Earnings Management and Accounting Income Aggregation*

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Current draft: July 2005

* We thank David Burgstahler, Shuping Chen, Peter Easton, Dave Guenther, Ole-Kristian Hope, Murgie Krishnan, Dawn Matsumoto, Jim Ohlson, Shiva Rajgopal, Steve Rock, Terry Shevlin, Dinah Shores, Steve Zeff, seminar participants at Baruch/Columbia/NYU/Rutgers conference and especially Suresh Govindaraj the discussant, London School of Economics, Morgan Stanley, University of Notre Dame, Rice University, the Securities and Exchange Commission, The Society of Quantitative Analysts, SUNY Binghamton, University of Toronto and the University of Washington for their comments and suggestions.

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Abstract

Quarterly earnings allow aggregation into annual earnings in four different ways. Fiscal year reported earnings is one of these four possible measures of annual earnings, the others being earnings for years ending at the first, second and third fiscal quarters. We provide evidence on earnings management in fiscal year earnings relative to these three alternative measures of firms' annual earnings. We confirm prior findings in Burgstahler and Dichev (1997) of discontinuities around zero and around prior year earnings in histograms of fiscal year earnings. Subsequent research questions whether these discontinuities are evidence of earnings management or whether they are attributable to biases induced by taxes, scaling and sample selection. Using the histograms of our alternative annual earnings measures, we offer additional evidence in this debate. 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 statistical properties 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. These results are more consistent with earnings management than with the effects induced by 'settling up' in fourth quarter earnings. Overall, this study contributes to the literature on the prevalence, effects of and factors associated with earnings management.

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Earnings Management and Accounting Income Aggregation

I. **Introduction**

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 of zero earnings and the previous period's earnings. The BD paper has had a major impact on accounting research. Their methodology is used in many subsequent papers investigating earnings management (including Beatty, Ke and Petroni, 2002, Dichev and Skinner, 2002, Leuz, Nanda and Wysocki, 2003, Leone and Van Horn, 2003, Phillips, Pincus, Rego and Wan, 2003, Frank and Rego, 2004 and Roychowdhury, 2004).

Some subsequent studies, however, question the validity of the BD methodology, suggesting that the results may be induced by the scaling mechanism used. Degeorge, Patel and Zeckhauser (1999, henceforth DPZ), assert that these results might be affected by a problem similar to the "aliasing problem" in the literature on the spectral analysis of time-series data. 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."

Durtschi and Easton (2005, henceforth DE) also assert that scaling could be responsible for the finding of discontinuities at zero in BD, both directly and through a sample selection bias it induces. They find that firms reporting small losses are priced differently from firms that report small profits. A consequence of this phenomenon is that

earnings to the left of zero are deflated by significantly different denominators than earnings to the right of zero, inducing a discontinuity in the histogram of deflated net income at zero. Therefore, even if the histogram of earnings did not have a discontinuity at zero, the histogram of the scaled earnings would exhibit this discontinuity.

In this paper, we investigate issues related to the BD methodology to test for earnings management using earnings measured over alternative annual periods. These alternative annual periods are 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 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 alternative annual earnings likely better represent the economic earnings for a year than the fiscal year earnings reported in annual financial statements.[1] Using the histograms of our alternative estimates of annual earnings we examine whether the BD results are indeed a consequence of the scaling procedures they use.

We also address another issue that has confronted researchers investigating discontinuities in the histogram of accounting income, i.e., the choice of the benchmark with which to compare the observed frequency in partitions of the histogram. We construct a benchmark using the distribution of our alternative estimates of annual earnings and use this benchmark to investigate for discontinuities in the distribution of fiscal year earnings. A useful feature of this benchmark is that we can use it to discern earnings management over wider intervals of the distribution than was possible in prior research.

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

Prior research concentrated on examining earnings management in the immediate neighborhood of specific thresholds. Unlike methods used in prior papers, our benchmark is also valid for tests of discontinuities at the peak of the distribution.

We are able to shed some light on the current debate on whether the BD results are evidence of earnings management or whether, as asserted by DPZ, Durtschi and Easton (2005) and Beaver, McNichols and Nelson (2003), they can be attributed to the effects of scaling, selection biases or the asymmetric effects of taxes on profit and loss firms. Our results, in general, validate the BD methodology as a test of earnings management.

Using our alternative measures of annual earnings, we also investigate reasons for the higher volatility of fourth-quarter earnings. We attempt to distinguish between the "settling up" effect attributable to the integral approach to quarterly income and earnings management as reasons for this difference in volatility. 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 alternative 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.

In this paper, we assume 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. 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.[2] 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).

We treat the firm's choice of fiscal year as exogenous to our investigation.[3] 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 describes our investigations into earnings management to meet thresholds. Section IV describes our tests to discriminate between earnings management and the "settling up" phenomenon. 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

As mentioned earlier, 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.[4]

[2] See, among others, Collins, Hopwood and McKeown (1984), Das and Shroff (2002), Gu and Lee (2002), and Hayn, Narayanamoorthy, and Watts (2001).
[3] See Smith and Pourciau (1988) for evidence on differences in firm characteristics among December year end and other firms.
[4] We do not analyze earnings management to meet analysts' forecasts because our methodology does not lend itself to an examination of this question.

Some recent studies question whether earnings management is responsible for the discontinuity around zero in the distribution of earnings, earnings changes and earnings surprises. For example, Dechow, Richardson and Tuna (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 is more likely to be the reason for the observed discontinuities.[5]

Beaver, McNichols, and Nelson (2003) investigate whether special items and the asymmetric tax treatment of positive and negative earnings could be responsible for the observed discontinuity at zero in the distribution of earnings and earnings changes. They do not rule out earnings management as contributing to the discontinuity. However, based on their investigations, they conclude that two thirds of the discontinuity could be attributed to these two factors. Keating (1999) finds evidence of the discontinuity around zero in a sample of credit unions. Since credit unions are exempt from federal corporate income taxes, her findings suggest that factors besides the asymmetric tax treatment also play a role in the discontinuity.

DE suggest that the discontinuity at zero in net income scaled by the market value of equity is a consequence of the scaling mechanism used and of selection biases. They point out that, unlike the distribution of market value deflated net income, the distribution of earnings per share (EPS), which is a variable that investors and analysts focus on, 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

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

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, they find that the 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 because the deflator for firms that report a small loss is generally lower than the deflator for firms that report a small gain. Scaling, therefore, moves small loss firms away from zero while it moves small profit firms towards zero inducing the appearance of a discontinuity at zero. DE also find that scaling by total assets or revenues induces similar biases as scaling by market value of equity.

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 rather whether they are induced by the testing procedures used.

Related to our examination of the higher moments of earnings, 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, 1988 and Bartov, 1993). Second, under the integral approach to accounting, 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.[6] Under this approach, any estimation errors in the preceding three quarters are

[6] See Rangan and Sloan (1998) for a more complete description of the integral approach to annual earnings and its implications.

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[7] 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. This could induce greater volatility in fourth quarter earnings when corrections are made. Finally, earnings management in the fourth quarter could cause earnings for this quarter 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.

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 alternative 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.

III. Earnings Management to Meet Thresholds

[7] or highest variance in revenue. See the model in Oyer (1998).

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 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 earlier, the intuition behind using these alternative 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 alternative annual periods may be less affected 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 Tests of 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 scaled by market value of equity. 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 and DE suggest that these results could be spurious – induced by scaling and selection biases in the scaling variable. BD deflate earnings and

earnings changes by market value of equity "because firms are drawn from a broad range of firm sizes." In addition, scaling modifies the histogram of earnings and earnings changes so that zero is not at the peak of the distribution. Existing tests for discontinuities in histograms are difficult to apply at the peak of the distribution.

We examine the histograms of scaled annual earnings computed over alternate annual periods as a preliminary investigation of whether scaling is responsible for 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 induced by scaling, we are likely to 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 prior year.[8] 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.[9] 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.[10] 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.

[8] In sensitivity tests (unreported) we also deflate by total assets instead of market value of equity.
[9] BD use these same widths for their partitions.
[10] 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.

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 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 would expect to see similar patterns for the three alternative annual periods.

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. 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).[11] 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. *Prima facie*, these results do not support DPZ and DE's contention that scaling induces the results that BD 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 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.

[11] 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, 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 positive for all four annual periods.[12] We conjecture that 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.[13]

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 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 earnings aggregated in all four

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

[13] 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.

histograms is the same – only the partitioning into annual periods differs. The statistical significance of deviations from expected frequency is evaluated using a Z-statistic.[14]

The results for earnings scaled by market value of equity at the beginning of the annual period using this alternate expectation are presented in panel A of Table 3. The table has the results for the forty partitions surrounding zero. 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. 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.[15] 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 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.

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[14] 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 $p_0^{(q)}$ is the proportion of the sample of earnings in annual period ending in quarter q which is in partition 0. Following the same line of argument as in footnote 6 of Burgstahler and Dichev (1997), the asymptotic variance is

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

and the test statistic is:

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

[15] The probability of 9 consecutive negative differences under the null is one in 512. The 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.

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 (see Basu, 1995, Givoly and Hayn, 2000, Gu and Wu, 2003), 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 - it does not appear to be confined to the immediate vicinity of thresholds.

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 1.138 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.[16] 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.

Similar patterns appear in the histogram of earnings changes. Frequencies for forty partitions around zero are tabulated in Panel B of Table 3. 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

[16] 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 1.138 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.'

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.[17] 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 at zero from large negative deviations to large positive deviations is striking. 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.

III.2 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 not be evidence of earnings management. For instance, DPZ 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 earnings and earnings changes. DE give two reason why scaling could induce the discontinuity. First, the scaling variable, market value of equity, is significantly smaller for firms experiencing small losses than for firms experiencing small gains. Second, the beginning of the year stock price used in constructing the scaling variable is more likely to be missing on Compustat for small loss firms than small profit firms. They claim that this results in a selection bias which contributes to the discontinuities in the distribution.

The results we present in Tables 2 and 3 would seem to argue against scaling being primarily responsible for the observed discontinuities. The discontinuities at zero, when present, in the distribution of our alternate annual earnings measures, scaled similarly to

[17] Again, some of these firms appear to have achieved the threshold of the previous year's earnings while others may have reined in earnings.

fiscal year earnings, are much smaller in magnitude and usually not statistically significant. However, DE report that firms that report small profits and losses at fiscal year end are priced differently than firms that report small profits and losses at the end of the other three quarters. [18] 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.

Figures 3A to 3D graph the distribution of unscaled annual net income for the four annual periods using partitions of width $100,000 (as in DE). 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 BD 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 40 partitions around zero net income are reported in Table 4, panel A.

The results in Table 4, panel A do not support the DPZ and DE assertions that the BD 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 (Z-statistic of -12.37) and significantly positive in partition 0 (Z-statistic of 8.51). In addition nine consecutive partitions immediately below zero have lower than expected frequencies while six consecutive partitions at or immediately above zero have greater than expected

[18] See footnote 31 of DE.

frequencies. The tenor of the results is very similar to that reported in panel A of Table 3 for net income scaled by market value of equity.

Panel B of Table 4 reports the results of a similar analysis for unscaled changes in net income. Again the results do not suggest that scaling is responsible for the discontinuity at zero that BD document. The deviation from the expected frequency is significantly negative in partition -1 (Z statistic of –2.70) and significantly positive in partition 0 (Z-statistic of 5.82). 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 results, again, are very similar to those reported in panel B of Table 3 where the change in earnings is scaled by market value of equity. 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 and is very likely related to earnings management to attain earnings thresholds.

III.3 Are there a discontinuities in the distribution of EPS?

DE 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. DPZ, using actual EPS data from I/B/E/S find evidence of a discontinuity in the distribution of levels and changes in earnings per share. On the other hand, DE, using EPS data from Compustat, find no evidence of such discontinuities. DE contend that, because DPZ use actual EPS as reported in the I/B/E/S database of analysts' forecasts of earnings, there is a selection bias in their sample. Analysts cover a smaller proportion of firms reporting small losses than those reporting small profits and this coverage is reflected in the I/B/E/S database. We re-examine this question using a 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 earnings per share, 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.[19]

Figures 4A to 4D present the histograms of this annual EPS for each of the four annual periods. In each of the four graphs, the peak of the distribution is at zero. As before, because the peak is at zero, we do not use the methodology used in BD to identify the discontinuity at zero. Instead, we again use the mean of the observed frequency in the identical partition for the other three annual periods as the expected frequency in the partition for fiscal year EPS.

We report results for this test on EPS in panel A of Table 5. The results of this test 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 clear evidence of a discontinuity at partition zero, in the case of EPS, the discontinuity appears to be shifted by a few partitions to approximately partition -2. In fact partitions -1 and -2 have greater than expected frequencies.[20] 16 consecutive partitions, beginning with partition -2, have greater than expected frequencies. The results in this table provide some indications of earnings management though it is not as clear as in earlier cases that it is to achieve the threshold of zero.

[19] In their analysis, DE use diluted earnings per share but report that they get similar results when they use primary earnings per share.

[20] We conjecture that the shifting of the discontinuity, relative to that for unscaled net income could arise from two causes. First, the EPS number we use excludes the effect of extraordinary items. 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 could cause some changes in the distribution.

Panel B of table 5 presents the results of a similar test on changes in primary EPS. This test investigates earnings management to avoid decreases in fiscal year EPS from the previous year. The results in this case are more clear-cut than for levels of EPS. There are significantly fewer than expected decreases of one cent in fiscal year EPS from the previous year (Z-statistic of -4.28) and significantly more instances than expected where fiscal year EPS just met the threshold of the previous year's EPS (Z statistic of 8.48). Seven consecutive partitions immediately below zero had lower than expected frequencies and three consecutive partitions including and greater than zero had higher than expected frequencies. Again, consistent with DPZ but not with DE, this is indicative of earnings management to meet the threshold of the previous year's EPS.[21] Because our data is from Compustat, it is not affected by selection biases associated with analyst following.

III.4 Is the discontinuity due to the asymmetric tax treatment of profits and losses?

Beaver, McNichols and Nelson (2003) 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 claim 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, McNichols and Nelson (2003) 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

[21] DE, in their tests, do not find discontinuities at zero in the histograms of unscaled net income and EPS and in the histograms of changes in these variables. It is possible that our test, which uses the histograms of the alternate annual periods, is more powerful..

similarly scaled net income. However, DE 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.

Figures VA to VD graph the histograms of pre-tax income for each of the four annual periods. It is apparent that the peak of the distribution is again at partition zero. We therefore use 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, presented in panel A of Table 6, are very similar to those for net income. Again, the actual frequency in partition -1 for fiscal year earnings is significantly lower than expected (Z=-9.14) and the actual frequency in partition 0 is significantly higher than expected (Z=6.71). Three consecutive partitions below zero have lower than expected frequency and eight consecutive partitions including and above zero have higher than expected frequencies. The magnitudes of the deviations from the expected are somewhat smaller than was the case for net income. Nevertheless it is clear that a substantial proportion of the discontinuity at zero in the histogram of net income is also present in the histogram of pre-tax income. 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 present, in panel B of Table 6, the results of a similar test on changes in pre-tax income. Unlike in the case of net income, matching the previous year's pre-tax income may not be important to managers. Not surprisingly therefore, the results are not as strong as for other thresholds. The frequency of observations for fiscal year pre-tax income in partition 0 is considerably higher than expected (Z statistic of 4.21). However, the deviation of actual from expected frequency in partition -1 is not significantly different from zero (Z-statistic of -0.73).

