Earnings management and accounting income aggregation

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Abstract

Quarterly earnings allow aggregation into annual earnings in four different ways. Fiscal year earnings is one measure of annual earnings, the others being earnings for annual periods ending at interim quarter-ends. We investigate earnings management in fiscal year earnings relative to these alternative measures of firms’ annual earnings. We confirm prior findings in Burgstahler and Dichev (1997. Earnings management to avoid earnings decreases and losses. Journal of Accounting and Economics 24, 99–126) of discontinuities around zero and prior year earnings in histograms of earnings. Subsequent research questions whether these discontinuities are evidence of earnings

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management. Using histograms of our alternative annual earnings measures, we offer evidence suggesting earnings management is responsible for the discontinuities.

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### 1. Introduction

In seminal papers, Hayn (1995) and Burgstahler and Dichev (1997) document the existence and prevalence of discontinuities around thresholds in earnings distributions. Burgstahler and Dichev (1997) shows that the histograms of scaled net income and changes in net income exhibit discontinuities around zero with a disproportionately low frequency in the partition immediately to the left of zero and a disproportionately high frequency in the partition which includes zero. They attribute these findings to earnings management by firms to meet earnings thresholds of zero earnings and the previous period’s earnings. The Burgstahler and Dichev (1997) paper has had a major impact on accounting research and their methodology is used in many subsequent papers investigating earnings management, including Beatty et al. (2002), Dichev and Skinner (2002), Leuz et al. (2003), Beaver et al. (2003b), Phillips et al. (2003, 2004), Leone and Van Horn (2005), Frank and Rego (2006) and Roychowdhury (2006). Some subsequent studies, for instance Durtschi and Easton (2005), question whether the Burgstahler and Dichev (1997) findings are evidence of earnings management, suggesting instead that the results may be induced by the scaling mechanism used or by selection biases in the sample. In this paper, we re-examine this question using a research design, which allows firms, in aggregate, to serve as their own controls. Our results, in general, validate the findings in Burgstahler and Dichev (1997).

We use histograms of earnings measured over alternative annual periods to investigate discontinuities in fiscal year earnings. These alternative annual periods end at the close of the first three quarters of the fiscal year. The intuition underlying the use of these alternative annual periods is that earnings measured over these periods are less likely to suffer from the effects of managerial income manipulation—through accrual or operating decisions—than earnings measured over the fiscal year. Since managers are unlikely to be evaluated based on earnings for annual periods other than the fiscal year, they have weaker incentives to manage these earnings. Managers are also less likely to manage income for annual periods other than the fiscal year for capital market and other contractual reasons such as debt contracts (see Dichev and Skinner, 2002). In addition, if fiscal year earnings are managed in the fourth quarter and if some of the effects of this earnings management reverse over subsequent quarters, these alternative annual earnings might better represent the economic earnings for a year than the fiscal year earnings reported in annual financial statements.¹

We construct a benchmark for expected frequency in partitions of histograms of fiscal year earnings using the distribution of annual earnings in the other three annual periods. A

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¹Results in Sloan (1996) and other papers suggest that accruals recorded in a period reverse over subsequent periods.
helpful feature of our research design is that we can discern earnings management over
wider intervals of the distribution than was possible in prior research. Prior research
focused on examining for earnings management in the immediate neighborhood of specific
thresholds. Unlike methods used in some prior papers, our benchmark is also valid for
tests for discontinuities at the peak of the distribution.

Perhaps the greatest challenge confronting researchers testing for earnings management is
specifying what earnings would be under the null hypothesis, i.e., in the absence of manipulation.
Some studies investigating earnings management through accruals manipulation use variations
of the Jones (1991) model to estimate accruals under the null hypothesis. However, Dechow et
al. (1995) and Kothari et al. (2005) find that the Jones model is mis-specified for firms
experiencing extreme performance. Similarly, researchers testing for discontinuities in earnings
distributions have wrestled with the problem of specifying expected frequencies, under the null,
in partitions of earnings histograms. We present an intuitive approach to specifying the null
hypothesis for studies that examine the distribution of earnings and related variables. Using this
approach, we offer evidence that contributes to the debate about the nature of discontinuities in
earnings distributions. We believe that this approach has wider applicability and can be used to
test for manipulation of accounting numbers in other contexts.

We treat the firm’s choice of fiscal year as exogenous to our investigation and do not
view managers’ choice of the fiscal year-end as a strategic variable in the short-term.2 The
rest of this paper is organized as follows. Section 2 surveys prior research in the area.
Section 3 describes our research design and results. Section 4 presents our conclusions.

2. Prior research

Studies on earnings management, including Hayn (1995), Burgstahler and Dichev (1997)
and DeGeorge et al. (1999) find a discontinuity around zero for levels and changes in
earnings. This is suggestive of earnings management to avoid reporting losses and earnings
decreases. DeGeorge et al. (1999) and Burgstahler and Eames (2003) also report similar
discontinuities around analysts’ forecasts of earnings.3

Some recent studies question whether earnings management is responsible for the
 discontinuity around zero in the distribution of scaled earnings, scaled earnings changes
and earnings surprises. For example, DeGeorge et al. (1999), assert that the Burgstahler
and Dichev (1997) results might be affected by a problem similar to the “aliasing problem”
in the literature on the spectral analysis of time-series data.4 They suggest that scaling
disperses non-zero observations in the distribution while not dispersing observations that
are exactly zero. They claim that this contributes to the discontinuity at zero in the
distribution of scaled earnings and earnings changes.

Durtschi and Easton (2005) also assert that scaling could be responsible for the finding of
discontinuities at zero in Burgstahler and Dichev (1997), both directly and indirectly

2See Smith and Pourciau (1988) for evidence on differences in firm characteristics among December fiscal year
end and other firms.

3We do not analyze earnings management to meet analysts’ forecasts because our methodology does not lend
itself to an examination of this question.

4To quote DeGeorge et al. (1999), (footnote 25, p. 19):

“A qualitatively similar pattern is reported in Burgstahler and Dichev (1997, Fig. 1), although, since they deflate
earnings, the extreme dip in density just below zero in their distribution of scaled earnings is most likely spurious.”

