Earnings Management to Avoid Losses: 
a cost of debt explanation

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April 2007

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Research Center on Industrial, Labour and Managerial Economics

Research Center supported by Fundação para a Ciência e a Tecnologia, Programa de Financiamento Plurianual through the Programa Operacional Ciência, Tecnologia e Inovação (POCTI)/Programa Operacional Ciência e Inovação 2010 (POCI) of the III Quadro Comunitário de Apoio, which is financed by FEDER and Portuguese funds.

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(*) José gratefully acknowledges the generous financial support of Bolsa de Valores de Lisboa e Porto (currently Euronext Lisbon), Faculdade de Economia da Universidade do Porto, and CETE, a Research Center supported by FCT - Fundação para a Ciência e a Tecnologia.

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We are grateful to Prof. Ross Watts for his suggestions and valuable insights. We also thank the comments of participants at the XVI Annual Congress of the European Accounting Association (Seville 2003), I Grudis Seminar (Porto 2003) and Asia-Pacific Journal of Accounting and Economics Symposium (Guangzhou 2005).
Abstract

In this paper we analyze firms’ earnings management behavior to avoid losses conditional on the (asymmetric) incentive underlying market (positive/negative) returns. Our intuition is that firms with negative returns in the period (bad news, BN) face a higher incentive to undertake earnings management, and that their ultimate intention is to hide from credit markets a signal (loss) that could be translated into a negative impact on their cost of debt. The empirical evidence supports this intuition. BN firms show higher earnings management pervasiveness than their counterparts with good news (GN), and the set with simultaneous BN and prior period positive earnings undertake more pervasive earnings manipulation than BN firms in general. Within this restricted set of firms, and consistent with a cost of debt explanation, we find that firms with larger needs of debt show a higher incidence of earnings management to avoid losses.

The overall empirical evidence challenges the implicit assumption in Burgstahler and Dichev (1997) that the incentive to manage earnings is homogeneous to all firms, and suggests that the discontinuities around zero in the earnings distributions are driven, at least partly, by firms’ earnings management behavior.

Keywords: earnings management, earnings thresholds, earnings discontinuities, cost of debt.

Data availability: data are available from the commercial sources identified in the paper.

JEL: M41, C21, L29.
1. Introduction

In this paper we analyze firms’ earnings management behavior to avoid losses conditional on the (asymmetric) incentive underlying market (positive/negative) returns. Our intuition is that firms with negative returns in the period face a higher incentive to undertake earnings management, and that their ultimate intention is to hide from credit markets a signal (loss) that could negatively affect their cost of debt.

The transaction costs theory predicts that the costs of information treatment might lead some stakeholders to determine the terms of the transactions with the firm based on heuristic cutoffs at zero (change in) earnings. A loss (earnings decrease) may thus convey a signal to outsiders evaluating the firm, in particular credit raters and stock analysts, negatively affecting firms’ credit ratings and their cost of debt (e.g. Dechow et al., 2000). However, such a signal may be differently weighed by outsiders, depending on the firms’ past signals.

Consider a firm with negative returns (BN) and pre-managed earnings slightly below zero. It is likely that this firm had positive earnings in the previous year, so a signal is being sent to credit markets. Managers might avoid the cost of a rating change if they manage earnings upward. They have a strong incentive to do so.

Now consider a firm with positive returns (GN) and pre-managed earnings slightly below zero. GN suggests that the firm’s previous earnings were also negative. The signal was sent out the previous year and the cost incurred. As it is unlikely that credit markets use zero earnings as a signal on the up side the manipulation is not worth the cost. As a result,

\[ \text{Schipper (1989) and Healy and Wahlen (1999), amongst others, define earnings management as the outcome of managers’ use of judgment in financial reporting and in structuring transactions to alter financial reports with the intent of obtaining a specific gain for themselves or for their firms.} \]
less earnings management will be expected for this GN firm. Hence, firms might face an asymmetric incentive to manipulate, depending on the sign of their market returns and on how they approach the earnings target – from above or from below –, and a higher incentive is expected to be translated into greater earnings management.\(^2\)

This intuition seems to highlight the importance of the cost of debt as firms’ ultimate incentive to undertake earnings management to avoid losses. Given that the sensitivity of a firm to this cost depends on its exposure to credit markets, we expect such an incentive to be higher for firms with larger needs of debt.

Burgstahler and Dichev (1997), hereafter referred to as BD (1997), DeGeorge et al. (1999) and Gore et al. (2001), amongst others, analyze the distribution of net income departing from the assumption that in the absence of earnings management, such a distribution will be smooth. They find graphical and statistical evidence that there is an unusually high frequency of firms in earnings intervals immediately to the right of zero and an unusually low frequency in those to the left.\(^3\) Using earnings levels and earnings changes as their variables, they take these unexpected frequencies as evidence that firms manage their earnings to avoid earnings losses or earnings decreases, consistent with the transaction costs theory. The implicit assumption in all these studies is that firms’ incentives to undertake earnings management are homogeneous. The intuition discussed so far challenges this assumption.

\(^2\) We thank Professor Ross Watts for this insight on firms’ incentives to undertake earnings management around the zero target.

\(^3\) Throughout the paper “unusual frequencies” and “discontinuities around/at zero” are interchangeably used with the same meaning.
To detect evidence of earnings management we depart from the same graphical methodology as in BD (1997), but extend it to control for the effect of GN and BN, and that of approaching the earnings target from above (below). The empirical evidence supports our expectations. Earnings management is asymmetrically related to the type of news firms receive during the period. BN firms have a higher degree of earnings management pervasiveness to avoid losses, consistent with a higher incentive to manipulate earnings. Moreover, such an incentive is also affected by the way firms approach the zero earnings target. BN firms approaching the target from above, i.e. having prior period positive earnings, show higher pervasiveness than BN firms approaching the target from below, consistent with a higher incentive. Finally, but of equal importance, firms’ needs of debt appear as a significant determinant of earnings management to avoid losses, consistent with the expectation that firms avoid sending signals to credit markets that may negatively affect their cost of debt. The evidence we gathered thus shows that the empirical global earnings distribution is the joint effect of distributions of firms with distinct incentives to manipulate earnings. Such evidence challenges the implicit assumption in BD (1997) that the incentives are homogeneous to all firms in the distribution. The results are robust to graphical and statistical tests, and to

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4 Because the distribution of earnings changes is a noisy version of the distribution of earnings levels (e.g. Beaver et al., 2003) and because DeGeorge et al. (1999) present the avoidance of losses as firms’ main earnings management threshold, we follow BD (1997) and restrict our analysis to the latter distribution. More recently, Brown and Caylor (2005) find evidence suggesting that firms’ earnings management thresholds evolved through time. For the period 1996-2001, their evidence shows that the main threshold is the avoidance of negative earnings surprises. However, such evidence does not contradict, and even supports, the fact that for the years of our sample DeGeorge et al.’s (1999) and BD’s (1997) rankings of the thresholds are valid. Nevertheless, we also tested for change in earnings distribution and the conclusions, although weaker, are not qualitatively different from those discussed in the paper.
tests of Probit models that control for some of the main variables that might affect earnings and the shape of its distribution.

The paper proceeds as follows. In the next section we develop the hypotheses to be tested and briefly discuss the literature. In Section 3 we introduce the research design and the sample selection, and in Section 4 the empirical results are discussed. Finally, in Section 5, we draw a brief conclusion.

2. **Earnings management to avoid losses: development of the testing hypotheses.**

Managers’ earnings management behavior is all related to costs and benefits. The costs are, for example, the time managers take in planning and implementing earnings management actions and the effect on managers’ reputation if and when manipulation is discovered. The benefits can be grouped by taking into account the direct beneficiary of earnings management: managers or the firm. Amongst the incentives related to managers’ private benefit, the maximization of bonus compensation and hiding poor performance to keep their jobs should be mentioned. Amongst those related to direct benefit for the firm, the most important are the avoidance of (i) debt covenants violations; (ii) market penalization for reporting losses, breaking a string of positive earnings or not meeting analysts’ forecasts; (iii) increases in transaction costs with stakeholders, and (iv) a rating change in credit markets. There is an incentive (motivation) to undertake earnings management when the benefits outweigh the costs.