While we cannot rule out the possibility that the asymmetric tax treatment of gains and losses contributes to the discontinuity at zero in the histogram of net income, it does appear that this phenomenon is not principally responsible for the phenomena documented in BD.

Summarizing our results so far, they appear to support BD's contention that the discontinuities in earnings and earnings change distributions are indicative of earnings management. It does not appear that distortions or selection biases introduced by scaling or the asymmetric tax treatment of gains and losses wholly explain their results.

IV Discriminating between Earning Management and Settling Up

As noted in Section II, there are competing explanations for the lower ERCs for fiscal fourth-quarter earnings. One theory suggests that the integral 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 possible explanation is 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 as noise in earnings 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. We believe that a possible reason for their results is heterogeneity across firms. We therefore 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.[22] 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:

$$(Median - Minimum)/(Maximum - Median)$$

[22] 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 other annual earnings periods.

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:

$$\left[(X-\mu)^4\right]/\sigma^4 - 3.$$

IV.1 Simulations

As a theoretical treatment turns out to be intractable, we validate our predictions for the higher moments of earnings, under both scenarios, using simulations. We simulate quarterly earnings series. Each draw of earnings for year y and quarter q, $EARN_{y,q}$, is from a N(0.25,1) distribution. These quarterly earnings are aggregated, in the four different ways, to get annual earnings for the four annual periods. 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 abnormally low. Specifically, if unmanaged fiscal year earnings are between (-0.2+η) and zero where η is N(0,0.01), 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 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. We aggregate simulated quarterly earnings for each firm, to arrive at four different estimates of annual earnings. We then compute the statistic (either variance, skewness or kurtosis) for each simulated firm's fiscal year earnings and for the earnings for the other three annual periods. For each firm, we then rank the statistic, where the comparison is between its values for the four annual periods, and assign 4 to the highest value and 1 to the lowest value. 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.

In Panel A of Table 7 we present the simulation results for the variance, skewness and kurtosis, averaged over the six reversal 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 annual 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 these simulation results in Panel B of Table 7.

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.[23]

IV.2 Results with Actual Data

We next investigate the statistical properties of the distribution of actual annual net income and earnings per share (EPS) to see if they conform to the patterns we find in the

[23] 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.

simulated earnings under either of the theories. We analyze the moments of net income 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.

Our results for the variance, reported in panels C and D of Table 7, are more consistent with the earnings management story than the settling up story. The ordering, for net income, 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. 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 firms manage earnings by taking large accruals in the fourth quarter, perhaps to meet annual earnings targets, and if these accruals reverse in succeeding quarters. For EPS, the highest variance is for the annual period ending in quarter 1. In other respects the ordering is similar to that for net income.[24]

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 panels C and D of Table 7, are consistent with this prediction and with results in panel A of the table where earnings management

[24] It is possible that managers attempt to reduce the perceived risk of firms by managing fiscal year EPS to reduce variance.

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 is consistent with managers taking 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 are generally more in line with predictions derived from the earnings management hypothesis.

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.

V. Conclusions

In this paper, we aggregate quarterly earnings over annual periods that differ from the fiscal year and compare the properties of these alternative 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.

Using our framework, we investigate several questions related to the debate over whether the results in BD about discontinuities in earnings and earnings change histograms at earnings thresholds are evidence of earnings management or whether they are spuriously induced by the research design. Our results generally validate the BD findings and indicate that their results are not spuriously induced by scaling as DPZ and DE suggest. They also indicate that the BD results, for the most part, cannot be attributed to the asymmetric tax treatment of gains and losses. Earnings management appears to be the most likely reason. 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.

We introduce a new benchmark for the expected frequency in each partition of the histogram of earnings and earnings change distribution, including at the peak of the distribution. Since many accounting variables of interest such as net income, EPS and changes in these variables have a natural peak at zero, this should aid future researchers investigate discontinuities in these variables. The benchmarks used in prior research were not appropriate for testing for discontinuities at the peak of distributions. We believe that this paper contributes to the methodology pioneered by Hayn (1995) and BD to test for earnings management. Their methodology has been used in numerous subsequent papers and is likely to continue to be used.

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.[25]

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.

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 disclosing 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.

[25] 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.

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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**

Notes to Table 1:
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. Bolded numbers are fiscal year annual earnings.

Table 2, Panel A: Frequency distribution of market value deflated net income

Partition	Annual period ending in fiscal year quarter											
	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

Table 2, Panel B: Frequency distribution of market value deflated changes in net income

Partition	Annual period ending in fiscal year quarter											
	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	0.567	-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 frequencies, in both panels, are expressed as percentages of the total sample. 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 Fiscal Year Net Income Scaled by Market Value of Equity

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic 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 Changes in Fiscal Year Net Income Scaled by Market Value of Equity

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for 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 3:

In panel A, net income was deflated by market value of equity as of the beginning of the year. The partitions are of width 0.005 of market value of equity. Only partitions with scaled earnings ranging from -10% to 10% are presented in panel A, for the sake of brevity.

In panel B, changes in net income were deflated by market value of equity as of the beginning of the prior year. The partitions are of width 0.025 of market value of equity. Only partitions with scaled changes in earnings ranging from -5% to 5% are presented in panel B, for the sake of brevity.

The frequencies, in both panels, 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. The Z-statistics are computed using the formula in footnote 13.

Table 4, Panel A: Expected and Actual Frequency of Fiscal Year Net Income (unscaled)
(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.389	0.379	0.009	0.51
-19	0.415	0.397	0.018	0.94
-18	0.397	0.413	-0.015	-0.83
-17	0.379	0.444	-0.065	-3.49
-16	0.435	0.445	-0.009	-0.48
-15	0.468	0.471	- 0.003	-0.15
-14	0.506	0.497	0.008	0.40
-13	0.521	0.522	-0.001	-0.04
-12	0.584	0.551	0.033	1.49
-11	0.547	0.609	-0.061	-2.78
-10	0.702	0.677	0.025	1.03
-9	0.714	0.727	-0.013	-0.53
-8	0.731	0.787	-0.056	-2.19
-7	0.791	0.820	-0.029	-1.11
-6	0.847	0.911	-0.064	-2.34
-5	0.939	0.972	-0.033	-1.16
-4	1.027	1.098	-0.071	-2.37
-3	1.099	1.206	-0.107	-3.43
-2	1.164	1.377	-0.213	-6.58
-1	**1.079**	**1.472**	**-0.393**	**-12.37**
0	**1.901**	**1.566**	**0.335**	**8.51**
1	1.493	1.349	0.144	4.09
2	1.358	1.260	0.098	2.89
3	1.266	1.152	0.114	3.50
4	1.098	1.038	0.060	1.96
5	1.011	0.964	0.047	1.59
6	0.861	0.888	-0.027	-0.98
7	0.870	0.845	0.025	0.923
8	0.856	0.775	0.081	3.02
9	0.680	0.749	-0.068	-2.77
10	0.823	0.705	0.118	4.52
11	0.723	0.697	0.026	1.05
12	0.696	0.648	0.048	1.99
13	0.636	0.652	-0.016	-0.67
14	0.615	0.614	0.001	0.02
15	0.611	0.586	0.025	1.10
16	0.543	0.581	-0.038	-1.74
17	0.530	0.534	-0.004	-0.21
18	0.526	0.517	0.009	0.42
19	0.457	0.477	-0.020	-1.02

Table 4, Panel B: Expected and Actual Frequency of Changes in Fiscal Year Net Income (unscaled)

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.416	0.454	-0.038	-1.98
-19	0.461	0.461	-0.001	-0.03
-18	0.456	0.481	-0.025	-1.24
-17	0.466	0.518	-0.052	-2.56
-16	0.523	0.536	-0.013	-0.62
-15	0.548	0.545	0.003	0.14
-14	0.598	0.627	-0.029	-1.25
-13	0.654	0.649	0.005	0.20
-12	0.699	0.680	0.019	0.78
-11	0.712	0.736	-0.025	-0.99
-10	0.766	0.819	-0.054	-2.06
-9	0.784	0.873	-0.089	-3.36
-8	0.917	0.979	-0.062	-2.19
-7	1.030	1.050	-0.020	-0.67
-6	1.121	1.138	-0.016	-0.52
-5	1.229	1.330	-0.101	-3.08
-4	1.388	1.444	-0.056	-1.61
-3	1.579	1.656	-0.077	-2.07
-2	1.886	1.973	-0.088	-2.18
-1	**2.212**	**2.330**	**-0.118**	**-2.70**
0	**2.754**	**2.476**	**0.278**	**5.82**
1	2.235	2.204	0.031	0.71
2	2.063	1.896	0.166	4.01
3	1.765	1.739	0.026	0.67
4	1.550	1.520	0.030	0.84
5	1.455	1.395	0.060	1.70
6	1.299	1.285	0.014	0.43
7	1.205	1.169	0.035	1.10
8	1.122	1.081	0.042	1.35
9	1.089	0.999	0.090	2.97
10	0.943	0.924	0.019	0.67
11	0.903	0.878	0.025	0.88
12	0.847	0.818	0.029	1.10
13	0.782	0.759	0.023	0.90
14	0.743	0.726	0.017	0.67
15	0.736	0.665	0.071	2.85
16	0.708	0.642	0.066	2.68
17	0.632	0.640	-0.008	-0.35
18	0.580	0.582	-0.002	-0.09
19	0.549	0.547	0.001	0.07

Notes to Table 4:

The partitions are of width $100,000. Only partitions with net income or changes in net income ranging from -$2,000,000 to $2,000,000 are presented, for the sake of brevity.

The frequencies, in both panels, 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. The Z-statistics are computed using the formula in footnote 13.

Table 5, Panel A: Expected and Actual Frequency of Fiscal Year Basic Earnings Per Share (unscaled)

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.354	0.348	0.006	0.35
-19	0.377	0.366	0.011	0.62
-18	0.374	0.374	-0.000	-0.01
-17	0.369	0.400	-0.031	-1.72
-16	0.383	0.405	-0.021	-1.17
-15	0.396	0.420	- 0.024	-1.29
-14	0.450	0.447	0.003	0.14
-13	0.456	0.464	-0.007	-0.37
-12	0.511	0.480	0.031	1.51
-11	0.499	0.478	0.021	1.02
-10	0.509	0.518	-0.010	-0.46
-9	0.554	0.541	0.013	0.60
-8	0.573	0.587	-0.014	-0.62
-7	0.564	0.604	-0.039	-1.77
-6	0.634	0.651	-0.017	-0.70
-5	0.705	0.695	0.010	0.40
-4	0.739	0.766	-0.027	-1.07
-3	0.766	0.833	-0.067	-2.58
-2	0.953	0.939	0.015	0.51
-1	**1.197**	**1.112**	**0.084**	**2.65**
0	**1.736**	**1.626**	**0.111**	**2.89**
1	1.049	0.781	0.268	9.21
2	0.922	0.684	0.238	8.71
3	0.711	0.626	0.086	3.51
4	0.657	0.571	0.086	3.66
5	0.577	0.537	0.040	1.78
6	0.575	0.505	0.070	3.19
7	0.528	0.498	0.030	1.40
8	0.487	0.455	0.033	1.59
9	0.503	0.457	0.046	2.24
10	0.496	0.448	0.047	2.33
11	0.455	0.412	0.043	2.17
12	0.451	0.432	0.020	0.99
13	0.423	0.397	0.026	1.36
14	0.398	0.398	-0.000	-0.02
15	0.413	0.372	0.042	2.22
16	0.432	0.380	0.053	2.77
17	0.378	0.348	0.027	1.63
18	0.372	0.358	0.014	0.78
19	0.341	0.359	-0.018	-1.05

Table 5, Panel B: Expected and Actual frequency of Changes in Fiscal Year Basic Earnings Per Share (unscaled)

(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.418	0.389	0.029	1.53
-19	0.434	0.428	0.007	0.35
-18	0.458	0.470	-0.012	-0.61
-17	0.500	0.547	-0.047	-2.22
-16	0.573	0.581	-0.008	-0.35
-15	0.608	0.621	-0.013	-0.55
-14	0.702	0.721	-0.018	-0.74
-13	0.779	0.792	-0.013	-0.51
-12	0.925	0.917	0.008	0.29
-11	1.075	1.080	-0.005	-0.17
-10	1.124	1.223	-0.099	-3.14
-9	1.389	1.430	-0.041	-1.19
-8	1.631	1.624	0.007	0.19
-7	1.866	1.971	-0.104	-2.60
-6	2.168	2.268	-0.100	-2.31
-5	2.597	2.777	-0.181	-3.82
-4	3.282	3.536	-0.254	-4.78
-3	4.236	4.386	-0.150	-2.52
-2	5.658	5.937	-0.279	-4.07
-1	**9.316**	**9.685**	**-0.369**	**-4.28**
0	**13.121**	**12.283**	**0.838**	**8.48**
1	8.194	7.934	0.261	3.23
2	6.220	6.017	0.202	2.85
3	4.477	4.489	-0.012	-0.20
4	3.435	3.333	0.101	1.89
5	2.546	2.574	-0.028	-0.60
6	2.012	1.987	0.024	0.58
7	1.615	1.641	-0.026	-0.70
8	1.322	1.309	0.014	0.40
9	1.081	1.102	-0.021	-0.69
10	0.912	0.916	-0.004	-0.14
11	0.811	0.762	0.049	1.87
12	0.682	0.699	-0.017	-0.70
13	0.582	0.620	-0.038	-1.70
14	0.506	0.512	-0.006	-0.27
15	0.437	0.458	-0.021	-1.05
16	0.394	0.403	-0.009	-0.46
17	0.391	0.368	0.024	1.29
18	0.324	0.318	0.006	0.34
19	0.296	0.295	0.001	0.04

Notes to Table 5:

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 partitions are of width one cent each. EPS has been rounded to the nearest cent. Only partitions with EPS ranging from -20 cents to 19 cents are presented, for the sake of brevity.

The frequencies, in both panels, 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. The Z-statistics are computed using the formula in footnote 13.