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through an induced sample selection bias. They point out that, unlike the distribution of market value deflated net income, the distribution of earnings per share (EPS) shows no evidence of a discontinuity at zero. They note that, in the histogram of EPS, there are significantly more observations with a small loss than a small profit. This would appear to be inconsistent with widespread earnings management to achieve a positive EPS benchmark. They also do not find evidence of a discontinuity at zero in the distribution of un-deflated net income. They assert that two factors could contribute to the observed discontinuity in market value deflated net income. First, a larger proportion of loss firms do not have a beginning of year price, which is used to construct the deflator, available on the Compustat annual files. This could result in a selection bias. Second, beginning of year prices for small loss firms are systematically lower than the corresponding figures for small profit firms. This could induce the observed discontinuities in scaled earnings. Scaling moves small loss firms away from zero and small profit firms towards zero thus inducing the appearance of a discontinuity at zero. Durtschi and Easton (2005) also find that scaling by total assets or revenues induces similar biases as scaling by market value of equity.

Beaver et al. (2003a) investigate whether the asymmetric tax treatment of positive and negative earnings and special items could be responsible for the observed discontinuity at zero in the distribution of earnings and earnings changes. While they cannot rule out earnings management as contributing to the discontinuity, they conclude that two-thirds of the discontinuity could be attributed to these two factors.

Dechow et al. (2003) investigate whether firms that just met thresholds of zero earnings and zero changes in earnings achieved these thresholds through accrual management. Using a battery of commonly used tests for accrual management, they fail to find evidence of such management in this sample of firms. They suggest that managers taking real actions such as expending additional effort (as opposed to using accounting accruals) to meet earnings targets are more likely to be the reason for the observed discontinuities. In this paper, we do not discriminate between earnings management through accounting manipulation or through operating decisions.

Consistent with the idea that managers are particularly concerned about fiscal year earnings, Collins et al. (1984), Das and Shroff (2002), and Hayn et al. (2001), provide evidence that the characteristics of fourth quarter earnings differ from earnings for the other three quarters. These studies generally find that fourth quarter earnings exhibit higher volatility. Capital markets seem to recognize this—the preponderance of research has found lower earnings response coefficients for fourth quarter earnings relative to other quarters (Salamon and Stober, 1994).

Using the distributions of our alternate measures of annual earnings, we are able to shed some light on the debate over whether the observed discontinuities in the distribution of fiscal year earnings are attributable to earnings management or whether they are artifacts of the testing procedures used.

3. Research design and test results

3.1. Research design

In this paper, we assume that managers are particularly concerned about fiscal year earnings reported in companies’ annual reports. Many bonus and compensation schemes are based on earnings measured over this time period. These pay schemes provide
incentives for managers to manipulate fiscal year income towards thresholds to maximize their compensation. Incentives to manage income are probably strongest in the fourth quarter of the fiscal year. At this time managers are likely to have a good sense of where they stand vis-à-vis annual targets. Capital market considerations and other contractual motives for earnings management may also be most salient at the end of the fiscal year. Using the distribution of earnings over the other annual periods as a benchmark, we attempt to discern patterns arising from earnings management in the histogram of fiscal year earnings. The alternate measures of annual earnings that we use are annual periods terminating at the end of the first, second, and third quarters of the fiscal year. Earnings management incentives present at fiscal year-end are likely not as strong at the end of interim quarters. We use the histogram of earnings over these alternative annual periods therefore as a proxy for the distribution of earnings under the null hypothesis of no earnings management.

Our research design, however, has some limitations. There is evidence that firms also manage quarterly earnings to achieve thresholds (see for example DeGeorge et al., 1999). This phenomenon would render the patterns induced by earnings management to meet fiscal-year targets less distinct. Also some contracts, principally debt contracts, are based on earnings for rolling annual periods, i.e., the sum of earnings for the past four quarters. This would provide incentives for firms to also manage earnings for the non-fiscal year annual periods to comply with these contracts. Either of these types of earnings management would likely induce a bias against finding evidence of earnings management at fiscal year-end, i.e., it would bias our tests towards the null.

3.2. Sample selection


We present an example of how we compute earnings for our alternative annual periods in Table 1. The third column of the table has IBM’s quarterly net income for the years 1999–2001. The last column presents the earnings aggregated over the four quarters ending at that quarter. These include both the fiscal year earnings and earnings in annual periods ending in the first, second, and third quarters.

3.3. Tests of earnings management to meet thresholds using Burgstahler and Dichev (1997) methodology

DeGeorge et al. (1999) and Durtschi and Easton (2005) suggest that the Burgstahler and Dichev (1997) results could be spurious—induced by scaling and selection biases in the scaling variable. We examine the histograms of scaled annual net income computed over alternate annual periods as a preliminary investigation of whether scaling is responsible for Burgstahler and Dichev (1997) results. We first replicate Burgstahler and Dichev (1997) histograms for fiscal year earnings. We then construct these histograms for annual earnings measured over alternate periods, periods ending at the first, second, and third quarters of the fiscal year. If the patterns observed by Burgstahler and Dichev (1997) arise because of a

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5We thank the referee for pointing this out.

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mechanical effect, such as the one induced by scaling, we are likely to observe similar patterns in the histograms of earnings for these other annual periods. If, on the other hand, the patterns they find are attributable to earnings management at fiscal year-end, we should find the pattern for fiscal year earnings but not for the other three annual periods.

We generate the histograms for net income scaled by market value of equity at the beginning of the annual period and for changes in net income scaled by market value of equity at the beginning of the prior annual period. In sensitivity tests, we also deflate by total assets instead of market value of equity and find similar results. We compute the frequency of observations in each partition of the histogram where each partition has a width of 0.5% of market value of equity for the histogram of earnings levels and 0.25% of market value of equity for the histogram of earnings changes. These are the same partition widths used in Burgstahler and Dichev (1997). In our first tests, similar to Burgstahler and Dichev (1997), we compare the actual frequency with an expected frequency where the expected frequency is the mean of the actual frequency in the two adjacent partitions.6 Also following Burgstahler and Dichev (1997), we compute a test (Z) statistic to evaluate the statistical significance of deviations from the expected frequency. This statistic, described in footnote 6 of Burgstahler and Dichev (1997), is the deviation from expected frequency in the partition deflated by the estimated standard deviation of the deviations from expected frequency.