In their analysis BD (1997) assume that the benefits of earnings management are constant to all firms and thus the incentives are related to the (ex ante) costs of manipulation. However, this perspective does not explain why, for example, firms with longer strings of positive (change in) earnings have a higher incentive to undertake earnings management.
In our paper we therefore adopt a contrasting perspective. We assume that the costs of manipulation are (relatively) constant to all firms, making the incentive directly related to the benefits firms may obtain. For example, firms that may avoid a change in their credit ratings face a higher potential benefit, and incentive, than those that saw already their ratings degraded. This seems to be a more realistic perspective, and is consistent with long or short term strategies underlying earnings management.

DeFond and Park (1997) find evidence suggesting that firms tend to smooth (manage) earnings in order to spread profits obtained in the current period over future periods (a “save for the future” strategy), or to reflect in the current period benefits expected to be gained in the future (a “borrow from the future” strategy). These strategies are consistent with investors’ preference for stable earnings through time (e.g. Barth et al., 1999) and, potentially, may be considered to be informative regarding firms’ persistent earnings. However, firms may also manage earnings to achieve more immediate earnings targets, such as avoiding current earnings decreases or losses. This behavior is not at all informative and may be deemed as opportunistic, fitting with the earnings management definitions of Schipper (1989) and Healy and Wahlen (1999).

The evidence in BD (1997), DeGeorge et al. (1999) and Beatty et al. (2002) for the USA, and Gore et al. (2001) for the UK, amongst others, seems to support this behavior. They find graphical and statistical evidence suggesting that firms manage their earnings to avoid small earnings losses or decreases. BD (1997) suggest an explanation for firms’ earnings management behavior based on the transaction costs theory. This theory predicts that: (i) earnings information affects the terms of transactions between the firm and its stakeholders, favoring firms with higher earnings. Firms that report earnings decreases or losses tend to face higher costs in transactions; (ii) the costs of information treatment might lead some stakeholders to determine the terms of the transactions with the firm
based on heuristic cutoffs at zero (change in) earnings. A loss (earnings decrease) may thus convey a signal to outsiders evaluating the firm, in particular credit raters and stock analysts, negatively affecting firms’ credit ratings and their cost of debt (e.g. Dechow et al., 2000). Thus, both these predictions suggest that firms tend to avoid reporting earnings decreases or losses, and face an incentive to manage earnings.

Accounting and finance literatures show that stock prices in efficient and unbiased capital markets reflect investors’ expectations about firms’ future performance, built upon all available information (e.g. Ball and Brown, 1968). The sign of market returns can thus be a source of information about such expectations, implicitly about firms’ (pre-managed) earnings, and reflect firms’ signals. These can be differently weighed by outsiders depending on firms’ past signals.

Consider a firm with current negative returns (BN) and pre-managed earnings slightly below zero. It is likely that this firm reported positive earnings in the previous year, so a signal is being sent to credit markets. Managers might avoid the cost of a rating change if they manage earnings upward. They have a strong incentive to do so. Now consider a firm with current positive returns (GN) and pre-managed earnings slightly below zero. GN suggests that firm’s previous reported earnings were also negative. The signal was sent out the previous year and the cost incurred. As it is unlikely that credit markets use zero earnings as a signal on the up side, the manipulation is not worth the cost. As a result less earnings management is expected for this GN firm. Hence, a firm might face an asymmetric incentive to undertake manipulation depending on the sign of its market returns and on how it approaches the earnings target – from above or from below.

The literature shows evidence that the level of pre-managed earnings is a determinant of earnings management (e.g. Gore et al., 2001).
Therefore, for firms with pre-managed negative earnings close to zero, it seems intuitive that those with BN face a stronger incentive to manage earnings upwards. Amongst them, firms that had prior period positive earnings, i.e. that approach the zero earnings target from above, might have a stronger incentive to undertake earnings management than otherwise. These intuitions are expressed in the following hypotheses:

H1: BN firms manage earnings to avoid losses in a more pervasive way than GN firms.

H2: BN firms approaching the earnings target from above, i.e. with prior period positive earnings, manage earnings to avoid losses in a more pervasive way than firms with prior period negative earnings.

DeFond and Jiambalvo (1994) and Sweeney (1994) show empirical evidence that firms manage earnings to avoid debt covenants violation and the related penalty in the cost of debt. The intuition we discussed above suggests that debt may play another important role in motivating firms’ earnings management beyond that of the debt covenant hypothesis. For BN firms that had prior period positive earnings, the cost of debt seems to be the ultimate incentive to avoid losses. Given that the sensitivity of a firm to this type of cost depends on its exposure to credit markets, we expect that incentive to be higher for firms with larger needs of debt.

This intuition is expressed in the following hypothesis:

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6 The direction of the manipulation is considered for firms with pre-managed (change in) earnings close to the target. Otherwise, firms may choose an income decreasing strategy of the “big-bath” type, creating conditions to show better performance in the future.
H3: BN firms with prior period positive earnings and larger needs of debt manage earnings to avoid losses in a more pervasive way than firms with fewer needs of debt.

The next section discusses the research design and sample selection adopted to test these hypotheses.

3. Research design and sample selection

3.1. Graphical analysis

The main feature of BD’s (1997) methodology is its simplicity. It is based on the distribution of earnings and on the assumption that in the absence of earnings management this distribution will be smooth. The empirical distribution is a histogram of the cross-sectional frequency of firm-years by intervals of the deflated earnings variable. The existence of earnings management to avoid losses is expected to take the form of unusually low frequencies of small losses and unusually high frequencies of small profits. BD (1997), using a sample of USA companies from the period 1976-1994, find such discontinuities at zero and take them as evidence of firms’ earnings management.

To test the null hypothesis that the distribution is smooth or, stated the other way round, that there are discontinuities around zero earnings, BD (1997) use a statistic based on the difference between the actual number of observations (firm-years) in an interval and the

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7 For a discussion of the limitations of this methodology to deal with managers’ incentives to undertake earnings management and the earnings targets they pursue, see, amongst others, McNichols (2000).

8 The intervals are defined as a percentage of deflated earnings. As in BD (1997), we use 0.0025 and 0.005 width intervals with similar results. The tabulated evidence is based on a 0.0025 width.
expected number for that same interval, divided by the standard deviation of the difference. The latter is defined as follows:

$$\text{std} = \sqrt{Np_i(1-p_i) + \frac{N(p_{i-1} + p_{i+1})(1-p_{i-1} - p_{i+1})}{4}},$$

where $N$ is the total number of observations in the sample and $p_i$ is the probability that an observation will fall into interval $i$. Under the null hypothesis of smoothness, this statistic is distributed approximately normally with a mean of zero and standard deviation of one. The expected number of observations for a given interval is defined as the average of the number of observations in the two adjacent intervals.

This statistic has its shortcomings. For example, it does not work well for maxima or minima of the distributions. Moreover, if the null hypothesis of smoothness does not hold at zero, the standardized differences for the interval immediately left of zero and immediately right of zero are not independent. However, the same insufficiencies apply to other similar statistics available in the literature, such as that proposed by DeGeorge et al. (1999).\(^9\)\(^10\)

The specificity of our own research design is based on the classification of each firm-year according to the sign of market returns (BN, bad news if negative) related to that observation, and on the way firms approach the zero earnings target. The analysis is thus performed for sub-samples of GN and BN firm-year observations, and sub-samples of

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\(^9\) Using the same notation we used above to describe BD’s (1997) statistic, DeGeorge et al.’s (1999) statistic is defined as the difference between $p_i - p_{i+1}$ and its expected value measured as mean $p_j - p_{j-1}$, where $j$ includes all classes in the distribution excluding class $i$. This difference is standardized by the standard deviation of $p_j - p_{j+1}$.

\(^10\) Given the explicit nature of the graphical evidence we do not expect the conclusions to be sensitive to the statistic adopted.
prior period positive and negative earnings. The differences between the distributions of each sub-sample are then statistically tested.\textsuperscript{11}

3.2. **Probit analysis**

BD (1997), DeGeorge et al. (1999) and Beatty et al. (2002), for the USA, and Gore et al. (2001), for the UK, amongst others, relate earnings management to the use of (discretionary) accruals, consistent with the evidence in the literature, and with accruals flexibility and low management cost relative to cash flows (e.g. Healy, 1985; DeFond and Jiambalvo, 1994; Bushee, 1998). However, Dechow et al. (2003) do not find evidence supporting discretionary accruals as an explanation for the earnings distribution discontinuities at zero. Their results do not come as a complete surprise if we take into account, as the authors do, the evidence in the literature showing that the methodology underlying the estimation of (aggregate) discretionary accruals is not completely reliable (e.g. McNichols, 2000). Nevertheless, Beaver et al. (2003) argue that at least a part of the discontinuities is driven by nondiscretionary earnings components, for instance the asymmetric impact on profit and loss firms of taxes and special items, and Dechow et al. (2003) and Durtschi and Easton (2005) relate these discontinuities to the deflator of the earnings variable.

