Earnings Management?
Erroneous Inferences based on Earnings Frequency Distributions

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February 2009

We thank Brad Badertscher, Ray Ball, Miao Bin, Alon Kalay, Jeff Burks, Donal Byard, Vincent Chen, Carol Dee, Rosemary Fullerton, Christian Leuz, Carol Marquardt, Mike Morris, Fred Mittelstaedt, Rachna Prakash, Ram Ramanan, an anonymous reviewer, students in Ray Ball's Accounting Ph.D. class at the University of Chicago, workshop participants at Baruch College, College of William and Mary, DePaul University, Loyola University of Chicago, National University of Singapore, University of Notre Dame, Utah State University, and the Ball and Brown tribute conference, University of New South Wales for helpful comments on an earlier draft of this paper, and students in the 2007 Limperg Institute "Advanced Capital Markets" class organized by Jan Bouwens at Tilburg University for helpful discussions during the early stages of this work.

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Abstract

A vast literature following Hayn [1995] and Burgstahler and Dichev [1997] attributed the so-called "discontinuities" in earnings distributions around zero to earnings management. Despite recent evidence that these discontinuities are likely caused by other factors, researchers and teachers continue to point to the shapes of these distributions as evidence of earnings management. We provide three sets of further evidence that these discontinuities are likely caused by factors other than earnings management: (1) we provide, as an example, a detailed analysis of the severe effects of sample selection in a recent study; this study erroneously concludes that the shape of an earnings distribution is evidence of earnings management, (2) we provide a simple explanation for the shape of the earnings distribution that is most often cited as evidence of earnings management; the relation between earnings and prices differs with the magnitude and the sign of earnings, and (3) we provide further examples that support the main point of our paper; evidence beyond the mere shape of a distribution must be brought to bear before researchers can draw conclusions regarding the presence/absence of earnings management.

1. Introduction

A vast literature following Hayn [1995] and Burgstahler and Dichev [1997] – hereafter BD -- attributed the so-called "discontinuities" in earnings distributions around zero to earnings management.[1] Despite clear evidence that these discontinuities are likely caused by other factors such as scaling and sample selection, studies continue to point to the shapes of these earnings distributions as evidence of earnings management. Best-selling text books rely on this evidence to motivate a discussion of earnings management, providing no mention of the fact that other explanations for the shape of these distributions exist.[2]

The main point of this paper is that researchers and teachers cannot rely on the shapes of these distributions as evidence of earnings management until alternative, much more likely, explanations for the shapes are ruled out. Rigorous academic research cannot be based on just an appeal to the popularity of the notion that the shapes of the earnings distributions are evidence of earnings management because: (1) supporting evidence that this is so is sparse, perhaps even non-existent; and (2) alternative explanations for the shapes of the distributions are often very evident. In this paper, we elaborate on several alternative explanations.

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[1] See, for example, Baber and Kang [1999], Beatty, Ke, and Petroni, [1999], Beaver, McNichols, and Nelson [2007], Burgstahler and Dichev [1997], Brown and Caylor [2004], Collins, Pincus, and Xie [1999], Degeorge, Patel, and Zeckhauser [1999], Easton [1999], Gunny, Jacob, and Jorgensen [2007], Holland and Ramsay [2004], Jacob and Jorgensen [2007], Kang [1999], Kerstein and Rai [2007], Leone and Van Horn [2003], Phillips, Pincus, Rego, and Wan [2004], Rego and Frank [2006], and Revsine, Collins, Johnson, and Mittelstaedt [2009].

[2] For example, in the textbook, "Financial Reporting and Analysis," Revsine, et al. [2009] show the discontinuity in the distribution of deflated earnings reported by BD and describe it as follows: "*The striking feature of this graph is the discontinuity in the number of firms reporting slightly negative earnings versus slightly positive earnings. Substantially fewer firms fall just below zero compared to those reporting earnings at or just above zero. What appears to be happening is that managers of firms that would otherwise report small losses…are finding ways to* ***prop up earnings in order to move reported profits into the…slightly positive range. One way of doing so, even in troubled times, is to exploit the flexibility in GAAP or to resort to a variety of accounting gimmicks to push earnings into the positive range****."* (Emphasis added).

Durtschi and Easton [2005] – hereafter DE -- show that the shapes of earnings distributions are driven by sample selection bias and scaling. We provide further evidence of these and other alternative explanations. In this paper, we first provide a detailed analysis of the effects of sample selection on the data at the core of yet another recent paper (Jacob and Jorgensen [2007] -- hereafter JJ), which posits that the shape of their earnings distribution is evidence of earnings management to avoid reporting losses; we use this example because, despite the fact that the sample selection bias is severe, the authors erroneously conclude that the shape of the resulting distribution is evidence of earnings management.

Second, we show how the observation that the relation between earnings and prices differs according to the magnitude and sign of the earnings provides a simple explanation for the shape of the earnings distribution that is most often cited as evidence of earnings management (namely, the distribution of net income deflated by market capitalization). This explanation has nothing to do with earnings management. Third, while DE focus primarily on sample selection biases and scaling as alternative explanations for the shapes of observed earnings distributions, the thrust of their message is that alternative hypotheses must be considered when interpreting the shape of an earnings distribution and that scaling and sample selection are just two such alternative hypotheses.[3] We use the analyses in JJ, as well as other recent papers, to provide additional illustrations of this point.

[3] DE provide likely non-earnings management explanations for the following earnings distributions: (1) net income, (2) net income deflated by market capitalization and/or by several other deflators, (3) changes in net income deflated by market capitalization and/or by several other deflators, (4) "actual" earnings per share in the I/B/E/S population, (5) changes in "actual" earnings per share in the I/B/E/S population, and (6) I/B/E/S analyst forecast errors.

The first portion of this paper focuses on the sample selection bias inherent in the JJ methodology. JJ introduce an alternate methodology and conclude that their findings suggest that "while scaling and associated selection biases might contribute to the observed discontinuities, they are not primarily responsible for these discontinuities." We show that this conclusion is not supported by their analyses.[4] Their results are clearly an artifact of sample selection criteria that severely censor the data, removing more observations immediately to the left of zero than observations immediately to the right.

The second portion of this paper focuses on the relation between earnings and prices (equivalently, the relation between net income and market capitalization). Many studies that are based on analyses of distributions of net income around zero focus on the distribution of net income deflated by market capitalization. These studies implicitly assume that deflation will not distort the underlying distribution of net income. But, we show that deflation will distort the distribution because the relation between the numerator (net income) and the denominator (market capitalization) differs in predictable ways with the magnitude and the sign of the net income. DE show that price per share of loss firms differs systematically from the price per share of firms reporting profits of the same magnitude, thereby providing evidence that deflation will affect the shape of the earnings distribution around zero.[5] We extend the analyses in DE and provide additional

[4] JJ claim that they have created a new methodology that may be used universally to check for evidence of earnings management. We show that the methodology is flawed.

[5] Nevertheless, studies continue to be based on analyses of the distribution of deflated earnings (see, for example, Beaver, McNichols, and Nelson [2007], Cohen, Mashruwala, and Zach [2008], Gunny, Jacob, and Jorgensen [2007], JJ, and Kerstein and Rai [2007]). Beaver, McNichols, and Nelson [2007] claim that their "results are not an artifact of deflation". This conclusion is unsubstantiated by their analyses. We will elaborate on this point. Also, since the hypotheses in the extant literature focus on management of earnings to avoid small losses, and since the arguments underlying these hypotheses do not suggest that

details regarding the way that deflation by beginning-of-year market capitalization results in the unusual shape of the distribution of deflated net income. In particular, we show how the "divot" in the distribution (the piece taken out of the intervals immediately to the left of zero which appears to be deposited immediately to the right of zero causing a "mini-peak") is due to predictable differences in the relation between net income and market capitalization.[6]

Although the focus of the paper is on the most-cited deflated earnings distributions where the deflator is market capitalization, we show that deflation by other variables also affects the shape of the distribution. Hence, we re-iterate the point from DE that any variable that differs between loss and profit observations should not be used as a deflator if the shape of the resultant earnings distribution is to be used as evidence of earnings management at zero.

The third portion of this paper focuses on additional alternative explanations for the shapes of earnings distributions. We use the distributions in JJ to illustrate that earnings management is often the least likely explanation for the shapes of the distributions, despite claims to the contrary. The JJ methodology consists of comparing the distribution of fiscal year (t) earnings with a benchmark distribution, which is, essentially, the average of the distributions of three "as-if" years of earnings.[7] Each of the three "as-if" years span four consecutive quarters: (1) ending with quarter one of fiscal year t; (2) ending with quarter two of fiscal year t; and (3) ending with quarter three

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earnings are managed relative to beginning-of-period market capitalization, DE question whether it is ever appropriate to examine deflated earnings in an earnings management context.