Figs. 1A through D depict the histograms of annual earnings deflated by beginning market value of equity. The discontinuity around zero is visually apparent for fiscal year earnings but not for annual earnings computed for the alternate periods. Table 2 presents frequencies for the 10 partitions around zero. We present results for the four annual

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Table 1
Example of aggregation of net income for alternative annual periods

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Fiscal quarter</th>
<th>Quarterly earnings (in million $s)</th>
<th>Earnings for annual period ending in quarter (in million $s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1</td>
<td>1470</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>2</td>
<td>2391</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>3</td>
<td>1762</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>4</td>
<td>2089</td>
<td>7712</td>
</tr>
<tr>
<td>2000</td>
<td>1</td>
<td>1519</td>
<td>7761</td>
</tr>
<tr>
<td>2000</td>
<td>2</td>
<td>1941</td>
<td>7311</td>
</tr>
<tr>
<td>2000</td>
<td>3</td>
<td>1963</td>
<td>7512</td>
</tr>
<tr>
<td>2000</td>
<td>4</td>
<td>2670</td>
<td>8093</td>
</tr>
<tr>
<td>2001</td>
<td>1</td>
<td>1750</td>
<td>8324</td>
</tr>
<tr>
<td>2001</td>
<td>2</td>
<td>2045</td>
<td>8428</td>
</tr>
<tr>
<td>2001</td>
<td>3</td>
<td>1595</td>
<td>8060</td>
</tr>
<tr>
<td>2001</td>
<td>4</td>
<td>2333</td>
<td>7723</td>
</tr>
</tbody>
</table>

Notes: This table presents IBM’s quarterly earnings for the years 1999–2001 and illustrates the computation of annual earnings over periods ending at each of the four quarters. Bold numbers are fiscal year annual earnings.

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6 Also similar to Burgstahler and Dichev (1997), we test the sensitivity of our results to using alternative definitions of expected frequency. We use the mean of the two partitions, one partition away from the partition under consideration in one test and the mean of the four adjacent partitions, two on either side in another.
periods, i.e., for the fiscal year and for annual periods ending at the first, second, and third quarters. For each annual period, the table shows the actual frequency (expressed as a percentage of the total sample), the deviation from the expected frequency and the Z-statistic for the statistical significance of the deviation.

The results confirm the prior findings in Burgstahler and Dichev (1997) for fiscal year annual earnings around zero (the first set of columns in the panel). The frequency in the partition immediately below zero, the $-1$ partition, is significantly lower than expected and the frequency in the partition including and immediately above zero, the $0$ partition, is significantly higher than expected. The Z-statistics corresponding to these partitions are strongly significant, statistically. As Burgstahler and Dichev (1997) suggest, this is consistent with management of annual earnings to avoid reporting losses. Further validating their analyses, we find that annual earnings computed using the alternate aggregation periods do not share these characteristics (except, to some extent, for the annual period ending in quarter one).

Also, the magnitude of the discontinuity around zero is considerably higher for fiscal year earnings than for any of the other three annual periods. As we move the reporting period away from the fiscal year, we may mix accruals in quarter four of the fiscal year with their partial reversal in the first quarters of the subsequent fiscal year. This reversal of discretionary short-lived accruals would render patterns in earnings computed over the alternative periods less distinct. Alternatively, the discontinuity around zero in fiscal year earnings may become less distinct in other annual periods because the income effects of operating decisions, such as channel stuffing, also reverse in later quarters. 

Prima facie, these results do not support DeGeorge et al. (1999) and Durtschi and Easton (2005) contention that scaling induces the results that Burgstahler and Dichev (1997) report in the neighborhood of zero in the histogram of scaled earnings.

If earnings management is more prevalent at fiscal year-end than at the end of other quarters, the histogram of fiscal year earnings might be less smooth, i.e., have more discontinuities than the histogram of earnings for the other annual periods. We investigate this conjecture by computing the average of the absolute values of the Z-statistics for 400 partitions of the histograms of scaled earnings separately for each annual period. Consistent with this conjecture, we find that the average of the absolute value of the Z-statistic is considerably higher for the histogram of fiscal year earnings than for any of the other annual periods. The average Z-statistic was 0.95 for the fiscal year earnings, 0.84 for annual periods ending in quarter 1, 0.79 for annual periods ending in quarter 2, and 0.81 for annual periods ending in quarter 3.

We do a similar analysis (not tabulated) for changes in net income. This analysis, as in Burgstahler and Dichev (1997), seeks to discern if managers also manage earnings to avoid decreases in earnings from the previous year. The results again indicate earnings management in fiscal year earnings. The deviation from expected frequency in partition $-1$ is negative (Z-statistic of $-6.72$) and the deviation from expected frequency in partition 0 is positive (Z-statistic of 4.93). Somewhat surprisingly, earnings computed for the other annual periods appear to share this property, although to a lesser extent. The deviation from the expected frequency in partition $-1$ is negative and this deviation in partition 0 is

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7We conjecture that the reason we observe results, for the annual period ending in quarter 1, similar but weaker than those for fiscal year earnings is that some of the accruals management at fiscal year end may not have completely reversed by the end of the first quarter.

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positive for all four annual periods. We conjecture that the reason for this phenomenon is that the distribution of earnings changes has a natural peak immediately to the right of zero (i.e., changes in earnings tend to be slightly positive). Burgstahler and Dichev (1997)

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Fig. 1. Fig. 1 illustrates the effect of the annual measurement period on net income scaled by market value of equity at the beginning of the year. Fig. 1a is the histogram of fiscal year scaled net income. Fig. 1b is the histogram of scaled net income for the annual period ending at the close of the first fiscal quarter. Fig. 1c is the histogram of scaled net income for the annual period ending at the close of the second fiscal quarter. Fig. 1d is the histogram of scaled net income for the annual period ending at the close of the third fiscal quarter. Fig. 1e represents the differences in each partition between the fiscal year histogram in Fig. 1a and an equally weighted average of the histograms in Figs. 1b-d.

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However, the deviations are only statistically significant at conventional levels for the fiscal year and the annual period ending in quarter two.
Table 2

Frequency distribution of market value deflated net income

<table>
<thead>
<tr>
<th>Partition</th>
<th>Annual period ending in fiscal year quarter</th>
<th>Four</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Freq. (%)</td>
<td>Freq. (%</td>
<td>Freq. (%)</td>
<td>Freq. (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z-stat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z-stat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Freq.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Earnings were deflated by market value of equity as of the beginning of the annual period. The expected frequency is computed as the mean of the frequency in the two adjacent partitions. For the sake of brevity, only partitions with earnings scaled by market capitalization ranging from −2.5% to 2.5% are presented in the table. The partitions are of width 0.005 of market value of equity. The frequencies are expressed as percentages of the total sample. The Z-statistics are computed using the formula described in footnote 6 of Burgstahler and Dichev (1997).
measure expected frequency as the mean of the frequencies in adjacent partitions. This is a reasonable proxy for expected frequency except near the peak of the distribution.

