Earnings Management and Accounting Income Aggregation*

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Abstract

We provide evidence on earnings management in fiscal year earnings by exploiting the fact that, in addition to fiscal year earnings disclosed in annual reports, quarterly earnings allow three alternative calculations of firms' annual earnings. The three alternative annual earnings periods to measure earnings start at fiscal quarters two, three, and four and end in the following fiscal year. We confirm prior findings of discontinuities around zero and around prior year earnings in histograms of fiscal year earnings. We also find evidence of earnings management in broader intervals around thresholds. We believe that our research design is better suited to test for earnings management in these broader intervals than those used in prior studies. We also compare the distribution of fiscal year earnings to annual earnings starting with the fiscal year quarters two, three and four. We find that the variance and kurtosis of earnings are higher for fiscal year earnings while skewness of earnings is lower at the fiscal year. The best annual period over which to measure earnings for out-of-sample prediction is the annual period starting with the fourth quarter of the fiscal year. Overall, our results are consistent with earnings management being more prevalent in fiscal year earnings than in annual earnings starting in the second, third, and fourth fiscal quarters.

I. Introduction

In this paper, we hypothesize that managers are particularly concerned about *fiscal year* earnings reported in companies' annual reports because 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 to maximize their compensation. In addition to fiscal year earnings, the SEC requires managers to report earnings for quarterly periods during the year. Under the integral approach to quarterly earnings, recommended by GAAP, quarterly earnings for the year sum up to the fiscal year earnings. Since compensation schemes are often based on fiscal year income, 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. Consistent with this, prior research provides evidence that the characteristics of fourth quarter earnings differ from earnings for the other three quarters.[1] For example, 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).

In this paper, we investigate earnings measured over alternative annual periods, i.e., annual periods ending 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

[1] See, among others, Collins, Hopwood and McKeown (1984), Das and Shroff (2002), and Gu and Lee (2002), Hayn, Narayanamoorthy, and Watts (2001).

periods other than the fiscal year, they have less incentive to manage these earnings. In addition, if fiscal year earnings are managed through the use of accounting accruals in the fourth quarter and if some of these accruals reverse over subsequent quarters, these alternate annual earnings likely better represent the economic earnings for a year than the fiscal year earnings in the financial statements. [2]

In seminal papers, Hayn (1995) and Burgstahler and Dichev (1997, henceforth BD) document the existence and prevalence of a discontinuity around zero earnings and zero earnings changes. BD documents that the histograms of scaled net income and changes in net income have 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. Degeorge, Patel and Zeckhauser (1999, henceforth DPZ), question the validity of the BD results suggesting that because they used scaled earnings in their analyses, their results might be affected by a problem similar to the "aliasing problem" in the literature on the spectral analysis of time-series data.[3] To quote DPZ (footnote 25, page 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."

Using our alternative estimates of annual earnings we are able to examine whether the BD results are indeed a consequence of their use of scaled earnings and earnings changes. If scaling is responsible for the BD results, we should find similar discontinuities

[2] Results in Sloan (1996) and other papers suggest that accruals made in a period reverse over subsequent periods.

[3] Similarly, Durtschi and Easton (2004) question whether scaling based on market value cause the discontinuity since firms with small losses have lower average stock price than firms the small profits.

at zero in the histograms of the alternative annual earnings since they are scaled in the same way as the fiscal year earnings examined in BD.

BD also examine the pervasiveness of earnings management over broader sections of the histogram of earnings and earnings changes. They use the frequency in the identical partitions of the histogram on the other side of its peak as the benchmark to compare the observed frequency. In doing so, they implicitly assume that the portion of the histogram on the other side of the peak from the threshold is unaffected by the earnings management they document. We feel that this assumption is questionable. Prior research (e.g., Basu, 1995, Givoly and Hayn, 2000) documents that scaled earnings are negatively skewed. It is also not obvious that the fiscal year earnings distribution would be symmetric about its peak in the absence of earnings management. We re-examine the pervasiveness of earnings management using a methodology that does not assume symmetry of the distribution under the null and find indications that earnings management is not confined to the immediate vicinity of thresholds.

The BD paper has had a major impact on accounting research. The methodology used in the paper has been used in subsequent papers (e.g., Beatty, Ke and Petroni, 2002, Dichev and Skinner, 2002 and Leuz, Nanda and Wysocki, 2003) investigating earnings management. We think it likely that this methodology will be used in future research examining earnings management. The intention of the analysis in this paper that is related to the BD paper is not to question their main conclusions but rather to refine the methodology.

We propose an alternate methodology to compute expectations for the frequency in each partition of the histogram of earnings (or earnings changes) and thereby test for discontinuities around zero. We compare frequencies in income (and income changes)

partitions for the fiscal year with the average frequencies for the same variables and the same partitions in histograms constructed using annual periods other than the fiscal year. These other annual periods serve as a benchmark for the expected frequency in the partition in periods where the incentives to manage earnings are not as compelling.

In tests that use fiscal year earnings and earnings computed over the alternate annual periods, our results are generally supportive of the BD and DPZ results but we do find some differences. We find similar results to theirs for fiscal year earnings. Moreover, we find little evidence of a discontinuity at zero earnings levels for earnings computed for annual periods ending at interim quarter ends. Earnings management at fiscal year-end to achieve thresholds appears to be responsible for the observed discontinuities in the histogram of earnings. When we examine changes in earnings, however, we find that similar, but smaller, discontinuities around zero are present for changes in annual earnings computed over alternative periods. The BD and DPZ methodologies, therefore, may not be as appropriate in examining changes in earnings. We are also able to get a better measure of the pervasiveness of earnings management over larger sections of the distribution of earnings and earnings changes in addition to the immediate vicinity of the thresholds.

We also distinguish between the "settling up" effect attributable to the integral approach to quarterly income and earnings management as reasons for the higher volatility of fourth-quarter earnings. Lipe and Bernard (2000) examine this question but find inconclusive results. We investigate the second, third and fourth moments of the distribution of net income and earnings per share (EPS) for the fiscal year and for our alternate annual periods. We find that the variance of annual earnings and EPS is higher for the fiscal year than for the other annual periods. In addition, the variance of annual

earnings and EPS declines monotonically as we move from the fiscal year to annual periods ending in the first, second, and third quarters. This result is more consistent with earnings management at fiscal year end than with effects induced by fourth quarter earnings being used to "settle up" the fiscal year earnings with the sum of the earnings for the preceding three quarters.

We find that fiscal year earnings are more negatively skewed than earnings for the other three annual periods. This is a possible result of the "big bath" phenomenon - i.e., firms recording excessively negative accruals in periods when earnings are too low to meet earnings thresholds. This finding too is more consistent with earnings management than with "settling up" affecting fourth quarter earnings.

In this paper, we treat the firm's choice of fiscal year as exogenous to our investigation.[4] We do not view manager's choice of fiscal year end as a strategic variable in the short-term.

The rest of this paper is organized as follows. Section II surveys prior research in the area. Section III develops our research questions and presents our empirical results. Section IV presents our conclusions. The appendix models the time-series of annual earnings formed by aggregating quarterly earnings that follow a specific process.

II. Prior research

Givoly, Ronen, and Schiff (1978) and Collins, Hopwood, and McKeown (1984), among others, document that fourth-quarter earnings are more volatile than interim quarter earnings. This increased volatility has been attributed to several sources. First, there is greater occurrence of write-offs and asset sales in the fourth quarter (see Elliott and Shaw,

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

1988 and Bartov, 1993). Second, under the integral approach, quarterly earnings are assumed to be an integral part of annual earnings and therefore fourth quarter earnings are used to "settle up" or reconcile annual earnings with the sum of quarterly earnings in the preceding three quarters.[5] Under the integral approach, any estimation errors in the preceding three quarters are corrected through fourth quarter earnings- a process which could make fourth quarter earnings more volatile. Third, Oyer (1998) suggests that fourth quarter earnings are more volatile because of activities managers undertake to meet bonus targets.

Other studies examine earnings response coefficients (ERCs) associated with earnings from different quarters. Differences in ERCs between the fourth and other quarters could have several causes. First, annual earnings are audited while interim earnings are only reviewed. Second, for seasonal firms, the fourth quarter often has the highest revenue[6] and therefore the most influence in determining annual income. Third, the settling up effect described in the prior paragraph causes fourth quarter earnings to be volatile. For example, firms using periodic LIFO for inventory use estimates to compute interim earnings which could induce greater volatility when corrections are made in the fourth quarter. Fourth, earnings management could cause fourth-quarter earnings to be more volatile and less informative. The first explanation would predict higher ERCs for fourth-quarter earnings while the last two explanations predict lower ERCs. The preponderance of empirical evidence (e.g., Kross and Schroeder, 1990, Salamon and Stober, 1994, Lipe and Bernard, 2000) suggests that ERCs are lower for fourth quarter unexpected earnings.

[5] See Rangan and Sloan (1998) for a more complete description of the integral approach to annual earnings and its implications.
[6] or highest variance in revenue. See the model in Oyer (1998).

Similar to this paper, Lipe and Bernard (2000) also apply a moving window of annual earnings to investigate whether the volatility of earnings measured over alternate annual periods is consistent with either earnings management or the 'settling up' effect in fourth-quarter earnings. Their empirical evidence is not consistent with either explanation. In contrast, we find indications of earnings management in our tests.

As mentioned earlier, recent studies on earnings management, including Hayn (1995), BD and DPZ, find a discontinuity around zero for levels and changes in earnings. This is suggestive of earnings management to avoid reporting losses and earnings decreases. DPZ and Burgstahler and Eames (2003) also report similar discontinuities around analysts' forecasts of earnings.[7]

Some recent studies question whether earnings management causes the discontinuity around zero in the distribution of earnings. For example, Dechow, Richardson and Tuna (2003) suggest that managers taking real actions (as opposed to accounting decisions) to meet earnings targets could also result in the observed discontinuity.[8] Beaver, McNichols, and Nelson (2002) report that the asymmetric tax treatment of positive and negative earnings explains two thirds of the discontinuity at zero in earnings and earnings changes.

III. **Research Questions, Design and Results**

Incentives arising from compensation and other contracts could cause earnings management to be more pervasive at fiscal year end than at interim quarter ends. We attempt to discern patterns arising from this using a research design which allows each

[7] We do not analyze earnings management to meet analysts' forecasts because our methodology does not lend itself to an examination of this question.

firm to serve as its own control. We measure annual earnings for time periods different from that used to compute fiscal year earnings, specifically for annual periods terminating at the end of the first, second and third quarters of the fiscal year. As argued above, the intuition behind using these alternate annual periods is that the earnings management incentives present at fiscal year end are likely not as powerful at the end of interim quarters. If earnings management at fiscal year end is achieved through accrual manipulation and these accrual manipulations reverse in the following quarters, annual earnings measured over alternate annual periods may be unaffected by the earnings management.

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 to 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.

III.1 Earnings Management to Meet Thresholds

BD offers persuasive evidence that firms manage earnings through either accounting or operating decisions. BD examine histograms of earnings levels and earnings changes. They document the existence of discontinuities in the histograms around zero of both variables: The frequency of observations immediately below zero is less than expected and the frequency at and immediately above zero is greater than expected. These findings are consistent with firms managing earnings to just meet thresholds. DPZ suggest that these results could be spurious – induced by scaling. We examine the histograms of

[8] In this paper, we do not discriminate between earnings management through accounting manipulation or through real actions.

annual earnings computed over alternate periods to investigate whether scaling contributes to the BD results.

