Earnings Management Around the Emergence of Profitability

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Abstract:

In this paper we examine whether discretionary accruals help explain firms' ability to sustain profitability after experiencing a prolonged series of quarterly losses. We posit that when firms approach profitability, they will use reserves to a greater extent in anticipation of reversing those reserves when the firm becomes profitable. We find results consistent with this behavior, specifically documenting that firms remaining profitable beyond the initial profitable quarter have a consistent pattern of income decreasing discretionary accruals in the preceding loss quarters. For these firms we also find consistently positive discretionary accruals in the quarters following initial profitability. The accrual behavior for firms sustaining profitability is in direct contrast to that of the firms unable to sustain. In the quarters preceding and including the initial reported profit, firms unable to sustain profitability use markedly higher income increasing discretionary accruals than firms sustaining profitability, a pattern that does not continue in future quarters as these firms again revert to a loss state. In our final analysis we document that past discretion relates inversely to future profitability, but only for those firms able to sustain profits. We interpret these findings as initial evidence toward discretionary accrual planning that extends beyond a single period.

Key Words: Earnings Management; Losses; Accounting Discretion

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I. Introduction

A compelling consensus exists that some managers strategically use accounting discretion to reach a variety of objectives. Upward earnings management has been shown to help firms beat analyst forecasts, avoid losses, and maintain earnings growth targets (Degeorge, et al. 1999; Burgstahler and Dichev 1997). Numerous other studies have documented earnings management around less regular events such as seasoned equity offerings (Teoh, et al. 1998), violation of debt covenants (DeFond and Jiambalvo 1994), or meeting regulatory hurdles (Collins et al. 1995). As a whole, the preponderance of existing earnings management research can be characterized as explicitly examining contexts in which managers focus on short term objectives around which they apply current accounting discretion to meet specific goals.

In this study we evaluate earnings management through a wider lens, examining whether discretionary accruals in prior periods can help define a company's future profitability state. We posit that to the extent managers can anticipate the need for future income increasing accruals, accounting discretion in periods leading up to that need will be income decreasing. To investigate this issue we examine a set of firms with high potential to have consistent and extended periods of earnings management — firms reporting an initial profit after a prolonged series of losses. We hypothesize that firms reaching profitability after prolonged losses have a unique set of incentives given the asymmetric costs associated with reporting a small profit versus a small loss (Brown 2001) and the reputation costs associated

with remaining in a loss state (Klein and Marquardt 2003). We argue that firms reaching profitability after prolonged losses are particularly sensitive to the impact of discretionary accounting choices on their reported earnings, and in making these choices have especially strong incentives to assure the company does not return to a loss state.

The sample consists of 1,789 quarters over the years 1990-2002 for firms that report positive quarterly earnings immediately preceded by a minimum of four consecutive quarterly losses. Our measure of discretionary accruals is estimated using a cross-sectional variation of the Jones (1991) model. We first evaluate the time-series properties of the discretionary component of firms' earnings both before and after initial profitability. Consistent with prior research (e.g., Joos and Plesko 2005), we find that, on average, firms are generally unable to sustain profitability beyond the current period. The sample varies considerably in this respect, however, as just over half are able to report a profit for the year subsequent to their initial profitable quarter and about one-fourth have four consecutive profitable quarters.

The variation in a firm's ability to remain profitable allows us to directly examine the role accounting discretion plays in helping describe why some firms sustain profits while others do not. Consistent with expectations, we find that firms remaining profitable beyond the initial profitable quarter have a consistent pattern of income decreasing discretionary accruals in the preceding loss quarters. Conversely, we find for the same firms that these measures are consistently positive in the quarters following initial profitability. Specifically, the reversal of firms' income decreasing accruals in quarters prior to profitability helps to yield profit in quarters post profitability, with the discretionary accrual component contributing to over half of those profits. The accrual behavior for firms sustaining profitability is in direct contrast to that of the firms unable to sustain. In the quarters

preceding and including the initial reported profit, firms unable to sustain profitability use markedly higher discretionary accruals than firms sustaining profitability, a pattern that does not continue in future quarters as these firms again revert to a loss state.

Logistic regressions of profit sustainability on past and future discretionary accruals, with controls such as earnings, size, and leverage, indicate that discretionary accruals significantly distinguishes between firms' ability to sustain profits. We conclude firms that sustain their profitability do so in part due to their conservative use of accounting discretion during their loss years. These primary inferences are robust to a number of alternative research design approaches, including varying the definition of profit sustainability, alternative approaches to measuring discretionary accruals, and basing our sample on firms that have a longer series of consecutive quarterly losses.

Our findings are consistent with the notion that firms able to sustain profitability do so in part with the aid of upward earnings discretion. An important implication is that managers of some loss firms may be attending to an earnings management "program", the result of which enables the company to sustain its profitable state beyond the initially profitable quarter. Negative accruals in loss years help keep the balance sheet lean and bode well for future earnings as the accrual component of earnings is allowed to build in future quarters. This interpretation is in contrast to inferences from prior research, wherein the discretionary accrual component of earnings has been shown to be *positively* associated with future profitability, conveying information about future earnings, operating cash flows and changes in current dividends (Subramanyam 1996).

In our final analysis we investigate this issue further, regressing alternative future performance measures (net income, cash from operations, and non-discretionary net income)

on past realizations of earnings components. The models are estimated separately for the subsample of firms that ex post sustain profits, and those that do not sustain. For the latter, consistent with prior research we find that the use of past discretion relates positively to future earnings based profitability. For firms that sustain profitability, however, we observe a different relationship. The association between past discretion and future profitability is significantly negative, indicating that for these firms the build up of discretionary slack in prior periods (i.e., negative accruals), and the subsequent use of positive discretionary accruals in future periods, are what help contribute to sustaining firms' reported profits.

This paper makes a number of important contributions. We extend ongoing research investigating the motivations, characteristics and consequences of earnings management. Existing earnings management research predominantly examines short term incentives of managers to move earnings toward a specific target. We contribute to the literature by documenting that in certain contexts there exists behavior more consistent with earnings management towards a longer term profitability goal. We also expand the understanding of the characteristics of firms experiencing accounting losses. Despite what are widely acknowledged to be common earnings and cash flow characteristics as defined by a company's lifecycle stage (Klein and Marquardt 2003), little is known about how managerial accounting discretion relates to these conditions. This study examines how accounting discretion, one fundamental but critical accounting characteristic, relate to firms' reaching and sustaining profitability. In particular, our tests provide evidence regarding what accounting characteristics help describe why the company has reached profitability, how sustainable this position is conditional on these characteristics, and the extent to which the use of discretionary accruals plays a role in describing these firms' ability to remain profitable.

The remainder of this paper is organized as follows. In Section II we further develop our predictions. Section III describes the research design including the sample and models. Section IV summarizes our main findings, and in Section V we outline additional specifications. Section VI concludes.