Table 6, Panel A: Expected and Actual Frequency of Pre-Tax Income (unscaled)
(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.389	0.363	0.027	1.47
-19	0.385	0.396	-0.011	-0.60
-18	0.379	0.404	-0.025	-1.37
-17	0.414	0.430	-0.015	-0.81
-16	0.446	0.446	-0.001	-0.03
-15	0.479	0.471	0.008	0.41
-14	0.499	0.510	-0.011	-0.51
-13	0.544	0.533	0.011	0.52
-12	0.586	0.578	0.008	0.35
-11	0.555	0.612	-0.057	-2.57
-10	0.658	0.666	-0.007	-0.31
-9	0.728	0.702	0.026	1.03
-8	0.723	0.781	-0.057	-2.26
-7	0.772	0.803	-0.031	-1.21
-6	0.817	0.929	-0.112	-4.16
-5	0.950	0.961	-0.011	-0.38
-4	1.062	1.052	0.010	0.33
-3	1.062	1.159	-0.096	-3.15
-2	1.191	1.292	-0.101	-3.12
-1	**1.084**	**1.372**	**-0.288**	**-9.14**
0	**1.653**	**1.405**	**0.248**	**6.71**
1	1.228	1.109	0.118	3.69
2	1.070	0.994	0.076	2.54
3	0.998	0.908	0.090	3.11
4	0.871	0.844	0.027	0.98
5	0.814	0.773	0.041	1.57
6	0.756	0.712	0.043	1.71
7	0.691	0.686	0.005	0.19
8	0.649	0.679	-0.030	-1.25
9	0.598	0.583	0.015	0.68
10	0.612	0.568	0.044	1.93
11	0.579	0.548	0.031	1.37
12	0.553	0.524	0.030	1.37
13	0.479	0.502	-0.023	-1.12
14	0.504	0.472	0.032	1.55
15	0.496	0.481	0.015	0.72
16	0.475	0.448	0.027	1.33
17	0.456	0.437	0.019	0.96
18	0.422	0.431	- 0.008	-0.43
19	0.416	0.408	0.007	0.39

Table 6, Panel B: Expected and Actual Frequency of Changes in Pre-Tax Income (unscaled)
(Using average of other annual periods as expectation)

Partition	Frequency for fiscal year (%)	Average frequency for other three annual periods	Difference	Z-statistic for difference
-20	0.401	0.433	-0.031	-1.66
-19	0.435	0.427	0.008	0.37
-18	0.469	0.469	-0.001	-0.03
-17	0.423	0.486	-0.063	-3.25
-16	0.500	0.516	-0.016	-0.76
-15	0.513	0.573	-0.060	-2.78
-14	0.507	0.587	-0.079	-3.72
-13	0.640	0.630	0.010	0.44
-12	0.665	0.692	-0.027	-1.13
-11	0.670	0.703	-0.033	-1.36
-10	0.743	0.791	-0.048	-1.89
-9	0.797	0.797	0.000	0.00
-8	0.878	0.913	- 0.035	-1.26
-7	0.950	0.953	-0.002	-0.09
-6	1.035	1.049	-0.014	-0.47
-5	1.113	1.194	-0.081	-2.59
-4	1.267	1.320	-0.054	-1.62
-3	1.413	1.502	-0.089	-2.55
-2	1.758	1.721	0.036	0.94
-1	**2.019**	**2.050**	**-0.030**	**-0.73**
0	**2.387**	**2.200**	**0.188**	**4.21**
1	1.934	1.874	0.060	1.47
2	1.744	1.711	0.033	0.86
3	1.509	1.499	0.010	0.28
4	1.414	1.358	0.056	1.63
5	1.292	1.257	0.035	1.07
6	1.142	1.128	0.014	0.45
7	1.083	1.072	0.011	0.36
8	1.010	0.971	0.039	1.31
9	0.936	0.937	-0.001	-0.05
10	0.900	0.878	0.022	0.80
11	0.826	0.797	0.029	1.09
12	0.765	0.776	-0.011	-0.43
13	0.706	0.717	-0.011	-0.43
14	0.709	0.677	0.031	1.27
15	0.675	0.615	0.060	2.51
16	0.655	0.585	0.070	2.99
17	0.634	0.603	0.032	1.36
18	0.584	0.594	- 0.010	-0.45
19	0.547	0.532	0.015	0.694

Notes to Table 6:

The partitions are of width $100,000. Only partitions with net income or changes in net income ranging from -$2,000,000 to $2,000,000 are presented, for the sake of brevity.

The frequencies, in both panels, 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. The Z-statistics are computed using the formula in footnote 13.

Table 7: Rankings of Moments of Net Income and EPS

Panel A: Simulations of Net Income with Fourth Quarter Earnings Management

Average rank	Annual period ending in fiscal year quarter			
	One	Two	Three	Four
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: Simulations of Net Income with Fourth Quarter Settling Up

Average rank	Annual period ending in fiscal year quarter			
	One	Two	Three	Four
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: Actual Net Income

Average rank	Annual period ending in fiscal year quarter			
	One	Two	Three	Four
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

Panel D: Actual EPS

Average rank	Annual period ending in fiscal year quarter			
	One	Two	Three	Four
Variance	2.653	2.413	2.335	2.588*
Skewness measure 1	2.457	2.543	2.609	2.349*
Skewness measure 2	2.518	2.493	2.496	2.466*
Skewness measure 3	2.530	2.466	2.401	2.585*
Kurtosis	2.505	2.460	2.413	2.609*

Notes to Table 7:

Net Income was computed as the sum of four consecutive quarterly earnings realizations. EPS was data item 27 from quarterly Compustat. 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 (in aggregate) were significant at less than the 0.0001 level.

Variance is defined as $\sigma^2 = E\left[\left(X-\mu\right)^2\right]$.

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

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

for $n = 1,2,3$. Therefore, 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.