We first replicate the BD 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 BD arise because of some mechanical effect, such as the one that DPZ suggest is induced by scaling, we should observe similar patterns in the histograms of earnings for these other annual periods.

We generate the histograms for net income scaled by market value of equity at the beginning of the year and for changes in net income scaled by market value of equity at the beginning of the previous year.[9] We compute the frequency of observations in each partition of the histogram where each partition has a width of 0.5 percent of market value of equity for the histogram of earnings levels and 0.25 percent of market value of equity for the histogram of earnings changes.[10] In our first tests, similar to BD, 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.[11] Also following BD, we compute a test (Z) statistic to evaluate the statistical significance of deviations from the expected frequency. This statistic is the deviation from expected frequency in the partition deflated by the estimated standard deviation of the deviations from expected frequency.

Our initial sample consists of all firms on the quarterly Compustat database between 1981 and 2001. The sample contains 920,926 quarterly observations for 22,015

[9] In sensitivity tests we also deflate by total assets instead of market value of equity.
[10] BD use this same width for their partitions.
[11] Also similar to BD, 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.

distinct firms from 1981 to 2001. Firm coverage varies from 6,482 firms in 1981 to 12,134 in 2001.

We first replicate the analysis in BD for fiscal year earnings and changes in fiscal year earnings and then perform a similar analysis for our three alternative annual periods. If 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. If, on the other hand, the patterns are spurious and induced by scaling we should also see similar patterns for the three alternative annual periods. We test for discontinuities in the histograms of earnings scaled by market value of equity. Table 2 presents results for the forty partitions around zero. Panel A reports the results for levels of net income and panel B the results for changes in net income. For each of the panels, we present results for the four annual periods, i.e., for annual periods ending at the first quarter, the second quarter, the third quarter and the fourth quarter. The last annual period, ending in the fourth quarter, corresponds to the fiscal year. 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 presented in panel A confirm the prior findings in BD for fiscal year annual earnings around zero (the last 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 BD 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).[12] 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 these 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. Figures 1A through 1D 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. These results do not support DPZ's contention that scaling is responsible for the BD results around zero.

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 earnings separately for each annual period. Consistent with this conjecture, we find that the average 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 0.84 for annual periods ending in quarter 1, 0.79 for annual periods ending in quarter 2, 0.81 for annual periods ending in quarter 3 and 0.95 for the fiscal year earnings.

[12] We 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.

The results for a similar analysis for changes in net income are presented in Panel B of Table 2. This analysis, as in BD, seeks to discern if managers also manage earnings to avoid decreases in earnings from the previous year. The results again support the earnings management story for fiscal year earnings. However, 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 positive for all four annual periods.[13] We conjecture the reason we observe 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). This is apparent from the histograms for changes in earnings deflated by market value of equity for all four annual periods presented in figures 2A to 2D. BD 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. The BD methodology to estimate expected frequency may not be as appropriate near the peak of the distribution.[14]

In a second test, we exploit the unique features of our research design to construct an alternative measure of the expected frequency in each partition. We compute the expected frequency in each partition of the histogram of fiscal year earnings as the mean of the actual frequencies in the identical partition of the histograms for the three alternate annual periods. We believe that the frequency in the identical partition of the histograms of earnings computed over the alternate annual periods is a natural benchmark for the frequency in the partition for fiscal year earnings. The earnings aggregated in all four histograms is the same – only the partitioning into annual periods differs.

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

The statistical significance of deviations from expected frequency is evaluated using a Z-statistic.[15]

The results, for the forty partitions surrounding zero, using this alternate expectation are presented in Table 3. As in Table 2, Panel A has results for levels of earnings while Panel B reports results for earnings changes.

As in table 2, the lower than expected frequency in the partition to the left of zero, and the higher than expected frequency in the partition to the right of zero, are striking and statistically significant. It is also noteworthy that indications of earnings management are not confined to the immediate vicinity of zero earnings or earnings changes. In Panel A of Table 3, nine consecutive partitions immediately below zero have lower than expected frequencies. Likewise, seven consecutive partitions immediately above zero have higher than expected frequencies.[16] The difference of the actual frequency from the expected is significant at the ten percent level or better for the six partitions immediately below zero

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[14] The alternate measures of expected frequency that BD use, for example, the mean of the frequencies in the four adjacent partitions, two on either side, are also subject to the same criticism.

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

$$\text{Diff} = p_0^{(4)} - \frac{1}{3}\left\{p_0^{(1)} + p_0^{(2)} + p_0^{(3)}\right\}.$$

Where $p_0^{(i)}$ is the proportion of the sample of earnings in annual period ending in quarter i which is in partition 0.

Following the same line of argument as in footnote 6 of Burgstahler and Dichev (1997), the asymptotic variance is

$$\text{VAR} = N\left[p_0^{(4)}\left(1-p_0^{(4)}\right) + \frac{1}{9}\left\{p_0^{(1)}\left(1-p_0^{(1)}\right) + p_0^{(2)}\left(1-p_0^{(2)}\right) + p_0^{(3)}\left(1-p_0^{(3)}\right)\right\}\right].$$

$$\text{Z} = \frac{\sqrt{N}\,\text{Diff}}{\left[p_0^{(4)}\left(1-p_0^{(4)}\right) + \frac{1}{9}\left\{p_0^{(1)}\left(1-p_0^{(1)}\right) + p_0^{(2)}\left(1-p_0^{(2)}\right) + p_0^{(3)}\left(1-p_0^{(3)}\right)\right\}\right]}.$$

[16] The probability of 9 consecutive negative differences under the null is one in 512. Probability of 7 consecutive positive differences is 1 in 128. The joint probability of getting a sequence of both of these under the null is 1 in 65,536.

and for the two partitions immediately above (and including) zero. Seven consecutive partitions from partition 7 to partition 13 exhibit lower than expected frequencies. This might be indicative of the 'reining in' that the model in DPZ suggests might be optimal for managers who have surpassed the threshold.

BD 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 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, the validity of this procedure is open to some doubt. 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 - earnings management does not appear to be confined to the immediate vicinity of the threshold.

We obtain an idea of the pervasiveness of earnings management to avoid reporting losses by aggregating, across partitions, the difference of the fiscal years actual frequency from the expected frequency. The sum of these differences for the nine partitions immediately to the left of zero, i.e., those labeled -9 to that labeled -1 is 1.14 percent. Approximately one percent of the total sample appears to have avoided reporting a small loss for the fiscal year. The majority of these firms may have succeeded in achieving the threshold of zero earnings but some proportion appears to have reined in earnings, perhaps in order to increase the probability of reaching the threshold in the subsequent period.[17]

[17] The sum of the positive deviations from expected frequencies in partitions 0 to 7 in panel A of Table 3 is 0.618 percent. This is less than the sum of negative deviations in partitions -9 to -1 of 1.14 percent. We conjecture that the difference is due to some firms in partitions -9 to -1 reining in earnings, perhaps by taking a 'big bath.'

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

There are also indications (not tabulated) of larger outliers in the distribution of fiscal year earnings than in the distributions of annual earnings over other annual periods. This is supportive of the "big bath" phenomenon to manage fiscal year earnings.

Similar patterns appear in the histogram of earnings changes. Frequencies for forty partitions around zero are tabulated in Panel B of Table 2. 19 consecutive partitions immediately below zero have lower than expected frequencies and four consecutive partitions immediately above zero have larger than expected frequencies. Again, the probability of observing this by chance is extremely small. The sum of deviations of the 19 partitions immediately to the left of zero, i.e., partitions labeled -19 through -1 is -1.7 percent. Almost two percent of the total sample appears to have avoided falling into the region of a small earnings decrease for the fiscal year, perhaps through earnings management.[18] Again, earnings management does not appear confined to the immediate vicinity of thresholds. This is also apparent in Figure 2E which plots the deviations from expected frequencies in each partition. Here again the abrupt change from large negative deviations to large positive deviations is noteworthy. Some of these insights were not apparent in the BD and DPZ analyses because the focus of their studies was the immediate vicinity of thresholds and because of the methodology they used.

III.2 Moments of the earnings distribution

As mentioned in the section on prior research, there are competing explanations for the lower ERCs for fiscal fourth-quarter earnings. According to one theory, the integral

[18] Again, some of these firms appear to have achieved the threshold of the previous years earnings while others may have reined in earnings.

approach to interim earnings causes fourth-quarter earnings to be more noisy than earnings for the other three quarters because fourth quarter earnings are used to 'settle up', or reconcile, the fiscal year earnings with the earnings of the previous three quarters. The earnings of the preceding three quarters could use estimates and approximations that may need to be corrected in computing annual earnings. Another theory suggests that fourth quarter earnings contain more noise because of earnings management at fiscal year end. Lipe and Bernard (2000) hypothesize that if settling up causes noisy fourth quarter earnings then the fiscal year earnings should be less volatile than annual earnings measured over other intervals. This is because, they argue, settling up corrects for errors in the earnings recorded in the first three quarters and renders the fiscal year earnings more accurate and less noisy. They also predict that, if this is the case, volatility should progressively increase as we move to annual periods ending in the first, second and third quarters because noise increases.

If, however, fourth quarter earnings are noisy because of earnings management through accruals manipulation and some of this accrual manipulation reverses over subsequent quarters, the predictions reverse. Fiscal year annual earnings would be expected to be the most volatile. The reversing accruals cause earnings measured over annual periods to become less volatile as we move to annual periods ending at quarter one and two. Volatility reaches its lowest level for the annual period ending in the third quarter when accruals have reversed to the greatest extent. Lipe and Bernard (2000) test their predictions using a pooled cross-sectional and time-series sample. They fail to find support for either of these theories. In contrast, we compute the volatility of fiscal year earnings and rank it relative to the volatility of earnings computed over annual periods ending at the first, second and third quarters for the same firm. Each firm acts as its own

control as the underlying quarterly earnings that are aggregated is the same. We then aggregate the rankings over all the firms in the sample.

We also examine higher moments of annual earnings. Prior research documents that write-offs are more common in the fourth quarter (Elliot and Shaw, 1988). A possible manifestation of the big bath phenomenon, this could cause fiscal year earnings to be negatively skewed compared to earnings for other annual periods.[19] We measure the skewness of firms' annual earnings aggregated in each of the four ways to examine if fiscal year earnings are more negatively skewed. Our initial skewness measure is $\left[(X-\mu)^3\right]/\sigma^3$, where X is annual earnings, μ is the mean of earnings, and σ is the standard deviation of earnings. We also compute two alternative measures of skewness described in McNichols (1988). Skewness measure 2 is $(\mu - Median)/\sigma$ and Skewness measure 3 is $(Median - Minimum)/(Maximum - Median)$. For all three skewness measures, we perform the analysis within each firm and aggregate the results across firms. We restrict our analysis to firms where sufficient data is available to compute annual earnings for at least ten years.

Bartov (1993) finds that over half of the sales of long-lived assets take place in the fourth quarter. Elliott and Shaw (1988) suggest that the majority of write-offs take place in the fiscal fourth quarter. If firms manage earnings by taking write-offs and recognizing gains on asset sales in the fourth quarter, the distribution of earnings would have fatter tails in the fiscal year compared to other annual periods. We test for this by measuring the kurtosis, the fourth moment, of the distribution. Fatter tails would cause kurtosis to be higher. We measure the kurtosis coefficient of fiscal year earnings and compare it to the

kurtosis coefficient of annual earnings measured over other annual intervals. The kurtosis coefficient is computed as $\left[(X-\mu)^4\right]/\sigma^4 - 3$.

