owned by institutional investors. Because the Spectrum database reports institutional ownership by quarter, I use the average of a fiscal year's four quarters' institutional ownership to get the annual measure. **CASH**: Cash plus marketable securities divided by current liabilities **LEV**: Leverage ratio. It is equal to total liabilities divided by total assets. **YEAR**: Year dummies, controlling for the time-varying trend in acquisition activities and R&D intensity from the early to late 1990s. **Q**: Market to book ratio of equity at the fiscal year end (proxy for the Tobin's q)

Table 3. Summary statistics

This table compares the summary statistics of the whole sample (whole), firms with acquisition activities (Buy) and firms with above industry average R&D intensity (Make). The sample is truncated at 0.5% from both tails according to the values of AQ, RD, Q, and CASH. The whole sample contains 1,140 firm-year observations.

Variable (Units)		Mean	Median	Std Dev	Mini	Max
AQ	*Whole*	0.024	0	0.097	0	0.93
	Make	0.034	0	0.457	0	0.93
	Buy	0.142	0.058	0.196	0.0001	0.93
RD	*Whole*	0.085	0.003	0.28	0	2.70
	Make	0.301	0.131	0.51	0.0001	2.70
	Buy	0.073	0.054	0.10	0	0.87
ACCT	*Whole*	0.191	0.17	0.153	0	0.867
	Make	0.180	0.13	0.161	0	0.749
	Buy	0.193	0.16	0.162	0	0.867
STKPPS	*Whole*	12.32	12.26	1.41	7.09	16.73
	Make	12.62	12.54	1.32	9.81	16.40
	Buy	13.02	12.88	1.30	9.90	16.40
STKRI	*Whole*	10.54	10.57	1.30	4.86	13.94
	Make	10.64	10.62	1.18	7.53	13.67
	Buy	10.83	10.77	1.35	7.70	13.94
SIZE	*Whole*	7.37	7.18	1.45	4.62	12.52
	Make	7.31	7.04	1.45	4.65	12.52
	Buy	7.91	7.64	1.66	4.89	12.52
Q	*Whole*	3.80	2.84	3.11	0.45	22.00
	Make	4.77	4.09	3.36	0.59	19.31
	Buy	4.37	3.25	3.54	0.82	21.00
LEV	*Whole*	0.50	0.52	0.20	0.03	0.95
	Make	0.37	0.35	0.19	0.03	0.89
	Buy	0.45	0.46	0.17	0.07	0.87
CASH	*Whole*	0.97	0.24	1.89	0	14.98
	Make	2.48	1.26	2.96	0.009	14.98
	Buy	1.04	0.56	1.52	0	9.88
TENURE	*Whole*	7.73	6	7.05	0	42
	Make	8.67	7	7.96	0	42
	Buy	8.16	6	6.54	0	30
INST	*Whole*	0.47	0.53	0.24	0	0.97
	Make	0.51	0.55	0.22	0	0.93
	Buy	0.55	0.58	0.18	0	0.97
AGE	*Whole*	58.48	59	7.67	38	88
	Make	57.63	58	6.31	44	79
	Buy	58.41	60	6.85	41	88
Annual acquisition value (MM$)	*Buy*	734	102	2,488	0.04	30,611
CEO ownership of the firm (%)	*Whole*	2.35	0.40	4.93	0	42
	Make	2.43	0.44	4.53	0	23.8
	Buy	2.66	0.51	4.82	0	30.7

Table 4. Correlation Matrix

Pearson Correlation Coefficients
(Prob > |r| under H0: Rho=0)

	RD	AQ	ACCT	STKPPS	STKRI	CASH	LEV	Q	SIZE	OWN	AGE	TENURE	INST
RD	1												
AQ	0.01 (0.80)	1											
ACCT	**-0.14** **(0.00)**	-0.04 (0.23)	1										
STKPPS	-0.005 (0.87)	**0.10** **(0.00)**	0.04 (0.14)	1									
STKRI	0.015 (0.61)	0.04 (0.19)	**-0.14** **(0.00)**	**0.53** **(0.00)**	1								
CASH	**0.62** **(0.00)**	0.002 (0.95)	**-0.08** **(0.00)**	**0.07** **(0.00)**	-0.04 (0.14)	1							
LEV	**-0.35** **(0.00)**	-0.01 (0.75)	0.03 (0.40)	**-0.11** **(0.00)**	**0.12** **(0.00)**	**-0.61** **(0.00)**	1						
Q	**0.13** **(0.00)**	**0.02** **(0.53)**	-0.002 (0.93)	**0.41** **(0.00)**	**0.22** **(0.00)**	**0.18** **(0.00)**	**-0.14** **(0.00)**	1					
SIZE	**-0.11** **(0.00)**	**0.04** **(0.19)**	**0.10** **(0.00)**	**0.51** **(0.00)**	**0.63** **(0.00)**	**-0.15** **(0.00)**	**0.17** **(0.00)**	**0.34** **(0.00)**	1				
OWN	**-0.07** **(0.02)**	**0.05** **(0.08)**	0.04 (0.22)	**0.37** **(0.00)**	**-0.22** **(0.00)**	0.02 (0.53)	**-0.06** **(0.03)**	-0.002 (0.95)	**-0.20** **(0.00)**	1			
AGE	**-0.12** **(0.00)**	-0.01 (0.71)	**0.12** **(0.00)**	**0.19** **(0.00)**	0.04 (0.15)	**-0.13** **(0.00)**	**0.08** **(0.00)**	**-0.08** **(0.01)**	**0.09** **(0.00)**	**0.15** **(0.00)**	1		
TENURE	-0.014 (0.65)	0.01 (0.74)	**0.06** **(0.06)**	**0.35** **(0.00)**	**-0.06** **(0.03)**	**0.11** **(0.00)**	**-0.20** **(0.00)**	0.02 (0.49)	**-0.13** **(0.00)**	**0.34** **(0.00)**	**0.40** **(0.00)**	1	
INST	-0.02 (0.55)	**0.08** **(0.01)**	**0.05** **(0.07)**	**0.10** **(0.00)**	**0.12** **(0.00)**	0.006 (0.83)	**-0.05** **(0.09)**	0.04 (0.20)	**0.13** **(0.00)**	**-0.09** **(0.00)**	0.01 (0.81)	-0.01 (0.61)	1

Table 5. The estimated coefficients from the 2SLS regressions

This table reports the results from the second stage of the 2SLS regressions. In the first stage, variables RD, AQ, ACCT, STKPPS and STKRI are regressed on the instrumental variables (CEO age, CEO tenure, industry-average measures). The fitted values are then used in the second stage. The number of observations in this sample is 1,140.

Independent Variables	AQ			RD		
	Predicted Signs	Coefficients (t statistics)	Coefficients (t statistics)	Predicted Signs	Coefficients (t statistics)	Coefficients (t statistics)
INTERCEPT		**-0.18 (-3.17)*** **	-0.10 (-1.51)		**-0.15 (1.71)***	**0.21 (2.36)****
ACCT	+	**0.09 (2.63)*** **	**0.07 (1.85)****	-	**-0.10 (-1.83)****	**-0.09 (-1.47)***
STKPPS	?	-0.002 (-0.36)	-0.007 (-1.49)	?	**-0.02 (-2.89)****	**-0.02 (-3.59)*** **
STKRI	-	**0.014 (2.81)****	**0.012 (2.19)****	+	**0.017 (2.25)****	**0.012 (1.62)***
AQ		-	-	?	**0.10 (2.09)****	0.05 (1.19)
RD	?	**0.04 (1.76)***	-0.04 (-1.04)		-	-
CASH		-	-	+	**0.07 (20.46)*** **	**0.06 (18.23)*** **
LEV		-	-	-	0.02 (0.71)	**0.05 (2.00)****
Q	?	-0.001 (-0.83)	-0.001 (-0.97)	+	**0.006 (3.89)*** **	**0.004 (2.24)****
SIZE	+	0.001 (0.43)	0.002 (0.78)	-	**-0.01 (-2.59)*** **	**-0.01 (-2.42)*** **
OWN	?	0.13 (1.36)	0.054 (0.53)	?	-0.18 (-1.24)	-0.03 (-0.23)
INST	?	0.09 (1.13)	0.058 (0.68)	?	**-0.21 (-1.71)***	-0.12 (-0.98)
ACCT x OWN	-	**-0.19 (-3.87)*** **	**-0.16 (-3.11)*** **	+	0.09 (1.23)	0.06 (0.88)
STKPPS x OWN	?	**0.017 (1.84)***	**0.019 (1.95)****	?	**0.03 (1.81)***	0.01 (0.59)
STKRI x OWN	+	**-0.033 (-4.25)*** **	**-0.028 (-3.46)*** **	-	**-0.02 (-1.73)****	-0.011 (-0.97)
ACCT x INST	-	**-0.11 (-2.41)*** **	**-0.11 (-2.40)****	+	0.03 (0.47)	-0.03 (-0.42)
STKPPS x INST	?	**0.02 (2.34)****	**0.02 (2.47)*** **	?	-0.001 (-0.09)	0.004 (0.39)
STKRI x INST	+	**-0.02 (-3.12)*** **	**-0.02 (-2.94)*** **	-	**0.02 (1.43)***	0.003 (0.32)
Adjusted R^2		3.6%	9.0%		40.4%	49.5%
Industry Fixed Effect		No	Yes		No	Yes

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% respectively (one-tail if there is a predicted sign, two-tail if the predicted sign is ambiguous).

Table 6. The estimated coefficients from the 2SLS regressions dropping CEO age as an instrumental variable

This table reports the results from the second stage of the 2SLS regressions. The regression models are the same as those used in Table 5 except for the instrumental variables used in the first stage for STKRI and STKPPS. The dataset used in this table does not require CEO age data. The instrumental variables used are therefore only CEO tenure and industry-average compensation measures.

Independent Variables	AQ			RD		
	Predicted Signs	Coefficients (t statistics)	Coefficients (t statistics)	Predicted Signs	Coefficients (t statistics)	Coefficients (t statistics)
INTERCEPT		**-0.067 (-2.69)*****	-0.034 (-1.26)		**0.17 (3.23)*****	**0.14 (2.69)*****
ACCT	+	**0.04 (2.32)****	**0.033 (1.65)****	-	**-0.047 (-1.39)***	-0.015 (-0.53)
STKPPS	?	0.002 (0.92)	-0.0004 (-0.16)	?	**-0.018 (-3.91)*****	**-0.013 (-2.95)*****
STKRI	-	**0.004 (1.68)****	0.002 (0.80)	+	**0.008 (1.70)****	**0.006 (1.45)***
AQ		-	-	?	**1.26 (5.63)*****	0.33 (0.62)
RD	?	**0.042 (2.61)*****	-0.021 (-0.90)		-	-
CASH		-	-	+	**0.057 (21.26)*****	**0.052 (22.34)*****
LEV		-	-	-	**-0.031 (-1.82)****	-0.13 (-0.90)
Q	?	-0.0006 (-0.86)	-0.0008 (-1.19)	+	**0.008 (6.28)*****	**0.005 (4.42)*****
SIZE	+	-0.0015 (-1.21)	-0.001 (-0.73)	-	**-0.004 (-1.59)***	**-0.008 (-3.81)*****
OWN	?	0.0004 (0.01)	-0.034 (-0.64)	?	0.13 (1.28)	0.10 (1.26)
INST	?	**-0.076 (-1.92)***	**-0.091 (-2.23)****	?	-0.069 (-0.89)	**-0.15 (-2.53)*****
ACCT x OWN	-	**-0.083 (-2.80)*****	**-0.081 (-2.72)*****	+	0.015 (0.26)	0.03 (0.59)
STKPPS x OWN	?	0.004 (0.94)	0.005 (1.10)	?	-0.0003 (-0.04)	-0.002 (-0.31)
STKRI x OWN	+	**-0.006 (-1.36)***	-0.003 (-0.74)	-	**-0.013 (-1.71)****	**-0.009 (-1.46)***
ACCT x INST	-	-0.007 (-0.32)	-0.0008 (-0.04)	+	-0.036 (-0.83)	**-0.043 (-1.28)***
STKPPS x INST	?	**0.013 (3.37)*****	**0.014 (3.64)*****	?	-0.006 (-0.76)	0.003 (0.49)
STKRI x INST	+	**-0.005 (-1.40)***	**-0.005 (-1.35)***	-	**0.011 (1.67)****	**0.009 (1.74)****
Adjusted R^2		2.6%	4.7%		25.7%	41.7%
Industry Fixed Effect		No	Yes		No	Yes

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% respectively (one-tail if there is a predicted sign, two-tail if the predicted sign is ambiguous).

Chapter Two:

Information Content of Earnings Management:

Evidence from Managing Earnings to Exceed Thresholds

1. Introduction

The accounting literature documents significant discontinuities around zero in earnings, earnings changes, and analyst forecast errors distributions (e.g., Hayn, 1995; Burgstahler and Dichev, 1997; Degeorge, Patel, and Zeckhauser, 1999). These discontinuities provide compelling evidence that firms manage earnings to exceed the three thresholds – zero, last period's earnings, and consensus analyst forecasts.[4] This intriguing phenomenon draws a lot of attention from both academics and regulators (see discussions in Healy and Wahlen, 1999; Dechow and Skinner, 2000).

Academics and regulators tend to interpret the earnings management activities around thresholds as driven by managers' opportunistic incentives. The explanations offered by academics are generally based on contracting or regulatory concerns. For example, Matsunaga and Park (2001) find a significant adverse effect on the CEO's cash bonuses when a firm misses the analyst consensus forecast or last period's earnings. Their findings suggest that CEO compensation contracts depend on managers meeting simple earnings benchmarks. Regulators tend to focus on the capital market consequences (see discussion in Dechow and Skinner, 2000). Regulators appear to believe that managing earnings to beat thresholds can mislead investors and therefore result in erroneous stock responses. For example, the SEC Staff Accounting Bulletin (SAB) No. 99 states that a relatively small misstatement of earnings can be material if 1) it helps a firm to exceed the three earnings thresholds – zero, last period's earnings, and consensus earnings forecasts, or 2) it may result in a significant positive or negative market reaction. I hereafter refer to the hypothesis that the discontinuities around thresholds are caused by managers' opportunistic motivations as the "opportunistic earnings manipulation hypothesis."

[4] Recent papers by Dechow, Tuna, and Richardson (2003) and Beaver, McNichols, and Nelson (2003) attribute part of the discontinuities to reasons unrelated to earnings management, such as the data truncation introduced by the exchange listing requirements and asymmetric tax treatment of profits and losses. Later in this paper, I explore these alternative explanations in my research design.

In this paper, I provide an alternative hypothesis for managers' motives to manage earnings around thresholds. I hypothesize that managers of firms facing severe information asymmetry signal the firms' superior future performance by managing earnings to exceed thresholds. I hereafter refer to this hypothesis as the "signaling hypothesis." The key intuition underlying the signaling hypothesis is that firms without sufficient future earnings growth do not benefit from managing earnings to exceed thresholds. Because managers' reporting discretion is bounded by the accounting regulations, earnings management in the current period reduces future earnings and therefore makes future earnings thresholds more difficult to exceed. As a result, only firms expecting superior future earnings growth can afford to manage earnings to exceed current periods' thresholds. Under the signaling hypothesis, earnings management conveys managers' private information about a firm's future performance and therefore helps bridge the information gap between managers and the capital market.

Summary of the testing method and results: To test the signaling hypothesis, I first examine the cross-sectional variation in managers' earnings management activities around the thresholds. Because the benefit from signaling is greater for firms facing severe information asymmetry, I expect to observe a positive association between managers' earnings management activities around thresholds and the degree of information asymmetry a firm faces. Measuring information asymmetry using firm size, analyst coverage, and a combination of the number of analyst following and the magnitude of forecast errors, I find evidence consistent with the hypothesis. My results show that the discontinuities around thresholds in earnings-related distributions are much more salient for information-strained firms than for firms with better information environments (e.g., higher analyst coverage). The results are also confirmed by using discretionary accruals as a proxy for earnings management.

I then test the credibility of the information content in earnings management by looking at the firms' accounting performance in subsequent periods. The findings are consistent with the notion that earnings management around thresholds provides real information about firms' future performance. Measuring firm performance using the following three years' ROA and annual ROA changes, I compare the future performance of firms that marginally beat the thresholds with that of firms that just miss the thresholds. Firms reporting small profits and small increases in earnings demonstrate superior subsequent performance compared to firms failing to meet the thresholds. This difference in future performance becomes weaker with the improvement of firms' information environments.

The last step of the analysis examines the market reactions to firms' beating or missing the thresholds. My results reveal that, for firms facing high degrees of information asymmetry, the market rewards firms reporting small profits and earnings increases with higher stock valuation compared to those firms that just miss the thresholds. After controlling for earnings levels and earnings surprises, the abnormal returns around the earnings announcement dates of firms reporting small profit or earnings increases are significantly higher than returns of firms just missing the thresholds. However, for firms with low levels of information asymmetry, the market does not react to firms' exceeding or missing the two thresholds – zero and last period's earnings.

The relation between returns and firms' beating or missing thresholds for high information asymmetry firms is unlikely to be driven by market fixation. If the market were to blindly use earnings thresholds to value firms and if managers were to succeed in misleading the market by earnings management, we should observe a return reversal in the subsequent periods. The reversal would most likely happen around future earnings announcement dates, when firms' true performance is revealed. However, I fail to find a reversal of the abnormal returns on the earnings announcement dates one quarter and one

year after the original earnings announcement dates. The higher returns awarded to firms exceeding earnings thresholds appear to be rational responses by the capital market to the information content contained in the earnings management activities.

If the signaling hypothesis does hold, a firm exceeding an earnings threshold through earnings management (e.g. small profit firms with high information asymmetry) will be punished by the market should it misses the earnings threshold in any future period. If firms can predict future earnings with certainty, this punishment should never be observed, because it results from a sub-optimal reporting decision and should not be adopted by any firm in equilibrium. However, in reality, firms could make mistakes in predicting future earnings and we should be able to observe these punishments. An examination of earnings announcement date abnormal returns controlling for firms' earnings paths documents these punishments and provides further evidence of the signaling hypothesis.

