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Re-Examining Real Earnings Management to Avoid Losses

By

Subprasiri Siriviriyakul

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Business Administration

in the

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of the

University of California, Berkeley

Committee in charge:

Professor Patricia Dechow, Chair

Professor Richard Sloan

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Spring 2014

Re-Examining Real Earnings Management to Avoid Losses

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by

Subprasiri Siriviriyakul

Abstract

Re-Examining Real Earnings Management to Avoid Losses

by

Subprasiri Siriviriyakul

Doctor of Philosophy in Business Administration

University of California, Berkeley

Professor Patricia Dechow, Chair

I re-examine the tests of real earnings management to avoid losses developed in Roychowdhury (2006). I find that small profit firms do not contain a higher proportion of observations with real activities manipulation than other firms in nearby earnings intervals. In addition, the real earnings management detected by the models is highly persistent, while the likelihood of staying in the small profit zone is not, suggesting the presence of omitted variables. I confirm this interpretation by demonstrating that the appearance of real earnings management for small profit firms is driven by persistently abnormal values for firms in extreme earnings intervals. Finally, a set of newly designed tests is unable to confirm the use of real earnings management to avoid losses in Roychowdhury's setting.

Dedication

This dissertation is dedicated to my parents,
Prasong and Sirirak Siriviriyakul.

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Chapter 1

Introduction

Earnings management is an important accounting issue for both researchers and practitioners. One means of managing earnings is by exercising discretion inherent in the accrual method of accounting. This is referred to as “accruals-based manipulation” and has no direct cash flow consequences. This type of manipulation has been widely discussed in research on earnings management. The other type of earnings management, which is referred to as “real activities manipulation” or “real earnings management” (hereafter called REM), has not been as extensively studied as the first type. However, it has become increasingly popular in the past few years. Real activities manipulation is important in the sense that it affects the underlying activities and cash flows. Moreover, the survey in Graham et al. (2005) reveals that it is quite a common phenomenon.

Roychowdhury (2006) is among the first to provide a comprehensive overview of real earnings management of operational activities. Specifically, he develops empirical methods to detect real activities manipulation, focusing on poor-quality sales manipulation, overproduction and reduction in discretionary expenses as the primary ways of engaging in real earnings management. He studies real activities manipulation in the setting of firms trying to beat the zero earnings benchmark. Using his newly-developed proxies for real activities manipulation, he shows that small profit firms have abnormally high levels of income-increasing real earnings management compared to the rest of the sample, consistent with the hypothesis that firms try to avoid losses by using real activities manipulation.

A large body of subsequent research follows his approaches and adopts his newly developed proxies for detecting real activities manipulation (e.g., Cohen et al. (2008), Cohen and Zarowin (2010), Doyle et al. (2013), McNinnis and Collins (2011), Zang (2012), McGuire et al. (2012), Zhao et al. (2012), etc.).¹ Given the volume of subsequent research that directly employs the REM proxies and the fact that the implication of these studies relies heavily on the validity of the REM proxies, it is surprising that to date little has been done to confirm the validity of either the models or the main results. In fact, many subsequent studies take for granted that the original

¹ Roychowdhury (2006) has had an important impact on REM research. According to Google Scholar, the paper has over 800 citations.

results fully establish the existence of real activities manipulation among small profit firms and perform subsequent analysis, the validity of which hinges critically on such presumption. The fact that most of the subsequent research on real earnings management is built on Roychowdhury (2006) and the lack of validation is the motivation for this dissertation to examine the robustness of the Roychowdhury's findings.

I first replicate the main tests (Table 4 of Roychowdhury (2006)). I then examine the implicit assumptions that firm-year observations with scaled earnings falling in the interval immediately to the right of zero (suspect firm-years) contain a higher proportion of REM firm-years as well as a larger magnitude of REM activities than those in other earnings intervals. Because real earnings management is a departure from normal activity, if the REM proxies truly capture REM activity, they should exhibit subsequent reversal. Therefore, I also test the time-series properties of the proxies. Next, I analyze the problem with the estimation approach; show how it particularly affects extreme observations, and why the problem can attribute to the main results. Finally, I design a new set of tests of real earnings management that avoids the problems inherent in the original tests.

Empirical results indicate that suspect firm-years neither contain a higher proportion of firm-years that manipulate earnings upward, nor use a larger magnitude of REM activities on average than observations in other nearby intervals. In addition, despite the fact that they are designed to capture a departure from normal activity, all of the REM proxies are highly persistent. This suggests that they contain omitted variables. Further analysis suggests that an omitted correlated variable is the underlying performance. Because the model estimation approach pools across all observations with varying degrees of performance, there is severe misspecification of REM proxies for extreme observations.² Recognizing this problem, I design a new set of tests to investigate the real earnings management hypothesis. First, a direct comparison of small profit firms with small loss firms suggests that although the two groups of firms both have high income-increasing REM proxies relative to the average of the entire population, small profit firms do not have a significantly larger magnitude of REM proxies compared to small loss firms. Second, focusing on small profit firms and small loss firms, I find some evidence of inconsistency between the direction of actual earnings movement in the final quarter and that predicted by the proxies. Finally, I use a new estimation approach that separates firms with different ranges of performance to measure earnings management activities and fail to find evidence of real earnings management among small profit firms, raising the possibility that the original results are driven by a rational response to fundamentally different economic characteristics rather than real earnings management.

As an additional analysis, I extend the study to investigate whether firms use REM activities to meet or beat two other earnings benchmarks, last year's earnings and consensus analyst forecast. I fail to find any evidence consistent with the use of REM activities for either benchmark. I also extend the analysis to the modified versions of REM models developed in two subsequent studies, Gunny (2010) and Athanasakou et al. (2011). I find that the modified REM models partially reduce an omitted correlated variable problem, but there is still no observable pattern consistent with the use of REM to avoid losses. Next, I change my comparison group to firms other than small losses and statistically test the difference in REM proxies between small

² The idea is similar to that in Dechow et al. (1995) and Kothari et al. (2007).

profit firms and the new comparison group. I find no significant difference in the magnitude of REM proxies both when the comparison group is the profit firms in the adjacent earnings interval to small profit firms and when the comparison group is randomly selected.

In addition, I also investigate the use of time-series estimation of the REM models instead of a cross-sectional estimation traditionally used in the literature. I find that all three models have improved explanatory power. When using time-series estimation, small profit firms do not use significantly more income-increasing REM activities than the rest of the sample. Moreover, unlike the cross-sectional estimation results, REM proxies from the time-series estimation exhibit subsequent reversal in the following year. Next, I perform a detailed analysis on one of the REM tools, overproduction, in the two categories of industries: manufacturing and non-manufacturing industries. I find evidence consistent with the use of overproduction in the latter category, suggesting that at least part of the main results is driven by test specification rather than true REM. Furthermore, an extra analysis of abnormal discretionary expenses reveals that a loss dummy variable has explanatory power that subsumes a small profit dummy variable, suggesting that the main results can be explained simply by a different linear relation of REM behavior on underlying performance between profitable and unprofitable firms. The two last additional analyses show that small profit firms do not exhibit stronger reversal of REM proxies than do other firms, and that they are not likely to repeatedly use REM activities in two consecutive years, as they are likely to move to other earnings intervals in the following year.

Finally, I conduct robustness tests of my results to alternative subsamples, variable definitions, and test specifications. Specifically, I investigate if the main results are robust to 1) a full sample period from 1987-2013; 2) an alternative variable definition of discretionary expenses; 3) an equal-sized portfolio analysis; 4) an alternative scaling variable; and 5) an alternative level of granularity in sorting. I find that all of the results in my sensitivity tests are qualitatively similar to those obtained in the main tests.

The study has three contributions. First, it cautions subsequent research against relying too heavily on the results that firms use real earnings management to avoid reporting losses, because a set of new tests is unable to confirm the original results. Second, it points out a potential problem with the estimation approach that could result in severe misspecification in the REM proxies for extreme observations. Finally, it shows that the modified models in subsequent studies partially reduce the problem with the original models, but they do not fully mitigate it.

The remainder of this dissertation is organized as follows. Chapter 2 discusses prior literature. Chapter 3 provides details on data, sample selection and estimation models. Chapter 4 presents main empirical findings, followed by additional analyses in Chapter 5. Chapter 6 summarizes robustness tests, and Chapter 7 concludes.

Chapter 2

Literature Review

2.1 Research on Benchmark Beating

Burgstahler and Dichev (1997) and Hayn (1995) document an interesting scenario that there is a discontinuity in the cross-sectional frequency distribution of earnings and change in earnings around zero. They interpret this as evidence of earnings management of firms in the small profit zone, where firms with small losses or small negative changes in earnings try to manage their earnings upward slightly in order to meet profitability or past performance. Many papers that follow try to investigate this scenario further and there are mixed results regarding whether earnings management is interpreted as a cause of the kink. For example, Kerstein and Rai (2007) show that compared to a control group, a high proportion of firms with small cumulative profits or losses at the beginning of the fourth-quarter report small annual profits rather than small annual losses, suggesting that upward earnings management causes the kink. Using a sample of firms with earnings restatements, Donelson et al. (2013) compare the distribution of restated (“unmanaged”) earnings to originally reported (“managed”) earnings. They find that discontinuities are *not* present in the distribution of analyst forecast errors and earnings changes using unmanaged earnings but are present using managed earnings, providing direct evidence of a link between earnings discontinuities and earnings management. However, Durtschi and Easton (2005 and 2009) indicate that the kink results from other factors including the denominator effect, sample selection criteria, differences between the characteristics of observations to the left of zero and observations to the right of zero, or a combination of these factors. Dechow et al. (2003) are unable to confirm that boosting of discretionary accruals is the key driver of the kink and provide a number of alternative explanations for the kink.

2.2 Real Earnings Management to Avoid Losses

Roychowdhury (2006) is among the first to explicitly categorize earnings management into two types. The first one is called “accrual earnings management,” which is the manipulation of accruals with no direct cash flow consequences. The second type is called “real earnings management,” which he defines as “*management actions that deviate from normal business practices, motivated by managers’ desire to mislead at least some stakeholders into believing certain financial reporting goals have been met in the normal course of operations*”.

Roychowdhury (2006) focuses on three real activities manipulation methods to manage earnings upward as follows.

1. Acceleration of the timing of sales through increased price discounts and more lenient credit terms. This results in a temporary increase in sales volume, which helps boost current period earnings. However, the price discounts and more lenient credit terms will result in lower cash flows given the sales level.

2. Overproduction. By producing more goods than necessary to meet expected demand, the fixed overhead costs are spread over a larger number of units, lowering fixed cost per unit and thereby increasing operating margin.

3. Reduction in discretionary expenses including advertising, R&D, and SG&A expenses. Reducing such expenses can boost current period earnings.

As a result, according to Roychowdhury (2006), given the sales levels, firms that manage earnings upwards are likely to have unusually high production costs, and/or unusually low discretionary expenses. However, the effects on cash flows from operations are mixed. Specifically, if firms accelerate the timing of sales through price discounts or lenient credit terms or increase production, cash flow from operation will be unusually low, while if firms reduce discretionary expenses, cash flow from operation will be unusually high.

Using abnormal level of cash flows from operations, abnormal level of production costs and abnormal level of discretionary expenses, Roychowdhury (2006) finds evidence consistent with managers manipulating real activities to avoid reporting small annual losses. The general implications of this research are consistent with the conclusions in Graham et al. (2005) which suggest that managers' real activities manipulation is relatively commonplace.

2.3 Subsequent Research on Real Earnings Management

Subsequent research widely adopts Roychowdhury's model of real earnings management (or some variants of it) to study real activities manipulation in many settings. For instance, Zang (2012) examines the tradeoff between the two types of earnings management and finds that managers use them as substitutes. A few studies investigate the use of real activities manipulation versus accruals earnings management before and after a certain time event. For example, Cohen et al. (2008) examine earnings management behavior before and after the passage of SOX and find evidence consistent with firms switching from accrual-based to real earnings management method after the passage of SOX; Cohen and Zarowin (2010) investigate accrual-based and real earnings management activities around seasoned equity offerings and find that firms use both types of earnings management around SEOs; Chien et al. (2013) study the effect of SFAS 151 on overproduction behavior and find that the mandatory rule actually provides a perverse incentive to engage in overproduction.

Many studies examine the effect of certain firm characteristics on the use of real activities manipulation. McGuire et al. (2012) study the impact of religion on financial reporting and find a positive association between religiosity and real earnings management. Zhao et al. (2012) study the effect of takeover protection on real earnings management and find that less-protected firms are associated with higher levels of real earnings management. Chi et al. (2011) examine the impact of audit quality on the choice of earnings management tools. They find that firms with

higher audit quality use real earnings management instead of accruals earnings management. Wongsunwai (2013) investigates the impact of venture (VC) capitalist quality on earnings management in companies conducting initial public offerings (IPOs), and finds that IPO firms backed by higher-quality VCs exhibit less aggressive financial reporting including lower real activities manipulation. Badertscher (2011) examines how the degree and duration of overvaluation affect management's use of alternative earnings management tools, and shows that managers engage in accruals earnings management in the early stages of overvaluation before moving to real earnings management in order to sustain their overvalued equity.

Yet, other studies examine the consequences of real earnings management. For example, Gunny (2010), Chen et al. (2010), Leggett et al. (2009), and Taylor and Xu (2010) examine the relation between real earnings management and subsequent operating performance. The results are quite mixed. While Leggett et al. (2009) find strong evidence that REM is negatively related to subsequent period return on assets and cash flows from operation, Taylor and Xu (2010) find that REM firms do not experience a significant decline in subsequent operating performance. In fact, Gunny (2010) and Chen et al. (2010) find evidence consistent with a positive signaling role for REM concerning future operating performance. Apart from future performance, several studies examine other effects of real activities manipulation. Alhadab (2013) analyzes the relationship between real earnings management and IPO failure risk, and finds that IPO firms with higher levels of real earnings management during the IPO year have a higher probability of IPO failure and lower survival rates in subsequent periods. Kim and Park (2014) examine the effect of clients' real activities manipulation on auditors' client retention decisions. They find that, with the exception of REM through overproduction, clients' opportunistic operating decisions are positively associated with the likelihood of auditor resignations.

It is interesting to note that most of the subsequent research relies heavily on the ability of REM proxies to detect real activities manipulation.³ Yet, so far there is a paucity of research that validates them. In addition, some subsequent studies take the results in the original paper as fully established evidence of the use of REM to beat a benchmark and perform further analysis, the validity of which critically hinges on the original results (e.g. Athanasakou et al. (2011), Chen et al. (2010), Leggett et al. (2009)). Given that a body of research on real earnings management relies on the results in Roychowdhury to a certain extent, I believe that a re-examination of the tests and results is of considerable importance.

This study suggests that one omitted correlated variable in Roychowdhury (2006) is performance. Many of the following studies could suffer from the same problem. For instance, in Zhao et al. (2012) and Chi et al. (2011), the suspect firms have significantly lower median performance than the non-suspect firms. Other things being equal, firms with smaller profits exhibit a higher level of REM activities on average (See Figure 2). Therefore, this could attribute to the findings of larger REM activities among the suspect firms. In Wongsunwai (2013), IPO firms backed by higher-quality VCs usually have higher performance; thus, they have lower REM on average. Similarly, because in general, firms with higher levels of REM have smaller profits, they are less likely to survive in subsequent periods compared to the more profitable ones, which could explain the results in Alhadab (2013). In sum, many subsequent studies do not sufficiently control for the underlying performance, which could potentially drive the results.

³ A few exceptions here include Chapman (2008), Das et al. (2011), Eldenburg et al. (2011), and Ertan (2013).

Chapter 3

Data, Sample Selection, and Estimation Models

3.1 Data and Sample Selection Process

All financial data are from Compustat Fundamentals Annual. Similar to Roychowdhury (2006), the sample period of the main tests is from 1987 to 2001. I require that cash flow from operations (CFO) be available on Compustat from the Statement of Cash Flows, restricting the sample to the post-1986 period. The sample must have sufficient data available to calculate all of the three REM proxies. I therefore require non-missing values of the following variables: CFO (Compustat #308), total assets (Compustat #6), sales (Compustat #12), cost of goods sold (Compustat #41), inventory (Compustat #3), SG&A (Compustat #189). I also require non-missing values of income before extraordinary items (Compustat #18), market value of equity (Compustat #199*Compustat #25), and book value of equity (Compustat #60) so that I can derive performance, size and market-to-book ratio for use as control variables in the main test.⁴ I exclude firms in regulated industries (SIC codes between 4400 and 5000) and banks and financial institutions (SIC codes between 6000 and 6500). Because the models for normal or expected CFO, production costs, and discretionary expenses are estimated every year and industry, I require at least 15 observations for each industry-year grouping. Extreme observations are truncated at 1% and 99%. Imposing all the data-availability requirements yields 51,487 firm-year observations over the period 1987-2001, including 44 industries and 8,161 individual firms.

Similar to Roychowdhury (2006), I define firm-years in the interval to the immediate right of zero as the *suspect firm-years*. Specifically, suspect firm-years have scaled income before extraordinary items that is greater than or equal to zero but less than 0.005. There are 1,159 suspect firm-years in total. Roychowdhury (2006) argues that he does not include other intervals in the suspect category because these intervals are likely to contain a higher proportion of firm-years that did not manipulate earnings at all.

⁴ In the additional analyses in Chapter 5, the sample needs to have complete information necessary to compute REM proxies from the modified models.

3.2 Estimation Models

Following Roychowdhury (2006), I use three metrics to estimate the level of real activities manipulation computed as follows.

First, generate the normal levels of discretionary expenses, CFO and production costs by running cross-sectional regressions for each industry and year as follows:

Discretionary expenses are defined as the sum of advertising expenses, R&D expenses and SG&A. When either advertising expenses or R&D expenses are missing, the values are set to zero. Total discretionary expenses are expressed as a function of lagged sales⁵.

$$\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it} \quad (1)$$

Normal CFO is expressed as a linear function of sales and change in sales.

$$\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it} \quad (2)$$

Production costs are defined as the sum of cost of goods sold and change in inventory during the year. Cost of goods sold is modeled as a linear function of contemporaneous sales, while inventory growth is modeled as a linear function of contemporaneous and lagged change in sales. Therefore, the model used to estimate normal level of production costs is:

$$\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it} \quad (3)$$

The proxies for real activities earnings management are abnormal level of the three variables defined above.

$$Abnormal\ level = actual\ level - normal\ level \quad (4)$$

I estimate abnormal levels of discretionary expenses, CFO and production costs using the entire sample of 51,487 firm-years. Table 1 reports the descriptive statistics of the regression coefficients for all of the three regressions, including the mean, lower quartile, median, and upper quartile across industry-years and t-statistics from standard errors across industry-years.

The coefficients are generally consistent with those in Roychowdhury's results both in terms of the sign and magnitude. The mean adjusted R^2 s are also similar. Specifically, the mean adjusted R^2 for abnormal discretionary expenses model, abnormal CFO model, and abnormal production costs in Roychowdhury (2006) are 0.38, 0.45, and 0.89 respectively, very close to 0.37, 0.30, and 0.88 calculated in this study.

⁵ All variables are deflated by total assets.

Chapter 4

Empirical Results

In this chapter, I begin with a replication of the main results which show that small profit firms (“suspect firm-years”) are more likely to engage in real activities manipulation than other firms. The next section presents an empirical analysis on the proportion of observations with income-increasing REM as well as the magnitude of REM activities, focusing on 30 earnings intervals surrounding zero. After carefully examining REM proxies in details, I analyze the potential issues with the original tests. Finally, I perform a set of newly designed tests to investigate the use of real earnings management among small profit firms.

4.1 Replication of Roychowdhury (2006)

Roychowdhury (2006) shows the main results that suspect firm-years are more likely to engage in real activities manipulation by estimating the following regression:

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t \quad (5)$$

where Y_t = abnormal discretionary expenses, abnormal CFO, and abnormal production costs from the industry-year regression model described in Section 3.2

$SIZE_{t-1}$ = logarithm of market value of equity

MTB_{t-1} = market-to-book ratio

$Net\ income_t$ = income before extraordinary items scaled by beginning-of-year total assets

$SUSPECT_NI$ = 1 if firm-years belong to the earnings interval just right of zero, and 0 otherwise

To control for systematic variation in abnormal discretionary expenses, abnormal CFO and abnormal production costs with growth opportunities, size, and performance, the three control variables are added in the main regression. Because the dependent variables are essentially deviations from normal levels within an industry-year, all the control variables in the regressions are also expressed as deviations from the respective industry-year means. The Fama-MacBeth regression is run cross-sectionally for each of the 15 years from 1987-2001. Roychowdhury argues that when firms engage in real activities manipulation to increase

earnings, it will have unusually low CFO or unusually low discretionary expenses and unusually high production costs (see Chapter 2). Therefore, I expect the coefficient estimate on SUSPECT_NI to be significantly negative (positive) when the dependent variables are (is) abnormal discretionary expenses and abnormal CFO (abnormal production costs).

The results in Panel B, Table 2 confirm those in Roychowdhury (2006) (Table 4 in his paper, Panel A, Table 2 in the dissertation). Specifically, when the dependent variable is abnormal discretionary expenses, the coefficient on SUSPECT_NI is negative (-0.0572) and significant at the 5% level ($t = -6.60$). Suspect firm-years have abnormal discretionary expenses that are lower on average by 5.7% of assets compared to the rest of the sample, which is economically significant. When the dependent variable is abnormal CFO, the coefficient on SUSPECT_NI is negative (-0.0103) and significant at the 5% level ($t = -2.43$). Suspect firm-years have abnormal CFO that is lower on average by 1% of assets compared to the rest of the sample, which is again economically significant. Finally, when the dependent variable is abnormal production costs, the coefficient on SUSPECT_NI is positive (0.0433) and significant at the 5% level ($t = 5.72$). Suspect firm-years have abnormal production costs that are higher on average by 4.3% of assets compared to the rest of the sample. This is also economically significant. Overall, the results show that small profit firms are likely to engage in real activities manipulations than other firms which are consistent with the hypothesis of the use of real earnings management to avoid losses.

4.2 REM over Earnings Intervals

Given the argument that firms engaging in real activities manipulation should have lower discretionary expenses, lower CFO, and higher production costs than normal, it follows that firms using REM should have negative values of abnormal discretionary expenses and abnormal CFO, and positive value of abnormal production costs. Therefore, if firms avoid losses by engaging in these activities, then there should be a higher proportion of negative abnormal discretionary expenses, negative abnormal CFO, and positive abnormal production costs in suspect firm-years interval than in any other intervals.

Figure 1 shows the percentage of positive and negative REM proxies for each earnings interval. The results in all panels focus on 30 earnings intervals surrounding zero. The suspect firm-years interval is interval 1 in the figure. Panel A presents the results for abnormal discretionary expenses. As is apparent in the figure, the proportion of firm-years with negative abnormal discretionary expenses is quite similar across all earnings intervals, revolving around 60-70%. Contrary to the REM hypothesis, the percentage of firm-years with income-increasing REM activity (negative abnormal discretionary expenses) in suspect firm-years interval is not higher than other profit intervals. This may be a result of two issues: (1) other profit intervals can also contain REM firm-years and (2) the small profit interval is polluted with firm-years managing earnings downward. However, if this is truly the case, one should expect the proportion of firm-years with income-increasing REM activity to diminish in loss intervals. The result shows that this is not the case. In fact, the percentage of firm-years with income-increasing REM activity in small loss interval (72%) is even higher than that in small profit interval (69%). Therefore, it seems to be the case that small profit firms do not contain a higher proportion of observations with income-increasing REM than either nearby profit firms or loss firms.