[6] Although DE present evidence that supports the conclusion that scaling affects the shape of earnings distributions they do not show evidence that scaling leads to the unusual pattern in the distribution in the immediate vicinity of zero (that is, the divot). This unusual pattern is often the focus of discussion of the BD results (see, for example, Revsine et al. [2009]).

[7] We provide more detail of the JJ benchmark distribution in section 2.

of fiscal year t. In other words, the benchmark against which the fiscal year's earnings (ending in the fourth quarter of year t) are compared is a weighted average of quarterly earnings over the six quarters ending in the third quarter of year t. JJ claim that differences between the distribution of fiscal year earnings and the distribution of the average of the three "as-if" years of earnings is evidence of earnings management.[8]

We provide several alternative explanations for these results and show that JJ offer no evidence that the shape of their earnings distribution is due to earnings management. Our alternate explanations are: (1) the distribution of fourth quarter earnings conditional on earnings of the first three quarters of the fiscal year is consistent with fourth quarter earnings reported under the integral method of accounting; (2) there are a number of economic reasons why the distribution of fiscal year net income will differ from the distribution of income of "as-if" years; (3) the distribution of a weighted average of earnings across two years is not a meaningful benchmark because averaging smoothes the distribution of the raw earnings data by combining the idiosyncratic performance in one year with the idiosyncratic performance in the next year; (4) deflation, which affects the shape of the earnings distribution, has a different effect on the shape of the distribution of deflated fiscal year net income than on the shape of deflated "as-if" year income; and (5) the JJ analyses are based on Compustat quarterly data, which are often restated;[9] and (6) much of the JJ analyses are based on quarterly Compustat data item 27 which cannot be used as a basis for assessing earnings management.

[8] Since most of our observations relate to any earnings metric, we use the generic term "earnings distribution" when our description applies to earnings metrics in general. When our observations relate to a specific type of metric such as the distribution of deflated net income or the distribution of earnings per share, we will be specific in our reference.

[9] We do not elaborate on this point other than to observe that, since Compustat often and inconsistently, restates data on the quarterly tapes, considerable caution must be exercised when using these data, which

All of the evidence we present underscores the point in DE that the shapes of frequency distributions of earnings metrics are not *ipso facto* evidence of earnings management; before one can draw conclusions regarding the presence/absence of earnings management, evidence beyond the mere shapes of these earnings distributions must be brought to bear.

The remainder of the paper proceeds as follows. In section 2, we use the sample selection criteria invoked by JJ to illustrate how sample selection bias contributes to the shapes of earnings distributions at zero. In section 3 we provide a detailed analysis of the effects of scaling; we show that the divot in distributions of deflated earnings immediately to the left of zero and the mini-peak immediately to the right of zero is evidence of the effects of scaling rather than evidence of earnings management. Section 4 provides a set of alternative explanations for the results in JJ (beyond sample selection and scaling), all of which are more plausible than earnings management. We present our conclusions in Section 5.

2. Sample Selection Bias and Irregularities in Earnings Distributions

We begin this section with an analysis of the distribution of all observations of net income on the Compustat Fundamental Annual file spanning 1976 to 2006. This distribution does not show an irregularity at zero. We then show how the sample selection criteria invoked in recent papers induce an irregularity at zero. These criteria *inter alia* remove more small negative net income observations than small positive net income observations; in other words, it is the sample selection criteria that induce the

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may differ from the amounts known at the time of the earnings announcement, as a basis for evidence of earnings management to avoid a reporting a loss.

irregularity, not earnings management as the papers imposing these criteria claim. We provide a detailed analysis of the effects of the JJ sample selection criteria because they provide a vivid demonstration of the effect of sample selection on the distribution of observations in the resultant sample.

We obtain the required data from the Compustat Fundamental and Legacy Annual and Quarterly files spanning 1976 to 2006. This sample period includes the periods used by BD (1976 to 1994), JJ (1981 to 2001), and DE (1983 to 2003) as well as the more recently available years. We replicate the relevant findings in BD, JJ and DE and we find that their results hold in our sample. To be consistent with all three papers, we eliminate regulated firms.

2.1. The Effect of Sample Selection on the Distribution of Net Income

The uppermost line in Figure 1 shows the frequency distribution of all observations of reported annual net income (annual Fundamental Compustat data item "Net Income") for 1976 to 2006. We partition firms into $100,000 intervals of net income as in DE, JJ, and Dechow, Richardson, and Tuna [2003]. As in DE, prior to any sample selection criteria being applied, there is no discontinuity in this distribution around zero.

The JJ sample selection criteria, however, severely censor the data and affect the shape of the distribution of annual net income. The line above the light gray area in Figure 1 shows the observations that survive the first JJ sample selection criterion; these observations have four consecutive quarters of observations of net income on the Fundamental Compustat quarterly file. This selection criterion leads to the deletion of twenty percent of the observations.

Since JJ, deflate net income by beginning-of-year market capitalization, an observation is included in their sample only if it has four quarters of net income data and also beginning-of-year market capitalization. The line above the medium gray area in Figure 1 shows the distribution of net income after this additional criterion is imposed. Now, only 33 percent of the observations in the lowest negative net income interval and 37 percent of the observations in the lowest positive net income interval remain. This sample selection criterion has induced a break in the distribution at zero.

In the summer of 2007, WRDS adopted the new Compustat Xpressfeed format and created the new "Fundamental" files. The pre-existing files, used by researchers prior to these files becoming available are still available on WRDS; they are called the "Legacy" files. The difference between the Legacy files and the Fundamental files that is most pertinent to this paper is that six missing value codes (viz., -0.001, -0.002, -0.003, -0.004, -0.007, and -0.008) are used on the Legacy files but these missing value codes are replaced by a "blank" in the Fundamental file. Note that, for net income data, these so-labeled missing values may be true observations of -$1,000, -$2,000, -$3,000, -$4,000, -$7,000, and -$8,000. Since Compustat rounds financial data to the nearest $1,000, this implies that net income between -$500 and -$4,499 and between -$6,500 and -$8,499 will be recorded as missing. In the years 1976 to 2006 there are 209 observations of net income on the Fundamental file that are missing from the Legacy files in these small negative net income intervals.[10] The effect of the absence of these observations on the file used by JJ is evident in the considerable dip in the silhouette of the black area in Figure 1.

[10] This effect is also evident in the Legacy quarterly files used in JJ where there are 665 observations that appear on the Fundamental file, but not the Legacy file.

It is evident that the sample selection criteria in JJ severely censor the data and this censoring affects the shape of the earnings distribution in ways that likely have nothing to do with earnings management. Other studies also invoke severe sample selection criteria and erroneously infer that the resulting shape of the earnings distribution is due to earnings management. For example, Beaver, McNichols, and Nelson [2007] – hereafter BMN -- select firms with positive sales, positive assets, and beginning of year market capitalization; they observe that this leads to the elimination of more observations in the intervals immediately to the left of zero than in the intervals immediately to the right.

We agree that it is extremely difficult, perhaps impossible, to create a sample where variables necessary for subsequent tests do not exclude more observations from either the left or from the right of zero. Nevertheless, serious consideration must be given to the effect of sample selection before drawing conclusions based on evidence of differences across the zero threshold. Our evidence suggests that, if sample constraints are imposed by the researcher, all efforts must be made to restore the original distribution of earnings realizations before any tests of earnings management are performed. This would in many cases require extensive hand collection of the missing earnings observations from sources such as the Standard and Poor's Corporate Reporter or from the original SEC filings. The issue is likely not lack of data *per se*, but lack of data on Compustat or other machine-readable sources.

3. The Effects of Scaling/Deflation

Many studies that are based on analyses of distributions of net income around zero focus on the distribution of net income deflated by market capitalization (see, for example, BMN, BD, Gunny, Jacob, and Jorgensen [2007], JJ, and Kerstein and Rai [2007]).[11] These studies implicitly assume that deflation will not distort the underlying distribution of net income; DE show that it does. In this section, we extend the analyses in DE and provide additional details regarding the way that deflation by beginning-of-year market capitalization results in the unusual shape of the distribution of deflated net income. In particular, we show how the "divot" in the distribution immediately to the left of zero and the "mini-peak" immediately to the right of zero are created. For this analysis we use the annual Compustat data, as in BD. The file used by BD, however, was the file similar to that now labeled "Legacy" by Compustat. Since this file excludes small loss observations (as we have shown in section 2.1), we base our analyses on the data in the Compustat Fundamental annual files.[12]

3.1. Difference in Market Capitalization of Companies Reporting Profits and Companies Reporting Losses

DE report that stock prices are lower for each dollar amount of negative earnings per share than for the same dollar amount of positive earnings per share. In a similar vein, Figure 2 shows, for each $100,000 net income interval, the 25th-percentile, median, and 75th-percentile of the distribution of beginning-of-year market capitalization (that is, price – Annual Compustat variable "prcc_f" – times number of shares outstanding – Annual Compustat variable "csho").[13]

[11] BMN claim that their "results are not an artifact of deflation." This conclusion is completely unsubstantiated by their analysis.
[12] Analyses based on the Compustat Legacy file yield very similar results.
[13] Figure 2 is similar to Figure 6 in DE, which shows the distribution of prices for each cent of earnings per share.