Contributions: This paper contributes to the literature in several ways. First, this paper provides an alternative explanation for the discontinuities at the thresholds in earnings distributions. In contrast to the "opportunistic earnings manipulation hypothesis" offered by most previous studies on earnings thresholds, my analysis indicates that managers of information-strained firms manage earnings around thresholds to signal future performance. The economic rationale described in this paper explains the existence of multiple earnings thresholds, which is consistent with the findings of previous research, making my explanation even stronger. Second, this paper recognizes the impact of information asymmetry on managers' motivation to manage earnings, while prior research on the information content of earnings management often overlooks the effect of information asymmetry.

Third, this is the first paper providing an economic rationale underlying the capital market reactions to exceeding or missing the earnings thresholds that is consistent with the

"market efficiency" theory. Previous literature provides evidence that the capital market reacts to firms' beating or missing earnings thresholds (e.g., Barth, Elliott and Finn, 1999; Bartov, Givoly, and Hayn, 2002). As discussed above, regulators use such findings as evidence that managers mislead the market by managing earnings to exceed thresholds. However, as pointed out by Dechow and Skinner (2000), "Academics are unlikely to view earnings management as problematic if it is observable at low cost to capital market participants." It is unconvincing that firms can mislead the capital market and trigger significant market reaction by marginally exceeding simple and highly visible benchmarks such as zero and last period's earnings. Evidence from this paper provides an explanation of these positive market reactions that is consistent with both the market and the managers behaving rationally.

This paper also has implications for standard setters. The findings from this paper challenge regulators' arguments that beating earnings thresholds is intended by managers solely to mislead the market. My evidence indicates that managerial reporting discretion can actually convey useful information under certain circumstances and therefore bridge the information gap between managers and outsiders. Because the cost of managing earnings to exceed thresholds comes from the restriction on managers' reporting discretion, an effective accounting regulatory system is the key for the signaling mechanism to work. However, an excessively strict accounting regulation reduces the value-relevant information contained in earnings.

Outline of the paper: The rest of the paper is organized as follows. The next section reviews previous research and describes the economic rationale underlying the signaling hypothesis of earnings management; the third section develops the testable hypotheses; the fourth section describes the research design; the sample selection and empirical results are presented in the fifth section; and the last section offers the concluding remarks.

2. The Signaling Hypothesis of Earnings Management around Thresholds

This section reviews previous literature regarding the signaling hypothesis of earnings management and describes the economic rationale underlying the signaling hypothesis in the context of beating earnings thresholds.

2.1 Literature Review

Managers' motivation for earnings management was an important subject in accounting research, even before earnings thresholds became a heated topic (Guay, Kothari, and Watts, 1996). Previous literature offers supporting evidence for the two alternative (not necessarily mutually exclusive) hypotheses regarding managers' motives for earnings management. The opportunistic earnings manipulation hypothesis interprets earnings management as a means by which managers or incumbent shareholders can obtain private benefits at the expense of other parties such as shareholders and debt holders (e.g., Healy, 1985; DeFond and Jiambalvo, 1994).

The signaling hypothesis claims that earnings management reveals managers' private information and therefore provides a more timely measure of a firm's future performance. For example, Subramanyam (1996) documents that the market rationally attaches positive value to discretionary accruals. DeFond and Park (1997) find that, concerned with job security and trying to smooth earnings, managers manage earnings according to their expectation of future performance. Altamuro, Beatty and Weber (2003) examine a sample of firms that accelerated revenue recognition and were targeted by a recent SEC regulation (SAB101), and they find that these firms' revenue recognition practices are motivated both by managerial "opportunistic manipulation" incentives and by managers' intention to provide value-relevant information about the firms' future performance to shareholders.

Most prior research examining earnings management's role in conveying value-relevant information uses certain discretionary accrual models. If the underlying accrual

model is mis-specified, it is difficult to draw valid inferences from the empirical results. For example, Subramanyam (1996) acknowledges that the findings in the paper may suffer from the measurement error in the discretionary accruals proxy. DeFond and Park (1997) cannot rule out the selection bias generated in the discretionary accrual measurement process as a potential explanation of their findings. In this paper, I provide additional evidence supporting the signaling hypothesis by testing the hypothesis in the context of managers managing earnings to exceed thresholds. This way of identifying earnings management activities does not depend on any accrual model and is therefore exempt from the measurement error problems associated with almost all widely used accrual models (as discussed in Dechow, Sloan, and Sweeney, 1995, and Guay, Kothari, and Watts, 1996).

2.2 The Economic Rationale Underlying the Signaling Hypothesis of Earnings Management around Thresholds

The reason why managing earnings to exceed thresholds can signal superior future performance lies in the fact that firms without sufficient future growth do not benefit from doing so. Because managers' reporting discretion is limited by the accounting regulations, earnings management in the current period reduces future earnings and therefore makes future earnings thresholds more difficult to beat. If a firm boosts earnings by manipulating accruals upward, the higher current accruals should adversely affect future earnings. If managers manage earnings by real activities such as reducing R&D investment or selling assets, the future profitability will suffer even more than from just using accrual manipulation.

The signaling mechanism can be explained using a simple repeated game framework. Let us assume that investors value firms rationally, using all available information, and there is no credible means of communication between managers and shareholders other than audited financial reports. Because accounting reports usually do not directly provide

information about a firm's future performance, investors may use heuristic earnings benchmarks to judge a firm's future growth. The investors reward a firm with higher valuation if the firm exceeds an earnings threshold and lowers the valuation if it misses the threshold in any future period.

The investors' valuation metrics should achieve a separating equilibrium for firms whose earnings fall short of an earnings threshold: firms expecting good future performance will manage earnings to exceed the threshold and firms with a poor outlook will not. Because making the thresholds in one period and missing the thresholds in another will result in zero net benefit from the capital market, and earnings management activities also involve other direct and indirect costs, only firms anticipating sufficient future earnings growth have an incentive to exceed the current period's threshold via earnings management[5]. This repeated-game nature distinguishes earnings thresholds from a "cheap talk" mechanism where manipulating information does not involve real costs. Therefore, being able to exceed the thresholds through earnings management indicates a promising outlook for the firm's future performance.

The framework assumes that managers are not short-sighted, that is, they care about their firms' market valuation in both the current period and all future periods. This is a reasonable assumption if managers are only motivated by the capital market incentives. Managers are, indeed, usually compensated based on both short- and long-term stock-based performance measures and managers' career concerns also provide incentives against short-sighted earnings management behavior. However, if there exist earnings-based incentives not linked to stock prices, the above assumptions may not hold.

In the latter case, managers may still manage earnings to exceed thresholds, even if

[5] The costs of earnings management can be both direct and indirect, and they may come from various sources. If a firm manages earnings through manipulating operating cash flows, the lowered future profitability imposes a direct cost on the firm. Examples of the indirect costs associated with earnings management are the reduced reliability of earnings, loss of reputation, higher taxes under the circumstances where GAAP is consistent with the tax codes, etc.

doing so leads to a net loss from the capital market. An example of these other incentives could be managers' contracting concerns, such as to avoid breaking earnings-based debt covenants. It is an empirical question whether these other incentives dominate and therefore erode the signaling function of earnings management around thresholds. As evidenced by my empirical results, firms exceeding thresholds via earnings management demonstrate superior future accounting performance, and exceeding earnings thresholds triggers positive market responses around the earnings announcement dates. These findings are in line with the signaling hypothesis, indicating that the contracting concerns are unlikely to be a dominant factor motivating managers' earnings management activities around thresholds.

Examining earnings thresholds to distinguish firm quality is certainly a crude way of valuing firms. It is useful when more sophisticated ways of communication are not available or formidably costly. When a rich supply of credible information in addition to reported earnings is available, the capital market would incorporate this information in its valuation and rely less on earnings in forming expectations about firms' future performance. For example, Bhushan (1989) documents that the marginal information content of earnings announcements decreases with firm size. Because firm size is usually used as a proxy for information environment (e.g., Collins and Kothari, 1989), the finding implies that a better information environment reduces the marginal information content of earnings. With the decrease of information asymmetry between managers and the capital market, the benefit from signaling using earnings management should decrease. Consequently, we should observe less evidence supporting the signaling hypothesis in firms facing a lower level of information asymmetry. Without controlling for the information environment, the tests of the signaling hypothesis are likely to lack power.

Previous research on the information content of earnings management generally overlooks the impact of the information environment. This paper recognizes the crucial role

of the information environment on managers' incentive to convey value-relevant information via earnings management. I provide empirical evidence consistent with the hypothesis that firms with worse information environments are more likely to manage earnings to reach certain earnings thresholds.

Economic theory provides the rationale behind the signaling hypothesis of earnings management around thresholds, but it does not specify which earnings thresholds are the thresholds of choice. Previous literature draws inferences from psychological research, citing people's tendency to process information using reference points, and identifies three important earnings thresholds: zero, last period's earnings, and analyst consensus forecasts. (e.g., Burgstahler and Dichev, 1997; Degeorge et al. 1999).

Unlike the first two thresholds – zero and last period's earnings – analyst consensus forecasts have some special characteristics. First, in the process of beating analyst consensus forecasts, both the reported earnings and the forecasts are subject to manipulation. A firm's tendency to meet or beat consensus analyst forecasts is driven by the incentives of both managers and analysts (see Lim, 2001, for a case of analysts' incentives affecting forecast errors). The interaction between analysts and managers in the earnings reporting process is likely to complicate the tests of the signaling hypothesis of earnings management using analysts' forecasts as a threshold.

Second, unlike with the first two earnings thresholds, in the context of beating analyst forecasts, information asymmetry is not likely to play a major role. For one thing, having analyst coverage is an indication of less severe information asymmetry between managers and the shareholders. In addition, guiding analyst forecasts requires frequent communication between the management and the financial analysts, which also suggests less severe information asymmetry. Matsumoto (2003) shows that firms try to avoid negative earnings surprises by both managing earnings and guiding analyst's forecasts, and firms with higher

institutional ownership are more likely to do so. Because higher institutional ownership is usually associated with a better information environment, her findings indicate that firms manage earnings and expectations to meet or beat analyst forecasts for reasons other than reducing information asymmetry. As discussed above, managing earnings to exceed earnings thresholds is more likely to contain value-relevant information if a firm faces severe information asymmetry. Therefore, exceeding consensus analyst forecasts does not look relevant in this context. For the above reasons, in this paper, I only use the first two earnings thresholds – zero and last period's earnings – to specify earnings management.

3 Development of Testable Hypotheses

I test the signaling hypothesis in three steps. First, I examine the relation between a firm's earnings management activities around the thresholds and the degree of information asymmetry it faces. Second, controlling for the level of information asymmetry, I examine whether a firm who manages earnings to exceed earnings thresholds exhibits higher future accounting performance. Third, I study the market responses to firms' exceeding or missing earnings thresholds and distinguish between the hypothesis that earnings management conveys real information and the hypothesis that the market fixates on reported earnings.

3.1 Firms' information environment and the signaling hypothesis of earnings management

Financial reporting, especially reported earnings, provides critical information to financial decision makers such as shareholders and debt holders. However, as discussed in the previous section, the importance of earnings decreases with the improvement of firms' information environments. As a result, the signaling function of earnings management should increase with the degree of information asymmetry a firm faces. We should observe a positive association between earnings management activities around the thresholds and the

degree of information asymmetry a firm faces.

In this paper, I specify earnings management firms as those exceeding earnings thresholds by a small amount. In an earnings histogram, the earnings management firms are those falling into a few bins to the right of an earnings threshold. This group of firms is hereafter referred to as **TBEAT** firms. I pursue my research questions by comparing this group of firms with those firms that miss the thresholds by a small amount (i.e., firms falling into a few bins to the left of a threshold, hereafter referred to as **TMISS** firms). I focus on the two earnings thresholds: zero and last period's earnings. TMISS firms are good matching samples for my study because these firms have earnings levels very similar to TBEAT firms, and they could have exceeded the thresholds had they just managed earnings a little bit upward. Higher future performance of TBEAT firms compared with TMISS firms would provide compelling evidence for the signaling hypothesis. In addition, if I can find differential market responses to the two groups of firms after controlling for all other characteristics, under the assumption of market efficiency, there must be forward-looking information contained in earnings management. What is more, according to the economic reasoning offered in the previous section, firms release a negative signal about future performance by missing earnings thresholds. Comparing TBEAT firms with TMISS firms instead of alternative matching samples increases the power of my tests.

The following hypothesis examines the relation between firms' information environments and their tendency to manage earnings to exceed the two earnings thresholds. Using the level of discontinuity in the earnings distribution as a proxy of earnings management, I develop Hypothesis 1.1 to test whether firms' earnings management activity changes with the cross-sectional variation in firms' information environments.

Hypothesis 1.1: The discontinuity in the earnings distribution becomes more salient when the level of information asymmetry faced by a firm increases.

Some recent papers question the significance of earnings management in explaining the discontinuity in the earnings distribution. Dechow, Richardson, and Tuna (2003) show that part of the earnings discontinuity at zero is due to the data truncation introduced by the exchange listing criteria concerning earnings. Beaver, McNichols, and Nelson (2003) claim that the asymmetric treatment of income taxes and special items for firms making a profit versus firms making a loss explains a big portion of the discontinuity in the distribution of earnings. Both papers suggest that the earnings distribution is not smooth even if there is no earnings management. Hypothesis 1.1 indirectly addresses these concerns. Because firms listed and incorporated in the U.S. face the same exchange listing requirements, tax codes, and accounting standards, firms with different degrees of information asymmetry should not have significantly different earnings distributions. Hence, if we observe a cross-sectional variation in the magnitude of the discontinuities, these discontinuities are more likely to be caused by earnings management. In addition, I also directly address the concerns regarding the tax treatment's impact on the discontinuities in earnings distributions by re-examining H1.1 using the pre-tax income and operating income instead of the bottom-line net income. The un-reported results are essentially the same as those obtained using the bottom-line net income.

Another way to directly address those concerns is to examine discretionary accruals. The discretionary accruals are measured using the modified Jones model introduced by Dechow, Sloan, and Sweeney (1995). Discretionary accruals are widely used in the literature as measures of earnings management. If the discontinuities in earnings distributions are really due to earnings management (i.e., firms manage earnings to exceed the thresholds), we should observe significantly positive discretionary accruals for TBEAT firms, especially those TBEAT firms that face severe information asymmetry problems. The

following hypothesis is designed to reinforce the results from Hypothesis 1.1 using discretionary accruals:

Hypothesis 1.2: The discretionary accruals of TBEAT firms are significantly positive, and their magnitude increases with the level of information asymmetry a firm faces.

Dechow, Richardson, and Tuna (2003) present evidence that small-profit firms use discretionary accruals to reach the threshold zero. Hypothesis 1.2 extends their study in the following way: I divide TBEAT firms (small-profit firms included) into two groups – firms with and without severe information asymmetry problems – and contrast the two groups' earnings management behavior. I hypothesize that TBEAT firms facing severe information asymmetry problems are more likely to manage earnings to obtain the earnings thresholds, compared with firms facing better information environments. Because Dechow et al. (2003) also find significant positive discretionary accruals for small-loss firms, I examine the discretionary accruals for TMISS firms as well.

3.2 Earnings management and firms' future performance

If the earnings management activities do convey managers' private information about firms' future performance, the expected future performance for firms exceeding earnings thresholds should be higher than for those firms that fail to beat the thresholds. Using ex post measures of ROA and annual ROA changes as proxies for firms' expected future performance, Hypothesis 2.1 is developed to test the information content in earnings management around thresholds.

Hypothesis 2.1: TBEAT firms exhibit higher ROA and ROA changes in the subsequent periods than TMISS firms.

As discussed in the previous subsection, the information content of earnings management should decrease with the improvement of firms' information environments. Going one step further than Hypothesis 2.1, Hypothesis 2.2 is designed to examine the cross-sectional variation of the information contained in earnings management.

Hypothesis 2.2: The difference between future ROA and ROA changes of TBEAT firms and those of TMISS firms is bigger for firms facing more severe information asymmetry problems.

3.3 Market responses to exceeding earnings thresholds by earnings management

If exceeding or missing earnings thresholds conveys value-relevant information for high information asymmetry firms, an efficient market should respond around the earnings announcement dates. There should be a market premium to TBEAT firms compared with TMISS firms, and this premium should increase with the level of information asymmetry faced by a firm. However, the market premium to TBEAT firms is also consistent with the market fixating on reported earnings. If the market is not efficient and fixates on reported earnings using simple benchmarks, managers will also be motivated to engage in earnings management, but this behavior will not provide any real information about the firms' future performance. Under the market fixation hypothesis, the market's responses to earnings announcements should reverse in future periods when investors learn the true future performance of the firms. The following two hypotheses address the market responses to earnings thresholds and distinguish between the market efficiency and the fixation hypotheses.

Hypothesis 3.1: For firms facing severe information asymmetry, ceteris paribus, the abnormal stock returns around the earnings announcement dates are higher for TBEAT firms than for TMISS firms.

Hypothesis 3.2: For firms facing severe information asymmetry, the higher abnormal stock returns experienced by TBEAT firms compared with those by TMISS firms do not reverse on the subsequent earnings announcement dates.

In addition to current period's earnings, the signaling hypothesis predicts that the returns of TBEAT firms should also be related to the firms' past reported earnings. Specifically, the higher stock returns to TBEAT firms should be the most prominent when a firm exceeds a threshold for the first time. And after the firm exceeds the threshold, keeping above the threshold is expected and should not lead to more market rewards. What's more,

firms manage earnings to exceed a threshold should be punished by the capital market should they miss the threshold in any future period. Because according to the signaling mechanism, getting punishment is an off-equilibrium behavior, this punishment should not be observed if firms can predict future earnings with certainty. However, in the real world, a manager may predict future earnings with error and miss an earnings threshold in time t even though he thought he could make it when he managed earnings to exceed the threshold in time t-1. To keep the signaling mechanism credible, the capital market has no choice but to punish these firms. The following hypotheses are designed to examine the relation between earnings announcement day returns and firms' past and current reported earnings (earnings paths).