3.4. Alternate test for earnings management to meet thresholds

As mentioned earlier, researchers investigating discontinuities in the earnings distribution face the problem of specifying the expected frequencies in partitions of the distribution under the null hypothesis of no earnings management. Burgstahler and Dichev (1997) and our tests reported in Table 2, use the average of the actual frequencies in the two adjacent partitions as the expected frequency in each partition. While this estimate of expected frequency makes intuitive sense it does have some deficiencies. First, if earnings are managed to meet a threshold, the frequencies in partitions adjacent to the threshold may also be affected by the earnings management. Second, the test may fail to detect earnings management if earnings management is not confined to a single partition but rather is prevalent over wider sections of the histogram. Finally, this expectation is not appropriate if the partition where earnings management is suspected is at the peak of the histogram.

We exploit the unique features of our research design to construct an alternative measure of the expected frequency in each partition, which does not suffer from these deficiencies. We compute the expected frequency in each partition of the histogram (expressed as the proportion of the sample in that partition) of fiscal year earnings as the mean of the actual frequencies in the identical partition of the histograms for the three alternative annual periods. We believe that the frequency in the identical partition of the histograms of earnings computed over the alternative annual periods is a natural benchmark for the frequency in the partition for fiscal year earnings. The quarterly earnings aggregated in all four histograms are the same—only the partitioning into annual periods differs. The statistical significance of deviations from expected frequency is evaluated using a Z-statistic. We describe this Z-statistic below.

With the same number of firm-year observations, $N$, for all four possible annual periods, the difference between the actual frequency and expected frequency is

$$\text{Diff}_i = p_i^{(4)} - \frac{1}{3}(p_i^{(1)} + p_i^{(2)} + p_i^{(3)}), \tag{1}$$

where $p_i^{(q)}$ is the proportion of the sample of earnings in annual period ending in quarter $q$ which is in partition $i$. Following the line of argument in footnote 6 of Burgstahler and Dichev (1997), the asymptotic variance of $\text{Diff}_i$ is

$$\text{VAR}_i = N[p_i^{(4)}(1 - p_i^{(4)}) + \frac{1}{3}(p_i^{(1)}(1 - p_i^{(1)}) + p_i^{(2)}(1 - p_i^{(2)}) + p_i^{(3)}(1 - p_i^{(3)}))] \tag{2}$$

and the test statistic, which under the null is normally distributed with mean zero and standard deviation one, to assess statistical significance of $\text{Diff}_i$ is

$$Z_i = \frac{N \text{Diff}_i}{(\text{VAR}_i)^{1/2}}. \tag{3}$$

Since the formula in Eq. (3) is not exact, we investigate the properties of this standardized difference under the null using Monte-Carlo simulations. We generate pseudo-quarterly earnings as series of Gaussian (mean zero, standard deviation one) random numbers of length 40. We aggregate these into annual earnings in the four
different ways and assign them to partitions based on their values. We find the frequency in each partition and the difference between the actual frequency in the pseudofiscal year and the expected frequency computed as the mean of the frequencies for annual earnings for annual periods ending in the three other quarters. We then compute the test statistics corresponding to the Diff in each partition and their associated *p*-values using the formula in (3). We use these *p*-values to find the rejection percentages at the 1%, 5%, and 10% levels. We find that the rejection percentages for these simulated test statistics (which correspond to the null) are close to their theoretical values. Nevertheless, in interpreting our results, we rely more on the ordinal ranking of the standardized differences in various partitions, computed using Eq. (3), rather than on their magnitudes.

We also assess the significance of deviations from expectations in the neighborhood of thresholds using two other metrics, which are less reliant on distributional assumptions. First, we report the number of consecutive partitions, in the neighborhood of earnings thresholds, where the sign of the deviation from expectations is consistent with earnings management at the threshold. Second, we compute and report the rank, among all partitions, of the absolute value of the standardized differences for partitions around the threshold, to help assess how unusual these test statistics are.

Table 3 presents the results for earnings scaled by market value of equity at the beginning of the annual period using this alternate expectation for frequencies for the 20 partitions surrounding zero. As in Table 2, the lower than expected frequency in the partition to the left of zero (standardized difference of −13.84, highest in absolute value) and the higher than expected frequency in the partition to the right of zero (standardized difference of 8.34, second highest in absolute value), are striking and statistically significant.

Indications of earnings management are not confined to the immediate vicinity of zero earnings. In Table 3, nine consecutive partitions immediately below zero have lower than expected frequencies. The difference between the actual frequency and the expected frequency is significant at the 10% level or better for the six partitions immediately below zero. Not all of the lower than expected frequency in these partitions is attributable to firms with unmanaged earnings in these partitions managing income to achieve the zero threshold. Instead some of these firms, especially those in partitions away from zero, may have engaged in a ‘big bath’ that moved them further away from the threshold in the current period to increase the probability of achieving the threshold in subsequent periods.

Seven consecutive partitions immediately above zero have higher than expected frequencies. Again, we do not believe that all of the excess frequency in these partitions is due to firms with unmanaged earnings below the zero threshold shifting earnings to achieve this threshold. The model in DeGeorge et al. (1999) suggests that some managers, who have surpassed the threshold, prefer to rein in earnings to increase the probability of achieving the threshold in future periods. The fact that seven consecutive partitions, from partition 7 to partition 13, exhibit lower than expected frequencies is consistent with this.

Fig. 1E plots the deviation from the expected frequency in each partition. The abrupt change from large negative deviations from expectations to large positive deviations at partition zero is striking.

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9The probability of nine consecutive negative differences under the null is 1 in 512. The probability of seven consecutive positive differences is 1 in 128. The joint probability of observing a sequence of both of these under the null is 1 in 65,536.

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Similar patterns appear in the histogram of earnings changes (not tabulated). The deviation from expected frequency is negative in partition $-1$ (standardized difference of $-5.70$, largest in absolute value) and positive in partition $0$ (standardized difference of $3.10$, sixth largest in absolute value). 19 consecutive partitions immediately below zero have lower than expected frequencies and four consecutive partitions immediately above zero have larger than expected frequencies.\textsuperscript{10} Again, earnings management does not appear to be confined to the immediate vicinity of thresholds. Some of these insights were not apparent in prior research because their focus was on the immediate vicinity of thresholds and because of the research design used in these studies. Fig. 2 graphs the deviations of actual from expected frequency for scaled changes in net income. Again, the change at the zero partition from large negative deviations to large positive deviations is striking. It is difficult to explain this abrupt change at the hypothesized threshold except as a manifestation of earnings management to meet the threshold of the prior fiscal year’s earnings.

\textsuperscript{10}The probability of observing this sequence by chance is 1 in 8,388,608.