Panel B shows the results for abnormal CFO. Overall, there is somewhat a higher variation in the proportion of observations with income-increasing REM activity (negative abnormal CFO) than in the case of abnormal discretionary expenses. Moving along earnings interval from losses to profits, the percentage of firm-years with income-increasing REM activity is decreasing. The result is again puzzling and contrary to the REM hypothesis. The original argument is that firms use REM to move from small losses to small profits; yet, the profit intervals which ex-post avoid losses turn out to have a lower percentage of observations with income-increasing REM activity than many loss intervals. Focusing on the intervals immediately to the left and right of zero, the small loss interval even has a higher percentage of observations with income-increasing REM activity (55%) than the suspect firm-year interval (52%). These results again suggest the similarity between small profit firms and other firms in nearby earnings interval with respect to the proportion of income-increasing REM.

The results for abnormal production costs are shown in Panel C. Unlike in Panel A and B, in this case the sign of income-increasing REM activity is positive. Similar to the previous two panels, however, the proportion of firm-years with income-increasing REM activity in suspect firm-years interval is not higher than many other profit firms. Furthermore, the percentage of the small loss interval with income-increasing REM activity is 66%, which is higher than 62% of the small profit interval. Therefore, once again similar proportions of observations with income-increasing REM are observed between small profit firms and other firms.

A potential concern with the previous test specification is that it does not take into account the magnitude of the proxies. For instance, even though suspect firm-years interval has similar proportion of negative abnormal discretionary expenses to the nearby intervals, the REM hypothesis could be valid if the value of abnormal discretionary expenses for suspect firm-years interval is more negative than that of the other intervals. To address this issue, I next investigate the magnitude of the three REM proxies.

Figure 2 presents the mean value of the three REM proxies for each earnings percentile.⁶ To obtain a more complete understanding, the sample is extended to include all observations. The vertical line indicates where the earnings is zero. Panels A through C report the results for abnormal discretionary expenses, abnormal CFO, and abnormal production costs over scaled earnings, respectively. All three panels in Figure 2 show that there is no noticeable difference between the REM proxies in the “small profit” earnings percentile and those in the nearby percentile portfolios. Therefore, it does not seem to be the case that small profit firms use abnormally high level of REM activities to increase earnings.

Small profit firms could contain both firms that try to avoid losses (income-increasing firms) and those that try to take a big bath or create some reserves (income-decreasing firms). Therefore, one explanation for the failure to find a dramatic increase in the level of REM activities among small profit firms is that the extremely high and low values of REM proxies for the two types of firms with opposing earnings management objectives average out to those of nearby portfolios. Therefore, I also plot the mean REM proxies separately for the positive and negative values. If it is truly the case that small profit firms contain both firms with extremely

⁶ I use earnings percentile in this analysis rather than a fixed earnings interval to form a group of firms. This is to avoid extreme variation in the mean REM proxies in the tails of the earnings distribution due to few numbers of observations.

high income-increasing and income-decreasing activities, then I expect to see a discontinuity in the average REM proxies for both signs at zero. Figure 3 shows that the results do not support the REM hypothesis. There is no discontinuity in the mean REM proxies at zero for both the positive and negative categories.

Overall, I find that, inconsistent with the REM hypothesis, small profit firms do not contain a higher proportion of observations with income-increasing REM than other firms in nearby earnings intervals, nor do they have a larger magnitude of REM proxies. In order to reconcile the results here with the original results in Roychowdhury (2006), it is worth noting that all empirical tests are a joint test of the validity of the REM proxies and the REM hypothesis. To get more insight on the issue at hand, I start with a careful examination of the three REM proxies in the next section.

4.3 Reversal Tests

Because real earnings management is “a departure from normal activity”, its empirical proxy is simply a residual from the model that determines the normal level of activity (see Equations (1) - (3)). However, it is impractical to include every possible factor that determines the normal level of activity into the model. Therefore, each of the three empirically-derived REM proxies includes two components: REM activity and omitted variables.

In this section, I test whether REM proxies behave as though they mostly contain omitted variables or truly capture REM activity by checking subsequent reversal of the three proxies. The underlying argument is that if REM proxies truly capture a departure from normal activities, they will reverse in the future; however, if REM proxies mostly contain omitted variables, they will be highly persistent, since the same partial models are applied to firms with the same underlying constructs repeatedly throughout the years.

Table 3 presents transition matrices of the three REM proxies. In each panel, I first form a quintile portfolio based on the magnitude of the REM proxy in the current year (year t) and the subsequent year (year $t+1$). Then, I report the relative frequencies that firm-year observations transition from a given current year’s quintile to the subsequent year’s quintiles. The relative frequencies are a percentage of the total number of observations in each current year’s quintile. Therefore, the sum of the frequencies in each row is 100%.

Panel A, B and C report the transition matrices for abnormal discretionary expenses, abnormal CFO, and abnormal production costs, respectively. The tenor of the results is similar across the three panels. Overall, it is apparent that most of the observations fall in the main diagonal cells. This implies that the REM proxies are highly persistent. In other words, firms that use income-increasing REM activities tend to be classified repetitively as “income-increasing REM firms” in the following year. For example, Panel A shows that firms in the first quintile of abnormal discretionary expenses (i.e. those with income-increasing REM) in the current year have a probability of 73.40% to remain in the same quintile in the subsequent year. For comparative purposes, the table also reports a transition matrix for discretionary accruals. Consistent with Allen et al. (2013), there is a concentration of observations along the extreme minor diagonal as well as in the main diagonal. This suggests that REM proxies are more persistent when compared to discretionary accruals. The evidence is consistent with the presence of omitted variables in the REM proxies.

To extend the analysis into more future years, I first form quintile portfolios based on the magnitude of REM proxies in the current year (year t). Then, I plot the average REM proxies for the year of portfolio formation and the following five years for each quintile. Figure 4 reports the results. As can be seen from the graphs, all three REM proxies take longer than five years to revert to mean, unlike discretionary accruals which exhibit a clear mean reversion in the following year. Therefore, the time-series properties suggest that REM proxies mostly contain omitted variables rather than truly capture REM activity.

4.4 Omitted Correlated Variable and Control Effect

Omitted variables could simply introduce some noise into the original tests. Alternatively, they could drive the results in the tests, causing an omitted correlated variable problem. The former scenario creates a high type II error, while the latter creates a high type I error. Given that the original test detects REM, I examine the possibility of the second scenario. Specifically, I examine whether omitted variables in REM proxies induce the original results.

In this section, it is useful to re-examine Figure 2, which presents the mean value of REM proxies for each earnings percentile portfolio. Panels A through C report the trend in abnormal discretionary expenses, abnormal CFO, and abnormal production costs over scaled earnings, respectively. For abnormal discretionary expenses in Panel A, the magnitude of abnormal discretionary expenses follow a V-shaped curve, while that of abnormal CFO in Panel B reveals an increasing trend across earnings intervals. The case for abnormal production costs in Panel C is slightly different. The mean abnormal production costs for all loss intervals seem to revolve around slightly positive values and then shift downward dramatically once they reach profit intervals. Overall, the three REM proxies are a function of the underlying performance. Going further, the results in Figure 2 partially facilitate understanding of the main results in Roychowdhury (2006). Specifically, the results that suspect firm-years have lower abnormal discretionary expenses than other firm-years seem to be driven by both extreme loss and profit observations, while the results that suspect firm-years have lower abnormal CFO and higher abnormal production costs than other firm-years seem to be driven by extreme profit observations. This has an important implication, since small profit firms are in general systematically different from firms with extreme earnings. Accordingly, the validity of the comparison between small profit firms and extreme observations is questionable.

It should be noted that, in the original tests in Roychowdhury (2006), the underlying performance as well as certain other control variables including size and market-to-book are included to address the omitted correlated variable problem. In the following analysis, however, I show that these control variables do not mitigate the problem.

Figure 5 reports the average REM proxies before and after the control variables for each earnings percentile. REM proxies before the control variables are the total value of REM proxies, while REM proxies after the control variables are the residuals from the regression of REM proxies on size, market-to-book, and performance. The figure indicates that REM proxies after the control variables are still a function of performance. Therefore, by simply adding the control variables, the omitted correlated variable problem is not mitigated.

4.5 Problem with Extreme Observations

A graphical presentation in the last section illustrates that the main results might be driven by extreme observations. I begin this section by directly examining the issue by re-conducting the main test, excluding observations with extreme performances. Table 4 presents the results replicating the main tests but using only firm-year observations with scaled earnings before extraordinary items between -0.075 to 0.075 (earnings interval -15 to 15 in Figure 1). Panel A reports the results for abnormal discretionary expenses. Unlike Table 2, the mean coefficient estimate of SUSPECT_NI is not statistically significant. The Fama-MacBeth t statistic changes from -6.60 in Table 2 to only -1.29. Panel B and C report the results for abnormal CFO and abnormal production costs, respectively. Overall, the results are of similar tenor to Panel A. The coefficient of interest, SUSPECT_NI, is no longer statistically significant when excluding extreme observations. This suggests that the main results are driven by extreme observations rather than the suspect firms.

This result calls into question the validity of including such firms as a comparison group. Specifically, extreme observations usually have different underlying economic characteristics from small profit firms. Consequently, it is possible that small profit firms appear to have abnormally high level of real earnings management activities relative to extreme observations because we fail to include some underlying economic determinants of real earnings management activities. I next investigate further the problem with the application of REM models to extreme observations in the presence of omitted correlated variable problem.

All REM models are estimated cross-sectionally for each industry-year combination. Therefore, one of the underlying assumptions is that all firms in a certain industry and year, regardless of their underlying economic conditions, would behave in the same way. This poses a potential problem because in a given industry and year, there are variations in economic characteristics among firms.

Figure 6 together with the following explanation shows how this problem could attribute to the original results. I first rank observations into percentiles based on scaled earnings. Then, for each earnings percentile, I calculate the average values of discretionary expenses, CFO and production costs as well as the average normal levels estimated from the REM models, and the abnormal levels. Figure 6 shows the scatter plot between the average total level as well as the normal and abnormal components of each of the three activities against average scaled earnings for each earnings percentile. The figure suggests that when the models are estimated by pooling all observations with different performance, it does not fully capture the normal level of each activity for those with extreme performance, as on average the actual level tends to be further away from the normal level estimated from the model among extreme observations.⁷ For instance, extremely profitable firms usually have high current sales growth. Therefore, the normal level of their discretionary expenses based on last year's sales might not reflect the optimal level of discretionary expenses that spike up to match a big increase in current year's sales. Additionally, conditional on being extremely profitable firms, the optimal CFO level could be higher than the normal level estimated from all firms pooling across performances, simply because of economy of scale, or the power to negotiate with related parties such as suppliers or

⁷ Consistent with Cohen et al. (2013), this results in severe test misspecification when applying the models to firms with extreme financial performance.

employees. Furthermore, because ROA is mean-reverted, extremely profitable firms may not be able to realize that they could not produce as much as the normal level estimated from the model; thus, their optimal level is lower.

In sum, because firms with extreme financial performance (either extreme losses or extreme profits) face different underlying economic conditions than firms that just meet the zero targets, their optimal level of discretionary expenses, CFO, and production costs is also different from the normal level estimated from a group of firms with varying degrees of performance. Consistent with Cohen et al. (2013), I argue that REM proxies of extreme observations are misspecified. Therefore, they should be excluded from the comparison group unless they are appropriately controlled for.

4.6 Newly-Designed Tests of REM to Avoid Losses

In this section I perform a set of newly-designed tests to examine whether firms use real activities manipulations to avoid reporting losses. Recognizing that the problem with the original tests lies in the extreme observations, the first two tests include only firms with similar characteristics to small profit firms as a control group. In the last test, however, I include extreme observations after fixing the problem inherent in the estimation approach. The results of the new tests are as follows.

4.6.1 Magnitude of REM Proxies: Small Profits vs. Small Losses

I begin with a direct comparison of the magnitude of REM proxies for small profit firms with small loss firms. The idea is that small loss firms do not avoid losses, while having the closest underlying performance to small profit firms. Therefore, they represent the perfect comparison group to small profit firms. For completeness and comparability with the original tests however, other firms are also compared with small profits and small losses.

Table 5 reports the results of the test. Panel A compares small profit firms to all other firms. Consistent with the real earnings management hypothesis, abnormal discretionary expenses and abnormal CFO of small profit firms are negative (-6.3% and -0.2% respectively) and lower than those of other firms (0.1% and 0.0% respectively). In addition, small profit firms have higher abnormal production costs (3.6%) than do other firms (-0.1%). However, the difference in abnormal CFO between the two groups is not statistically significant at 10% level. I also present other firm characteristics for comparison between the two groups. Small profit firms on average are of smaller size and have lower growth than other firms. The mean scaled earnings of small profit firms are significantly higher than other firms at less than 1% level, which is likely due to the left skewed distribution of scaled earnings. Scaled discretionary expenses of small profit firms are significantly lower than other firms. Interestingly, the scaled CFO of small profit firms is significantly higher, while the scaled production costs are not significantly different from other firms.

Panel B of Table 5 presents the key result which is the direct comparison between small profit firms and small loss firms. According to the REM hypothesis, small profit firms employ a variety of REM activities, including cutting discretionary expenses, sales manipulation, and overproduction in order to avoid reporting losses. Thus, they should have more negative values of abnormal discretionary expenses and abnormal CFO, and more positive value of abnormal

production costs than small loss firms. None of these are supported by the results in Panel B. Although small profit firms do have the predicted signs for each REM proxy, the magnitudes are inconsistent with the hypothesis. Abnormal discretionary expenses (-6.3%) are significantly less negative for small profit firms than those for small loss firms (-8.7%) at 5% level, while abnormal CFO and abnormal production costs for small profit firms (-0.2% and 3.6% respectively) are insignificantly different from small loss firms (-0.8% and 4.6% respectively). Most firm characteristics are similar between small profits and small losses with the exception of scaled earnings and discretionary expenses.

Panel C compares small loss firms to other firms. The results indicate that small loss firms have significantly lower abnormal discretionary expenses and significantly higher abnormal production costs than the average firm, while abnormal CFO is not statistically significant. Overall, small profit firms and small loss firms both have lower abnormal discretionary expenses and abnormal CFO and higher abnormal production costs relative to the average of the entire population. Therefore, real earnings management does not appear to distinguish between small loss and small profit firms. This casts a serious doubt on the hypothesis that firms use REM to avoid reporting losses.

One concern with the test of small loss versus small profit firms is that it is possible that small loss firms also use real activities manipulation because they, too, have incentives to beat the benchmark and unsuccessfully attempt to achieve the target. To this end, I offer two comments. First, suppose this interpretation is true, it implies that we cannot use real activities manipulation as an explanation for benchmark beating, because both firms that do beat and do not beat the benchmark use real activities manipulation. In other words, real earnings management cannot successfully distinguish small profit and small loss firms. Second, I perform further analysis on small profit and small loss firms to provide additional evidence on the inconsistency between REM proxies and the actual directional shift of earnings among these firms in the next test.

4.6.2 REM Proxies and Directional Shift of Earnings

The second test relies on the argument in Zang (2007) that “*when a manager is making the real activities manipulation decision, presumably two conditions should be met. The first is that the manager has strong incentives to manipulate earnings for the current quarter; the second is that he has gathered adequate information about both the true earnings performance and the market’s expectation to estimate how far unmanipulated earnings are from the earnings target – in order to determine the amount of REM needed.*” Given these requirements, managers are likely to perform real activities manipulation during the fourth fiscal quarter than in the other fiscal quarters.

Consistent with this argument, I divide small profit firms and small loss firms into two groups: (1) income-increasing group and (2) non-income-increasing group. The first group includes observations whose reported earnings shift upward in the fourth quarter, while the non-income-increasing REM group includes observations whose reported earnings either stay in the same earnings bin or shift downward in the fourth quarter. I then calculate the mean REM proxies for each group. According to the REM hypothesis, I expect that the income-increasing group has the signs of REM proxies that are consistent with income-increasing REM (i.e. negative abnormal discretionary expense, negative abnormal CFO, and positive abnormal

production costs), while the non-income-increasing group should exhibit the opposite signs of REM proxies (i.e. positive abnormal discretionary expense, positive abnormal CFO, and negative abnormal production costs).

Table 6 reports the mean REM proxies for each group of small profit firms in Panel A and for small loss firms in Panel B. The tenor of the results is similar across two panels. Overall, the results suggest that although the first group has the sign of REM proxies consistent with the actual directional shift of earnings, the second group does not. In at least two out of three proxies, the results imply that the firms use income-increasing REM, even though the actual earnings shift downward in the fourth quarter. The differences in means across the two groups are either insignificant or significant but of the wrong sign. This implies that the non-income-increasing group appears to use equal or more income-increasing REM than the income-increasing group, which again casts a serious doubt on the REM hypothesis.

4.6.3 A New Estimation Approach

In the final test, I include all observations into the analysis. Because firms with extreme financial performance (either extreme losses or extreme profits) face different underlying economic conditions than firms that just meet the zero targets, their optimal level of discretionary expenses, CFO, and production costs is also different from the normal level estimated from a group of firms with varying degrees of performance. In order to resolve the problem, I re-estimate the normal level of each activity separately for each industry, year, and range of performance. Observations are sorted into each range of performance based on scaled earnings intervals. Each interval is of width 0.05⁸. The middle interval has income before extraordinary items scaled by lagged total assets between -0.025 and 0.025. The new estimation approach should result in a more realistic estimation of the normal level of all firms including extreme observations. I use the new approach to estimate the three REM proxies and replicate Roychowdhury's main tests. The results are reported in Table 7.

It is apparent that when using the new estimation approach, all results disappear. Specifically, the mean coefficient estimate of SUSPECT_NI is insignificant regardless of which type of REM proxies is used as a dependent variable. Therefore, it seems to be the case that the main results are driven by a rational response to fundamentally different characteristics rather than real earnings management to avoid reporting losses.

⁸ The interval width is admittedly arbitrary. However, it is designed to reflect a tradeoff between an attempt to include observations other than small profit firms in a given range (to avoid throwing-the-baby-out-with-the-bath-water problem) and an attempt to separate observations with different economic constructs into different intervals.

Chapter 5

Additional Analyses

5.1 Other Earnings Benchmarks

In this section, I examine whether the findings in the previous section also extend to two other earnings benchmarks, specifically last year's earnings and consensus analyst forecast.

5.1.1 Previous Year's Earnings

I start the analysis by repeating the original tests. However, suspect firm-years are identified as firms that just beat their previous year's performance. Specifically, I run the following regression:

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_CH_NI)_t + \varepsilon_t \quad (6)$$

where Y_t is the REM proxies; an indicator variable "SUSPECT_CH_NI" is equal to one when the change in earnings before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is equal to zero otherwise.

Panel A of Table 8 shows that on average firms that just beat last year's earnings have an abnormally low level of discretionary expenses and abnormally high level of production costs. Therefore, it appears that firms are likely to engage in two types of real earnings management activities, i.e. cutting discretionary expenses and overproduction, in order to achieve last year's profitability level. However, Panel B shows that, similar to the zero earnings benchmark case, none of the three REM proxies for small positive earnings change group (suspect firm-years) are significantly different from those for small negative earnings change group. Again, this implies the results in Panel A are driven by extreme observations and firms do not use real activities manipulation to try to beat last year's profitability.

5.1.2 Analyst Forecast

I repeat the main analysis, but this time the suspect firm-years are identified as firms whose forecast error with respect to final mean consensus analyst forecast is one cent.

Table 9 shows the results of the main tests using analyst forecast as a benchmark. Overall, the coefficient of the variable of interest, SUSPECT_FE, has the opposite sign from

what would be expected given the real earnings management hypothesis. Therefore, it seems to be the case that firms do not use real activities manipulation to beat analyst forecast.

5.2 Modified REM Models

In this section, I apply the same analysis that I perform earlier on the original REM models to the modified models from two subsequent studies, Gunny (2010) and Athanasakou et al (2011). The objectives are twofold: (1) to evaluate whether the modified models help reduce an omitted correlated variable problem; and (2) to test if a pattern consistent with REM to avoid losses exists when using the modified models. The model estimation is described in Appendix A. The model parameters for Gunny's modified REM models and Athanasakou et al.'s modified REM models are reported in Table 10 and Table 11, respectively. Overall, the coefficient estimates and the adjusted R^2 from Gunny's models are fairly close to those reported in the original paper.⁹

I start with the replication of the main tests. Table 12 shows that in some cases the results are similar to those using the original REM models in Table 2. It appears that small-profit firms use real earnings management to avoid reporting losses. However, in other cases the results from the main tests disappear. For instance, abnormal production costs from both Gunny's and Athanasakou et al.'s provide similar results to the original model, while the significance of abnormal R&D expense from both modified models, and abnormal CFO from Athanasakou et al.'s model drops completely.

Next, I plot the average magnitude of REM proxies over earnings percentile portfolios. The results for Gunny's modified models and Athanasakou et al.'s modified models are reported in Figure 7 and Figure 8, separately. Overall, there is no apparent discontinuity in the mean REM proxies among small profit firms and firms in other portfolios. Furthermore, the figures show that the trend is similar to those from Roychowdhury's models, although less pronounced. For example, the V-shaped curves of abnormal R&D and SG&A expenses are pretty flat compared to that of abnormal discretionary expenses. Apparently, the additional control variables in the modified R&D and SG&A models reduce the association between firm's operating performance and REM proxies. The same is true for the CFO model and the two production cost models. Although there is still an upward trending in abnormal CFO over earnings interval, the slope is smaller than the original model. Abnormal production costs still slope downward but the lines are flatter than the original model. Overall, the results suggest that additional control variables in the modified REM models lessen the effect of an omitted correlated variable problem but they do not entirely mitigate it.

When I calculate the mean REM separately for positive and negative values of REM proxies in Figure 9 and Figure 10, the results are of the same tenor. Specifically, the trend in the plots is smooth at the point of zero earnings, indicating that when separating firms with opposing earnings management objectives, the small profit firms in each group have similar level of REM activities to the nearby portfolios. Again, this is evidence inconsistent with the REM hypothesis.

Next, I compare the modified REM proxies for small profit firms with those of small loss firms. Again, the results, reported in Table 13 and Table 14, are similar to the main analysis. The

⁹ Athanasakou et al. (2011) do not report the descriptive statistics of model parameters.

differences are either insignificant or significant but with the wrong sign. For example, I find that abnormal R&D and SG&A expenses from the Gunny's modified models are significantly more negative for small loss firms (-0.014 and -0.047, respectively) compared with small profit firms (-0.006 and -0.021, respectively). This contradicts the argument that small profit firms have abnormally low discretionary expenses to avoid reporting losses.