Fig. 1A: Fiscal Year Scaled Net Income

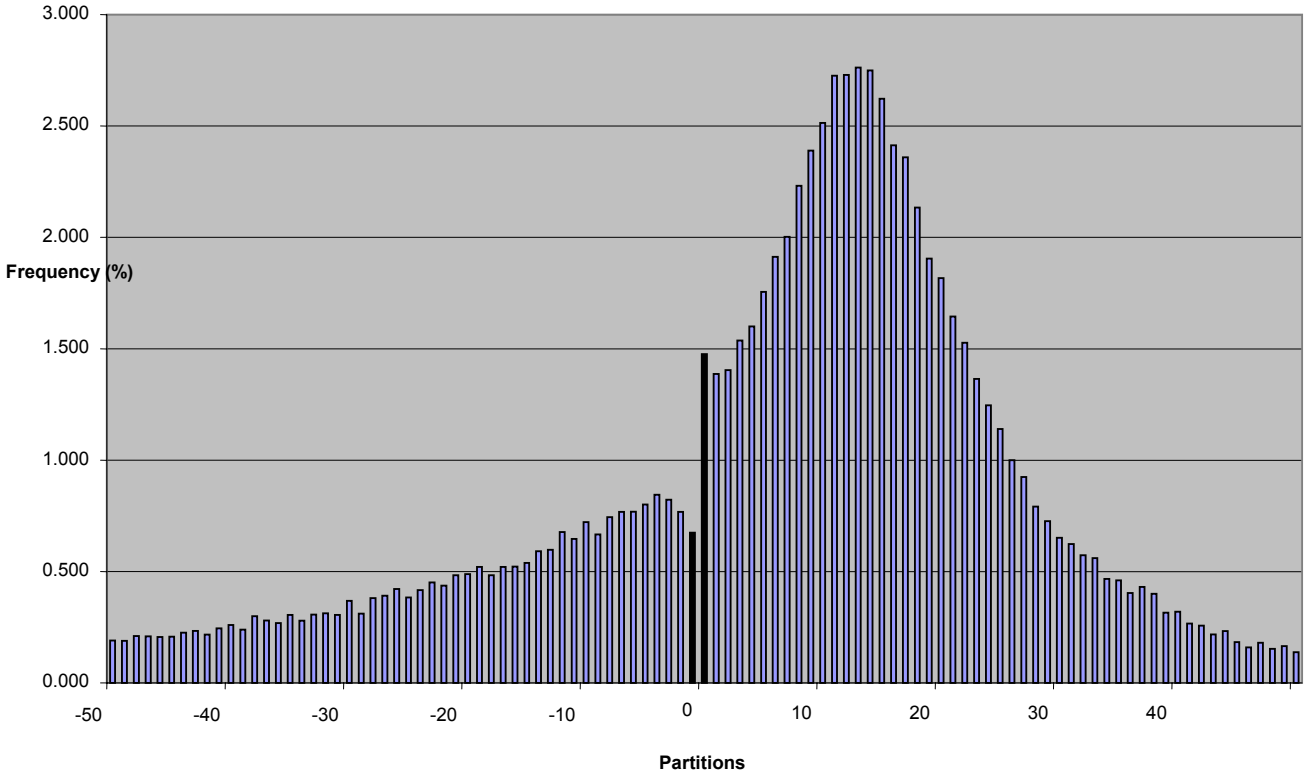

Fig 1B: Scaled Net Income for Annual Period Ending in Quarter One

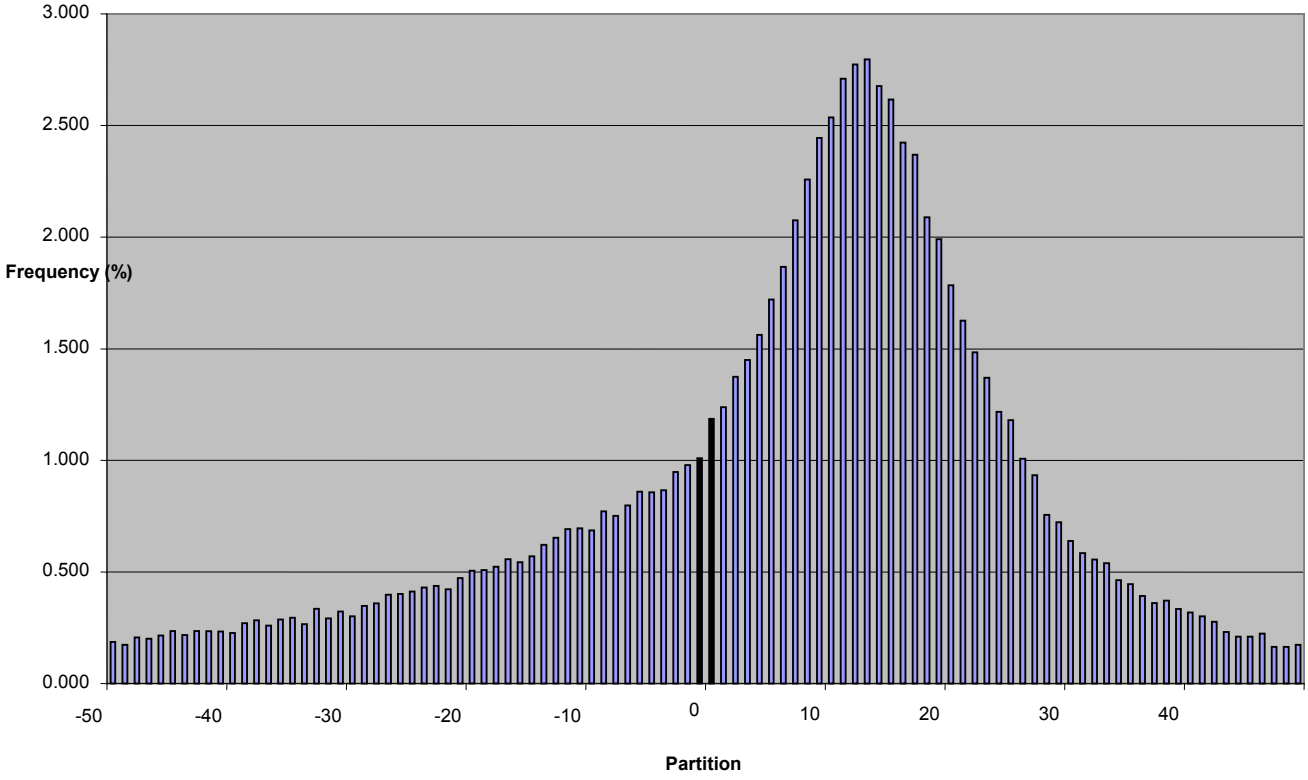

Fig. 1C: Scaled Net Income for Annual Period Ending in Quarter 2

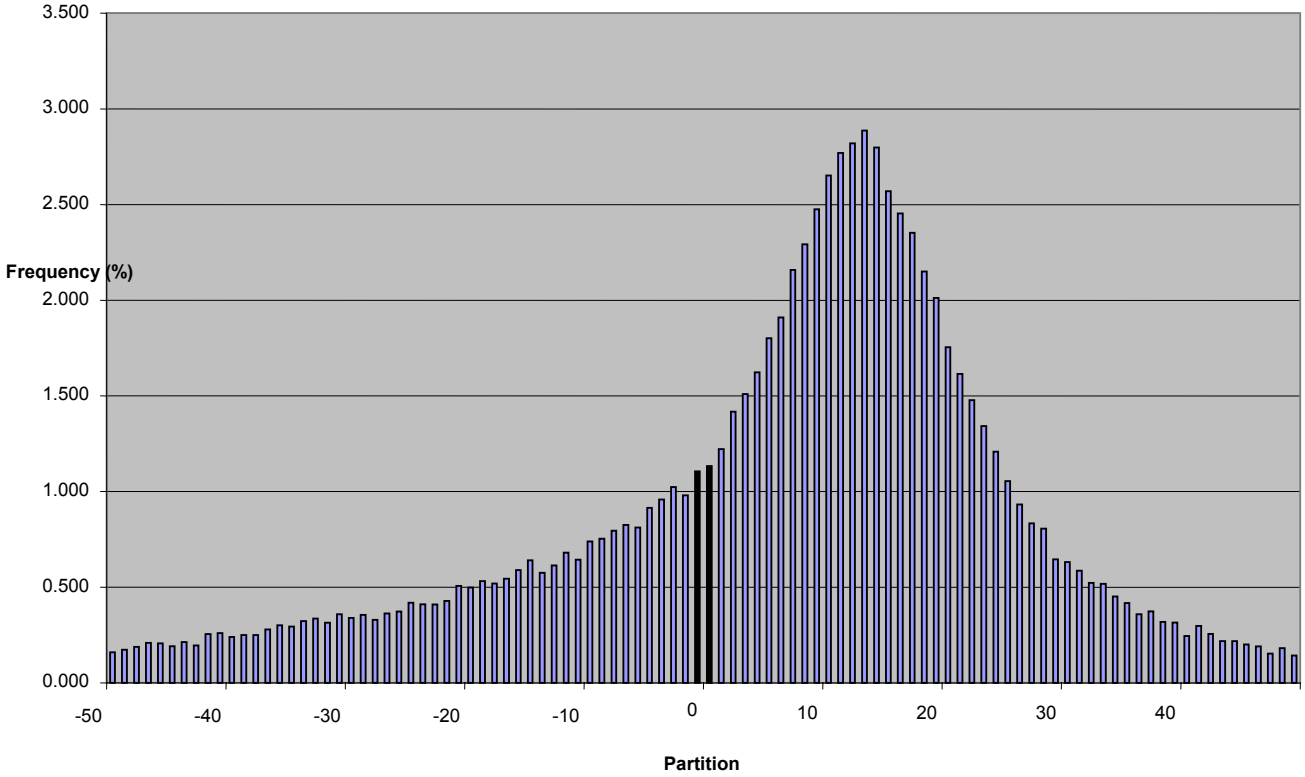

Fig. 1D: Scaled Net Income for Annual Period Ending in Quarter 3

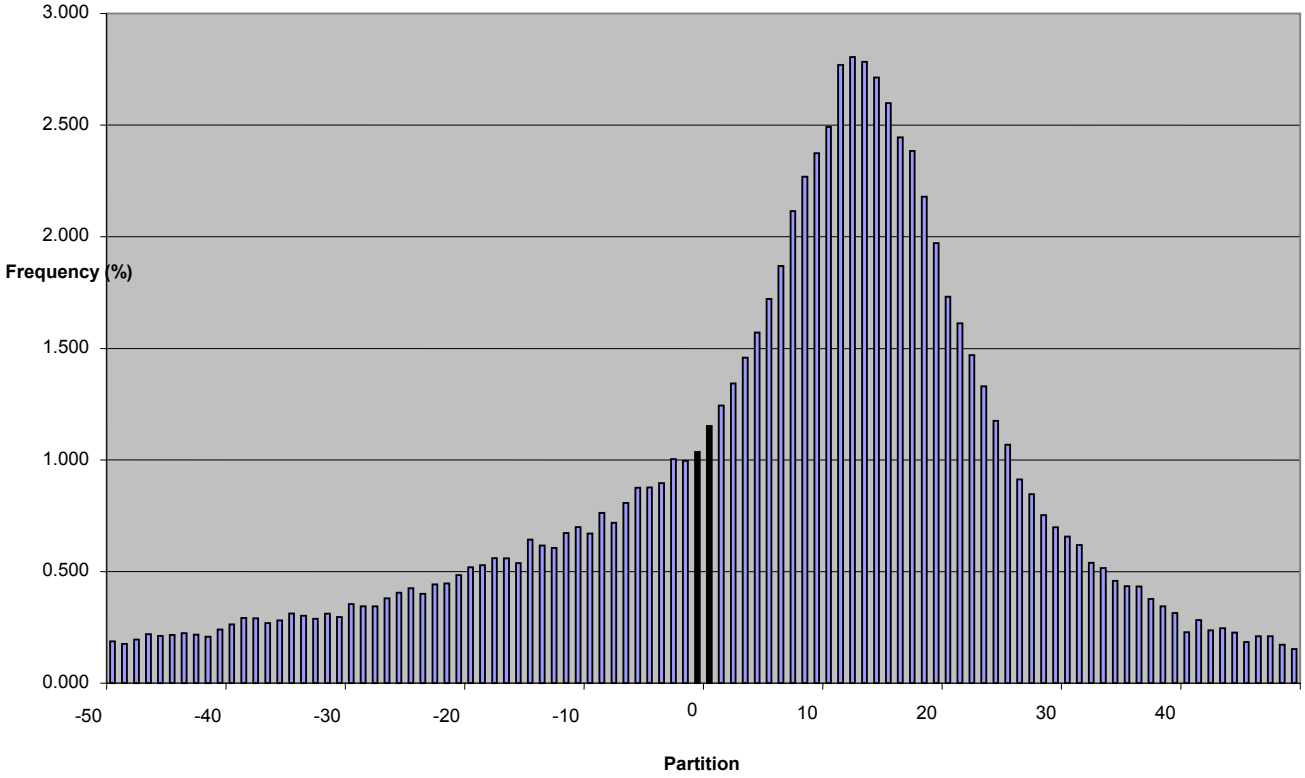

Fig. 1E: Difference between Actual and Expected Frequency of Scaled Net Income

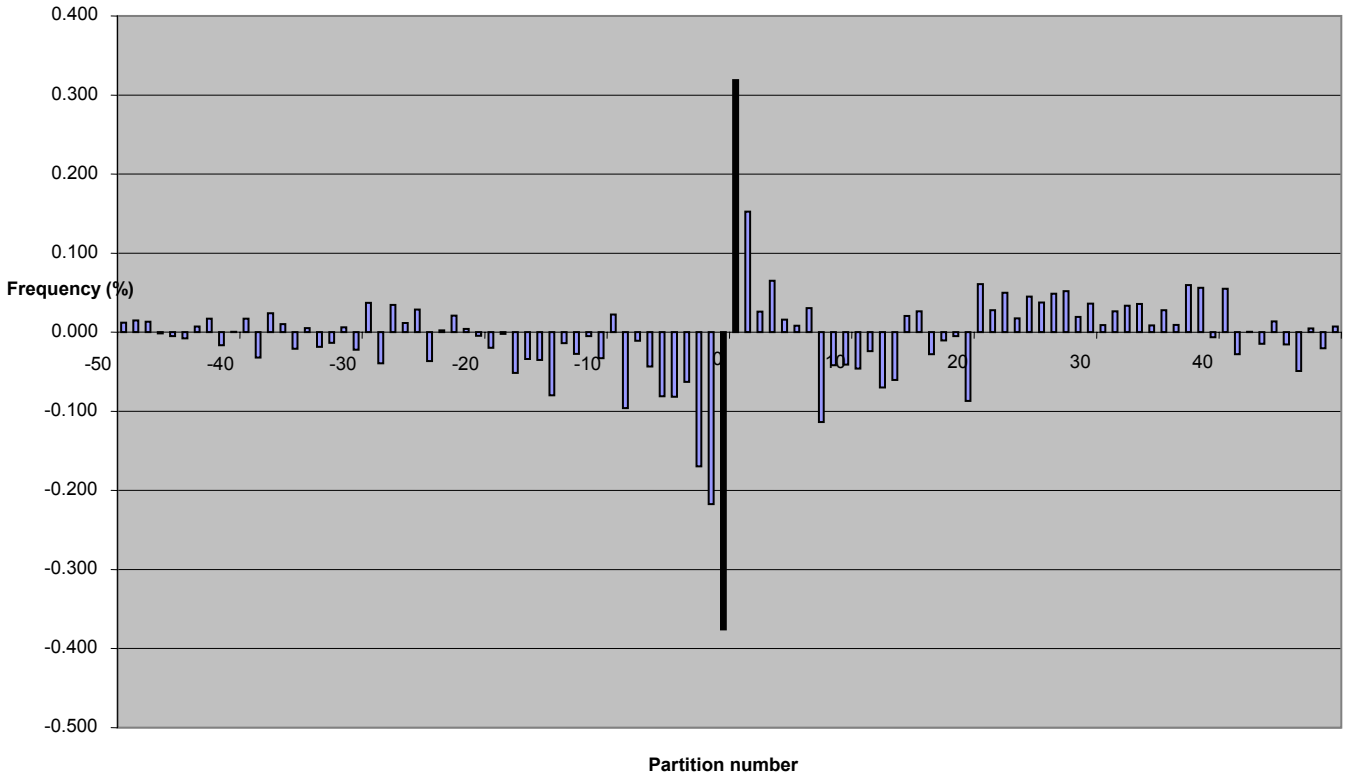

Figure 1:

Figure 1 illustrates the effect of the annual measurement period on net income scaled by market value of equity at the beginning of the year.
Figure 1A is the histogram of fiscal year scaled net income.
Figure 1B is the histogram of scaled net income for the annual period starting at the first fiscal year quarter end.
Figure 1C is the histogram of scaled net income for the annual period starting at the second fiscal year quarter end.
Figure 1D is the histogram of scaled net income for the annual period starting at the third fiscal year quarter end.
Figure 1E is the histogram of differences between the fiscal year histogram in figure 1A and an equally weighted average of the histograms in figures 1B, 1C, and 1D.