II. Background and Hypotheses

The creation and reduction in net assets are what define accrual accounting, and management control over the timing of some of those accruals has led to the well-chronicled issue of earnings management. With investors placing so much emphasis on achieving target benchmarks, firms have been increasingly reporting earnings that beat expectations. A wide body of evidence suggests that available discretionary accounting choices are what have led to this change (Dechow et al. 2000; Healy and Wahlen 1999).

A conundrum exists for the manager engaged in earnings management, however, as the nature of accrual accounting ensures that any accrual made in one period will eventually be reversed in another. That is, firms whose managers have increased (decreased) earnings in previous periods with discretionary accruals will have overstated (understated) net assets, a condition that eventually must unwind (Barton and Simko 2002). Management awareness of this accounting "fact" implies that earnings management will, in some cases, take the form of predictable periods of income increasing (or decreasing) behavior, followed by periods of opposing adjustment. In this study our objective is to identify and examine one such case.

Because the preponderance of earnings management research have been focused on discretionary accrual behavior around a single event, there has been, in general, scant

attention paid to the longer-term implications of past earnings management.[1] To investigate a longer-run view of earnings management requires a fixed, stable event around which earnings would be managed. Reporting profits, conditional on a prior extended period of losses, is one such event. Reaching and sustaining profitability is a fundamental objective of every publicly traded company. For firms in a loss state, this condition must be temporary if it is to continue as a going concern.[2] The importance of losses to investors, and ultimately to managers, relates to the long-term association between profit generation and the dividend paying ability of the firm. Not surprisingly, the profit threshold has been shown to be a critical single-period benchmark. Burgstahler and Dichev (1997) and DeGeorge et. al, (1999) each document the propensity of firms to avoid losses with the use of available working capital accruals when reported losses would otherwise be small, providing evidence that accounting discretion is used by managers to avoid a loss state.

Uncertainty regarding the causes of loss persistence and the increasing incidence of firms reporting losses has led to a large body of research aimed at understanding the consequences of this important firm characteristic. Conclusions reached from this research relate to the conditional valuation of losses by investors (e.g., Hayn [1995], Berger et al., [1996] and Joos and Plesko [2005]), business- and life-cycle characteristics as descriptors of loss firms (Klein and Marquardt [2005]), and accounting conservatism as a driver of the increasing incidence of losses in recent years (Givoly and Hayn [2000]). Most recently, Joos and Plesko (2005) develop an estimate of expected loss persistence, based on past

[1] Exceptions include studies focused on constraints that build from the inevitable reversal of past accruals (e.g., Barton and Simko [2002]; Kasznik [1999]), or from manager's use of large scale write-offs as a means to enhance future earnings growth (cf., Alciatore [1998]).
[2] Hayn (1995) describes this condition as the abandonment option hypothesis, under which the firm will convert or liquidate assets in the event losses are expected to persist.

profitability, earnings components, dividend policy, and the incidence and frequency of past losses. They document that investors use the information in these variables to assess the likelihood that a firms' negative income will persist. They also find that the pricing of losses is dependent on investors' perception of loss persistence, and that the presence of research and development costs is an important determinant as to whether losses are valued as transitory.

Our interest lies in understanding if reaching the profitability threshold is predicated by periods of building reserves, and whether the subsequent unwinding of those reserves helps the firm remain in a profitable state. Our first expectation is based on evidence provided by Givoly and Hayn (2000), that the historical decline in profitability has been driven by a decline in accruals. The natural implication of their finding is that persistent loss firms would be expected to use, on average, more negative accruals. As such, we examine the following hypothesis (stated in alternative form):

> $H1_a$: For firms with persistent losses, discretionary accruals in periods prior to reaching profitability are income decreasing.

To the extent that the observed building of reserves relates to the anticipation of profitability, we expect the period of initial profitability will be an inflection point that defines when the reserves will be released. Firms more successful in this respect, all else equal, we expect would have been engaged in these activities to a greater extent than those less successful. That is, temporary loss reversals are more likely associated with firms that did not build as large a reserve, and therefore have less income increasing discretion available after profitability. We represent these expectations with the following hypotheses (stated in alternative form):

$H2_a$: After prolonged losses, firms that sustain profitability for longer periods use more income decreasing accruals in periods prior to initial profitability.

and

$H3_a$: After prolonged losses, firms that sustain profitability for longer periods use more income increasing accruals in periods subsequent to initial profitability.

III. Research Design

Sample Selection and Descriptive Statistics

The sample is gathered from quarterly *Compustat.* We begin in 1990 because the reporting of quarterly cash from operations by *Compustat* became consistent in 1988, and our analysis of earnings characteristics requires two years of data preceding the current quarter. We gather data through 2003 but end our sampling period in 2002 given we examine earnings behavior four quarters after the current quarter. An initial set of other restrictive criteria are imposed: (i) due to our focus on the time series properties of reported earnings, both earnings and total assets must be available for the eight quarters before and four quarters after the current quarter, and (ii) the firm must not be in the financial institution (two-digit SIC codes 60-69), telecommunication (48) or utility (49) industries. We impose this latter restriction to avoid confounds that may result when estimating discretionary accruals on regulated industries. The resulting sample consists of 14,110 firms representing 411,878 quarterly observations.

Table 1 summarizes the effects of the remaining data requirements that lead to our primary sample. We eliminate all firms that do not have at least four quarters of consecutive losses prior to reaching profitability, a requirement that reduces the initial sample to 4,338 firms and 6,179 observations. Although this reduction is substantial, it is not surprising given that typical exchange-traded companies do not tend to have consistent losses, and also that the

sample period spans a period of economic expansion. In this study we also analyze the four quarters subsequent to reaching profitability. Thus, we eliminate 17 firms spanning 411 quarterly observations classified as "overlapping" observations, or observations that begin a new consecutive series of at least four quarters of losses less than one year after breaking a series of prior quarterly losses.[3] Finally, we eliminate all observations that lack sufficient data to estimate discretionary accruals. Our primary sample consists of 1,481 firms and 1,789 observations.

In Table 1 we also report frequencies for subsamples we use in later tests, each based on the firm's ability to sustain profitability once reached.[4] Approximately one-half of the primary sample does not sustain profits into the immediate next quarter (889 observations of 1,789 total), approximately one-quarter revert to losses in either the second or third quarters (426 observations), and the remainder remain profitable for each of the subsequent three quarters (474 observations). Additionally, taking an annual, as opposed to a quarterly, perspective results in approximately one-half of the sample (838 firms spanning 925 observations) reporting an annual profit for the four quarters beginning in the quarter of initial profitability. As a whole, firms in the sample exhibit considerable variation in their ability to sustain profitability in subsequent quarters, a feature we exploit in later tests.