> ***Hypothesis 3.3:*** For a firm facing severe information asymmetry, if it marginally exceeds an earnings threshold in time t but missed the threshold in time t-1, it should have higher earnings announcement day abnormal stock returns than other firms marginally exceeding the earnings threshold in time t.

> ***Hypothesis 3.4:*** For a firm facing severe information asymmetry, if it reports a loss in time t but reported a small profit in time t-1, it should have lower earnings announcement day abnormal stock returns than other firms reporting losses in time t.

4. Research Design

4.1 Measures of information asymmetry

In this paper, I use three measures to gauge the level of information asymmetry between a firm's management and its investors: firm size, whether or not a firm has analyst coverage, and a measure based on the numbers of analysts following and analyst forecast errors. Firm size is frequently used as a proxy for information environments (e.g., Collins and Kothari, 1989). In my empirical tests, I measure firm size using a firm's market value of equity at the end of the fiscal year. The group of firms with fiscal-year-end market value greater than US $1 billion is regarded as big firms and as having lower levels of information asymmetry. Firms with fiscal-year-end market value less than US $100 million are labeled

as small firms and as facing more severe information asymmetry.

Because firm size is usually correlated with many other firm characteristics, I also use analyst coverage to measure information asymmetry. It has long been documented that information intermediaries play an important role in today's capital market. Firms with analyst coverage have less severe information asymmetry problems than firms without. The second measure of information asymmetry is whether or not a firm has analyst coverage.

As stated above, there may be measurement error while using firm size as a measure of information asymmetry. Because analyst coverage is highly correlated with firm size, using analyst coverage as a measure cannot fully solve the problem. To address this concern, I rank firms into size quartiles, and compare the earnings histogram of firms with analyst coverage with that of firms without analyst coverage in each size quartile.

Even among firms having analyst coverage, the levels of information asymmetry differ. I also construct a measure of the levels of information asymmetry based on analyst forecasts. The first component of the measure is the number of analysts following a certain firm. Firms with more analysts following are regarded as having lower levels of information asymmetry. For each firm year, the number of analysts following the firm (NUMEST) is measured as the maximum number of forecasts issued by different analysts in a month during the 12 months preceding the actual earnings announcement date. The second component of the information measure is the magnitude of analyst forecast errors (SFE). The bigger the absolute value of analyst forecast errors, the worse the firm's information environment. SFE is equal to |EPS-Forecast|/|EPS|, where "Forecast" is measured as the median of the analyst forecasts issued in the month preceding the earnings announcement. I rank firms into quartiles according to their NUMEST and SFE. The firms in the smallest NUMEST quartile and biggest SFE quartile are labeled as "high information asymmetry" firms. Firms falling in the biggest NUMEST quartile and smallest SFE quartile are regarded

as "low information asymmetry" firms.

4.2 Information asymmetry and the signaling hypothesis of earnings management

H1.1 tests information asymmetry's impact on firms' earnings management behavior. I examine the hypothesis by examining the magnitude of the discontinuities in the earnings/earnings changes distributions. The distribution of firms with the highest levels of information asymmetry is compared with the distribution of firms with the lowest levels of information asymmetry. In examining the earnings and earnings changes histograms, I erase the observations with extreme values (roughly 5% on each tail). To determine the bin width in the distributions, I follow the methodology used in Degeorge et al. (1999) and try to be consistent with previous research on earnings thresholds (e.g., Burgstahler and Dichev, 1997). The bin width is set to 0.005 for the earnings distributions and to 0.0025 for the earnings changes distributions.[6]

To form a vigorous statistical test of the difference between earnings distributions of firms facing various levels of information asymmetry, I perform a regression analysis based on the two earnings distributions (firms with high and low degrees of information asymmetry) for each earnings threshold. The OLS regression analysis method is similar to the one used in Altamuro, Beatty, and Weber (2003). For each earnings measure (earnings and earnings changes), I draw histograms for the group of firms facing high levels of information asymmetry and the group of firms with low information asymmetry. I then compare the magnitude of the discontinuity at zero in the two histograms by estimating the following regression model:

$$Diff = \alpha + \beta_1 Info + \beta_2 Threshold + \beta_3 Info \bullet Threshold + e \qquad \textbf{(Model 1)}$$

[6] Degeorge el al. (1999) state that: "Silverman (1986) and Scott (1992) recommend a bin width positively related to the data variability and negatively related to number of observations. For example, one suggestion calls for a bin width equal to $2(IQR)n^{-1/3}$", where IQR is the sample interquartile range (difference between Q3 and Q1) and n is the number of available observations. According to this formula, in the earnings distributions, the big firm sample (market value > $1 billion) should have a bin width of 0.007 and small firm sample (market value < $10 million) should have a bin width of 0.005.

The number of observations used in the regression model is equal to the total number of bins in the two histograms (high information asymmetry firms and low information asymmetry firms). ***Diff*** is calculated based on the method introduced in Burgstahler and Dichev (1997). It is defined as the difference between the actual number of observations and the expected number of observations (the average number of observations of the two neighboring bins) for each bin in the two distributions divided by the estimated standard deviation of the bins in each distribution.[7] ***Threshold*** is an indicator variable that is equal to 1 for the histogram bin just above zero, -1 for the histogram bin just below zero, and zero otherwise. ***Info*** is an indicator variable that is 1 if the ***Diff*** value is drawn from the distribution of the high information asymmetry firms, zero otherwise. H1.1 predicts a positive sign on β_3.

Hypothesis 1.2 is designed to reinforce the results from the first hypothesis. To test the hypothesis, I measure earnings management using discretionary accruals. The modified Jones model is used to estimate the discretionary accruals, and the data in the same industry-year are used to estimate the model parameters for each firm. I estimate the following regression model to calculate nondiscretionary accruals:

$$TA_{it}/A_{t-1} = a_t\,[1/A_{it-1}] + b_{1t}\,[(\Delta REV_{it}-\Delta AR_{it})/A_{it-1}] + b_{2t}\,[PPE_{it}/A_{it-1}] + e_{it} \qquad \textbf{(Model 2)}$$

where, for firm i at time t,
TA_{it} = total accruals, computed following Dechow et al. (1995);[8]
A_{t-1} = total assets;
REV_{it} = total revenues;
AR_{it} = accounts receivable;
PPE_{it}= gross property plant and equipment;
e_{it} = error term.

The above model is estimated using cross-sectional data from firms in the same

[7] As discussed in Burgstahler and Dichev (1997), the estimated variance of the difference is approximately the sum of the variances of the components of the difference. Denoting the total number of observations as N and the probability that an observation will fall into interval i by p_i, the estimated variance of difference between observed and expected number of observations for interval i is $Np_i(1-p_i)+(1/4)N(p_{i-1}+p_{i+1})(1-p_{i-1}-p_{i+1})$.
[8] Total accruals should be equal to the difference between net income (Compustat data172) and cash flows from operations (data308). But because cash flow data are not available before 1987, I compute the total accruals following Dechow et al. (1995). TA = (ΔData4-ΔData1)-(ΔData5-ΔData34- ΔData71)-Data14.

industry (same two-digit SIC code) and the same fiscal year. Discretionary accruals are estimated as the difference between a firm's total accruals and the fitted value of total accruals using coefficient estimates from the above model.

The modified Jones model treats all increase in credit sales as earnings management, and this method may show positive discretionary accruals for growth firms even if these firms have not engaged in earnings management. Because of the limitation of the modified Jones model, I also conduct the same analyses using the industry cross-sectional Jones model. The specification of the Jones model is similar to the modified Jones model, except that the change in sales is not adjusted by the change of accounts receivable. The estimated discretionary accruals using the modified Jones model is denoted as ***Jones***, and the estimated discretionary accruals measured by a variation of the original Jones model is denoted as ***Modjones***.

Hypothesis 1.2 partitions firms into two groups according to their information environment. The hypothesis predicts that, for high information asymmetry firms, the discretionary accruals are significantly positive for firms that just exceed the earnings thresholds (TBEAT firms) and not significantly different from zero for firms just missing the thresholds (TMISS firms). While for firms not facing information asymmetry problems, the discretionary accruals are zero for both TBEAT and TMISS firms.

4.3 Beating thresholds and firms' future performance

H2.1 and H2.2 examine whether exceeding earnings thresholds signals superior expected future performance. I use the subsequent three years' actual ROA and annual ROA changes as proxies for the expected future performance and compare the ROA of TBEAT firms with that of TMISS firms. ROA is defined as net income of the year divided by total assets as of the fiscal year end. ROA change is calculated as the difference of current year's ROA and the previous year's ROA (i.e., ROA change $_t = ROA_t - ROA_{t-1}$).

4.4 Market responses to exceeding earnings thresholds by earnings management

H3.1 predicts that TBEAT firms should, on average, enjoy a higher abnormal return than TMISS firms around earnings announcement dates, and that this premium increases with the level of information asymmetry a firm faces. I test this hypothesis by estimating the following regression model:

$$CAR = \alpha + \beta_1 Info + \beta_2 Pos + \beta_3 Info \bullet Pos + \beta_4 EARNMKT + \beta_5 FE + \beta_6 EARNDIFMKT + Ydummies + e \quad \textbf{(Model 3)}$$

Where for each firm-year observation:

CAR: The three-day cumulative abnormal return measured in the window [-1, +1] around the earnings announcement date. It is equal to the three-day cumulative returns around the earnings announcement date minus the three-day cumulative CRSP value weighted return.[9]

Info: An indicator variable that is equal to 1 if the firm belongs to the group of high information asymmetry firms, zero otherwise. While using analyst coverage as the measure of information asymmetry, it is equal to 1 if a firm does not have analyst following and 0 if a firm does. Using NUMEST and SFE as measures, it is equal to 1 if a firm falls in the lowest quartile of NUMEST and highest quartile of SFE, 0 otherwise.

Pos: An indicator variable that is 1 for the firms exceeding earnings thresholds, 0 otherwise.

FE: Earnings surprises. Equal to actual EPS minus the median of the analysts' earnings forecasts issued in the month preceding the earnings announcement date. This variable is included in the regressions where analyst forecasts are available.

EARNMKT: Earnings divided by the fiscal year beginning market value of equity.

EARNDIFMKT: Earnings changes divided by the market value of equity at the beginning of the fiscal year. This variable is included in the regressions examining the earnings changes distributions and those regressions where analyst forecast errors are not available.

Ydummies: Year dummies controlling for the individual year effect on news contained in earnings announcements.

When whether or not a firm has analyst coverage is used as the measure of information asymmetry, the analyst forecast errors (FE) are not included in the regression analyses because they are not available for more than half of the sample. In this case, I assume that

[9] I also calculate the cumulative abnormal returns using three alternative methods: size matched portfolio adjusted returns, the market model adjusted returns, and the Fama-French three factor model adjusted returns. When estimating the parameters in the market model and the Fama-French three factor model, I use the estimation window from -210 to -61 trading days relative to the event date. Consistent with the findings in Brown and Warner (1985), the empirical results using the alternative abnormal return measures are qualitatively the same as using the simple market adjusted returns.

the expected earnings are equal to last period's reported earnings and use the earnings changes (EARNDIFMKT) as a control variable in lieu of the forecast error.

H3.1 predicts significantly positive signs on both β_3 and $\beta_2 + \beta_3$.

The following regression model is used to test H3.2:

$$CAR_{t+1} = \alpha + \beta_1 Info_t + \beta_2 Pos_t + \beta_3 Info_t \bullet Pos_t + \beta_4 EARNMKT_{t+1} + Ydummies + e$$

(Model 4)

All the variable definitions are the same as in Model 3, except for the time period when the variables are measured. The annual earnings announcement date is denoted as *t*, and *t+1* represents the subsequent earnings announcement dates. The information asymmetry (***Info***) and earnings management measures (***Pos***) are taken from time t, whereas the abnormal stock returns and control variables are from time *t+1*. Unlike in the regression model for H3.1, the analyst forecast error at *t+1* is not included as a control variable. The reason is that inefficient market response could be reflected in inefficient analyst forecasts. If analysts are also misguided at time *t* and correct their mistakes at *t+1*, the inclusion of the forecast errors at time *t+1* will reduce the power of the test. I test H3.2 in both a short window and a long window. In the short window test, *t+1* denotes the first quarterly earnings announcement date subsequent to the annual earnings announcement date. In the long window test, t+1 represents the annual earnings announcement date one year after t. H3.2 predicts non-negative coefficients on Pos_t and $Info_t \bullet Pos_t$.

To test H3.3 and H3.4, I examine the three-day abnormal stock returns around the earnings announcement dates for firms with various earnings paths. I use analyst coverage as the measure of information asymmetry and zero as the earnings threshold in this test. The following table describes the predicted sign and magnitude of the abnormal returns:

Earnings		Abnormal Returns	
Fiscal year t	Fiscal year t-1	Without analyst coverage	With analyst coverage
Small profit	Small profit	zero	zero
Small profit	Loss	Positive	zero
Loss	Small Profit	More negative	zero
Loss	Loss	negative	zero

5. Data and Empirical Results

In this section, I describe the sample selection and empirical results. The empirical results are presented in three steps. The results are generally consistent with the hypotheses. In the first step, I show that there is a positive association between the degree of information asymmetry a firm faces and its earnings management activities around the thresholds. The second step shows that the future accounting performance of firms that just beat the earnings thresholds is higher than that of firms that just miss the thresholds. The third step studies the capital market's responses to the earnings management activities around earnings thresholds.

5.1 Sample selection and summary statistics

I examine the earnings distributions using annual earnings from fiscal years 1980 to 2001. The financial data including earnings are taken from the Compustat annual industrial and research dataset. Earnings numbers used in this study are the bottom line net income (Compustat data172)[10]. The return data are from CRSP. The analyst forecasts are from the I/B/E/S database. Firms reporting exact zero earnings or earnings changes are scarce, and as discussed in Burgstahler and Dichev (1997), it is impossible in many cases to verify whether these data are correct. In the regression analyses for the two thresholds, I exclude firm-year observations with earnings exactly meeting the thresholds. This process reduces the sample size by less than 0.1%.

[10] To address the concern raised by Beaver et al. (2003) that the discontinuity in earnings distributions is largely due to the asymmetric tax treatment of profits vs. losses, I also conduct most of my empirical analysis using the pretax net income (Compustat data 170). The results are essentially the same as using the after tax net income (data 172).

All available observations meeting the minimal data requirements for the respective tests are included in the sample. For tests only requiring basic financial variables such as earnings and firm size, the sample contains 132,239 observations, with 3,866 firm-years reporting small profits (less than 1% of fiscal year beginning market value of equity) and 1,925 reporting small losses. In the same sample, there are 3,443 observations reporting small earnings increases (less than 0.25% of fiscal year beginning market value of equity) and 2,450 reporting small earnings decreases. When discretionary accruals measures are required, the sample size decreases to 108,961. In this sample, numbers of firm-years with small profits, losses, earnings increases, and decreases are 3,298, 1,621, 2,504, and 1,846, respectively. For hypotheses requiring analyst-forecast-based measures, the dataset shrinks to 60,365 observations, with numbers of firm-years reporting small profits, losses, earnings increases, and earnings decreases being 2,360, 1,174, 2,104 and 1,461 respectively.

Table 1 presents summary statistics of the key variables for the whole sample, the group of firms making small profit/losses, and the group of firms making small earnings increases/decreases. Because most variables are highly skewed and with extreme observations in the sample, the mean and standard deviation reported in the table are calculated after winsorizing the sample at 1% on both tails. We can see from the table that small profits/losses firms have roughly the same characteristics as the whole sample, whereas the small earnings increases/decreases firms tend to be bigger in size and more profitable (as measured by earnings and ROA) compared with the whole sample.

[Insert Table 1 here]

Consistent with the findings from Dechow, Tuna, and Richardson (2002), firms falling in the vicinity of earnings thresholds have higher discretionary accruals (Modjones) than the

whole sample.[11] However, the magnitude of discretionary accruals for those that exceed the thresholds is not much bigger than those that miss the thresholds. Later in the empirical tests, we will see that only firms facing high information asymmetry show significant differences in discretionary accruals between threshold-beating and -missing firms.

Table 2 reports the correlation matrix of the whole sample. Because the variables are highly skewed and have extreme outliers in the sample (statistics not tabulated), in addition to the standard Pearson correlation, I also report the nonparametric Spearman correlation. As shown in the table, the measures related to information asymmetry present significant correlation consistent with my assumption. The number of analysts following (NUMEST) and firm size (LNMKT) are positively correlated and standardized forecast errors (SFE) are negatively correlated with NUMEST and LNMKT. Consistent with the findings in previous research, the level of discretionary accruals calculated by using modified Jones or the original Jones model does not differ a lot (the correlation is over 99%).

[Insert Table 2 here]

5.2 Firms' information environments and the signaling hypothesis

5.2.1 Analyses of the earnings histograms

Analyzing the earnings distributions, I find strong evidence consistent with H1.1. There is huge discontinuity around zero in the distributions for the groups of firms facing severe information asymmetry. For firms facing less severe information asymmetry, the discontinuity becomes much weaker. The results from examining the earnings changes histogram are weaker, but generally consistent with the hypotheses.

The test statistics used to test the null hypothesis that the distribution is smooth is the

[11] Note that the mean and median discretionary accruals for the whole sample are negative. This is due to the fact that the intercept in the accrual model is forced to zero. Because discretionary accruals are defined as the residual terms in the regression model, they pick up the value of the intercept. If the model is well specified, the intercept should be equal to zero and the mean discretionary accruals for the whole sample should also be equal to zero. However, if the model does not capture all determinants of accruals, the intercept may not be equal to zero. In the sample used by this paper, the mean discretionary accruals are negative, indicating that there exists a negative intercept in the accrual model.

standardized difference (t statistics) used in Burgstahler and Dichev (1997). It is equal to the difference between the actual number of observations in an interval and the expected number of observations in the interval (average number of observations in its two neighboring intervals), divided by the estimated standard deviation of the difference (see footnote 11 for details about the calculation). Under the null hypothesis that a distribution is smooth, the standardized difference of each bin in the distribution should be equal to 0. If firms try to obtain positive earnings by earnings management, we should expect to see a significantly negative standardized difference for the bin to the left of zero and a significantly positive standardized difference for the bin to the right of zero.