Fig. 2A: Scaled Changes in Fiscal year Net Income

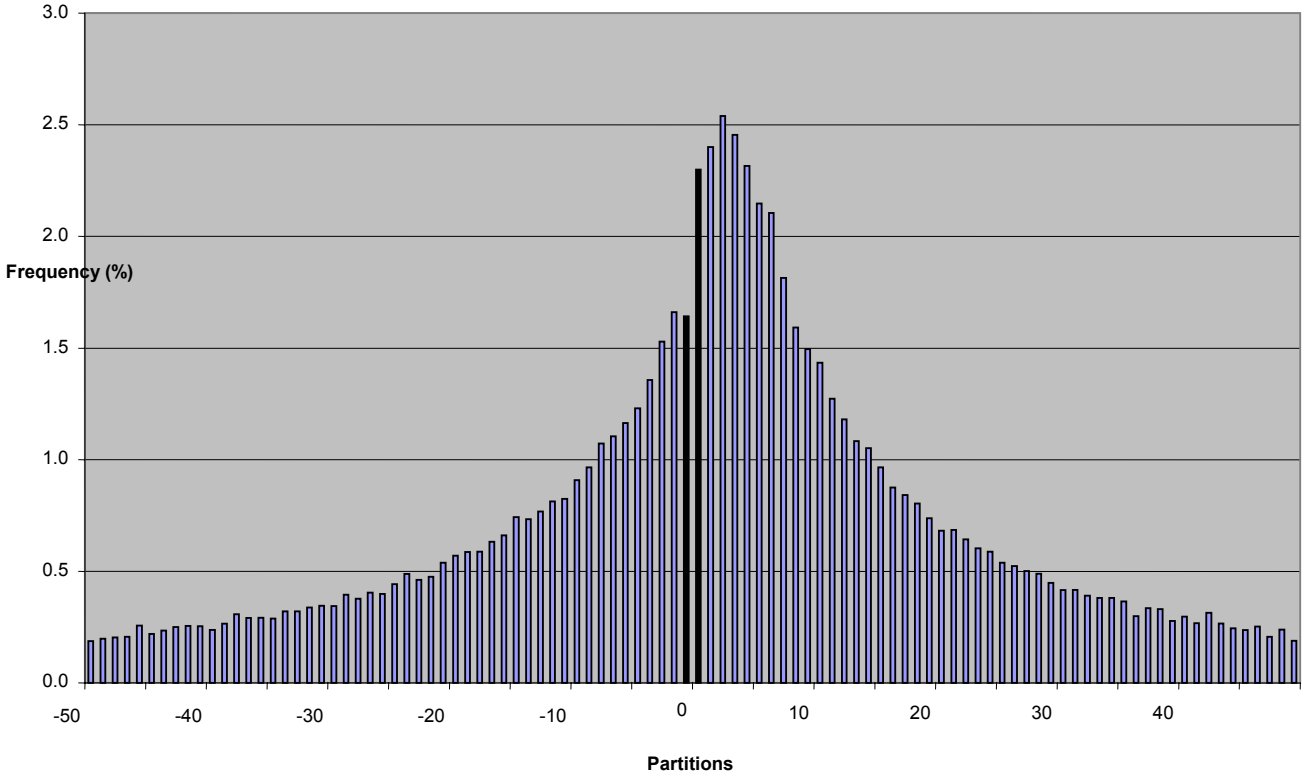

Fig. 2B: Scaled Changes in Net Income for Annual Period Ending in Quarter One

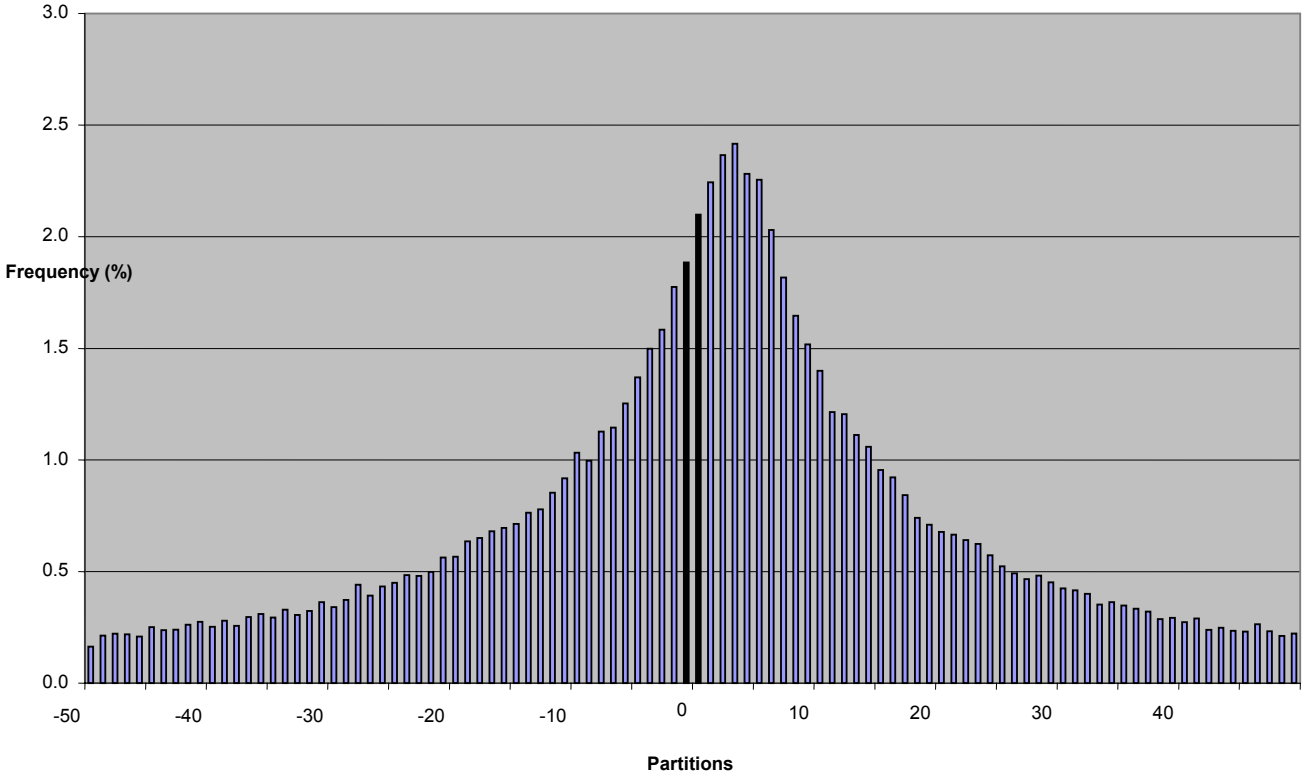

Fig. 2C: Scaled Changes in Net Income for Annual Periods Ending in Quarter Two

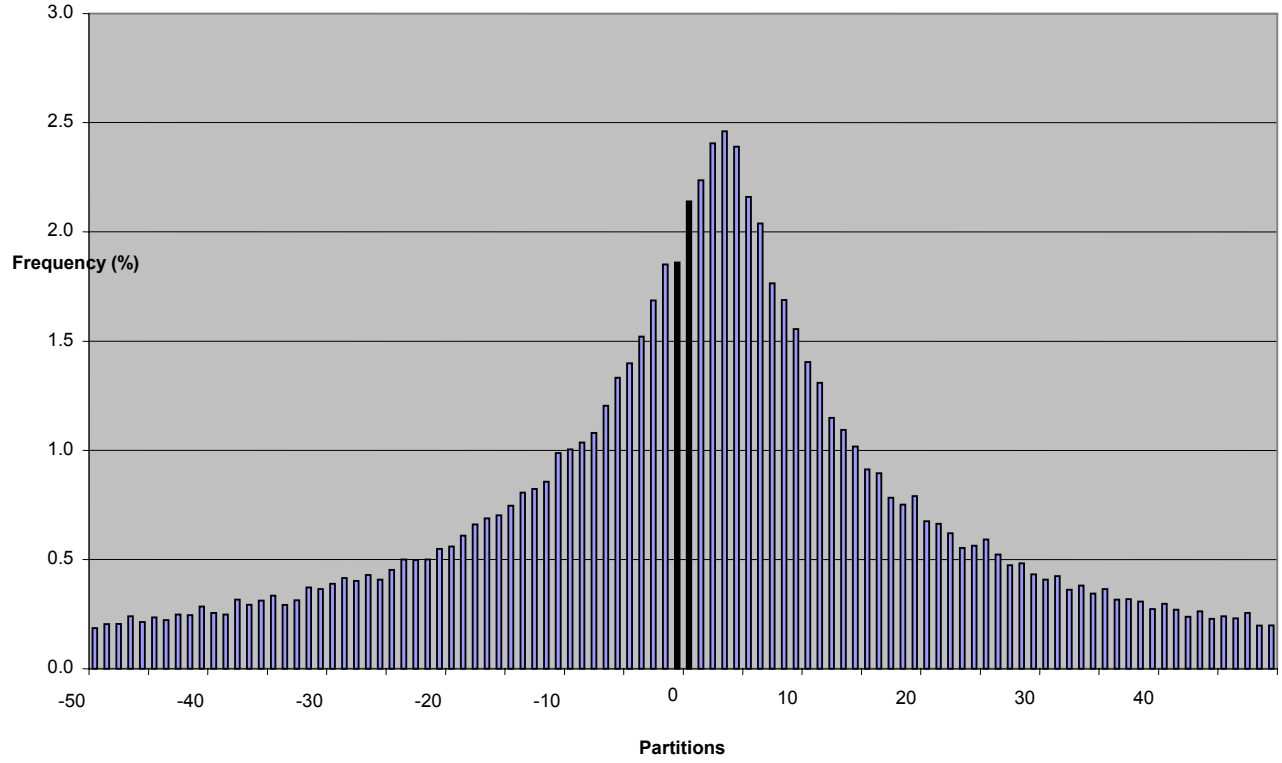

Fig. 2D: Scaled Changes in Net Income for Annual Periods Ending in Quarter Three

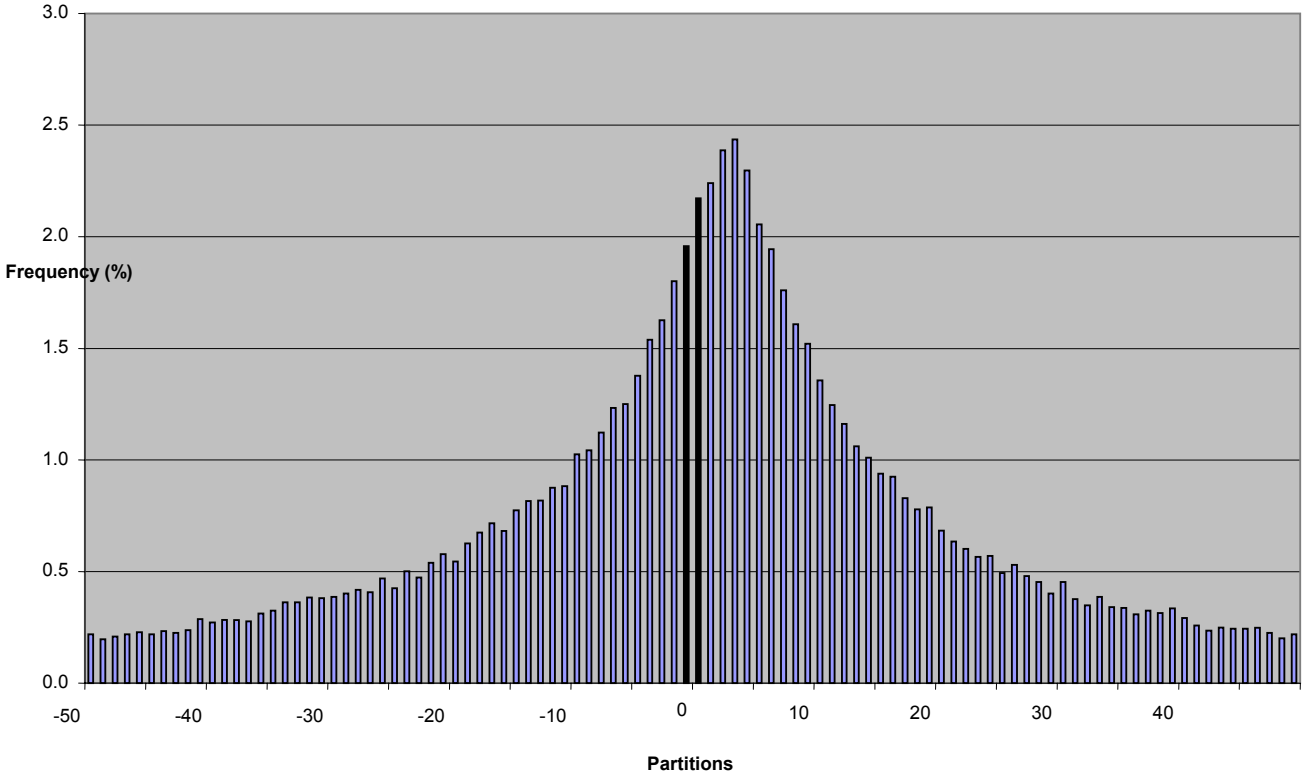

Fig. 2E: Difference between Actual and Expected Frequencies for Fiscal Year Scaled Changes in Net Income

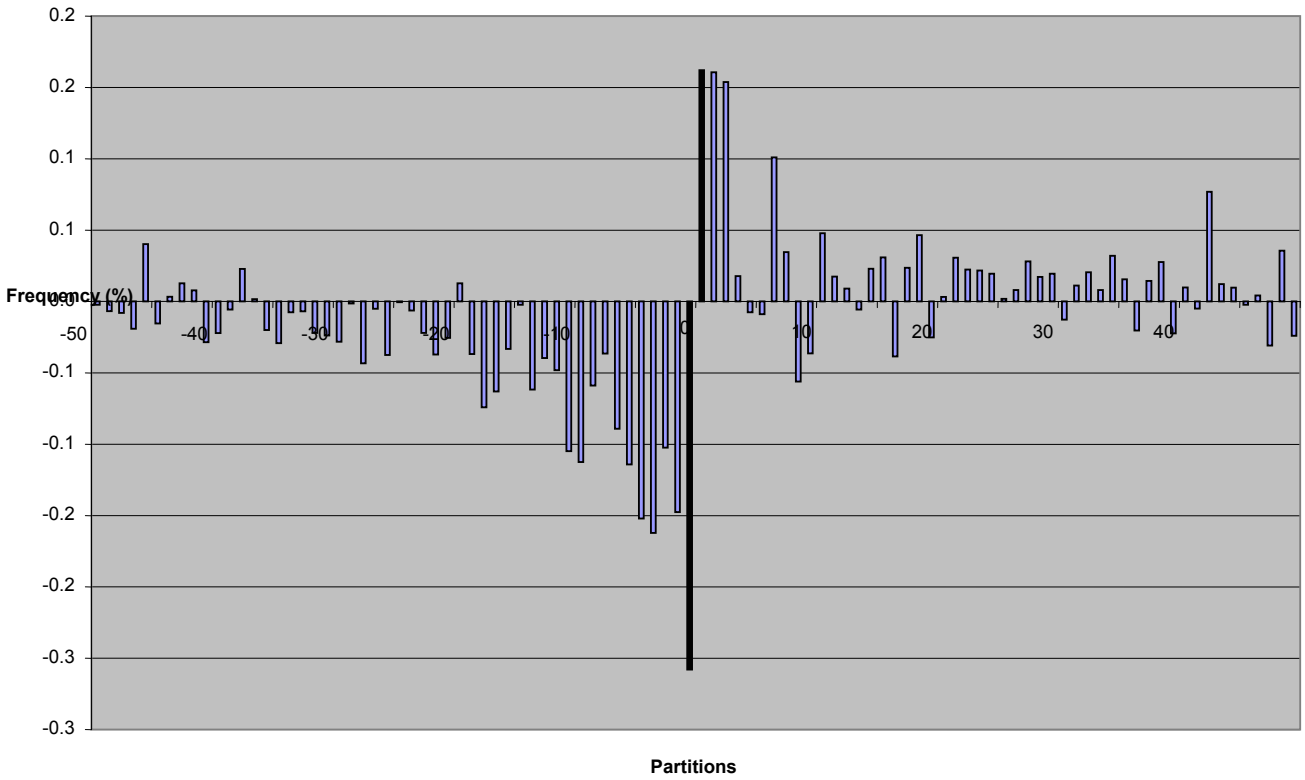

Figure 2:

Figure 2 illustrates the effect of the annual measurement period on changes in net income scaled by market value of equity at the beginning of the prior year.

Figure 2A is the histogram of annual earnings scaled changes in fiscal year net income.
Figure 2B is the histogram of annual scaled earnings changes for the annual period starting at the first fiscal quarter end.
Figure 2C is the histogram of annual scaled earnings changes for the year starting at the second fiscal quarter end.
Figure 2D is the histogram of annual scaled earnings changes for the year starting at the third fiscal quarter end.
Figure 2E is the histogram of differences between the fiscal year histogram in figure 2A and an equally weighted average of the histograms in figures 2B, 2C, and 2D.