Table 15 reports the replication of Roychowdhury's main results excluding extreme observations. Panel A reports results for Gunny's modified models, while Panel B reports results for Athanasakou et al.'s modified models, respectively. With the exception of abnormal production costs in Panel A, both panels show that the significance of the main coefficient drops completely after excluding extreme observations. This is consistent with the main results being driven by extreme observations in general.

Finally, I check subsequent reversal of all modified REM models. Table 16 and Table 17 reveal that results are qualitatively similar to those using the original model specifications. REM proxies exhibit high persistence, suggesting that the models tend to classify REM firms repeatedly over two consecutive years. When the analysis is extended to more than one year into the future, Figure 11 and Figure 12 reveal that the modified REM proxies revert to mean more quickly than the original models. However, a few modified proxies such as abnormal SG&A expenses and abnormal production costs from both Gunny's and Athanasakou et al.'s versions still take longer than five years to revert to the mean. Therefore, the implication is that the modified REM proxies still contain omitted variables.

Taken together, the modified REM models partially reduce an omitted correlated variable problem. However, there is still no observable pattern consistent with the hypothesis of REM to avoid losses. The results here have important implications. The main analysis in the study is a joint test of the ability of REM proxies to capture REM activities and the existence of firms using REM to avoid losses. Failure to find significant results could be due to poor REM proxies or the lack of firms using REM to avoid losses or both. Because the tests using refined models still yield no results, the evidence seems to support the second scenario, i.e. firms do not use REM to avoid losses. Nonetheless, one could not rule out the possibility that certain omitted variables distort the results and thus obscure the existing pattern of REM in the data. The bottom line is that subsequent research should keep in mind the potential concerns raised in this study before using the REM proxies or claiming the existence of REM to avoid losses.

5.3 Comparison of REM Proxies for Small Profit Firms and Other Firms in Nearby Earnings Intervals

In Section 4.6.1, I compare REM proxies in small profit firms directly with those in small loss firms, because small loss firms represent an ideal comparison group. In this section, I provide an additional analysis by using alternative comparison groups that also have similar characteristics to small profit firms. Specifically, I start with a comparison group of profit firms that fall in the interval immediately to the right of small profit firms. The results reported in Table 18, Panel A show that there is no significant difference in the magnitude of REM proxies using this alternative control group as well.

In Panel B, the comparison group is randomly selected from any observations with income before extraordinary items scaled by lagged total assets between -0.05 and 0.05.¹⁰ The size of each control group is 1,159 firm-year observations to match the size of small profit firms. Once randomly-selected, the mean REM proxies are calculated for the comparison group and then compared with those in small profit firms. Panel B reports the distribution of the average REM proxies for the 10,000 randomly-selected portfolios of firms as well as the percentage of cases that the level of REM activities in small profit firms is significantly higher than that in other intervals. I find that the majority of cases are not consistent with REM hypothesis. Specifically, only 0.42% of the randomly-selected portfolios cut significantly less discretionary expenses than small profit firms, while only 22.72% and 4.15% of the randomly-selected portfolios use sales manipulation and overproduce less than small profit firms, respectively.

5.4 Time-Series Estimation

In Chapter 4, a concern with the traditional REM proxies is the way it is estimated cross-sectionally for each industry and year. As previously described in the last chapter, industry-year estimation imposes an assumption regarding homogeneity between all firms in a given industry-year combination. In this section, I therefore estimate all of the REM models using time-series estimation. Specifically, the regressions are estimated for every firm. Firms with fewer than 8 time-series observations are eliminated from the sample. Table 19 reports the model parameters using time-series estimation approach. The table shows that when estimating using a firm-level basis, the models have more explanatory power. For example, the mean adjusted R^2 for discretionary expenses model increases from 0.37 in cross-sectional estimation (Table 1, Panel A) to 0.57 in time-series estimation (Table 19, Panel A). The same is true for abnormal CFO and abnormal production costs. This finding supports the use of time-series estimation rather than cross-sectional estimation of the REM models.

I repeat the analyses in Chapter 4 but using REM proxies estimated from a firm-level basis. Interestingly, a replication of Roychowdhury's main results shows that when using time-series estimation, the results, reported in Table 20, are either insignificant or barely significant. Figure 14 shows that a trend of REM proxies over earnings percentile is similar to that when estimated cross-sectionally, although the trend is much less pronounced. Figure 15 shows that, similar to the cross-sectional estimation results, there is no discontinuity at zero in the average level of REM activities for both income-increasing and income-decreasing groups. Unlike the cross-sectional estimation results, however, Table 21 and Figure 16 reveal that REM proxies using time-series estimation exhibit subsequent reversal in the following year. For completeness, I also report the results of a replication of Roychowdhury's main tests when extreme observations (Table 22) are excluded and a comparison of REM proxies in small profit firms and small loss firms (Table 23), both of which show similar results to when REM proxies are estimated cross-sectionally.

Overall, the findings support the argument in Chapter 4 that REM proxies estimated by industry-year combination results in severely misspecified models, and thus contain significant portion of omitted variables. A time-series estimation approach presents a viable alternative to

¹⁰ The idea here is to select firm-year observations with similar characteristics to small profit firms. The test is designed to show that the insignificant differences do not hold only when small profit firms are compared to small loss firms, but also when they are compared to other firms with similar characteristics.

the cross-sectional estimation that improves explanatory power of the models. However, there are problems specific to the time-series estimation as well. For example, it imposes a long time-series data for each firm, which potentially leads to a survivorship bias problem. This also greatly reduces the total number of observations left in the analyses. Another problem with time-series estimation is that it is based on the assumption of homogeneity for each firm across its time series. Therefore, the estimation approach is not appropriate for a firm with drastic changes throughout the years.

5.5 Overproduction in Manufacturing vs. Non-Manufacturing Industries

In this section, I focus on one of the REM tools, overproduction. I take advantage of the cross-sectional differences in the two categories of industries: manufacturing and non-manufacturing industries. Specifically, non-manufacturing industries do not have production costs and, therefore, cannot manage earnings by overproduction. I repeat the analyses in the main tests separately for the two categories of industries. The idea is that if it is truly the case that overproduction is used as a part of REM tools to manage earnings, the main results in Chapter 4 should only be evident in manufacturing industries.

The replication of Roychowdhury's main tests is reported in Table 24. It is clear that, even though small profit firms in manufacturing industries seem to overproduce ($SUSPECT_NI = 0.0494$) more than those in non-manufacturing industries ($SUSPECT_NI = 0.0284$), when compared with the rest of the sample, the main results are also significant among firms in non-manufacturing industries. Specifically, the coefficient on $SUSPECT_NI$ in the non-manufacturing industries is positive and statistically significant. This finding supports the argument that at least a part of the main results is driven by test specification rather than true REM.

I also perform a series of tests separately for the two subsamples to see if there is any difference in REM behavior between the two groups. Figure 17 reports the percentage of positive and negative abnormal production costs for each earnings interval separately for manufacturing and non-manufacturing industries. Figure 18 and Figure 19 present the mean abnormal production costs for each earnings percentile when the positive and negative values in each earnings percentile portfolio are combined and separated, respectively. Overall, the two subsamples show strikingly similar results in all three figures, again casting doubt on the use of overproduction among small profit firms in the manufacturing industries. Finally, I perform a reversal test. Table 25 reports transition matrices of abnormal production costs and discretionary accruals separately for manufacturing and non-manufacturing firms. The table shows that once again the results in the two subsamples are similar. If anything, Panel A and B show that there appears to be slightly more concentration of observations in the main diagonal for the manufacturing industries. If the manufacturing firms overproduce, their abnormal production costs should exhibit more reversal. Therefore, this is inconsistent with the use of overproduction among manufacturing firms. Panel C and D show similar transition matrices of discretionary accruals among the two subsamples. Finally, Figure 20 reports results of mean reversion in the following five years separately for the two categories. The result for manufacturing industries in Panel A is also qualitatively similar to that for non-manufacturing industries in Panel B.

To summarize, there is no noticeable difference in the production behavior between manufacturing and non-manufacturing industries. This calls into question the validity of the overproduction proxy as well as the use of overproduction to manage earnings.

5.6 Loss Dummy Variable

This section is motivated by Figure 2 in the main results, which plots the average REM proxies over earnings percentile. Specifically, in Panel A of Figure 2, there is a V-shaped pattern when the mean abnormal discretionary expenses is plotted against the mean scaled earnings, with the bottom of the curve at zero earnings. This implies that the type of linear function that explains the relation between abnormal discretionary expenses and the underlying performance depends on whether a given observation is a loss or a profit firm. Taken further, being profitable or unprofitable could potentially explain Roychowdhury's main results in Table 2. In other words, an indicator variable of being loss firms could potentially have explanatory power that subsumes an indicator variable of being small profit firms. To investigate this possibility, I add a loss dummy variable and its interaction with Net Income to the original test specification and replicate Roychowdhury's main results again.

Table 26 reports the results. The regression in the first column is simply that from the original test specification, added here for comparative purpose. As described in the previous chapter, the coefficient of interest, *SUSPECT_NI*, is negative and significant at 5% level, consistent with small profit firms abnormally cutting their expenses when compared to the rest of the sample. However, when the loss dummy variable and an interaction term between the loss dummy variable and net income are added to the regression, the second column shows that the main results disappear. Specifically, the coefficient of interest, *SUSPECT_NI*, is no longer statistically significant. Instead, the two added variables are statistically significant, supporting the argument that the main results can be explained simply by whether the firms are profitable or unprofitable.

5.7 Reversal Tests of Suspect vs. Non-Suspect Firms

This section examines the difference in the time-series property of REM proxies between suspect and non-suspect firm-years. Suspect observations are simply small profit firms, with income before extraordinary items between 0% and 0.5% of lagged total assets, while non-suspect observations include all other firms. The idea behind the test is that if suspect observations truly use REM activities to manipulate earnings, the REM proxies should exhibit more reversal in the suspect group than in the non-suspect group. Panel A, B and C of Table 27 report the results for abnormal discretionary expenses, abnormal CFO, and abnormal production costs separately. For comparative purpose, Panel D reports the results for discretionary accruals.

Panel A shows that abnormal discretionary expenses are highly persistent in both subsample. If anything, it appears that the suspect observations are slightly more persistent than their non-suspect counterpart. This is against the REM hypothesis. Panel B shows somewhat mixed results regarding the comparative persistence between the two groups. For example, considering an observation that is sorted as quintile 1 in year t , although a higher percentage of suspect observations stay in quintile 1 in year $t+1$ (48.07% versus 36.99%), a higher percentage of suspect observations also move to the highest quintile (8.39% versus 4.05%). Thus, it is inconclusive as to whether REM proxies are more or less persistent in the suspect group when

compared with the non-suspect group. The same is true for Panel C and D. Since there is no clear evidence that suspect observations exhibit stronger reversal, the results in this section complement those in the main empirical tests, calling into question the use of REM to avoid losses.

5.8 Extra Analysis on Suspect Firms

In Chapter 4, Section 4.3, the transition matrices show that REM proxies are highly persistent. However, an alternative interpretation of the results is that firms use REM activity repeatedly as they try to avoid reporting losses in the second year as well. To further investigate this issue, I report the likelihood of a firm just avoiding losses for two consecutive years.

Table 28 reports a 2*2 contingency table displaying the number of observations that are suspect firm-years (small profit firms) and those that are not. Each firm-year is classified into two groups both in the current year (year t) and in the subsequent year (year $t+1$). The table shows that most of the observations are not suspect firm-years. More importantly, firms that just avoid losses in the current year are more likely to become non-suspect firm-years in the following year. In fact, an association test reports a phi coefficient to be negative (-0.02) and statistically significant at less than 1% significance level. This evidence is inconsistent with the argument that firms use REM repeatedly to avoid reporting losses.

Chapter 6

Robustness Tests

In this section, I conduct sensitivity tests of my results to alternative subsamples, variable definitions, and test specifications.

6.1 Full Sample Analysis

The main empirical tests conducted so far use the sample period from 1987-2001 in order to match that in Roychowdhury (2006). One interesting question is whether the results are still robust when the more recent periods are included in the analysis. In this section, I therefore rerun the main analysis using a full sample period from 1987-2013.

Table 29 reports the model parameters for the three REM models using the full sample. Overall, the adjusted R^2 's are slightly higher than the original sample. The coefficient estimates are fairly similar to those reported in Table 1. When I replicate Roychowdhury's main results in Table 30, the results from the full sample mirror those from the original sample. Specifically, small profit firms appear to use abnormally low discretionary expenses, have abnormally low cash flow from operations, and overproduce when compared to the rest of the sample. When I examine the REM proxies over earnings intervals, Figure 21 shows that the percentage of observations with income-increasing earnings is similar across 30 earnings intervals surrounding zero. Figure 22, which plots the mean REM proxies over earnings percentile, shows that there is no discontinuity of the average REM proxies at zero earnings. Furthermore, the trend of each REM proxy using the full sample is very similar to those obtained from the original sample. Specifically, abnormal discretionary expenses exhibit a V-shaped pattern with the bottom of the curve at zero earnings; abnormal CFO exhibits an S-shaped curve, while abnormal production costs are pretty stable in the loss zone and form a sharp decline in the profit zone. When calculating the mean REM proxies separately for positive and negative values, there is no noticeable discontinuity at zero earnings, consistent with the original sample results. Again, this suggests that small profit firms do not use extremely high levels of REM activities in both directions when compared to firms in nearby earnings percentile. When I perform the reversal

test, Table 31 reveals that, similar to the original sample results, the three REM proxies are highly persistent as a majority of observations stay in the main diagonal of the transition matrices. Figure 24 presents the mean reversion five years into the future. The results are again of the same tenor as the original sample results. It takes more than five years for the three REM proxies to revert to mean, while it takes only one year for discretionary accruals to do so. I also replicate Roychowdhury's main tests excluding extreme observations in the full sample analysis. The results, reported in Table 32, show that the significance drops completely for all three REM models. Finally, when I compare REM proxies for small profit firms with small loss firms, I find that small loss firms, in fact, cut more discretionary expenses than small profit firms. The level of abnormal CFO and abnormal production costs for the two groups are not statistically significant. Therefore, one again, I fail to find evidence consistent with the REM hypothesis.

In sum, this section shows that the empirical results are qualitatively similar when the sample period is extended to include more recent data.

6.2 Alternative Proxies for Discretionary Expenses

Discretionary expenses are defined as the sum of SG&A expenses (Compustat # 189), advertising expenses (Compustat # 45), and R&D expenses (Compustat # 46) in order to be consistent with Roychowdhury (2006). However, according to the data definition in Standard & Poor's Compustat user guide, SG&A expenses (Compustat # 189) include advertising expenses and R&D expenses already. Therefore, to avoid the double counting of advertising and R&D expenses, in this section, discretionary expenses are defined simply as SG&A expenses (Compustat # 189).

I rerun the main empirical tests using this alternative definition of discretionary expenses. The results are reported in Table 34 and Figure 25. Panel A of Table 34 reveals similar model parameters to those in the main tests, although using the alternative definition provides slightly more explanatory power on average. Panel B of Table 34 presents a replication of Roychowdhury's main tests with and without extreme observations. The results indicate that, consistent with the results in Chapter 4, small profit firms have abnormally low discretionary expenses compared to the rest of the sample only when the control sample includes extreme observations. Panel A, B, and C of Figure 25 show that there is no difference in the proportion and magnitude of REM between small profit firms and other nearby earnings intervals, nor is there any difference when the average magnitude of REM proxies are calculated separately for positive and negative values. The reversal tests in Panel C of Table 34 and Panel D of Figure 25 show that abnormal discretionary expenses are highly persistent. Finally, Panel D of Table 34 shows that small loss firms cut significantly more discretionary expenses than small profit firms.

Therefore, all of the main empirical results still hold when an alternative definition of discretionary expenses is used.

6.3 Equal-Sized Portfolio Analysis

In Section 4.6.1, I compare the REM proxies between small profit firms and small loss firms, where the latter is defined as any firm-year observations with reported income before extraordinary items between -0.5% and 0% of lagged total assets. This results in 518 firm-year observations, while the small profit group has 1,159 firm-year observations. As a sensitivity test, in this section, I extend the range of performance to include more loss firms until the number of observations in “small losses” group equal that in “small profits” group. The results are reported in Table 35. When using an equal-sized portfolio, small loss firms still cut significantly more discretionary expenses than small profit firms. Moreover, abnormal CFO and abnormal production costs in small profit firms are insignificantly different from those in small loss firms. Overall, the results are of the same tenor as those reported in the main tests.

6.4 Alternative Scaling Variable

For all three REM models, the scaling variable for each variable is lagged total assets. In this section, I investigate if the results are robust when an alternative scaling variable is used. Specifically, all variables are scaled by the number of shares outstanding instead of total assets.

Three interesting findings are obtained from the analysis. First, Table 36 shows that all three REM models have more explanatory power when using the alternative scaling variable. For example, the mean adjusted R^2 of discretionary expenses model in Panel A increases from 0.37 to 0.63, while the mean adjusted R^2 of CFO model in Panel B increases from 0.30 to 0.48. Second, when the mean REM proxies are plotted against mean scaled earnings, the trend is roughly the same regardless of the scaling variable. As can be seen in Figure 26, one exception here, however, is abnormal discretionary expenses. Instead of the V-shaped pattern when total assets are used as scaling variable, the graph roughly exhibits an S-shaped pattern when the number of shares outstanding is used as scaling variable. Finally, Table 37 shows that the results lose significance in Roychowdhury’s main results when using the alternative scaling variable. The implication here is that the main results could be driven by a denominator effect or a scaling bias.

6.5 Reversal Tests: Alternative Level of Granularity in Sorting

When I perform reversal tests, the firms are sorted into quintile portfolios based on the magnitude of REM proxies. In this section, I change the level of granularity in the sorting process. Specifically, I examine whether the results are robust when I sort firm-year observations into decile and percentile portfolios.

The transition matrices using decile portfolios are reported in Table 38. Overall, the results are robust when using decile portfolios. Panel A, B, and C reveal that the three REM proxies are highly persistent, as there is a concentration of observations along the main diagonal of the matrices. Panel D shows that discretionary accruals are less persistent, as there is a

concentration of observations in the extreme deciles along the minor diagonal of the matrix as well. Figure 27 reports the mean reversion of REM proxies and discretionary accruals for the next five years using decile portfolios. The results are similar to those from the quintile portfolio analysis. It takes longer than five years for the three REM proxies to revert to mean, while it takes one year for the discretionary accruals to do so. Finally, I perform the analysis using percentile portfolios. The results are reported in Figure 28, and are similar to those obtained when using quintile or decile portfolios. Therefore, this section shows that the reversal test results are robust to whether the observations are sorted into quintile, decile, or percentile portfolios.

Chapter 7

Conclusions

In this dissertation, I re-examine the tests of real earnings management to avoid losses developed in Roychowdhury (2006). Accounting researchers have frequently employed the three REM models derived in Roychowdhury and a research design similar to his in order to test for real activities manipulation. Many others take his results as fully establishing the existence of real earnings management among small profit firms and perform subsequent tests such as examining future performance of firms using real earnings management. However, there is scant evidence to date about the validity of the REM models. In this dissertation, I investigate the robustness of Roychowdhury's findings.

First, I replicate the main results which show that suspect firm-years are more likely to engage in real activities manipulation than other firms. Then, I show that despite the original findings, small profit firms do not contain a higher proportion of firm-years that manipulate earnings upward nor do they have a larger magnitude of REM activities than other firms in nearby earnings intervals. To examine REM proxies more closely, I investigate their subsequent reversals. I find that all of the three proxies are highly persistent, implying that REM proxies contain omitted variables rather than truly capture REM activity. I find evidence suggesting that an omitted correlated variable is the underlying performance and that the original results are driven by extreme observations. Because firms with extreme performance (either extreme losses or extreme profits) face different underlying economic conditions than firms that just meet the zero target, the pattern of abnormal discretionary expenses, abnormal CFO, and abnormal production costs documented in the original paper could be explained by a rational response to different underlying economic conditions rather than real earnings management to avoid reporting losses.

Finally, I construct three new tests to examine the REM hypothesis. In the first test, I argue that in order to directly test whether firms move from small losses to small profits, one should compare REM proxies of small profit firms with small loss firms. I find that small profit firms and small loss firms both have lower abnormal discretionary expenses and abnormal CFO and higher abnormal production costs relative to the average of the entire population. Therefore, real earnings management does not appear to distinguish between small loss and small profit firms, which calls into question the REM hypothesis. In the second test, I show some evidence of the inconsistency between the direction of actual earnings shift in the fourth quarter and that

predicted by the proxies. The analysis reveals that both observations whose earnings shift upwards and downwards appear to use income-increasing REM, which is inconsistent with the REM hypothesis. In the last test, I estimate the normal level of the three activities for each industry, year, and range of performance and re-run the main test in the original paper. The coefficient estimate on SUSPECT_NI is no longer statistically significant for all REM proxies. Therefore, I fail to find evidence consistent with the REM hypothesis in all of my newly-designed tests.

In the additional analyses, I find that firms do not use real earnings management to beat last year's earnings and consensus analyst forecast, and that the modified REM models from two subsequent studies, Gunny (2010) and Athanasakou et al (2011) partially reduce an omitted correlated variable problem; however, there is still no observable pattern consistent with the hypothesis of REM to avoid losses. I also find that small profit firms do not exhibit a higher level of REM activities when compared to both the profit firms in the adjacent earnings interval and the randomly selected portfolios of firms in nearby earnings intervals. Because part of the problems with the original tests lies in the way REM proxies are estimated, I investigate the use of time-series estimation rather than the traditional cross-sectional estimation approach. I find that REM models estimated from the time-series estimation have more explanatory power; the proxies are more persistent; and unlike the cross-sectional estimation results, there is no evidence that small profit firms use an abnormally large magnitude of real activities manipulation compared to the rest of the sample.

Furthermore, I also perform detailed analyses particular to each type of REM activities. First, I focus on abnormal production costs and perform a placebo test, exploiting the cross-sectional variation in the production behavior between the two categories of industries. I find that there is evidence of the use of overproduction in non-manufacturing industries, indicating that at least part of the main results is driven by test specification rather than true REM. Next, I focus on abnormal discretionary expenses and find that a loss dummy variable has explanatory power that subsumes the small profit indicator variable in the main tests. The two last additional analyses show that small profit firms do not exhibit stronger reversal of REM proxies than do other firms, and that they are not likely to repeatedly use REM activities in two consecutive years, as they are likely to move to other earnings intervals in the following year. Finally, my primary results are robust to the inclusion of more recent period data, an alternative definition of discretionary, an equal-sized portfolio analysis, the use of the number of shares outstanding as a scaling variable, and the different level of granularity in sorting.

The dissertation has important implications for future research. First, because the main results in Roychowdhury (2006) are subject to the test specification, subsequent researchers should be careful before taking the results that firms use real activities manipulation to avoid reporting a loss as finalized. Second, because all REM models are estimated cross-sectionally for each industry-year combinations and because firms with extreme performance (either extreme losses or extreme profits) face different underlying economic conditions than firms that just meet the zero targets, their optimal level of discretionary expenses, CFO, and production costs is also different from the normal level estimated from a group of firms with various performances. Subsequent research should realize that this results in poor model specification for observations with extreme performances. Finally, the modified models in subsequent studies partially reduce the problem with the original models; however, they do not fully mitigate it.