Figure 2, Panel A, demonstrates that, like prices, the market capitalization of companies reporting a loss tends to be smaller than for companies reporting the same dollar amount of profit. For example, companies/observations with annual net income in the smallest negative interval (between $0 and -$100,000) have a median market capitalization of $2.22 million while observations in the smallest positive net income interval (between $0 and $100,000) have a median market capitalization of $4.38 million. The difference in these medians may be used to demonstrate the point made by DE that scaling will cause observations with positive net income to be drawn away from zero to a lesser extent than observations with negative net income (-$0.1m/$2.22m = -0.045 while $0.1m/$4.38m = 0.023).[14]

Larger deflators to the right of zero result in smaller deflated-net-income numbers for profit firms. Since market capitalization is positive, firms with large market capitalization relative to their net income (i.e., large firms that report a temporarily small net income) can have a very small deflated-net-income, but this cannot become negative. In other words, there will be a tendency for those firms to accumulate in the smallest positive deflated-net-income interval. This will cause a step in the distribution of deflated net income at zero. This step is a partial explanation for the distribution of deflated net income that is most cited in the literature (namely the BD distribution of net income deflated by market capitalization), which shows a divot immediately to the left of zero and a mini-peak immediately to the right of zero. In the next section we divide

[14] BMN claim that the distribution of market capitalization is symmetric around zero. This claim is based on visual inspection of Figure 5, Panel B in their paper, which is the distribution of the mean of market capitalization analogous to the distribution of the quartiles of market capitalization in our Figure 2. The claim is not supported by the results in their figure. For example, the mean market capitalization for the observations in the $100,000 interval to the left of zero is $8.34m, while the mean market capitalization for the observations in the cell immediately to the right of zero is $13.79m (when the BMN sample selection criteria are applied, these means increase to $8.54m and $13.97m).

observations into two sub-samples: (1) those in the net income interval on either side of zero (-$100,000 to $100,000); and (2) all other observations. This enables us to: (1) show that the upward step in the distribution is evident for a subset of smallest net income observations; and (2) show how the divot and mini-peak are formed.[15]

3.2. The Relation between Earnings and Prices Varies According to the Magnitude of the Profit or Loss: Detailed Analysis of the Effects of Scaling

Figure 3, Panel A plots the distribution of net income deflated by beginning-of-year market capitalization (net income – Annual Compustat variable "ni" divided by price – Annual Compustat variable "prcc_f" – times number of shares outstanding – Annual Compustat variable "csho") for companies reporting net income between -$100,000 and $100,000.[16] There are 2,431 observations with net income between $0 and $100,000 that meet the BD sample selection criteria, and 1,596 observations between $0.00 and -$100,000. Since this difference in the *number* of observations may itself create a step in the distribution of these observations (deflated by market capitalization), we show the *percentage* of observations in each deflated net income interval in Figure 3, Panel B.

The expected step in the distribution of deflated-net-income at zero, caused by a larger deflator to the right of zero, is evident in Figure 3, Panels A and B. After deflation, 37.8 percent (920/2431) of the observations with a small positive net income are in the deflated-net-income interval (0.005) immediately to the right of zero. For these observations beginning-of-year price per share is at least 200 times earnings per share. On the other hand, only 24.7 percent (394/1596) of the observations with the smallest

[15] Similar patterns emerge if the sample in the immediate vicinity of zero is taken from wider net income intervals. We have repeated the analyses with samples between -$1million and $1million; results are similar but not as stark as those we present.
[16] The interval width shown in Figure 3 is 0.005 as in JJ and BD.

negative net income are in the deflated-net-income interval (-0.005) immediately to the left of zero. It is not surprising that a smaller percentage of loss observations have a price per share that is greater than 200 times the amount of the loss per share than the percentage of profit observations that have a price per share that is greater than 200 times the amount of profit per share; simply put, one would expect profits to be valued more highly that the same dollar amount of loss.

Observations fall in the second interval to the left and to the right of zero (that is, deflated net income between -0.010 and -0.005 and between 0.005 and 0.010) if their price per share is between 100 and 200 times earnings per share. Again, the percentage of loss observations with prices in this range (12.4 percent) is less than the percentage of profit observations (15.4 percent) with prices in this range. Prices for observations in the third interval to the left and to the right of zero range from 66.67 to 100 times earnings and the percentage of loss observation in this interval (7.6 percent) is slightly less than the percentage of profit observations in this interval (8.5 percent). To summarize; for all three intervals in the immediate vicinity of zero, profits are, as we would expect, valued more highly that the same dollar amount of loss.

Since the percentage of observations with net income between $0 and -$100,000 in the three deflated-net-income intervals next to zero (44.8 percent) is much less than the percentage of observations with net income between $0 and $100,000 in the three deflated net income intervals next to zero (61.7 percent), there are less observations spread over the remaining cells. Hence, we see a greater percentage of negative net income observations in the deflated net income intervals where prices are less than 66.67

times the amount of the loss than in the deflated positive net income intervals where prices are greater than 66.67 times the amount of the profit.

Figure 3, Panel C plots the distribution of net income deflated by beginning-of-year market capitalization for all remaining observations that meet the BD selection criteria (i.e., those reporting net income less than -$100,000 and greater than $100,000). The shape of this frequency distribution may be readily explained in terms of the well-documented relations between prices and earnings (implicitly the relation between market capitalization (the numerator) and net income (the denominator). Beaver and Morse [1978], Ou and Penman [1989], Penman [1991,1996], for example, show that negative, high, and low PE ratios revert rapidly toward the mean PE ratio consistent with the notion that the earnings are transitorily negative, low, or high, respectively. In other words, price captures the future stream of expected earnings, which will differ from the earnings of the next period, which is the denominator in the PE ratio.

To the right of zero, the peak in this distribution of net income deflated by beginning-of-year market capitalization is in the interval 0.055 to 0.06 (that is, the PE multiple is in the range 16.66 to18.18). Observations that fall to the right of this peak have even lower PE ratios; as shown by Penman [1991, 1996] this implies that the market sees these earnings as being temporarily high, expecting them to fall in the future. Observations that fall to the left of this peak are firms that have a higher PE ratio and thus are seen to have transitorily low earnings that are expected to rise in the future.

The transitory nature of earnings is implicit in the entire distribution of negative earnings; a non-zero price reflects the market's expectation that positive earnings are expected sometime in the future. The peak in the deflated-net-income distribution to the

left of zero for these larger losses is in the interval -0.015 to -0.020, the fourth interval to the left of zero (that is, the price-per-share for these observations is about 50 times earnings), which is a manifestation of expectations that these negative earnings are transitory and will improve in the future. However, the expectations are not so high that these observations are drawn all the way to the interval to the immediate left of zero; rather these prices are such that more observations tend to be drawn to the interval that is almost at zero. This is expected because firms reporting relatively large losses would, ceteris paribus, have relatively low prices.

Figure 3, Panel D combines Panels A and C to recreate BD Figure 1. The dark (lowest) section is the distribution of deflated net income for observations of net income between -$100,000 and $100,000 (Panel A). The light (uppermost) section is the distribution of deflated net income for all other observations of net income (Panel C). This figure shows that: (1) the larger proportion of small positive net income observations (less than $100,000) that are drawn into the interval 0 to 0.005 by deflation (as compared to the smaller proportion of small negative net income observations drawn into the corresponding negative interval) leads to the mini-peak immediately to the right of zero; and (2) the smaller proportion of observations with net income less than -$100,000 that are drawn into the deflated net income interval -0.005 to 0 compared to the proportion of observations that are drawn to the next three negative net income intervals (-0.005 to -0.020) leads to the divot immediately to the left of zero.