Fig. 3A: Unscaled Fiscal Year Net Income

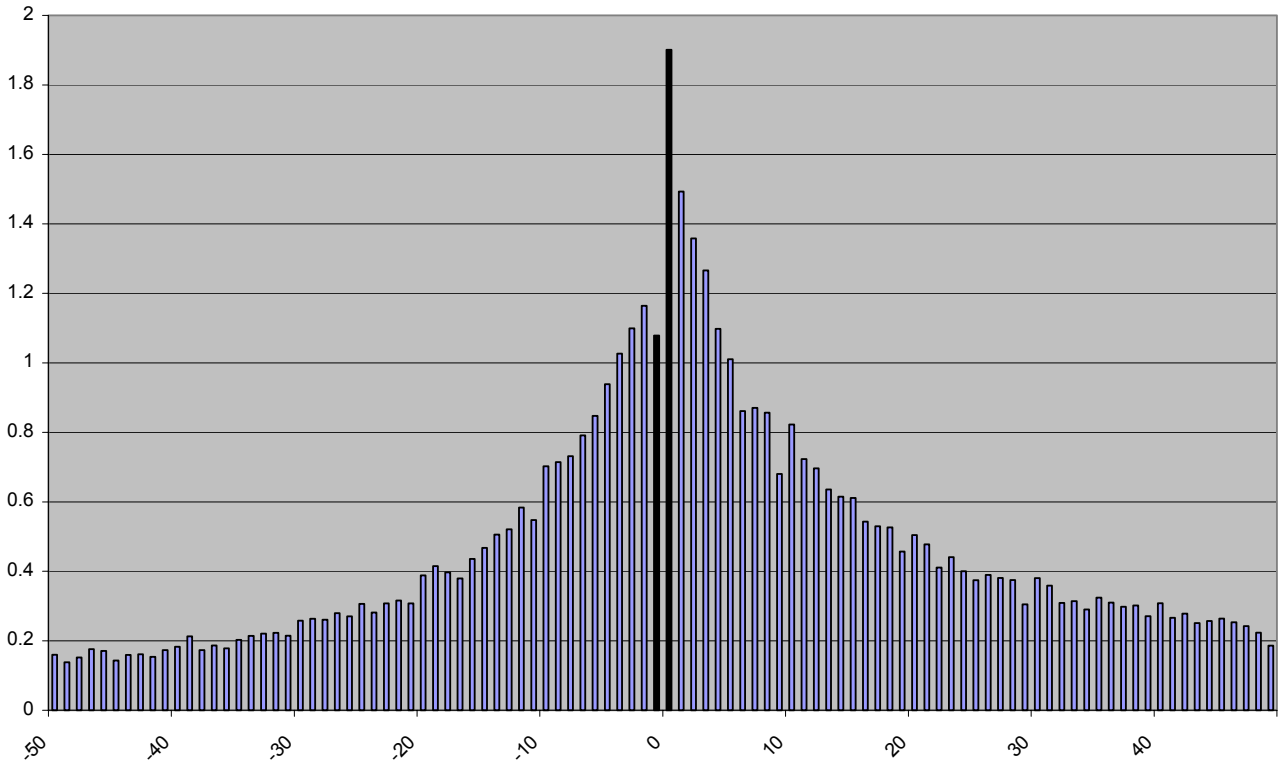

Fig. 3B: Unscaled Net Income: Annual Period Ending in Quarter 1

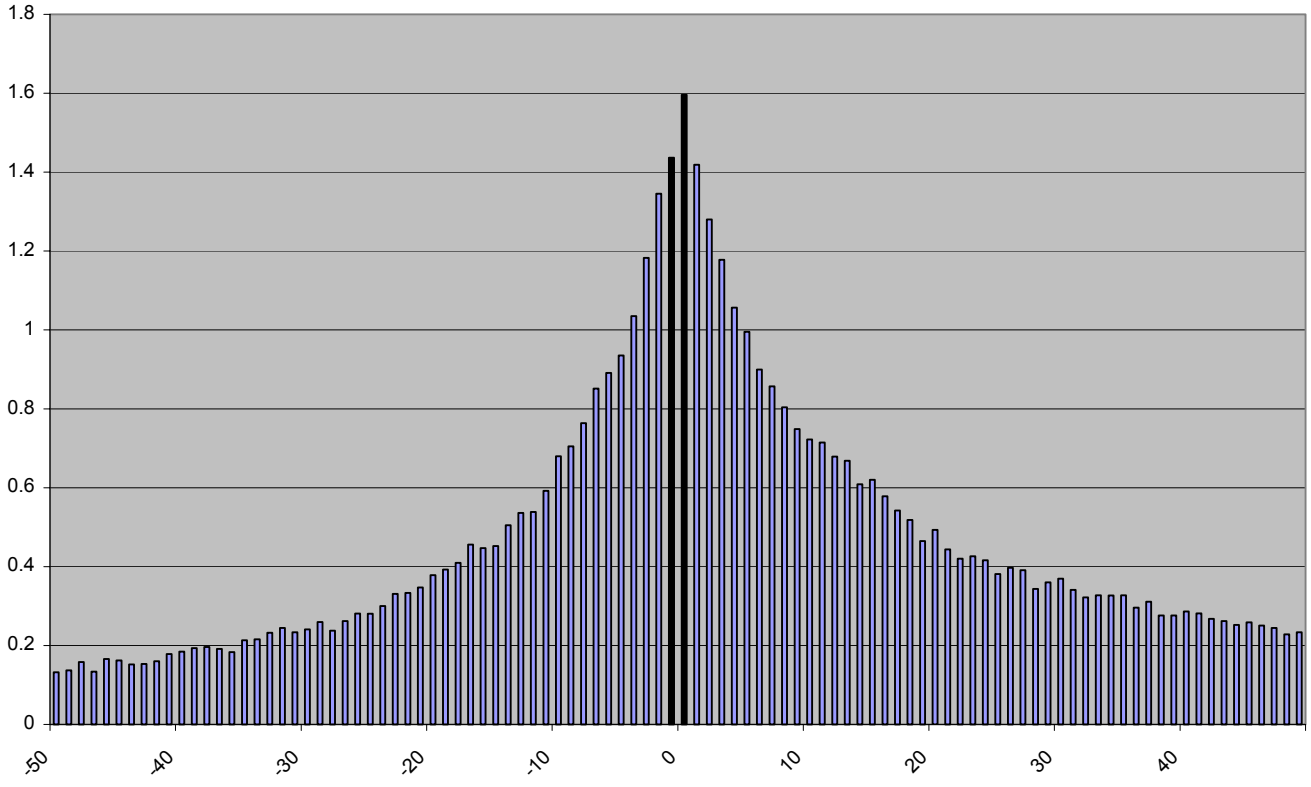

Fig. 3C: Unscaled Net Income: Annual Period Ending in Quarter 2

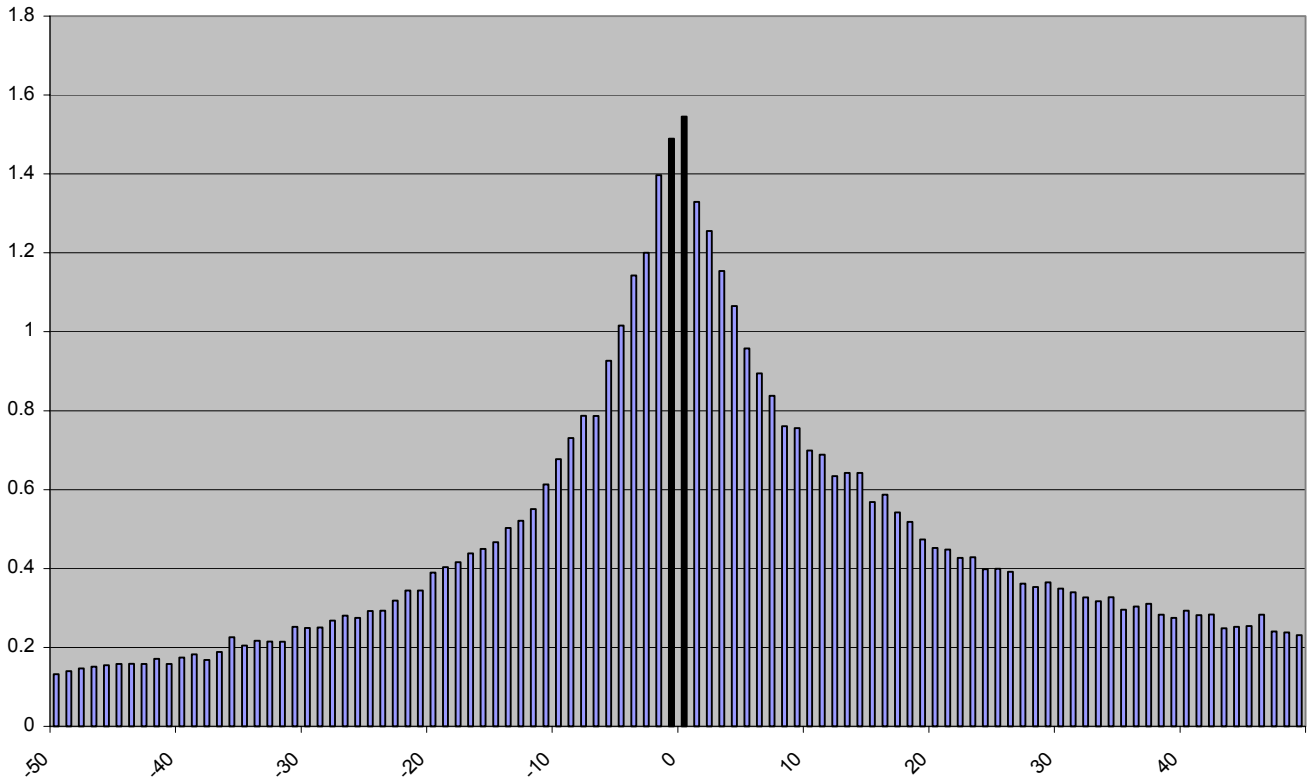

Fig. 3D: Unscaled Net Income: Annual Period Ending in Quarter 3

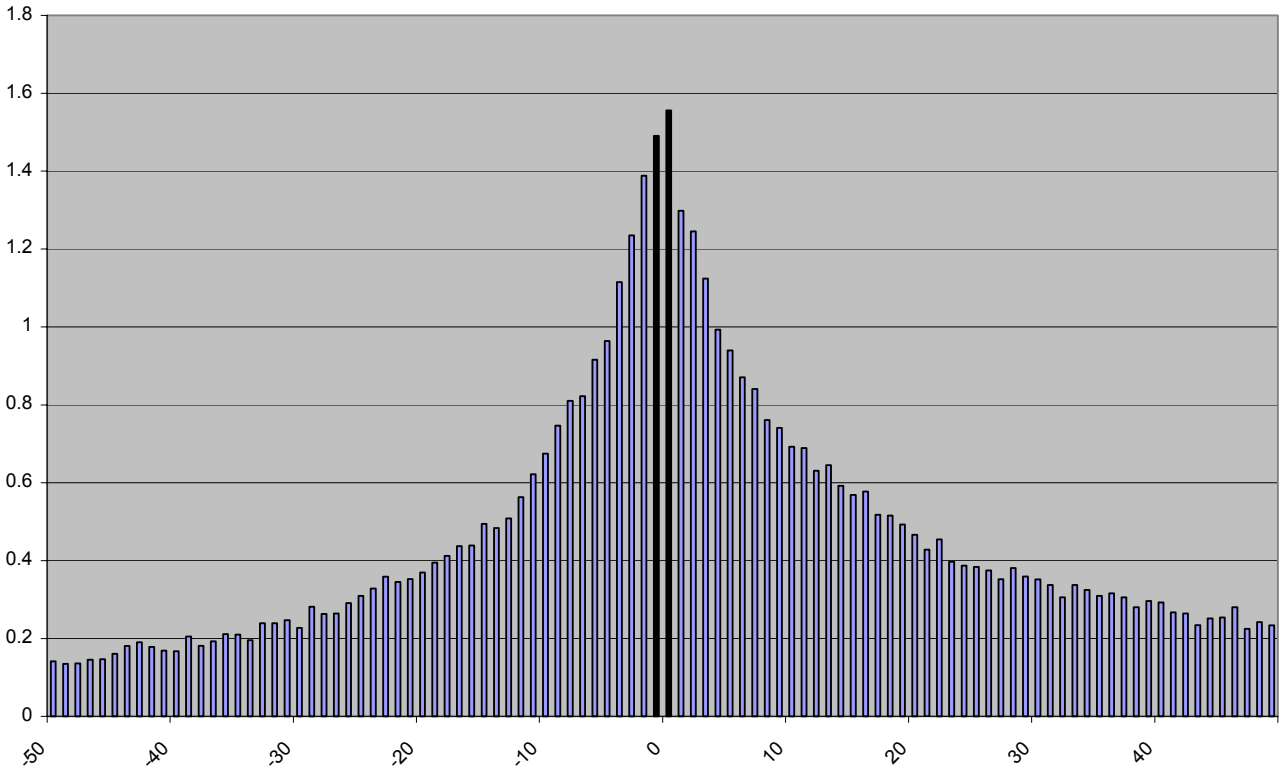

Fig. 3E: Unscaled Fiscal Year Net Income: Deviation of Actual from Expected frequency

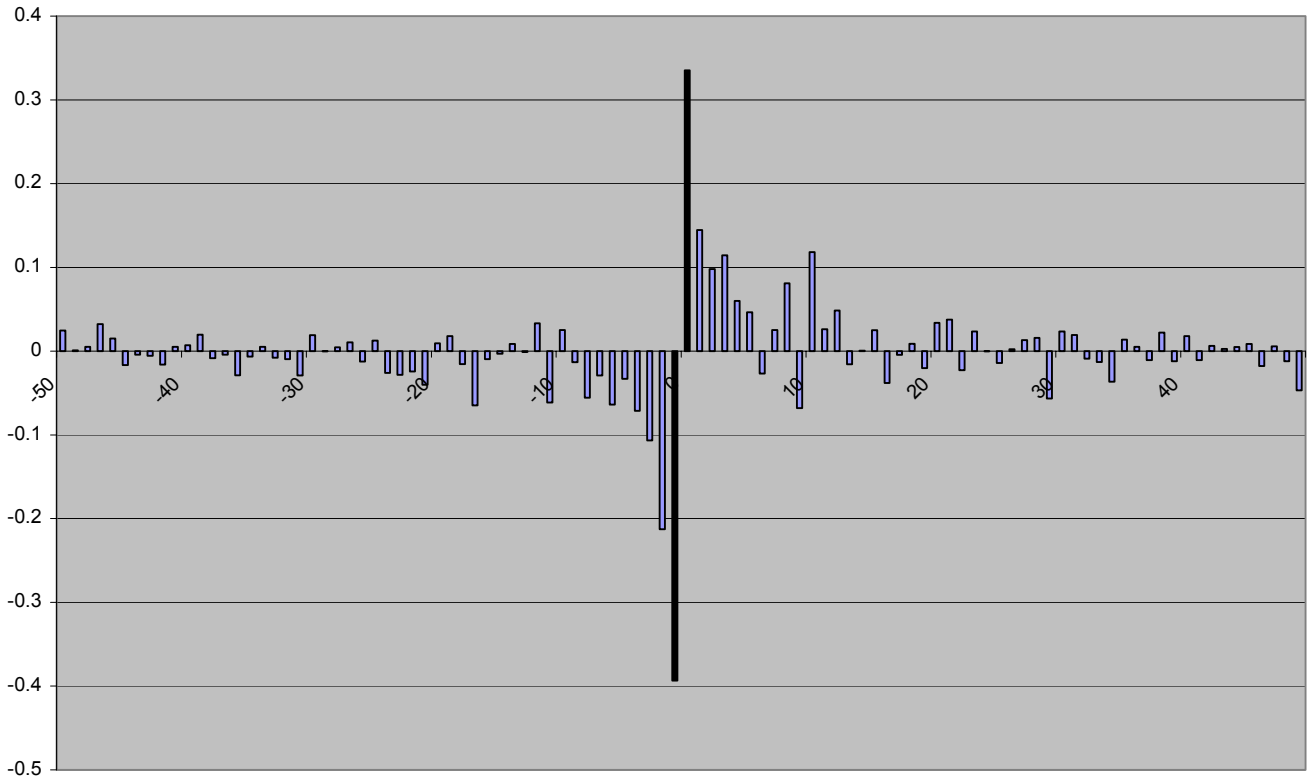

Figure 3:

Figure 3 illustrates the effect of the annual measurement period on net income.

Figure 3A is the histogram of fiscal year net income.
Figure 3B is the histogram of net income for the year starting at the first fiscal quarter end.
Figure 3C is the histogram of net income for the year starting at the second fiscal quarter end.
Figure 3D is the histogram of net income for the year starting at the third fiscal quarter end.
Figure 3E is the histogram of differences between the fiscal year histogram in figure 3A and an equally weighted average of the histograms in figures 3B, 3C, and 3D