As a final note, this dissertation aims neither at devaluing research on REM in general nor at disputing Roychowdhury's conceptual overview of REM. In fact, as observed in DeFond (2010), real activities manipulation is one area that seems to be relatively under-researched, compared to research that investigates accruals-based earnings management. Roychowdhury (2006) is among the first to provide a more comprehensive overview of how transaction management of operational activities can be implemented and his attempt to develop comprehensive measures of REM is an important, fundamental step to research in this area. It is without a question that more research on REM is needed. The main challenge, though, lies in recognizing the main issues with the current literature and defining a more precise definition of real earnings management as well as refining the proxies employed in the analysis.

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Figure 1: Percentage of Positive and Negative REM Proxies for Each Earnings Interval

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: The figure reports the percentage of firm-years with positive and negative abnormal discretionary expenses, abnormal CFO, and abnormal production costs respectively for each of the 30 earnings intervals surrounding zero. The earnings is defined as income before extraordinary items scaled by total assets. Each panel includes firm-years whose scaled earnings are between -0.075 and 0.075. Each interval is of width 0.005, with category 1 including firm-years with earnings greater than or equal to zero and less than 0.005 (the “suspect firm-years”). The figure is truncated at the two ends. The vertical dash line indicates where the scaled earnings is zero.

Figure 2: Mean REM Proxies for Each Earnings Percentile

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: In this figure, observations are ranked based on the magnitude of scaled earnings into percentile. Each dot represents the average REM proxies against the average scaled earnings (scatter plots). Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 3: Mean REM Proxies Classified by Signs for Each Earnings Percentile

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 4: Mean Reversion of REM Proxies and Discretionary Accruals

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Panel D: Discretionary accruals

Note: This figure plots the mean REM proxies and discretionary accruals for the current and the following five years separately for each quintile portfolio. The portfolios are formed based on the current year's value of either REM proxies or discretionary accruals. Panels A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively, while Panel D presents the results for discretionary accruals. The figure includes 51,487 firm-year observations from 1987-2001.

Figure 5: REM Proxies before and after Control Variables for Each Earnings Percentile

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: The figure reports the average REM proxies and the component after control variables (size, market-to-book, and performance) for each scaled earnings percentile. Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets. REM proxies before control variables are simply the residuals from the regression models. REM proxies **after control variables** are measured as the residual values from the following regressions: $REM\ proxies_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \varepsilon_t$.

Figure 6: Average Level of the Three Discretionary Variables and Its Decomposition into Normal and Abnormal Components

Panel A: Discretionary expenses

Panel B: CFO

Panel C: Production costs

Note: The figure reports the average level, the average normal and abnormal parts of discretionary expenses, CFO, and production costs for each scaled earnings percentile respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets. Normal levels are measured as the predicted values from the corresponding industry-year regressions. Abnormal levels are measured as deviations from the predicted values from the industry-year regressions.

Figure 7: Mean Gunny's Modified REM Proxies for Each Earnings Percentile

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal gain on asset sales

Panel D: Abnormal production costs

Note: This figure shows scatter plots of the mean value of Gunny's modified REM proxies for each earnings percentile against mean scaled earnings. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses, gain on asset sales, and production costs respectively. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 8: Mean Athanasakou et al.'s Modified REM Proxies for Each Earnings Percentile

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal production costs

Panel D: Abnormal CFO

Note: This figure shows scatter plots of the mean value of Athanasakou et al.'s modified REM proxies for each earnings percentile against mean scaled earnings. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses production costs, and CFO respectively. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 9: Mean Gunny's Modified REM Proxies Classified by Signs for Each Earnings Percentile

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal gain on asset sales

Panel D: Abnormal production costs

Note: This figure shows scatter plots of the mean value of Gunny's modified REM proxies for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses, gain on asset sales, and production costs respectively. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 10: Mean Athanasakou et al.'s Modified REM Proxies Classified by Signs for Each Earnings Percentile

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal production costs

Panel D: Abnormal CFO

Note: This figure shows scatter plots of the mean value of Athanasakou et al.'s modified REM proxies for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses, production costs, and CFO respectively. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 11: Mean Reversion of Gunny's Modified REM Proxies

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal gain on asset sales

Panel D: Abnormal production costs

Note: This figure plots the mean Gunny's modified REM proxies for the current and the following five years separately for each quintile portfolio. The portfolios are formed based on the current year's value of the REM proxies. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses, gain on asset sales, and production costs respectively.

Figure 12: Mean Reversion of Athanasakou et al.'s Modified REM Proxies

Panel A: Abnormal R&D expenses

Panel B: Abnormal SG&A expenses

Panel C: Abnormal production costs

Panel D: Abnormal CFO

Note: This figure plots the mean Athanasakou et al.'s modified REM proxies for the current and the following five years separately for each quintile portfolio. The portfolios are formed based on the current year's value of the REM proxies. Panel A, B, C, and D present the results for abnormal R&D expenses, SG&A expenses, production costs, and CFO respectively.

Figure 13: Percentage of Positive and Negative REM Proxies for Each Earnings Interval Using Time-Series Estimation

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: The figure reports the percentage of firm-years with positive and negative abnormal discretionary expenses, abnormal CFO, and abnormal production costs respectively for each of the 30 earnings intervals surrounding zero. **REM proxies are the residuals from the REM regression models, estimated by firms rather than industry-year combination.** The earnings is defined as income before extraordinary items scaled by total assets. Each panel includes firm-years whose scaled earnings are between -0.075 and 0.075. Each interval is of width 0.005, with category 1 including firm-years with earnings greater than or equal to zero and less than 0.005 (the “suspect firm-years”). The figure is truncated at the two ends. The vertical dash line indicates where the scaled earnings is zero.

Figure 14: Mean REM Proxies for Each Earnings Percentile Using Time-Series Estimation

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. **REM proxies are residuals from the REM regression models, estimated by firms rather than industry-year combination.** Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 15: Mean REM Proxies Classified by Signs for Each Earnings Percentile Using Time-Series Estimation

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. **REM proxies are residuals from the REM regression models, estimated by firms rather than industry-year combination.** Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 16: Mean Reversion of REM Proxies and Discretionary Accruals Using Time-Series Estimation

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Panel D: Discretionary accruals

Note: This figure plots the mean REM proxies and discretionary accruals for the current and the following five years separately for each quintile portfolio. **REM proxies are residuals from the REM regression models, estimated by firms rather than industry-year combination.** The portfolios are formed based on the current year's value of either REM proxies or discretionary accruals. Panels A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively, while Panel D presents the results for discretionary accruals. The figure includes 51,487 firm-year observations from 1987-2001.

Figure 17: Percentage of Positive and Negative Abnormal Production Costs for Each Earnings Interval in Manufacturing and Non-Manufacturing Industries

Panel A: Manufacturing industries

Panel B: Non-manufacturing industries

Note: The figure reports the percentage of firm-years with positive and negative abnormal production costs for each of the 30 earnings intervals surrounding zero. Panel A reports the results for manufacturing industries, while Panel B reports the results for non-manufacturing industries. The earnings is defined as income before extraordinary items scaled by total assets. Each panel includes firm-years whose scaled earnings are between -0.075 and 0.075. Each interval is of width 0.005, with category 1 including firm-years with earnings greater than or equal to zero and less than 0.005 (the “suspect firm-years”). The figure is truncated at the two ends. The vertical dash line indicates where the scaled earnings is zero.

Figure 18: Mean Abnormal Production Costs for Each Earnings Percentile in Manufacturing and Non-Manufacturing Industries

Panel A: Manufacturing industries

Panel B: Non-manufacturing industries

Note: This figure shows scatter plots of the mean value of abnormal production costs for each earnings percentile against mean scaled earnings. Panel A reports the results for manufacturing industries, while Panel B reports the results for non-manufacturing industries. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 19: Mean Abnormal Overproduction Costs Classified by Signs for Each Earnings Percentile in Manufacturing and Non-Manufacturing Industries

Panel A: Manufacturing industries

Panel B: Non-manufacturing industries

Note: This figure shows scatter plots of the mean value of abnormal production costs for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. Panel A reports the results for manufacturing industries, while Panel B reports the results for non-manufacturing industries. The figure includes 51,487 firm-year observations from 1987-2001. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 20: Mean Reversion of Abnormal Production Costs in Manufacturing and Non-Manufacturing Industries

Panel A: Manufacturing industries

Panel B: Non-manufacturing industries

Note: This figure plots the mean abnormal production costs for the current and the following five years separately for each quintile portfolio. The portfolios are formed based on the current year's value of abnormal production costs. Panel A reports the results for manufacturing industries, while Panel B the reports results for non-manufacturing industries. The figure includes 51,487 firm-year observations from 1987-2001.

**Figure 21: Percentage of Positive and Negative REM Proxies for Each Earnings Interval-
Full Sample Analysis**

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: The figure reports the percentage of firm-years with positive and negative abnormal discretionary expenses, abnormal CFO, and abnormal production costs respectively for each of the 30 earnings intervals surrounding zero. **The sample period spans 1987-2013.** The earnings is defined as income before extraordinary items scaled by total assets. Each panel includes firm-years whose scaled earnings are between -0.075 and 0.075. Each interval is of width 0.005, with category 1 including firm-years with earnings greater than or equal to zero and less than 0.005 (the “suspect firm-years”). The figure is truncated at the two ends. The vertical dash line indicates where the scaled earnings is zero.

Figure 22: Mean REM Proxies for Each Earnings Percentile-Full Sample Analysis

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. **The figure includes 89,412 firm-year observations from 1987-2013.** Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 23: Mean REM Proxies Classified by Signs for Each Earnings Percentile-Full Sample Analysis

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. The plots are shown separately for positive and negative values of REM proxies. Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. **The figure includes 89,412 firm-year observations from 1987-2013.** Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 24: Mean Reversion of REM Proxies and Discretionary Accruals-Full Sample Analysis

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Panel D: Discretionary accruals

Note: This figure plots the mean REM proxies and discretionary accruals for the current and the following five years separately for each quintile portfolio. The portfolios are formed based on the current year's value of either REM proxies or discretionary accruals. Panels A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively, while Panel D presents the results for discretionary accruals. **The figure includes 89,412 firm-year observations from 1987-2013.**

Figure 25: Analysis of Abnormal Discretionary Expenses Proxy-Alternative Definition of Discretionary Expenses

Panel A: Percentage of positive and negative abnormal discretionary expenses for each earnings interval

Panel B: Mean abnormal discretionary expenses for each earnings percentile

Panel C: Mean abnormal discretionary expenses classified by signs for each earnings percentile

Panel D: Mean reversion of abnormal discretionary expenses

Note: The figure reports analysis on abnormal discretionary expense when alternative definition of discretionary expenses is used. **Specifically, discretionary expenses are defined as Selling, General, and Administrative expenses scaled by lagged total assets.** The sample period spans 1987-2001. Panel A reports the percentage of firm-years with positive and negative abnormal discretionary expenses for each of the 30 earnings intervals surrounding zero. Each interval is of width 0.005, with category 1 including firm-years with earnings greater than or equal to zero and less than 0.005 (the “suspect firm-years”). Panel B shows scatter plots of the mean value of abnormal discretionary expenses for each earnings percentile against mean scaled earnings, while Panel C reports the results separately for positive and negative values of abnormal discretionary expenses. Panel D plots the mean abnormal discretionary expenses for the current and the following five years separately for each quintile portfolios. The portfolios are formed based on the current year’s value of abnormal discretionary expenses.

Figure 26: Mean REM Proxies for Each Earnings Percentile-Alternative Scaling Variable

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Note: This figure shows scatter plots of the mean value of REM proxies for each earnings percentile against mean scaled earnings. **When estimating REM proxies, the scaling variable is the number of shares outstanding rather than total assets.** Panel A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively. Scaled earnings are defined as income before extraordinary items scaled by total assets.

Figure 27: Mean Reversion of REM Proxies and Discretionary Accruals-Decile Portfolios

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Panel D: Discretionary accruals

Note: This figure plots the mean REM proxies and discretionary accruals for the current and the following five years separately for each **decile** portfolio. The portfolios are formed based on the current year's value of either REM proxies or discretionary accruals. Panels A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively, while Panel D presents the results for discretionary accruals. The figure includes 51,487 firm-year observations from 1987-2001.

Figure 28: Mean Reversion of REM Proxies and Discretionary Accruals-Percentile Portfolios

Panel A: Abnormal discretionary expenses

Panel B: Abnormal CFO

Panel C: Abnormal production costs

Panel D: Discretionary accruals

Note: This figure plots the mean REM proxies and discretionary accruals for the current and the following five years separately for each **percentile** portfolio. The portfolios are formed based on the current year's value of either REM proxies or discretionary accruals. Panels A, B, and C present the results for abnormal discretionary expenses, CFO, and production costs respectively, while Panel D presents the results for discretionary accruals. The figure includes 51,487 firm-year observations from 1987-2001.

Table 1: Model Parameters*Panel A: Discretionary expenses model*

	Intercept	1/AT _{t-1}	SALES _{t-1} /AT _{t-1}	Adj R ²
Mean	0.1441	1.8999	0.1437	0.37
(t statistic)	(18.24)	(15.78)	(25.92)	
Lower quartile	0.0345	0.6131	0.0540	0.20
Median	0.1241	1.1823	0.1157	0.32
Upper Quartile	0.2770	2.1655	0.2036	0.52

Panel B: Cash flow from operations model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _{t-1}	Adj R ²
Mean	0.0202	-0.9560	0.0445	0.0067	0.30
(t statistic)	(6.19)	(-16.16)	(17.38)	(1.28)	
Lower quartile	-0.0198	-1.1154	0.0082	-0.0537	0.15
Median	0.0226	-0.6142	0.0339	-0.0024	0.26
Upper Quartile	0.0676	-0.2660	0.0784	0.0592	0.41

Panel C: Production costs model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _{t-1}	ΔSALES _{t-1} /AT _{t-1}	Adj R ²
Mean	-0.1388	-0.4497	0.7966	0.0081	-0.0145	0.88
(t statistic)	(-21.39)	(-4.55)	(150.52)	(1.06)	(-1.87)	
Lower quartile	-0.2179	-0.6441	0.7197	-0.0827	-0.0941	0.84
Median	-0.1374	-0.1304	0.8087	0.0067	-0.0183	0.92
Upper Quartile	-0.0501	0.1239	0.8897	0.1004	0.0566	0.96

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel C: } \frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. There are 580 separate industry-years. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across industry-years) for each of these regressions.

2. Variable definitions: AT = total assets; SALES = sales; ΔSALES = change in sales, e.g. ΔSALES_t = SALES_t - SALES_{t-1}; DISX = Discretionary expenses (R&D + Advertising + Selling, General and Administrative expenses); as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations; PROD = production costs (COGS + Change in inventory).

Table 2: Replication of Roychowdhury's Main Results*Panel A: Roychowdhury's Main Results (Table 4 of Roychowdhury (2006))*

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	0.0464** (11.94)	0.0026** (7.40)	-0.0021** (-2.51)
MTB	0.0033** (2.00)	0.0010** (3.11)	-0.0039** (-6.36)
SIZE	0.0237** (7.34)	0.0001 (0.56)	-0.0041** (-3.96)
Net income	-0.1721** (-4.65)	0.1904** (7.21)	-0.1118** (-6.02)
SUSPECT_NI	-0.0591** (-4.35)	-0.0200** (-3.05)	0.0497** (4.99)
Expected sign	Negative	Negative	Positive

Panel B: My Replication of Roychowdhury's Main Results

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	0.0014** (5.50)	0.0002** (2.29)	-0.0010** (-4.88)
MTB	-0.0002 (-0.26)	0.0003 (1.10)	-0.0003** (-2.35)
SIZE	0.0138** (16.82)	-0.0020** (-2.12)	-0.0034** (-4.37)
Net income	-0.2465** (-13.23)	0.2659** (11.78)	-0.1412** (-7.24)
SUSPECT_NI	-0.0572** (-6.60)	-0.0103** (-2.43)	0.0433** (5.72)
Expected sign	Negative	Negative	Positive
No. of observations	51,487	51,487	51,487
Adjusted R ²	0.08	0.24	0.04

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 51,487 observations. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$

Panel A presents the original results in Roychowdhury (2006), while Panel B reports my replication. Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².

3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 3: Transition Matrices of REM Proxies and Discretionary Accruals*Panel A: Abnormal discretionary expenses*

Year t	Year $t+1$					Avg. Abnormal discretionary expense t
	1	2	3	4	5	
1	73.40%	18.84%	4.10%	1.96%	1.70%	-0.3111
2	18.42%	53.22%	21.23%	5.39%	1.74%	-0.1556
3	4.26%	20.59%	49.57%	21.43%	4.15%	-0.0510
4	2.06%	5.82%	19.89%	51.98%	20.26%	0.0821
5	1.54%	2.05%	5.07%	19.51%	71.83%	0.4319
Avg. Abnormal discretionary expense $t+1$	-0.3168	-0.1584	-0.0558	0.0729	0.4178	

Panel B: Abnormal CFO

Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	47.83%	22.55%	12.55%	8.78%	8.29%	-0.2250
2	22.52%	30.67%	23.14%	14.68%	9.00%	-0.0461
3	12.85%	23.94%	28.47%	23.21%	11.53%	0.0141
4	8.51%	14.85%	23.82%	31.38%	21.43%	0.0689
5	8.10%	9.28%	12.43%	22.04%	48.16%	0.1871
Avg. Abnormal CFO $t+1$	-0.2119	-0.0406	0.0177	0.0708	0.1880	

Panel C: Abnormal production costs

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	69.20%	19.87%	6.09%	2.88%	1.97%	-0.3138
2	18.05%	46.24%	22.44%	8.97%	4.30%	-0.0905
3	5.80%	21.59%	40.42%	23.32%	8.87%	0.0108
4	2.60%	8.25%	22.20%	42.76%	24.18%	0.1031
5	2.46%	4.46%	9.27%	23.00%	60.81%	0.2849
Avg. Abnormal production costs $t+1$	-0.3111	-0.0917	0.0076	0.0987	0.2780	

Panel D: Discretionary accruals

Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	32.73%	19.24%	14.77%	13.97%	19.29%	-0.1922
2	18.94%	24.82%	21.93%	19.84%	14.47%	-0.0396
3	13.89%	22.54%	26.02%	23.23%	14.33%	0.0097
4	14.03%	18.98%	22.25%	24.86%	19.87%	0.0550
5	19.12%	15.55%	15.41%	18.77%	31.16%	0.1725
Avg. Discretionary accruals $t+1$	-0.1977	-0.0389	0.0102	0.0546	0.1690	

Note: This table reports transition matrices of the three REM proxies and the discretionary accruals. For each year, firms are classified into five quintiles based on the REM proxies or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D presents the results for abnormal discretionary expenses, abnormal CFO, abnormal production costs, and discretionary accruals respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 4: Replication of Roychowdhury's Main Results Excluding Extreme Observations

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0401** (-14.94)	-0.0092** (-9.35)	0.0319** (18.66)
MTB	0.0012** (2.61)	0.0000 (0.18)	-0.0010** (-2.61)
SIZE	0.0055** (10.28)	-0.0026** (-2.83)	0.0029** (2.27)
Net income	-0.2946** (-6.27)	0.3227** (12.27)	-0.1178** (-4.34)
SUSPECT_NI	-0.0110 (-1.29)	-0.0053 (-1.47)	0.0101 (1.36)
Expected sign	Negative	Negative	Positive
No. of observations	25,457	25,457	25,457
Adjusted R ²	0.01	0.04	0.00

Notes:

- *Significant at the 10% level. **Significant at the 5% level.
- This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes only firm-year observations with reported income before extraordinary items scaled by lagged total assets between -0.075 to 0.075. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
- Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 5: Firm Characteristics and REM Proxies for Small Profit firms Compared to All Other Firms and Small Loss Firms*Panel A: Comparison of small profits with all others*

	Small Profit Firms			All Others			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.063	1,159	0.055	0.001	50,328	0.112	-9.16	0.000
Abnormal CFO	-0.002	1,159	0.012	0.000	50,328	0.032	-0.53	0.593
Abnormal Production Costs	0.036	1,159	0.037	-0.001	50,328	0.055	6.50	0.000
Net Income	0.002	1,159	0.000	-0.040	50,328	0.204	20.97	0.000
MTB	2.418	1,159	1,191.155	2.818	50,328	3,421.163	-0.38	0.703
SIZE	4.151	1,159	4.925	4.430	50,328	5.604	-4.22	0.000
AGE	23.533	383	119.103	20.842	19,303	38.269	4.81	0.000
Sale Growth	0.095	1,159	0.534	0.238	50,328	9.842	-5.57	0.000
Discretionary Expenses	0.358	1,159	0.090	0.481	50,328	0.212	-13.57	0.000
CFO	0.041	1,159	0.009	0.033	50,328	0.049	2.74	0.006
Production Costs	1.015	1,159	0.807	1.032	50,328	0.889	-0.64	0.520

Panel B: Comparison of small profits with small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.063	1,159	0.055	-0.087	518	0.040	2.11	0.035
Abnormal CFO	-0.002	1,159	0.012	-0.008	518	0.009	1.10	0.273
Abnormal Production Costs	0.036	1,159	0.037	0.046	518	0.029	-0.97	0.330
Net Income	0.002	1,159	0.000	-0.003	518	0.000	71.02	0.000
MTB	2.418	1,159	1,191.155	2.306	518	218.183	0.09	0.926
SIZE	4.151	1,159	4.925	4.319	518	5.609	-1.36	0.173
AGE	23.533	383	119.103	21.904	177	85.258	1.83	0.068
Sale Growth	0.095	1,159	0.534	0.048	518	0.073	1.92	0.055
Discretionary Expenses	0.358	1,159	0.090	0.306	518	0.060	3.72	0.000
CFO	0.041	1,159	0.009	0.038	518	0.007	0.50	0.619
Production Costs	1.015	1,159	0.807	0.998	518	1.094	0.32	0.752

Panel C: Comparison of small loss firms with other firms

	Small Loss Firms			Other Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.087	518	0.040	0.001	50,969	0.111	-9.75	0.000
Abnormal CFO	-0.008	518	0.009	0.000	50,969	0.032	-1.78	0.075
Abnormal Production Costs	0.046	518	0.029	0.000	50,969	0.055	6.08	0.000
Net Income	-0.003	518	0.000	-0.039	50,969	0.202	18.34	0.000
MTB	2.306	518	218.183	2.814	50,969	3,402.718	-0.73	0.467
SIZE	4.319	518	5.609	4.424	50,969	5.590	-1.01	0.311
AGE	21.904	177	85.258	20.885	19,509	39.557	1.46	0.143
Sale Growth	0.048	518	0.073	0.237	50,969	9.730	-10.34	0.000
Discretionary Expenses	0.306	518	0.060	0.480	50,969	0.210	-15.90	0.000
CFO	0.038	518	0.007	0.033	50,969	0.049	1.41	0.158
Production Costs	0.998	518	1.094	1.032	50,969	0.885	-0.74	0.462

Notes:

1. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets. Other firms in Panel A include all firm-years that are not small profit firms (including small loss firms). Other firms in Panel C include all observations that are not small loss firms.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it-1}}{AT_{it-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it}}{AT_{it-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{it-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it}}{AT_{it-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{it-1}} + k_5 \frac{\Delta SALES_{it-1}}{AT_{it-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; AGE = Number of years since IPO; Sale Growth = the difference between current and last year's sales divided by last year's sales; Discretionary expenses are the sum of R&D, Advertising, and Selling, General and Administrative expenses scaled by lagged total assets as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 6: Extra analysis on small profits and small losses*Panel A: Small profit firms*

	Group (1): Income-increasing group		Group (2): Non-income-increasing group		Difference in means [(1)-(2)]	
	Expected sign	Actual mean value	Expected sign	Actual mean value	Expected sign	Actual diff.
Abnormal Discretionary Expenses	-	-0.0341	+	-0.0912	-	0.0572**
Abnormal CFO	-	-0.0097	+	0.0103	-	-0.0200*
Abnormal Production Costs	+	0.0280	-	0.0379	+	-0.0099
No. of observations		206		373		

Panel B: Small loss firms

	Group (1): Income-increasing group		Group (2): Non-income-increasing group		Difference in means [(1)-(2)]	
	Expected sign	Actual mean value	Expected sign	Actual mean value	Expected sign	Actual diff.
Abnormal Discretionary Expenses	-	-0.1130	+	-0.0746	-	-0.0384
Abnormal CFO	-	0.0078	+	-0.0069	-	0.0147
Abnormal Production Costs	+	0.0612	-	0.0300	+	0.0312
No. of observations		93		211		

Notes:

1. This table reports the mean REM proxies for each subgroup of the small profit and small loss firms. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets.
2. For each panel, **the income-increasing group (Group (1))** includes observations whose reported earnings **shift upward** in the fourth quarter, while **the non-income-increasing group (Group (2))** includes observations whose reported earnings **either stay at the same earnings bin or shift downward** in the fourth quarter.
3. *, ** denote statistical significance at 10% and 5% respectively from the test of difference in means.
4. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; and Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$.