Table 3
Expected and actual frequency of fiscal year net income scaled by market value of equity (Using average of other annual periods as expectation)

<table>
<thead>
<tr>
<th>Partition</th>
<th>Frequency for fiscal year (%)</th>
<th>Average frequency for other three annual periods</th>
<th>Difference</th>
<th>Z-statistic for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-10$</td>
<td>0.721</td>
<td>0.699</td>
<td>0.023</td>
<td>0.83</td>
</tr>
<tr>
<td>$-9$</td>
<td>0.667</td>
<td>0.763</td>
<td>$-0.096$</td>
<td>$-3.60$</td>
</tr>
<tr>
<td>$-8$</td>
<td>0.744</td>
<td>0.755</td>
<td>$-0.011$</td>
<td>$-0.39$</td>
</tr>
<tr>
<td>$-7$</td>
<td>0.767</td>
<td>0.811</td>
<td>$-0.043$</td>
<td>$-1.53$</td>
</tr>
<tr>
<td>$-6$</td>
<td>0.768</td>
<td>0.849</td>
<td>$-0.081$</td>
<td>$-2.84$</td>
</tr>
<tr>
<td>$-5$</td>
<td>0.801</td>
<td>0.882</td>
<td>$-0.082$</td>
<td>$-2.80$</td>
</tr>
<tr>
<td>$-4$</td>
<td>0.844</td>
<td>0.907</td>
<td>$-0.063$</td>
<td>$-2.10$</td>
</tr>
<tr>
<td>$-3$</td>
<td>0.823</td>
<td>0.992</td>
<td>$-0.169$</td>
<td>$-5.67$</td>
</tr>
<tr>
<td>$-2$</td>
<td>0.767</td>
<td>0.985</td>
<td>$-0.217$</td>
<td>$-7.50$</td>
</tr>
<tr>
<td>$-1$</td>
<td>0.674</td>
<td>1.050</td>
<td>$-0.376$</td>
<td>$-13.48$</td>
</tr>
<tr>
<td>$0$</td>
<td>1.476</td>
<td>1.157</td>
<td>0.319</td>
<td>8.34</td>
</tr>
<tr>
<td>$1$</td>
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<td>$2$</td>
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<td>1.378</td>
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<td>0.68</td>
</tr>
<tr>
<td>$3$</td>
<td>1.537</td>
<td>1.472</td>
<td>0.065</td>
<td>1.64</td>
</tr>
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<td>$4$</td>
<td>1.601</td>
<td>1.585</td>
<td>0.016</td>
<td>0.39</td>
</tr>
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<td>$5$</td>
<td>1.756</td>
<td>1.747</td>
<td>0.008</td>
<td>0.20</td>
</tr>
<tr>
<td>$6$</td>
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<td>1.882</td>
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<td>0.69</td>
</tr>
<tr>
<td>$7$</td>
<td>2.003</td>
<td>2.116</td>
<td>$-0.113$</td>
<td>$-2.49$</td>
</tr>
<tr>
<td>$8$</td>
<td>2.232</td>
<td>2.273</td>
<td>$-0.042$</td>
<td>$-0.87$</td>
</tr>
<tr>
<td>$9$</td>
<td>2.390</td>
<td>2.431</td>
<td>$-0.041$</td>
<td>$-0.83$</td>
</tr>
</tbody>
</table>

Notes: Net income was deflated by market value of equity as of the beginning of the annual period. The partitions are of width 0.005 of market value of equity. Only partitions with scaled earnings ranging from $-5\%$ to $5\%$ are presented for the sake of brevity. The frequencies are expressed as percentages of the total sample. The mean of the frequency in the same partition for the three alternative annual periods was used as the expected frequency. The Z-statistics are computed using the formula in Eq. (3) in the paper.
3.5. Are the discontinuities induced by scaling?

As mentioned earlier, several recent papers suggest that the discontinuities at zero in the distribution of scaled earnings and earnings changes may be induced by the scaling procedures used. The results we present in Tables 2 and 3 would seem to argue against scaling being primarily responsible for the observed discontinuities. When present, the discontinuities at zero in the distribution of our alternate annual earnings measures, which are scaled similarly to fiscal year earnings, are much smaller in magnitude and usually not statistically significant. However, Durtschi and Easton (2005) find that firms that report small losses in the fiscal year-end are priced differently than firms that report small losses at the end of the other three quarters.\footnote{They report no differences in pricing for stocks making small profits. See footnote 32 of Durtschi and Easton (2005).} This opens up the possibility that our results in Tables 2 and 3 could also be affected by biases associated with scaling. We investigate this possibility by repeating our Table 3 analysis on unscaled net income and EPS.

Figs. 3A–3D graph the distribution of unscaled annual net income for the four annual periods using partitions of width $100,000$ (as in Durtschi and Easton, 2005). It is apparent from the figures that the peak of the distribution of net income is at zero for all four annual periods. The test for a discontinuity in the distribution at zero used in Burgstahler and Dichev (1997) and by us in Table 2 uses an expected frequency in a partition which is the mean of the actual frequency in the two neighboring partitions. This test is not appropriate to test for a discontinuity at the peak of the distribution. However, our test in Table 3, which uses the mean of the frequency in the partition for the alternate annual periods, is applicable for any partition including the one that encompasses the peak. We therefore perform this test on unscaled fiscal year net income. The results for the 20 partitions around zero net income are reported in Table 4.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig2.png}
\caption{Fig. 2 presents the differences in frequencies, in each partition, of changes in annual earnings scaled by market value of equity at the beginning of the prior year between the fiscal year and the mean of the other three annual periods.}
\end{figure}
The results in Table 4 do not support the DeGeorge et al. (1999) and Durtschi and Easton (2005) assertions that the Burgstahler and Dichev (1997) results on the discontinuity at zero in earnings are attributable to scaling. Our test indicates a discontinuity at zero in the distribution of unscaled net income. The deviation from expected frequency is significantly negative in partition $-1$ (standardized difference of $-12.37$, largest in absolute value) and significantly positive in partition 0 (standardized difference of 8.51, second largest in absolute value). In addition nine consecutive partitions immediately below zero have lower than expected frequencies while six consecutive partitions at and immediately above zero have greater than expected frequencies. The probability of observing this sequence by chance is 1 in 32,768. The tenor of the results is similar to that reported in Table 3 for net income scaled by market value of equity. Fig. 3E graphs the deviations of the actual from expected frequencies for the 100 partitions around zero. Similar to scaled net income, we again observe the abrupt change at zero from large negative to large positive deviations.