To validate our predictions for the higher moments of earnings under both scenarios, we simulate quarterly earnings series. Each draw of earnings for year t and quarter i, Q_{ti} is from a distribution N(0.25,1). These quarterly earnings are aggregated to get annual earnings in the four different ways. Earnings management in fiscal year earnings is introduced to meet the zero earnings threshold, the threshold of the previous year's earnings and by simulating a big bath when unmanaged earnings are unusually low. Specifically, if unmanaged fiscal year earnings are between (-0.2+η) where η is N(0,0.01), and zero earnings management is assumed to bring earnings up to zero. Similarly, if the fiscal year earnings are less than the prior fiscal year earnings by less than 0.2, earnings management is assumed to bring the current fiscal year earnings up to the level of last years earnings. Finally, if fiscal year earnings are less than -1, the firm is assumed to take a big bath, reducing fiscal year earnings by 1 unit. The earnings management in all three cases is assumed to reverse in subsequent quarters. We vary the period over which earnings management to meet thresholds is assumed to reverse from one quarter to six quarters. Earnings management through big-baths are assumed to reverse over twice the reversal period of the earnings management to meet thresholds. We simulate quarterly earnings for 5,000 firms using series of length 40 for each of the six reversal periods and compute variance, skewness and kurtosis for annual earnings aggregated in the four different ways. In Panel A of Table 4 we present the simulation results for these three variables averaged over the six reversal periods. We aggregate simulated quarterly

[19] We assume that some of the effects of the big bath reverse in following quarters and therefore the effects are not as pronounced on the earnings of annual earnings periods.

earnings for each firm, to arrive at four different estimates of annual earnings. For each of these four cases, we calculate the value of the measure (either variance, skewness or kurtosis) for each firm's annual earnings. For each firm, we then rank the measure, where the comparison is between its values for the four annual periods, and assign 4 to the highest measure and 1 to the lowest measure. The average rank is therefore 2.5. We then calculate the average rank across all firms, separately for each of the four annual periods. We proceed to test whether the rank of the variable for fiscal year earnings is different from that for the three other annual periods.

The simulation results confirm our intuition about the patterns that are induced by earnings management to meet fiscal year targets. Variance is highest for fiscal year earnings (i.e., earnings for the annual period ending at the fourth quarter). Also variance decreases monotonically as we move from the fiscal year to annual periods ending at the end of the first, second and third quarters. Skewness is lowest (i.e., most negative) for fiscal year earnings and increases monotonically as we move to annual periods ending at the first, second and third quarters. Kurtosis is highest for fiscal year earnings and lowest for annual earnings for the period ending at quarter two.

We also simulate quarterly earnings under the 'settling up' hypothesis. We simulate 10,000 series of 40 quarterly earnings. Quarterly earnings for the first three quarters of the fiscal year are drawn from a N(0.25,1) distribution. Earnings for the fourth quarter are defined to be:

$$1 - \sum_{q=1}^{3} EARN_q + \varepsilon$$

Where $EARN_q$ is the simulated earnings for fiscal quarter q and ε is a N(0,1) white noise term. Annual earnings for each of the four annual periods are computed as the sum

of four consecutive quarterly earnings. As before, we rank the variance, skewness and kurtosis of earnings for the four different annual periods within each series and average them across the 10,000 series. We report the simulation results in Panel B of Table.

Again, consistent with our intuition, under the 'settling up' hypothesis, variance is lowest for the fiscal year (i.e., the annual period ending in quarter four). It increases monotonically and reaches its peak for the annual period ending in quarter three. The skewness coefficient is lowest for the annual period ending in quarter one and is highest for the annual period ending in quarter two. The kurtosis coefficient is highest for fiscal year earnings and is lowest for the annual period ending in quarter two. The simulation results suggest that both the earnings management and the 'settling up' theories have similar predictions for kurtosis but very different predictions for the variance and skewness of annual earnings from the four annual periods.[20]

We next investigate the statistical properties of the distribution of actual annual earnings and earnings per share (EPS) to see if they conform to the patterns we find in the simulated earnings under either of the theories. We analyze the moments of earnings and EPS for each firm, aggregating quarterly earnings in the four different ways. Again the aggregation uses the same underlying quarterly data and therefore, as in earlier tests, each firm acts as its own control. The first moment, the mean, is therefore the same for all four aggregation methods. We investigate, in sequence the higher moments, variance, skewness, and kurtosis corresponding to the second, third and fourth central moments respectively.

[20] To examine the sensitivity of the simulation results to the parameters we used, we varied these parameters. We find that the ordering of the results is robust to a broad range of parameter values.

Our results for the variance, reported in Table 4, are more consistent with the earnings management story than the settling up story. The ordering of the variances is identical to the ordering in the simulated series in which earnings management was introduced. The ordering differs substantially from that for the simulated series under the 'settling up' assumption. For both net income and EPS, the mean rank of the variance of fiscal year earnings is significantly higher than the mean rank for any of the other three annual periods. Moreover, the variance declines monotonically as we move from fiscal year earnings to earnings for the annual periods ending in quarters one, two and three. This is the pattern we expect if managers manage earnings by taking large accruals in the fourth quarter, perhaps to meet annual earnings targets, and if these accruals reverse in succeeding quarters. Lipe and Bernard (2000) did not find support for either of the theories, perhaps because they aggregate across firms. We believe our research design where each firm is its own control makes for a cleaner test.

We perform a similar analysis for the skewness of the distribution of earnings. If managers take a big bath when unmanaged earnings are low, this will induce negative skewness in the distribution of earnings. This effect will lead to a lower rank of earnings skewness at the fiscal year end if some of the effects of the big bath reverse over succeeding quarters. Our results, reported in panel C of Table 4, are consistent with this prediction and with results in panel A of the table where earnings management was induced in simulated series. The rank of the skewness coefficient for both net income and EPS are lowest (i.e., most negative) for the fiscal year. A greater number of large negative realizations of earnings appear in the fiscal year aggregation than in the other three. The results for the other two skewness measures are similar. The distribution of annual earnings is most negatively skewed when fiscal year earnings are used. (Note that for

skewness measure 3, a higher rank indicates that the distribution is more negatively skewed). This suggests that managers take large negative accruals in the fourth quarter which reverse, at least partially, in subsequent quarters.

Finally, we analyze the fourth moment of earnings, kurtosis. We find that the kurtosis of EPS is larger at the reported fiscal year than at alternative annual periods. The ordering of the kurtosis coefficient is the same as that in the simulated series in both panels A and B. However for net income, the kurtosis coefficient is highest for annual earnings for the period ending in quarter one. These results are weakly consistent with both the settling up theory and earnings management through the big bath phenomenon or managers taking large positive accruals on occasion.

Overall our results for the higher moments of the earnings distribution are more consistent with the earnings management theory than with the settling up theory for fourth quarter earnings. When the predictions of the two theories differ, our results generally support the predictions under earnings management.

One implication of the higher variance of fiscal year earnings compared to the earnings for the other annual periods is that these earnings should be harder to predict. To test this implication, we compare the predictability of earnings computed using each of our four annual periods. In untabulated results we find that out of sample random walk errors are larger for fiscal year earnings than for earnings using the alternative annual periods.

IV. Conclusion

In this paper, we aggregate quarterly earnings over annual periods that differ from the fiscal year and compare the properties of these pseudo-annual earnings with those of fiscal year earnings. This research design enables us to explore issues associated with earnings management using each individual firm as its own control.

We validate the findings of BD about earnings management to meet thresholds using our framework. Our results indicate that the BD results are not spuriously induced by scaling as DPZ suggest. Further, using a methodology which we argue is more appropriate than that used in BD to examine the same question, we document that earnings management is not confined to the immediate vicinity of earnings thresholds. We believe that this paper contributes to the methodology pioneered by Hayn (1995) and BD to test for earnings management.

We attempt to discriminate between earnings management and 'settling up' as the reasons for the lower ERCs of fourth fiscal quarter earnings. We find that the variance of fiscal year earnings is higher than the corresponding variances of earnings computed over other annual periods. We also find that this variance declines monotonically as we move from fiscal year earnings to earnings computed over annual periods ending at the first, second and third quarters. Further, we find that the distribution of fiscal year net income and EPS are more negatively skewed, than the corresponding distributions for alternative annual periods. Both these findings are more consistent with the earnings management than with the 'settling up' theory.[21]

Our results have implications for investors and analysts. They suggest that investors and analysts can use quarterly data to unravel part of managers' earnings management decisions by choosing to analyze firm performance reported on a different annual basis than the one reported in the annual financial statements.

[21] Since we always aggregate across four quarters and include one fourth quarter in each aggregation, at least one quarter in every annual period is audited. Consequently, we do not believe that our major results are driven by differences in the audit quality of the last quarter of the fiscal year compared to the other three quarters.

Collectively, we view our results as further evidence confirming the prevalence of earnings management particularly in annual earnings. Our methodology is applicable to other settings. As one natural extension, we could investigate the properties of earnings relative to cash flows. Second, a similar study on non-U.S. firms with interim earning might reveal whether the room for managerial discretion varies due to, for example, some countries allowing for more, or less, flexibility in financial reporting. For example, it is possible that earnings from firms in countries with more book-tax conformity are less likely to exhibit these patterns.

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Table 1
Example of Aggregation of Net Income for Alternative Annual Periods

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

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.