Beatty et al. (2002), for the bank industry, put forward additional evidence supporting the notion that the discontinuities around zero are due to earnings management. As in their

\textsuperscript{11} The assumptions underlying this type of analysis, about the shape of the earnings distribution, may be questionable due to their lack of theoretical support. However, Hayn (1995), using a different research design, finds a similar kind of discontinuity at zero earnings. One may always argue that such discontinuities may not be due to earnings management, but to firms’ achievement of “normal business targets” (e.g. increase in sales, positive earnings). This is an old unresolved question. The literature is still in need of a clear distinction between earnings management and the accomplishment of “normal business targets”.
research, we use Probit models. Our aim is to test whether our graphical results and the differences in the discontinuities hold after controlling for some of the main effects that may influence the sign of current earnings. It is thus a way of testing the robustness of the results obtained from the graphical analysis. Moreover, we also use the model to test for the intuition on the cost of debt hypothesis (H3).

The control variables included in the model, such as size, taxes and special items, find support in the literature, namely in Beatty et al. (2002), BD (1997) and Beaver et al. (2003).

We estimate a set of models based on the following global model:

\[
\text{INTERV}_i = \alpha_0 + \alpha_1 \text{D1}_i + \alpha_2 \text{PRIOR}_i + \alpha_3 \text{D1 PRIOR}_i + \alpha_4 \text{DEBT}_i + \\
+ \alpha_5 \text{PRIOR DEBT}_i + \alpha_6 \text{D1 PRIOR DEBT}_i + \alpha_7 \text{SIZE}_i + \\
+ \alpha_8 \text{SPITEM}_i + \alpha_9 \text{TAX}_i + \sum \alpha_j \text{IND}_i + \sum \alpha_k \text{YEAR}_i + \epsilon_i
\]

where the variables are:

- INTERV = dummy variable that takes a value of one if net income is in the interval \( ] 0; 0.0025 \] and a value of zero if the firm has deflated net income in the interval \( ] -0.0025; 0 \];
- D1 = dummy variable that takes a value of one if the firm has negative market returns (bad news) in the year, zero otherwise;
- PRIOR = dummy variable that takes a value of one if prior period earnings (#172) is positive, zero otherwise;
- D1 PRIOR = interactive variable defined as D1*PRIOR;
- DEBT = dummy variable that takes a value of one if the percentage change in total debt \([\Delta(#6-#216)_t / (#6-#216)_{t-1}] \) in the current period is positive, zero otherwise;
- PRIOR DEBT = interactive variable defined as PRIOR*DEBT;
- D1 PRIOR DEBT = interactive variable defined as D1*PRIOR*DEBT;
- SIZE = dummy variable that takes a value of one if firm market value (#199*#25) is in the upper third of the distribution, zero otherwise;
- SPITEM = Special Items (#17), deflated by prior period total assets (#6);
- TAX = Income Taxes (#16), deflated by prior period total assets (#6);
\[ \Sigma \text{IND} = \text{set of dummy variables that take a value one if the firm belongs to the industry, zero otherwise}; \]
\[ \Sigma \text{YEAR} = \text{set of dummy variables that take a value one if the firm-year corresponds to the year, zero otherwise}; \]
\[ i,t = \text{firm and year (1976-1994) indexes, respectively.}^{12} \]

D1 is a variable that controls for the sign of market returns. The evidence in Basu (1997) shows an asymmetric relation between net income and current returns, with the former variable being more sensitive to negative returns. Taking this relation, Garrod and Valentincic (2001), for the UK, and Moreira (2002), for the USA, find that by controlling an earnings sample for the sign of net income, the coefficient on a dummy variable with a value of one for negative current returns (BN) tends not to be significant for positive earnings. This means that in our model we should also expect the coefficient on D1 not to be statistically significant. However, if our intuition about the impact of BN on firms’ incentive to undertake earnings management holds, then we will expect the coefficient on D1 to be positive, i.e. BN firms are expected to report significantly more small positive and fewer small negative earnings. We thus predict a positive coefficient on D1 \( (\alpha_i > 0) \).

PRIOR controls for prior period earnings sign. As discussed above and expressed in hypothesis H2, the way firms approach the earnings target might affect the incentive they have to undertake earnings management. BN firms with prior period positive earnings are expected to undertake more pervasive earnings manipulation. However, PRIOR, in itself, is not expected to be a determinant of the discontinuities. Thus, we predict that the coefficient on this variable \( (\alpha_2) \) will not be statistically significant, and that on D1_PRIOR it will be positive \( (\alpha_3 > 0) \).

\(^{12}\) The sign # stands for Compustat variable code.
DEBT is a proxy for firms’ needs of debt, reflecting the current pressure they may suffer to avoid increases in their cost of debt. However, such a pressure is expected to exist only in cases where there was no previous negative signal sent to credit markets. Therefore, we expect the coefficient on this variable ($\alpha_4$) and that on PRIOR_DEBT ($\alpha_5$) not to be statistically significant. The coefficient on D1_PRIOR_DEBT ($\alpha_6$) is expected to be positive, consistent with our third hypothesis.

SIZE, SPITEM and TAX are control variables. Given that there is no strong theory to explain their potential impact on firms’ incentives to undertake earnings management, we do not assign any prediction about the sign of their coefficients. The same applies to $\Sigma$IND and $\Sigma$YEAR, two sets of variables that aim to control for industry and year effects.

3.3. Definition of the variables

a) The degree of earnings management pervasiveness ($pp$)

Considering $n_a^i$ as the number of actual firms in interval $i$ ($i =$ first interval to the left of zero; first interval to the right of zero) and $n_e^i$ as the expected number of firms in that same interval in the pre-managed earnings distribution, we define firms’ degree of earning management pervasiveness ($pp$) as the absolute value of the following ratio (proportion):

$$pp = \left| \frac{n_e^i - n_a^i}{n_e^i} \right|.$$  

This definition is similar to that used in BD (1997), and the same happens to the expectation of the number of observations in a given interval. Such an expectation is defined as the average of the actual number of observations in two adjacent intervals.\(^\text{13}\)

\(^{13}\) We used other definitions for this expectation, namely the average of up to eight adjacent intervals, but the results were very similar to those reported.
Thus, the degree of pervasiveness appears as a proportion of the predicted number of firms undertaking earnings management in a given interval over the expected number of firms in this interval in the pre-managed earnings distribution.\(^\text{14}\)

b) **Good and bad news**

GN and BN are defined as positive and negative yearly market returns, respectively.\(^\text{15} \text{16}\)

c) **Other variables**

As in BD (1997), we use net income (#172) as the earnings variable. To dilute the differences in the size of firms in the sample the observations are deflated. We use the beginning-of-the-year total assets for year \(t\) (#6) to deflate earnings.\(^\text{17}\)

\(^\text{14}\) The literature does not offer clear evidence to guarantee that this measure is completely uncorrelated with the partition variable. If there were any correlation, there would be a measurement error (McNichols and Wilson, 1988; Beaver et al., 2003). However, given that the research design adopted is based on the comparison of such a measure for two sub-samples, measurement errors, if any, might offset each other, at least partly. Moreover, since we use graphical and statistical approaches simultaneously, we do not expect our conclusions to be affected by any potential measurement error.

\(^\text{15}\) As a robustness test, we re-performed the graphical analysis of the discontinuities around zero controlling for small (positive and negative) returns. That is, we defined GN (BN) firms as those with RET \(> x\%\) \(< - x\%\), where \(x\) is equal to 1%, 2%, 5% and 10%. In all these situations the results were qualitatively similar to those discussed in the paper. We thank Professor David Otley for this suggestion.