We obtain a sense of the pervasiveness of earnings management to avoid reporting losses by aggregating, across partitions, the difference of the actual frequency in the fiscal year from the expected frequency. The sum of these differences for the nine partitions immediately to the left of zero, i.e., $-9$ to $-1$ is 0.908%. Approximately 1% of the total sample appears to have avoided reporting a small loss for the fiscal year. Some of these firms may have succeeded in achieving the threshold of zero earnings—the sum of the differences between the actual and expected frequencies in partitions 1–5 is 0.798%. However, a non-trivial proportion appears to have reined in earnings, perhaps to increase the probability of reaching the threshold in subsequent periods.

Burgstahler and Dichev (1997) document indications of earnings management in the two partitions on either side of zero. They also examine the pervasiveness of earnings management in other partitions by using the frequency in the equidistant partition on the other side of the peak of the histogram as the benchmark. Since prior research documents that the distribution of earnings is skewed (see Basu, 1995; Givoly and Hayn, 2000; Gu and Wu, 2003), the validity of this procedure is open to debate. We believe that our methodology, which does not rely on the earnings distribution being symmetric under the null, is more appropriate. We find indications that earnings management is fairly widespread—it does not appear to be confined to the immediate vicinity of thresholds. This finding is also consistent with predictions from models where managers maximize their compensation over several periods by meeting earnings benchmarks through earnings management.

We also perform a similar analysis (not tabulated) on unscaled changes in net income. Again the results do not suggest that scaling is responsible for the discontinuity at zero that Burgstahler and Dichev (1997) document. The deviation from the expected frequency is significantly negative in partition $-1$ (standardized difference of $-2.48$, seventh highest in absolute value) and significantly positive in partition 0 (standardized difference of 5.34, highest in absolute value). 11 consecutive partitions immediately below zero have lower than expected frequencies and 17 consecutive partitions at or above zero have greater than expected frequencies. The sum of deviations of the 11 partitions immediately to the left of zero, i.e., partitions labeled $-11$ through $-1$ is $-0.706\%$. Approximately 0.7% of the total sample appears to have avoided falling into the region of a small earnings decrease for the

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12The probability of observing this sequence under the null is less than 1 in 260 million.
fiscal year, perhaps through earnings management. The results, again, are similar to those where the change in earnings is scaled by market value of equity.

Fig. 3. Fig. 3 illustrates the effect of the annual measurement period on net income (unscaled). Fig. 3a is the histogram of fiscal year net income. Fig. 3b is the histogram of net income for the year ending at the close of the first fiscal quarter. Fig. 3c is the histogram of net income for the year ending at the close of the second fiscal quarter. Fig. 3d is the histogram of net income for the year ending at the close of the third fiscal quarter. Fig. 3e represents the differences in each partition between the fiscal year histogram in Fig. 3a and an equally weighted average of the histograms in Figs. 3b–d.

fiscal year, perhaps through earnings management. The results, again, are similar to those where the change in earnings is scaled by market value of equity.

13Again, some of these firms may have achieved the threshold of the previous year’s earnings while others may have reined in earnings.
Overall, the results reported in Table 4 suggest that the discontinuity at zero in the distribution of scaled net income is not an artifact of the scaling mechanism. We find similar results when we use unscaled net income. It appears likely that these results are related to earnings management to attain earnings thresholds.

3.6. Are there discontinuities in the distribution of EPS?

Durtschi and Easton (2005) state that “although the focus of the earnings management literature may be on net income, anecdotal evidence suggests that firms, analysts, and shareholders tend to focus on earnings per share. Further, net income is rarely discussed in analysts’ reports or in the popular press—rather the emphasis is on earnings per share.” We therefore focus on the distribution of EPS in this sub-section.

The evidence on this issue in prior research is mixed. Using actual EPS data from I/B/E/S, DeGeorge et al. (1999) find evidence of a discontinuity in the distribution of levels and changes of EPS. On the other hand, Durtschi and Easton (2005), using EPS data from Compustat, find no evidence of such discontinuities. Durtschi and Easton (2005) contend that, because DeGeorge et al. (1999) use actual EPS as reported in the I/B/E/S database of analysts’ forecasts of earnings, their sample is subject to a selection bias. Analysts cover a

Table 4
Expected and actual frequency of fiscal year net income (unscaled) (Using average of other annual periods as expectation)

<table>
<thead>
<tr>
<th>Partition</th>
<th>Frequency for fiscal year (%)</th>
<th>Average frequency for other three annual periods</th>
<th>Difference</th>
<th>Z-statistic for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>−10</td>
<td>0.702</td>
<td>0.677</td>
<td>0.025</td>
<td>1.03</td>
</tr>
<tr>
<td>−9</td>
<td>0.714</td>
<td>0.727</td>
<td>−0.013</td>
<td>−0.53</td>
</tr>
<tr>
<td>−8</td>
<td>0.731</td>
<td>0.787</td>
<td>−0.056</td>
<td>−2.19</td>
</tr>
<tr>
<td>−7</td>
<td>0.791</td>
<td>0.820</td>
<td>−0.029</td>
<td>−1.11</td>
</tr>
<tr>
<td>−6</td>
<td>0.847</td>
<td>0.911</td>
<td>−0.064</td>
<td>−2.34</td>
</tr>
<tr>
<td>−5</td>
<td>0.939</td>
<td>0.972</td>
<td>−0.033</td>
<td>−1.16</td>
</tr>
<tr>
<td>−4</td>
<td>1.027</td>
<td>1.098</td>
<td>−0.071</td>
<td>−2.37</td>
</tr>
<tr>
<td>−3</td>
<td>1.099</td>
<td>1.206</td>
<td>−0.107</td>
<td>−3.43</td>
</tr>
<tr>
<td>−2</td>
<td>1.164</td>
<td>1.377</td>
<td>−0.213</td>
<td>−6.58</td>
</tr>
<tr>
<td>−1</td>
<td>1.079</td>
<td>1.472</td>
<td>−0.393</td>
<td>−12.37</td>
</tr>
<tr>
<td>0</td>
<td>1.901</td>
<td>1.566</td>
<td>0.335</td>
<td>8.51</td>
</tr>
<tr>
<td>1</td>
<td>1.493</td>
<td>1.349</td>
<td>0.144</td>
<td>4.09</td>
</tr>
<tr>
<td>2</td>
<td>1.358</td>
<td>1.260</td>
<td>0.098</td>
<td>2.89</td>
</tr>
<tr>
<td>3</td>
<td>1.266</td>
<td>1.152</td>
<td>0.114</td>
<td>3.50</td>
</tr>
<tr>
<td>4</td>
<td>1.098</td>
<td>1.038</td>
<td>0.060</td>
<td>1.96</td>
</tr>
<tr>
<td>5</td>
<td>1.011</td>
<td>0.964</td>
<td>0.047</td>
<td>1.59</td>
</tr>
<tr>
<td>6</td>
<td>0.861</td>
<td>0.888</td>
<td>−0.027</td>
<td>−0.98</td>
</tr>
<tr>
<td>7</td>
<td>0.870</td>
<td>0.845</td>
<td>0.025</td>
<td>0.92</td>
</tr>
<tr>
<td>8</td>
<td>0.856</td>
<td>0.775</td>
<td>0.081</td>
<td>3.02</td>
</tr>
<tr>
<td>9</td>
<td>0.680</td>
<td>0.749</td>
<td>−0.068</td>
<td>−2.77</td>
</tr>
</tbody>
</table>