3.3 Other deflators

While examination of other possible alternative deflators is not the focus of this paper, Table 1 shows the means and medians of several deflators for various intervals of

net income. Deflators shown are: market capitalization which is common shares outstanding (csho) times fiscal year closing price (prcc_f), net operating assets (as in Penman, 2003) which is operating assets minus operating liabilities. Operating assets are defined as Total assets (at) minus cash and short term investments (che). Operating liabilities are defined as total assets (at) – short-term debt (dlc) – long-term debt (dltt) – minority interest (mib) – preferred stock (pstk) – common equity (ceq). Also shown are Net Sales (sale), number of employees (emp), total assets (at), shareholder equity (ceq) and common shares used to calculate basic earnings per share (cshpri). All of these deflators are statistically significantly smaller for the loss intervals than for the profit intervals of the same size. We could posit intuitive explanations for these differences such as loss firms are more likely to have had asset impairments, loss firms are more likely to have laid-off employees, loss firms are more likely to have poor revenue streams, etc., but we leave a careful examination of these differences to other authors. The salient point to this paper is the following: prior to using any deflator for a study that examines differences in net income across zero, it is important to ensure that the deflator will not distort the underlying distribution at zero. If the deflator differs systematically between profit and loss firms, as do all of the variables detailed in Table 1, the distribution will be distorted. Therefore, none of these variables is an appropriate deflator. A simple examination, such as that shown in Table 1, will reveal whether there are problems with other possible deflators that a researcher might choose.

Arguably, earnings per share is yet another form of deflated net income and the denominator (in the calculation of fully diluted earnings per share, the weighted average number of shares outstanding adjusted for dilutive securities) may affect its

distribution.[17] Although there are several reasons why this argument may be moot in the context of management of earnings around a zero threshold, we briefly address this issue.

Reasons why the argument may be moot include: (1) earnings per share *per se* (rather than net income) is a focus of attention of investment analysts and investors; (2) as Guay [2002] observes, management of earnings per share via a change in the number of shares outstanding is a highly visible activity which will obviously be ineffective if the intent of managing earnings is to obscure what is actually happening in a firm; and (3) management of earnings from negative to positive cannot be done by managing shares outstanding alone.[18] Nevertheless, one might argue that some firms may attempt to "manage" earnings per share by changing the number of shares outstanding. They could do this by issuing more stock, splitting the stock (thus, lowering the loss or the profit per share), repurchasing stock, or via a reverse stock split (thus, increasing the loss or the profit per share).

If the number of shares outstanding is pervasively larger for loss observations than for profit observations, we will observe (as do DE) a higher number of observations with very small negative earnings per share (compared with the number of observations with small positive earnings per share). [19] But the number of shares used to calculate

[17] Basic earnings per share is net income adjusted for preferred dividends divided by the weighted average of the shares outstanding over the fiscal period. Fully diluted earnings per share is a similar ratio that takes account of the effects of dilutive shares on both the numerator and the denominator.

[18] At the margin, it is possible that the cash received from the issuance of new shares could be used to boost income from negative to positive.

[19] BMN state that DE "argue that share deflation considerably mitigates the discontinuity at zero in the distribution of earnings" and "that share deflation is superior to deflation by other financial variables because the number of shares does not differ systematically between loss and profit observations and thus will not induce a spurious discontinuity." DE do not make either of these arguments. Rather, they argue that firms do not manage earnings deflated by financial variables; and, though it is possible that firms manage earnings per share, the distribution of earnings per share does not show evidence of earnings management. DE observe that the number of shares outstanding does not differ *significantly* between observations of negative earnings per share and observations of positive earnings per share of the same

basic earnings per share is *smaller* for most loss observations than for profit observations of the same magnitude, significantly so for both the smallest and largest net income intervals shown. It follows that the shape of the earnings per share distribution (that is more small negative earnings per share observations that small positive earnings per share observations) is not due to deflation of net income by number of shares.

4. Additional Alternative Explanations for the Shapes of Earnings Distributions

In this section we provide additional alternative explanations for the shapes of deflated earnings distributions. We use the distributions in JJ to illustrate that earnings management is often the least likely explanation for the shapes of these distributions, despite claims to the contrary.

The method in JJ relies on a comparison of the distribution of fiscal year t net income to a benchmark distribution that is the average of three distributions of net income for three "as-if" years; the first "as-if" year ends with quarter one of year t, the second ends with quarter two of year t, and the third ends with quarter three of year t.

As shown in Section 2, sample selection bias is a severe problem in JJ. But sample selection bias is not the only alternative explanation for their results. In this section we first show that "as-if" years ending at dates other than the fiscal year end are not a meaningful benchmark because of the unique features of a fiscal year, which include: (1) the fact that U.S. firms follow the integral method of accounting; and (2) fiscal year end-dates are chosen for economic reasons. Next we show that creating a benchmark by averaging net income/earnings across years, smoothes the benchmark distribution. We also show that the distribution of end-of-year prices differs from the

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magnitude (while the distribution of financial variables does differ significantly between negative and positive earnings per share observations).

distribution of end of "as-if" year prices, providing another reason why the distribution of (deflated) fiscal-year net income will differ from the distribution of weighted-average (deflated) net income across years.

4.1. U.S. Firms Follow the Integral Method of Accounting; Quarters within an Integral/Fiscal Year are Related

4.1.1. The Fourth Quarter is Integral to Quarters One, Two, and Three

The question we address in this section is whether the use of the integral method of accounting implies that "as-if" years of net income, which span two fiscal years are an inappropriate benchmark for comparison with fiscal year income. U.S. firms follow the integral method of accounting; that is, each quarterly statement is considered an installment in a fiscal year (APB 28). The reporting requirements of APB 28 require firms to allocate expenses throughout a fiscal year based on forecasted annual figures that relate to that particular year (specifically that year's sales). At the same time, APB 28 forbids firms from smoothing expenses *across* fiscal years. This fiscal-year basis of allocation results in components of income that are inter-related within the fiscal year, but are not related across fiscal years because the allocation base used in quarters from adjacent years may be very different. Examples of differences can be clearly seen by looking at some common expenses that are allocated within a fiscal year. First, determination of cost of goods sold may be based on the gross profit percentage, which may be based on historical percentages and/or cost changes expected in the current fiscal year. Second, taxes are also estimated during the fiscal year. A final example might be operating expenses which can also be estimated within a fiscal year; for example, firms in the transportation industry may estimate an annual cost for fuel which they allocate over

interim quarters. Fuel costs can vary widely over years, so the cost basis for the quarterly allocation of fuel costs can differ widely from year to year.

This requirement to estimate costs over interim quarters causes quarter four to be intimately connected to the prior three quarters as it is the “settling up” quarter where estimates made in the first three quarters of the fiscal year are reconciled to actual outcome in the final/fourth quarter. It follows that “as-if” years, which combine quarterly earnings spanning two integral fiscal-years, combine “installments,” which have different costs bases.

Earlier research has documented the importance of the integral method to the relation between interim earnings within a fiscal year and to the way these earnings differ across years. Bathke and Lorek [1984], for example, find that forecast errors are higher for the fourth-quarter than in any other quarter, and note that these results suggest a fourth-quarter "dumping" process by which accruals and deferrals estimated on an interim basis are brought into correspondence with the annual figures. Mendenhall and Nichols [1988] find a larger reaction to earnings surprises in interim quarters than in quarter four, and contend that this is most likely because managers and accountants exercise greater discretion over interim quarter earnings levels than over fourth-quarter earnings levels, as fourth-quarter earnings are merely a “settling up” between estimates for the year and actual outcomes. Also, Rangan and Sloan [1998] study the time-series properties of earnings and find that the auto-regressive coefficients are larger when quarters from the same fiscal year are used in the auto-regression than when quarters from across fiscal years are used. They specifically note that this is consistent with the

requirements of the integral method of accounting which leads to earnings within a fiscal year being related via the cost estimates, which are made with the same annual basis.

Because of the integral theory of accounting, a fiscal year is different than a constructed "as-if" year, and using an "as-if" year as a benchmark is inappropriate. A second, perhaps more serious, issue is that numbers in interim reports are often restated at the annual audit.

To explore the effect of the integral method on the differences between a net income of fiscal year and a benchmark created from "as-if" years of net income, we examine the relation between net income for quarter four of the fiscal year relative to the net income for quarters one through three of the fiscal year; then we contrast this to the relation between the net income of final quarters in the "as-if" years and the net income of the three quarters leading up to the final quarter. Under the integral method of accounting, three quarterly reports may be based on estimates but the annual report is more focused on actual outcomes. Fourth quarter earnings are the difference between the sum of the first three quarters and the fiscal year total. The fourth quarter includes effects of settling differences between the estimates made in the first three quarters, and the actual financial results for the year.

The analyses summarized in Figure 4 are designed to shed light on whether the patterns of fourth quarter net income reflect the use of the integral method of accounting or, as JJ claim, management of earnings of the fourth quarter. Although the results of our analyses appear to be quite compelling it is important to note that any analyses, such as these, based on quarterly Compustat data, must be viewed with some caution because they are based on data that may be re-stated.