Figure 1 shows the earnings histograms of big versus small firms (the bin width is set to 0.005). The earnings histogram for the whole sample is also provided as a reference. The discontinuity around zero is more salient for the small firm sample (fiscal year end market cap less than US $100 million). The standardized difference is -6.03 for the bin left of zero and 5.51 for the bin right of zero in the small firm histogram. But for big firms (market cap greater than US $1 billion), the discontinuity becomes much weaker (the standardized difference is equal to -2.18 for the bin left of zero and 1.55 for the bin right of zero).

[Insert Figure 1 here]

Using analyst coverage, number of analysts following (NUMEST) and forecast errors (SFE) as measures for information asymmetry, Figures 2 and 3 present similar results as Figure 1. In Figure 2, panel 1 is the earnings histogram of firms without analyst coverage, which shows much more prominent discontinuity around zero compared with the histogram in panel 2 where firms with analyst coverage are included. The standardized difference of the bin left of zero in panel 1 is -5.21 (5.45 for the bin right of zero), while in panel 2 it is -4.02 (2.61).

[Insert Figure 2 here]

[Insert Figure 3 here]

In Figure 3, firm-years in the highest quartile of SFE and lowest quartile of NUMEST are categorized as firms facing information asymmetry. Panel 1 of Figure 3 is the earnings histogram of this group. Panel 2 is the earnings histogram for firm-years in the lowest quartile of SFE and highest quartile of NUMEST. Firms with more severe information asymmetry problem show a bigger kink around zero in the earnings histogram (panel 1). The standardized difference is -8.10 for the bin left of zero in this distribution, and 4.24 for the bin right of zero. This discontinuity almost disappears in the earnings histogram of the firms with more analysts following and smaller forecast errors. The standardized difference for the bin left of zero in this distribution is -2.02 (1.68 for the bin right of zero).

Earnings in the histograms are scaled by the fiscal-year-beginning market value. To address the concerns that my results may be driven by this scaling variable, I consider several alternative bases for scaling. When fiscal-year-end market value and book value of equity are used to scale earnings, the results are qualitatively unchanged. Using total assets to scale earnings, the earnings distribution looks unusual. Although there seems to be a "bump" around zero in the histogram for big firms, it is not the same discontinuity as we expect from earnings management (the test statistics is equal to -1.86 for the bin right of zero when it should be positive in the case of earnings management). In fact, the distribution for big firms looks like two close-to-normal distributions overlapping with each other. This "bump" turns out to be driven by firms in the regulated industries.[12] After taking out firms in the utilities and financial services industries, the "bump" around zero for big firms disappears. But for small firms, the discontinuity in the earnings distribution still exists after the observations from regulated industries are excluded from the sample. The results for the

[12] The regulations in many industries restrict firms' profitability, and financial service firms and utility companies are usually very highly leveraged. Both factors cause regulated firms' ROA to cluster around an unusually low level.

threshold EARNDIFMKT are also not sensitive to the deflator used in the definition of the variables.

Figure 4 addresses the possible measurement error associated with using firm size to measure information asymmetry. The four panels compare histograms of firms with versus without analyst coverage in four size quartiles. We can see that even after controlling for firm size, firms without analyst coverage still demonstrate significantly higher levels of earnings management compared with firms with analyst coverage.

[Insert Figure 4 here]

Table 3 presents the results from the regression analysis testing the relation between the level of information asymmetry and smoothness of earnings distributions. Panel 1 reports the results for the earnings threshold zero. Consistent with Hypothesis 1.1, the coefficient on the interactive term "Info • Threshold" is significantly positive using all three measures of information asymmetry. The results indicate that firms facing severe information asymmetry problems are more likely to manage earnings to obtain positive profit.

[Insert Table 3 here]

Figures 5, 6 and 7 present the earnings changes histograms (the bin size is set to 0.0025). The results are much weaker than those from examining earnings histograms, but we can still see that the discontinuity around zero is more salient for small firms than for big firms. For the big firm sample, the t statistics testing the smoothness of earnings changes distributions is -2.11 for the bin left of zero (1.37 for the bin right of zero). For small firms, it is -2.38 (2.88). Using analyst coverage to measure information asymmetry, there is no significant difference. The standardized differences for the bins left of zero and right of zero are -2.00 and 2.35 in the histogram for firms with analyst coverage. The two statistics are -2.45 and 1.88 in the histogram for firms without analyst coverage. Using analyst following and forecast errors as measures for information asymmetry, I find results consistent with the

hypothesis. The t statistics for the bin left of zero is -3.16 (3.88 for the bin right of zero) for firms falling in the lowest quartile of NUMEST and highest quartile of SFE, and is -2.08 (1.48) for firms falling in the highest quartile of NUMEST and lowest quartile of SFE.

Panel 2 of Table 3 presents the regression results examining the earnings increase threshold. Three measures of information asymmetry are used in the tests: firm size, analyst coverage, and a combination of NUMEST and SFE. The coefficients on the interactive terms are positive for two out of the three regressions using different information asymmetry measures, but none of the coefficients is statistically significant.

[Insert Figure 5, 6, and 7 here]

5.2.2 Discretionary accruals for TBEAT and TMISS firms

H1.2 addresses the concern that the discontinuities in earnings and earnings changes distributions may be caused by factors other than earnings management. This hypothesis examines the discretionary accruals for TBEAT and TMISS firms facing different levels of information asymmetry. The results from testing this hypothesis reinforce those from testing H1.1. Tables 4 and 5 present the empirical results. Because the discretionary accruals are highly skewed in the sample (the skewness measure for the whole sample is equal to 22) and have extreme values, I report both the mean and median discretionary accruals for each firm group. I also report the test statistics for the sign of both the mean (t test) and the median (sign test and signed rank test) discretionary accruals. The evidence is consistent with earnings management being a main cause of the discontinuities in the earnings histogram. The findings also support the notion that firms facing higher levels of information asymmetry are more likely to manage their earnings to reach the threshold, and firms with less severe information asymmetry problems are likely to report earnings close to the thresholds simply by law of probability.

[Insert Table 4 and 5 here]

From Table 4 panel 1, we can see that, among firms making small profits, the group with the most severe information asymmetry problems demonstrates higher discretionary accruals than firms facing low degrees of information asymmetry. Both the mean and median discretionary accruals for all the three high-information-asymmetry groups are positive. In addition, the positive mean discretionary accruals for the small firm group and the no-analyst-coverage firm group are statistically significant. Given that the mean and median discretionary accruals for the whole sample are negative, the significantly positive discretionary accruals provide strong support for the notion that these firms achieve positive profits by managing earnings. However, among firms facing less severe information asymmetry, the median discretionary accruals are negative for all three groups and significantly negative for firms with analyst coverage and firms with high SFE and low NUMEST.

Because previous literature also finds significantly positive discretionary accruals for small-loss firms, I also calculate the discretionary accruals for these firms (see Table 4, panel 2). In my sample, the mean and median discretionary accruals reported by the small-loss firm groups are either not significantly different from zero or significantly negative.

Table 5 presents the discretionary accruals for firms reporting small earnings increases/decreases. The evidence from using the second threshold – last period's earnings – is much weaker than that from using the first threshold. However, we can still see that the median discretionary accruals of high information asymmetry firms are higher than those of firms facing less severe information asymmetry, which indicates that firms facing higher degrees of information asymmetry are more likely to achieve the current earnings levels by earnings management.

To address the concerns associated with using the modified Jones model to measure discretionary accruals, I also redo all the above tests using the industry cross-sectional Jones model. The results are essentially the same.

5.3 Earnings management and firms' future performance

Table 6 reports the ROA and annual ROA changes in the three years following the annual earnings announcement date for the TBEAT firms and TMISS firms. Because ROA and ROA changes are highly skewed (the measures of skewness are equal to -131 and 85 respectively) and have extreme outliers, I report the median and the upper and lower quartiles. Table 6 also reports the P values of the nonparametric median test assessing the difference between the median discretionary accruals of TBEAT firms and those of TMISS firms.[13] Because small-profit firms by definition start with a higher ROA than small-loss firms, I also report the ROA at year *t* as a benchmark.

[Insert Table 6 here]

Consistent with Hypothesis 2.1, the results suggest that firms that manage earnings to report positive profit and increases in earnings exhibit superior performance in the subsequent periods, compared to firms missing these thresholds by a small amount. For both earnings thresholds, the ROA of TBEAT firms significantly surpasses that of TMISS firms in all three years. Although small-profit firms start with a higher ROA than small-loss firms at year *t*, the ROA gap between these two groups of firms is widened in the following years. These findings are inconsistent with the "opportunistic earnings manipulation hypothesis," in which TBEAT firms should show lower future performance because of the reversal of the

[13] The nonparametric median test is the two-sample equivalent of the one-sample sign-test. Unlike the Wilcoxon signed rank test, where the two samples are assumed to have identical distributions under the null hypothesis, the median test does not depend on any assumptions other than the null hypothesis that the medians of the two samples are equal. An unreported analysis of the TBEAT firms and TMISS firms reveals that the future ROA of TMISS firms are much more volatile than TBEAT firms. Therefore, the two samples being compared may not have similar distributions. The median test seems to be more appropriate in this context. The median test is relatively crude and insensitive compared with other tests. However, because there are so few assumptions, a statistically significant result is very convincing.

managed portion of earnings. Comparing the subsequent annual ROA changes of TMISS and TBEAT firms, we can also observe that TBEAT firms exhibit higher performance in the subsequent years than TMISS firms.

Table 7 reports the subsequent three years' performance for firms facing various levels of information asymmetry. Again, firm size, analyst coverage, and a combination of SFE and NUMEST are used to measure the level of information asymmetry. The first panel reports the future ROA and ROA changes for firms reporting small profits and losses in various information asymmetry groups. Consistent with Hypothesis 2.2, the evidence shows that firms with higher degrees of information asymmetry report a bigger and more consistent positive difference between the future accounting performance of TBEAT firms and TMISS firms. The positive correlation between the performance difference and the degree of information asymmetry indicates that firms facing more severe information asymmetry are more likely to signal their future performance by managing earnings to exceed thresholds. Panel 2 of Table 7 presents the results for the second threshold, last period's earnings. Using firm size and analyst coverage as information measures, I find results generally consistent with Hypothesis 2.2. However, when SFE and NUMEST are used as measures of information asymmetry, the difference between ROA and ROA changes of TBEAT firms and TMISS firms does not monotonically increase with the degree of information asymmetry. The results suggest that, when analyst forecasts are available, the signaling effect of the second threshold – last period's earnings – becomes much weaker.

[Insert Table 7 here]

5.4 Market responses to exceeding earnings thresholds by managing earnings

After establishing the link between earnings management and future performance, I examine the market responses in this section. Table 8 presents the regression results from testing Hypothesis 3.1. Because most of the independent variables in the regression models

are highly skewed and have extreme outliers, I drop all observations in the top and bottom 1% of the sample according to the value of the independent variables in order to increase the power of my test and avoid erroneous results driven by outliers.[14] Panel 1 of Table 8 reports the testing results regarding the first earnings threshold, zero. The regression analysis is conducted twice using two measures of information asymmetry: the first one is whether or not a firm has analyst coverage; the second measure is constructed based on both NUMEST and SFE. The second measure requires that a firm have at least one analyst following. Consistent with the hypothesis, the coefficient on the interactive term of Pos and Info is significantly positive in both regressions. Since the coefficient on Pos is not significantly different from zero, the results indicate that exceeding the earnings threshold zero gains higher market returns only if the firm faces a high level of information asymmetry.

[Insert Table 8 here]

Panel 2 of Table 8 presents the regression results regarding the second earnings threshold – last period's earnings. Using analyst coverage as a measure of information asymmetry, I find strong evidence supporting Hypothesis 3.1: the coefficient on the interactive term of ***Pos*** and ***Info*** is significantly positive. The results become much weaker when I restrict my focus to firms with analyst following and use the second information asymmetry measure: the coefficient on the interactive term is not significantly different from zero.

If we assume that the capital market is efficient, the above empirical results indicate that managing earnings to exceed thresholds, especially the threshold zero, does convey value-relevant information to investors. In addition, the information content of earnings management increases with the level of information asymmetry. However, these findings are also consistent with the notion that the market fixates on reported earnings and that this

[14] The unreported tests using the whole sample get results qualitatively the same.

earnings fixation increases with the degree of information asymmetry. Under the market fixation argument, the market's responses to earning announcements should reverse in the future period when investors learn the true earnings. Hypothesis 3.2 is developed to distinguish between the market efficiency theory and the market fixation argument.

Table 9 presents results regarding the earnings threshold of zero. Panel 1 examines the returns around the first quarterly earnings announcement date following the annual earnings announcement when the threshold is beaten. Panel 2 examines the first annual earnings announcement date following the original earnings announcement. The coefficients on the dummy variable Pos and on the interactive term are non-negative in all regressions, indicating that the positive returns enjoyed by threshold-beating firms do not reverse in the subsequent periods. The findings are consistent with the notion that the earnings management activity around zero conveys value-relevant information, and the higher market returns enjoyed by the TBEAT firms do not result from market fixation.

[Insert Table 9 here]

Table 10 shows results regarding the second threshold, last period's earnings. Consistent with my hypothesis, the tests do not find significantly negative coefficients on either the indicator variable Pos or the interactive term.

[Insert Table 10 here]

Table 11 reports the abnormal stock returns for firms with various earnings paths. Consistent with H3.3, for firms facing high information asymmetry, the positive stock returns to TBEAT firms are the most prominent when the firms exceed the threshold after reporting a loss in the previous year. For firms keep reporting small profits, the market does not response to the earnings threshold any more, i.e. the abnormal returns are not significantly different from zero. The results are also consistent with H3.4. For firms without analyst coverage (high information asymmetry firms), the negative stock returns are

the most prominent when the loss firms reported small profits in the previous fiscal year. The median abnormal returns is -0.86% for firms reporting a small profit in time t-1 but a loss in time t, whereas the median abnormal returns for loss firms that reported a loss in the previous period is only -0.72%. In addition, this -0.86% negative abnormal returns more than offset the positive returns rewarded by the market when the firm exceeds the earnings threshold for the first time (0.84%), indicating that firms that cannot keep exceeding the thresholds do not benefit from earnings management.

[Insert Table 11 here]

6. Conclusions

This paper finds that firms' earnings management activities around thresholds contain managers' private information about firms' future performance. Lacking other means of communication between the management and the market, investors in information-strained firms view financial earnings as a critical information source and use heuristic cutoff points to judge firms' future performance. Because earnings management in the current period reduces future earnings and therefore makes future earnings thresholds harder to reach, and earnings management also involves many other costs, only firms anticipating sufficient future growth benefit from managing earnings to exceed thresholds. As a result, managers can convey their private information by managing earnings to exceed thresholds.

My empirical results reveal that firms facing severe information asymmetry problems are more likely to manage earnings to exceed thresholds, and their earnings management practices also contain more information about the firms' future performance. Further study of returns shows that the capital market recognizes the information content of earnings management and rationally incorporates it in setting prices. The evidence from studying the first earnings threshold – zero – provides strong support for the signaling hypothesis.

Although the empirical results from analyzing the second earnings threshold – last period's earnings – are much weaker, they are generally consistent with the signaling hypothesis.

The findings of this paper have implications for both academics and standard setters. This paper provides an economic rationale for the earnings management activities around earnings thresholds that is consistent with both the market participants and the managers behaving rationally. The ability of earnings management to signal future performance does not discount accounting regulation's role in improving the transparency of accounting information. On the contrary, appropriate accounting regulation is key for the signaling mechanism to work. Only when managers' reporting discretion is effectively limited by accounting regulations, can the separating equilibrium of earnings management activities around thresholds be sustainable. One implication of this paper is thus that overly strict accounting rules could reduce the value-relevant information contained in reported earnings.

REFERENCES

Altamuro, J., A. Beatty, and J. Weber. 2003. Motives for early revenue recognition: evidence from SEC staff accounting bulletin (SAB) 101. Working paper, Massachusetts Institute of Technology

Bartov, E., D. Givoly, and C. Hayn. 2002. The reward to meeting or beating earnings expectations. Journal of Accounting and Economics 33, 173-204

Barth, M.E., J. A. Elliott, and M. W. Finn. 1999. Market rewards associated with patterns of increasing earnings. Journal of Accounting Research 37, No. 2, Autumn 1999

Beatty, A., B. Ke, and K. Petroni. 2002. Differential earnings management to avoid earnings declines and losses across publicly and privately held banks. The Accounting Review, July 2002

Beaver, W.H., M.F. McNichols, and K.K. Nelson. 2003. An alternative interpretation of the discontinuity in earnings distribution. Working paper, Stanford University

Brown, S.J., and J.B. Warner. 1985. Using daily stock returns – the case of event studies. Journal of Financial Economics, 14, 3-31

Burgstahler, D. and I. Dichev. 1997. Earnings management to avoid earnings decreases and losses. Journal of Accounting and Economics 24, 99-126

Bhushan, R., (1989), Firm Characteristics and Analyst Following. Journal of Accounting and Economics, 11, 255-274.

Collins, D.W. and S.P. Kothari. 1989. An analysis of the intertemporal and cross-sectional determinants of earnings response coefficients. Journal Accounting and Economics 11, 143-181

Dechow, P.M., S.A. Richardson, and I.A.Tuna. 2003. Why are earnings kinky? An examination of the earnings management explanation. Review of Accounting Studies 8, 355-384.