Table 7: Replication of Roychowdhury's Main Results Using Models Run by Industry, Year, and Earnings Interval

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0036** (-4.02)	-0.0003 (-0.85)	0.0012** (4.99)
MTB	0.0043** (6.62)	-0.0005** (-3.11)	-0.0018** (-5.15)
SIZE	0.0021** (2.66)	0.0020** (9.31)	-0.0021** (-4.85)
Net income	-0.3491** (-8.01)	0.3202** (9.30)	-0.1912** (-2.99)
SUSPECT_NI	-0.0067 (-0.85)	-0.0017 (-0.99)	0.0073 (1.67)
No. of observations	40,204	40,204	40,204
Adjusted R ²	0.03	0.04	0.01

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$. **All regressions are run by industry-year-earnings interval. Each interval is of width 0.05. The middle interval has income before extraordinary items scaled by lagged total assets between -0.025 and 0.025.** MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 8: Analysis of Real Earnings Management to Beat Last Year's Earnings*Panel A: Comparison of firm-years that just beat last year's earnings with the rest of the sample*

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	0.0023** (9.32)	-0.0002 (-1.10)	-0.0010** (-4.93)
MTB	-0.0002 (-0.26)	0.0003 (1.10)	-0.0003** (-2.36)
SIZE	0.0143** (17.90)	-0.0020** (-2.15)	-0.0036** (-4.75)
Net income	-0.2460** (-13.23)	0.2659** (11.78)	-0.1415** (-7.23)
SUSPECT_CH_NI	-0.0489** (-9.11)	0.0041 (1.21)	0.0220** (5.61)
Expected sign	Negative	Negative	Positive
No. of observations	51,485	51,485	51,485
Adjusted R ²	0.08	0.24	0.04

Panel B: Comparison of firm-years that just beat last year's earnings with firm-years that just miss last year's earnings

	Earnings Change				Test Statistic	p-value
	Small Positive		Small Negative			
	Mean	Variance	Mean	Variance		
Abnormal Discretionary Expenses	-0.053	0.048	-0.057	0.044	0.52	0.600
Abnormal CFO	0.018	0.010	0.016	0.010	0.68	0.497
Abnormal Production Costs	0.012	0.035	0.015	0.033	-0.45	0.653
SIZE	5.211	4.985	5.127	5.614	1.14	0.254
MTB	2.338	151.258	1.943	22.654	1.42	0.155
Net Income	0.046	0.006	0.034	0.007	4.71	0.000
Discretionary Expenses	0.358	0.075	0.350	0.071	0.99	0.324
CFO	0.079	0.010	0.075	0.010	1.21	0.228
Production Costs	1.086	0.875	1.059	0.742	0.97	0.331
Number	2,364		1,691			

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.

2. Panel A of the table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 51,485 observations. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_CH_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Panel B reports the comparison between firms with small positive earnings changes and firms with small negative earnings changes. Small positive earnings changes group includes firm-years with the level current year's reported income before extraordinary items exceeding last year's value by 0% to 0.5% of lagged total assets. Small negative earnings changes group includes firm-years with changes in reported income before extraordinary items between -0.5% and 0% of lagged total assets.
4. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_CH_NI = an indicator variable that is set equal to one if the difference between current and last year's income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 9: Comparison of Firm-Years that Just Beat Analyst Forecasts with the Rest of the Sample

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0090** (-5.55)	-0.0047** (-4.27)	0.0062** (4.45)
MTB	0.0075** (3.37)	0.0018 (0.95)	-0.0051** (-2.86)
SIZE	0.0153** (9.42)	0.0013 (1.53)	-0.0093** (-11.78)
Net income	-0.0554 (-1.03)	0.3449** (10.93)	-0.3065** (-6.93)
SUSPECT_FE	0.0187** (5.70)	0.0104** (3.90)	-0.0129** (-4.42)
Expected sign	Negative	Negative	Positive
No. of observations	15,819	15,819	15,819
Adjusted R ²	0.05	0.25	0.07

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 15,819 observations. The regressions being estimated are of the form $Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_FE)_t + \varepsilon_t$. Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_FE = an indicator variable that is set equal to one if forecast error with respect to final mean consensus analyst forecast is one cent, and is set equal to zero otherwise.

Table 10: Model Parameters for Gunny's Modified Models*Panel A: R&D expenses model (290 industry-year regressions)*

	Intercept	$1/AT_{t-1}$	MV_t	Q_t	INT_t/AT_{t-1}	RD_{t-1}/AT_{t-1}	Adj R^2
Mean	-0.0012	-0.0086	0.0016	0.0040	0.0117	0.9264	0.80
(t statistic)	(-0.47)	(-0.38)	(3.15)	(3.98)	(1.8)	(32.03)	
Lower quartile	-0.0127	-0.0718	-0.0017	-0.0005	-0.0241	0.7434	0.69
Median	-0.0006	-0.0026	0.0003	0.0033	0.0118	0.9139	0.85
Upper Quartile	0.0103	0.0926	0.0032	0.0091	0.0428	1.1085	0.96

Panel B: SG&A expenses model (680 industry-year regressions)

	Intercept	$1/AT_{t-1}$	MV_t	Q_t	INT_t/AT_{t-1}	$\Delta SALES_t/AT_{t-1}$	$\Delta SALES_t/AT_{t-1} * DD$	Adj R^2
Mean	0.2942	0.8670	-0.0133	0.0318	-0.0962	0.2365	0.0725	0.46
(t statistic)	(33.02)	(8.94)	(-9.76)	(9.51)	(-3.79)	(13.63)	(0.23)	
Lower quartile	0.1446	0.0603	-0.0292	-0.0016	-0.3687	0.1001	-0.4782	0.27
Median	0.2645	0.4087	-0.0116	0.0243	-0.1201	0.2144	-0.2170	0.44
Upper Quartile	0.3941	1.0429	0.0033	0.0592	0.1219	0.3633	-0.0221	0.68

Panel C: Gain on asset sales model (483 industry-year regression)

	Intercept	$1/AT_{t-1}$	MV_t	Q_t	INT_t/AT_{t-1}	$ASALES_t/AT_{t-1}$	$ISALES_t/AT_{t-1}$	Adj R^2
Mean	0.0011	0.0858	-0.0006	-0.0017	0.0635	0.2269	0.1752	0.37
(t statistic)	(0.66)	(3.39)	(-1.59)	(-2.38)	(9.43)	(4.96)	(3.21)	
Lower quartile	-0.0099	-0.0491	-0.0023	-0.0060	0.0049	0.0146	-0.0081	0.11
Median	-0.0008	0.0108	0.0000	-0.0007	0.0266	0.1940	0.0332	0.34
Upper Quartile	0.0102	0.0977	0.0020	0.0022	0.0804	0.4581	0.1825	0.63

Panel D: Production costs model (720 industry-year regression)

	Intercept	$1/AT_{t-1}$	MV_t	Q_t	$SALES_t/AT_{t-1}$	$\Delta SALES_t/AT_{t-1}$	$\Delta SALES_{t-1}/AT_{t-1}$	Adj R^2
Mean	-0.0512	0.0250	0.0017	-0.0462	0.7796	0.0350	-0.0062	0.85
(t statistic)	(-6.25)	(0.27)	(1.44)	(-11.41)	(147.38)	(3.74)	(-0.76)	
Lower quartile	-0.1574	-0.3112	-0.0156	-0.0869	0.7007	-0.0638	-0.0937	0.80
Median	-0.0426	0.0410	-0.0017	-0.0230	0.8000	0.0396	-0.0027	0.91
Upper Quartile	0.0695	0.4180	0.0141	0.0056	0.8772	0.1376	0.0790	0.95

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{RD_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{i,t}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t}}{AT_{i,t-1}} * DD + \varepsilon_{it}$$

$$\text{Panel C: } \frac{GAINA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{ASALES_{i,t}}{AT_{i,t-1}} + k_7 \frac{ISALES_{i,t}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel D: } \frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{SALES_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. The number of industry-year regressions is reported on the heading of each panel. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across industry-years) for each of these regressions.

2. Variable definitions: AT = total assets; RD = R&D expenses; MV = log of market value of equity; Q = Tobin's Q; INT = internal funds or the sum of income before extraordinary items, R&D expenses and depreciation expenses; SGA = Selling, General and Administrative expenses; SALES = sales; $\Delta SALES$ = change in sales, e.g. $\Delta SALES_t = SALES_t - SALES_{t-1}$; DD = indicator variable equal to one when total sales decrease between year t-1 and t, zero otherwise; GAINA = income from asset sales; ASALES = long-lived asset sales; ISALES = long-lived investment sales; PROD = production costs (COGS + Change in inventory).

Table 11: Model Parameters for Athanasakou et al's Modified Models*Panel A: R&D expenses model (286 industry-year regressions)*

	Intercept	1/ AT _{t-1}	RD _{t-1} / AT _{t-1}	INT _t / SALES _t	BTM	CAPX _t / AT _{t-1}	MV _t	ROA _{t-1}	Adj R ²
Mean	-0.0058	0.0484	0.9315	0.0052	-0.0041	0.1444	0.0021	-0.0021	0.82
(t statistic)	(-1.71)	(1.27)	(45.72)	(0.94)	(-2.7)	(6.21)	(3.69)	(-0.26)	
Lower quartile	-0.0135	-0.0525	0.7715	-0.0127	-0.0067	0.0017	-0.0012	-0.0344	0.72
Median	-0.0012	0.0292	0.9336	-0.0015	-0.0003	0.0589	0.0003	0.0075	0.87
Upper Quartile	0.0138	0.1407	1.0900	0.0061	0.0010	0.2145	0.0030	0.0483	0.96

Panel B: SG&A expenses model (688 industry-year regressions)

	Intercept	1/ AT _{t-1}	SALE _t / AT _{t-1}	SALE _t / AT _{t-1} *DD	ROA _{t-1}	Adj R ²
Mean	0.0852	1.0893	0.1749	-0.0049	-0.2746	0.53
(t statistic)	(12.98)	(13.2)	(19.52)	(-0.58)	(-13.1)	
Lower quartile	0.0165	0.1502	0.0878	-0.0347	-0.5423	0.37
Median	0.0786	0.5099	0.1592	0.0001	-0.2800	0.54
Upper Quartile	0.1566	1.1947	0.2383	0.0382	-0.0247	0.70

Panel C: Production costs model (723 industry-year regressions)

	Intercept	1/ AT _{t-1}	SALES _t / AT _{t-1}	ΔSALES _t / AT _{t-1}	ΔSALES _{t-1} / AT _{t-1}	ROA _{t-1}	Adj R ²
Mean	-0.0574	-0.7252	0.8083	0.0107	0.0132	-0.5344	0.87
(t statistic)	(-11.05)	(-8.14)	(163.67)	(0.84)	(1.27)	(-22.92)	
Lower quartile	-0.1329	-0.8021	0.7265	-0.1017	-0.0548	-0.8074	0.82
Median	-0.0509	-0.2070	0.8293	0.0066	0.0197	-0.4916	0.91
Upper Quartile	0.0163	0.0365	0.8952	0.1080	0.1084	-0.2132	0.95

Panel D: Cash flow from operations model (694 industry-year regressions)

	Intercept	1/ AT _{t-1}	SALES _t / AT _{t-1}	ΔSALES _t / AT _{t-1}	ROA _{t-1}	Adj R ²
Mean	-0.0123	-0.1913	0.0118	0.0049	0.5398	0.52
(t statistic)	(-2.8)	(-5.31)	(2.64)	(0.66)	(36.75)	
Lower quartile	-0.0528	-0.3514	-0.0131	-0.0498	0.3275	0.35
Median	-0.0139	-0.0738	0.0101	0.0060	0.5418	0.53
Upper Quartile	0.0260	0.0815	0.0383	0.0656	0.7595	0.70

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{RD_{i,t-1}}{AT_{i,t-1}} + k_4 \frac{INT_{it}}{SALES_{i,t-1}} + k_5 BTM_{it} + k_6 \frac{CAPX_{it}}{AT_{i,t-1}} + k_7 MV_{i,t-1} + k_8 ROA_{i,t-1} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{SALES_{it}}{AT_{i,t-1}} * DD + k_5 ROA_{i,t-1} + \varepsilon_{it}$$

$$\text{Panel C: } \frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + k_6 ROA_{i,t-1} + \varepsilon_{it}$$

$$\text{Panel D: } \frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 ROA_{i,t-1} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. The number of industry-year regressions is reported on the heading of each panel. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R^2 s (across industry-years) for each of these regressions.

2. Variable definitions: AT = total assets; RD = R&D expenses; INT = internal funds or the sum of income before extraordinary items, R&D expenses and depreciation expenses; BTM = book-to-market; CAPX = Capital expenditure; MV = the natural logarithm of the market value of equity; ROA = income before interest, tax, depreciation, and amortization over total assets; SGA = Selling, General and Administrative expenses; SALES = sales; $\Delta SALES$ = change in sales, e.g. $\Delta SALES_t = SALES_t - SALES_{t-1}$; DD = indicator variable equal to one when total sales decrease between year t-1 and t, zero otherwise; PROD = production costs (COGS + Change in inventory); CFO = cash flows from operations.

Table 12: Replication of Roychowdhury's Main Results Using the Modified Models*Panel A: Gunny's modified models*

	Abnormal R&D expense	Abnormal SG&A	Abnormal gain on asset sales	Abnormal production costs
Intercept	0.0001 (1.45)	0.0004** (3.72)	0.0000 (1.56)	-0.0005** (-4.35)
MTB	0.0000 (0.45)	0.0000 (0.77)	0.0000 (0.56)	0.000 (-1.18)
SIZE	0.0008** (2.01)	0.0003 (0.31)	-0.0002** (-2.39)	0.0043** (4.71)
Net income	-0.0303** (-4.39)	-0.0388** (-3.31)	0.0002 (0.29)	-0.0819** (-3.08)
SUSPECT_NI	-0.0032 (-1.32)	-0.0204** (-3.56)	-0.0014 (-1.44)	0.0207** (4.12)
Expected sign	Negative	Negative	Positive	Positive
No. of observations	33,827	70,785	24,909	80,459
Adjusted R2	0.04	0.04	0.00	0.04

Panel B: Athanasakou et al.'s modified models

	Abnormal R&D expense	Abnormal SG&A	Abnormal production costs	Abnormal CFO
Intercept	0.0001 (1.62)	0.0007** (8.07)	-0.0006** (-5.42)	0.0000 (0.09)
MTB	0.0000 (0.49)	0.0004 (1.46)	0.0000 (-0.60)	-0.0001 (-1.15)
SIZE	0.0015** (4.67)	0.0098** (2.19)	-0.0007 (-0.95)	-0.0002 (-0.16)
Net income	-0.0254** (-4.59)	-0.0376** (-2.97)	-0.0023** (-2.73)	0.0480** (3.85)
SUSPECT_NI	-0.0039 (-1.47)	-0.0328** (-8.20)	0.0267** (5.34)	0.0005 (0.11)
Expected sign	Negative	Negative	Positive	Negative
No. of observations	32,372	72,240	80,487	75,647
Adjusted R2	0.03	0.02	0.01	0.04

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.

2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The regressions being estimated are of the form $Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t$. Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R^2 .
3. Variable definitions: In Panel A, abnormal R&D expense, abnormal SG&A, abnormal gain on asset sales, and abnormal production costs are calculated using Gunny's modified models; in Panel B, abnormal R&D expense, abnormal SG&A, abnormal production costs, and abnormal CFO are calculated using Athanasakou et al.'s modified models ; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 13: Firm Characteristics and Gunny's Modified REM Proxies for Small Profit Firms Compared to All Other Firms and Small Loss Firms

Panel A: Comparison of small profits with all others

	Small Profit Firms			All Others			Test Statistic	p-value
	Mean	Variance	Number	Mean	Variance	Number		
Abnormal R&D Expense	-0.006	0.001	582	0.000	0.014	33,245	-4.10	0.000
Abnormal SG&A Expense	-0.021	0.040	1,566	0.000	0.104	69,219	-4.04	0.000
Abnormal Gain on Asset Sales	-0.002	0.001	580	0.000	0.005	24,329	-1.44	0.150
Abnormal Production Costs	0.016	0.042	1,759	0.000	0.116	78,700	3.18	0.001
R&D Expenses	0.065	0.005	582	0.155	0.389	33,245	-19.98	0.000
SG&A Expenses	0.288	0.069	1,566	0.877	1646.556	69,219	-3.82	0.000
Gain on Asset Sales	0.006	0.001	580	-0.043	70.250	24,329	0.91	0.362
Production Costs	0.904	0.985	1,759	1.055	130.411	78,700	-3.21	0.001

Panel B: Comparison of small profits with small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Variance	Number	Mean	Variance	Number		
Abnormal R&D Expense	-0.006	0.001	582	-0.014	0.001	234	3.27	0.001
Abnormal SG&A Expense	-0.021	0.040	1,566	-0.047	0.036	732	3.01	0.003
Abnormal Gain on Asset Sales	-0.002	0.001	580	-0.002	0.001	283	0.00	1.000
Abnormal Production Costs	0.016	0.042	1,759	0.011	0.052	877	0.55	0.584
R&D Expenses	0.065	0.005	582	0.057	0.004	234	1.58	0.115
SG&A Expenses	0.288	0.069	1,566	0.249	0.052	732	3.64	0.000
Gain on Asset Sales	0.006	0.001	580	0.010	0.001	283	-1.74	0.081
Production Costs	0.904	0.985	1,759	0.802	0.800	877	2.66	0.008

Panel C: Comparison of small loss firms with other firms

	Small Loss Firms			Other Firms			Test	
	Mean	Variance	Number	Mean	Variance	Number	Statistic	p-value
Abnormal R&D Expense	-0.014	0.001	234	0.000	0.014	33,593	-6.46	0.000
Abnormal SG&A Expense	-0.047	0.036	732	0.000	0.103	70,053	-6.60	0.000
Abnormal Gain on Asset Sales	-0.002	0.001	283	0.000	0.005	24,626	-1.03	0.301
Abnormal Production Costs	0.011	0.052	877	0.000	0.115	79,582	1.41	0.158
R&D Expenses	0.057	0.004	234	0.154	0.386	33,593	-18.14	0.000
SG&A Expenses	0.249	0.052	732	0.871	1626.958	70,053	-4.08	0.000
Gain on Asset Sales	0.010	0.001	283	-0.042	69.402	24,626	0.98	0.328
Production Costs	0.802	0.800	877	1.054	128.978	79,582	-5.01	0.000

Notes:

1. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets. Other firms in Panel A include all firm-years that are not small profit firms (including small loss firms). Other firms in Panel C include all observations that are not small loss firms.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal R&D expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{RD_{i,t-1}}{AT_{i,t-1}} + k_4 \frac{INT_{it}}{SALES_{i,t-1}} + k_5 \frac{BTM_{it}}{AT_{i,t-1}} + k_6 \frac{CAPX_{it}}{AT_{i,t-1}} + k_7 \frac{MV_{i,t-1}}{AT_{i,t-1}} + k_8 \frac{ROA_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal SG&A expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{MV_{it}}{AT_{i,t-1}} + k_4 \frac{Q_{it}}{AT_{i,t-1}} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} * DD + \varepsilon_{it}$; Abnormal gain on asset sales is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{GAINA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{MV_{it}}{AT_{i,t-1}} + k_4 \frac{Q_{it}}{AT_{i,t-1}} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{ASALES_{it}}{AT_{i,t-1}} + k_7 \frac{ISALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{MV_{it}}{AT_{i,t-1}} + k_4 \frac{Q_{it}}{AT_{i,t-1}} + k_5 \frac{SALES_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; R&D expenses are R&D expenses scaled by lagged total assets; SG&A expenses are Selling, General and Administrative expenses scaled by lagged total assets; Gain on asset sales are income on asset sales; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 14: Firm Characteristics and Athanasakou et al's Modified REM Proxies for Small Profit Firms Compared to All Other Firms and Small Loss Firms

Panel A: Comparison of small profits with all others

	Small Profit Firms			All Others			Test Statistic	p-value
	Mean	Variance	Number	Mean	Variance	Number		
Abnormal R&D Expense	-0.006	0.001	569	0.000	0.011	31,803	-4.14	0.000
Abnormal SG&A Expense	-0.033	0.049	1,604	0.001	1.815	70,636	-4.53	0.000
Abnormal Production Costs	0.025	0.041	1,771	-0.001	0.110	78,716	5.25	0.000
Abnormal CFO	0.004	0.020	1,632	0.000	0.290	74,015	0.99	0.320
R&D Expenses	0.065	0.005	569	0.143	0.321	31,803	-17.95	0.000
SG&A Expenses	0.287	0.068	1,604	0.879	1615.232	70,636	-3.91	0.000
Production Costs	0.913	0.981	1,771	1.065	130.333	78,716	-3.23	0.001
CFO	0.042	0.008	1,632	-0.185	427.527	74,015	2.99	0.003

Panel B: Comparison of small profits with small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Variance	Number	Mean	Variance	Number		
Abnormal R&D Expense	-0.006	0.001	569	-0.009	0.001	228	1.21	0.226
Abnormal SG&A Expense	-0.033	0.049	1,604	-0.045	0.029	752	1.44	0.149
Abnormal Production Costs	0.025	0.041	1,771	0.020	0.041	859	0.59	0.553
Abnormal CFO	0.004	0.020	1,632	-0.007	0.140	795	0.80	0.423
R&D Expenses	0.065	0.005	569	0.056	0.003	228	1.92	0.055
SG&A Expenses	0.287	0.068	1,604	0.248	0.051	752	3.71	0.000
Production Costs	0.913	0.981	1,771	0.835	0.910	859	1.94	0.052
CFO	0.042	0.008	1,632	0.041	0.008	795	0.26	0.796

Panel C: Comparison of small loss firms with other firms

	Small Loss Firms			Other Firms			Test Statistic	p-value
	Mean	Variance	Number	Mean	Variance	Number		
Abnormal R&D Expense	-0.009	0.001	228	0.000	0.010	32,144	-4.15	0.000
Abnormal SG&A Expense	-0.045	0.029	752	0.000	1.794	71,488	-5.64	0.000
Abnormal Production Costs	0.020	0.041	859	0.000	0.109	79,628	2.85	0.004
Abnormal CFO	-0.007	0.140	795	0.000	0.286	74,852	-0.52	0.602
R&D Expenses	0.056	0.003	228	0.143	0.318	32,144	-18.12	0.000
SG&A Expenses	0.248	0.051	752	0.872	1595.985	71,488	-4.17	0.000
Production Costs	0.835	0.910	859	1.064	128.852	79,628	-4.43	0.000
CFO	0.041	0.008	795	-0.182	422.747	74,852	2.96	0.003

Notes:

1. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets. Other firms in Panel A include all firm-years that are not small profit firms (including small loss firms). Other firms in Panel C include all observations that are not small loss firms.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal R&D expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{RD_{i,t-1}}{AT_{i,t-1}} + k_4 \frac{INT_{it}}{SALES_{i,t-1}} + k_5 \frac{BTM_{it}}{AT_{i,t-1}} + k_6 \frac{CAPX_{it}}{AT_{i,t-1}} + k_7 \frac{MV_{i,t-1}}{AT_{i,t-1}} + k_8 \frac{ROA_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal SG&A expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{SALES_{it}}{AT_{i,t-1}} * DD + k_5 \frac{ROA_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + k_6 \frac{ROA_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{ROA_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; R&D expenses are R&D expenses scaled by lagged total assets; SG&A expenses are Selling, General and Administrative expenses scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets; CFO = Cash flow from operations scaled by lagged total assets.