(Table 1 About here)

Table 2 provides percentage frequencies for 27 industry groups as defined by Fama and French (1997). To provide a basis for relative comparisons, the first column of data

[3] For instance, if a company has four quarters of losses, then becomes profitable and stays profitable for two quarters, and then becomes unprofitable in the third quarter, this company would in general remain in the sample. The same company would be excluded, however, if the third quarter is the first in a new series of four unprofitable quarters that lead to a profitable state.

[4] The construction of the sample requiring at least four losses before becoming profitable does not allow us to use a matched sample. The firms unable to sustain profitability, however, serve the same purpose.

presents the industry composition for the entire Compustat population over the years 1990-2002. The second through fifth columns present comparable percentage frequencies for the full sample and subsamples based on how long firm-observations sustain quarterly profitability. In general, we do not observe significant industry bias in our sample versus the full population. One exception is the highly cyclical Petroleum and Natural Gas industry, representing only 5.2 percent of the population but 9.2 percent of the primary sample. The Business Equipment, Healthcare, and Service industries are the most represented in the sample, but each only modestly higher than in the overall population. Finally, industry composition across the subsamples based on sustainability is also consistent with that of the population.

(Table 2 About here)

Our hypothesis posits that firms able to sustain profitability do so in part from their prior judicious use of accounting discretion. In consideration of the appropriate model (see below) that allows for a direct test of this hypothesis, we first define our measure of "sustainability" to capture the varying length of time a firm remains profitable. We categorize firms into three groups consistent with those reported in Table 1: (i) those firms for which a loss is reported in the quarter immediately succeeding the initial quarter of profitability, (ii) those firms that remain profitable for two or three quarters, but not longer, and (iii) those firms that remain profitable for at least four consecutive quarters.

In Table 3 we present the means and medians of select fundamentals for the full sample and the three subsamples formed on profit sustainability. Not surprisingly, the losses these firms experience are likely due to their early development stage as on average the firms in our sample are relatively small. The mean (median) market value of equity, assets, and

sales are only 286.4 (21.6), 433.1 (28.9) and 108.3 (7.8) million dollars, respectively. Furthermore, we find a firm's ability to sustain profits increasing with firm size as defined by either market value of equity, assets, or sales. Leverage, measured as long-term debt to total assets, also increases with firms' ability to sustain profits, indicative of these firms' greater borrowing capacity and resultant greater flexibility of their capital structures.

The statistics in Table 3 also shed some light on the magnitude of profitability increases reported in the first quarter of profitability. Return on assets (ROA) averages 4.9 percent, but the median level of just under 1 percent indicates firms are most often just marginally above break-even. The highest initial profitability comes from those firms least likely to sustain those profits with an ROA of 6.9 percent for firms only able to sustain profits for one quarter versus 4.3 and 2.0 percents respectively, for firms that sustain for 2-3 quarters and four or more. The change in net income to assets better reflects these differences, with means (medians) of 17.6 (5.6) and 6.3 (3.0) percent for those firms least likely and most likely to sustain, respectively. Consistent with large one-time items driving at least some, but not all, of these differences, the use of special items is markedly higher for firms that do not sustain profitability.

(Table 3 About here)

Estimation of Discretionary Accruals

The main issue addressed in this paper is whether the ability to reach, and ultimately sustain, profitability is systematically associated with a firm's use of discretionary accruals. To this effect we examine the magnitude of discretionary (DAC) and non-discretionary (NDAC) accruals in the quarters leading to and following the first quarter of profitability. Non-discretionary accruals for each firm quarter are measured as total accruals less DAC. We

estimate DAC for firm i in quarter t using the residual from the following regression, estimated by two-digit SIC (Jones 1991; Han and Wang 1998):

$$TAC_{it}/TA_{it-1} = \delta_0(1/TA_{it-1}) + \delta_1[(\Delta REV_{it} - \Delta REC_{it})/TA_{it-1}] + \delta_2(PPE_{it}/TA_{it-1}) + \delta_3 Q1_{it} + \delta_4 Q2_{it} + \delta_5 Q3_{it} + \varepsilon_{it} \quad (1)$$

TAC is total accruals (earnings before extraordinary items and discontinued operations less operating cash flows); TA is total assets; ΔREV and ΔREC are the quarterly changes in revenues and accounts receivable, respectively; PPE is gross property, plant and equipment; and Q1, Q2, and Q3 are fiscal-quarter indicators scaled by TA, included to control for seasonality.

Table 4 provides the median levels of earnings and its components for the four quarters before and after the firm reaches profitability. Each are scaled by beginning of quarter assets, and the sample is again divided into the relevant groups based on the firm's ex post ability to sustain quarterly profits. An interesting pattern begins to emerge. Across all firms we find that discretionary accruals exceed reported profitability in the quarter of initial profitability (quarter equals zero), indicating that discretionary accruals as measured by DAC enabled the firms' profitability state. The table also shows that total and discretionary accruals monotonically decrease as firms' ability to sustain profitability increases. Although this pattern is most apparent at quarter zero, it is also clearly observable in each of the three quarters leading up to profitability. Quarters zero to one is an inflection point, as the level of discretion used by firms that sustain profitability exceeds firms that do not. Notable too is that firms able to sustain profit for four quarters have significantly higher cash flow from operations indicating that, to a greater extent, these firms, in addition to achieving accounting

profit, are also generating sustainable cash flows. Non-discretionary accruals are also fairly stable for each group and across all eight quarters examined.

(Table 4 About here)

Model

We use logit to evaluate firms' ability to sustain profitability. Specifically, the general form of the model is the following (firm subscripts omitted):

$$\text{SUST} = \alpha_0 + \alpha_1 \text{DAC}_{-4,-1} + \alpha_2 \text{DAC}_0 + \alpha_3 \text{DAC}_{1,3} + \sum_{k=4}^{13} \alpha_k \Phi_0 + \omega_0 \quad (2)$$

where the dependent variable, SUST, is an indicator set to one if the firm sustains profitability for four consecutive quarters, and zero otherwise. With these groups we do not measure the magnitude of profits or losses reported, but we do incorporate magnitude effects as an independent control. DAC is our measure of discretionary accruals as defined above. Because we predict the use of discretionary accruals varies depending on the timing relative to initial profitability, we include DAC over the trailing four quarters (i.e., summed from -4 to -1), at quarter 0, and for the succeeding three quarters (+1 to +3).

Φ is a matrix of control variables that reflect other expected influences on a firms' ability to sustain profitability. First, firms that report higher profits would naturally be expected to be less likely to return to a loss state in subsequent quarters. Net income before extraordinary items and discontinued operations (NI), scaled by total assets, controls for the magnitude of reported earnings and we expect its coefficient to be positive. Conversely, to the extent that one-time items helped generate current profits we expect the opposite relation. Special items (SPECITEM) is one such proxy for transitory items included in earnings. We

include this variable, also scaled by total assets, and expect it to have a negative association with a firm's ability to sustain profitability.