Dechow, P.M. and D.J. Skinner. 2000. Earnings management: Reconciling the views of accounting academics, practitioners, and regulators. Accounting Horizons 14 No. 2, 235-250

Dechow, P.M., R.G.Sloan, and A.P. Sweeney. 1995. Detecting earnings management. The Accounting Review 70, 193-225

DeFond, M.L., and J. Jiambalvo. 1994. Debt covenant violation and manipulation of accruals. Journal of Accounting and Economics 17, 145-176

DeFond, M.L., and C. W. Park. 1997. Smoothing income in anticipation of future earnings. Journal of Accounting and Economics 23, 115-139

Degeorge, F., J. Patel, and R. Zeckhauser. 1999. Earnings management to exceed thresholds. Journal of Business, 72, 1-33

Dichev, I. and D. J. Skinner, 2001. Large-sample evidence on the debt covenant hypothesis. Journal of Accounting Research, Vol 40, No. 4, September 2002

Fama, E. 1998. Market efficiency, long-term returns, and behavioral finance. Journal of Financial Economics, 49, 282-306.

Guay, W., S.P. Kothari, and R.L. Watts, 1996. A market-based evaluation of discretionary-accrual models," Journal of Accounting Research, 34, Supplement 83-105

Hayn, C., 1995. The information content of losses. Journal of Accounting and Economics 20, 125-153

Healy, P.M., 1985. The effect of bonus schemes on accounting decisions. Journal of Accounting and Economics 7, 85-107

Healy, P.M., and J.M. Wahlen. 1999. A review of the earnings management literature and its implications for standard setting. Accounting Horizons 13: 365-383

Krishnaswami, S. and V. Subramaniam, 1999. Information asymmetry, valuation, and the corporate spin-off decision. Journal of Financial Economics 53, 73-112.

Levitt, A.L. 1998. Remarks by Chairman Arthur Levitt. Security and Exchange Commission. The "Numbers Game". NYU Center for Law and Business, New York, NY. <http://www.sec.gov/news/speech/speecharchive/1998/spch220.txt>

Lim, T. 2001. Rationality and Analysts' Forecast Bias. Journal of Finance 56, 369-385.

Matsumoto, D., 2002. Management's incentive to avoid negative earnings surprises. The Accounting Review, 77, 483-514

Matsunaga, S.R. and Park, C.W., 2001. The effect of missing a quarterly earnings benchmark on the CEO's annual bonus. The Accounting Review 76, 313-332

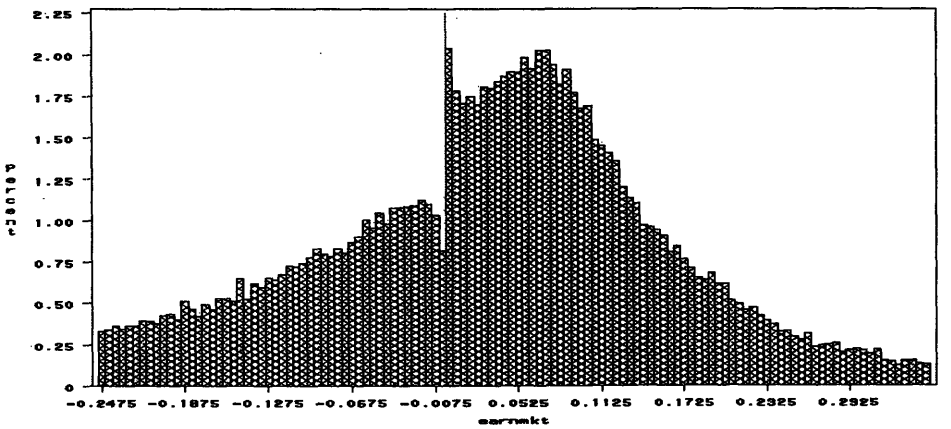
Securities and Exchange Commission, 1999. Materiality. Staff Accounting Bulletin No. 99 (August 12th)

Subramanyam, K.R. The price of discretionary accruals. 1996. The pricing of discretionary accruals. Journal of Accounting and Economics 22, 249-281.

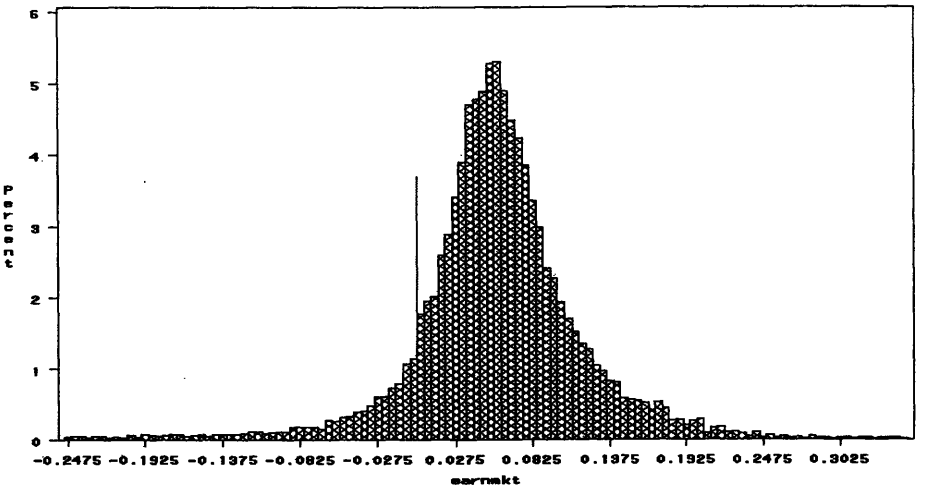
Figure 1. Earnings histograms grouped by firm size (fiscal year end market value).

Earnings are scaled by fiscal year beginning market value of equity (bin size=0.005).

Panel 1. Firm-year from 1980-2001 with fiscal year end market value less than $100 million



Panel 2. Firm-years from 1980-2001 with fiscal year end market value greater than $1 billion



Panel 3. All firm years from 1980-2001

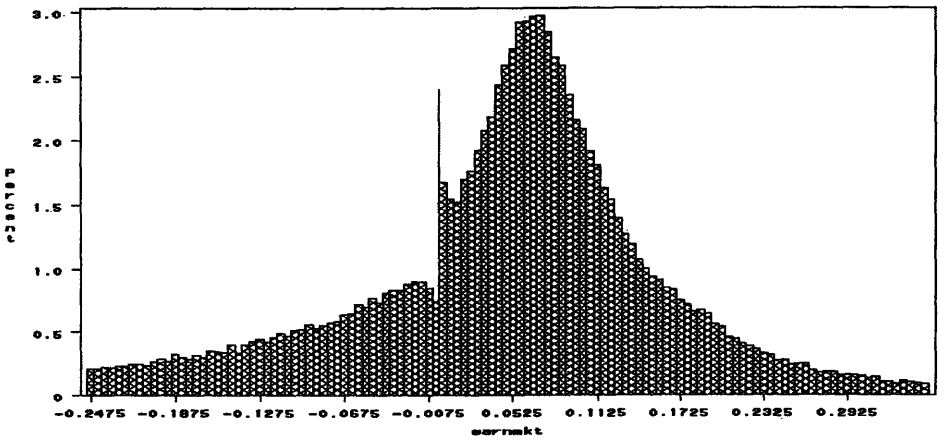
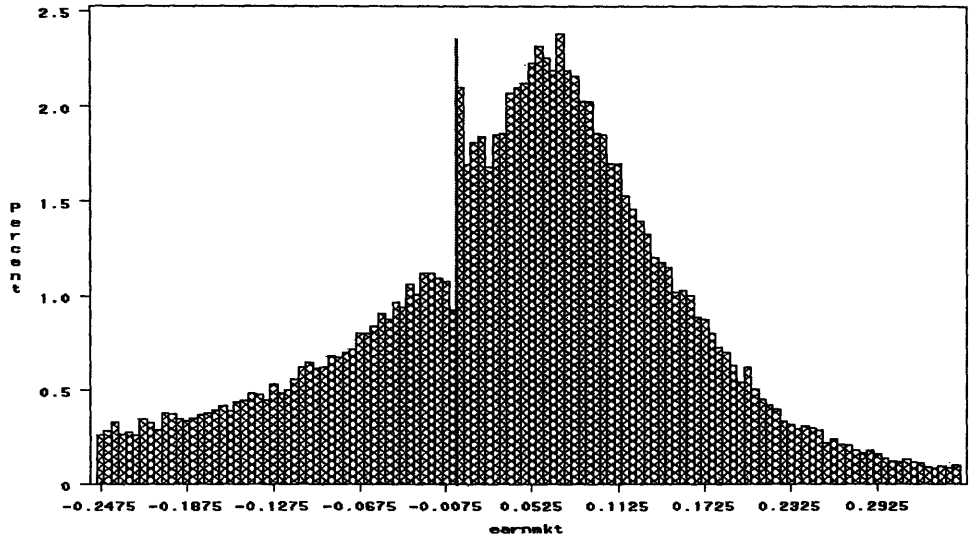


Figure 2. Earnings histogram grouped by analyst coverage.
Earnings are scaled by fiscal year beginning market value of equity (bin size=0.005).

Panel 1. Firm-years with no analyst coverage



Panel 2. Firm years with analyst coverage

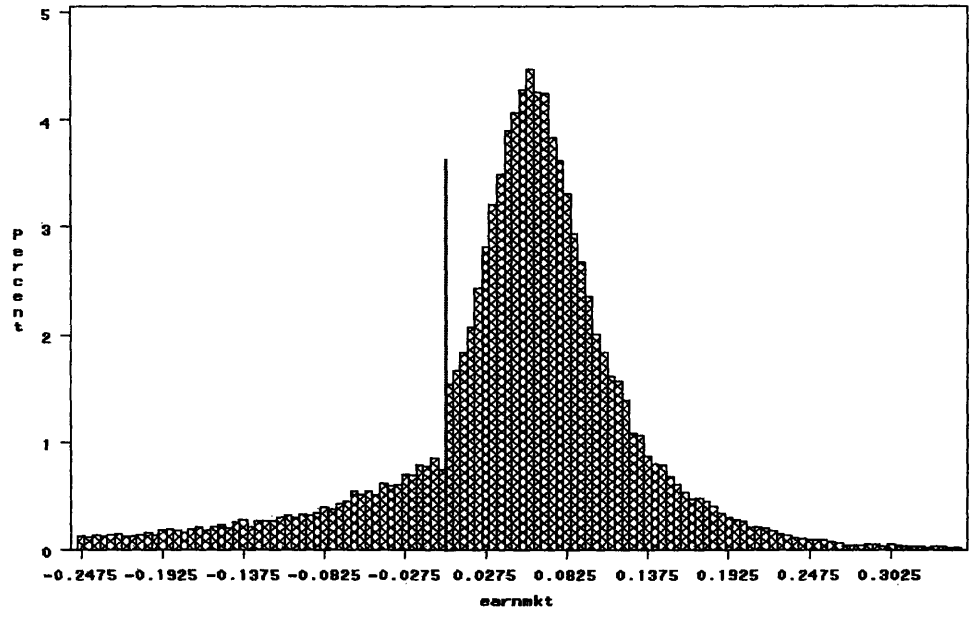
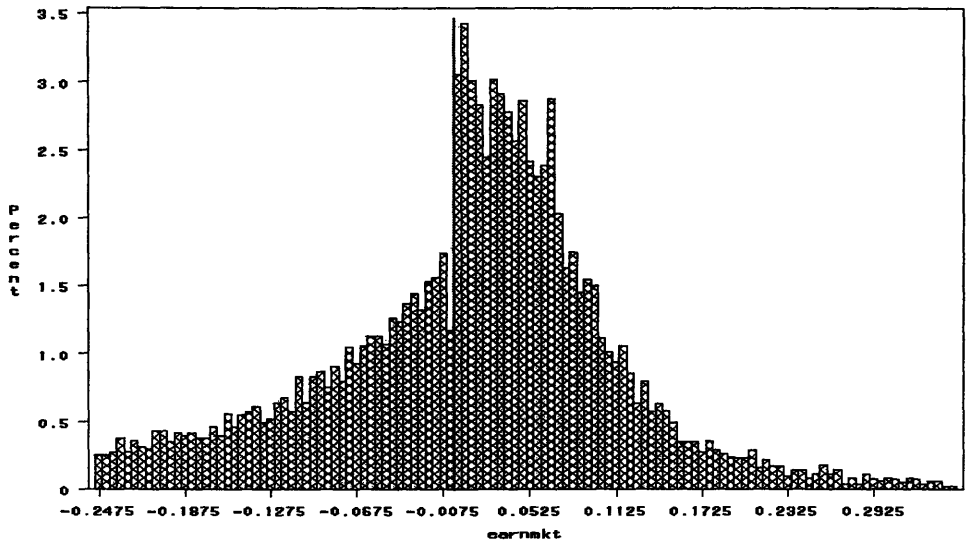


Figure 3. Earnings histograms grouped by absolute analyst forecast errors and number of analyst following.
Earnings are scaled by fiscal year beginning market value of equity (bin size=0.005).

Panel 1. Firm-years with number of analyst following in the lowest quartile and absolute analyst forecast error scaled by actual earnings in the highest quartile



Panel 2. Firm years with number of analyst following in the highest quartile and absolute analyst forecast error scaled by actual earnings in the lowest quartile

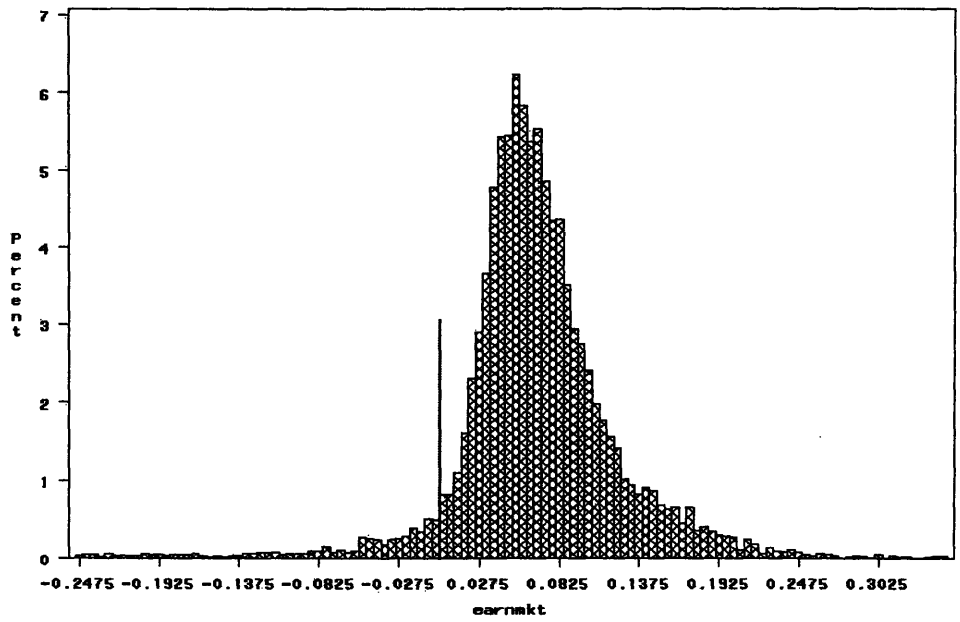
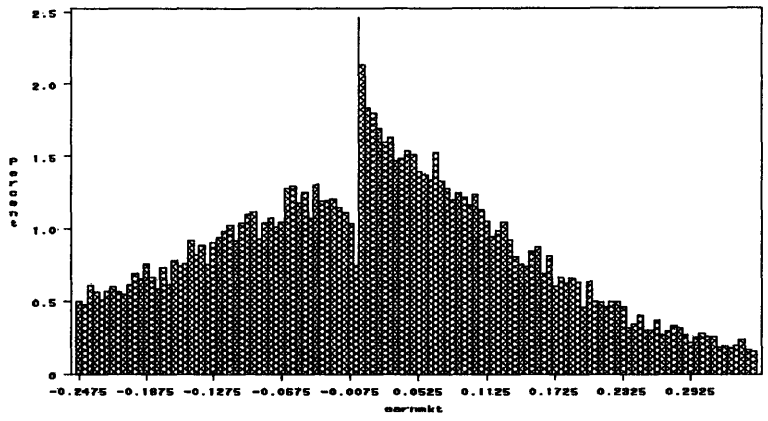


Figure 4. Earnings histograms for firms with and without analyst coverage in each size quartile.
Firms are ranked into quartiles according to the market value of equity at the fiscal year end. The t statistics for the bin immediately left of zero (immediately right of zero) testing the smoothness of the distributions are reported below each graph.