Table 15: Replication of Roychowdhury's Main Results Excluding Extreme Observations Using the Modified Models

Panel A: Gunny's modified models

	Abnormal R&D expense	Abnormal SG&A	Abnormal gain on asset sales	Abnormal production costs
Intercept	-0.0032** (-2.97)	-0.0180** (-13.66)	-0.0012* (-1.66)	0.0085** (4.38)
MTB	0.0001* (1.75)	-0.0001 (-0.47)	0.0001 (0.90)	0.0000 (0.27)
SIZE	-0.0009 (-1.38)	-0.0020** (-2.59)	0.0002 (0.74)	0.0102** (13.18)
Net income	-0.0425** (-5.37)	-0.0072 (-0.53)	-0.0056 (-0.73)	-0.0549** (-2.97)
SUSPECT_NI	0.0015 (0.91)	-0.0022 (-0.45)	0.0007 (0.67)	0.0116** (2.30)
Expected sign	Negative	Negative	Positive	Positive
No. of observations	13,034	33,441	11,804	38,599
Adjusted R2	0.03	0.04	0.02	0.01

Panel B: Athanasakou et al.'s modified models

	Abnormal R&D expense	Abnormal SG&A	Abnormal production costs	Abnormal CFO
Intercept	-0.0023** (-4.47)	-0.0325** (-9.78)	0.0190** (13.46)	0.0077** (2.29)
MTB	0.0001 (1.24)	0.0001 (0.49)	-0.0001 (-0.64)	0.0000 (-0.31)
SIZE	-0.0005* (-1.77)	0.0036** (3.67)	0.0044** (6.14)	-0.001 (-0.93)
Net income	-0.0457** (-5.89)	-0.0602** (-3.09)	-0.0009 (-0.06)	0.0675** (3.75)
SUSPECT_NI	0.0004 (0.19)	0.0015 (0.38)	0.0071 (1.37)	-0.0056 (-1.54)
Expected sign	Negative	Negative	Positive	Negative
No. of observations	12,760	34,053	38,060	34,923
Adjusted R2	0.02	0.04	0.00	0.01

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.

2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes only firm-year observations with reported income before extraordinary items scaled by lagged total assets between -0.075 to 0.075. The regressions being estimated are of the form $Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t$. Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R^2 .
3. Variable definitions: In Panel A, abnormal R&D expense, abnormal SG&A, abnormal gain on asset sales, and abnormal production costs are calculated using Gunny's modified models; in Panel B, abnormal R&D expense, abnormal SG&A, abnormal production costs, and abnormal CFO are calculated using Athanasakou et al.'s modified models ; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 16: Transition Matrices of Gunny's Modified REM Proxies*Panel A: Abnormal R&D expenses*

Year t	Year $t+1$					Avg. Abnormal R&D expense t
	1	2	3	4	5	
1	29.10%	19.12%	16.29%	16.95%	18.54%	-0.0834
2	15.48%	29.62%	25.91%	18.40%	10.58%	-0.0261
3	13.57%	24.80%	27.49%	21.45%	12.69%	-0.0106
4	15.38%	17.19%	20.40%	26.84%	20.19%	0.0097
5	25.20%	10.12%	10.22%	17.30%	37.15%	0.1125
Avg. Abnormal R&D expense $t+1$	-0.0880	-0.0280	-0.0128	0.0070	0.1027	

Panel B: Abnormal SG&A expenses

Year t	Year $t+1$					Avg. Abnormal SG&A expenses t
	1	2	3	4	5	
1	58.94%	23.36%	9.20%	4.89%	3.61%	-0.2796
2	22.71%	43.20%	23.29%	7.83%	2.96%	-0.1192
3	8.76%	22.84%	40.23%	22.53%	5.64%	-0.0287
4	5.27%	7.70%	21.49%	46.23%	19.31%	0.0781
5	3.48%	3.55%	6.01%	18.73%	68.23%	0.3466
Avg. Abnormal SG&A expenses $t+1$	-0.2822	-0.1157	-0.0251	0.0815	0.3543	

Panel C: Abnormal gain on asset sales

Year t	Year $t+1$					Avg. Abnormal gain on asset sales t
	1	2	3	4	5	
1	29.32%	21.18%	16.82%	16.61%	16.07%	-0.0397
2	19.66%	25.22%	22.60%	19.10%	13.42%	-0.0119
3	14.97%	21.46%	25.61%	22.79%	15.16%	-0.0036
4	14.08%	19.62%	21.28%	25.13%	19.88%	0.0051
5	16.82%	14.40%	15.65%	18.59%	34.54%	0.0502
Avg. Abnormal gain on asset sales $t+1$	-0.0374	-0.0118	-0.0040	0.0042	0.0410	

Panel D: Abnormal production costs

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	63.82%	21.42%	7.33%	3.98%	3.46%	-0.3413
2	20.17%	43.10%	22.44%	9.50%	4.79%	-0.1115
3	6.84%	21.77%	39.95%	22.99%	8.45%	-0.0071
4	3.90%	9.00%	22.13%	42.89%	22.07%	0.0948
5	4.36%	5.33%	8.60%	20.96%	60.76%	0.3615
Avg. Abnormal production costs $t+1$	-0.3468	-0.1136	-0.0094	0.0913	0.3596	

Note: This table reports transition matrices of the Gunny's modified REM proxies. For each year, firms are classified into five quintiles based on the modified REM proxies. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D present the results for abnormal R&D expenses, abnormal SG&A expenses, abnormal gain on asset sales, and abnormal production costs respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 17: Transition Matrices of Athanasakou et al.'s Modified REM Proxies*Panel A: Abnormal R&D expenses*

Year t	Year $t+1$					Avg. Abnormal R&D expense t
	1	2	3	4	5	
1	31.21%	20.92%	15.67%	14.90%	17.31%	-0.0778
2	17.44%	28.37%	25.05%	17.83%	11.31%	-0.0236
3	14.03%	23.43%	26.59%	22.36%	13.58%	-0.0071
4	13.17%	16.32%	21.79%	28.19%	20.54%	0.0119
5	22.91%	11.86%	11.38%	17.36%	36.49%	0.0981
Avg. Abnormal R&D expense $t+1$	-0.0807	-0.0247	-0.0085	0.0096	0.0882	

Panel B: Abnormal SG&A expenses

Year t	Year $t+1$					Avg. Abnormal SG&A expenses t
	1	2	3	4	5	
1	62.37%	21.83%	7.64%	4.32%	3.83%	-0.3103
2	19.80%	45.40%	23.31%	8.52%	2.96%	-0.1067
3	7.98%	21.62%	41.83%	22.59%	5.98%	-0.0242
4	4.96%	8.30%	20.37%	45.49%	20.88%	0.0756
5	4.05%	3.39%	6.97%	19.49%	66.10%	0.3455
Avg. Abnormal SG&A expenses $t+1$	-0.3289	-0.1089	-0.0253	0.0733	0.3424	

Panel C: Abnormal production costs

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	61.34%	21.21%	7.65%	4.80%	5.00%	-0.3461
2	19.49%	41.39%	22.77%	10.36%	6.00%	-0.1021
3	7.20%	21.69%	38.57%	23.13%	9.41%	0.0018
4	4.80%	9.97%	21.64%	41.58%	22.01%	0.1007
5	6.32%	6.55%	9.54%	20.57%	57.03%	0.3434
Avg. Abnormal production costs $t+1$	-0.3531	-0.1030	0.0000	0.0985	0.3422	

Panel D: Abnormal CFO

Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	36.34%	18.90%	13.32%	12.48%	18.95%	-0.2536
2	19.97%	25.98%	21.62%	18.00%	14.43%	-0.0488
3	12.92%	23.12%	26.68%	22.53%	14.76%	0.0090
4	12.13%	17.87%	23.63%	27.17%	19.20%	0.0625
5	17.64%	14.76%	15.37%	20.19%	32.03%	0.2307
Avg. Abnormal CFO $t+1$	-0.2476	-0.0432	0.0133	0.0659	0.2360	

Note: This table reports transition matrices of the Athanasakou et al.'s modified REM proxies. For each year, firms are classified into five quintiles based on the modified REM proxies. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D present the results for abnormal R&D expenses, abnormal SG&A expenses, abnormal production costs, and abnormal CFO respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 18: Comparison of REM Proxies for Small Profit Firms with Firms in Nearby Intervals*Panel A: Comparison of small profit firms with profit firms in the adjacent interval*

	Small Profit Firms			Profit Firms in Adjacent Interval			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.063	1,159	0.055	-0.073	1,199	0.054	1.04	0.299
Abnormal CFO	-0.002	1,159	0.012	0.001	1,199	0.015	-0.63	0.530
Abnormal Production Costs	0.036	1,159	0.037	0.041	1,199	0.032	-0.65	0.514
Net Income	0.002	1,159	0.000	0.008	1,199	0.000	-101.28	0.000
MTB	2.418	1,149	1191.155	1.611	1,182	36.969	0.78	0.435
SIZE	4.151	1,149	4.925	4.055	1,182	5.190	1.03	0.303
AGE	24.533	383	119.103	24.704	426	117.658	-0.22	0.823
Sale Growth	0.095	1,159	0.534	0.104	1,199	0.387	-0.32	0.748
Discretionary Expenses	0.358	1,159	0.090	0.348	1,199	0.081	0.83	0.407
CFO	0.041	1,159	0.009	0.046	1,199	0.011	-1.21	0.225
Production Costs	1.015	1,159	0.807	1.010	1,199	0.735	0.14	0.890

Panel B: Comparison of small profit firms with randomly-selected firms in nearby intervals

	Small Profit Firms (1,159 firm-year observations)		Other Intervals (10,000 portfolios of 1,159 firm-year observations each)							% of cases consistent with REM hypothesis
	Mean	Variance	Mean	Min	Q1	Median	Q3	Max	Std	
Abnormal Discretionary Expenses	-0.063	0.055	-0.064	-0.089	-0.068	-0.064	-0.060	-0.041	0.006	0.42%
Abnormal CFO	-0.002	0.012	0.003	-0.007	0.001	0.003	0.005	0.016	0.003	22.72%
Abnormal Production Costs	0.036	0.037	0.033	0.012	0.030	0.033	0.037	0.057	0.005	4.15%

Notes:

1. The table reports a comparison between small profit firms and firms in nearby intervals. In Panel A, the control group is the profit firms falling in the interval immediately to the right of small profit firms. Specifically, these firms have income before extraordinary items scaled by lagged total assets between 0.005 and 0.010. In

Panel B, the control group is randomly selected 10,000 times from any observations with income before extraordinary items scaled by lagged total assets between -0.05 and 0.05. The size of each control group is 1,159 firm-year observations to match the size of small profit firms. Panel B reports the distribution of the average REM proxies for 10,000 randomly-selected portfolios of firms as well as the percentage of cases that the level of REM activities in small profit firms are significantly higher than that in other intervals.

2. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets.
3. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows:

$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$, where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.

4. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; AGE = Number of years since IPO; Sale Growth = the difference between current and last year's sales divided by last year's sales; Discretionary expenses are the sum of R&D, Advertising, and Selling, General and Administrative expenses scaled by lagged total assets as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 19: Model Parameters Using Time-Series Estimation*Panel A: Discretionary expenses model*

	Intercept	1/AT _{t-1}	SALES _{t-1} /AT _{t-1}	Adj R ²
Mean	0.1340	68.9125	0.1610	0.57
(t statistic)	(19.36)	(6.14)	(26.71)	
Lower quartile	-0.0069	0.2035	0.0096	0.36
Median	0.0832	3.3685	0.0958	0.61
Upper Quartile	0.2474	18.5760	0.2781	0.81

Panel B: Cash flow from operations model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _{t-1}	Adj R ²
Mean	-0.0247	1.2888	0.1017	-0.0208	0.50
(t statistic)	(-4.35)	(0.10)	(17.36)	(-3.73)	
Lower quartile	-0.1560	-8.6055	-0.0241	-0.1442	0.29
Median	-0.0203	-0.5844	0.0858	-0.0176	0.50
Upper Quartile	0.0991	4.2369	0.2232	0.0999	0.70

Panel C: Production costs model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _{t-1}	ΔSALES _{t-1} /AT _{t-1}	Adj R ²
Mean	-0.0748	5.9908	0.6947	0.0341	-0.0126	0.94
(t statistic)	(-11.73)	(0.41)	(99.9)	(5.81)	(-3.09)	
Lower quartile	-0.2162	-6.8317	0.5105	-0.0906	-0.1022	0.93
Median	-0.0493	-0.0102	0.7119	0.0413	-0.0094	0.97
Upper Quartile	0.0867	7.9572	0.8871	0.1665	0.0786	0.99

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{DISX_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it-1}}{AT_{it-1}} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{CFO_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it}}{AT_{it-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{it-1}} + \varepsilon_{it}$$

$$\text{Panel C: } \frac{PROD_{it}}{AT_{it-1}} = k_1 + k_2 \frac{1}{AT_{it-1}} + k_3 \frac{SALES_{it}}{AT_{it-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{it-1}} + k_5 \frac{\Delta SALES_{it-1}}{AT_{it-1}} + \varepsilon_{it}$$

The regressions are estimated for every firm. Firms with fewer than 8 time-series observations are eliminated from the sample. There are 2,988 separate firms. The table reports the mean coefficient across firms and t-statistics calculated using the standard error of the mean across firms. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across firms) for each of these regressions.

2. Variable definitions: AT = total assets; SALES = sales; ΔSALES = change in sales, e.g. ΔSALES_t = SALES_t - SALES_{t-1}; DISX = Discretionary expenses (R&D + Advertising + Selling, General and Administrative expenses); as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations; PROD = production costs (COGS + Change in inventory).

Table 20: Replication of Roychowdhury's Main Results Using Time-Series Estimation

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0103** (-3.22)	0.0076** (3.00)	-0.0026 (-1.48)
MTB	0.0001 (1.37)	0.0000 (-0.79)	0.0000 (0.89)
SIZE	0.0023** (5.83)	-0.0018** (-5.36)	0.0007** (2.40)
Net income	-0.0677** (-4.03)	0.0691** (6.88)	-0.0303** (-7.60)
SUSPECT_NI	-0.0032 (-1.08)	-0.0001 (-0.03)	0.0026* (1.65)
Expected sign	Negative	Negative	Positive
No. of observations	34,839	34,839	34,839
Adjusted R ²	0.03	0.04	0.01

Notes:

- *Significant at the 10% level. **Significant at the 5% level.
- This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 34,839 observations. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
- Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding time-series regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding time-series regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding time-series regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity; SIZE = Logarithm of market value of equity; Net income = Income before extraordinary items scaled by lagged total assets; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 21: Transition Matrices of REM Proxies and Discretionary Accruals Using Time-Series Estimation

Panel A: Abnormal discretionary expenses

Year t	Year $t+1$					Avg. Abnormal discretionary expense t
	1	2	3	4	5	
1	37.57%	17.59%	10.40%	11.27%	23.17%	-0.1093
2	15.19%	28.27%	21.99%	20.00%	14.54%	-0.0240
3	9.08%	22.33%	32.50%	24.91%	11.18%	-0.0017
4	11.65%	19.66%	24.43%	27.27%	16.99%	0.0200
5	23.32%	14.18%	11.60%	18.24%	32.66%	0.1151
Avg. Abnormal discretionary expense $t+1$	-0.1081	-0.0242	-0.0019	0.0200	0.1165	

Panel B: Abnormal CFO

Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	19.64%	15.30%	14.94%	18.84%	31.28%	-0.0959
2	14.48%	20.27%	22.33%	24.09%	18.83%	-0.0262
3	13.24%	22.57%	27.68%	22.56%	13.95%	-0.0003
4	18.63%	24.77%	22.37%	20.37%	13.86%	0.0252
5	29.58%	19.22%	14.21%	16.42%	20.58%	0.0935
Avg. Abnormal CFO $t+1$	-0.0957	-0.0260	0.0000	0.0258	0.0937	

Panel C: Abnormal production costs

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	23.04%	15.81%	12.34%	17.67%	31.13%	-0.0766
2	14.25%	20.53%	23.18%	24.08%	17.97%	-0.0214
3	12.64%	22.43%	28.73%	23.35%	12.84%	-0.0007
4	15.73%	24.68%	23.53%	21.94%	14.12%	0.0197
5	30.16%	18.72%	13.56%	15.10%	22.45%	0.0773
Avg. Abnormal production costs $t+1$	-0.0767	-0.0217	-0.0007	0.0195	0.0771	

Panel D: Discretionary accruals

Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	19.07%	15.51%	14.18%	19.22%	32.03%	-0.1146
2	12.85%	20.40%	23.14%	25.89%	17.72%	-0.0276
3	12.99%	22.79%	27.63%	23.03%	13.55%	0.0016
4	18.81%	24.75%	22.78%	19.32%	14.35%	0.0300
5	31.92%	18.69%	13.62%	14.79%	20.98%	0.1139
Avg. Discretionary accruals $t+1$	-0.1182	-0.0293	0.0004	0.0290	0.1125	

Note: This table reports transition matrices of the three REM proxies and the discretionary accruals. For each year, firms are classified into five quintiles based on the REM proxies or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D presents the results for abnormal discretionary expenses, abnormal CFO, abnormal production costs, and discretionary accruals respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 22: Replication of Roychowdhury's Main Results Excluding Extreme Observations Using Time-Series Estimation

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0167** (-8.80)	0.0029 (1.30)	-0.0005 (-0.23)
MTB	-0.0001 (-1.17)	0.0000 (0.17)	0.0001 (1.00)
SIZE	0.0019** (4.65)	-0.0013** (-5.21)	0.0008** (2.47)
Net income	0.0807** (3.14)	0.1131** (7.06)	-0.0934** (-5.74)
SUSPECT_NI	0.0049* (1.96)	0.0022 (0.74)	-0.0002 (-0.13)
Expected sign	Negative	Negative	Positive
No. of observations	18,547	18,547	18,547
Adjusted R ²	0.01	0.04	0.01

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes only firm-year observations with reported income before extraordinary items scaled by lagged total assets between -0.075 to 0.075. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding time-series regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding time-series regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding time-series regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity; SIZE = Logarithm of market value of equity; Net income = Income before extraordinary items scaled by lagged total assets; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 23: Firm Characteristics and REM Proxies for Small Profit firms Compared to All Other Firms and Small Loss Firms Using Time-Series Estimation

Panel A: Comparison of small profits with all others

	Small Profit Firms			All Others			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.004	852	0.006	0.000	33,987	0.013	-1.47	0.142
Abnormal CFO	0.000	852	0.004	0.000	33,987	0.006	0.00	1.000
Abnormal Production Costs	0.002	852	0.003	0.000	33,987	0.004	1.05	0.294
Net Income	0.002	852	0.000	0.010	33,987	0.107	-4.51	0.000
MTB	1.375	852	13.450	2.681	33,987	526.671	-7.38	0.000
SIZE	4.293	852	4.927	4.733	33,987	5.663	-5.70	0.000
Discretionary Expenses	0.337	852	0.084	0.442	33,987	0.140	-10.36	0.000
CFO	0.048	852	0.006	0.064	33,987	0.030	-5.68	0.000
Production Costs	0.985	852	0.698	1.060	33,987	0.866	-2.58	0.010

Panel B: Comparison of small profits with small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.004	852	0.006	-0.014	351	0.056	0.77	0.439
Abnormal CFO	0.000	852	0.004	-0.006	351	0.003	1.65	0.099
Abnormal Production Costs	0.002	852	0.003	0.006	351	0.002	-1.32	0.188
Net Income	0.002	852	0.000	-0.003	351	0.000	69.28	0.000
MTB	1.375	852	13.450	1.764	351	9.731	-1.86	0.062
SIZE	4.293	852	4.927	4.617	351	5.463	-2.22	0.027
Discretionary Expenses	0.337	852	0.084	0.295	351	0.056	2.61	0.009
CFO	0.048	852	0.006	0.041	351	0.006	1.42	0.154
Production Costs	0.985	852	0.698	0.932	351	0.617	1.04	0.297

Panel C: Comparison of small loss firms with other firms

	Small Loss Firms			Other Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.014	351	0.056	0.000	34,488	0.013	-1.11	0.268
Abnormal CFO	-0.006	351	0.003	0.000	34,488	0.006	-2.03	0.042
Abnormal Production Costs	0.006	351	0.002	0.000	34,488	0.004	2.49	0.013
Net Income	-0.003	351	0.000	0.010	34,488	0.105	-7.44	0.000
MTB	1.764	351	9.731	2.658	34,488	519.272	-4.32	0.000
SIZE	4.617	351	5.463	4.723	34,488	5.651	-0.85	0.398
Discretionary Expenses	0.295	351	0.056	0.440	34,488	0.140	-11.34	0.000
CFO	0.041	351	0.006	0.064	34,488	0.030	-5.43	0.000
Production Costs	0.932	351	0.617	1.059	34,488	0.864	-3.01	0.003