LOGASSETS is the natural log of total assets and is included to control for firm size. We expect larger firms to be more stable and thus predict its coefficient to be positive. Price-to-sales (P-S), used to eliminate division by zero and negative percentages, proxies for expectations of firms' growth prospects and we predict a positive coefficient for this variable. The profitability of firms with higher leverage is more sensitive to changes in the operating environment. We include long-term debt to total assets (LEVERAGE) and predict a negative relation with SUST. Another indicator that may explain a firm's ability to sustain profitability is its past profitability. We expect firms early in their lifecycles or those otherwise unable to generate past significant earnings are less likely to sustain current profitability. Retained earnings scaled by total assets (RETEARN) is thus included as an additional control, and we expect it to have a positive coefficient. Finally, we include an indicator for Big 5 auditor as a proxy for audit quality. Firms audited by the Big 5 have been shown to have lower levels of abnormal accruals (Payne and Robb 2000) and thus would be more likely to have higher quality, sustainable earnings. We expect this coefficient to be positive. The final control variables are indicator variables for the different quarters. These variables control for any seasonality.

IV. Main Results

In this section we report results from estimations of our main logistic regression as defined by equation (2). Table 5 summarizes results using as a dependent variable firms that sustain for four quarters (SUST=1), versus three alternative subsamples of non-sustainers

(SUST=0). We report three unique estimations of equation (2). The first is based on those firms that remain profitable for only one quarter (subsample A). The second, is for those firms remaining profitable for two or three quarters (subsample B). The final is for any firm that does not sustain profits for at least four quarters (subsample C).

Our primary variables of interest are those related to the use of discretionary accruals: DAC_0 for the contemporaneous measure of quarterly discretionary accruals, and $DAC_{-4,-1}$ for the discretion used over the four quarters leading to profitability. As expected, we observe a negative coefficient on each variable, significantly so for the prior four quarters of discretion (for example subsample A, -0.164; probability difference from zero $\leqq$ 0.07). The primary inferences from each alternative subsample is effectively the same. Although firms' past use of discretion is negatively associated with their ability to sustain profitability, the coefficient on the current level of DAC is negative but insignificant. Notably the magnitude of net income and the use of special items are each insignificant when the sample of non-sustainers excludes firms with only one quarter of profits (coefficients of -1.530 and -0.038 respectively). These results are consistent with firms able to sustain profitability using discretion to accumulate reserves to a much greater extent than those firms unable to sustain. An implication of this finding, for this context, is that past discretion may be used as a screening device for gauging a firm's ability to sustain profitability.

(Table 5 About here)

Our control variables are generally significant and of the expected sign with the exception of the control variables for growth prospects as reflected in price-to-sales (P-S) and past profitability and age (RETEARN) which are not significant.[5]

One notable exception is the coefficient on the magnitude of reported earnings, NI, which we expected to be positive but instead is strongly negative (-3.972; probability<0.01). This finding suggests that firms reporting profits slightly higher than break-even in quarter t_0 are more likely to continue on that path than are firms reporting large profits. This inference is likely not driven by a higher incidence of transitory items for non-sustainers. Figure 1 shows that non-sustainers seem to reverse all of their stored DAC in the initial quarter of profitability whereas sustainers use much less DAC in the initial quarter and seem to dole it out slowly during the following quarters.

The control for special items, SPECITEM, is also significantly negative as expected, consistent with firms unable to sustain profitability having a higher propensity to use one-time transitory items as their means to reach profitability. Not surprisingly and consistent with expectations, larger firms and those less levered are more likely to be sustainers (0.096, probability 0.01; and -0.473, 0.05, respectively). Whether a firm is audited by one of the Big 5 is significant as well. These audit firms arguably add credibility and there may be a selection bias from and towards sustaining firms.

(Figure 1 About here)

[5] Joos and Plesko (2005) find that research and development expense is a significant factor in predicting whether firms will become profitable. We include research and development expense in our model and find no change in inferences.

V. Alternative Specifications

In this section we test the robustness of our main results by making a series of modifications to our research design. First, because our primary sample is based on a somewhat arbitrary measure of loss firms, four prior quarters of losses, we also test our hypothesis using a sample formed under a more restrictive definition requiring eight consecutive quarterly losses. The smaller sample size that results we expect will be offset by increased statistical power from this sharper definition of a "prolonged" loss state.

In Table 6 we summarize the re-estimation of equation (2) using this alternative sample. Our inferences are generally consistent with those based on our primary sample, although we find a slightly stronger relation between both discretionary accrual variables and profit sustainability. For the full sample, for instance, the coefficient on DAC over the prior four quarters is -0.304, with a probability less than zero of 0.01 whereas in Table 5 the coefficient on DAC is -0.192. The control variables, on the other hand, show a generally weaker association. Only our size proxy, LOGASSETS, is consistently related with the ability to sustain profits. Consistent with this subsample yielding more explanatory power, the adjusted R^2 for each estimation is higher than its counterpart in Table 5. Under hypothesis H2 we predicted that a firm will accumulate discretionary accruals prior to profitability to increase the probability of sustaining profitability, and again this is what the results in Table 6 suggest.

(Table 6 About here)

In Table 7 we summarize results using ordered logistic regressions. This alternative to standard logistic regression is used as a means to include relative comparisons of all observations in a single model. This specification comes at the risk of reducing power,

however, as we now assume the marginal effects of moving from a single quarter of profitability is equivalent to moving from 2 or 3 quarters of profitability to a full four quarters. We estimate the model for each of two sample definitions – four quarters of consecutive losses (first column) and eight quarters of consecutive losses (second column). Hypothesis H2 predicts that firms accumulate discretionary accruals prior to profitability, and in hypothesis H3 we expect that firms, post profitability, will use those accumulated discretionary accruals to help sustain profitability. Consistent with these expectations, we observe a negative (positive) coefficient pre- (post-) profitability for each of these effects. For the subsample of firms based on eight consecutive quarterly losses, each of these is significant at better than two percent (-0.19 for $DAC_{-4,-1}$ and +0.40 for $DAC_{+1,+3}$).

Additionally, the significant intercepts suggest that a company's probability of sustaining profitability on average decreases monotonically, as would be expected (Joos and Plesko 2005). For example, firms that are able to sustain three quarters after four (or eight) quarters of losses have, on average, a lower probability of sustaining for a fourth quarter. Firms that only sustain for one quarter have a lower probability of sustaining for a second quarter. The significance of the quarter variables in Table 7 also merits note. For firms with four loss periods, the quarter that the company becomes profitable has changed with quarter one and two becoming highly significant. Firms with eight loss periods provide even stronger findings in that only quarter one is significant with a coefficient higher than seen in prior tables. This would suggest that firms with long histories of losses are more likely to become profitable in the first quarter, consistent with a motivation that would help yield a full year of profits.