Table 2

Panel A: Frequency distribution of market value deflated earnings

Annual period ending in fiscal year quarter

Partition	One			Two			Three			Four		
	Freq. (%)	Freq.- Exp. Freq	Z-stat	Freq. (%)	Freq.- Exp. Freq	Z-stat	Freq (%)	Freq.- Exp. Freq	Z-stat	Freq. (%)	Freq.- Exp. Freq	Z-stat
-20	0.506	0.016	0.66	0.499	-0.022	-0.85	0.519	0.014	0.52	0.488	-0.014	-0.56
-19	0.508	-0.007	-0.27	0.533	0.023	0.88	0.528	-0.012	-0.45	0.521	0.035	1.40
-18	0.523	-0.009	-0.36	0.520	-0.018	-0.70	0.561	0.017	0.62	0.483	-0.037	-1.50
-17	0.557	0.024	0.92	0.545	-0.010	-0.39	0.560	0.011	0.39	0.520	0.018	0.69
-16	0.543	-0.021	-0.79	0.590	-0.002	-0.08	0.538	-0.063	-2.35	0.522	-0.007	-0.28
-15	0.570	-0.013	-0.47	0.640	0.057	2.00	0.643	0.066	2.31	0.538	-0.019	-0.72
-14	0.622	0.011	0.38	0.576	-0.051	-1.84	0.616	-0.008	-0.28	0.591	0.024	0.89
-13	0.654	-0.003	-0.12	0.614	-0.014	-0.49	0.606	-0.038	-1.36	0.597	-0.037	-1.34
-12	0.692	0.017	0.59	0.680	0.051	1.75	0.672	0.020	0.67	0.677	0.055	1.92
-11	0.695	0.006	0.20	0.644	-0.066	-2.24	0.700	0.028	0.93	0.647	-0.052	-1.82
-10	0.687	-0.047	-1.57	0.739	0.040	1.29	0.671	-0.060	-2.01	0.721	0.065	2.19
-9	0.771	0.052	1.69	0.754	-0.012	-0.39	0.763	0.068	2.20	0.667	-0.066	-2.25
-8	0.752	-0.033	-1.07	0.794	0.004	0.14	0.718	-0.067	-2.17	0.744	0.027	0.89
-7	0.798	-0.008	-0.24	0.826	0.023	0.70	0.808	0.011	0.35	0.767	0.011	0.37
-6	0.860	0.033	1.00	0.812	-0.058	-1.78	0.875	0.033	0.99	0.768	-0.016	-0.51
-5	0.857	-0.006	-0.19	0.914	0.029	0.85	0.876	-0.010	-0.28	0.801	-0.005	-0.17
-4	0.866	-0.036	-1.10	0.959	-0.010	-0.30	0.896	-0.044	-1.27	0.844	0.033	1.02
-3	0.948	0.026	0.75	1.024	0.054	1.51	1.004	0.058	1.63	0.823	0.017	0.53
-2	0.978	0.000	-0.01	0.981	-0.084	-2.33	0.995	-0.024	-0.68	0.767	0.019	0.61
-1	**1.010**	**-0.072**	**-2.01**	**1.105**	**0.048**	**1.29**	**1.035**	**-0.038**	**-1.04**	**0.674**	**-0.447**	**-14.00**
0	**1.185**	**0.062**	**1.62**	**1.133**	**-0.031**	**-0.81**	**1.153**	**0.013**	**0.34**	**1.476**	**0.445**	**10.99**
1	1.238	-0.042	-1.06	1.222	-0.053	-1.32	1.243	-0.004	-0.10	1.387	-0.053	-1.27
2	1.374	0.030	0.74	1.417	0.052	1.22	1.342	-0.008	-0.20	1.404	-0.058	-1.39
3	1.449	-0.019	-0.44	1.509	-0.011	-0.26	1.458	0.001	0.03	1.537	0.035	0.80
4	1.562	-0.023	-0.52	1.623	-0.032	-0.70	1.571	-0.019	-0.42	1.601	-0.046	-1.02
5	1.720	0.005	0.12	1.801	0.035	0.73	1.721	0.001	0.03	1.756	-0.001	-0.02
6	1.867	-0.031	-0.64	1.910	-0.070	-1.40	1.869	-0.049	-1.01	1.912	0.033	0.69
7	2.076	0.013	0.26	2.158	0.057	1.09	2.115	0.046	0.90	2.003	-0.069	-1.39
8	2.259	-0.001	-0.02	2.292	-0.024	-0.45	2.269	0.024	0.46	2.232	0.035	0.68
9	2.444	0.047	0.85	2.475	0.003	0.05	2.374	-0.006	-0.11	2.390	0.017	0.32
10	2.536	-0.041	-0.73	2.652	0.030	0.52	2.491	-0.081	-1.43	2.514	-0.044	-0.79
11	2.709	0.055	0.96	2.770	0.033	0.57	2.770	0.122	2.08	2.726	0.104	1.83
12	2.773	0.020	0.34	2.820	-0.008	-0.14	2.804	0.028	0.46	2.729	-0.015	-0.25
13	2.796	0.072	1.23	2.887	0.078	1.30	2.783	0.024	0.41	2.762	0.022	0.38
14	2.676	-0.030	-0.52	2.798	0.070	1.18	2.713	0.022	0.38	2.750	0.058	1.01
15	2.616	0.066	1.17	2.570	-0.056	-0.98	2.599	0.020	0.34	2.622	0.040	0.71
16	2.424	-0.069	-1.26	2.454	-0.008	-0.14	2.445	-0.047	-0.84	2.413	-0.077	-1.42
17	2.370	0.114	2.12	2.353	0.051	0.94	2.385	0.072	1.32	2.359	0.085	1.60
18	2.089	-0.092	-1.80	2.150	-0.032	-0.62	2.180	0.002	0.03	2.134	0.003	0.05
19	1.991	0.055	1.11	2.012	0.060	1.18	1.972	0.017	0.33	1.905	-0.071	-1.46

Panel B: Frequency distribution of market value deflated earnings changes

Annual period ending in quarter

	One			Two			Three			Four		
Partition	Freq. (%)	Freq.-Exp. Freq	Z-stat	Freq. (%)	Freq.-Exp. Freq	Z-stat	Freq (%)	Freq.-Exp. freq	Z-stat	Freq. (%)	Freq.-Exp. freq	Z-stat
-20	0.567	-0.032	-1.10	0.559	-0.020	-0.68	0.546	-0.057	-1.92	0.570	0.008	0.27
-19	0.636	0.027	0.90	0.609	-0.001	-0.02	0.626	0.015	0.50	0.587	0.008	0.27
-18	0.651	-0.007	-0.24	0.660	0.011	0.36	0.675	0.004	0.13	0.588	-0.022	-0.73
-17	0.681	0.007	0.22	0.689	0.007	0.22	0.716	0.038	1.14	0.632	0.008	0.26
-16	0.697	0.000	-0.02	0.703	-0.014	-0.44	0.682	-0.063	-1.93	0.661	-0.027	-0.85
-15	0.713	-0.017	-0.52	0.746	-0.009	-0.26	0.775	0.026	0.75	0.742	0.045	1.39
-14	0.764	0.018	0.53	0.806	0.021	0.62	0.816	0.020	0.56	0.734	-0.021	-0.64
-13	0.779	-0.030	-0.87	0.823	-0.008	-0.22	0.818	-0.028	-0.78	0.767	-0.006	-0.19
-12	0.853	0.004	0.13	0.856	-0.049	-1.35	0.876	0.025	0.69	0.813	0.018	0.52
-11	0.918	-0.025	-0.67	0.987	0.057	1.48	0.883	-0.067	-1.81	0.824	-0.036	-1.04
-10	1.033	0.076	1.97	1.004	-0.007	-0.18	1.025	0.062	1.58	0.908	0.013	0.35
-9	0.996	-0.084	-2.16	1.036	-0.006	-0.15	1.043	-0.031	-0.77	0.966	-0.025	-0.65
-8	1.127	0.056	1.40	1.079	-0.040	-0.99	1.123	-0.015	-0.36	1.073	0.038	0.96
-7	1.145	-0.046	-1.11	1.204	-0.002	-0.04	1.233	0.047	1.09	1.105	-0.014	-0.34
-6	1.254	-0.004	-0.09	1.331	0.030	0.68	1.250	-0.055	-1.27	1.164	-0.003	-0.08
-5	1.370	-0.006	-0.13	1.399	-0.027	-0.59	1.377	-0.017	-0.37	1.230	-0.031	-0.72
-4	1.499	0.022	0.48	1.520	-0.022	-0.47	1.538	0.037	0.77	1.357	-0.023	-0.51
-3	1.583	-0.054	-1.12	1.687	0.001	0.02	1.626	-0.044	-0.88	1.529	0.020	0.43
-2	1.775	0.041	0.81	1.851	0.078	1.49	1.801	0.009	0.17	1.661	0.075	1.55
-1	**1.885**	**-0.052**	**-1.00**	**1.859**	**-0.136**	**-2.56**	**1.958**	**-0.029**	**-0.53**	**1.643**	**-0.338**	**-6.72**
0	**2.099**	**0.035**	**0.64**	**2.140**	**0.092**	**1.64**	**2.173**	**0.073**	**1.30**	**2.299**	**0.278**	**4.93**
1	2.244	0.011	0.20	2.236	-0.036	-0.63	2.240	-0.039	-0.67	2.401	-0.019	-0.32
2	2.366	0.036	0.61	2.406	0.058	0.97	2.386	0.048	0.81	2.540	0.112	1.87
3	2.416	0.092	1.58	2.460	0.062	1.04	2.436	0.094	1.57	2.455	0.028	0.47
4	2.281	-0.054	-0.94	2.389	0.080	1.34	2.297	0.051	0.88	2.315	0.014	0.24
5	2.255	0.099	1.75	2.160	-0.054	-0.95	2.055	-0.065	-1.17	2.148	-0.063	-1.12
6	2.030	-0.005	-0.10	2.039	0.076	1.39	1.944	0.037	0.69	2.105	0.124	2.28
7	1.816	-0.022	-0.42	1.765	-0.098	-1.90	1.759	-0.016	-0.32	1.815	-0.033	-0.65
8	1.646	-0.021	-0.42	1.689	0.029	0.57	1.607	-0.033	-0.67	1.591	-0.064	-1.32
9	1.518	-0.005	-0.12	1.555	0.009	0.18	1.521	0.039	0.82	1.495	-0.018	-0.39
10	1.400	0.034	0.76	1.404	-0.028	-0.60	1.357	-0.027	-0.59	1.435	0.051	1.12
11	1.214	-0.089	-2.08	1.308	0.032	0.73	1.246	-0.014	-0.32	1.273	-0.034	-0.80
12	1.205	0.042	1.01	1.148	-0.053	-1.25	1.162	0.009	0.21	1.181	0.002	0.06
13	1.112	-0.020	-0.49	1.093	0.010	0.25	1.062	-0.025	-0.61	1.083	-0.033	-0.83
14	1.059	0.025	0.64	1.017	0.015	0.38	1.010	0.010	0.26	1.052	0.027	0.69
15	0.955	-0.036	-0.95	0.912	-0.044	-1.17	0.938	-0.029	-0.77	0.966	0.002	0.07
16	0.922	0.023	0.64	0.895	0.047	1.29	0.925	0.042	1.12	0.875	-0.029	-0.79
17	0.843	0.011	0.32	0.784	-0.039	-1.13	0.828	-0.024	-0.66	0.842	0.002	0.07
18	0.741	-0.036	-1.07	0.751	-0.036	-1.07	0.779	-0.029	-0.83	0.804	0.014	0.40
19	0.710	0.001	0.05	0.791	0.078	2.29	0.787	0.056	1.64	0.738	-0.005	-0.15

Notes to Table 2:

Earnings were deflated by market value of equity as of the beginning of the year. Earning changes were deflated by market value of equity as of the beginning of the prior year. 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 -10% to 10% and earnings changed scaled by market capitalization of -5% to 5% are presented in the table. The Z statistic is computed using the formula described in footnote 6 of Burgstahler and Dichev (1997).