\(^\text{16}\) The market returns used in this paper are estimated using Compustat fiscal year-end prices (#199) and dividends per share (#26). We have taken missing dividends per share as no dividend payment. Although this specification of buy-and-hold returns does not reflect the impact of the earnings announcement, it has the advantage of isolating the impact of publicly available “news” received from other sources not related to the previous year (e.g. Basu, 1997; Ball et al., 2000; Pope and Walker, 1999). Moreover, it tends not to reflect the impact of earnings management performed at the fiscal year end, consistent with our interpretation that GN and BN may reflect investors’ expectation of pre-managed earnings.
3.4. **Sample selection and descriptive statistics**

We follow the same procedure as in BD (1997) to replicate their sample of earnings levels. The data is for the USA, and for the period 1976/1994.\textsuperscript{18} From the 2003 *Compustat* disks we consider all non-financial companies, except utilities, available in *Primary, Secondary and Tertiary, Full Coverage and Research Annual Industrial Files*. All missing observations in earnings variables, deflators and returns are deleted. As in BD (1997), the upper and lower 1\% of deflated earnings for each year is considered as missing. The sample we obtain after controlling for GN/BN news is slightly larger than the equivalent sample in BD (1997), i.e. 79 311 as opposed to 75 999 observations.\textsuperscript{19} In Table 1, Panel A, we tabulate some descriptive statistics for the global sample. The number of observations per year is in most cases higher than 4000 observations, increasing steadily until the last year (1994) where it reaches 5181. The proportion of GN and BN per year does not follow a steady evolution, but ranges between 40 percent and 60 percent, with a slight decrease of GN in the second half of the period. The global proportion of GN is approximately 54 percent.

\begin{table}[h]
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\end{table}

\textsuperscript{17} We also tested for earnings before extraordinary items and discontinued operations available for common stock (#237), and for (lagged) market value of common equity (#199*#25) as a deflator. The results are qualitatively similar to those reported, and do not support the suggestion in Durtschi and Easton (2005) that the discontinuities are (at least partly) driven by the use of lagged market value as the deflator.

\textsuperscript{18} The analysis was also performed using different data samples. The results are qualitatively similar to those reported.

\textsuperscript{19} This difference arises because we use a different deflator (lagged total assets instead of lagged market value), collect the data from more recent disks, and control the sample for market returns and for prior period earnings.
Around 72 percent of the total firm-years have current positive earnings, but since 1985 this percentage is very close to 60 percent. The mean of deflated earnings is consistent with this evolution and with previous literature showing an increased number of firms reporting negative earnings over time (e.g. Givoly and Hayn, 2000). It becomes increasingly negative after 1984, although the median stays positive and relatively stable, consistent with more negative earnings and a higher dispersion.

Panel B shows that BN firms on average have lower mean and median deflated earnings than GN firms and a lower proportion of profits (around 58 percent), consistent with our early expectation that bad news (negative returns) tend to reflect (pre-managed) earnings decreases or losses.

The firm-years in the two central intervals of the earnings distribution are the basic sample used to perform the Probit analysis. Panel C shows the selection of the working sample, which has 1,138 observations (276 and 862, respectively to the left and to the right of zero) after deleting those with missing data in any variable of the model and also negative Stockholders’ Equity.20

For this sample, untabulated descriptive statistics show that the correlation coefficients of the main variables used in the Probit analysis are very small or even insignificant. The (obvious) exception is NI, deflated net income, which is highly correlated with the sign of earnings. Moreover, it is apparent that firm-years in the interval to the right and left of

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20 By deleting firm-years with negative Stockholder’s Equity we attempt to prevent any potential spurious effect arising from firms that might have particular incentives, if any, to undertake earnings management. However, re-performing the analysis with those observations does not change the results.
zero have no significant difference in mean and median TAX and SPITEM,\textsuperscript{21} and that the right interval has proportionally more BN firms that its counterpart on the left, consistent with our expectations.

\textbf{[TABLE 2]}

Table 2 displays descriptive statistics for DEBT, the change in total debt $[\Delta(#6-#216)_{t} / (#6-#216)_{t-1}]$, by quadrants of market returns and prior period earnings (PRIOR), for both the left and right intervals. We take this variable as a proxy for firms’ needs of debt.\textsuperscript{22} One can see that the changes are statistically different across classes of PRIOR, with the exception of GN firms for the left interval, consistent with the intuition that firms with larger needs of debt tend to have a stronger incentive to report positive earnings. They are statistically independent of the sign of market returns, i.e. GN and BN firms have similar needs of debt. This applies for both the left and right intervals.\textsuperscript{23}

\textsuperscript{21} The lack of statistical difference for variables TAX and SPITEM do not follow the evidence in Beaver et al. (2003). Even the difference we obtain when considering the whole earnings sample rather than the observations around zero suggests that the impact of those variables may not be a driving force of the discontinuities in the earnings distribution.

\textsuperscript{22} We take the change in debt instead of total debt as a proxy for firms’ needs of debt because the cost of debt is expected to be more related to the former than to the later.

\textsuperscript{23} We also defined firms’ needs of debt as the change in long term debt (#9), the change in debt in current liabilities (#34) and the change in total debt defined as (#9+#34). The results are qualitatively similar to those reported in Table 2.
4. Empirical results

4.1. Earnings management to avoid losses: graphical analysis

4.1.1. The discontinuities of the earnings distributions

Exhibit 1, Fig. 1.1, reports the (truncated) distribution of deflated earnings levels.\textsuperscript{24} It compares to Fig. 3 in BD (1997), and uses an interval width of 0.0025.\textsuperscript{25} As expected, the frequency discontinuities at zero are visible and, as shown in Table 3, have highly significant standardized differences (13.99 and -9.03, for the interval to the left and right of zero, respectively).\textsuperscript{26}

[EXHIBIT 1]

Fig. 1.2 comparatively reports the (truncated) distributions of GN and BN firms. It can be seen that the distribution of GN firms (bars) is slightly skewed to the right, contrasting with the distribution of BN firms (solid line). This is consistent with the descriptive statistics in Table 1, Panel B, showing that GN firms tend to have higher mean and median deflated earnings. The discontinuities at zero are visible in both distributions. The standardized differences reported in Table 3 corroborate the visual assessment. For the interval to the left (right) of zero, they are 7.26 (-5.44) for GN and 12.44 (-7.25) for BN distributions. Moreover, the relative magnitude of these standardized differences together

\[\text{Displaying truncated distributions, rather than complete ones, is intended to highlight the aim of the analysis, that is to say, the discontinuities around zero.}\]

\[\text{The analysis was re-performed using an interval width of 0.005. The results are qualitatively similar.}\]

\[\text{The standardized differences are higher than the maximum values tabulated in a standardized normal distribution for the usual level of confidence (5%). They are different from zero at less than 0.0001. Throughout the paper the significance of these statistics is assessed against 1.96 (the 5\% two-tail z-stat for a standardized normal distribution).}\]
with the visual graphical evidence suggest that the discontinuities around zero are of different relative size, higher for BN firms, supporting our first hypothesis.

[TABLE 3]

Table 3 also reports the standardized differences for the discontinuities in the distributions of BN firms with prior period positive (BN_PRIOR_Pos) and negative (BN_PRIOR_Neg) earnings. For the interval to the left (right) of zero they are 11.29 (-7.18) for prior period positive earnings and 5.49 (-2.13) for negative earnings. For the sake of parsimony we do not display the graphs, but a visual assessment of the relative size of these differences suggests that the discontinuities are higher for BN_PRIOR_Pos, consistent with our second hypothesis.

Finally, this Table displays the standardized differences for the discontinuities in the distributions of BN firms with prior period positive earnings and high (BN_PP_DEBT_H) and low (BN_PP_DEBT_L) needs of debt.\(^{27}\) The discontinuities are all significant. For the interval to the left (right) of zero they are 9.46 (-5.57) for high needs of debt and 5.96 (-4.70) for low needs.\(^{28}\) The relative size of the computed statistics is consistent with our third hypothesis, which states that BN firms with prior period positive earnings and high needs of debt undertake more earnings management than firms with low needs of debt.

Thus, this graphical analysis seems to support all our hypotheses. However, as BD (1997) point out, the statistics we use do not allow precise inferences about relative differences in the discontinuities. Although their differences reflect the proportionate discontinuity, they

\(^{27}\) The 978 BN observations with missing DEBT have been deleted. This explains the difference, in Table 3, between the sum of BN_PP_DEBT_H plus BN_PP_DEBT_L and the number of observations in BN_PRIOR_Pos sub-sample.