(Table 7 About here)

One consistently significant control variable in Table 7 is special items (SPECITEM). The negative coefficient strongly implies that the short duration of profitability experienced by firms that do not sustain may be due to their use of transitory items. By their very nature these line items are unlikely to appear in subsequent quarters. To further assess the impact of special items on our inferences, we re-gathered our sample by evaluating each quarter of profitability before SPECITEM. Using this approach approximately 200 (100) observations would not have been profitable in the four (eight) quarter loss period subsamples. With the new sample we re-estimate the ordered logistic regressions as in Table 7 (results not reported). In regressions using the longer loss period we find that discretionary accruals during the quarter of profitability are significantly negative. With the other exception of net income at time zero becoming significant, all variables follow the pattern found in Table 7.

As a whole, these alternative specifications and the results of Table 5 confirm the general inferences observable from the univariate time-series variables from Table 4 and Figure 1. The prior use of discretionary accruals as measured by DAC appears to help discriminate between firms on the basis of their future profitability. Firms able to sustain profitability use more income decreasing accounting discretion in periods before a prolonged series of quarterly losses is broken, and more income increasing discretion thereafter.

Discretionary Accruals and Future Profitability

We document above that firms able to sustain quarterly profitability use less discretionary accruals in prior periods, relative to those firms unable to sustain profitability. An implication of this finding is that discretionary accruals inversely relates to these firms' future profitability. Notably this finding is in contrast to prior research that finds, in general,

that discretionary accruals are positively associated with future profitability. Specifically, Subramanyam (1996) finds that annual DAC helps predict future profitability after controlling for current levels of operating cash flows and nondiscretionary accruals, a result he interprets as consistent with managers using discretionary accruals to communicate information about future earnings. In the context we examine, we appear to find a relation that runs counter to the more general setting.

To further explore this issue we replicate Subramanyam's (1996) analysis of DAC's relation with future profitability. The OLS regressions on our data take the following form (firm subscripts omitted):

$$\text{PERF}_{0,+3} = \phi_0 + \phi_1 \text{CFO}_{-4,-1} + \phi_2 \text{NDAC}_{-4,-1} + \phi_3 \text{DAC}_{-4,-1} + \nu \qquad (3)$$

where PERF is one of three performance measures: cash from operations (CFO), net income (NI), or non-discretionary net income (NDNI, or NI less DAC). Each dependent measure is the value of the variable summed over each of the four quarters beginning with the quarter of profitability, regressed on the sum of the prior four quarters for CFO, NDAC and DAC. Consistent with Subramanyam, if DAC is positively associated with and helps predict future profitability, we expect $\phi_3 > 0$.

We estimate equation (3) separately for firms that sustain profitability and those that do not sustain. Table 8 presents a summary of the estimation results. Panel A is based on the 1,281 observations of non-sustaining firms and reveals a positive association with prior DAC and each of the two earnings alternatives (ϕ_3 = 0.204 and 0.158 for NDNI and NI, respectively; each significant at a .01 level). Together these results support the notion that the use of past discretion relates positively to future earnings based profitability.

Panel B of Table 8, however, reveals a different relation. Here equation (3) is estimated on the sample of firms able to sustain profitability at least four consecutive quarters. The association between past discretion ($DAC_{-4,-1}$) and future profitability ($NI_{0,+3}$) is significantly negative (ϕ_3 = -0.194, at a .01 confidence level). In addition, this same relation does not hold when non-discretionary net income is used as a dependent measure (ϕ_3 = -0.031). Because by construction the difference between NI and NDNI is future discretionary accruals, one can infer that it is the build up of discretionary slack in prior periods (i.e., negative accruals), and the subsequent use of positive discretionary accruals in future periods, help contribute to sustaining firms' reported profits. This finding corroborates the interpretation of univariate time-series results from Table 4 and Figure 1.

(Table 8 About here)

In sum, the results in Table 8 indicate a clear systematic difference between the use of discretionary accruals by firms with differing earnings prospects. For firms sustaining profitability, the break-even threshold plays a critical role in determining the point at which these firms begin to tap unused reserves, and the association between their past use of discretion and future profitability is unlike that of the more general case.

VI. Conclusions

Our objective is to explore the implications of loss firms' use of accounting discretion by documenting how earnings management behavior surrounding the quarter of initial profitability helps dictate a firm's future profitability. Most earnings management research concentrates on short-term earnings management objectives such as potential debt covenant violations, equity offerings, or meeting an earnings based benchmark. In this paper we take a

longer term perspective, investigating earnings management activity of a two year period surrounding an event critical to firms' long-term success – reaching profitability after extended periods of accounting losses.

We examine 1,789 firm-quarter observations, over the years 1990-2002, for which the firm was able to reverse a series of at least four quarters of losses. We find that these loss firms are, on average, unable to sustain quarterly profitability, although about one-quarter are able to sustain quarterly profitability for the following four quarters. These firms that ex post sustain profitability exhibit a pattern of discretionary accruals consistent with building reserves in loss quarters and reversing those reserves during periods of profits.

Specifically, we find that through the judicious use of discretionary accruals in the quarters pre- and post- initial profitability, management is able to sustain profitability to a much higher degree than managers whose discretionary accruals follows a different pattern. The pattern used to sustain profitability appears to be a "cookie jar" approach in the quarters preceding initial profitability where we find negative earnings management. For the initial quarter of profitability earnings management is not in evidence. Finally, we find significantly positive earnings management for the quarters following initial profitability as managers draw from the "cookie jar." Because discretionary accruals must eventually reverse, one would expect to see positive discretionary accruals at some point following a series of negative discretionary accruals. What our results show is the reversal is coincident with the emergence of profitability.

In one final corroborative analysis we regress alternative future performance measures (net income, cash from operations, and non-discretionary net income) on past realizations of earnings components. Consistent with prior research (Subramanyam 1996), we find that for

firms unable to sustain profitability, the use of past discretion relates positively to future earnings. For firms that sustain profitability, however, we observe the opposite relation. The association between past discretion and future profitability is significantly negative, indicating that for these firms the build up of discretionary slack in prior periods (i.e., negative accruals), and the subsequent use of positive discretionary accruals in future periods, are what help contribute to sustaining firms' reported profits.

This paper makes a number of important contributions. We extend ongoing research investigating the motivations, characteristics and consequences of earnings management (Healy and Wahlen 1999; Dechow et. al 2000). We contribute to the literature by documenting that in certain contexts there exists behavior more consistent with earnings management towards a longer term profitability goal. We also extend the understanding of firms experiencing accounting losses. There are widely acknowledged characteristics of firms experiencing accounting losses (Klein and Marquardt 2003), but little evidence regarding how accounting discretion relates to these conditions. This study examines how this accounting characteristic relates to firms' reaching and sustaining profitability.