Table 3

PANEL A: Expected and actual frequency of market value deflated fiscal year net income

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency in other three annual periods	Difference	Z-stat for difference
-20	0.488	0.508	-0.020	-0.87
-19	0.521	0.523	-0.002	-0.08
-18	0.483	0.535	-0.051	-2.27
-17	0.520	0.554	-0.034	-1.44
-16	0.522	0.557	-0.035	-1.49
-15	0.538	0.617	-0.080	-3.31
-14	0.591	0.605	-0.014	-0.55
-13	0.597	0.625	-0.027	-1.10
-12	0.677	0.682	-0.005	-0.18
-11	0.647	0.679	-0.033	-1.26
-10	0.721	0.699	0.023	0.83
-9	0.667	0.763	-0.096	-3.60
-8	0.744	0.755	-0.011	-0.39
-7	0.767	0.811	-0.043	-1.53
-6	0.768	0.849	-0.081	-2.84
-5	0.801	0.882	-0.082	-2.80
-4	0.844	0.907	-0.063	-2.10
-3	0.823	0.992	-0.169	-5.67
-2	0.767	0.985	-0.217	-7.50
-1	**0.674**	**1.050**	**-0.376**	**-13.48**
0	**1.476**	**1.157**	**0.319**	**8.34**
1	1.387	1.235	0.153	4.07
2	1.404	1.378	0.026	0.68
3	1.537	1.472	0.065	1.64
4	1.601	1.585	0.016	0.39
5	1.756	1.747	0.008	0.20
6	1.912	1.882	0.031	0.69
7	2.003	2.116	-0.113	-2.49
8	2.232	2.273	-0.042	-0.87
9	2.390	2.431	-0.041	-0.83
10	2.514	2.560	-0.046	-0.90
11	2.726	2.750	-0.024	-0.45
12	2.729	2.799	-0.070	-1.32
13	2.762	2.822	-0.060	-1.14
14	2.750	2.729	0.021	0.39
15	2.622	2.595	0.027	0.52
16	2.413	2.441	-0.028	-0.56
17	2.359	2.369	-0.010	-0.21
18	2.134	2.140	-0.005	-0.11
19	1.905	1.992	-0.087	-1.95

Table 3, PANEL B: Expected and actual frequency of market value deflated changes in fiscal year net income

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year	Average frequency in other three annual periods	Difference	Z-statistic for difference
-20	0.570	0.557	0.013	0.49
-19	0.587	0.624	-0.037	-1.37
-18	0.588	0.662	-0.074	-2.74
-17	0.632	0.695	-0.063	-2.25
-16	0.661	0.694	-0.033	-1.16
-15	0.742	0.745	-0.002	-0.07
-14	0.734	0.795	-0.062	-2.04
-13	0.767	0.807	-0.040	-1.29
-12	0.813	0.861	-0.048	-1.52
-11	0.824	0.929	-0.105	-3.27
-10	0.908	1.020	-0.113	-3.35
-9	0.966	1.025	-0.059	-1.71
-8	1.073	1.110	-0.037	-1.01
-7	1.105	1.194	-0.089	-2.41
-6	1.164	1.278	-0.114	-3.01
-5	1.230	1.382	-0.152	-3.89
-4	1.357	1.519	-0.162	-3.95
-3	1.529	1.632	-0.102	-2.36
-2	1.661	1.809	-0.147	-3.26
-1	**1.643**	**1.900**	**-0.258**	**-5.70**
0	**2.299**	**2.137**	**0.162**	**3.10**
1	2.401	2.240	0.161	3.01
2	2.540	2.386	0.154	2.80
3	2.455	2.437	0.018	0.33
4	2.315	2.323	-0.007	-0.14
5	2.148	2.157	-0.009	-0.18
6	2.105	2.004	0.101	2.02
7	1.815	1.780	0.035	0.74
8	1.591	1.647	-0.056	-1.27
9	1.495	1.531	-0.036	-0.85
10	1.435	1.387	0.048	1.15
11	1.273	1.256	0.017	0.44
12	1.181	1.172	0.009	0.24
13	1.083	1.089	-0.006	-0.15
14	1.052	1.029	0.023	0.65
15	0.966	0.935	0.031	0.91
16	0.875	0.914	-0.038	-1.17
17	0.842	0.818	0.024	0.74
18	0.804	0.757	0.047	1.49
19	0.738	0.763	-0.025	-0.83

Notes to Table 2:

Earnings were deflated by market value of equity as of the beginning of the year. Earning changes were deflated by market value of equity as of the beginning of the prior year. The frequencies are expressed as percentages of the total sample. The mean of the frequency in the same partition for the alternative annual periods was used as the expected frequency. For the sake of brevity, only partitions with scaled earnings or changes in earnings ranging from -10% to 10% are presented in the table. The Z statistics are computed using the formula in footnote 13.

Table 4
Rankings of Moments of Net Income and EPS

Panel A: With Net Income Simulated with Fourth Quarter Earnings Management:

Average rank	Annual period ending at			
	First quarter	Second quarter	Third quarter	Fourth quarter
Variance	2.589	2.341	2.155	2.916
Skewness measure 1	2.485	2.625	2.693	2.197
Kurtosis	2.496	2.423	2.452	2.628

Panel B: With Net Income Simulated with Fourth Quarter Settling Up:

Average rank	Annual period ending at			
	First quarter	Second quarter	Third quarter	Fourth quarter
Variance	2.189	3.063	3.694	1.055
Skewness measure 1	2.424	2.564	2.520	2.493
Kurtosis	2.525	2.460	2.487	2.529

Panel C: With actual Net Income and EPS

Variable	Average rank	Annual period ending at			
		First quarter	Second quarter	Third quarter	Fourth quarter
Net Income:	Variance	2.571	2.475	2.379	2.595*
	Skewness measure 1	2.473	2.545	2.605	2.365*
	Skewness measure 2	2.512	2.534	2.506	2.432*
	Skewness measure 3	2.504	2.446	2.416	2.642*
	Kurtosis	2.584	2.487	2.433	2.510

		Annual period ending at			
		First quarter	**Second quarter**	**Third quarter**	**Fourth quarter**
EPS:	**Variance**	2.618	2.428	2.333	2.632*
	Skewness measure 1	2.471	2.570	2.590	2.357*
	Skewness measure 2	2.508	2.520	2.530	2.426*
	Skewness measure 3	2.509	2.451	2.404	2.636*
	Kurtosis	2.526	2.427	2.464	2.582*

Notes to Table 4:

Moments of Net Income and Earnings Per Share (EPS) were computed for the sum of four consecutive quarterly earnings realizations. A firm was included in the sample if it had enough data to compute ten annual earnings. For each firm, the moments of these annual earnings variables ending at each of the four quarters was ranked from 4=highest to 1=lowest. The mean ranks reported are the mean of these ranks across all firms in the sample.

* Differences between the annual period ending in the fourth quarter and other annual periods were significant at less than the 0.0001 level.

The skewness measure 1 is defined as $E\left[\left(X-\mu\right)^3\right]/\sigma^3$ where μ is the mean and σ is the standard deviation. Skewness measure 2 is $\left(\mu-\text{Median}\right)/\sigma$. Skewness measure 3 is $\left(\text{Median}-\text{Minimum}\right)/\left(\text{Maximum}-\text{Minimum}\right)$. The kurtosis coefficient is $\left\{E\left[\left(X-\mu\right)^4\right]/\sigma^4-3\right\}$.

The procedure used to generate simulated net income is described in section III of the paper.

Appendix
Annual Earnings Computed over Different Intervals

In this appendix we consider a setting without earnings management and provide sufficient conditions under which, consistent with our null hypothesis, the fiscal year end would not affect the variance, third or fourth moments of annual earnings.

For exposition, we consider a firm whose fiscal year coincides with the calendar year and denote its quarterly earnings for year y and quarter q by $x_{y,q}$. Further assume that quarterly earnings are mean reverting and follow a seasonal first order autoregressive process, such that

$$x_{y,q} = m_q + \rho\left(x_{y-1,q} - m_q\right) + \tilde{e}_{y,q}$$

where m_q is the long-run level of quarter q earnings, ρ is the autocorrelation parameter that captures the speed of adjustment to the mean reversion, $\tilde{e}_{y,q}$ is the error term that is independent distributed with mean zero and quarter-specific variance, σ_q^2. Annual earnings can be calculated as

$$X_y = x_{y,1} + x_{y,2} + x_{y,3} + x_{y,4}.$$

Under the above assumptions,

$$X_y = \mu + \rho\left(X_{y-1} - \mu\right) + \tilde{\varepsilon}_y$$

where $\mu = \sum_{q=1}^{4} m_q$ is the long-run level of annual earnings, and $\tilde{\varepsilon}_y = \sum_{q=1}^{4} \tilde{e}_{y,q}$ is the random component in annual earnings that is distributed with mean zero and variance, $\sigma^2 = \sum_{q=1}^{4} \sigma_q^2$. The insight is that annual earnings do not exhibit seasonality because the aggregation is over the business cycle.

In this paper we use quarterly earnings and aggregate to annual earnings in three additional ways different from the fiscal year. In particular, we consider the following three time-series:

$$X_y^{[1]} = x_{y,2} + x_{y,3} + x_{y,4} + x_{y+1,1}$$
$$X_y^{[2]} = x_{y,3} + x_{y,4} + x_{y+1,1} + x_{y+1,2}$$
$$X_y^{[3]} = x_{y,4} + x_{y+1,1} + x_{y+1,2} + x_{y+1,3}.$$

It can easily be verified that

$$X_y^{[n]} = \mu + \rho\left(X_{y-1}^{[n]} - \mu\right) + \tilde{\varepsilon}_y$$

for $n = 1,2,3$. That is, the assumptions provided above suffice to ensure that the choice of annual period for calculating annual earnings does not matter. This holds true even though quarterly data may exhibit seasonality (from sales as suggested by the findings in Oyer, 1998), as captured by quarterly variation in the expected level of earnings, m_q, and even though the variance of earnings, σ_q^2, may change with the calendar quarter, q.

Note, however, that when working with these annualized earnings observations give rise to an overlapping observations problem. The problem of overlapping observations causes the estimator of the variance of earnings for different annualized data on the same firm to be dependent. This means that standard statistical significance levels on the tests for difference in variances do not apply because they presume independent samples. We circumvent this overlapping observations problem by using ranks for any given firm.

Figure 1:

Figure 1 illustrates the effect of the annual measurement period on earnings.
Figure 1A contains the histogram of the annual earnings based on firms' choice of fiscal year for the annual report.
Figure 1B contains the histogram of the annual earnings based on the year starting at the end of the first fiscal year quarter.
Figure 1C contains the histogram of the annual earnings based on the year starting at the end of the second fiscal year quarter.
Figure 1D contains the histogram of the annual earnings based on the year starting at the end of the third fiscal year quarter.
Figure 1E illustrates the difference between the fiscal year histogram in figure 1A and an equally weighted average of the histograms in figures 1B, 1C, and 1D.