Notes: The partitions are of width $100,000. Only partitions with net income from –$1,000,000 to $1,000,000 are presented, for the sake of brevity. The frequencies are expressed as percentages of the total sample. The mean of the frequency in the same partition for the three alternative annual periods was used as the expected frequency. The Z-statistics are computed using the formula in Eq. (3) in the paper.
smaller proportion of firms reporting small losses than those reporting small profits and this difference in coverage is reflected in the I/B/E/S database.

We re-examine this question using our benchmark for the frequency in a partition of the fiscal year EPS as the mean of the frequencies in the identical partition of EPS in the other three annual periods. The EPS data we use is from data item number 27 in the Compustat quarterly database which represents primary EPS, excluding extraordinary items, applicable to the last 12-month period. At year-end, this figure is identical to the fiscal year EPS reported to shareholders. At the end of interim quarters, this figure is approximately the sum of the last four quarterly primary EPS numbers.\textsuperscript{14} We find a significantly larger number of cases where this variable is missing for the first three quarters of the fiscal year than where it is missing for the fourth quarter. We therefore restrict our sample to firm-years where this data item is available for all four quarters of the year. The analysis is conducted on EPS rounded to the nearest cent.

We report results for this test for discontinuities in EPS for twenty partitions around zero in Table 5. The results are similar to those reported for unscaled net income and for net income scaled by market value of equity with the following exception. While in the other cases, there was evidence of a discontinuity at partition zero, in the case of EPS, the discontinuity appears to be shifted by one partition to partition 1. In fact partition 0 has a lower than expected frequency (standardized difference is $-4.55$, fourth largest in absolute magnitude).\textsuperscript{15} Partition 1 has higher than expected frequency (standardized difference of 6.85, largest in absolute magnitude). The incentive appears to be to report positive EPS rather than just non-negative EPS. Nine consecutive partitions, beginning with partition $-8$, have lower than expected frequencies and six consecutive partitions beginning with partition 1 have higher than expected frequencies. The probability of observing this sequence under the null is 1 in 32,768. Fig. 4 graphs the deviations of the actual frequencies from the expected for the 100 partitions around zero EPS. The change from large negative deviations to large positive deviations that we observed for net income is also apparent in this graph. The major difference from the graph for net income is that the positive deviations start at an EPS of one cent rather than at zero.

We also perform a similar analysis (not tabulated) on changes in primary EPS. Again, the sample is restricted to firm-years where this variable is available for all four quarters of the fiscal year. This test investigates earnings management to avoid decreases in fiscal year EPS from the previous year. There are significantly fewer than expected decreases of one cent in fiscal year EPS from the previous year (standardized difference of $-5.91$, largest in absolute magnitude) and significantly more instances than expected where fiscal year EPS just met the threshold of the previous year’s EPS (standardized difference of 4.16, second largest in absolute magnitude). Fourteen consecutive partitions immediately below zero had lower than expected frequencies and three consecutive partitions including and greater than zero had higher than expected frequencies. The probability of observing this sequence under the null is 1 in 131,072. Consistent with DeGeorge et al. (1999) but not with Durtschi

\textsuperscript{14}In their analysis, Durtschi and Easton (2005) use diluted earnings per share but report that they get similar results when they use primary earnings per share.

\textsuperscript{15}We conjecture that the shifting of the discontinuity, relative to that for unscaled net income could be attributable to two reasons. First, the EPS number we use excludes the effect of extraordinary items while net income includes them. We are constrained to use this EPS number because it is the only one Compustat reports for annual periods other than the fiscal year. Second, scaling by weighted average shares outstanding in computing EPS could induce some changes in the distribution.
and Easton (2005), this is indicative of earnings management to meet the threshold of the previous year’s EPS. Because our data is extracted from Compustat, the results cannot be attributed to selection biases associated with analyst following in the I/B/E/S data.

3.7. Is the discontinuity due to the asymmetric tax treatment of profits and losses?

Beaver et al. (2003a) suggest that, because of restrictions on tax refunds for loss firms, the taxes associated with profits are proportionately higher than the tax savings associated with losses. Small profits are therefore taxed differently than small losses. They argue that this asymmetric tax treatment can explain a substantial proportion of the discontinuity at zero in scaled net income. While we do not directly test this assertion, we test one of its implications. If a considerable portion of the discontinuity in net income is attributable to tax effects, the discontinuity at zero in pre-tax income should be perceptibly smaller. Beaver et al. (2003a) test this implication for pre-tax income scaled by market value of equity at the beginning of the year and find that the magnitude of the discontinuity is substantially reduced compared with the discontinuity in similarly scaled net income.