Notes:

1. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets. Other firms in Panel A include all firm-years that are not small profit firms (including small loss firms). Other firms in Panel C include all observations that are not small loss firms.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next to it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding time-series regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding time-series regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding time-series regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity; SIZE = Logarithm of market value of equity; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; Discretionary expenses are the sum of R&D, Advertising, and Selling, General and Administrative expenses scaled by lagged total assets as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 24: Replication of Roychowdhury's Main Results on Overproduction Separately for Manufacturing and Non-Manufacturing Industries

	Non-Manufacturing Industries	Manufacturing Industries	Total Sample
Intercept	-0.0006** (-3.18)	-0.0012** (-4.97)	-0.0010** (-4.88)
MTB	-0.0004** (-2.04)	-0.0005* (-1.77)	-0.0003** (-2.35)
SIZE	0.0010 (1.29)	-0.0053** (-5.10)	-0.0034** (-4.37)
Net income	-0.1463** (-6.31)	-0.1488** (-7.26)	-0.1412** (-7.24)
SUSPECT_NI	0.0284** (3.21)	0.0494** (6.14)	0.0433** (5.72)
Expected sign	Positive	Positive	Positive
No. of observations	18,639	32,848	51,487
Adjusted R ²	0.02	0.05	0.04

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 51,487 observations, including 18,639 observations from non-manufacturing industries and 32,848 observations from manufacturing industries. The regressions being estimated are of the form

$$Abnormal\ production\ costs_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different sample as described at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 25: Transition Matrices of Overproduction Proxy and Discretionary Accruals Separately for Manufacturing and Non-Manufacturing Industries

Panel A: Abnormal production costs for manufacturing industries

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	70.50%	19.38%	5.79%	2.58%	1.75%	-0.2911
2	18.19%	47.47%	22.03%	8.40%	3.92%	-0.0868
3	5.55%	21.19%	41.81%	22.68%	8.78%	0.0072
4	2.36%	7.69%	21.63%	44.30%	24.01%	0.0951
5	2.12%	4.30%	9.01%	22.67%	61.89%	0.2723
Avg. Abnormal production costs $t+1$	-0.2868	-0.0867	0.0049	0.0910	0.2632	

Panel B: Abnormal production costs for non-manufacturing industries

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	66.76%	20.78%	6.64%	3.46%	2.36%	-0.3562
2	17.80%	43.97%	23.20%	10.02%	5.01%	-0.0974
3	6.26%	22.31%	37.90%	24.49%	9.03%	0.0174
4	3.04%	9.29%	23.25%	39.91%	24.50%	0.1177
5	3.09%	4.76%	9.77%	23.61%	58.76%	0.3085
Avg. Abnormal production costs $t+1$	-0.3573	-0.1008	0.0126	0.1127	0.3057	

Panel C: Discretionary accruals for manufacturing industries

Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	31.75%	18.44%	15.19%	14.56%	20.06%	-0.1803
2	18.24%	24.55%	21.90%	20.06%	15.25%	-0.0353
3	13.74%	22.27%	25.80%	23.38%	14.81%	0.0087
4	14.40%	19.68%	22.68%	24.25%	19.00%	0.0495
5	21.08%	15.64%	14.67%	18.04%	30.56%	0.1619
Avg. Discretionary accruals $t+1$	-0.1836	-0.0343	0.0092	0.0494	0.1562	

Panel D: Discretionary accruals for non-manufacturing industries

Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	34.68%	20.82%	13.94%	12.80%	17.76%	-0.2159
2	20.25%	25.33%	21.99%	19.42%	13.01%	-0.0476
3	14.18%	23.03%	26.44%	22.93%	13.42%	0.0117
4	13.35%	17.70%	21.46%	26.00%	21.49%	0.0650
5	15.44%	15.37%	16.77%	20.12%	32.29%	0.1921
Avg. Discretionary accruals $t+1$	-0.2250	-0.0473	0.0120	0.0644	0.1933	

Note: This table reports transition matrices of the overproduction proxy and the discretionary accruals separately for manufacturing and non-manufacturing industries. For each year, firms are classified into five quintiles based on either the overproduction proxy or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panels A and B present the results for abnormal production costs, while Panels C and D present the results for discretionary accruals. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 26: Replication of Roychowdhury's Main Results Including Loss Dummy Variable

	Abnormal discretionary expenses	Abnormal discretionary expenses
Intercept	0.0014** (5.50)	-0.0624** (-12.50)
MTB	-0.0002 (-0.26)	-0.0002 (-0.35)
SIZE	0.0138** (16.82)	0.0125** (11.17)
Net income	-0.2465** (-13.23)	0.3825** (7.75)
Net income*Loss		-0.7581** (-9.93)
Loss		0.0292** (1.97)
SUSPECT_NI	-0.0572** (-6.60)	-0.0096 (-1.05)
Expected sign	Negative	Negative
No. of observations	51,487	51,487
Adjusted R ²	0.08	0.13

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 51,487 observations. The regressions being estimated are of the following forms:
 $Abnormal\ discretionary\ exp_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t$
 $Abnormal\ discretionary\ exp_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(Net\ income * Loss)_t + \beta_5(Loss)_t + \beta_6(SUSPECT_NI)_t + \varepsilon_t$. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; Loss = an indicator variable equal to one when income before extraordinary items are negative and zero otherwise; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 27: Reversal Tests of Suspect and Non-Suspect Firms*Panel A: Abnormal discretionary expenses*

<i>non-suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal discretionary expense t
	1	2	3	4	5	
1	73.31%	18.86%	4.12%	1.97%	1.74%	-0.3116
2	18.42%	53.24%	21.16%	5.43%	1.75%	-0.1560
3	4.27%	20.57%	49.66%	21.34%	4.16%	-0.0511
4	2.03%	5.81%	20.06%	51.89%	20.21%	0.0824
5	1.56%	2.04%	5.12%	19.44%	71.83%	0.4327
Avg. Abnormal discretionary expense $t+1$	-0.3171	-0.1585	-0.0560	0.0732	0.4196	
<i>suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal discretionary expense t
	1	2	3	4	5	
1	76.42%	17.90%	3.49%	1.75%	0.44%	-0.2957
2	18.58%	52.57%	23.32%	3.95%	1.58%	-0.1411
3	3.77%	21.23%	46.23%	25.00%	3.77%	-0.0469
4	3.43%	6.29%	11.43%	56.57%	22.29%	0.0697
5	0.00%	2.70%	0.90%	24.32%	72.07%	0.3719
Avg. Abnormal discretionary expense $t+1$	-0.3046	-0.1564	-0.0462	0.0603	0.3050	

Panel B: Abnormal CFO

<i>non-suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	48.07%	22.42%	12.41%	8.72%	8.39%	-0.2266
2	22.50%	30.66%	22.99%	14.81%	9.04%	-0.0462
3	12.92%	23.81%	28.36%	23.30%	11.61%	0.0142
4	8.40%	14.77%	23.79%	31.45%	21.59%	0.0690
5	8.08%	9.22%	12.37%	22.02%	48.31%	0.1874
Avg. Abnormal CFO $t+1$	-0.2138	-0.0406	0.0179	0.0708	0.1882	
<i>suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	36.99%	28.32%	19.08%	11.56%	4.05%	-0.1490
2	22.87%	31.01%	27.91%	10.47%	7.75%	-0.0446
3	10.63%	28.35%	32.28%	20.08%	8.66%	0.0111
4	13.76%	18.52%	25.40%	28.04%	14.29%	0.0659
5	9.43%	14.15%	16.98%	23.58%	35.85%	0.1711
Avg. Abnormal CFO $t+1$	-0.1319	-0.0403	0.0129	0.0713	0.1736	

Panel C: Abnormal production costs

<i>non-suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	69.19%	19.89%	6.10%	2.87%	1.94%	-0.3141
2	18.15%	46.12%	22.47%	8.95%	4.32%	-0.0906
3	5.79%	21.62%	40.40%	23.32%	8.87%	0.0108
4	2.62%	8.31%	22.24%	42.68%	24.16%	0.1031
5	2.50%	4.50%	9.31%	22.92%	60.76%	0.2854
Avg. Abnormal production costs $t+1$	-0.3116	-0.0918	0.0077	0.0987	0.2784	
<i>suspect observations</i>						
Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	69.64%	17.86%	5.36%	3.57%	3.57%	-0.2882
2	13.33%	52.22%	21.11%	10.00%	3.33%	-0.0848
3	6.34%	20.00%	41.46%	23.41%	8.78%	0.0113
4	1.95%	6.61%	21.01%	45.53%	24.90%	0.1020
5	0.88%	3.10%	7.96%	25.66%	62.39%	0.2664
Avg. Abnormal production costs $t+1$	-0.2824	-0.0860	0.0067	0.0958	0.2610	

Panel D: Discretionary accruals

<i>non-suspect observations</i>						
Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	32.77%	19.21%	14.75%	13.88%	19.39%	-0.1934
2	19.00%	24.79%	21.78%	19.90%	14.53%	-0.0396
3	13.89%	22.46%	26.05%	23.21%	14.38%	0.0098
4	13.94%	18.97%	22.20%	24.98%	19.91%	0.0551
5	18.94%	15.52%	15.56%	18.77%	31.20%	0.1731
Avg. Discretionary accruals $t+1$	-0.1988	-0.0388	0.0102	0.0548	0.1693	
<i>suspect observations</i>						
Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	30.30%	21.21%	15.91%	18.94%	13.64%	-0.1243
2	16.67%	26.13%	27.48%	17.57%	12.16%	-0.0380
3	13.81%	25.71%	24.76%	23.81%	11.90%	0.0085
4	17.24%	19.40%	24.14%	20.69%	18.53%	0.0512
5	26.97%	16.85%	8.43%	18.54%	29.21%	0.1448
Avg. Discretionary accruals $t+1$	-0.1517	-0.0411	0.0087	0.0495	0.1513	

Note: This table reports transition matrices of the three REM proxies and the discretionary accruals, separately for suspect and non-suspect observations. Suspect observations are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets, while non-suspect observations are firm-years with reported income before extraordinary items in other ranges. For each year, firms are classified into five quintiles based on the REM proxies or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D present the results for abnormal discretionary expenses, abnormal CFO, abnormal production costs, and discretionary accruals respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 28: Distribution of firm-years Based on Likelihood of Just Avoiding Losses in Two Consecutive Years

Year t	Year $t+1$		Total
	Non-suspect firm-years	Suspect firm-years	
Non-suspect firm-years	40,707	939	41,646
Suspect firm-years	929	51	980
Total	41,636	990	42,626
phi correlation coefficient			-0.029
chi-square test statistic			36.71

Note: This table reports the distribution of firm-year observations based on whether they are “suspect firm-years” or not. Suspect firm-years are defined as firms with income before extraordinary items scaled by lagged total assets between 0 and 0.005. The table also reports a phi correlation coefficient, which measures an association between the likelihood of being a suspect firm-year in two consecutive years. The chi-square test statistic reports statistical significance of the association.

Table 29: Model Parameters-Full Sample Analysis*Panel A: Discretionary expenses model*

	Intercept	1/AT _{t-1}	SALES _{t-1} /AT _{t-1}	Adj R ²
Mean	0.1464	2.2154	0.1361	0.42
(t statistic)	(24.98)	(15.83)	(31.08)	
Lower quartile	0.0387	0.6365	0.0444	0.24
Median	0.1318	1.3075	0.1104	0.39
Upper Quartile	0.2717	2.4354	0.2047	0.59

Panel B: Cash flow from operations model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _t	Adj R ²
Mean	0.0217	-1.1454	0.0501	0.0219	0.35
(t statistic)	(8.69)	(-16.22)	(23.54)	(4.39)	
Lower quartile	-0.0185	-1.3385	0.0081	-0.0471	0.18
Median	0.0282	-0.6885	0.0370	0.0138	0.31
Upper Quartile	0.0705	-0.2695	0.0821	0.0883	0.47

Panel C: Production costs model

	Intercept	1/AT _{t-1}	SALES _t /AT _{t-1}	ΔSALES _t /AT _{t-1}	ΔSALES _{t-1} /AT _{t-1}	Adj R ²
Mean	-0.1361	-0.4096	0.7898	0.0023	-0.0175	0.88
(t statistic)	(-28.22)	(-3.86)	(188.98)	(0.3)	(-2.59)	
Lower quartile	-0.2192	-0.6075	0.7114	-0.1111	-0.1044	0.84
Median	-0.1272	-0.1196	0.7969	-0.0025	-0.0208	0.91
Upper Quartile	-0.0487	0.1725	0.8853	0.1056	0.0673	0.96

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$$

$$\text{Panel C: } \frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. There are 1,034 separate industry-years. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across industry-years) for each of these regressions.

2. Variable definitions: AT = total assets; SALES = sales; ΔSALES = change in sales, e.g. ΔSALES_t = SALES_t - SALES_{t-1}; DISX = Discretionary expenses (R&D + Advertising + Selling, General and Administrative expenses); as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations; PROD = production costs (COGS + Change in inventory).

Table 30: Replication of Roychowdhury's Main Results-Full Sample Analysis

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0292** (-3.35)	-0.0164** (-2.13)	0.0155** (5.65)
MTB	-0.0001 (-0.38)	0.0002 (1.18)	-0.0002** (-2.75)
SIZE	0.0060** (3.48)	0.0034** (2.36)	-0.0033** (-6.59)
Net income	-0.1590** (-7.52)	0.1594** (6.24)	-0.0808** (-4.84)
SUSPECT_NI	-0.0486** (-8.61)	-0.0069** (-2.31)	0.0365** (6.77)
Expected sign	Negative	Negative	Positive
No. of observations	89,412	89,412	89,412
Adjusted R ²	0.07	0.17	0.02

Notes:

- *Significant at the 10% level. **Significant at the 5% level.
- This table reports the results of Fama-MacBeth regressions, over a period of twenty-seven years from 1987-2013. The total sample includes 89,412 observations. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across twenty-seven years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
- Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 31: Transition Matrices of REM Proxies and Discretionary Accruals-Full Sample Analysis

Panel A: Abnormal discretionary expenses

Year t	Year $t+1$					Avg. Abnormal discretionary expense t
	1	2	3	4	5	
1	73.85%	18.61%	3.96%	2.00%	1.58%	-0.3220
2	18.04%	54.41%	21.04%	4.90%	1.61%	-0.1531
3	4.24%	19.84%	50.29%	21.71%	3.92%	-0.0520
4	2.00%	5.24%	19.59%	53.23%	19.95%	0.0755
5	1.52%	1.96%	4.69%	18.56%	73.27%	0.4438
Avg. Abnormal discretionary expense $t+1$	-0.3246	-0.1536	-0.0553	0.0680	0.4284	

Panel B: Abnormal CFO

Year t	Year $t+1$					Avg. Abnormal CFO t
	1	2	3	4	5	
1	51.19%	21.65%	11.17%	7.96%	8.03%	-0.2360
2	23.01%	32.57%	22.63%	13.49%	8.30%	-0.0437
3	11.58%	24.44%	30.06%	22.99%	10.93%	0.0177
4	7.62%	14.36%	24.48%	32.60%	20.95%	0.0711
5	7.24%	8.32%	11.84%	22.76%	49.83%	0.1914
Avg. Abnormal CFO $t+1$	-0.2218	-0.0385	0.0201	0.0716	0.1915	

Panel C: Abnormal production costs

Year t	Year $t+1$					Avg. Abnormal production costs t
	1	2	3	4	5	
1	69.14%	20.22%	5.80%	2.70%	2.14%	-0.3010
2	18.47%	46.12%	22.85%	8.48%	4.07%	-0.0864
3	5.65%	21.75%	41.26%	23.02%	8.32%	0.0084
4	2.64%	8.00%	21.47%	44.41%	23.47%	0.0956
5	2.39%	4.37%	8.93%	22.18%	62.13%	0.2787
Avg. Abnormal production costs $t+1$	-0.2995	-0.0873	0.0062	0.0923	0.2709	

Panel D: Discretionary accruals

Year t	Year $t+1$					Avg. Discretionary accruals t
	1	2	3	4	5	
1	33.94%	19.33%	14.40%	13.74%	18.60%	-0.2156
2	19.36%	25.58%	22.11%	18.97%	13.98%	-0.0395
3	13.99%	22.20%	26.51%	23.35%	13.95%	0.0098
4	13.47%	18.96%	22.53%	25.53%	19.51%	0.0556
5	18.20%	14.89%	14.90%	18.92%	33.08%	0.1941
Avg. Discretionary accruals $t+1$	-0.2149	-0.0384	0.0093	0.0538	0.1919	

Note: This table reports transition matrices of the three REM proxies and the discretionary accruals for a full sample period from 1987-2013. For each year, firms are classified into five quintiles based on the REM proxies or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given quintile in year t will transition to each quintile in the subsequent year (year $t+1$). Panel A, B, C, and D present the results for abnormal discretionary expenses, abnormal CFO, abnormal production costs, and discretionary accruals respectively. Cells with a higher probability than random occurrence (Prob. $\geq 20\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Table 32: Replication of Roychowdhury's Main Results Excluding Extreme Observations-Full Sample Analysis

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	-0.0691** (-14.78)	0.0081** (3.57)	0.0173** (5.80)
MTB	0.0005 (1.03)	0.0001 (1.12)	-0.0006** (-2.41)
SIZE	0.0029** (3.88)	-0.0018** (-2.82)	0.0032** (4.39)
Net income	-0.0712 (-1.18)	0.3875** (14.35)	-0.2223** (-7.30)
SUSPECT_NI	0.0012 (0.21)	-0.0052 (-1.92)	0.0050 (1.01)
Expected sign	Negative	Negative	Positive
No. of observations	43,567	43,567	43,567
Adjusted R ²	0.02	0.04	0.00

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of twenty-seven years from 1987-2013. The total sample includes only firm-year observations with reported income before extraordinary items scaled by lagged total assets between -0.075 to 0.075. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across twenty-seven years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 33: Firm Characteristics and REM Proxies for Small Profit firms Compared to All Other Firms and Small Loss Firms- Full Sample Analysis

Panel A: Comparison of small profits with all others

	Small Profit Firms			All Others			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.056	1,810	0.050	0.001	87,602	0.139	-10.55	0.000
Abnormal CFO	-0.002	1,810	0.011	0.000	87,602	0.039	-0.78	0.434
Abnormal Production Costs	0.033	1,810	0.034	-0.001	87,602	0.054	7.72	0.000
Net Income	0.002	1,810	0.000	-0.139	87,602	199.911	2.95	0.003
MTB	2.206	1,810	772.035	2.786	87,602	3165.934	-0.85	0.394
SIZE	4.505	1,810	5.106	4.876	87,602	6.348	-6.90	0.000
Discretionary Expenses	0.346	1,810	0.096	0.478	87,602	0.552	-17.14	0.000
CFO	0.044	1,810	0.008	0.030	87,602	0.109	5.88	0.000
Production Costs	0.948	1,810	0.738	0.964	87,602	2.930	-0.76	0.446

Panel B: Comparison of small profits with small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.056	1,810	0.050	-0.075	1,036	0.069	1.96	0.050
Abnormal CFO	-0.002	1,810	0.011	-0.002	1,036	0.010	0.00	1.000
Abnormal Production Costs	0.033	1,810	0.034	0.040	1,036	0.029	-1.02	0.306
Net Income	0.002	1,810	0.000	-0.003	1,036	0.000	116.51	0.000
MTB	2.206	1,810	772.035	2.061	1,036	135.900	0.19	0.846
SIZE	4.505	1,810	5.106	4.810	1,036	5.468	-3.39	0.001
Discretionary Expenses	0.346	1,810	0.096	0.301	1,036	0.069	4.11	0.000
CFO	0.044	1,810	0.008	0.046	1,036	0.007	-0.60	0.550
Production Costs	0.948	1,810	0.738	0.911	1,036	0.856	1.05	0.292

Panel C: Comparison of small loss firms with other firms

	Small Loss Firms			Other Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.075	1,036	0.069	0.001	88,376	0.138	-9.21	0.000
Abnormal CFO	-0.002	1,036	0.010	0.000	88,376	0.039	-0.63	0.529
Abnormal Production Costs	0.040	1,036	0.029	0.000	88,376	0.054	7.48	0.000
Net Income	-0.003	1,036	0.000	-0.138	88,376	198.160	2.85	0.004
MTB	2.061	1,036	135.900	2.782	88,376	3,152.460	-1.77	0.078
SIZE	4.810	1,036	5.468	4.869	88,376	6.336	-0.81	0.420
Discretionary Expenses	0.301	1,036	0.069	0.477	88,376	0.548	-20.63	0.000
CFO	0.046	1,036	0.007	0.030	88,376	0.108	5.66	0.000
Production Costs	0.911	1,036	0.856	0.964	88,376	2.909	-1.81	0.071

Notes:

1. The sample period spans 1987-2013. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets. Other firms in Panel A include all firm-years that are not small profit firms (including small loss firms). Other firms in Panel C include all observations that are not small loss firms.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next to it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; Discretionary expenses are the sum of R&D, Advertising, and Selling, General and Administrative expenses scaled by lagged total assets as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 34: Analysis of Abnormal Discretionary Expenses Proxy-Alternative Definition of Discretionary Expenses

Panel A: Model parameter

	Intercept	1/AT _{t-1}	SALES _{t-1} /AT _{t-1}	Adj R ²
Mean	0.1199	1.7948	0.1357	0.40
(t statistic)	(18.26)	(15.69)	(29.24)	
Lower quartile	0.0335	0.6123	0.0597	0.24
Median	0.1019	1.0750	0.1167	0.36
Upper Quartile	0.2199	1.9550	0.1976	0.55

Panel B: Replication of Roychowdhury's main results

	Abnormal discretionary expense	
	Including extreme observations	Excluding extreme observations
Intercept	-0.0381** (-10.21)	-0.0548** (-15.80)
MTB	-0.0001 (-0.17)	0.0008* (1.67)
SIZE	0.0078** (11.91)	0.0019** (3.01)
Net income	-0.1714** (-14.80)	0.1245** (3.57)
SUSPECT_NI	-0.0434** (-6.25)	-0.0043 (-0.69)
Expected sign	Negative	Negative
No. of observations	51,487	25,457
Adjusted R ²	0.07	0.00

Panel C: Transition matrix of abnormal discretionary expenses

Year <i>t</i>	Year <i>t+1</i>					Avg. Abnormal discretionary expense <i>t</i>
	1	2	3	4	5	
1	72.96%	19.25%	4.07%	1.86%	1.86%	-0.2531
2	18.08%	52.01%	22.30%	5.65%	1.96%	-0.1198
3	4.83%	21.19%	47.37%	22.44%	4.17%	-0.0360
4	2.12%	5.82%	20.71%	51.18%	20.17%	0.0680
5	1.55%	2.15%	5.38%	19.20%	71.71%	0.3390
Avg. Abnormal discretionary expense <i>t+1</i>	-0.2582	-0.1224	-0.0400	0.0607	0.3273	

Panel D: Firm characteristics and abnormal discretionary expenses for small profit and small loss firms

	Small Profit Firms			Small Loss Firms			Test Statistic	p-value
	Mean	Number	Variance	Mean	Number	Variance		
Abnormal Discretionary Expenses	-0.063	1,159	0.055	-0.087	518	0.040	2.11	0.035
Discretionary Expenses	0.358	1,159	0.090	0.306	518	0.060	3.72	0.000

Notes:

1. This table reports the analysis of abnormal discretionary expenses using alternative definition of discretionary expenses. Specifically, abnormal discretionary expenses are equal to Selling, General, and Administrative expenses scaled by lagged total assets.
2. Panel A reports the estimated parameters in the following regression:

$$\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. There are 580 separate industry-years. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across industry-years) for each of these regressions.
3. In Panel A, the variables are defined as follows: AT = total assets; SALES = sales; ΔSALES = change in sales, e.g. ΔSALES_t = SALES_t - SALES_{t-1}; DISX = Discretionary expenses (R&D + Advertising + Selling, General and Administrative expenses); as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations; PROD = production costs (COGS + Change in inventory).
4. Panel B reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The two columns report results for the full sample as well as the sample of firms with income before extraordinary items scaled by lagged total assets between -0.075 and 0.075. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$

Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
5. For Panel B, * denotes significant at the 10% level, and ** denotes significant at the 5% level.
6. In Panel B, the variables are defined as follows: Abnormal discretionary expenses are measured as deviations from the predicted values from the regression specified in Note 2; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.
7. Panel C reports a transition matrix of abnormal discretionary expenses. For each year, firms are classified into five quintiles based on the abnormal discretionary expenses proxy. The table presents the likelihood that a firm-year observation in a given quintile in year *t* will transition to each quintile in the subsequent year (year *t* + 1). Cells with a higher probability than random occurrence (Prob. ≥ 20%) are bolded. The average values for each quintile in year *t* are reported in the last column, while the average values in year *t* + 1 are reported in the last row.
8. Panel D reports a comparison of the total and abnormal discretionary expenses between small profit and small loss firms. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of total assets. Small loss firms are firm-years with reported income before extraordinary items between -0.5% and 0% of total assets.