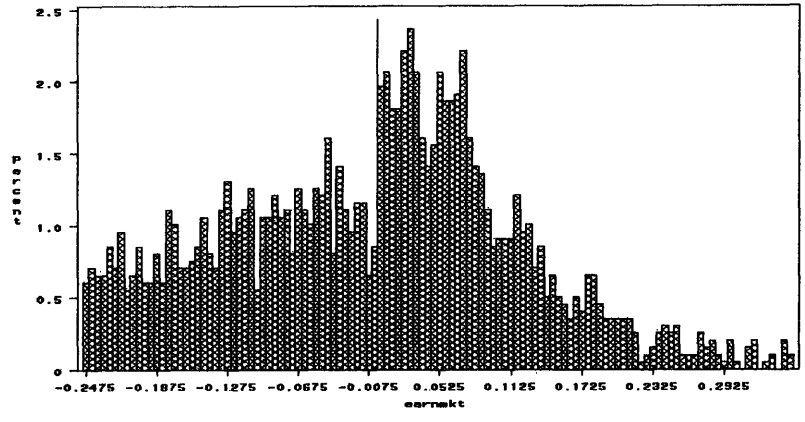
Panel 1. Bottom size quartile

Firms without analyst coverage



t = -6.68 (5.82)

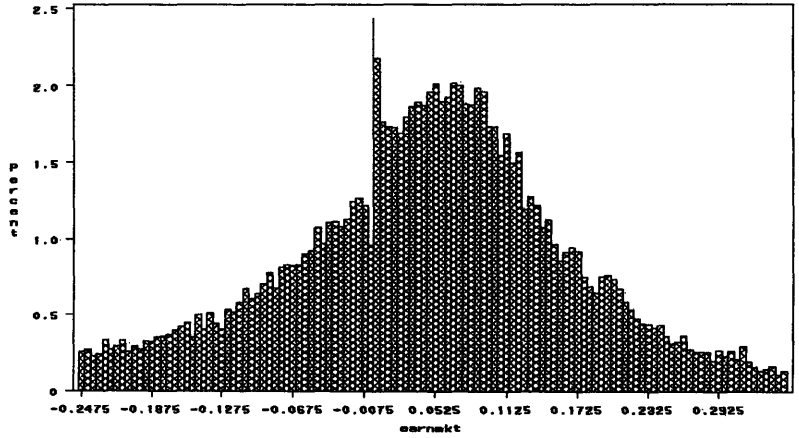
Firms with analyst coverage



t = -3.65 (3.66)

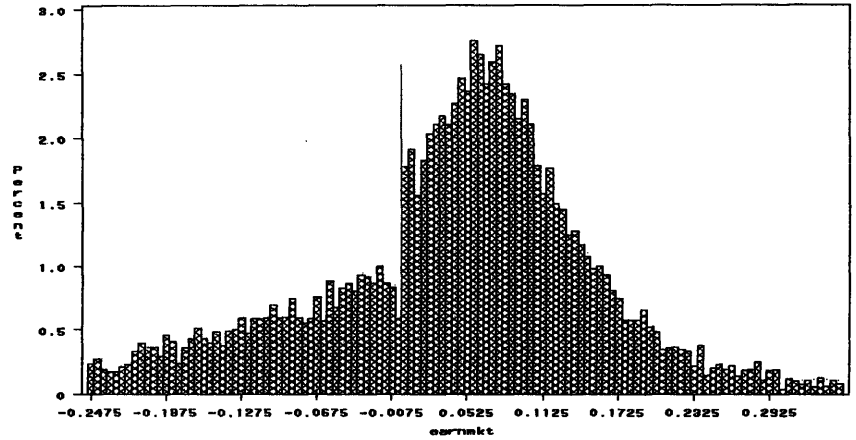
Panel 2. Second size quartile

Firms without analyst coverage



t = -5.49 (5.42)

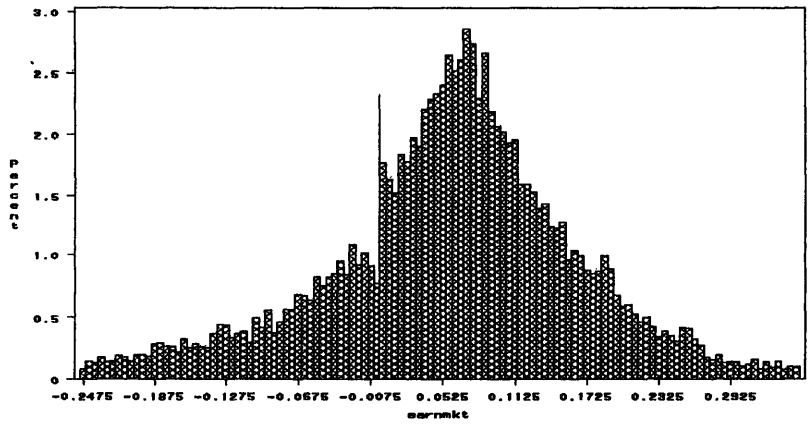
Firms with analyst coverage



t = -6.44 (3.96)

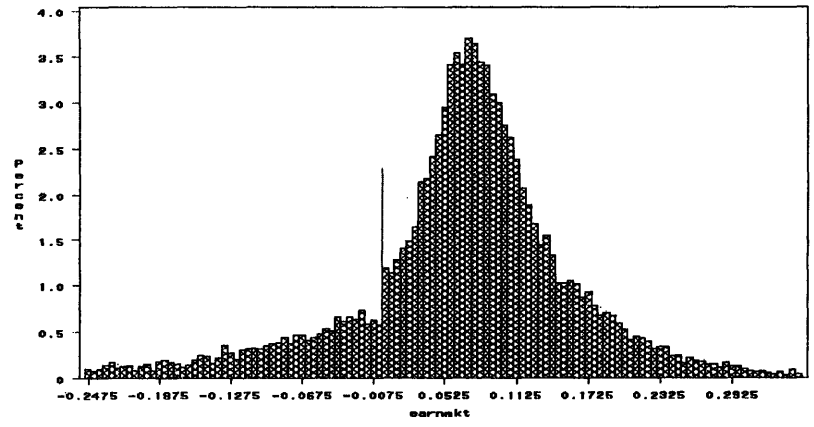
Panel 3.Third size quartile

Firms without analyst coverage



t = -4.72 (4.18)

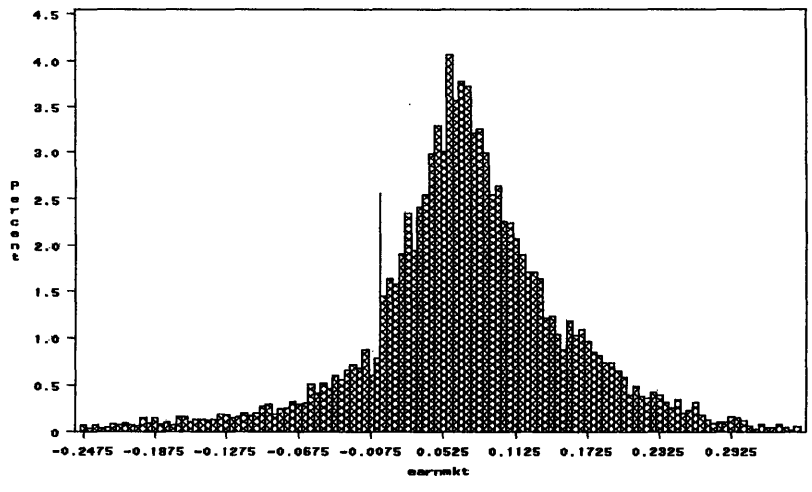
Firms with analyst coverage



t = -3.33 (2.95)

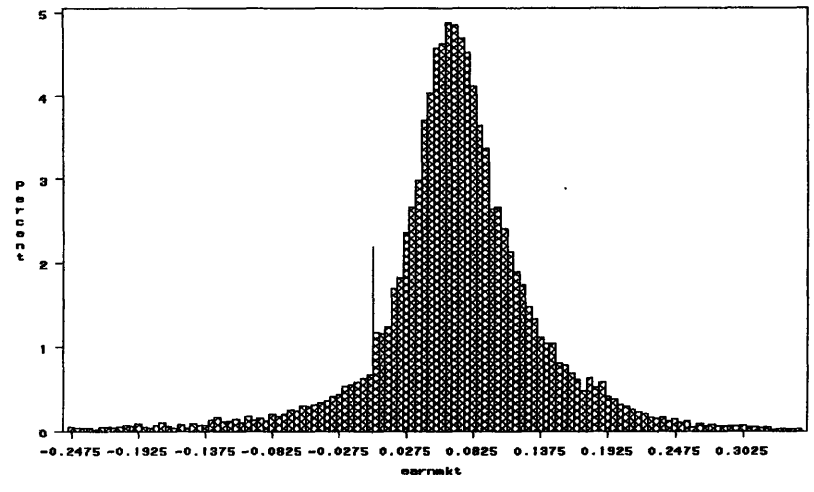
Panel 4. Top size quartile

Firms without analyst coverage



t = -2.12 (1.87)

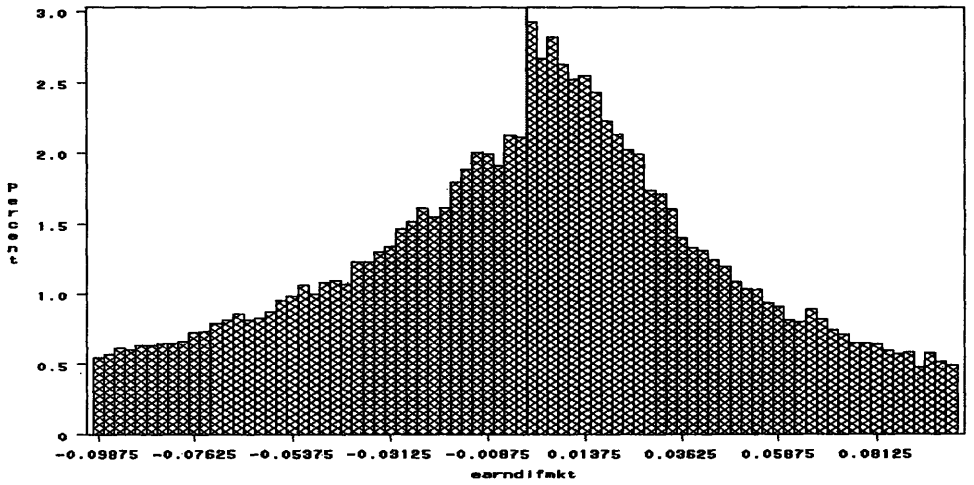
Firms with analyst coverage



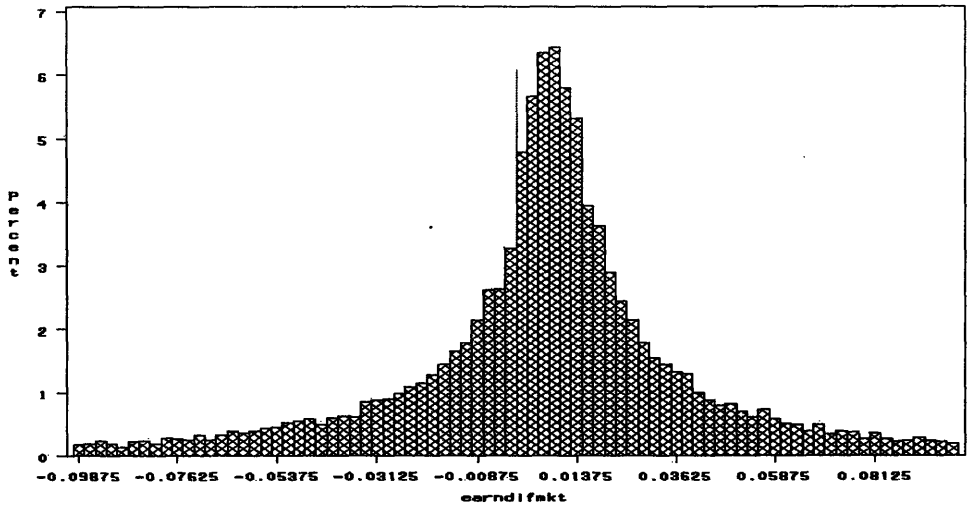
t = -2.29 (2.20)

Figure 5. Earnings changes histograms grouped by firm size.
Annual earnings changes are scaled by fiscal year beginning market value of equity (bin size=0.0025).

Panel 1. Firm-years from 1980-2001 with market value less than $100 million



Panel 2. Firm-years from 1980-2001 with market value greater than $1 billion



Panel 3. All firm-years from 1980-2001

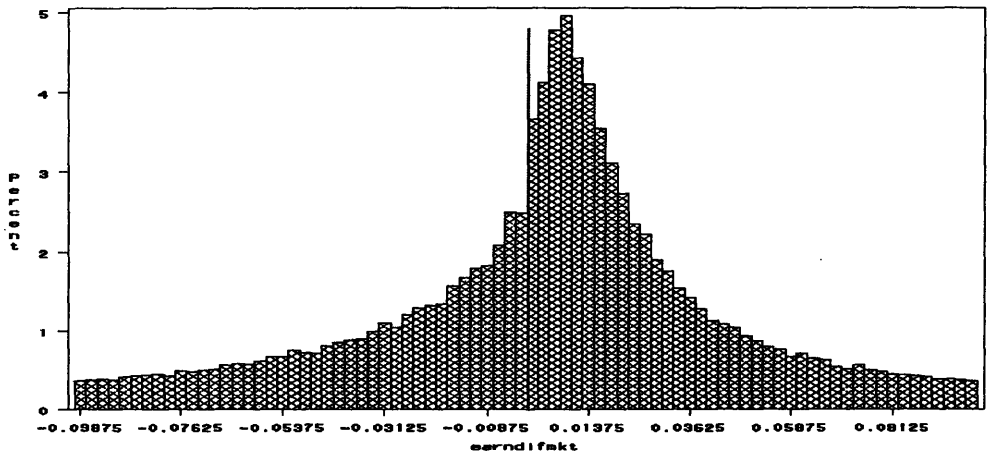
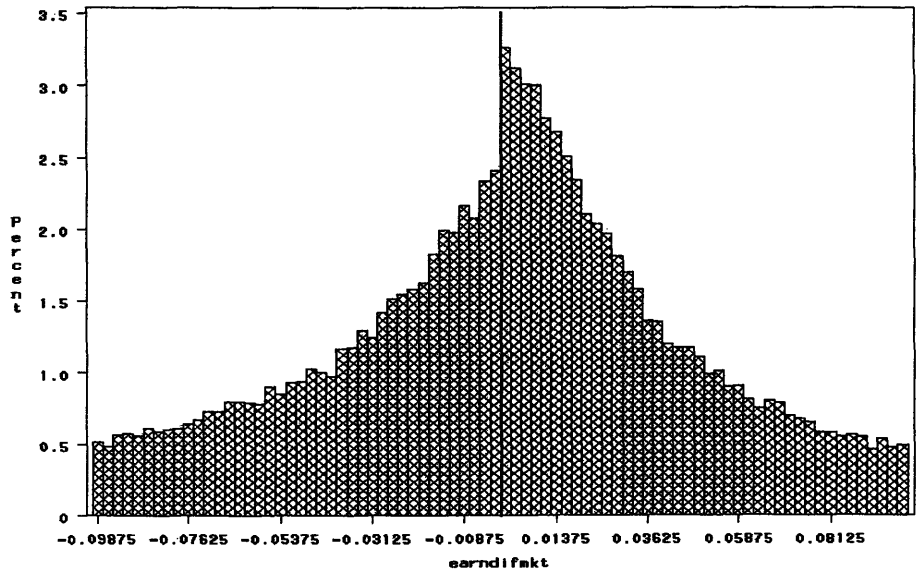


Figure 6. Earnings changes histograms grouped by analyst coverage.
Annual earnings changes are scaled by fiscal year beginning market value of equity (bin size=0.0025).

Panel 1. Firm-years without analyst coverage



Panel 2. Firm-years with analyst coverage

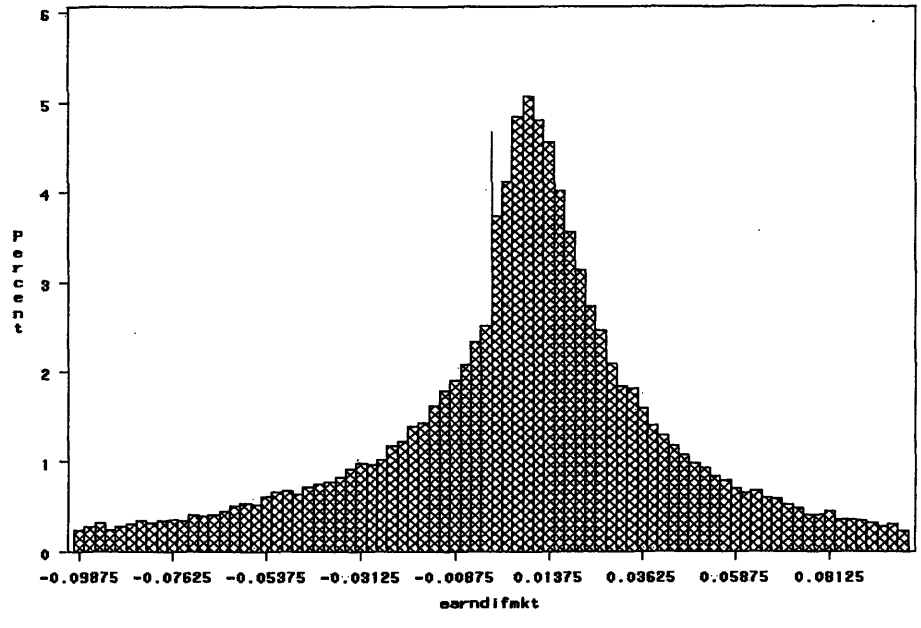
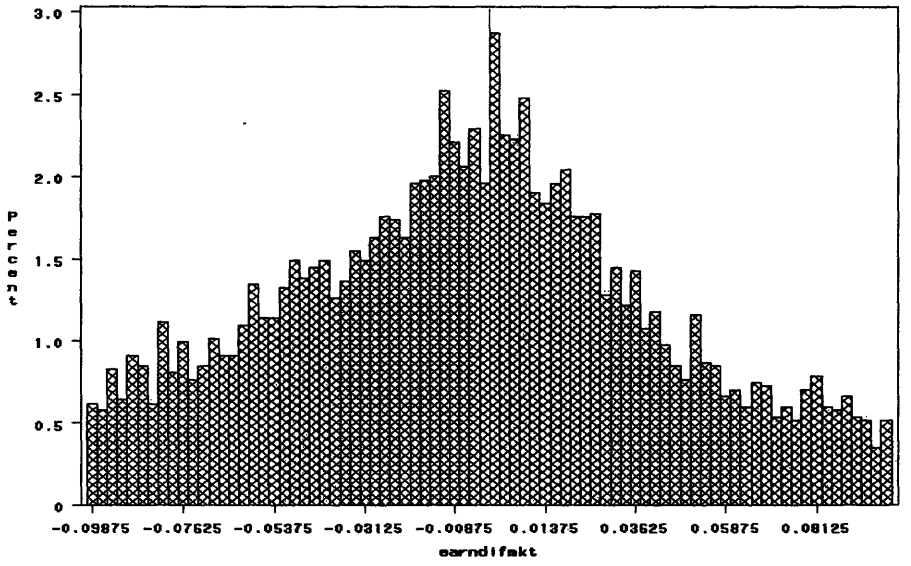


Figure 7. Earnings changes histograms grouped by analyst forecast errors and number of analyst following.