Fig. 1A: Fiscal year earnings

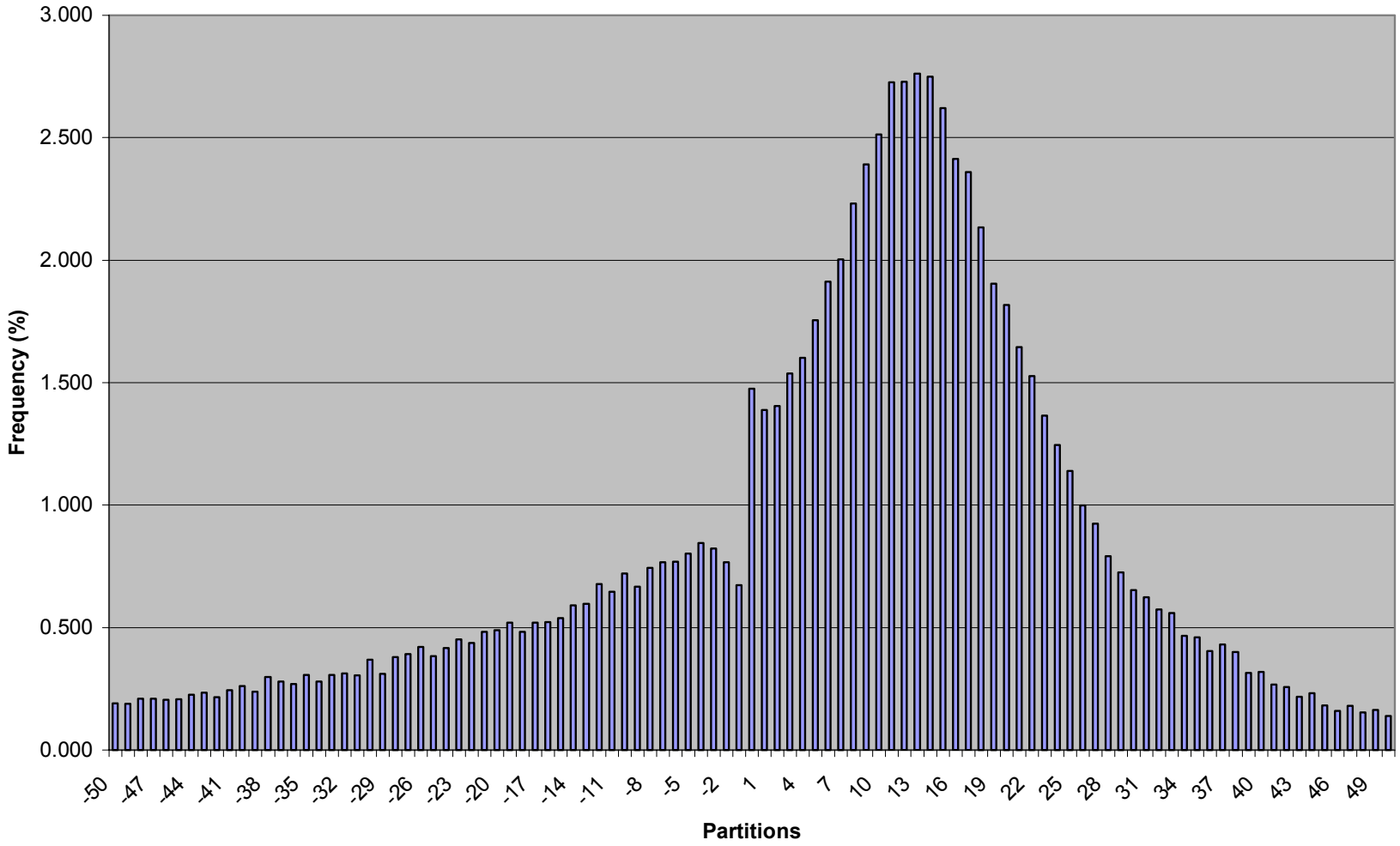

Fig 1B: Earnings for annual period ending in quarter one

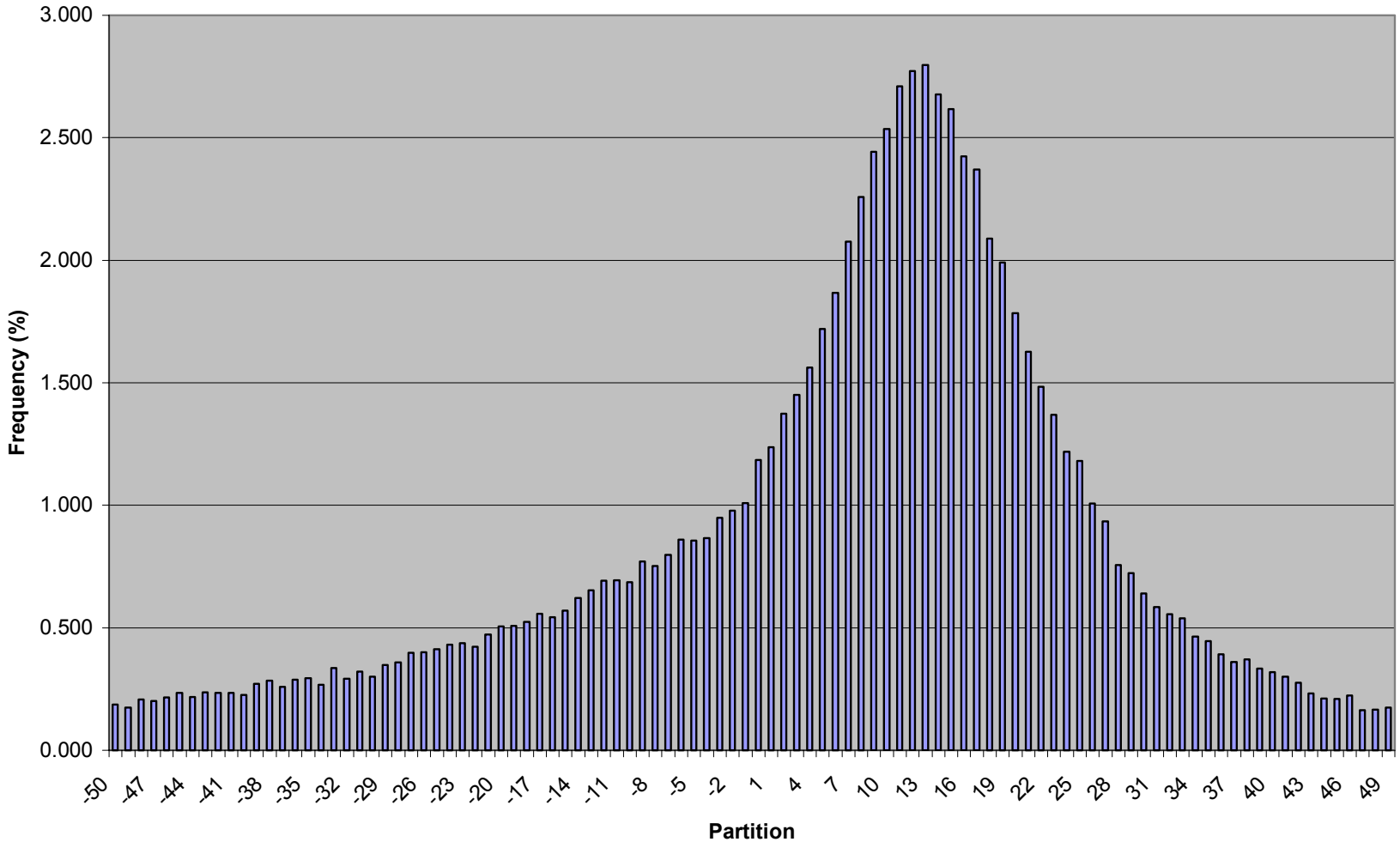

Fig. 1C: Earnings for annual period ending in quarter 2

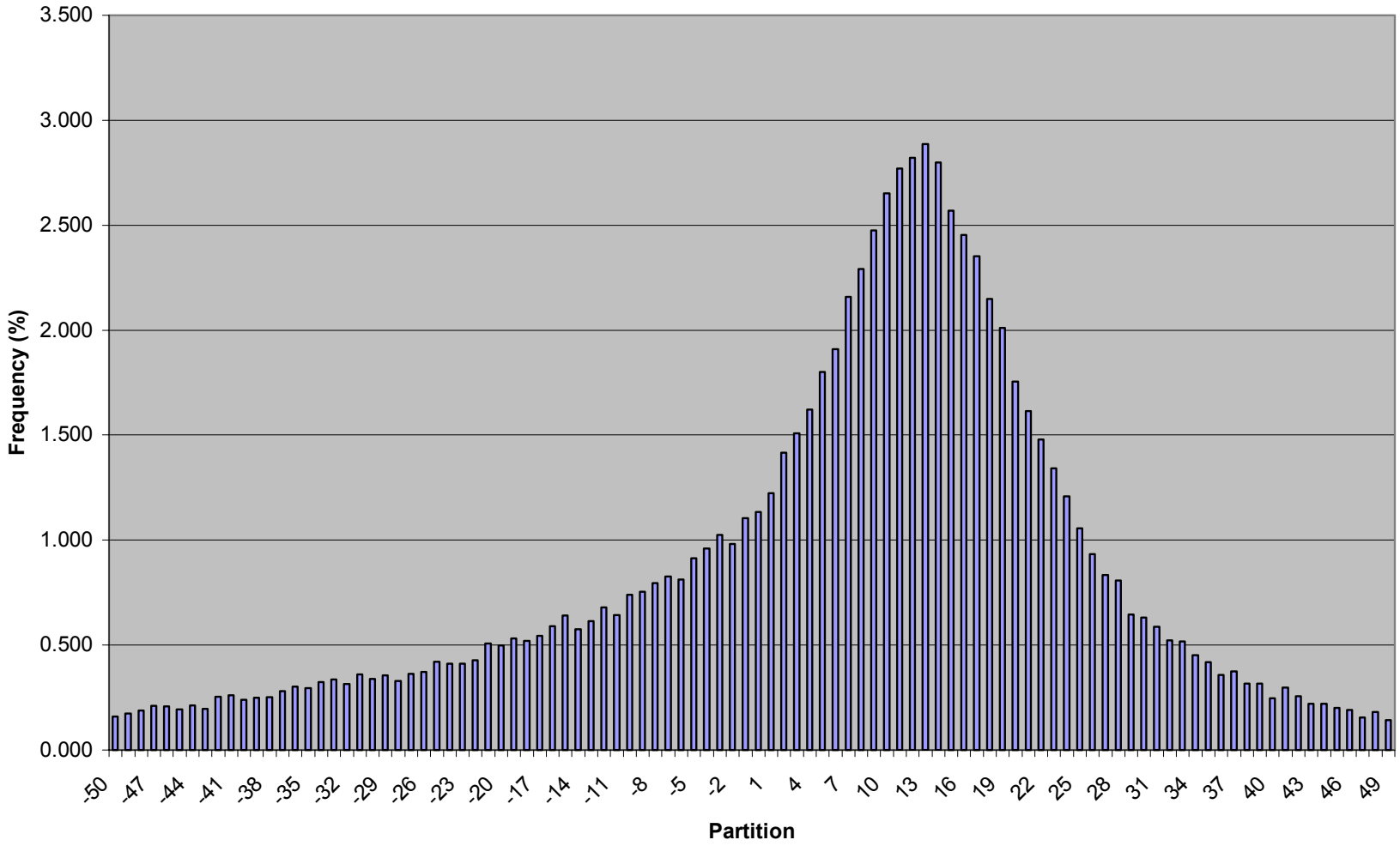

Fig. 1D: Earnings for annual period ending in quarter 3

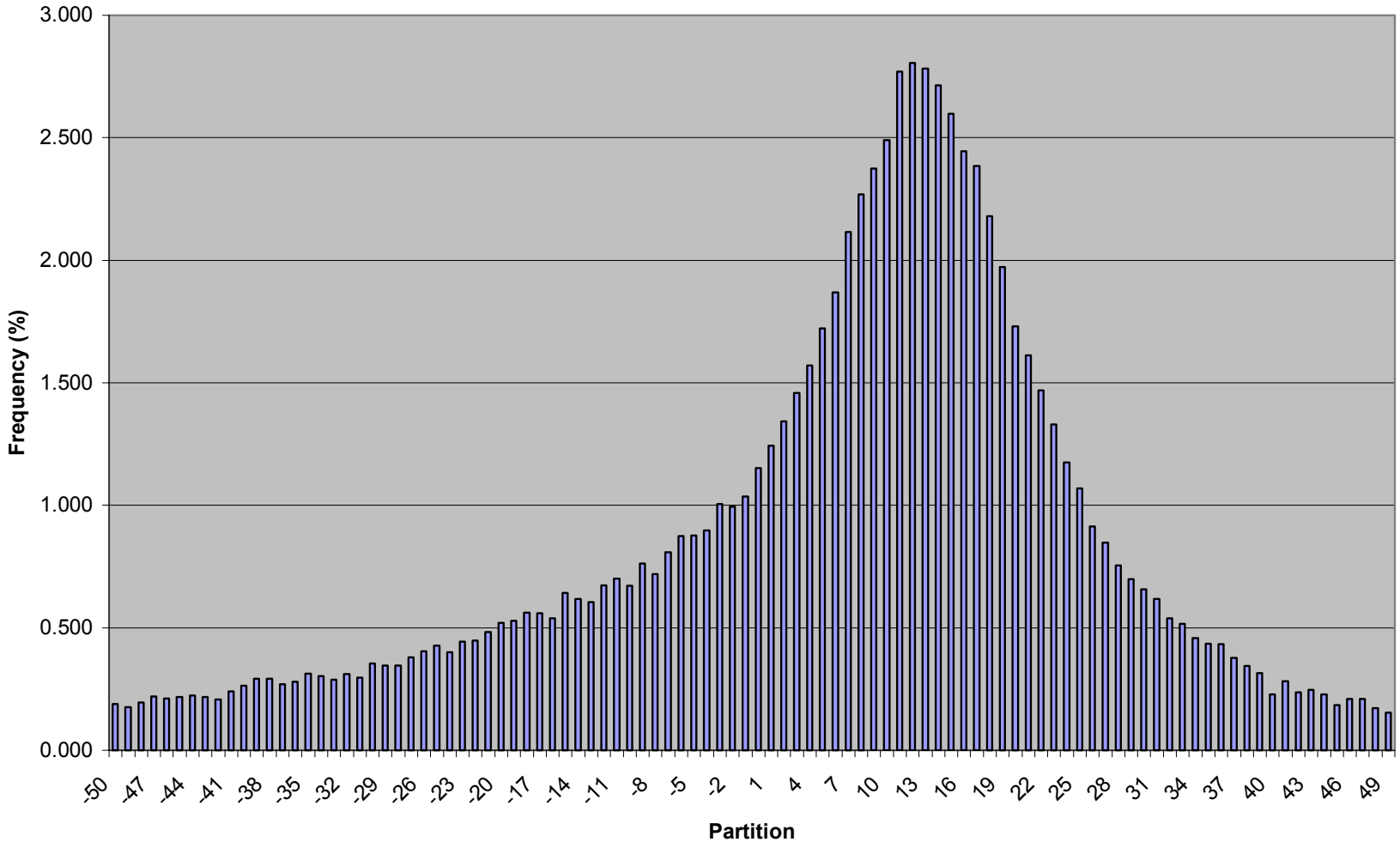

Fig. 1E: Difference between actual and expected frequency of earnings

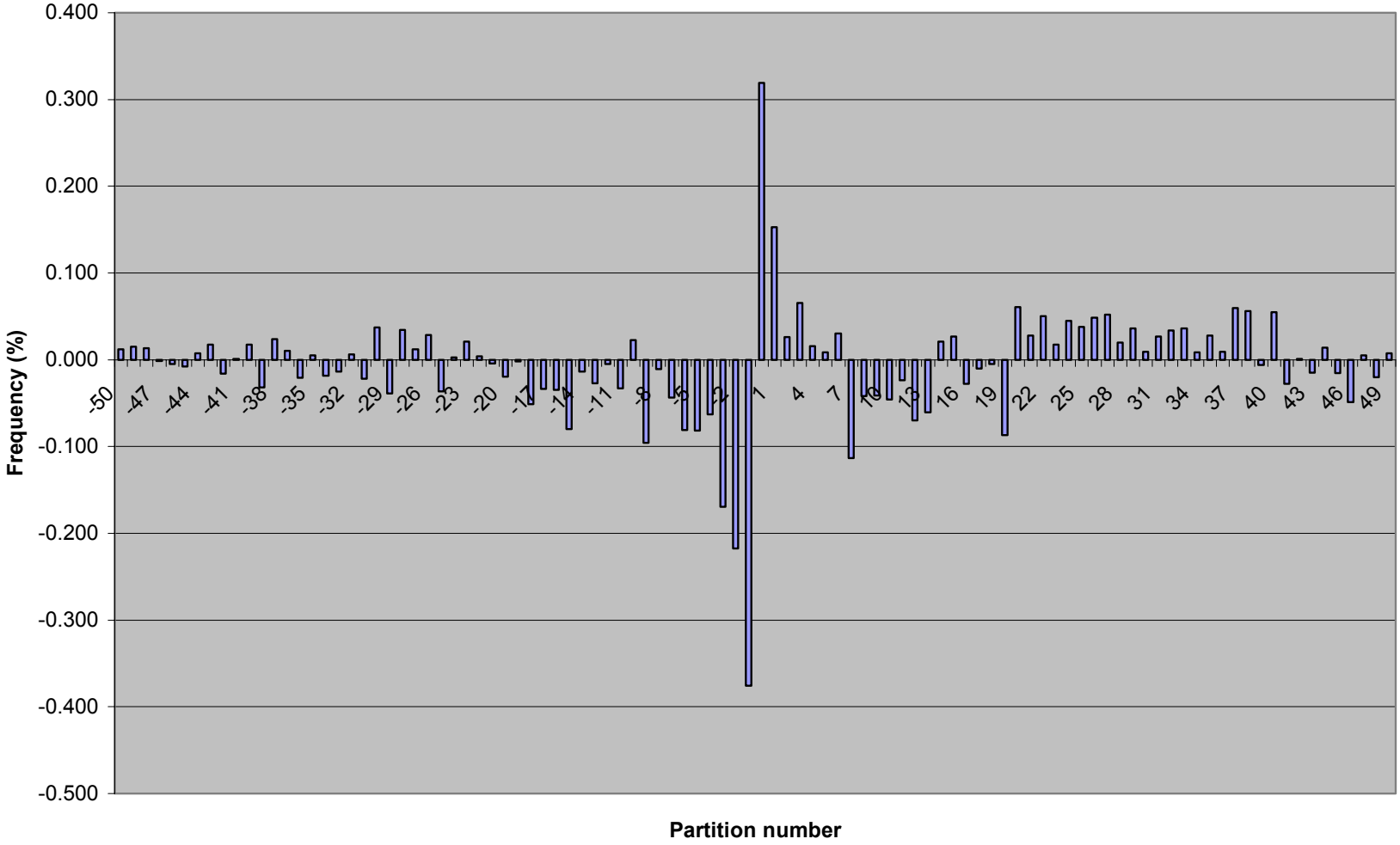

Figure 2:

Figure 2 illustrates the effect of the annual measurement period on changes in earnings.

Figure 2A contains the histogram of the annual earnings changes based on firms' choice of fiscal year for the annual report.
Figure 2B contains the histogram of the annual earnings changes based on the year starting at the end of the first fiscal year quarter.
Figure 2C contains the histogram of the annual earnings changes based on the year starting at the end of the second fiscal year quarter.
Figure 2D contains the histogram of the annual earnings changes based on the year starting at the end of the third fiscal year quarter.
Figure 2E illustrates the difference between the fiscal year histogram in figure 2A and an equally weighted average of the histograms in figures 2B, 2C, and 2D.