Fig. 4A: Fiscal Year EPS

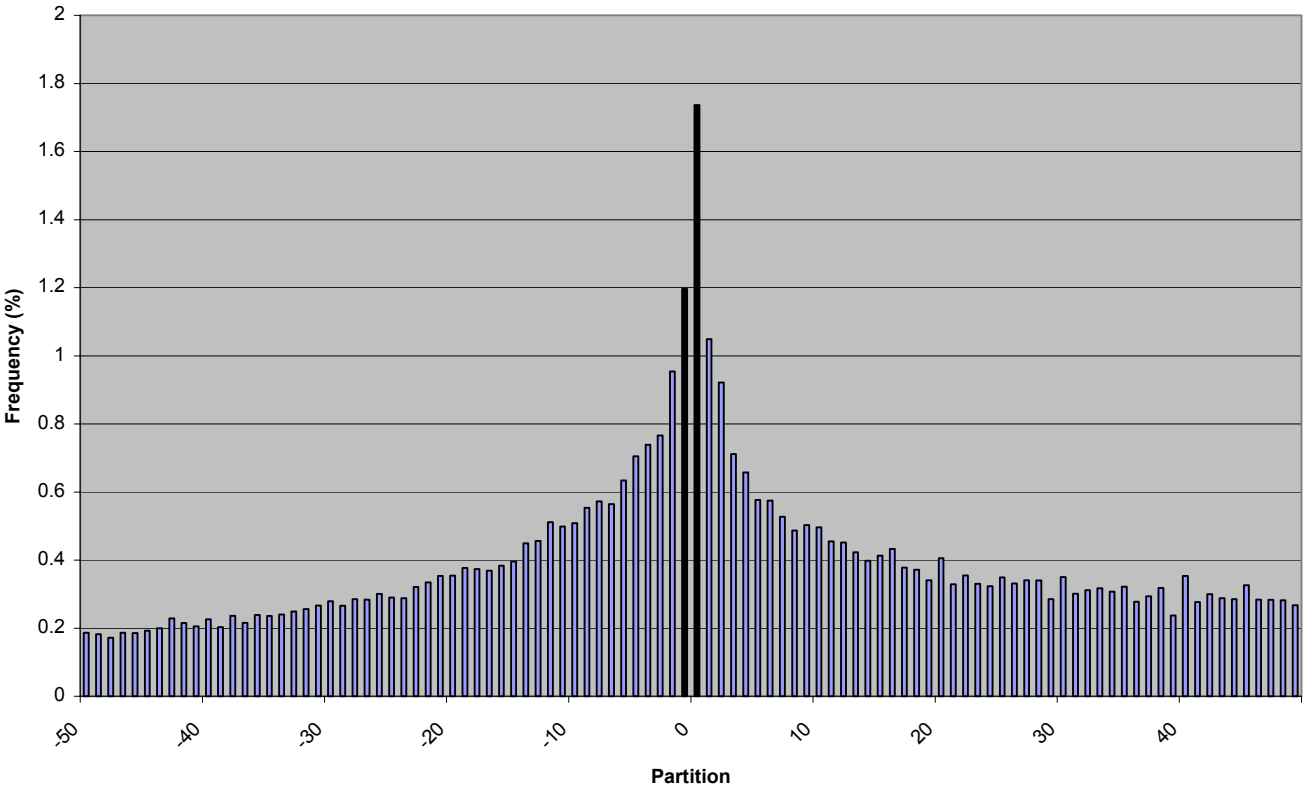

Fig. 4B: EPS for Annual Period Ending in Quarter 1

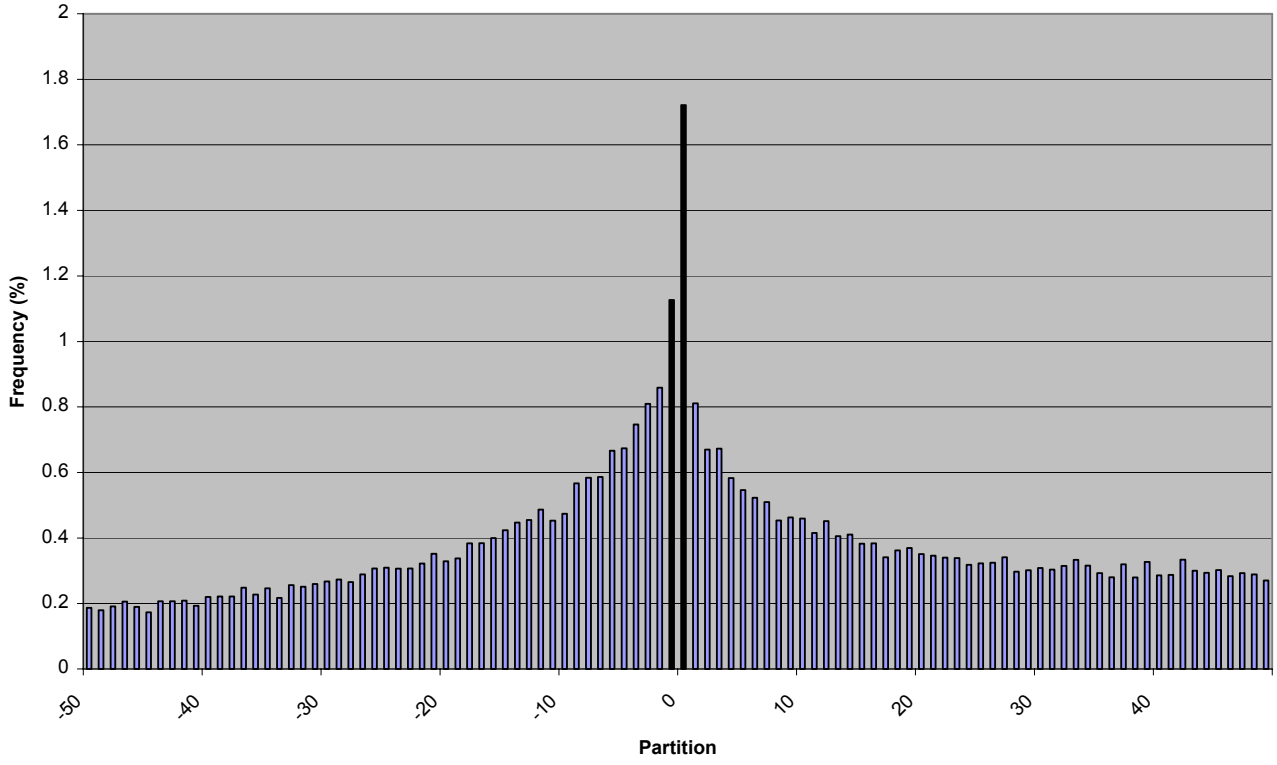

Fig. 4C: EPS for Annual Period Ending in Quarter 2

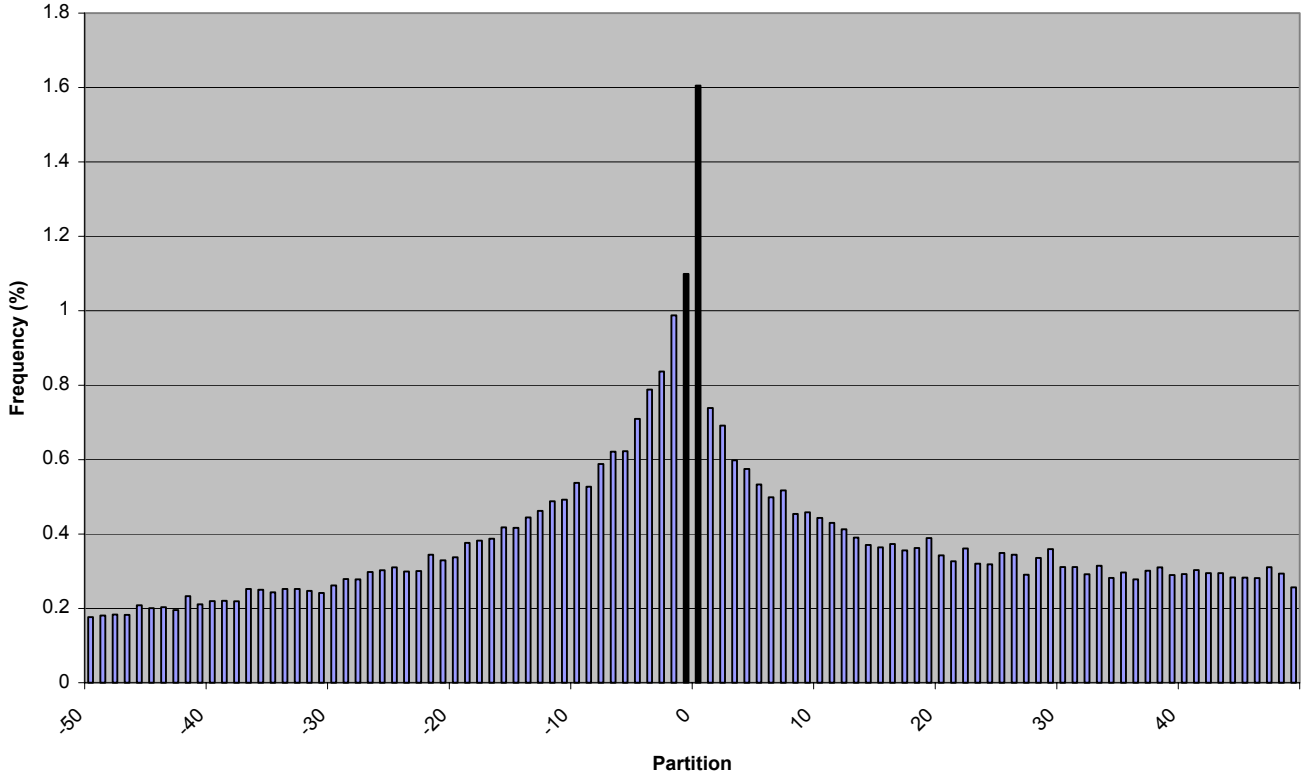

Fig. 4D: EPS for Annual Period Ending in Quarter 3

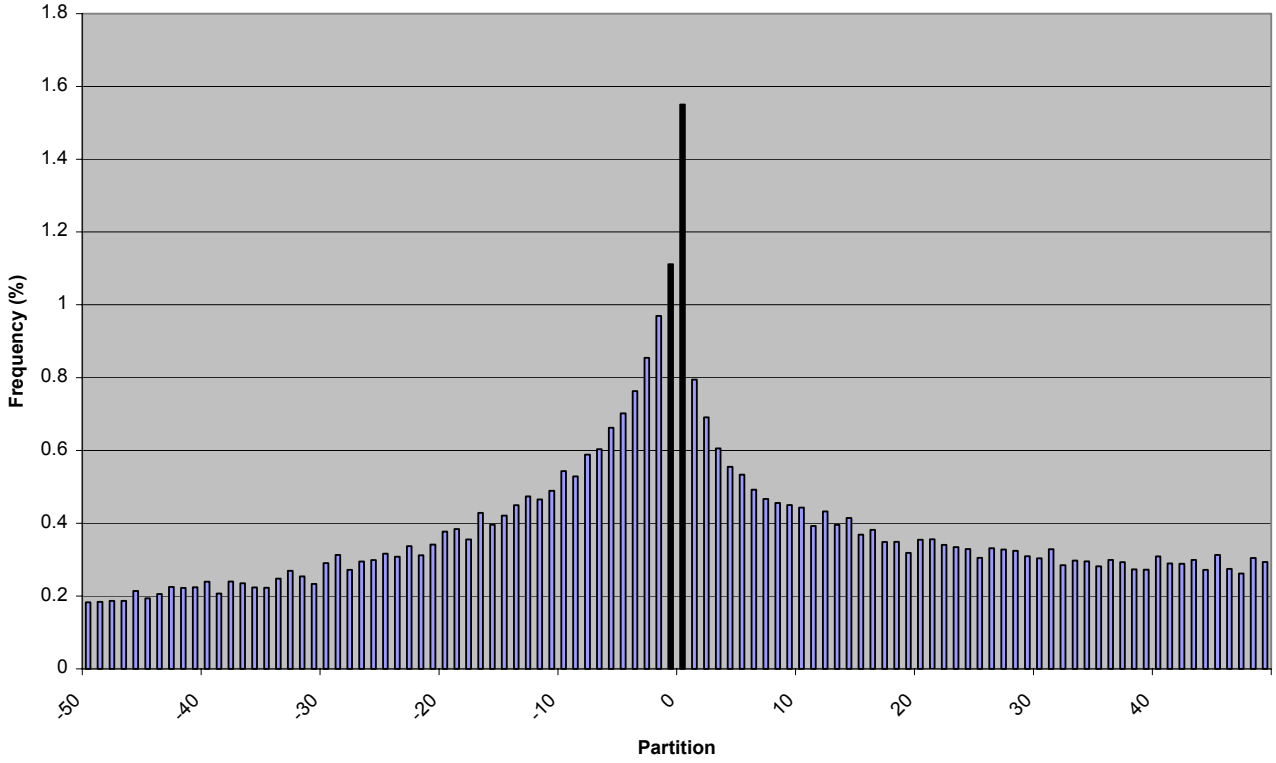

Fig. 4E: Fiscal Year EPS: Deviation of Actual Frequency from Expected

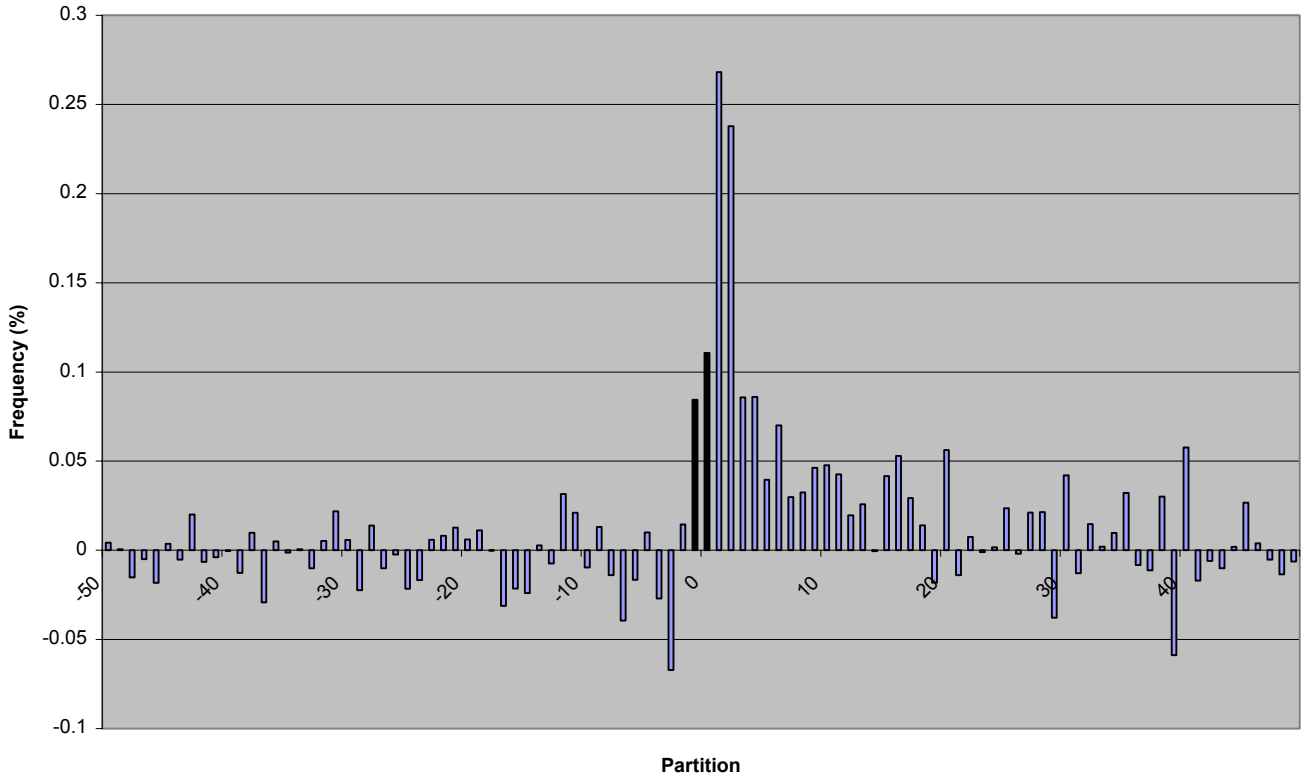

Figure 4:

Figure 4 illustrates the effect of the annual measurement period on EPS. EPS is defined as primary earnings per share (excluding extraordinary items) applicable to the last 12-month period (data item number 27 in the Compustat quarterly database)

Figure 4A is the histogram of fiscal year EPS.
Figure 4B is the histogram of EPS for the year starting at the first fiscal quarter end.
Figure 4C is the histogram of EPS for the year starting at the second fiscal quarter end.
Figure 4D is the histogram of EPS for the year starting at the third fiscal quarter end.
Figure 4E is the histogram of differences between the fiscal year histogram in figure 4A and an equally weighted average of the histograms in figures 4B, 4C, and 4D.