Figure 4, Panel A describes the net income of those firms that have the smallest losses ($0 to -$100,000) for each of the "as-if" years ending in quarters one, two, and three as well as the fiscal year (ending in quarter four). The loss is calculated as in JJ as the sum of four quarters of net income. We first examine net income of the fiscal year – in particular we examine the relation between net income of quarter four and net income of the rest of the fiscal year. Of the observations that had a fiscal year net income between $0 and -$100,000, 70 percent were positive going into quarter four, but became negative because of the quarter four net income. This is consistent with the integral theory of accounting in that estimates that were perhaps too optimistic were "settled up" in quarter four. Compare this result to the "as-if" years. For the "as-if" year ending in quarter one, the "settling-up" effect is smaller; 63 percent of the observations had positive net income after the first three quarters of the "as-if" year, but the "as-if" annual income became negative in the last quarter. The percentage of "as-if" years ending in quarter two and quarter three that become negative in the fourth quarter are 59 percent and 55 percent, respectively.

The monotonic decline in the percentage of observations of annual net income that become negative due to the effect of income of the last quarter in the "as-if" years is consistent with the integral method of accounting. The "as-if" year ending quarter one has three quarters from within the same fiscal year, including that year's fourth quarter, so it most closely resembles the actual fiscal year. The "as-if" year ending quarter two spans two years equally, but it has a quarter three and quarter four from the same year which are related via the integral method. The "as-if" year ending quarter three is the least similar to an actual fiscal year because it has three quarters from one fiscal year, but

the quarter four included within that "as-if" year is unrelated to the other three quarters, thus this year is least like the fiscal year.[20]

Figure 4, Panel B repeats the same analysis, but for the firms with small positive annual net income ($0 to $100,000). Beginning again with the actual fiscal year we find that the sum of the first three quarters of net income is negative for 52 percent of the observations, and the annual net income only becomes positive because of the reported net income in quarter four. As with the observations of small negative net income, it appears that few firms were pessimistic about their estimates; only a little more than half the of the observations of annual net income became positive when the estimates for the first three quarters were "settled-up" in actual annual net income for the year. If estimates had been low, or net income was being managed in quarter four to create positive annual income, one would expect more than 52 percent of the observations of net income to become positive due to fourth quarter earnings. Once again, the patterns of net income for the "as-if" years differ from the patterns for the fiscal year. The net income of a considerably higher proportion of firms in the "as-if" years became positive in the last quarter of the constructed years than become positive in the actual fiscal year (57, 63, 66 percent for each "as-if" year, compared to only 52 percent for the fiscal year). This pattern does not appear to support a conclusion of earnings management in the fourth quarter of a fiscal year. Again it is consistent with use of the integral method of accounting; overly optimistic estimates in the first three quarters are reversed when the actual results for the fiscal year become known. These conclusions are also supported by

[20] We repeat the analyses summarized in Figure 4, Panel A for each year 1977 to 2006. In 23 of these 30 years, the proportion of firms reporting a small annual loss because of negative fourth quarter net income is greater than this proportion for each of the "as-if" years. The monotonic decline in the percentage of observations that become negative due to the net income of the "as-if" last quarter (as seen in Figure 4, Panel A) is observed in 15 of the 30 years.

the monotonic increase in the percentage of observations that become positive due to the net income of the "as-if" last quarter as the number of quarters from the integral year ending in quarter four declines.[21] Clearly, the JJ benchmark, that is an average of the three "as-if" years of net income, is distinctly different from fiscal year net income. To use this as the benchmark against which to compare fiscal year net income in order to isolate something as subtle as earnings management in a fiscal year is inappropriate.

In Figure 5, we replicate Figure 1 (which is based on annual net income), this time using quarterly net income data from the Fundamental Compustat quarterly file for each of the four quarters of the fiscal year using interval widths of $25,000 instead of widths of $100,000. Figure 5, Panels A to D shows the distributions of quarterly net income for all observations of quarterly net income for the years 1976 to 2006. Again note the caveat that these data are restated must be borne in mind as we interpret these results. For each of these quarters, we find that there are less observations in the interval immediately to the left of zero than in the interval immediately to the right of zero; however, there appears to be no irregularity in these distributions. The peak of the distributions is in the interval immediately to the right of zero; as one might expect when looking at thirty years of data, firms must eventually earn a profit or disappear from the sample.

A comparison of the distribution of fourth quarter net income with the distribution of net income for each of the interim quarters reveals two features of interest. First, the

[21] We repeat the analyses summarized in Figure 4, Panel B for each year 1977 to 2006. In 19 of these 30 years, the proportion of firms reporting a small annual profit because of positive fourth quarter net income is less than this proportion for the last quarter in each of the "as-if" years. The monotonic increase in the percentage of observations that become negative due to the net income of the "as-if" last quarter is observed in 15 of the 30 years. However, in 20 of the 30 years, the percentage of observations that become positive due to the last quarter of earnings in the "as-if" year ending in quarter one is less than the percentage of observations that become positive due to the last quarter of earnings in the "as-if" year ending in quarter one.

difference between the percentage of observations immediately to the right of zero and the percentage of observations immediately to the left of zero is much smaller for fourth quarter net income than for net income of each of the interim quarters. This observation seems inconsistent with the notion that firms manage fourth quarter earnings to change a loss into a profit and it is consistent with the notion that the integral method of accounting leads to a fourth quarter settling up for the optimism in the estimates made in the interim quarters. Second, the distribution of fourth quarter net income is much flatter (more disbursed) than the distribution of net income of the interim quarters. In quarter four, 53 percent of the observations are in the tails of the shown distribution, while the tails of the first three quarters contain 42 percent, 45 percent and 45 percent, respectively. In addition, of the total observations, quarter four has 41 percent of the observations that are negative, while quarters one through three have 39 percent, 36 percent and 37 percent, respectively. Again this is inconsistent with firms managing earnings in quarter four to create positive earnings and it is consistent with optimistic estimates being reconciled to actual results in the last quarter.

4.1.2. "As-if" Years have an Income Distribution that Differs from that of Fiscal Years because the Quarters Comprising the Year are not Integral

The main analyses in JJ rely on a comparison of distribution of fiscal year net income with the distribution of net income for three "as-if" years ending in quarters one, two and three of the fiscal year and with the average of the distributions across these three "as-if" years. As we have already noted, the difference between the distributions of "as-if" year net income and fiscal year net income are likely due to use of the integral method of accounting rather than to earnings management. We provide non-earning-management reasons in addition to the use of the integral method of accounting that

would lead one to expect the distribution of "as-if" year net income to differ from the distribution of fiscal year net income. We provide further evidence that combining quarters from different integral years affects the shape of the resultant distribution. We also show the effect of averaging distributions of net income from three "as-if" years (as in JJ).

4.2. The Fiscal Year is Chosen for Sound Economic Reasons

The start-date and end-date of a fiscal year are likely consciously chosen by management for sound economic reasons. Managers, investors, creditors, labor unions, etc., tend to focus on fiscal-period earnings, rather than earnings of "as-if" years that end at dates other than the fiscal-year end date. Compensation packages are generally adjusted annually based on fiscal-year performance; investment, marketing, production, and inventory decisions and contracts with suppliers are based on a fiscal year. In addition, earnings may contain a seasonal component that is related to the company's choice of fiscal year; retail companies, for example, often receive a large portion of their revenue in the last fiscal quarter.[22]

Use of the distribution of "as-if" earnings or a weighted-average of earnings across two fiscal years as a benchmark against which to compare the distribution of fiscal-year earnings implicitly assumes that the business and economic environment of one fiscal year is essentially the same as that of the next. Specifically, the implicit assumptions are that there is no growth, that the competitive and economic environments

[22] Sixty percent of retail department and variety stores have a fiscal-year end of late-January after the completion of the holiday season when their inventory is depleted. They make investment decisions (particular regarding inventory), re-stock their shelves, and begin a new cycle where the outcome of their investment decisions, advertising strategy, etc. will be realized over the forthcoming fiscal year culminating in the next holiday season when the success or failure of their investment decisions becomes known. By contrast, only 17 percent of retail grocery stores have a January fiscal-year-end, as they do not have the same degree of seasonality in their sales.

are the same, that innovations are evenly spread throughout the years, that supply, distribution and sales problems/issues/highlights/surprises are spread evenly over time, and that various contracts for compensation, contracts with suppliers, etc., do not change between fiscal years. In other words, if the benchmark is a weighted average over six quarters ending in the third quarter of year t (as in JJ), and this benchmark is compared to a fiscal year ending in the fourth quarter of year t, one must assume that conditions have remained unchanged and over time, there has been no growth. If there has been, on average, some small growth, one would expect more small profits in the fiscal year as compared to the benchmark.