\(^{28}\) Also in this case, and for the same reason as before, we do not display the graphs of the distribution.
also depend on the number of observations, which varies across earnings intervals and distributions. Hence, those differences cannot be directly compared in order to assess the relative earnings management pervasiveness.

Table 3 also shows an estimate of the number of firms that (supposedly) managed earnings around zero. The expected number of observations minus the actual number of observations in the interval is labeled as “N. Observ.”, the former being defined as the average of the number of observations in the two adjacent intervals. Although the numbers seem to support all our hypotheses, the same constraint of the different number of observations in each sub-sample prevents us from drawing a grounded conclusion. Our next step is thus to test statistically whether these estimates are different across distributions.\(^{29}\)

4.1.2. **Statistical difference in the degree of earnings management pervasiveness**

In sub-section 3.3) a) we defined the degree of earnings management pervasiveness (\(pp\)) as the proportion of the (predicted) number of firms in a given interval that undertakes earnings management over the expected number of firms in that interval. This definition has two advantages over the measurement discussed in the previous sub-section. Firstly, this new measurement takes into account the number of observations in each interval and thus enables direct comparisons to be made across earnings distributions and intervals. Secondly, it also allows the use of statistical methods to test the differences in pervasiveness.

\[\text{TABLE 4}\]

\(^{29}\) These results are robust to different definitions of the variables, namely: i) definition of earnings (using \#237); ii) deflator (using market value, \#199*#25); iii) interval width (0.005); iv) sample period.
Table 4, Panel A, reports estimates of the degree of pervasiveness to avoid losses for both intervals around zero, and for GN and BN firms. The latter have, for both intervals, a degree of pervasiveness slightly higher than 60 percent. That of GN firms is around 45 percent. Thus, there is a difference in that degree of around 17 (13) percentage points to the left (right) interval. Using the statistical test for the difference between the proportions of success in two independent samples (Sandy, 1990) we find that such an estimated difference is significant at less than 0.0001 in both intervals. Hence, BN firms show a higher degree of pervasiveness in avoiding earnings losses, consistent with the hypothesized incentive they face to manage earnings. This evidence is fully supportive of our first hypothesis and corroborates the conclusions of our previous visual assessment based on the empirical distributions.

Table 4, Panel B, shows similar information for the sub-samples of BN firms with prior period positive (BN_PRIOR_Pos) and negative (BN_PRIOR_Neg) earnings. The difference in pervasiveness is 11 percentage points to the left interval and 45 to the right, both of which are statistically significant. BN firms with prior period positive earnings, i.e. approaching the earnings target from above, are expected to face a higher incentive to manipulate earnings. A higher degree of pervasiveness suggests that such an incentive exists. This evidence adds to that discussed in the previous sub-section and is supportive of our second hypothesis.30 31

30 Untabulated results show that when we control for GN firms and prior period earnings sign there is no statistical difference in the degree of pervasiveness in the left interval, and this difference in the right interval is much smaller than that reported in Panel B and in favor of prior period negative earnings. Thus, the opposite we hypothesized for BN firms.

31 We also tested for sub-samples of prior period positive and prior period negative earnings (untabulated results). There is no significant difference in the degree of pervasiveness in the left and the right intervals.
Finally, Panel C displays information for the sub-samples of BN firms with prior period positive earnings and low (DEBT Low) and high (DEBT High) needs of debt. The evidence is mixed. In the left interval the difference in pervasiveness is 12 percentage points and is statistically significant at the usual level of confidence. Firms with higher needs of debt seem to undertake more earnings manipulation, consistent with our third hypothesis. Conversely, and contrary to our expectations, in the right interval there is no significant difference in the degree of pervasiveness across distributions. However, given the technical characteristics of the methodology we use, the smaller number of observations in each sub-sample might affect the precision of the assessment. The statistics displayed in Table 2, on the number of observations, seem to give some support to this potential explanation for such an unexpected result. The proportion of firms with BN and prior period positive earnings is higher than that of GN firms in both intervals, and this proportion is higher in the right interval.

In sum, the empirical evidence collected so far fully supports our first and second hypotheses. It suggests that firms with BN in the current period and prior period positive earnings face a higher incentive to avoid losses, and do have a higher degree of earnings management pervasiveness. The occurrence of prior positive earnings does not by itself explain differences in this degree. Moreover, the empirical evidence partly supports our third hypothesis and the intuition that the needs of debt play a role in firms’ incentive to undertake earnings management.

The importance of the overall evidence is threefold. Firstly, it adds to the literature that supports the discontinuities in the earnings distribution as being driven (at least partly) by earnings management. Secondly, it highlights the role of some of firms’ earnings

The sign of prior earnings is a determinant of the incentive to undertake earnings management only when interacting with the sign of return.
management incentives. The theory we test, and the results we obtain, contribute to a better understanding of these incentives and how they work. Thirdly, it challenges the implicit assumption in BD (1997) that the incentives to undertake earnings management are similar in all firms. Our research shows that the earnings distribution is the joint impact of (at least) two groups of firms with differentiated incentives to manipulate earnings.

Recent research (e.g. Dechow et al., 2003; Beaver et al., 2003; Durtschi and Easton, 2005) argues that the discontinuities in the earnings distributions may not be due to earnings management but to other reasons underlying those distributions. Despite the fact that the evidence in such research conflicts with the empirical results of other recent studies that support the earnings management explanation (e.g. Beatty et al., 2002), and with that presented so far in this paper, we perform a Probit analysis to test whether the underlying impact of market news on earnings, the way firms approach the zero earnings target and their needs of debt, are (in fact) driving forces of firms’ earnings management when other controls are in place.

Below, we discuss the results of this analysis.

4.2. **Probit analyses of differences in earnings management to avoid losses**

Table 5 displays the results of Probit analyses for the differential likelihood of reporting small profits versus small losses. As in the previous sub-section, we control for classes of GN and BN firms (D1), for classes of BN firms with prior period positive (negative) earnings (PRIOR) and, within those with prior positive earnings, for classes of high (low) needs of debt (DEBT).

We perform six models with a similar structure. All of them control for some of the effects referred to in the literature as potential determinants of the discontinuity at zero in the
earnings distribution. These effects are size (SIZE), special items (SPITEM) and taxes (TAX). The analysis includes 1,138 firm-year observations with deflated earnings between [-0.0025; 0.0025], 54 percent of which are classified as BN firms.

[TABLE 5]

Model 1 tests whether BN firms do undertake earnings management to avoid losses in a more pervasive way than GN firms. The coefficient on D1, the dummy variable reflecting the dichotomy GN vs. BN firms, is significantly positive, consistent with our expectation and the statistical evidence reported in Tables 3 and 4. This evidence supports our first testing hypothesis and suggests that BN firms are more pervasive in undertaking earnings management, reporting a significantly greater number of small profits and fewer small losses than GN firms do.  

We hypothesized that prior period earnings sign (PRIOR), i.e. the way firms approach the earnings target, is a determinant of the incentive to undertake manipulation. Models 2 and 3 test this effect. The former shows that the coefficient on PRIOR is statistically insignificant, corroborating our previous intuition that this variable is not, by itself, a driving force of the discontinuities in the earnings distributions. Model 3 tests, and supports, the intuition underlying our second hypothesis. BN firms with prior period positive earnings (D1_PRIOR) do undertake more pervasive earnings management,

32 The proportion of BN firm-years in the first interval in the right hand side of the distribution is consistent with this result: approximately 57% against 46% in the first interval in the left and 47% for the whole distribution.

33 Consistent with this outcome, graphical evidence not reproduced here shows that when we split the global sample by the sign of prior period earnings there is no statistical difference in the degree of pervasiveness.
consistent with the statistical evidence in Tables 3 and 4 (Panel B).

Thus, the way firms approach the earnings target – from above or from below – is a determinant of their incentive to manipulate earnings.