Fig 2A: Changes in fiscal year earnings

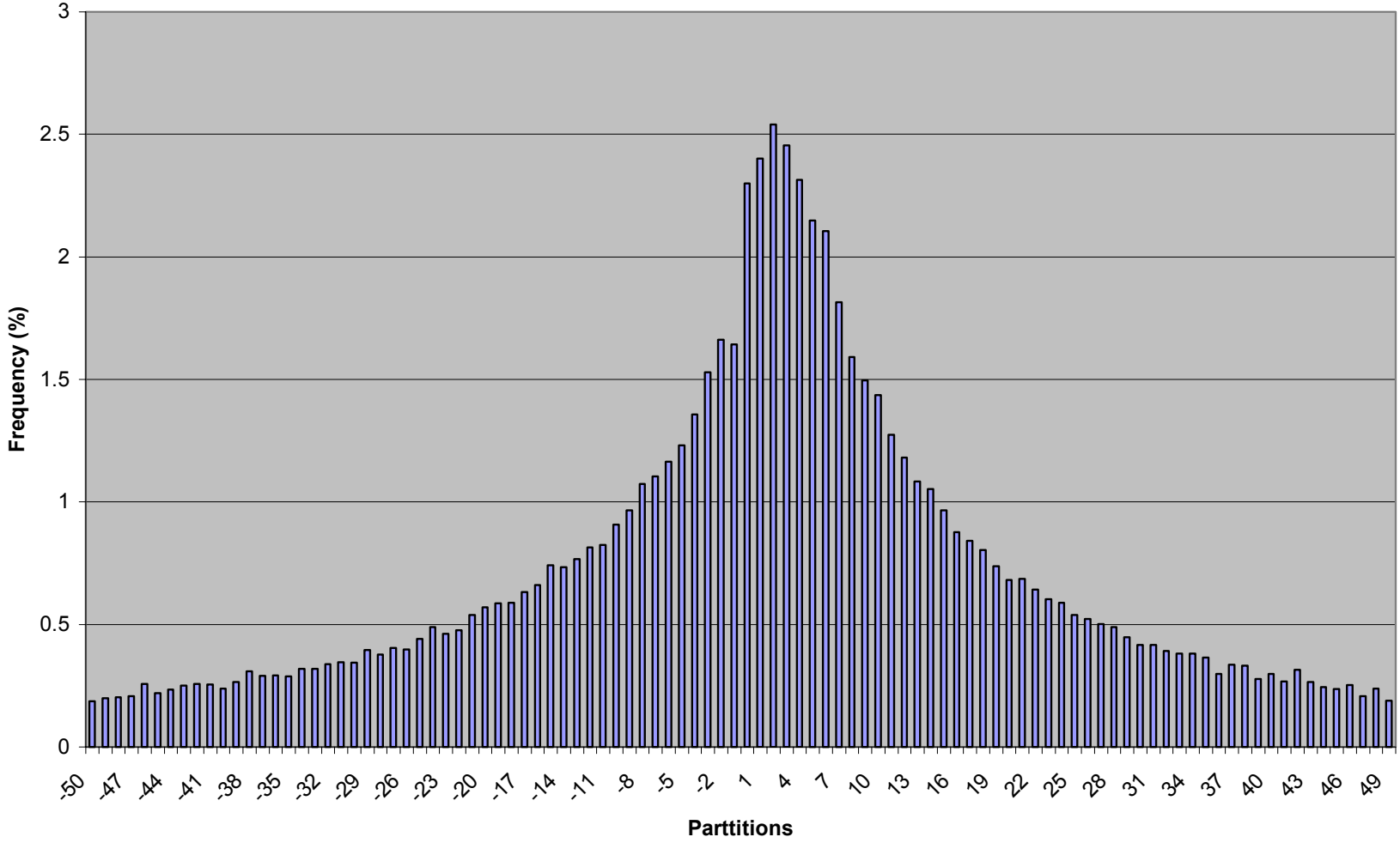

Fig. 2B: Earnings changes for annual period ending in quarter one

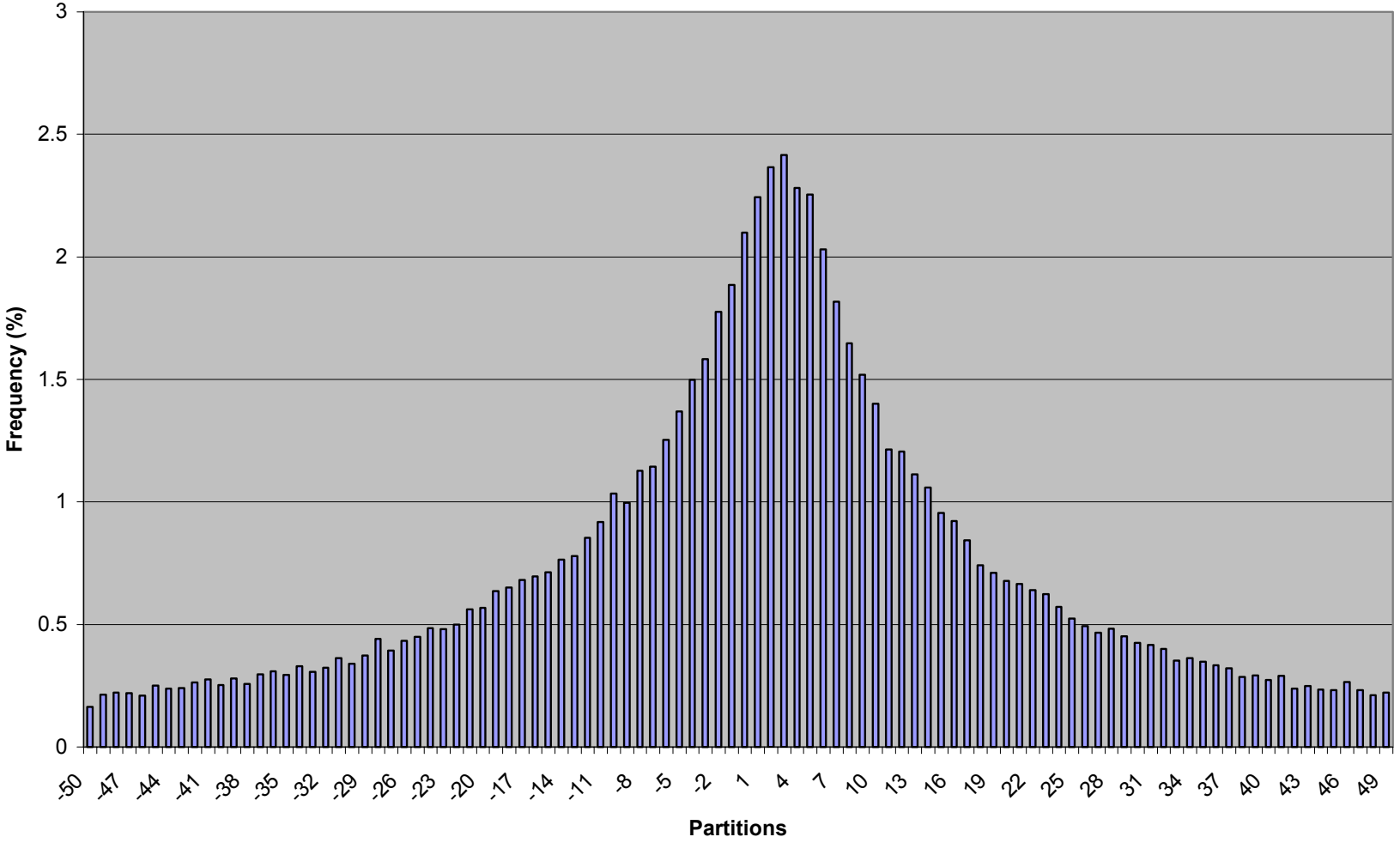

Fig. 2C: Earnings changes for annual period ending in quarter two

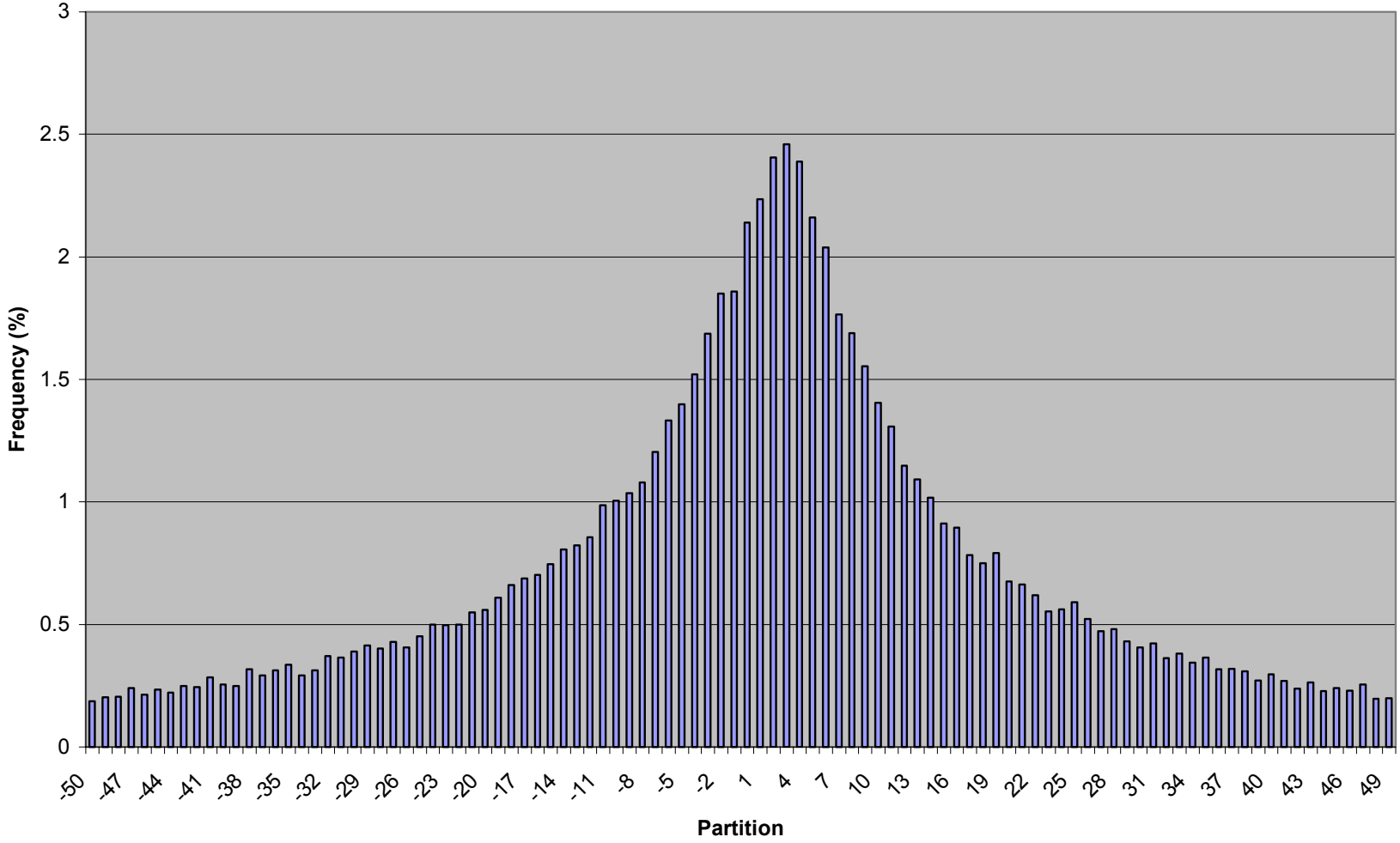

Fig. 2D: Earnings changes for annual period ending in quarter three

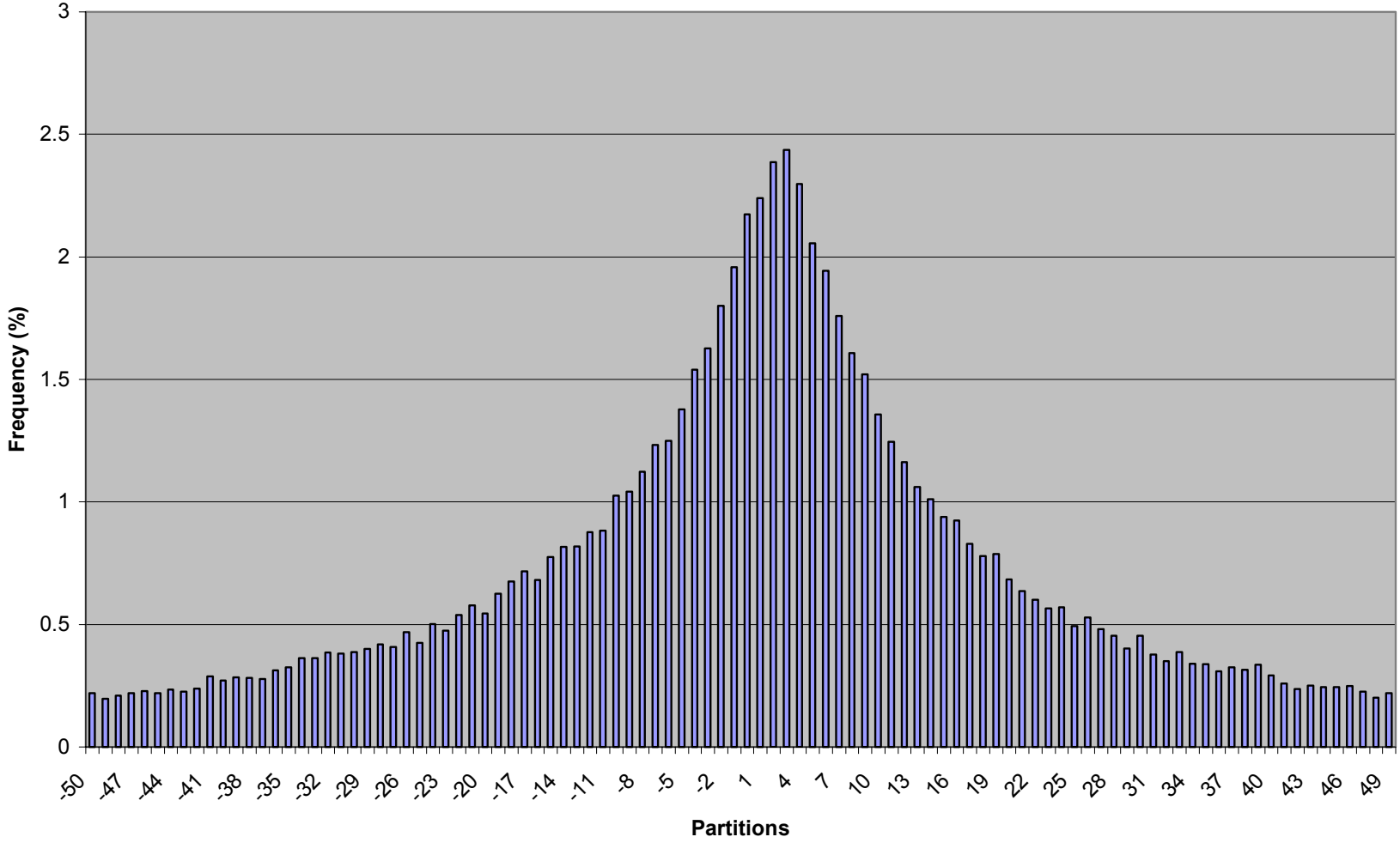

Fig. 2E: Difference between actual and expected frequencies for fiscal year earnings changes