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FIGURE 1

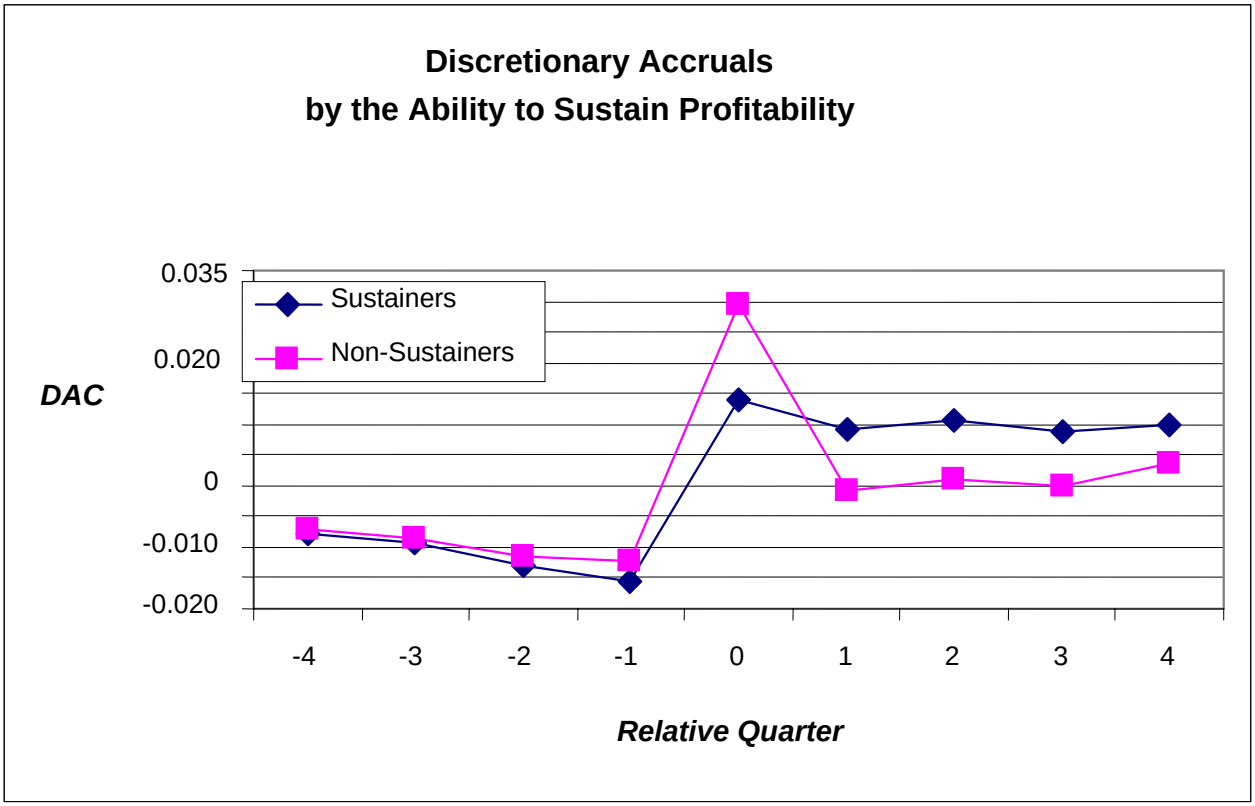
Discretionary Accruals
by the Ability to Sustain Profitability
DAC
0.035
0.020
0
-0.010
-0.020
Sustainers
Non-Sustainers
-4
-3
-2
-1
0
1
2
3
4
Relative Quarter

TABLE 1

Sample Selection – Compustat Years 1990 through 2002

	# of Firms		# of Obs.
Quarterly earnings and assets available	14,110		411,878
Lagged quarters -4 through -1 with losses, quarter 0 profitable	4,338		6,179
less: Overlapping observations	17		411
	4,321		5,768
less: Incomplete data to estimate discretionary accruals	2,840		3,979
Primary sample	1,481		1,789
Quarter +1 unprofitable	793		889
Quarter +1 profitable and quarter +2 or +3 unprofitable	400		426
Quarters 0 through +3 profitable	455		474
	1,648	A	1,789
Sum of quarters 0 through +3 unprofitable	777		864
Sum of quarters 0 through +3 profitable	838		925
	1,615	A	1,789

A Some firms enter the sample more than once and fall into different categories of their ability to sustain profitability. Therefore the number of firms by profitability does not equal the number of firms in the primary sample.

TABLE 2
Industry Percentages of Population vs. Primary Sample

	Fama and French (1997) Industry Classification	Population	Sample	1 qtr	2-3 qtrs	>= 4 qtrs
1	Food Products	2.6	1.6	1.1	1.9	2.1
2	Beer & Liquor	0.3	0.2	0.2	0.0	0.2
3	Tobacco Products	0.1	0.0	0.0	0.0	0.0
4	Recreation	3.6	3.5	4.7	4.0	0.8
5	Printing and Publishing	1.4	1.1	0.9	1.2	1.3
6	Consumer Goods	2.2	1.7	1.2	3.1	1.5
7	Apparel	1.5	1.0	1.0	1.2	0.8
8	Healthcare, Medical Equipment, Pharmaceutical Products	11.7	14.0	14.8	11.7	14.3
9	Chemicals	2.1	1.5	1.6	0.2	2.3
10	Textiles	0.7	0.8	0.4	1.9	0.4
11	Construction and Construction Materials	4.1	3.4	2.4	4.9	4.0
12	Steel Works Etc	1.7	2.5	2.0	4.0	1.9
13	Fabricated Products and Machinery	4.5	4.2	3.3	4.9	5.3
14	Electrical Equipment	1.7	1.8	1.8	2.3	1.5
15	Automobiles and Trucks	1.7	1.4	0.9	2.1	1.7
16	Aircraft, ships, and railroad equipment	0.7	0.7	0.7	0.5	0.8
17	Precious Metals, Non-Metallic, and Industrial Metal Mining	1.9	1.8	2.5	0.5	1.9
18	Coal	0.1	0.0	0.0	0.0	0.0
19	Petroleum and Natural Gas	5.2	9.2	8.0	9.4	11.4
22	Personal and Business Services	15.3	14.1	15.9	12.4	12.4
23	Business Equipment	14.6	17.3	16.1	17.1	19.8
24	Business Supplies and Shipping Containers	1.9	1.7	1.5	1.2	2.7
25	Transportation	2.9	2.7	2.9	2.8	2.3
26	Wholesale	5.0	3.8	4.3	2.6	4.0
27	Retail	6.1	4.3	5.2	4.7	2.3
28	Restaurants, Hotels, Motels	2.6	2.0	2.0	3.1	1.1
30	All Other	3.4	3.6	4.6	2.3	3.0
	Total observations	411,878	1,789	889	426	474

Table presents the percentage of observations in each of industry group. Industry groups are formed based on 30 industry classifications as defined by Fama and French (1997). Three industry groups, utilities (#20), communications (#21), and banking and insurance (#29) are excluded.