Fig. 5A: Unscaled Fiscal Year Pre-tax Income

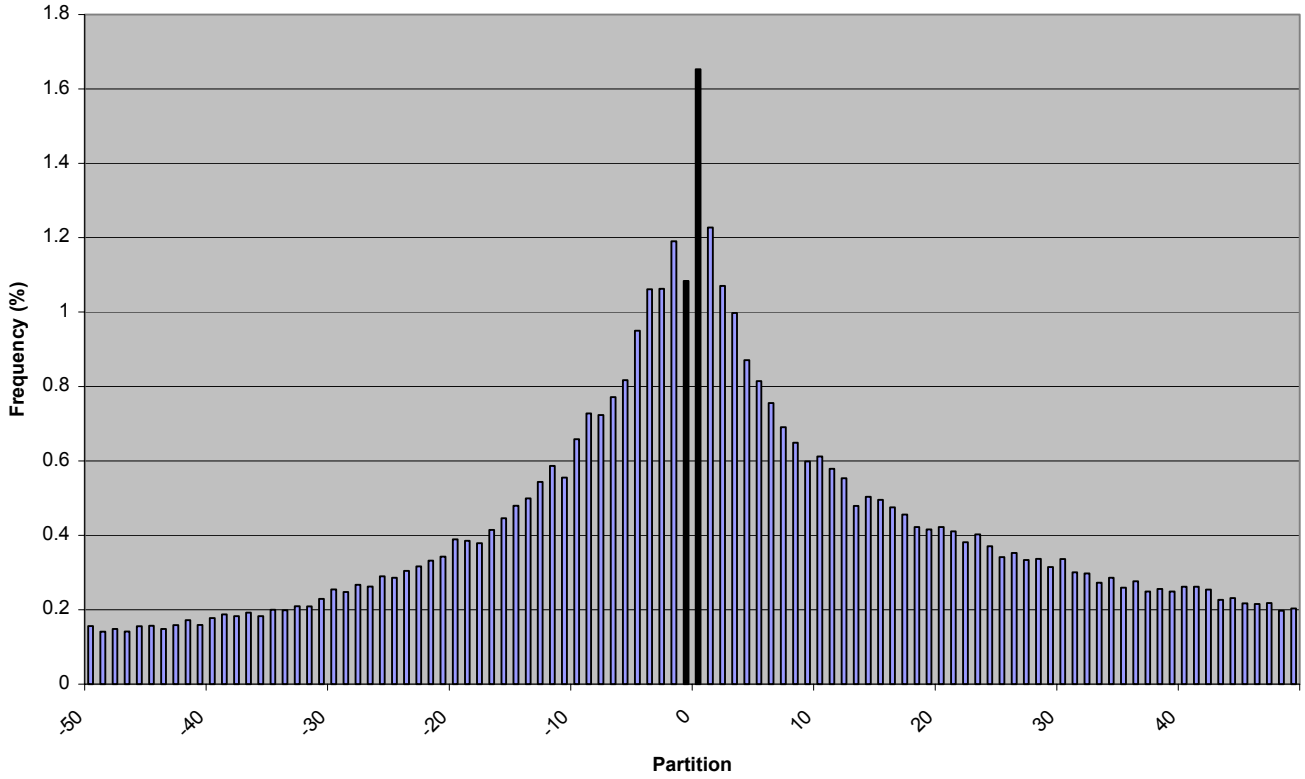

Fig. 5B: Unscaled Pre-tax Income: Annual Period Ending in Quarter 1

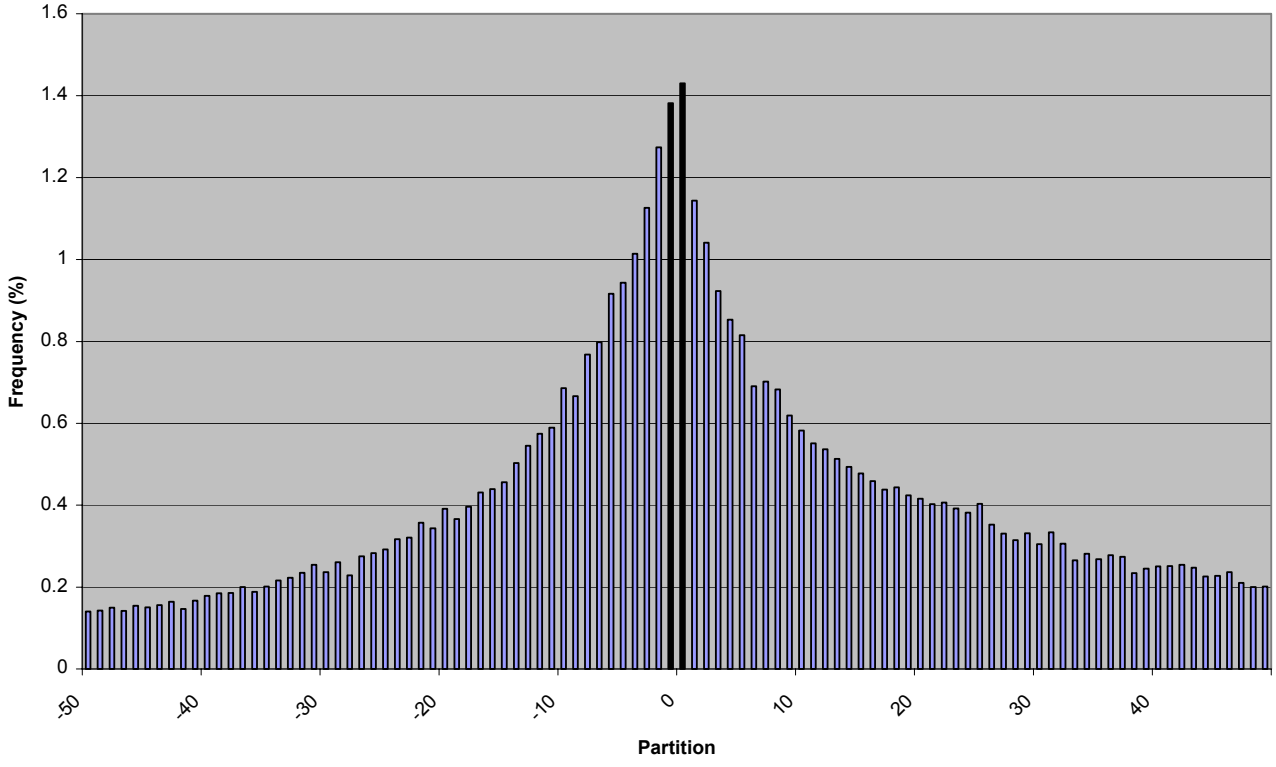

Fig. 5C: Unscaled Pre-tax Income: Annual period Ending in Quarter 2

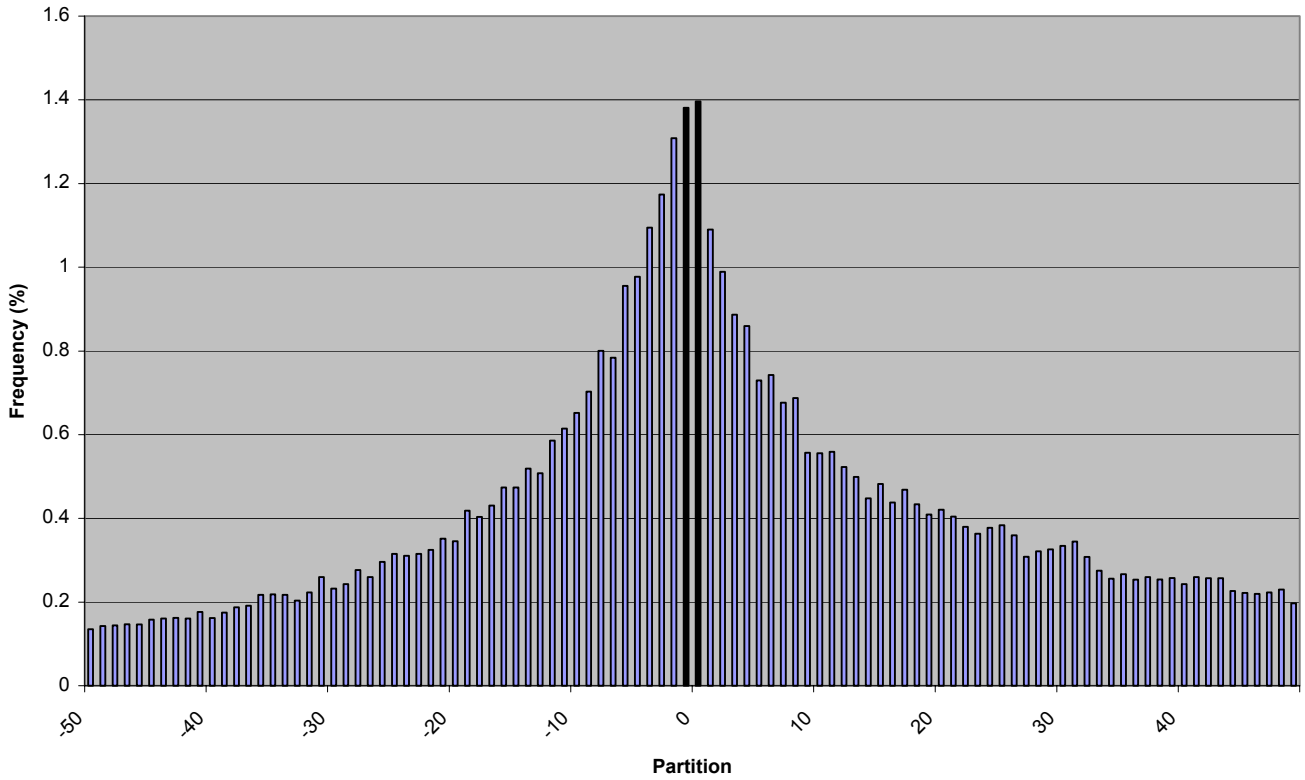

Fig. 5D: Unscaled Pre-tax Income: Annual Period Ending in Quarter 3

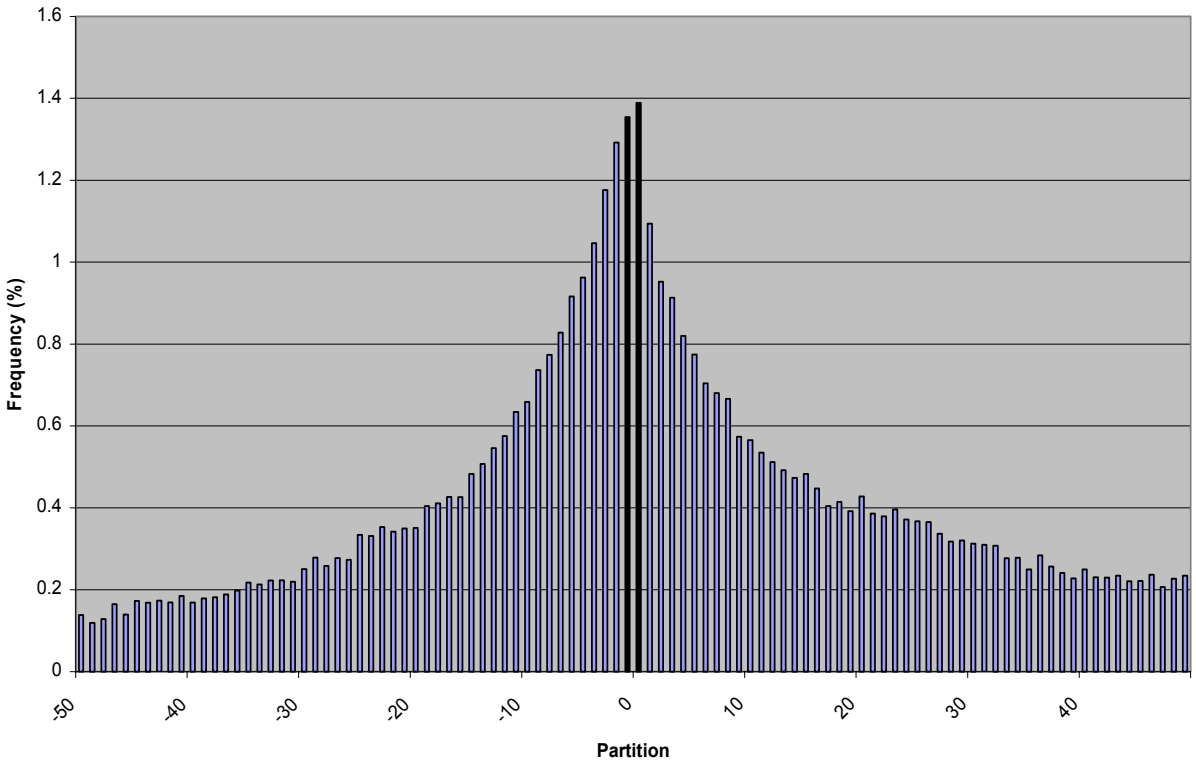

Fig. 5E: Unscaled Fiscal Year Pre-tax Income: Deviation of Actual from Expected Frequency

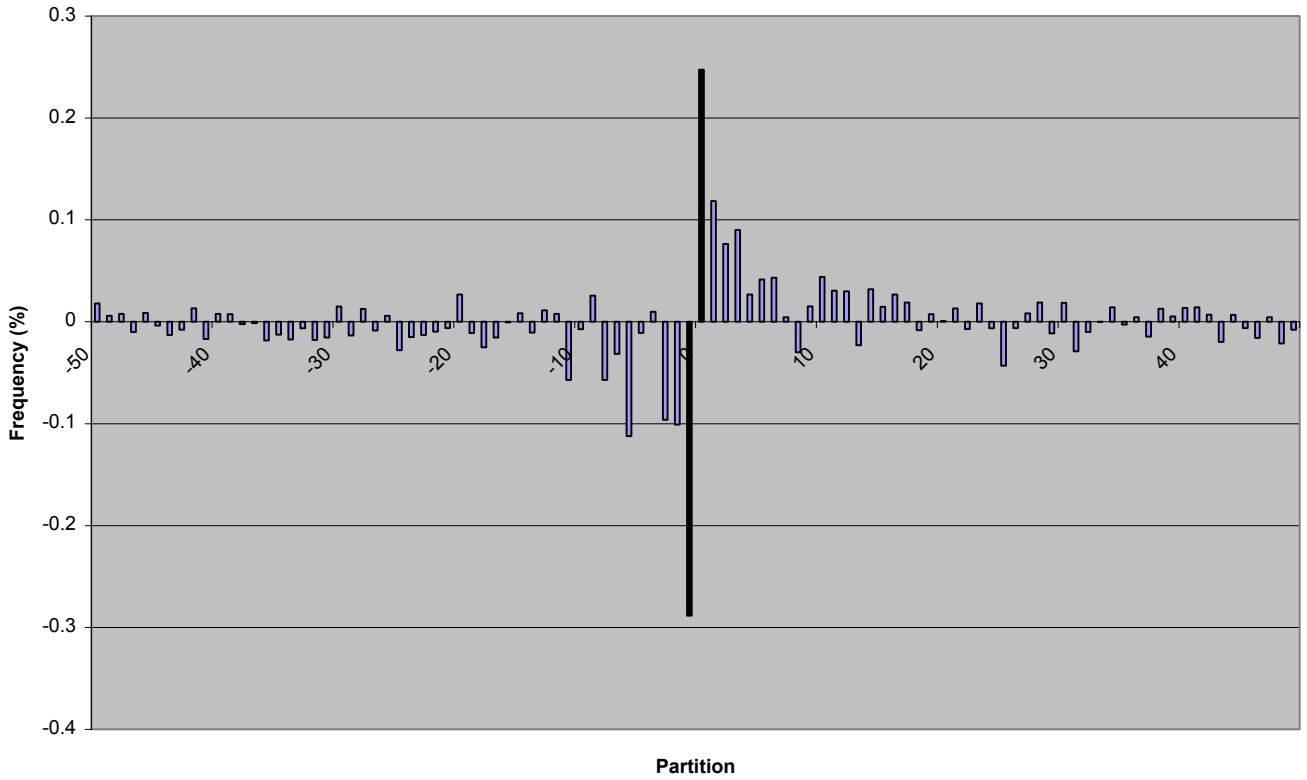

Figure 5:

Figure 5 illustrates the effect of the annual measurement period on unscaled pre-tax income.

Figure 5A is the histogram of fiscal year unscaled pre-tax income.
Figure 5B is the histogram of unscaled pre-tax income for the year starting at the first fiscal quarter end.
Figure 5C is the histogram of unscaled pre-tax income for the year starting at the second fiscal quarter end.
Figure 5D is the histogram of unscaled pre-tax income for the year starting at the third fiscal quarter end.
Figure 5E is the histogram of differences between the fiscal year histogram in figure 5A and an equally weighted average of the histograms in figures 5B, 5C, and 5D.