Determining net income for years that span two fiscal/integral years and averaging the distributions of these net income data has two effects; it smoothes the irregularities in the distribution and draws observations toward the mean. Averaging across periods tends to offset idiosyncrasies from one period against idiosyncrasies of another period.[23]

4.3. Combining Quarters from Different Integral Years Affects the Shape of the Resultant Distribution

The distributions of "as-if" year net income for each of the three years ending quarters one, two, and three are shown in Figure 6, which is a replication of JJ Figure 3, Panels A through D. We combine the distributions for each "as-if" year into one figure and focus on the distribution around zero. Notice that the distribution of "as-if" year net income that is most similar to that of the fiscal/integral year (i.e., has an irregularity to the left of zero—recall that this is due to the sample selection induced discontinuity as shown

[23] The devil's advocate may argue that earnings management may be one of these idiosyncrasies. We agree. But we hasten to add: (1) earnings management is just one of many factors that may differ across observations; and (2) researchers should not assume the existence of earnings management if they have not ruled out other, possibly more plausible, explanations.

in our Figure 1) is the year that has most quarters integral to the fourth quarter of the fiscal year (that is, the "as-if" year ending quarter one). The distribution that is least similar to that of the integral/fiscal year is that where the fourth quarter is not integral to any of the other three quarters (that is the "as-if" year ending quarter three). The differences among the distributions of "as-if" years earnings is consistent with the fact that fiscal year earnings are affected by the integral method of accounting and the "as-if" years of earnings combine the earnings across two integral years to form a year that is not integral.[24]

Most of the analyses in JJ rely on a comparison of the distribution of fiscal year net income to a benchmark distribution that is the average of three distributions of net income for three "as-if" years. The data comprising the average are described in Figure 7. Figure 7 shows how averaging over three "as-if" years effectively assigns a weight of 1/12 to earnings of quarter two of year t-1, 2/12 to earnings of quarter three of year t-1, 3/12 to earnings of quarter four of year t-1, 3/12 to earnings of quarter one of year t, 2/12 to quarter two of year t and 1/12 to quarter 3 of year t. In other words, only half of the quarters comprising this average are integral to the fourth quarter. The effect of this averaging is to dampen the distribution as we show in Figure 8, where the dark line represents the average of the three distributions of "as-if" net income shown in our Figure

[24] We repeat the analyses summarized in Figure 6 for each year 1977 to 2006. In 18 of these years the absolute value of the difference between the number of observations in the interval -$100,000 < net income < $0 for fiscal year net income and the number of observation in this interval for "as-if" year ending quarter one was less than this difference between the number of observations for fiscal year net income and the number of observations for "as-if" year ending quarter three. In 23 of these years the absolute value of the difference between the number of observations in the interval $0 < net income < $100,000 for fiscal year net income and the number of observation in this interval for "as-if" year ending quarter one was less than this difference between the number of observations for fiscal year net income and the number of observations for "as-if" year ending quarter three.

6 and the light line is the distribution of integral/fiscal year net income shown in the black area of our Figure 1.

JJ argue that, the difference between the distribution of "as-if" years of net income and the distribution of fiscal year net income (which exhibits a selection-induced discontinuity as demonstrated in section 2) is evidence that their results "do not support the … DE…assertions that the [BD] results on the discontinuity at zero in earnings is attributable to scaling". Recall that the shape of the distribution of fiscal year net income used by JJ is due to sample selection criteria, which remove many more small loss observations than small profit observations. It follows that the observation that a discontinuity in the earnings, which is due to sample selection, is not observed in the distribution of income for "as-if" years provides no evidence either for or against the effects of scaling on the earnings distribution. All that JJ have shown is that the "as-if" years combine quarters of net income across non-integral years.[25]

4.3.1. A Demonstration of the Effect of Averaging Across Integral Periods; the Australian Football League (AFL) Analogy

Similar to a business reporting cycle, each football match has four quarters. If the score for each quarter of a football match is analogous to quarterly earnings of the firm, the score for the match (that is, the sum of the scores for each of the four quarters) is then analogous to the annual net earnings.[26]

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[25] There is a possibility (albeit remote) that the differences between the distributions in Figure 8 are due to differences in the samples. To ensure that this is not so, we repeat the analyses for the sub-sample of observations for which JJ observe income for each of the "as-if" years and for the subsequent fiscal year. The patterns discussed in section 4.1 are again evident.

[26] Whether one accepts this analogy is, in some ways, irrelevant as the point of our analyses is to show the inevitable effects of combining parts of non-integral periods on the shape of frequency distributions. The analogy can be expanded by noting other parallels including: both the football coach and corporate management prepare the team (firm) with a strategy prior to each match (year); both the coach and management team have the opportunity to modify this strategy during the match (year) in light of the competition encountered; the firm's goal is to maximize the year's profits and the coach's goal is to

We follow the methodology in JJ to create three "as-if" matches which we average together to form a benchmark distribution of match-scores. As in JJ, we add four consecutive quarters of scores (that is, for the four consecutive quarters that end with quarter one of the current match, with quarter two of the current match, and with quarter three of the current match). We then average the three "as-if" match-scores in the same way that JJ average their three "as-if" years of earnings and we use that average as a benchmark for the expected scores in the current match.

Our data comes from 22 rounds of matches among the 16 teams that have comprised the AFL over the years 1997 to 2006.[27] In other words we analyze data for 220 matches for each of 16 teams (a total of 3,420 matches). The same 16 teams have comprised the AFL for these 10 years. Points in the AFL are scored in two different ways: *goals* (when the ball is kicked between the two goal posts) are awarded six points and *behinds* (when the ball is kicked between the goal post and a behind post) are awarded one point.[28] The winner is the team that has the highest total score by the end of the match. If the scores are even at the end of play, the match is a draw.

Figure 9 demonstrates the effect of averaging scores across football matches. The dark line, which represents the average score of three "as-if" matches, is noticeably

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maximize the match score; both the match and fiscal year have a natural beginning and end, and that end is a time to tally up and make judgments on the performance of the team or firm, and to think about strategy for the next match (year). In both cases; the competition, the makeup of the team (firm), the strategy, may differ from match (year) to match (year). Just as the fourth quarter in business is the time to "balance out" the firm's earnings, as influenced by the estimates made in the prior quarter's installments, similarly the football team's strategy may change in the fourth quarter depending on the performance in the first three quarters. In combining either income across fiscal years or scores across matches, idiosyncratic superior performance in the previous year (match) may be averaged with idiosyncratic inferior performance in the current year (match). This averaging may (likely will) result in a change in the shape of the distribution of scores (earnings).

[27] 1997 represents a natural year to start the analysis because the teams comprising the AFL have been the same from that year until today.

[28] One point is also awarded if the ball hits a goal post, or if an opposition player sends the ball between the goal posts by touching it with any part of the body.

smoother than the light line which shows the actual distribution of match scores. This smoothing effect of averaging is almost inevitable, as match-specific events/scores in one match are averaged with match-specific events/scores in another.[29]

4.4. Scalers Differ Between Fiscal Year Loss Observations and "as-if" Year Loss Observations

Figure 10 captures the spirit of DE footnote 32 where it is noted that prices may be different at the beginning of the fiscal year than they are at the beginning of the three JJ "as-if" years. This figure shows the distribution of beginning-of-year market capitalization (price – Quarterly Legacy Compustat data item 14 -- times shares outstanding – Quarterly Legacy Compustat data item 61) for the benchmark created from "as-if" years ending in quarters one through three and the distribution of beginning-of-*fiscal*-year market capitalization for each net income interval.

Figure 10 shows that, while there are differences in the distributions of market capitalization on both sides of zero, there is a more noticeable difference in the distributions to the left of zero. Specifically, firms reporting negative net income tend to have higher market capitalization at the beginning of the "as-if" years than at the beginning of the fiscal year. The effect is that when JJ compare deflated fiscal year income to the average of the three deflated "as-if" year's income, deflation will draw fiscal year negative net income observations toward zero to a lesser extent than it will draw the "as-if" year observations toward zero. By contrast, there are no such distinct differences to the right of zero in the deflators of positive net income. This difference in

[29] We do not report the distributions for each of the three "as-if" years. These distributions do not exhibit the effects of combining quarters across matches that we see when analyzing combinations of net income across fiscal years. Two explanations are: (1) our sample size is not large enough to see this effect with the AFL data, and (2) the fourth quarter of a football match may not have the pivotal effect on the score for the game that is exhibited with fourth quarter net income and income of the fiscal year.

deflators for negative net income will contribute to the JJ conclusion that there are too few observations of small negative net income in the distribution of fiscal year income; but this difference in the number of observations is not due to earnings management.

We present these analyses as yet another example of the possibility that the deflator may affect the earnings distributions as well as affecting the comparison across distributions. Although examination of the reasons for this difference is beyond the scope of this paper, we offer some suggestions. A number of studies make the observation that fourth quarter prices are less value relevant (see, for example, Mendenhall and Nichols [1988] and Salamon and Stober [1994]). Explanations for this phenomenon include tax-loss selling (which is quite consistent with our observation that year-end prices of loss firms are lower at fiscal year-end than at "as-if" year end and with the fact that the vast majority of observations in our sample have December as their fiscal year end), insider trading, and seasonality in the risk-return relation.