9. In Panel D, test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows: $t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$, where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.

Table 35: Comparison of Small Profit and Small Loss Firms-Alternative Specification of Equal-Sized Portfolios

	Small Profit Firms			Small Loss Firms			Test	
	Mean	Number	Variance	Mean	Number	Variance	Statistic	p-value
Abnormal Discretionary Expenses	-0.063	1,159	0.055	-0.084	1,159	0.048	2.23	0.026
Abnormal CFO	-0.002	1,159	0.012	-0.007	1,159	0.010	1.15	0.251
Abnormal Production Costs	0.036	1,159	0.037	0.044	1,159	0.029	-1.06	0.289
Net Income	0.002	1,159	0.000	-0.005	1,159	0.000	76.34	0.000
MTB	2.418	1,149	1,191.155	1.914	1,138	107.036	0.47	0.636
SIZE	4.151	1,149	4.925	4.155	1,138	5.147	-0.04	0.966
AGE	24.533	383	119.103	22.530	387	63.960	2.90	0.004
Sale Growth	0.095	1,159	0.534	0.043	1,159	0.119	2.19	0.029
Discretionary Expenses	0.358	1,159	0.090	0.316	1,159	0.069	3.59	0.000
CFO	0.041	1,159	0.009	0.039	1,159	0.008	0.52	0.602
Production Costs	1.015	1,159	0.807	0.990	1,159	0.824	0.67	0.505

Notes:

1. The table reports firm characteristics and REM proxies for small profit and small loss firms using alternative specification of **equal-sized portfolios**. The sample period spans 1987-2001. Small profit firms are firm-years with reported income before extraordinary items between 0% and 0.5% of lagged total assets. Small loss firms are the 1,159 loss observations with the highest (least negative) reported income before extraordinary items scaled by lagged total assets.
2. Test statistic is based on a difference in means across samples (t-test) with p-values reported in the column next it. Specifically, test statistic is calculated as follows:

$$t(\bar{x}_1 - \bar{x}_2) = (\bar{x}_1 - \bar{x}_2) / \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$
where $\bar{x}_i$ is the mean of sample group i, σ_i^2 is the variance of sample group i, N_i is the number of observations in group i. Degree of freedom of t-statistics = $N_1 + N_2 - 2$.
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; AGE = Number of years since IPO; Sale Growth = the difference between current and last year's sales divided by last year's sales; Discretionary expenses are the sum of R&D, Advertising, and Selling, General and Administrative expenses scaled by lagged total assets as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations scaled by lagged total assets; Production costs are the sum of COGS and change in inventory scaled by lagged total assets.

Table 36: Model Parameters-Alternative Scaling Variable*Panel A: Discretionary expenses model*

	Intercept	1/ CSHO _{t-1}	SALES _{t-1} / CSHO _{t-1}	Adj R ²
Mean	0.9530	1.8491	0.1801	0.63
(t statistic)	(10.5)	(5.97)	(40.75)	
Lower quartile	0.1170	-1.4615	0.1005	0.48
Median	0.9554	0.3074	0.1681	0.63
Upper Quartile	1.7572	3.4410	0.2448	0.78

Panel B: Cash flow from operations model

	Intercept	1/ CSHO _{t-1}	SALES _t / CSHO _{t-1}	ΔSALES _t / CSHO _{t-1}	Adj R ²
Mean	0.3815	-2.3645	0.0537	0.0118	0.48
(t statistic)	(7.4)	(-9.08)	(24.38)	(1.44)	
Lower quartile	-0.0439	-2.9199	0.0266	-0.0534	0.30
Median	0.2847	-1.3308	0.0493	0.0059	0.48
Upper Quartile	0.7266	-0.2519	0.0729	0.0798	0.64

Panel C: Production costs model

	Intercept	1/ CSHO _{t-1}	SALES _t / CSHO _{t-1}	ΔSALES _t / CSHO _{t-1}	ΔSALES _{t-1} / CSHO _{t-1}	Adj R ²
Mean	-1.2288	1.3272	0.7480	0.0679	0.0148	0.97
(t statistic)	(-13.33)	(3.55)	(163.44)	(5.91)	(0.99)	
Lower quartile	-1.9129	-1.4571	0.6813	-0.0743	-0.1164	0.96
Median	-0.9214	1.0879	0.7516	0.0839	0.0055	0.98
Upper Quartile	-0.2430	3.6540	0.8185	0.2034	0.1461	0.99

Notes:

1. This table reports the estimated parameters in the following regressions:

$$\text{Panel A: } \frac{DISX_{it}}{CSHO_{it-1}} = k_1 + k_2 \frac{1}{CSHO_{it-1}} + k_3 \frac{SALES_{it-1}}{CSHO_{it-1}} + \varepsilon_{it}$$

$$\text{Panel B: } \frac{CFO_{it}}{CSHO_{it-1}} = k_1 + k_2 \frac{1}{CSHO_{it-1}} + k_3 \frac{SALES_{it}}{CSHO_{it-1}} + k_4 \frac{\Delta SALES_{it}}{CSHO_{it-1}} + \varepsilon_{it}$$

$$\text{Panel C: } \frac{PROD_{it}}{CSHO_{it-1}} = k_1 + k_2 \frac{1}{CSHO_{it-1}} + k_3 \frac{SALES_{it}}{CSHO_{it-1}} + k_4 \frac{\Delta SALES_{it}}{CSHO_{it-1}} + k_5 \frac{\Delta SALES_{it-1}}{CSHO_{it-1}} + \varepsilon_{it}$$

The regressions are estimated for every industry year. Two-digit SIC codes are used to define industries. Industry-years with fewer than 15 firms are eliminated from the sample. There are 580 separate industry-years. The table reports the mean coefficient across all industry-years and t-statistics calculated using the standard error of the mean across industry-years. The table also reports the lower quartile, median, and the upper quartile of the coefficient as well as the mean R²s (across industry-years) for each of these regressions.

2. Variable definitions: CSHO = number of shares outstanding; SALES = sales; ΔSALES = change in sales, e.g. ΔSALES_t = SALES_t - SALES_{t-1}; DISX = Discretionary expenses (R&D + Advertising + Selling, General and Administrative expenses); as long as SG&A is available, advertising and R&D are set to zero if they are missing; CFO = Cash flow from operations; PROD = production costs (COGS + Change in inventory).

Table 37: Replication of Roychowdhury's Main Results-Alternative Scaling Variable

	Abnormal discretionary expenses	Abnormal CFO	Abnormal production costs
Intercept	0.0060 (1.36)	0.0062* (1.76)	-0.0088 (-1.40)
MTB	0.0033 (1.36)	-0.0001 (-0.29)	-0.0015 (-1.76)
SIZE	0.2654** (7.56)	0.1246** (20.98)	-0.3185** (-21.44)
Net income	-0.1612 (-1.18)	0.6072** (7.87)	-0.4991** (-3.95)
SUSPECT_NI	-0.2538 (-1.22)	-0.3244** (-2.14)	0.4435 (1.51)
Expected sign	Negative	Negative	Positive
No. of observations	51,487	51,487	51,487
Adjusted R ²	0.02	0.03	0.03

Notes:

1. *Significant at the 10% level. **Significant at the 5% level.
2. This table reports the results of Fama-MacBeth regressions, over a period of fifteen years from 1987-2001. The total sample includes 51,487 observations. The regressions being estimated are of the form

$$Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ income)_t + \beta_4(SUSPECT_NI)_t + \varepsilon_t.$$
Each column presents the results of the above regression for a different dependent variable, whose name appears at the top of the respective column. T-statistics are calculated using the standard errors of the mean across fifteen years. They are reported in parentheses. The table also reports the average number of annual observations and adjusted R².
3. Variable definitions: Abnormal discretionary expenses are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{DISX_{it}}{CSHO_{i,t-1}} = k_1 + k_2 \frac{1}{CSHO_{i,t-1}} + k_3 \frac{SALES_{i,t-1}}{CSHO_{i,t-1}} + \varepsilon_{it}$; Abnormal CFO is measured as deviations from the predicted values from the corresponding industry-year regression $\frac{CFO_{it}}{CSHO_{i,t-1}} = k_1 + k_2 \frac{1}{CSHO_{i,t-1}} + k_3 \frac{SALES_{it}}{CSHO_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{CSHO_{i,t-1}} + \varepsilon_{it}$; Abnormal production costs are measured as deviations from the predicted values from the corresponding industry-year regression $\frac{PROD_{it}}{CSHO_{i,t-1}} = k_1 + k_2 \frac{1}{CSHO_{i,t-1}} + k_3 \frac{SALES_{it}}{CSHO_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{CSHO_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{CSHO_{i,t-1}} + \varepsilon_{it}$; MTB = the ratio of market value of equity to book value of equity, expressed as deviation from the corresponding industry-year mean; SIZE = Logarithm of market value of equity, expressed as deviation from the corresponding industry-year mean; Net income = Income before extraordinary items scaled by lagged total assets, expressed as deviation from the corresponding industry-year mean; SUSPECT_NI = an indicator variable that is set equal to one if income before extraordinary items scaled by lagged total assets is between 0 and 0.005, and is set equal to zero otherwise.

Table 38: Transition Matrices of REM Proxies and Discretionary Accruals Using Decile Ranking

Panel A: Abnormal discretionary expenses

Year t	Year $t+1$										Avg. Abnormal discretionary expense t
	1	2	3	4	5	6	7	8	9	10	
1	64.44%	21.29%	5.58%	2.57%	1.45%	0.92%	0.94%	0.74%	0.89%	1.17%	-0.3859
2	19.78%	42.33%	21.51%	7.11%	3.75%	1.93%	1.30%	0.91%	0.70%	0.68%	-0.2428
3	6.23%	20.37%	33.68%	21.36%	8.79%	4.59%	2.26%	1.15%	0.95%	0.62%	-0.1813
4	2.72%	7.52%	20.44%	30.96%	20.42%	8.65%	4.80%	2.56%	1.08%	0.83%	-0.1299
5	1.88%	3.37%	8.88%	18.82%	29.96%	20.78%	9.09%	4.04%	1.95%	1.23%	-0.0795
6	1.23%	2.05%	4.85%	8.77%	17.88%	30.56%	20.75%	8.81%	3.51%	1.59%	-0.0231
7	0.87%	1.74%	2.61%	5.00%	8.67%	17.84%	30.82%	20.89%	8.60%	2.96%	0.0415
8	0.49%	1.00%	1.70%	2.30%	3.75%	9.42%	18.24%	34.02%	22.75%	6.33%	0.1234
9	0.69%	0.85%	0.76%	1.54%	2.32%	4.53%	8.32%	19.82%	41.20%	19.96%	0.2476
10	0.74%	0.79%	0.69%	1.09%	1.26%	1.88%	4.04%	6.17%	20.01%	63.31%	0.6304
Avg. Abnormal discretionary expense $t+1$	-0.3940	-0.2443	-0.1835	-0.1332	-0.0837	-0.0288	0.0338	0.1127	0.2341	0.6132	

Panel B: Abnormal CFO

Year t	Year $t+1$										Avg. Abnormal CFO t
	1	2	3	4	5	6	7	8	9	10	
1	41.10%	17.33%	10.59%	6.56%	5.11%	4.24%	3.74%	3.32%	3.79%	4.21%	-0.3350
2	17.60%	20.56%	15.61%	11.86%	8.62%	6.84%	5.76%	4.59%	4.32%	4.23%	-0.1246
3	9.96%	16.24%	17.29%	14.43%	11.89%	8.54%	7.42%	5.98%	4.93%	3.30%	-0.0650
4	6.67%	12.17%	14.72%	14.90%	13.51%	12.33%	8.85%	7.09%	5.98%	3.78%	-0.0274
5	4.90%	8.99%	13.35%	14.19%	14.14%	13.59%	11.29%	8.59%	6.83%	4.13%	0.0014
6	4.03%	7.82%	9.32%	11.13%	14.50%	14.68%	14.91%	11.53%	7.21%	4.86%	0.0264
7	3.29%	5.56%	6.75%	9.93%	11.61%	15.29%	15.47%	14.42%	11.90%	5.79%	0.0535
8	3.19%	4.97%	5.59%	7.44%	8.85%	11.89%	15.79%	17.09%	15.99%	9.19%	0.0845
9	2.82%	4.45%	4.79%	5.29%	6.52%	9.20%	10.54%	16.76%	22.30%	17.33%	0.1287
10	5.17%	3.81%	3.86%	4.56%	3.96%	4.95%	6.92%	9.49%	17.70%	39.57%	0.2496
Avg. Abnormal CFO $t+1$	-0.3152	-0.1151	-0.0587	-0.0224	0.0053	0.0298	0.0559	0.0860	0.1289	0.2509	

Panel C: Abnormal production costs

Year t	Year $t+1$										Avg. Abnormal production costs t
	1	2	3	4	5	6	7	8	9	10	
1	61.85%	21.25%	6.41%	3.62%	2.13%	1.52%	0.95%	0.66%	0.78%	0.83%	-0.4255
2	18.81%	37.20%	20.80%	8.40%	5.11%	3.30%	2.58%	1.51%	1.30%	1.00%	-0.2077
3	6.24%	18.44%	29.16%	19.25%	9.75%	6.68%	3.95%	2.94%	2.09%	1.51%	-0.1202
4	3.01%	8.34%	18.99%	25.06%	17.81%	10.70%	6.90%	4.17%	3.10%	1.90%	-0.0605
5	1.92%	4.85%	10.24%	17.56%	23.51%	17.79%	10.45%	6.45%	4.22%	3.00%	-0.0120
6	1.48%	3.38%	5.70%	9.83%	16.56%	23.00%	17.73%	11.84%	6.48%	3.99%	0.0330
7	0.78%	1.98%	3.27%	6.37%	10.29%	16.86%	24.70%	18.84%	11.28%	5.63%	0.0777
8	0.68%	1.75%	2.13%	4.72%	6.41%	10.78%	17.56%	24.41%	22.17%	9.40%	0.1288
9	0.56%	1.62%	2.08%	2.89%	4.15%	6.69%	10.70%	19.52%	29.39%	22.39%	0.1969
10	1.13%	1.64%	1.84%	2.06%	3.02%	4.55%	5.66%	9.49%	21.67%	48.94%	0.3804
Avg. Abnormal production costs $t+1$	-0.4226	-0.2066	-0.1211	-0.0620	-0.0149	0.0295	0.0740	0.1238	0.1903	0.3712	

Panel D: Discretionary accruals

Year t	Year $t+1$										Avg. Discretionary accruals t
	1	2	3	4	5	6	7	8	9	10	
1	24.61%	13.26%	9.45%	6.77%	6.22%	6.30%	5.32%	6.66%	8.14%	13.26%	-0.2904
2	13.62%	14.60%	11.41%	10.47%	8.10%	8.65%	8.17%	7.54%	8.79%	8.65%	-0.1061
3	9.00%	11.73%	12.57%	12.41%	11.17%	9.79%	8.77%	9.33%	8.58%	6.65%	-0.0553
4	6.49%	10.68%	11.84%	12.83%	11.26%	11.63%	12.00%	9.57%	8.11%	5.61%	-0.0240
5	5.80%	8.55%	10.88%	12.60%	13.60%	12.74%	11.88%	10.08%	8.17%	5.71%	-0.0007
6	5.49%	7.95%	10.53%	11.10%	12.43%	13.29%	13.11%	11.34%	8.70%	6.06%	0.0199
7	5.56%	7.55%	9.30%	9.93%	10.43%	12.47%	13.56%	12.34%	11.09%	7.76%	0.0415
8	6.67%	8.30%	9.26%	9.47%	10.27%	11.31%	11.95%	11.86%	12.48%	8.43%	0.0686
9	7.34%	8.70%	8.47%	8.81%	9.41%	8.61%	9.74%	12.04%	14.10%	12.78%	0.1101
10	12.59%	9.82%	7.85%	5.85%	5.65%	6.96%	6.74%	8.81%	13.43%	22.31%	0.2392
Avg. Discretionary accruals $t+1$	-0.2952	-0.1061	-0.0545	-0.0231	-0.0002	0.0202	0.0416	0.0679	0.1078	0.2340	

Note: This table reports transition matrices of the three REM proxies and the discretionary accruals. For each year, firms are classified into ten deciles based on either the REM proxies or the discretionary accruals. The table presents the likelihood that a firm-year observation in a given decile in year t will transition to each decile in the subsequent year (year $t+1$). Panel A, B, C, and D present the results for abnormal discretionary expenses, abnormal CFO, abnormal production costs, and discretionary accruals respectively. Cells with a higher probability than random occurrence (Prob. $\geq 10\%$) are bolded. The average values for each quintile in year t are reported in the last column, while the average values in year $t+1$ are reported in the last row.

Appendix A: Modified REM Model Estimation

Gunny's Modified Models

Gunny (2010) refines the discretionary expenses model by estimating the normal level of R&D expense and SG&A expense separately. The normal level of R&D expense is estimated as follows:

$$\frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{RD_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it} \quad (7)$$

The independent variables are designed to control for factors that influence the level of R&D spending. The natural logarithm of the market value of equity (MV) is used to control for size. Tobin's Q is a proxy for the marginal benefit to marginal cost of installing an additional unit of a new investment. Internal funds (INT) are a proxy for funds available for investment. The prior year's R&D (RD_{t-1}) serves as a proxy for the firm's R&D opportunity set.

The normal level of SG&A is estimated using the following model:

$$\frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{i,t}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t}}{AT_{i,t-1}} * DD + \varepsilon_{it} \quad (8)$$

In addition to market value, Tobin's Q, and internal funds, controls for sticky cost behavior (Anderson et al. (2003)) are included. The idea is that the magnitude of SG&A increase associated with increased sales is greater than the magnitude of SG&A decrease associated with an equal decrease in sales. Therefore, Gunny (2010) uses an interaction between changes in sales and an indicator variable equal to one when sales decreases from previous year.

Gunny (2010) also investigates an abnormal gain on asset sales as an additional kind of REM activities. The idea is that the timing of asset sales is a manager's choice, and because gains are reported on the income statement at the time of the sale, the timing of asset sales could be used as a way to manage reported earnings. The normal level of gain on asset sales is estimated as follows:

$$\frac{GAIN_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{INT_{it}}{AT_{i,t-1}} + k_6 \frac{ASALES_{i,t}}{AT_{i,t-1}} + k_7 \frac{ISALES_{i,t}}{AT_{i,t-1}} + \varepsilon_{it} \quad (9)$$

Income from asset sales (GainA) is expressed as a function of long-lived asset sales (ASales) and long-lived investment sales (ISales).¹¹ Similar to the previous two models, controls for size, Tobin's Q, and internal funds are included.

Finally, Gunny (2010) refines Roychowdhury (2006)'s production cost model by adding controls for size (MV), and Tobin's Q as follows:

$$\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 MV_{it} + k_4 Q_{it} + k_5 \frac{SALES_{it}}{AT_{i,t-1}} + k_6 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_7 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + \varepsilon_{it} \quad (10)$$

¹¹ Similar to Gunny (2010), the variables are transformed to make the relationship monotonic, so when income from asset sales is negative, asset sales and investment sales enter the regression with negative signs.

Another attempt to refine REM models is in Athanasakou et al. (2011). Following Gunny (2010), they estimate normal level of R&D and SG&A expenses in separate models. The R&D model is as follows:

$$\frac{RD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{RD_{i,t-1}}{AT_{i,t-1}} + k_4 \frac{INT_{i,t}}{SALES_{i,t}} + k_5 BTM_{it} + k_6 \frac{CAPX_{it}}{AT_{i,t-1}} + k_7 MV_{i,t-1} + k_8 ROA_{i,t-1} + \varepsilon_{it} \quad (11)$$

This model is similar to Gunny. However, they add capital expenditure (CAPEX) and lagged return on assets (ROA_{t-1}) as additional variables. Also, book to market ratio (BTM) is used as a proxy for Tobin's Q in Athanasakou's model.

The model for normal SG&A expense is also similar to Gunny (2010), but they add a control variable for the firm's prior operating performance (ROA_{t-1}).

$$\frac{SGA_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{i,t}}{AT_{i,t-1}} + k_4 \frac{SALES_{i,t}}{AT_{i,t-1}} * DD + k_5 ROA_{i,t-1} + \varepsilon_{it} \quad (12)$$

Finally, the models for normal production costs and normal CFO are adapted from Roychowdhury (2006) by adding a control variable for the firm's prior operating performance (ROA_{t-1}) as follows:

$$\frac{PROD_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 \frac{\Delta SALES_{i,t-1}}{AT_{i,t-1}} + k_6 ROA_{i,t-1} + \varepsilon_{it} \quad (13)$$

$$\frac{CFO_{it}}{AT_{i,t-1}} = k_1 + k_2 \frac{1}{AT_{i,t-1}} + k_3 \frac{SALES_{it}}{AT_{i,t-1}} + k_4 \frac{\Delta SALES_{it}}{AT_{i,t-1}} + k_5 ROA_{i,t-1} + \varepsilon_{it} \quad (14)$$