<table>
<thead>
<tr>
<th>Partition</th>
<th>Frequency for fiscal year (%)</th>
<th>Average frequency for other three annual periods</th>
<th>Difference</th>
<th>Z-statistic for difference</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.462</td>
<td>0.506</td>
<td>−0.043</td>
<td>−2.02</td>
</tr>
<tr>
<td>−9</td>
<td>0.527</td>
<td>0.527</td>
<td>0.000</td>
<td>0.00</td>
</tr>
<tr>
<td>−8</td>
<td>0.539</td>
<td>0.576</td>
<td>−0.037</td>
<td>−1.63</td>
</tr>
<tr>
<td>−7</td>
<td>0.513</td>
<td>0.594</td>
<td>−0.081</td>
<td>−3.56</td>
</tr>
<tr>
<td>−6</td>
<td>0.593</td>
<td>0.631</td>
<td>−0.038</td>
<td>−1.63</td>
</tr>
<tr>
<td>−5</td>
<td>0.653</td>
<td>0.679</td>
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<td>−1.03</td>
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<td>0.688</td>
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<td>−2.35</td>
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<td>0.694</td>
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</tr>
<tr>
<td>−2</td>
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<td>0.926</td>
<td>−0.070</td>
<td>−2.42</td>
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<tr>
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<td>1.074</td>
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<td>−0.42</td>
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<td>0.863</td>
<td>0.698</td>
<td>0.165</td>
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<tr>
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<td>0.683</td>
<td>0.642</td>
<td>0.041</td>
<td>1.62</td>
</tr>
<tr>
<td>4</td>
<td>0.631</td>
<td>0.587</td>
<td>0.044</td>
<td>1.81</td>
</tr>
<tr>
<td>5</td>
<td>0.556</td>
<td>0.550</td>
<td>0.007</td>
<td>0.28</td>
</tr>
<tr>
<td>6</td>
<td>0.557</td>
<td>0.517</td>
<td>0.041</td>
<td>1.77</td>
</tr>
<tr>
<td>7</td>
<td>0.507</td>
<td>0.509</td>
<td>−0.002</td>
<td>−0.08</td>
</tr>
<tr>
<td>8</td>
<td>0.477</td>
<td>0.470</td>
<td>0.008</td>
<td>0.35</td>
</tr>
<tr>
<td>9</td>
<td>0.477</td>
<td>0.472</td>
<td>0.005</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Notes: EPS is defined as primary earnings per share, excluding extraordinary items, applicable to the last 12-month period (data item number 27 in the quarterly Compustat database). The sample is restricted to cases where this variable is available, for a specific firm, for all four quarters of the fiscal year. The partitions are of width one cent each. EPS has been rounded to the nearest cent. Only partitions with EPS ranging from −10 cents to 9 cents are presented, for the sake of brevity. The frequencies are expressed as percentages of the total sample. The mean of the frequency in the same partition for the three alternative annual periods was used as the expected frequency. The Z-statistics are computed using the formula in Eq. (3) in the paper.
However, Durtschi and Easton (2005) argue that scaling by market value of equity distorts the distribution and introduces selection biases. We therefore conduct our analysis on unscaled pre-tax income.

We perform, on unscaled pre-tax income, our alternate test based on deviations of the fiscal year frequency in each partition from the mean of the frequencies in the identical partition for the other three annual periods. The results (not tabulated) are similar to those for net income. Again, the actual frequency in partition \(-1\) for fiscal year earnings is significantly lower than expected (standardized difference of 9.14, largest in absolute value) and the actual frequency in partition \(0\) is significantly higher than expected (standardized difference is 6.71, second largest in absolute value). Three consecutive partitions below zero have lower than expected frequency and eight consecutive partitions including and above zero have higher than expected frequencies. The probability of observing this sequence under the null is one in 2048.

The magnitudes of the deviations from the expected frequency are somewhat smaller for pre-tax income than for net income. This finding is open to several possible interpretations, which are not mutually exclusive. First, as Beaver et al. (2003a) suggest, the discontinuity in pre-tax income is smaller than that in net income because net income includes effects attributable to the asymmetric tax treatment of gains and losses while pre-tax income does not. A second possible reason is that pre-tax income excludes the effects of discontinued operations, extraordinary items and tax expense. If managers use these excluded items strategically to achieve earnings thresholds, pre-tax income may not exhibit discontinuities at these thresholds to the same extent as net income. Finally, if zero net income is a threshold for managers, the exclusion of any component of net income may weaken the discontinuity at zero. The effect of the exclusion is similar to that of introducing noise in the distribution of earnings.16 Our tests do not allow us to discriminate between these alternative explanations. Nevertheless it is apparent that a substantial proportion of the

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16In this case, the excluded components are tax expense, income effects of discontinued operations and extraordinary items. We thank the referee for suggesting this explanation.

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discontinuity at zero in the histogram of net income is also present in the histogram of pre-tax income. Fig. 5 graphs the deviation of actual from expected frequency for the 100 partitions around zero for pre-tax income. The change at zero from large negative deviations to large positive ones that we observed for net income is also apparent in this graph. These results seem to indicate that the asymmetric tax treatment of gains and losses is not primarily responsible for the discontinuity at zero in net income.

For completeness, we also perform a similar analysis (not tabulated) on changes in pre-tax income. In contrast to the case for net income, matching the previous year’s pre-tax income is unlikely to be an important target for managers. Not surprisingly therefore, the evidence of a discontinuity in this case is not as strong as for other thresholds. The frequency of observations for fiscal year changes in pre-tax income in partition 0 is considerably higher than expected (standardized difference of 3.81, largest in absolute value). However, the deviation of actual from expected frequency in partition –1 is not significantly different from zero (standardized difference of –0.66).

4. Conclusions

In this paper, we aggregate quarterly earnings over annual periods that differ from the fiscal year and compare the distribution of these alternative annual earnings with those of fiscal year earnings. This research design enables us to explore issues associated with earnings management using, in aggregate, firms as their own controls. A persistent problem that has faced researchers investigating earnings management is estimating what earnings would have been in the absence of earnings management. We view our measures of earnings for the alternative annual periods as serving as a reasonable proxy for this in testing for discontinuities in earnings distributions.

Using our framework, we investigate several questions related to the debate over whether the results in Burgstahler and Dichev (1997) about discontinuities in earnings and earnings change histograms are evidence of earnings management or whether they are spuriously induced by the research design. Our results generally validate the Burgstahler and Dichev (1997) findings and indicate that their main results are not spuriously induced by scaling. They also indicate that, for the most part, the Burgstahler and Dichev (1997) results cannot be attributed to the asymmetric tax treatment of gains and losses. Further, we document that earnings management is not confined to the immediate vicinity of earnings thresholds but is discernible over broader sections of earnings and earnings change histograms.

Our conclusions differ from those in Durtschi and Easton (2005). They find no evidence of a discontinuity at zero in unscaled net income or EPS. We conjecture that differences in our results may be due to differing methodologies to test for discontinuities in distributions. Our findings suggest that while scaling and associated selection biases might contribute to the observed discontinuities, they are not primarily responsible for these discontinuities.

Although we have only considered the specific context of examining for discontinuities in earnings distributions, we believe that the methodology has broader applicability, especially as a measure of earnings management. Our results also have implications for investors and analysts. They suggest that investors and analysts can use quarterly data to unravel part of managers’ earnings management in fiscal year earnings by choosing to
analyze firm performance reported on a different annual basis than the one reported in the annual financial statements.

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