TABLE 3

Means and Medians of Sample Characteristics: Primary Sample and Sample Partitioned by Sustainability of Profits

	Primary Sample	1 qtr	2-3 qtrs	>= 4 qtrs
N	1,789	889	426	474
Market Value of Equity	286.4	174.9	258.2	507.1
	(21.6)	(17.8)	(21.1)	(35.8)
Assets	433.1	329.7	409.9	647.8
	(28.9)	(22.1)	(30.1)	(41.7)
Sales	108.3	89.1	94.9	156.3
	(7.8)	(5.9)	(8.4)	(12.7)
LTD-to-Assets	0.215	0.225	0.206	0.206
	(0.098)	(0.076)	(0.111)	(0.124)
CAPX-to-Assets	0.028	0.030	0.023	0.028
	(0.012)	(0.013)	(0.010)	(0.013)
Book-to-Market	-0.265	-0.222	0.141	-0.689
	(0.521)	(0.457)	(0.680)	(0.522)
Price-to-Sales	4.377	5.928	2.662	3.178
	(0.702)	(0.852)	(0.583)	(0.650)
ROA	0.049	0.069	0.043	0.020
	(0.009)	(0.011)	(0.008)	(0.007)
ΔNI-to-Assets	0.131	0.176	0.112	0.063
	(0.042)	(0.056)	(0.039)	(0.030)
SPECITEM-to-Assets	0.033	0.056	0.015	0.007
	(0.000)	(0.000)	(0.000)	(0.000)

Table presents means (top) and medians (in parentheses below) for various fundamental characteristics. Variables are presented for the full sample as well as the sample partitioned by whether the firms have ex post sustained earnings beyond the current quarter. All variables are gathered from Compustat, defined as follows: market value of equity is end of quarter share price (Compustat data #14) times common shares outstanding (#28); assets (#44); sales (#2); long term debt (LTD, #51); capital expenditures (CAPX, #90); book-to-market is common equity (#59) divided by market value of equity; net income before extraordinary items (NI, #8); and special items (SPECITEM, #32).

TABLE 4

Medians of Earnings Components by Quarter Relative to First Profitable Quarter (0)

		-4	-3	-2	-1	0	+1	+2	+3
Variable:									
ROA	Sustain 1	-0.0380	-0.0420	-0.0368	-0.0306	0.0103	-0.0292	-0.0206	-0.0204
	Sustain 2.3	-0.0228	-0.0265	-0.0269	-0.0220	0.0072	0.0071	-0.0085	-0.0143
	Sustain 4	-0.0225	-0.0220	-0.0234	-0.0167	0.0069	0.0122	0.0145	0.0180
CFO-to-Assets	Sustain 1	-0.0137	-0.0137	-0.0095	-0.0101	0.0084	-0.0021	-0.0092	-0.0073
	Sustain 2.3	-0.0033	-0.0033	-0.0011	-0.0020	0.0058	0.0089	0.0044	0.0052
	Sustain 4	-0.0002	-0.0002	0.0022	0.0060	0.0134	0.0208	0.0239	0.0317
TAC-to-Assets	Sustain 1	-0.0277	-0.0267	-0.0247	-0.0238	0.0060	-0.0275	-0.0157	-0.0166
	Sustain 2.3	-0.0167	-0.0260	-0.0337	-0.0256	0.0039	0.0008	-0.0185	-0.0225
	Sustain 4	-0.0256	-0.0246	-0.0282	-0.0268	-0.0036	-0.0069	-0.0085	-0.0131
DAC-to-Assets	Sustain 1	-0.0099	-0.0066	-0.0095	-0.0082	0.0260	-0.0143	0.0005	0.0018
	Sustain 2.3	-0.0007	-0.0067	-0.0115	-0.0122	0.0224	0.0132	0.0011	-0.0017
	Sustain 4	-0.0081	-0.0090	-0.0133	-0.0151	0.0110	0.0079	0.0093	0.0040
NDAC-to-Assets	Sustain 1	-0.0149	-0.0140	-0.0140	-0.0132	-0.0157	-0.0134	-0.0157	-0.0153
	Sustain 2.3	-0.0126	-0.0145	-0.0143	-0.0131	-0.0118	-0.0125	-0.0152	-0.0147
	Sustain 4	-0.0121	-0.0138	-0.0124	-0.0112	-0.0114	-0.0127	-0.0140	-0.0148

where:	Observations	Time Zero		
		ROA	DAC	ROA - DAC
Sustain 1 = Quarter +1 unprofitable	889	0.0103	0.0266	= -0.0163
Sustain 2.3 = Quarter +1 profitable and quarter +2 or +3 unprofitable	426	0.0072	0.0224	= -0.0152
Sustain 4 = Quarters 0 through +3 profitable	474	0.0069	0.0110	= -0.0041
	1,789			

TABLE 5

Logistic Regression of Profit Sustainability on Current and Past Discretion and Other Firm-Specific Controls

		Full Sample (c)		*Subsample (a)*		*Subsample (b)*	
Variable	*Predicted Sign*	*Parameter Estimate*	*Probability*	*Parameter Estimate*	*Probability*	*Parameter Estimate*	*Probability*
Intercept		-1.459	<0.01	-1.154	<0.01	-0.075	0.77
NI_0	+	-3.616	<0.01	-3.972	<0.01	-1.530	0.26
$SPECITEM_0$	-	-2.972	0.03	-3.647	0.01	-0.038	0.98
DAC_0	-	-0.346	0.19	-0.267	0.37	-0.434	0.25
$DAC_{-4,-1}$	-	-0.192	0.02	-0.164	0.07	-0.343	0.03
$LOGASSETS_0$	+	0.092	0.01	0.096	0.01	0.096	0.02
$P\text{-}S_0$	-	0.001	0.89	-0.002	0.71	<0.016	0.34
$LEVERAGE_0$	-	-0.398	0.08	-0.473	0.05	-0.311	0.30
$RETEARN_0$	+	-0.001	0.93	0.008	0.68	-0.019	0.41
$BIG5_0$	+	0.447	<0.01	0.409	0.01	0.452	0.02
QTR1		0.210	0.17	0.557	<0.01	-0.527	0.01
QTR2		-0.139	0.39	0.196	0.26	-0.826	<0.01
QTR3		-0.372	0.03	-0.326	0.06	-0.555	0.01
n: SUST=0		1,315		889		426	
n: SUST=1		474		474		474	
R-squared		.06		.10		.05	
Model Chi-Sq		107.64		136.76		50.35	
Model Significance		<0.01		<0.01		<0.01	

Logistic regressions are run on various definitions of sustaining profitability. For each model SUST is set to 1 when quarterly earnings are profitable for 4 consecutive quarters. For subset (a) SUST = 0 if profitable for 1 quarter only, for subset (b) SUST = 0 if profitable for 2 or 3 quarters but not 4 quarters, and for the full sample (c) SUST = 0 if profitable for less than 4 quarters. NI is net income before extraordinary items, DAC is discretionary accruals, LOGASSETS is the natural log of total assets, P-S is the ratio of stock price to sales, LEVERAGE is total long term debt to total assets, RETEARN is retained earnings, Big5 is an indicator variable equal to 1 if the firm is audited by a BIG5 accounting firm and zero otherwise, The subscript of zero indicates the data was taken as of time period zero. Other variables are defined in Table 3.