Annual earnings changes are scaled by fiscal year beginning market value of equity (bin size=0.0025).

Panel 1. Firm-years with number of analyst following in the lowest quartile and analyst forecast error scaled by actual earnings in the highest quartile



Panel 2. Firm years with number of analyst following in the highest quartile and analyst forecast error scaled by actual earnings in the lowest quartile

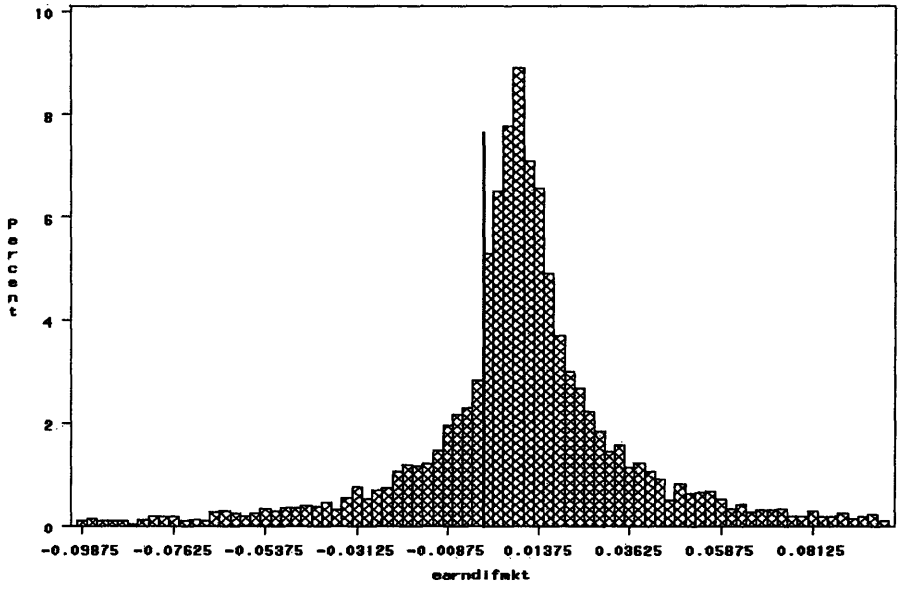


Table 1. Summary statistics of the key variables

This table presents the summary statistics of the key variables for the whole sample, firms with small profit/losses (earnings less than 1% of the market value of equity), and firms with small earnings increases/decreases (earnings changes less than 0.25% of the market value of equity). Because most of the variables are highly skewed in the sample and have extreme outliers, the mean and standard deviation reported here are winsorized mean/standard deviation at 1% at each tail.

EARNMKT:	Earnings divided by the fiscal year beginning market value of equity.
EARNDIFMKT:	Annual earnings changes divided by the fiscal year beginning market value of equity.
LNMKT:	Logarithm of the market value of equity as of fiscal year beginning.
NUMEST:	Maximum number of analyst following during the 12 month preceding the annual earning announcement
FE:	Analyst forecast error. It is equal to the actual EPS minus consensus analyst forecast issued in the month immediately preceding the annual earnings announcement.
SFE:	Absolute value of FE scaled by the absolute value of actual EPS.
MODJONES:	Discretionary accruals estimated using the modified Jones model described in Dechow, Sloan, and Sweeney (1995).
ROA:	Return on assets. Net Income/Total Assets

Panel 1. Summary statistics for the whole sample and firms with small profits/losses

	Whole Sample			Firms with Small Profits			Firms with Small Losses		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
EARNMKT	(0.036)	0.053	0.419	0.005	0.005	0.003	(0.005)	(0.005)	0.003
EARNDIFMKT	0.0036	0.007	0.480	0.001	(0.002)	0.147	(0.016)	(0.002)	0.111
EARNINGS (In Millions)	40.02	2.10	158.73	3.94	0.35	20.64	(4.56)	(0.56)	16.46
MKT VALUE (In Millions)	818	64	2757	1026	63	3924	889	66	2884
LNMKT	4.21	4.19	2.34	4.54	4.23	2.24	4.81	4.51	2.24
NUMEST	7.06	4	7.61	6.73	4	7.31	7.37	5	7.54
FE	(0.126)	0	0.484	(0.126)	(0.020)	0.327	(0.103)	(0.016)	0.247
SFE	0.318	0.037	0.825	2.372	0.320	5.064	2.046	0.275	5.430
MODJONES	(0.015)	(0.011)	0.191	0.009	(0.002)	0.167	0.012	(0.005)	0.202
ROA	(0.075)	0.024	0.381	0.008	0.004	0.016	(0.011)	(0.005)	0.107

Panel 2. Summary statistics for the whole sample and firms with small earnings increases/decreases

	Whole Sample			Firms with Small Earnings Increases			Firms with Small Earnings Decreases		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
EARNMKT	(0.036)	0.053	0.419	0.056	0.060	0.064	0.048	0.053	0.072
EARNDIFMKT	0.0036	0.007	0.480	0.001	0.001	0.001	(0.001)	(0.001)	0.001
EARNINGS (In Millions)	40.02	2.10	158.73	94.87	9.96	263.59	101.50	7.48	326.60
MKT VALUE (In Millions)	818	64	2757	1942	183	6082	2206	163	7489
LNMKT	4.21	4.19	2.34	5.35	5.21	2.22	5.26	5.09	2.27
NUMEST	7.06	4	7.61	9.20	6	8.68	8.93	6	8.61
FE	(0.126)	0	0.484	(0.029)	0	0.149	(0.047)	0.000	0.224
SFE	0.318	0.037	0.825	0.125	0.016	0.384	0.126	0.022	0.364
MODJONES	(0.015)	(0.011)	0.191	0.006	0.003	0.131	0.007	(0.001)	0.143
ROA	(0.075)	0.024	0.381	0.026	0.045	0.151	(0.001)	0.039	0.203

Table 2. Correlation Matrix (Prob > |r| under H0: Rho=0)

This table reports the Pearson (left of the diagonal) and Spearman Correlation Coefficients of the whole sample. Because the sample shows skewed results for most of the variables, the nonparametric Spearman correlation coefficients are also included in addition to the standard Pearson correlation.

	Earnmkt	Earndifmkt	Earnings	MKT VALUE	LNMKT	NUMEST	FE	SFE	Modjones	Jones	ROA
Earnmkt	1	**0.4751 (0.00)**	**0.7138 (0.00)**	**0.2730 (0.00)**	**0.2731 (0.00)**	**0.0965 (0.00)**	**0.2751 (0.00)**	**-0.2678 (0.00)**	**0.1781 (0.00)**	**0.1505 (0.00)**	**0.7724 (0.00)**
Earndifmkt	**0.6874 (0.00)**	1	**0.3268 (0.00)**	**0.0481 (0.00)**	**0.0478 (0.00)**	**0.0137 (0.53)**	**0.2726 (0.00)**	**-0.1433 (0.00)**	**0.0855 (0.00)**	**0.0641 (0.00)**	**0.0392 (0.00)**
Earnings	0.0015 (0.56)	0.0008 (0.77)	1	**0.6433 (0.00)**	**0.6436 (0.00)**	**0.5551 (0.00)**	**0.2351 (0.00)**	**-0.4212 (0.00)**	**0.1643 (0.00)**	**0.1414 (0.00)**	**0.7151 (0.00)**
MKT VALUE	0.0007 (0.80)	0.0006 (0.81)	**0.5900 (0.00)**	1	**1.0000 (0.00)**	**0.7535 (0.00)**	**0.1949 (0.00)**	**-0.3986 (0.00)**	**0.0941 (0.00)**	**0.0717 (0.00)**	**0.3485 (0.00)**
LNMKT	-0.0004 (0.87)	-0.0011 (0.68)	**0.2707 (0.00)**	**0.3397 (0.00)**	1	**0.7536 (0.00)**	**0.1950 (0.00)**	**-0.3986 (0.00)**	**0.0940 (0.00)**	**0.0715 (0.00)**	**0.3485 (0.00)**
NUMEST	-0.0012 (0.77)	-0.0015 (0.70)	**0.2903 (0.00)**	**0.3461 (0.00)**	**0.7184 (0.00)**	1	**0.1488 (0.00)**	**-0.3872 (0.00)**	**0.0263 (0.00)**	**0.0211 (0.00)**	**0.2183 (0.00)**
FE	0.0044 (0.28)	0.0017 (0.68)	0.0013 (0.76)	0.0002 (0.96)	**0.0098 (0.02)**	0.0055 (0.18)	1	**-0.2656 (0.00)**	**0.0465 (0.00)**	**0.0265 (0.00)**	**0.0235 (0.00)**
SFE	**-0.0072 (0.08)**	-0.0014 (0.73)	**-0.0140 (0.00)**	**-0.01353 (0.00)**	**-0.0751 (0.00)**	**-0.0533 (0.00)**	-0.0041 (0.31)	1	**-0.0873 (0.00)**	**-0.0678 (0.00)**	**-0.0323 (0.00)**
Modjones	-0.0003 (0.92)	-0.0003 (0.92)	0.0020 (0.50)	0.0008 (0.80)	0.0023 (0.45)	-0.0051 (0.26)	0.0012 (0.79)	0.0002 (0.96)	1	**0.9282 (0.00)**	**0.1932 (0.00)**
Jones	-0.0003 (0.92)	-0.0003 (0.92)	0.0021 (0.50)	0.0006 (0.84)	0.0010 (0.73)	-0.0060 (0.18)	0.0007 (0.89)	0.0022 (0.63)	**0.9918 (0.00)**	1	**0.1600 (0.00)**
ROA	0.00002 (0.99)	0.00004 (0.98)	**0.0047 (0.08)**	0.0030 (0.26)	**0.0243 (0.00)**	**0.0209 (0.00)**	**0.0209 (0.00)**	**-0.0180 (0.00)**	0.0023 (0.43)	0.0029 (0.34)	1

Table 3. Cross-sectional variation of the earnings management activities around thresholds
This table presents the results from the regression analysis testing the relation between information asymmetry and the discontinuities around thresholds in earnings and earnings changes distributions.

Model: $Diff = \alpha + \beta_1 Info + \beta_2 Threshold + \beta_3 Info \bullet Threshold$

Panel 1. Earnings level distributions

Measure of information asymmetry		Intercept	Info	Threshold	Info • Threshold	Adjusted R^2
	Predicted Sign		?	+	+	
Firm size	Est. Coefficient	-0.037	0.020	**1.882*** **	**3.886*** **	44.8%
	(t statistics)	(-0.63)	(0.25)	**(4.28)**	**(6.25)**	
Whether or not there is analyst coverage	Est. Coefficient	-0.018	0.002	**3.318*** **	**2.011*** **	64.8%
	(t statistics)	(-0.44)	(0.04)	**(10.93)**	**(4.69)**	
Number of analyst following and analyst forecast errors	Est. Coefficient	-0.063	0.042	**1.852*** **	**4.317*** **	23.7%
	(t statistics)	(-0.62)	(0.30)	**(2.42)**	**(3.98)**	

Panel 2. Earnings changes distributions

Measure of information asymmetry		Intercept	Info	Threshold	Info • Threshold	Adjusted R^2
	Predicted Sign		?	+	+	
Firm size	Est. Coefficient	-0.018	0.012	**1.779*** **	0.493	24.1%
	(t statistics)	(-0.50)	(0.25)	**(4.16)**	(0.81)	
Whether or not there is analyst coverage	Est. Coefficient	-0.017	0.004	**2.367*** **	-0.006	27.8%
	(t statistics)	(-0.37)	(0.07)	**(6.87)**	(-0.01)	
Number of analyst following and analyst forecast errors	Est. Coefficient	-0.041	0.014	**3.798*** **	0.168	11.3%
	(t statistics)	(-0.62)	(0.39)	**(4.20)**	(0.83)	

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% (one-tail), respectively.

Diff: The standardized difference between the expected number of observations and the actual number of observations for each bin in the two distributions. The expected number of observations is equal to the average number of observations in the two neighboring bins.

Threshold: An indicator variable that is one for the histogram bin just above zero, -1 for the histogram bin just below zero, and zero otherwise.

Info: An indicator variable that is one if the Diff value is drawn from the histogram of high information asymmetry firms, zero otherwise.

Table 4. Discretionary accruals of small profit/loss firms (TBEAT firms and TMISS firms in earnings histogram)

Panel 1. Small profit firm-years -- firm-years with profit less than 1% of the market value of equity

	mean	median	Std. Dev.	*Tests of whether mean/median discretionary accruals are zero*					
				t test	P value of t test	Sign test	P value of sign test	Signed rank test	P value of signed rank test
Market value < $100 million	0.011	0.001	0.280	**1.81**	**0.07**	7.5	0.80	12477	0.17
Market value > $1000 million	0.009	(0.007)	0.175	1.07	0.29	(14.5)	0.18	(2498)	0.33
Without analyst coverage	0.015	0.001	0.290	**2.28**	**0.02**	7	0.77	12122	0.63
With analyst coverage	0.009	(0.006)	0.206	1.63	0.11	**(41)**	**0.03**	(16130)	0.26
NUMEST in the lowest quartile and SFE in the highest quartile	0.003	0.002	0.250	0.21	0.84	3.5	0.73	830	0.61
NUMEST in the highest quartile and SFE in the lowest quartile	(0.007)	(0.030)	0.185	(0.29)	0.78	**(8.5)**	**0.04**	**(254)**	**0.08**

Panel 2. Small loss firm-years -- firm-years with loss less than 1% of the market value of equity

	mean	median	Std. Dev.	*Tests of whether mean/median discretionary accruals are zero*					
				t test	P value of t test	Sign test	P value of sign test	Signed rank test	P value of signed rank test
Market value < $100 million	0.029	0.0009	0.825	1.12	0.26	4.5	0.80	12477	0.17
Market value > $1000 million	(0.002)	(0.025)	0.313	(0.09)	0.92	**(33.5)**	**0.00**	**(4121)**	**0.00**
Without analyst coverage	0.032	0.0009	0.834	1.21	0.22	5	0.78	9352	0.31
With analysts coverage	0.005	(0.010)	0.164	0.81	0.43	**(43)**	**0.00**	(7982)	0.11
NUMEST in the lowest quartile and SFE in the highest quartile	0.005	(0.002)	0.146	0.39	0.70	(1.5)	0.86	179	0.68
NUMEST in the highest quartile and SFE in the lowest quartile	(0.009)	(0.049)	0.255	(0.21)	0.83	**(8.5)**	**0.01**	**(135)**	**0.06**

Table 5. Discretionary accruals of firms reporting small earnings increase/decrease (TBEAT firms and TMISS firms in earnings changes histogram)

Panel 1. Small earnings increase firm-years -- firm-years with earnings increases less than 0.25% of the market value of equity

	mean	median	Std. Dev.	*Tests of whether mean/median discretionary accruals are zero*					
				t test	P value of t test	Sign test	P value of sign test	Signed rank test	P value of signed rank test
Market value < $100 million	(0.014)	0.004	0.316	(0.79)	0.43	**30**	**0.06**	8270	0.34
Market value > $1 billion	0.001	0.002	0.122	**3.01**	**0.00**	15.5	0.24	**9139**	**0.06**
Without analyst coverage	(0.005)	0.004	0.298	(0.60)	0.54	**37**	**0.03**	**21073**	**0.05**
With analysts coverage	0.007	0.002	0.129	**2.00**	**0.05**	19.5	0.31	12820	0.41
NUMEST in the lowest quartile and SFE in the highest quartile	0.007	0.004	0.166	0.41	0.68	3	0.68	18	0.95
NUMEST in the highest quartile and SFE in the lowest quartile	0.002	0.003	0.112	**2.04**	**0.04**	4.5	0.60	1376	0.18

Panel 2. Small earnings decrease firm-years -- firm-years with earnings decreases less than 0.25% of the market value of equity

	mean	median	Std. Dev.	*Tests of whether mean/median discretionary accruals are zero*					
				t test	P value of t test	Sign test	P value of sign test	Signed rank test	P value of signed rank test
Market value < $100 million	0.016	(0.0003)	0.541	0.80	0.45	(3)	0.85	2679	0.65
Market value > $1 billion	0.012	(0.005)	0.172	1.53	0.13	(14.5)	0.19	**(5441)**	**0.05**
Without analyst coverage	0.017	0.003	0.497	1.00	0.32	11.5	0.46	5016	0.51
With analysts coverage	0.007	(0.004)	0.152	1.37	0.17	(21)	0.19	(11444)	0.20
NUMEST in the lowest quartile and SFE in the highest quartile	0.005	(0.004)	0.170	0.23	0.82	(1)	0.91	(115)	0.54
NUMEST in the highest quartile and SFE in the lowest quartile	(0.007)	(0.010)	0.097	(0.76)	0.45	**(15.5)**	**0.01**	**(838)**	**0.03**

Table 6. Future Accounting Performance

This table presents the subsequent three years' ROA and ROA changes for TBEAT firms versus TMISS firms around the two earnings thresholds. The change of ROA in year t is equal to ROA_t-ROA_{t-1}. Numbers in parentheses are the P values from the one-sided nonparametric median test testing the difference between the values in the two samples.

Panel 1. First Threshold – Zero Earnings.