Our third hypothesis proposes a likely reason why BN firms with prior period positive earnings (PRIOR) face an incentive to undertake earnings management: to avoid an increase in their cost of debt. Thus, within this set of firms, those with larger needs of debt are expected to face a higher incentive to manipulate. Models 4 to 6 test this intuition using DEBT, a dummy variable that proxies for firms’ future needs of debt. Model 4 shows that the coefficient on this variable is statistically insignificant, consistent with our intuition that firms’ needs of debt are not, by themselves, a driving force of the discontinuities in the earnings distribution. However, testing for the interaction of this variable with PRIOR (Model 5), the coefficient is statistically significant, suggesting that firms approaching the earnings target from above (PRIOR) and with larger needs of debt (DEBT) do face a higher incentive to manipulate earnings. This is an unexpected result, and contradicts the expectation we formulated in sub-section 3.2. A potential reason for the significance of this coefficient is that the variable PRIOR_DEBT might be acting as a proxy for D1_PRIOR_DEBT. The fact that the coefficient on the latter (Model 6) and its level of significance are higher than those on PRIOR_DEBT seems to be supportive of this tentative explanation.

The evidence in Model 6 is consistent with the graphical and statistical evidence discussed in the previous sub-section, showing that BN firms approaching the earnings target from above and with larger needs of debt do report a significantly greater number of small profits and fewer small losses than other firms. This

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34 If we test for BN firms with prior period negative earnings the coefficient is not significant.

35 As we move from Model 1 to Model 6 the coefficient on the main variable is increasing, consistent with the intuition that the cost of debt is the ultimate incentive for firms’ earnings manipulation.
result is also consistent with the statistical evidence in Table 3 and complements the evidence in Table 4 (Panel C). Altogether, the empirical evidence in Models 4 to 6 fully support our third hypothesis.36

The coefficients on the control variables are systematically insignificant across models, consistent with untabulated descriptive statistics discussed in sub-section 3.4. This evidence suggests that firm size is not a driving force of firms’ location around zero earnings, and that the tax and special items effects discussed in Beaver et al. (2003) do not have, in the current study, a role in explaining the discontinuity at zero in the earnings distribution. More than a denial of previous evidence about the determinants of the discontinuities, our results suggest that at least a part of them is driven by discretionary actions undertaken by managers.

In sum, the empirical evidence discussed in this sub-section highlights the importance of the sign of market returns (GN and BN) as a proxy for managers’ incentive to undertake earnings management to avoid losses, and the roles played by PRIOR and DEBT in maximizing such an incentive. The results corroborate the empirical evidence collected from the graphical and statistical analyses, and bring to light a new and intuitive explanation for the discontinuities around zero in the earnings distribution. They are indeed an important contribution to our understanding of the determinants of such discontinuities.

36 The models in Table 5 are tested for the right interval at zero, i.e. for the likelihood of firms reporting a greater number of small profits. However, testing for the left interval (likelihood of reporting fewer small losses) does not qualitatively change the results. The same is true when we use other proxies for firms’ needs of debt [the sign of the change in long term debt (#9) and in total debt (#9+#34), and ranks of high/low long term debt (#9) and total debt (#9+#34)].
5. Conclusion

In this paper we analyze firms’ earnings management behavior to avoid losses conditional on the (asymmetric) incentive underlying market returns and prior period earnings signs. Our intuition is that firms with negative returns in the period face a higher incentive to undertake earnings management, and that their ultimate intention is to hide from credit markets a signal (loss) that could negatively affect their cost of debt.

Our graphical and statistical empirical evidence supports this intuition. BN firms show higher earnings management pervasiveness than their counterparts with good news (GN), reporting a greater number of small profits and fewer small losses. The set with simultaneously BN and prior period positive earnings (PRIOR) undertakes more pervasive earnings manipulation than BN firms in general. However, PRIOR is not in itself a determinant of the location of firm-years around the zero earnings target.

Within this restricted set of firms with BN and PRIOR, and consistent with a cost of debt explanation, we find that firms with larger needs of debt (DEBT) show higher pervasiveness in undertaking earnings management to avoid losses. As for PRIOR, we also tested for DEBT as the determinant of the discontinuity in the earnings distribution, but the variable was not significant. The results are robust to the use of graphical and statistical tests, including Probit models that control for some of the main variables that might affect the shape of the earnings distribution.

This paper adds to a large and growing body of literature that discusses firms’ earnings management behavior. Recently the discussion has focused on whether the graphical evidence in BD (1997) is driven by firms’ intentional earnings manipulation or by a mere statistical effect related to an asymmetric impact of some earnings components, or even to the research design adopted in the studies (e.g. Dechow et al., 2003, Beaver et al., 2003,
Beatty et al., 2002 and Durtschi and Easton, 2005). The empirical evidence provided in these studies is mixed.

The main contributions of our research to this literature are threefold. Firstly, it extends the methodology introduced in BD (1997) and uses it to compare the earnings management behavior across sets of firms with differentiated characteristics and/or incentives. Secondly, it discusses the existence of asymmetric earnings management incentives and relates them to the discontinuities around the earnings zero target. Thus, it challenges the implicit assumption in the seminal paper of BD (1997) that this kind of incentive is homogeneous to all firms in the distribution. Our research shows that the earnings distribution is the joint impact of sets of firms with differentiated incentives to manipulate earnings. Finally, based on a well-grounded theory, it also contributes to a better understanding of the roles of earnings signals sent to credit markets and of firms’ debt as determinants of earnings management. At a time when firms’ earnings management behavior is still a “black box” this is an important contribution indeed.
References


Table 1. Descriptive statistics for deflated earnings.


<table>
<thead>
<tr>
<th>YEAR</th>
<th>NOBS</th>
<th>MEAN</th>
<th>STD</th>
<th>MEDIAN</th>
<th>%GN</th>
<th>%Pos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>3254</td>
<td>0.066</td>
<td>0.069</td>
<td>0.065</td>
<td>0.74</td>
<td>0.89</td>
</tr>
<tr>
<td>1977</td>
<td>3219</td>
<td>0.067</td>
<td>0.068</td>
<td>0.066</td>
<td>0.63</td>
<td>0.90</td>
</tr>
<tr>
<td>1978</td>
<td>3136</td>
<td>0.076</td>
<td>0.068</td>
<td>0.073</td>
<td>0.66</td>
<td>0.92</td>
</tr>
<tr>
<td>1979</td>
<td>3301</td>
<td>0.073</td>
<td>0.080</td>
<td>0.073</td>
<td>0.64</td>
<td>0.89</td>
</tr>
<tr>
<td>1980</td>
<td>3575</td>
<td>0.058</td>
<td>0.097</td>
<td>0.063</td>
<td>0.69</td>
<td>0.85</td>
</tr>
<tr>
<td>1981</td>
<td>3751</td>
<td>0.045</td>
<td>0.116</td>
<td>0.058</td>
<td>0.41</td>
<td>0.80</td>
</tr>
<tr>
<td>1982</td>
<td>4271</td>
<td>0.010</td>
<td>0.141</td>
<td>0.038</td>
<td>0.56</td>
<td>0.70</td>
</tr>
<tr>
<td>1983</td>
<td>4225</td>
<td>0.010</td>
<td>0.156</td>
<td>0.042</td>
<td>0.68</td>
<td>0.71</td>
</tr>
<tr>
<td>1984</td>
<td>4409</td>
<td>0.003</td>
<td>0.168</td>
<td>0.045</td>
<td>0.35</td>
<td>0.70</td>
</tr>
<tr>
<td>1985</td>
<td>4425</td>
<td>-0.017</td>
<td>0.180</td>
<td>0.034</td>
<td>0.57</td>
<td>0.64</td>
</tr>
<tr>
<td>1986</td>
<td>4442</td>
<td>-0.027</td>
<td>0.195</td>
<td>0.027</td>
<td>0.49</td>
<td>0.62</td>
</tr>
<tr>
<td>1987</td>
<td>4657</td>
<td>-0.023</td>
<td>0.200</td>
<td>0.030</td>
<td>0.38</td>
<td>0.63</td>
</tr>
<tr>
<td>1988</td>
<td>4674</td>
<td>-0.019</td>
<td>0.197</td>
<td>0.032</td>
<td>0.53</td>
<td>0.64</td>
</tr>
<tr>
<td>1989</td>
<td>4525</td>
<td>-0.022</td>
<td>0.198</td>
<td>0.027</td>
<td>0.51</td>
<td>0.62</td>
</tr>
<tr>
<td>1990</td>
<td>4481</td>
<td>-0.033</td>
<td>0.204</td>
<td>0.021</td>
<td>0.30</td>
<td>0.61</td>
</tr>
<tr>
<td>1991</td>
<td>4459</td>
<td>-0.033</td>
<td>0.198</td>
<td>0.016</td>
<td>0.63</td>
<td>0.60</td>
</tr>
<tr>
<td>1992</td>
<td>4573</td>
<td>-0.029</td>
<td>0.206</td>
<td>0.022</td>
<td>0.53</td>
<td>0.62</td>
</tr>
<tr>
<td>1993</td>
<td>4753</td>
<td>-0.025</td>
<td>0.211</td>
<td>0.029</td>
<td>0.59</td>
<td>0.64</td>
</tr>
<tr>
<td>1994</td>
<td>5181</td>
<td>-0.024</td>
<td>0.226</td>
<td>0.039</td>
<td>0.42</td>
<td>0.68</td>
</tr>
<tr>
<td>Total</td>
<td>79311</td>
<td></td>
<td></td>
<td></td>
<td>0.54</td>
<td>0.72</td>
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<table>
<thead>
<tr>
<th>NEWS</th>
<th>NOBS</th>
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<th>STD</th>
<th>MEDIAN</th>
<th>% Pos</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN</td>
<td>42296</td>
<td>0.038</td>
<td>0.145</td>
<td>0.058</td>
<td>0.76</td>
</tr>
<tr>
<td>BN</td>
<td>37015</td>
<td>-0.038</td>
<td>0.197</td>
<td>0.017</td>
<td>0.58</td>
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</tbody>
</table>