TABLE 6

Logistic Regression of Profit Sustainability on Current and Past Discretion and Other Firm-Specific Controls

		Full Sample (c)		*Subsample (a)*		*Subsample (b)*	
Variable	*Predicted Sign*	*Parameter Estimate*	*Probability*	*Parameter Estimate*	*Probability*	*Parameter Estimate*	*Probability*
Intercept		-1.551	<0.01	-1.229	<0.01	-0.067	0.87
NI_0	+	-3.789	0.02	-4.337	0.01	-1.175	0.48
$SPECITEM_0$	-	-1.577	0.27	-1.940	0.21	-0.041	0.98
DAC_0	-	-0.651	0.19	-0.443	0.44	-0.981	0.12
$DAC_{-4,-1}$	-	-0.304	0.01	-0.263	0.03	-0.587	0.02
$LOGASSETS_0$	+	0.129	0.02	0.124	0.03	0.145	0.05
$P\text{-}S_0$	-	0.002	0.57	0.001	0.88	0.007	0.29
$LEVERAGE_0$	-	-0.431	0.16	-0.531	0.11	-0.072	0.87
$RETEARN_0$	+	-0.013	0.44	-0.007	0.71	-0.012	0.63
$BIG5_0$	+	0.293	0.21	0.273	0.27	0.265	0.36
QTR1		0.303	0.19	0.623	0.01	-0.542	0.09
QTR2		-0.294	0.24	-0.070	0.79	-1.005	<0.01
QTR3		-0.390	0.13	-0.284	0.28	-0.894	0.01
n: SUST=0		633		448		185	
n: SUST=1		197		197		197	
R-squared		.072		.106		.085	
Model Chi-Sq		62.18		72.28		33.81	
Model Significance		<0.01		<0.01		<0.01	

Logit regressions are run on various definitions of sustaining profitability. For each model SUST is set to 1 when quarterly earnings are profitable for 4 consecutive quarters. For subset (a) SUST = 0 if profitable for 1 quarter only, for subset (b) SUST = 0 if profitable for 2 or 3 quarters but not 4 quarters, and for the full sample (c) SUST = 0 if profitable for less than 4 quarters. Variables are defined in Table5.

TABLE 7

Ordered Logistic Regression of Profit Sustainability on Current, Past and Future Accounting Discretion

		Four Loss Periods		*Eight Loss Periods*	
Variable	*Predicted Sign*	*Parameter Estimate*	*Probability*	*Parameter Estimate*	*Probability*
Intercept_1		-1.69	<0.01	-2.00	<0.01
Intercept_2		-1.29	<0.01	-1.59	<0.01
Intercept_3		-0.59	<0.01	-0.90	<0.01
NI_0	+	-0.21	0.58	-0.19	0.62
$SPECITEM_0$		-3.59	<0.01	-3.17	<0.01
DAC_0	-	-0.34	0.11	-0.53	0.11
$DAC_{-4,-1}$	-	-0.03	0.57	-0.19	0.02
$DAC_{+1,+3}$	+	0.25	<0.01	0.40	<0.01
$LOGASSETS_0$	+	0.09	<0.01	0.13	<0.01
$P\text{-}S_0$	-	-0.01	0.14	<0.01	0.34
$LEVERAGE_0$	+	-0.28	0.12	-0.33	0.17
$RETEARN_0$	-	0.01	0.48	-0.01	0.41
$BIG5_0$	+	0.29	0.02	0.27	0.14
QTR1		0.64	<0.01	0.76	<0.01
QTR2		0.35	0.01	0.29	0.15
QTR3		-0.15	0.27	0.06	0.76
N: SUST=1		889		448	
N: SUST=2		281		123	
N: SUST=3		145		62	
N: SUST=4		474		197	
R-squared		0.08		0.10	
Model Chi-Sq		155.28		87.47	
Significance		<0.01		<0.01	

Variables are defined in Table5.

TABLE 8

Regression of Components of Net Income on Levels of One-Year Ahead Net Income, Operating Cash Flows, and Nondiscretionary Income: A Re-examination of Subramanyam (1996)

Dependent Variable	Intercept	$CFO_{-4,-1}$	$NDAC_{-4,-1}$	$DAC_{-4,-1}$	Adj. R^2 N
Predicted: (Subramanyam 1996)	+	+	+	+	
Panel A: Non-Sustaining Firms					
$CFO_{0,+3}$	0.043	0.309	0.039	0.051	.136
	(1.91)	(13.11)	(2.71)	(0.018)	1,281
$NDNI_{0,+3}$	-0.229	0.256	0.081	0.204	.073
	(-4.03)	(4.31)	(2.20)	(4.47)	1,281
$NI_{0,+3}$	-0.103	0.170	0.081	0.158	.094
	(-3.29)	(5.18)	(4.01)	(6.27)	1,281
Panel B: Sustaining Firms					
$CFO_{0,+3}$	0.214	0.059	-0.163	-0.132	.205
	(4.70)	(1.11)	(-6.60)	(-5.27)	436
$NDNI_{0,+3}$	-0.191	0.117	-0.135	-0.031	.027
	(-2.22)	(1.16)	(-2.91)	(-0.65)	436
$NI_{0,+3}$	0.250	-0.222	-0.160	-0.194	.470
	(8.28)	(-6.26)	(-9.77)	(-11.68)	436

Notes: Table presents OLS regressions of future profitability on past realizations of the earnings components. The models are estimated in the subsamples of sustainers and non-sustaining firms, with loss firms identified using the prior four quarter of data. The alternative profitability proxies are cash from operations (CFO), non-discretionary net income (NDNI), and net income (NI). Prior earnings components are cash from operations, non-discretionary accruals (NDNI) and discretionary accruals (DAC). Coefficients and t-statistics (in parentheses) are presented for each model. Observations that are more than three standard deviations from the mean of each variable are excluded.