This panel reports the future ROA and ROA changes of firms making small profit/losses (less than 1% of the market value of equity)

		ROA			ROA Changes		
	No. of Obs.	Q1	Median	Q3	Q1	Median	Q3
t							
$0<EARNMKT_t<0.01$	3882		0.0044				
$-0.01<EARNMKT_t<0$	1923		-0.0050				
Difference			**0.0094**				
			(P<0.01)				
t+1							
$0<EARNMKT_t<0.01$	3412	-0.0572	0.0052	0.0422	-0.0705	0.0002	0.0299
$-0.01<EARNMKT_t<0$	1633	-0.1048	-0.0100	0.0268	-0.0921	-0.0001	0.0393
Difference			**0.0152**			**0.0003**	
			(P<0.001)			**(P=0.09)**	
t+2							
$0<EARNMKT_t<0.01$	2973	-0.0724	0.0066	0.0464	-0.0666	0.0024	0.0367
$-0.01<EARNMKT_t<0$	1375	-0.1097	-0.0016	0.0412	-0.0846	0.0027	0.0445
Difference			**0.0082**			-0.0003	
			(P<0.001)			(P=0.46)	
t+3							
$0<EARNMKT_t<0.01$	2603	-0.0687	0.0107	0.0507	-0.0591	0.0011	0.0391
$-0.01<EARNMKT_t<0$	1172	-0.1207	-0.0017	0.0430	-0.0704	-0.0006	0.0491
Difference			**0.0124**			0.0017	
			(P<0.001)			(P=0.14)	

Panel 2. The Second Threshold – Last period's earnings

This panel reports the future ROA and ROA changes of firms making small earnings increases/decreases (less than 0.25% of the market value of equity)

		ROA			ROA changes		
	No. of Obs.	Q1	Median	Q3	Q1	Median	Q3
t							
$0<EARNDIFMKT_t<0.0025$	3414		0.0455				
$-0.0025<EARNDIFMKT_t<0$	2450		0.0390				
Difference			**0.0065 (P<0.01)**				
t+1							
$0<EARNDIFMKT_t<0.0025$	3024	0.0078	0.0394	0.0753	-0.0273	-0.0022	0.0077
$-0.0025<EARNDIFMKT_t<0$	2155	-0.0009	0.0324	0.0644	-0.0282	-0.0022	0.0088
Difference			**0.0070 (P<0.01)**			0.0000 (P=0.44)	
t+2							
$0<EARNDIFMKT_t<0.0025$	2690	0.0058	0.0370	0.0755	-0.0231	-0.0007	0.0110
$-0.0025<EARNDIFMKT_t<0$	1869	-0.0089	0.0316	0.0638	-0.0277	-0.0012	0.0120
Difference			**0.0054 (P<0.01)**			0.0005 (P=0.35)	
t+3							
$0<EARNDIFMKT_t<0.0025$	2368	0.0053	0.0381	0.0760	-0.0225	-0.0001	0.0140
$-0.0025<EARNDIFMKT_t<0$	1616	-0.0057	0.0335	0.0637	-0.0249	-0.0004	0.0149
Difference			**0.0046 (P<0.01)**			0.0003 (P=0.15)	

Table 7. Future accounting performance grouped by degree of information asymmetry

This table reports the subsequent three years' ROA and ROA changes for TBEAT firms versus TMISS firms facing various information environments. The numbers in parentheses are the P values from the one-sided nonparametric median test testing the difference between the values in the two samples.

Panel 1. The first threshold – Zero earnings.

Median of the future ROA and ROA changes of firms making small profits/losses at time t (less than 1% of the market value of equity)

	Market Value < $100 Mil	Market Value >$1 Billion	Without Analyst Coverage	With Analyst Coverage	SFE in the highest quartile & NUMEST in the lowest quartile	SFE in the lowest quartile & NUMEST in the highest quartile
ROA						
t+1						
$0<EARNMKT_t<0.01$	0.0015	0.0178	0.0024	0.0091	0.0021	0.0334
$-0.01<EARNMKT_t<0$	-0.0171	0.0116	-0.0160	0.0042	-0.0085	0.0287
Difference	**0.0186**	0.0062	**0.0184**	**0.0049**	**0.0106**	0.0047
	(P<0.01)	(P=0.15)	**(P<0.01)**	**(P<0.01)**	**(P=0.08)**	(P=0.22)
t+2						
$0<EARNMKT_t<0.01$	0.0024	0.0257	0.0035	0.0144	0.0044	0.0377
$-0.01<EARNMKT_t<0$	-0.0081	0.0197	-0.0100	0.0153	0.0048	0.0200
Difference	**0.0105**	0.0060	**0.0135**	-0.0009	-0.0004	**0.0177**
	(P<0.01)	(P=0.28)	**(P<0.01)**	(P=0.43)	(P=0.46)	**(P=0.03)**
t+3						
$0<EARNMKT_t<0.01$	0.0077	0.0313	0.0070	0.0191	0.0104	0.0391
$-0.01<EARNMKT_t<0$	-0.0122	0.0293	-0.0115	0.0149	-0.0032	0.0328
Difference	**0.0199**	0.0020	**0.0185**	0.0042	0.0136	0.0063
	(P=0.01)	(P=0.35)	**(P<0.01)**	(P=0.25)	(P=0.18)	(P=0.17)
ROA changes						
t+1						
$0<EARNMKT_t<0.01$	-0.0053	0.0076	-0.0037	0.0033	-0.0037	0.0281
$-0.01<EARNMKT_t<0$	-0.0058	0.0185	-0.0048	0.0095	-0.0048	0.0365
Difference	0.0005	**-0.0109**	0.0011	**-0.0062**	0.0011	-0.0084
	(P=0.15)	**(P=0.03)**	(P=0.48)	**(P=0.05)**	(P=0.40)	(P=0.11)
t+2						
$0<EARNMKT_t<0.01$	0.0028	0.0026	0.0012	0.0003	0.0032	-0.0048
$-0.01<EARNMKT_t<0$	0.0023	0.0028	0.0014	0.0041	0.0068	0.0015
Difference	0.0005	-0.0002	-0.0002	-0.0038	-0.0036	-0.0063
	(P=0.13)	(P=0.19)	(P=0.49)	(P=0.30)	(P=0.20)	(P=0.28)
t+3						
$0<EARNMKT_t<0.01$	0.0011	0.0015	0.0021	0.0000	0.0033	0.0004
$-0.01<EARNMKT_t<0$	-0.0017	0.0024	-0.0010	-0.0002	-0.0018	0.0061
Difference	**0.0027**	-0.0009	**0.0031**	0.0002	0.0051	**-0.0065**
	(P=0.10)	(P=0.25)	**(P=0.09)**	(P=0.48)	(P=0.24)	**(P=0.05)**

Panel 2. The second threshold – Last period's earnings

Median of the future ROA and ROA changes of firms making small earnings increases/decreases at time t (less than 0.25% of the market value of equity)

	Market Value < $100 Mil	Market Value >$1 Billion	Without Analyst Coverage	With Analyst Coverage	SFE in the highest quartile & NUMEST in the lowest quartile	SFE in the lowest quartile & NUMEST in the highest quartile
ROA						
t+1						
$0<EARNDIFMKT_t<0.0025$	0.0189	0.0474	0.0291	0.0423	0.0123	0.0577
$-0.0025<EARNDIFMKT_t<0$	0.0157	0.0450	0.0241	0.0402	0.0156	0.0520
Difference	0.0032 (P=0.13)	0.0024 (P=0.24)	**0.0050 (P=0.06)**	0.0021 (P=0.21)	-0.0033 (P=0.42)	0.0057 (P=0.13)
t+2						
$0<EARNDIFMKT_t<0.0025$	0.0177	0.0456	0.0268	0.0445	0.0174	0.0565
$-0.0025<EARNDIFMKT_t<0$	0.0139	0.0408	0.0212	0.0390	0.0107	0.0489
Difference	**0.0038 (P=0.10)**	**0.0048 (P=0.04)**	**0.0056 (P=0.04)**	**0.0055 (P<0.01)**	0.0067 (P=0.16)	**0.0076 (P=0.02)**
t+3						
$0<EARNDIFMKT_t<0.0025$	0.0206	0.0442	0.0250	0.0425	0.0216	0.0595
$-0.0025<EARNDIFMKT_t<0$	0.0187	0.0437	0.0255	0.0386	0.0164	0.0531
Difference	0.0019 (P=0.30)	0.0005 (P=0.47)	-0.0005 (P=0.40)	**0.0039 (P=0.07)**	**0.0052 (P=0.10)**	**0.0064 (P=0.05)**
ROA changes						
t+1						
$0<EARNDIFMKT_t<0.0025$	-0.0019	-0.0028	-0.0014	-0.0025	-0.0021	-0.0038
$-0.0025<EARNDIFMKT_t<0$	-0.0050	-0.0019	-0.0024	-0.0017	-0.0028	-0.0025
Difference	**0.0031 (P=0.08)**	**-0.0009 (P=0.10)**	0.0010 (P=0.17)	**-0.0008 (P=0.06)**	0.0007 (P=0.42)	-0.0013 (P=0.21)
t+2						
$0<EARNDIFMKT_t<0.0025$	-0.0010	-0.0011	-0.0014	-0.0001	0.0013	0.0004
$-0.0025<EARNDIFMKT_t<0$	-0.0007	-0.0021	-0.0024	-0.0011	-0.0008	-0.0011
Difference	-0.0003 (P=0.19)	0.0010 (P=0.11)	0.0010 (P=0.39)	**0.0010 (P=0.04)**	0.0021 (P=0.24)	**0.0015 (P=0.09)**
t+3						
$0<EARNDIFMKT_t<0.0025$	-0.0008	-0.0005	-0.0007	-0.0001	0.0002	-0.0001
$-0.0025<EARNDIFMKT_t<0$	-0.0016	-0.0007	-0.0002	0.0001	-0.0039	-0.0020
Difference	0.0008 (P=0.29)	0.0002 (P=0.47)	-0.0005 (P=0.24)	-0.0002 (P=0.27)	0.0041 (P=0.25)	0.0019 (P=0.12)

Table 8. Abnormal stock returns around the annual earnings announcement date for TBEAT firms and TMISS firms facing varying degrees of information asymmetry

Model: $CAR = \alpha + \beta_1 Info + \beta_2 Pos + \beta_3 Info \bullet Pos + \beta_4 EARNMKT + \beta_5 FE + \beta_6 EARNDIFMKT + Ydummies + e$

Measure of Information asymmetry		Intercept	Pos	Info	Info • Pos	EARNMKT	FE	EARNDIFMKT	Adj. R^2	No. of Obs.
	Predicted Sign		+	-	+	+	+	+		
Panel 1. Firms with small profits/losses (earnings are less than 1% of the market value of equity)										
Analyst coverage	Est. Coefficient	-0.004	-0.003	**-0.007***	**0.010***	0.428	-	**0.033*****	0.62%	3722
	(t statistics)	(-0.13)	(-0.41)	**(-1.43)**	**(1.57)**	(0.80)		**(3.09)**		
NUMEST & SFE	Est. Coefficient	0.005	-0.005	**-0.022*****	**0.023****	-0.119	**0.024*****	-	1.8%	1816
	(t statistics)	(0.59)	(-0.65)	**(-2.54)**	**(1.93)**	(-0.18)	**(3.26)**			
Panel 2. Firms with small earnings increases/decreases (earnings changes are less than 0.25% of the market value of equity)										
Analyst coverage	Est. Coefficient	0.002	-0.004	-0.004	**0.005***	**0.070*****	-	-0.849	0.24%	3987
	(t statistics)	(0.36)	(-0.73)	(-0.80)	**(1.60)**	**(3.98)**		(-0.53)		
NUMEST & SFE	Est. Coefficient	0.004	-0.006	0.005	0.012	**0.027****	**0.029*****	-	0.44%	2502
	(t statistics)	(1.36)	(-0.22)	(0.54)	(1.07)	**(1.72)**	**(3.14)**			

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% (one-tail), respectively.

CAR: The abnormal returns are the three-day cumulative market-adjusted return from day -1 to day +1 around the annual earnings announcement date.

EARNMKT: Net income divided by market value of equity as of the fiscal year beginning

EARNDIFMKT: Change of net income divided by the market value of equity as of the fiscal year beginning.

FE: Earnings surprise. Equal to actual earnings minus the closest consensus earnings forecast

Info: Dummy variable for information asymmetry. If using analyst coverage as the measure of information asymmetry, it is equal to 1 if a firm does not have analyst coverage and 0 otherwise. Using NUMEST and SFE, it is equal to 1 if a firm's NUMEST is in the lowest quartile and SFE in the highest quartile, 0 otherwise.

NUMEST: Average number of analyst following during the 12 months immediately before the annual earnings announcement.

Pos: Dummy variable. It is equal to 1 if the firm has made a small profit or earnings increase, 0 if the firm has made a small loss or earnings decrease.

SFE: The absolute value of the difference between the closest consensus analyst earnings forecast and the actual earnings, scaled by the absolute value of the actual earnings.

Ydummies: Year dummies controlling for individual year effect.

Table 9. Testing results of the return reversal of small profit/loss firms

Model: $CAR_{t+1} = \alpha + \beta_1 Info_t + \beta_2 Pos_t + \beta_3 Info_t \bullet Pos_t + \beta_4 EARNMKT_{t+1} + Ydummies + e$

Panel 1. Short window – t+1 represents the first quarterly earnings announcement date following the original annual earnings announcement date.

Measure of Information asymmetry		Intercept	Pos_t	$Info_t$	$Info_t \bullet Pos_t$	$EARNMKT_{t+1}$	Adj. R^2	No. of Obs.
	Predicted Sign		+	?	Non-negative	+		
Analyst coverage	Est. Coefficient	**0.008***	0.002	-0.005	0.003	**0.101*****	0.8%	3149
	(t statistics)	**(1.81)**	(0.25)	(-0.84)	(0.41)	**(5.29)**		
NUMEST & SFE	Est. Coefficient	**0.012****	-0.004	-0.015	**0.022***	**0.108*****	0.8%	1525
	(t statistics)	**(2.36)**	(-0.69)	(-1.51)	**(1.83)**	**(3.45)**		

Panle 2. Long window – t+1 represents the first annual earnings announcement date following the original annual earnings announcement date.

Measure of Information asymmetry		Intercept	Pos_t	$Info_t$	$Info_t \bullet Pos_t$	$EARNMKT_{t+1}$	Adj. R^2	No. of Obs.
	Predicted Sign		+	?	Non-negative	+		
Analyst coverage	Est. Coefficient	-0.001	0.008	0.006	0.00004	**0.023*****	1.2%	3236
	(t statistics)	(-0.13)	(1.41)	(0.89)	(0.01)	**(6.17)**		
NUMEST & SFE	Est. Coefficient	-0.001	0.006	-0.002	0.010	0.010	0.2%	1490
	(t statistics)	(-0.20)	(0.95)	(-0.20)	(0.78)	(1.58)		

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% (two-tail), respectively.

Table 10. Testing results of the return reversal of small earnings increase/decrease firms

Model: $CAR_{t+1} = \alpha + \beta_1 Info_t + \beta_2 Pos_t + \beta_3 x\ Info_t \bullet Pos_t + \beta_4 EARNMKT_{t+1} + Ydummies + e$

Panel 1. Short window – t+1 represents the first quarterly earnings announcement date following the original annual earnings announcement date.

Measure of Information asymmetry		Intercept	Pos_t	$Info_t$	$Info_t \bullet Pos_t$	$EARNMKT_{t+1}$	Adj. R^2	No. of Obs.
	Predicted Sign		+	?	Non-negative	+		
Analyst coverage	Est. Coefficient	0.003	0.002	**-0.008*** **	0.006	**0.037** **	0.2%	3540
	(t statistics)	(1.17)	(0.60)	**(-2.14)**	(1.26)	**(1.91)**		
NUMEST & SFE	Est. Coefficient	0.004*	0.0003	-0.011	**0.020***	-0.003	0.01%	2205
	(t statistics)	(1.65)	(0.12)	(-1.30)	**(1.85)**	(-0.08)		

Panle 2. Long window – t+1 represents the first annual earnings announcement date following the original annual earnings announcement date.

Measure of Information asymmetry		Intercept	Pos_t	$Info_t$	$Info_t \bullet Pos_t$	$EARNMKT_{t+1}$	Adj. R^2	No. of Obs.
	Predicted Sign		+	?	Non-negative	+		
Analyst coverage	Est. Coefficient	0.003	0.0002	0.0006	-0.002	**0.025*** **	1.8%	3591
	(t statistics)	(1.20)	(0.06)	(0.17)	(-0.11)	**(8.34)**		
NUMEST & SFE	Est. Coefficient	0.003	0.0006	-0.004	-0.002	0.009	0.1%	2231
	(t statistics)	(1.33)	(0.21)	(-0.42)	(-0.21)	(1.34)		

The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1% (two-tail), respectively.

Table 11. Market reactions to firms with various earnings path

This table reports the three day cumulative abnormal returns around the annual earnings announcement date of fiscal year t. The abnormal returns are equal to the raw returns from day -1 to +1 minus the market returns. A firm is identified as reporting a small profit if its net income is less than 1% of its fiscal year beginning market value of equity. The p-values in the parentheses are two-tail.

Fiscal year t	*Fiscal year t-1*	*No. of obs.*	*Three Day Abnormal Returns* $_t$	
			Mean (p-value of t test)	*Median (p-value of Wilcoxon test)*
Firms without analyst following				
Small Profit	No constraint	958	**0.59% (0.06)**	-0.07% (0.76)
Small Profit	Small Profit	105	0.04% (0.97)	-0.27% (0.24)
Small Profit	Loss	348	**1.98% (<0.01)**	**0.84% (<0.01)**
Loss	No constraint	10,071	**-0.35% (0.01)**	**-0.78% (<0.01)**
Loss	Small Profit	472	-0.39% (0.47)	**-0.86% (0.01)**
Loss	Loss	6,492	-0.14% (0.48)	**-0.72% (<0.01)**
Firms with analyst following				
Small Profit	No constraint	1,611	0.23% (0.32)	0.02% (0.88)
Small Profit	Small Profit	182	-0.34% (0.66)	-0.25% (0.75)
Small Profit	Loss	404	**0.86% (0.08)**	0.31% (0.11)
Loss	No constraint	11,615	**-0.46% (<0.01)**	**-0.67% (<0.01)**
Loss	Small Profit	574	-0.18% (0.67)	-0.70% (0.26)
Loss	Loss	6,236	**-0.47% (<0.01)**	**-0.70% (<0.01)**