4.5. Analysis of "as-if" Annual Earnings per Share

JJ's analysis of the distribution of earnings per share is very similar to their analysis of net income and deflated net income. However, rather than using reported earnings per share, they use Compustat Legacy quarterly data item 27. According to Compustat Legacy, in interim quarters (the basis of the JJ benchmark): (1) quarterly data item 27 will equal (*within four cents deviation*) the sum of the prior four quarters of basic earnings per share, excluding extraordinary items; and, (2) one to three quarters of a four quarter total may include restated data whereas the others may not. We question whether meaningful conclusions can be drawn from the JJ analysis of earnings per share because: (1) the four cent deviation in the Compustat variable may add too much noise when the

focus is on managing earnings per share to report an extra cent, and (2) arguments regarding earnings management focus on reported earnings per share rather than earnings per share after they are subsequently restated. In addition, from the data we can examine, it appears the JJ sample selection criteria remove a larger proportion of firms reporting zero and small losses than firms reporting small profits.

5. Conclusions

In this paper we have examined conclusions regarding earnings management that have been drawn from comparisons of distributions of earnings. We show that sample selection criteria, which eliminate more small loss observations than observations of a small profit, create irregularities in earnings distributions around zero but there is no basis for the conclusion that the irregularity is due to earnings management. We reiterate the point made in DE that, if a sample selection criterion leads to the deletion of more observations of small losses than observations of small profits, the shape of earnings distributions in the vicinity of zero cannot be used as evidence of earnings management.

We also show how the observation that the relation between earnings and prices differs according to the magnitude and sign of the earnings provides a simple explanation for the shape of the earnings distribution that is most often cited as evidence of earnings management (namely, the distribution of net income deflated by market capitalization); this explanation has nothing to do with earnings management.

The arguments for analyzing the distribution of *deflated* net income rather than the distribution of net income are: (1) deflation is an attempt to homogenize firms (DeGeorge, Patel and Zeckhauser [1999]), and (2) firms are drawn from a broad range of

firm sizes (BD). But these studies do not provide reasons why heterogeneity or differences in firm size may affect the analyses. More importantly, the implicit assumption is that deflation will not distort the underlying distribution of net income. The analyses in DE and in Section 3 of this paper suggest that it does.

Also, there is no reason to think that firms manage earnings deflated by beginning-of-period price; rather, they may manage net income or earnings per share. It follows that the distributions that may be used to show evidence of earnings management are the distributions of net income and of earnings per share. DE show that these distributions do not show evidence of an irregularity at zero.

Studies that recognize the fact that deflation affects the shape of the net income distribution attempt to control for scale in their research design. For example, Kerstein and Rai [2007] – hereafter KR -- examine movements among the four BD deflated net income intervals around zero. In their analysis movements constitute their coded dependent variable in a logistic regression. They attempt to control for the effect of scaling by adding log of market capitalization as another independent variable. While this may help, the effects of scale are likely to remain because the relation between the magnitude of net income and magnitude of market capitalization, which affects the classification of the data in KR, likely will not be captured by simply adding log of market capitalization as another explanatory variable. An obvious way of avoiding spurious effects of scaling is to do the analyses in KR using movements among net income and earnings per share intervals rather than movements among deflated earnings intervals.

We show evidence of alternative explanations other than sample selection and scaling for the observed shapes of deflated earnings distributions. Our main example is the use of the distribution of "as-if" years of net income that end in quarters other than quarter four of the fiscal year, We show that the distribution of these "as-if" net income numbers differ from the distribution of fiscal year net income because the "as-if" years combine observations across two non-integral periods. This is particularly pertinent to the analysis of net income data because U.S. firms follow accounting procedures that lead to an integral relation between the earnings of the fourth quarter of the fiscal year and the earnings of the first three quarters.

We conclude, as do DE, that the observed shapes of earnings distributions around zero is not *ipso facto* evidence of earnings management; rather, additional evidence beyond the shape of the distribution must be brought to bear. In this paper we have provided more plausible explanations for the shape of these distributions; use of the integral method of accounting, sample selection bias, scaling, and averaging. The distributions that are not affected by these research-design flaws do not exhibit patterns that suggest earnings are being managed to avoid losses.

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Figure 1: **The Effect of Sample Selection Criteria on the Frequency Distribution of Net Income**

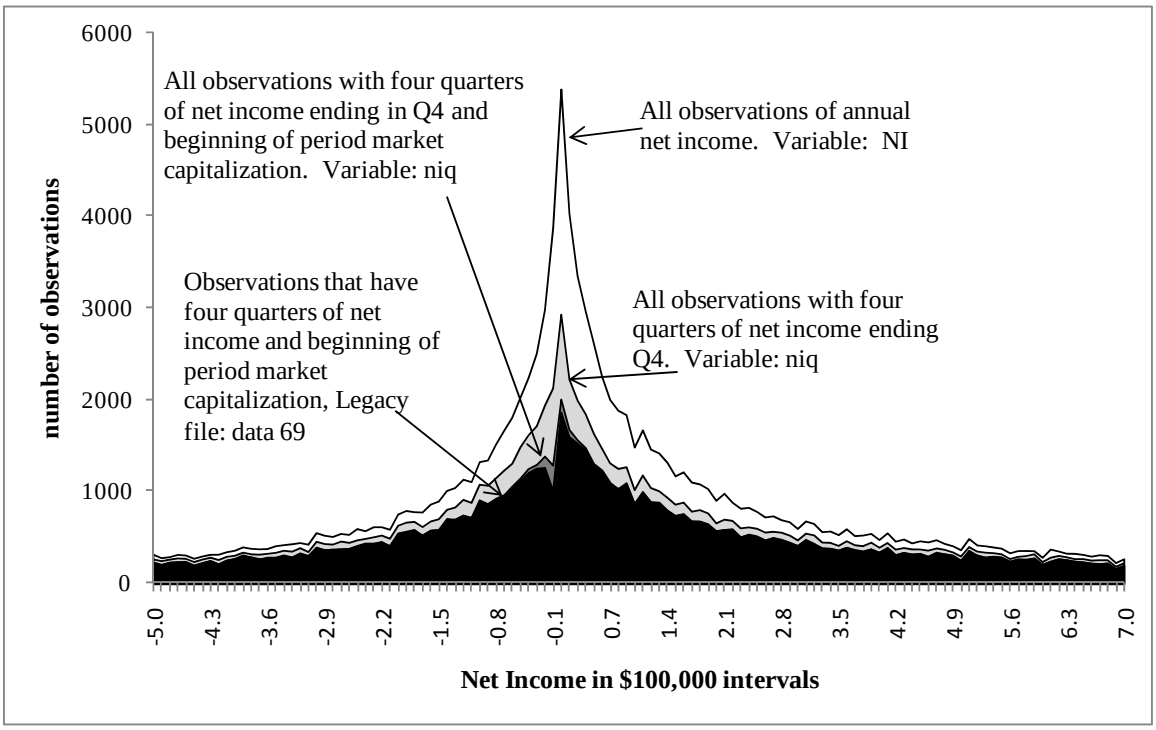


Figure 1 shows the effect of the JJ sample selection criteria on the frequency distribution of annual net income. Intervals are $100,000 wide as in DE and Dechow, Richardson and Tuna (2003). The line above the white (uppermost) section shows the frequency distribution of all available observations of annual net income (ni) in the Compustat Fundamental annual file for the 108,772 observations between -$5,000,000 and $7,000,000. 28,680 observations are < -$5,000,000 and 54,080 observations are > $7,000,000. The line above the light gray section plots the frequency distribution of fiscal year net income computed as in JJ as the sum of four quarters of data (Quarterly Compustat Fundamental variable "niq") after removing the observations that do not meet the first JJ sample selection criteria of having four consecutive quarters of data for that fiscal year; 79,045 of the 153,037 observations that meet this sample selection criteria are shown. The dark gray section, which is most noticeable just to the left of zero, is the frequency distribution of observations that meet both JJ selection criteria, four quarters of net income in the Fundamental Quarterly Compustat files and beginning of period market capitalization ("csho"*"prcc_f"); 64,968 of the 130,741 observations are shown. The black (bottom) section plots fiscal year net income from the Compustat Legacy files computed as in JJ as the sum of four quarters of data (Compustat Legacy data item 69) after removing those observations that do not meet both JJ sample selection criteria: four consecutive quarters of data and beginning-of-year market capitalization (Quarterly Legacy Compustat data item 14 times Quarterly Legacy Compustat data item 61); 64,069 of the 130,657 observations that meet this sample criteria are shown. The difference between the medium gray and the black area demonstrates the effect of Compustat missing value codes on the Legacy files, which code observations with net income -0.001, -0.002, -0.003, -0.004, -0.007 and -0.008 as missing.