Panel C. Sample selection for the Probit analysis of Table 5. Period 1976/94.

<table>
<thead>
<tr>
<th>Description</th>
<th>N. Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm-years in the intervals immediately to the left and the right of zero (deflated earnings in the interval ] -0.0025; 0.0025 ] )</td>
<td>1,153</td>
</tr>
<tr>
<td>Firm-years with missing data or Stockholders’ Equity (#216) &lt; 0</td>
<td>15</td>
</tr>
<tr>
<td>Working sample</td>
<td>1,138</td>
</tr>
<tr>
<td>Firm-years in the interval ] -0.0025; 0 ]</td>
<td>276</td>
</tr>
<tr>
<td>Firm-years in the interval ] 0; 0.0025 ]</td>
<td>862</td>
</tr>
</tbody>
</table>

Notes:

a) Deflated earnings is Net Income (#172) deflated by prior period total assets (#6);

b) GN is “good news” (RET ≥ 0), BN is “bad news”’” (RET < 0). RET is market return at the fiscal year end;

c) %Pos (%GN) is the percentage of current positive earnings (good news) in the sample.
Table 2. Change in total debt around the zero earnings target.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]</td>
<td>[2]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEBT Median (N.Obs.)</td>
<td>DEBT Median (N.Obs.)</td>
<td>Probability [1=2]</td>
<td>%N.Obs. [2/1]</td>
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</tr>
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</table>

**LEFT INTERVAL**

<table>
<thead>
<tr>
<th>Market Returns</th>
<th>Negative (BN)</th>
<th>Positive (GN)</th>
<th>Probability [GN=BN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (GN)</td>
<td>-0.123</td>
<td>-0.017</td>
<td>0.815</td>
</tr>
<tr>
<td>(44)</td>
<td>(63)</td>
<td>(82)</td>
<td>1.30</td>
</tr>
<tr>
<td>Negative (BN)</td>
<td>-0.037</td>
<td>0.014</td>
<td>0.020</td>
</tr>
<tr>
<td>(82)</td>
<td>(87)</td>
<td></td>
<td>1.98</td>
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</table>

**RIGHT INTERVAL**

<table>
<thead>
<tr>
<th>Market Returns</th>
<th>Negative (BN)</th>
<th>Positive (GN)</th>
<th>Probability [GN=BN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (GN)</td>
<td>-0.021</td>
<td>0.034</td>
<td>0.003</td>
</tr>
<tr>
<td>(173)</td>
<td>(210)</td>
<td></td>
<td>1.21</td>
</tr>
<tr>
<td>Negative (BN)</td>
<td>-0.032</td>
<td>0.035</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(121)</td>
<td>(358)</td>
<td></td>
<td>2.96</td>
</tr>
</tbody>
</table>

**Notes:**

a) The values reported in the table are the medians of DEBT, the percentage change in total debt \(\Delta(\#6-\#216_t / \#6-\#216_{t-1})\), that we take as a proxy for firms’ needs of debt. For example, firms with prior period negative earnings and GN have DEBT median equal to -0.017. In parenthesis we report the number of observations in each quadrant. Taking the same example, the number of observations is 63.

b) The left interval is deflated net income \([-0.0025; 0]\) and the right interval is \([0; 0.0025]\).

c) “Probability” is the p-value of a Wilcoxon test for the equality of medians across classes; “%N.Obs.” is the proportion of prior period positive earnings observations in each market returns class.
Table 3. **Statistical significance of the discontinuities around zero earnings.**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Distribution</th>
<th>Discontinuity at the …</th>
<th>… left of zero</th>
<th>… right of zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>GLOBAL (79,311 obs.)</td>
<td>339</td>
<td>13.99</td>
<td>-305</td>
</tr>
<tr>
<td>1.2</td>
<td>GN (42,296 obs.)</td>
<td>122</td>
<td>7.26</td>
<td>-124</td>
</tr>
<tr>
<td>1.2</td>
<td>BN (37,015 obs.)</td>
<td>217</td>
<td>12.44</td>
<td>-181</td>
</tr>
<tr>
<td></td>
<td>BN_PRIOR_Pos (25,032 obs.)</td>
<td>164</td>
<td>11.29</td>
<td>-154</td>
</tr>
<tr>
<td></td>
<td>BN_PRIOR_Neg (11,983 obs.)</td>
<td>53</td>
<td>5.49</td>
<td>-27</td>
</tr>
<tr>
<td></td>
<td>BN_PP_DEBT_H (15,791 obs.)</td>
<td>103</td>
<td>9.46</td>
<td>-92</td>
</tr>
<tr>
<td></td>
<td>BN_PP_DEBT_L (8,263 obs.)</td>
<td>57</td>
<td>5.96</td>
<td>-63</td>
</tr>
</tbody>
</table>

**Notes:**

a) As in BD (1997), the Z1 statistic tests the null hypothesis that the distribution of deflated earnings will be smooth. It is based on the difference between the actual number of observation in an interval and the expected number for that same interval, divided by the standard deviation of the difference. The latter is defined as follows:

\[
\text{std} = \sqrt{Np_i(1-p_i) + \frac{N(p_{i-1} + p_{i+1})(1-p_{i-1} - p_{i+1})}{4}},
\]

where N is the total number of observations in the sample and \( p_i \) is the probability that an observation will fall into interval \( i \). Under the null hypothesis of smoothness, this statistic is distributed approximately Normal with mean 0 and standard deviation 1. The expected number of observations for a given interval is defined as the average of the number of observations in two adjacent intervals;

b) The assessment of the significance of these statistics is performed against 1.96. This number corresponds to a level of significance of 5% for a standardized normal distribution;
c) “Global” stands for the whole earnings distribution; GN (BN) for good (bad) news sub-sample; BN_PRIOR_Pos (BN_PRIOR_Neg) for sub-samples of BN firms with prior period positive (negative) earnings; BN_PP_DEBT_H (BN_PP_DEBT_L) for sub-samples of BN firms with prior period positive earnings and High (Low) needs of DEBT. DEBT is the percentage change in total debt $[\Delta(#6-#216)_t / (#6-#216)_{t-1}]$;

d) Earnings (#172) is deflated by total assets (#6) as of the end of the prior period;

e) “N. Observ.” equals the expected minus the actual number of observations in the interval. To the left of zero the interval width is ]-0.0025; 0[, to the right it is ]0; 0.0025].
Table 4. Differences in the degree of pervasiveness to avoid losses.

<table>
<thead>
<tr>
<th>Description</th>
<th>Discontinuity at the …</th>
<th>... left of zero</th>
<th>... right of zero</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: sub-samples of good and bad news firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good News</td>
<td>Bad News</td>
<td>Good News</td>
</tr>
<tr>
<td>1. Number of actual firms</td>
<td>149</td>
<td>133</td>
<td>390</td>
</tr>
<tr>
<td>2. Number of expected firms</td>
<td>271</td>
<td>350</td>
<td>266</td>
</tr>
<tr>
<td>3. Pervasiveness (\frac{(2-1)}{2})</td>
<td>0.45</td>
<td>0.62</td>
<td>0.47</td>
</tr>
<tr>
<td>4. Difference in pervasiveness</td>
<td>0.17</td>
<td></td>
<td>0.13</td>
</tr>
<tr>
<td>5. Standard deviation</td>
<td>0.039</td>
<td></td>
<td>0.042</td>
</tr>
<tr>
<td>6. Z2 Statistic ([4/5])</td>
<td>4.26</td>
<td></td>
<td>3.29</td>
</tr>
<tr>
<td>7. P-value</td>
<td>&lt; 0.0001</td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td><strong>Panel B: sub-samples of bad news firms with prior period positive / negative earnings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRIOR Neg</td>
<td>PRIOR Pos</td>
<td>PRIOR Neg</td>
</tr>
<tr>
<td>4. Difference in pervasiveness</td>
<td>0.11</td>
<td></td>
<td>0.45</td>
</tr>
<tr>
<td>5. Standard deviation</td>
<td>0.058</td>
<td></td>
<td>0.056</td>
</tr>
<tr>
<td>6. Z2 Statistic ([4/5])</td>
<td>1.87</td>
<td></td>
<td>8.01</td>
</tr>
<tr>
<td>7. P-value</td>
<td>0.06</td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Panel C: sub-samples of bad news firms with prior period positive earnings and high/low needs of debt

<table>
<thead>
<tr>
<th></th>
<th>DEBT Low</th>
<th>DEBT High</th>
<th>DEBT Low</th>
<th>DEBT High</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Difference in pervasiveness</td>
<td>0.12</td>
<td>-0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Standard deviation</td>
<td>0.062</td>
<td>0.060</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Z2 Statistic [4/5]</td>
<td>1.94</td>
<td>-0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. P-value</td>
<td>0.05</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

a) The Z2 statistic is the probability density function of the difference between the proportions of success in two independent samples (Sandy, 1990: chap. 10), and is distributed approximately Normal with mean 0 and variance 1. Under the null hypothesis of no difference in the proportions, this statistic is defined as follows: 
\[ Z2 = \frac{\bar{P}_b - \bar{P}_g}{std} \]
where the numerator is the difference between the proportions of “bad news” (b) and “good news” (g) firms undertaking earnings management.

The standard deviation is estimated as: 
\[ std = \sqrt{\frac{\bar{P}(1-\bar{P})}{n_g} + \frac{\bar{P}(1-\bar{P})}{n_b}} \]
where \( n \) is the number of expected “good news” (g) and “bad news” (b) firms in the interval. \( \bar{P} \) is the pooled proportion of both samples:

\[ \bar{P} = \frac{n_g \bar{P}_g + n_b \bar{P}_b}{n_g + n_b} \]

b) The p-value underlying the critical value of the Z2 statistic are two-tailed;

c) The expected number of observations for a given interval is defined as the average of the number of observations in two adjacent intervals. To the left of zero the interval width is [-0.0025; 0], to the right it is [0; 0.0025].

d) PRIOR_Pos (PRIOR_Neg) are BN firms with prior period positive (negative) earnings; DEBT Low (High) are BN firms with prior period positive earnings and Low (High) needs of debt.
Table 5. Probit analysis: determinants of earnings management to avoid losses.

$$\text{INTERV}_{it} = \alpha_0 + \alpha_1 D1_{it} + \alpha_2 \text{PRIOR}_{it} + \alpha_3 D1 \_ \text{PRIOR}_{it} + \alpha_4 \text{DEBT}_{it} +$$
$$+ \alpha_5 \text{PRIOR \_ DEBT}_{it} + \alpha_6 D1 \_ \text{PRIOR \_ DEBT}_{it} + \alpha_7 \text{SIZE}_{it} +$$
$$+ \alpha_8 \text{SPIITEM}_{it} + \alpha_9 \text{TAX}_{it} + \sum \alpha_j \text{IND}_i + \sum \alpha_k \text{YEAR}_i + \epsilon_{it}$$

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model 1 (Coefficient (p-value))</th>
<th>Model 2 (Coefficient (p-value))</th>
<th>Model 3 (Coefficient (p-value))</th>
<th>Model 4 (Coefficient (p-value))</th>
<th>Model 5 (Coefficient (p-value))</th>
<th>Model 6 (Coefficient (p-value))</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>0.177 (0.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIOR</td>
<td>0.119 (0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1_PRIOR</td>
<td>0.242 (0.01)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEBT</td>
<td>0.252 (0.21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIOR_DEBT</td>
<td></td>
<td>0.226 (0.02)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1_PRIOR_DEBT</td>
<td></td>
<td></td>
<td>0.268 (0.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.020 (0.83)</td>
<td>-0.003 (0.97)</td>
<td>0.001 (0.98)</td>
<td>0.018 (0.88)</td>
<td>-0.009 (0.92)</td>
<td>0.003 (0.97)</td>
</tr>
<tr>
<td>SPITEM</td>
<td>-0.305 (0.85)</td>
<td>-0.081 (0.96)</td>
<td>-0.044 (0.98)</td>
<td>-0.124 (0.95)</td>
<td>0.052 (0.97)</td>
<td>-0.034 (0.98)</td>
</tr>
<tr>
<td>TAX</td>
<td>3.811 (0.22)</td>
<td>3.331 (0.28)</td>
<td>3.810 (0.23)</td>
<td>3.967 (0.32)</td>
<td>3.441 (0.27)</td>
<td>3.597 (0.25)</td>
</tr>
</tbody>
</table>

Notes:

a) Intercept coefficients are untabulated, but they are all insignificant; year and industry intercept effects were controlled in all models using IND and YEAR dummy variables;
b) **Variable definitions:** INTERV is a dummy variable that takes value one if net income is in the interval \[0; 0.0025\], and value zero if the firm has deflated net income in the interval \[-0.0025; 0\]. D1 is a dummy variable that takes value one if the firm has “bad news” in the year, zero otherwise; PRIOR is a dummy variable that takes value one if prior period earnings (#172) is positive, zero otherwise; D1_PRIOR is an interactive variable defined as D1*PRIOR; DEBT is a dummy variable that takes value one if the change in total debt \([\Delta(#6-#216)]\) in the current period is positive, zero otherwise; PRIOR_DEBT is an interactive variable defined as PRIOR*DEBT; D1_PRIOR_DEBT is an interactive variable defined as D1*PRIOR*DEBT; SIZE is a dummy variable that takes value one if firm market value (#199*#25) is in the upper third of the distribution, zero otherwise; SPITEM is Special Items (#17) and TAX is Income Taxes (#16), both deflated by prior period total assets (#6); ΣIND is a set of dummy variables, taking a value of one if the firm belongs to the industry, zero otherwise; ΣYEAR is a set of dummy variables, taking a value of one if the firm-year corresponds to the year, zero otherwise; i,t are firm and year (1976-1994) indexes, respectively.

c) The models have been regressed using 1,138 observations, and test for the likelihood of reporting a greater number of small profits (right interval). INTERV has 276 and 862 observations for classes 0 (left) and 1 (right), respectively; BN firm-years (D1=1) are 54 percent of the total number of observations, 78 percent of which are in class 1 (right); firm-years with positive change in total debt (DEBT=1) are 51 percent of the total number of observations, 53 percent of which are in class 1 (right); firm-years with prior period positive earnings (PRIOR=1) are 65 percent of the total number of observations, 66 percent of which are in class 1 (right).

d) P-values are two-tailed.
Exhibit 1. **Empirical distribution of deflated earnings.**

![Empirical distribution of deflated earnings](image)

**Fig. 1.1.** Global distribution of net income (#172) deflated by total assets (#6) as of the beginning of the year ($TA_{t-1}$). Interval width is 0.0025, and the first interval to the right of zero is $]0 : 0.0025[$.

The vertical axis represents the number of observations in each interval.
Fig. 1.2. Comparative **Good** and **Bad News** distributions of net income (#172) deflated by total assets (#6) as of the beginning of the year ($T_{A-1}$). Interval width is 0.0025, and the first interval to the right of zero is $] 0 ; 0.0025]$. The vertical axis represents the number of observations in each interval.