Figure 2: **Distribution of beginning-of-period market capitalization as used by BD**

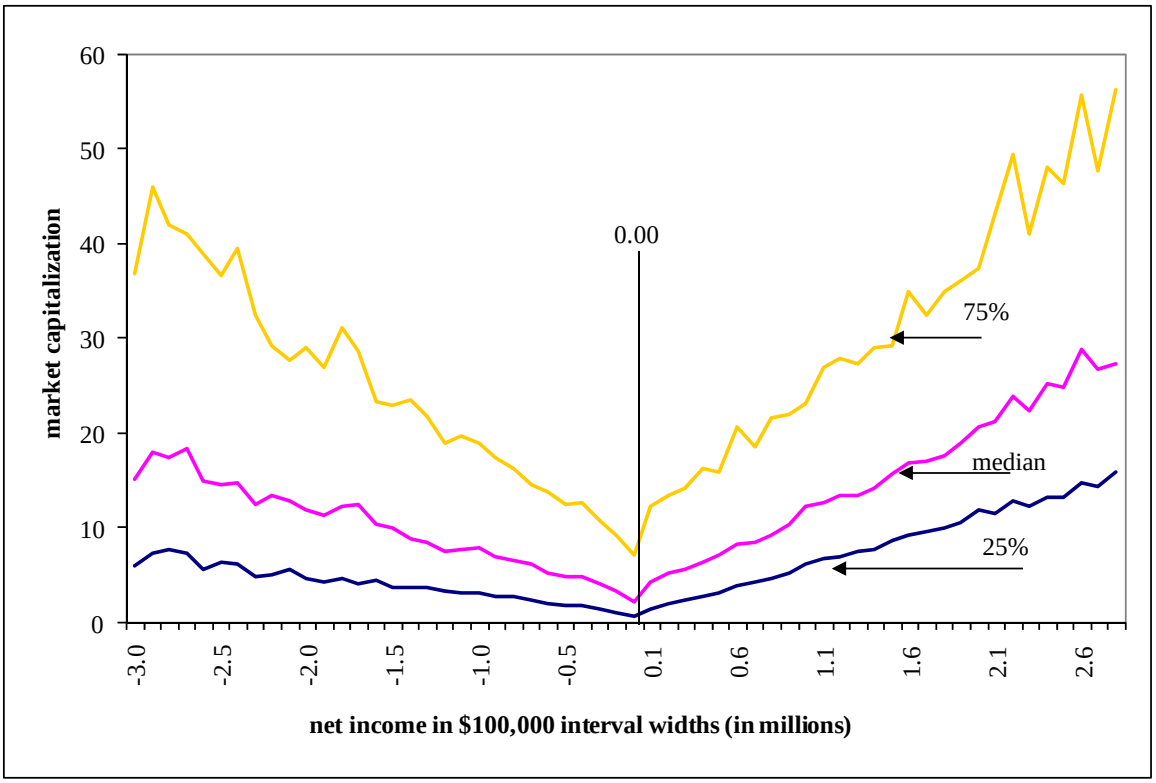
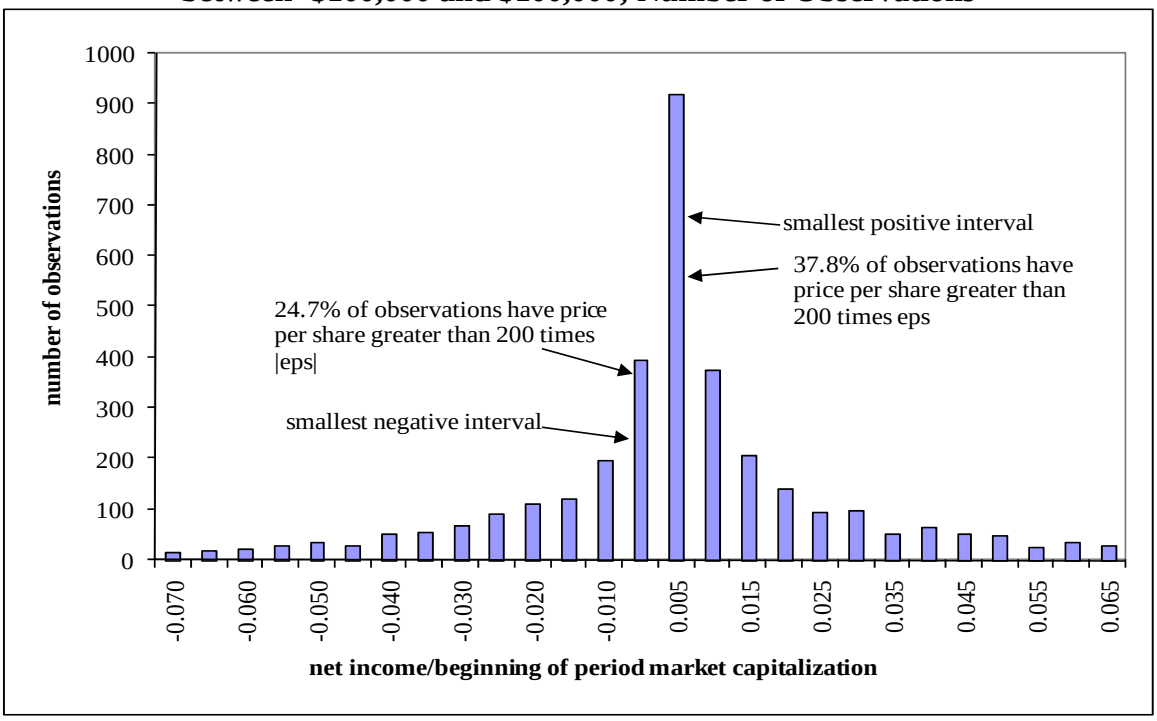


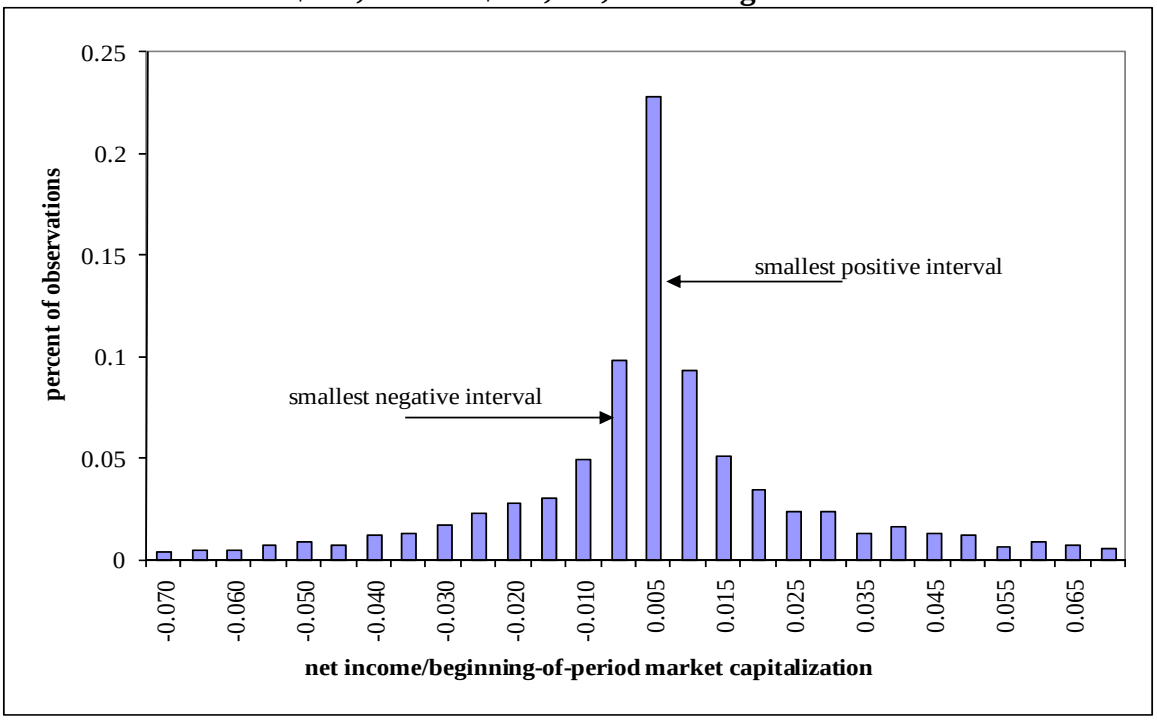
Figure 2 shows the distribution (25th percentile, median, and 75th percentile) of market capitalization (that is, price – "prcc_f" times number of shares outstanding – "csho") for all net income observations between -$3,000,000 and $3,000,000 that meet the BD sample selection criteria. Observations are placed in $100,000 net income intervals.

Figure 3: **Effect of Deflation on the Distribution of (Deflated) Net Income**

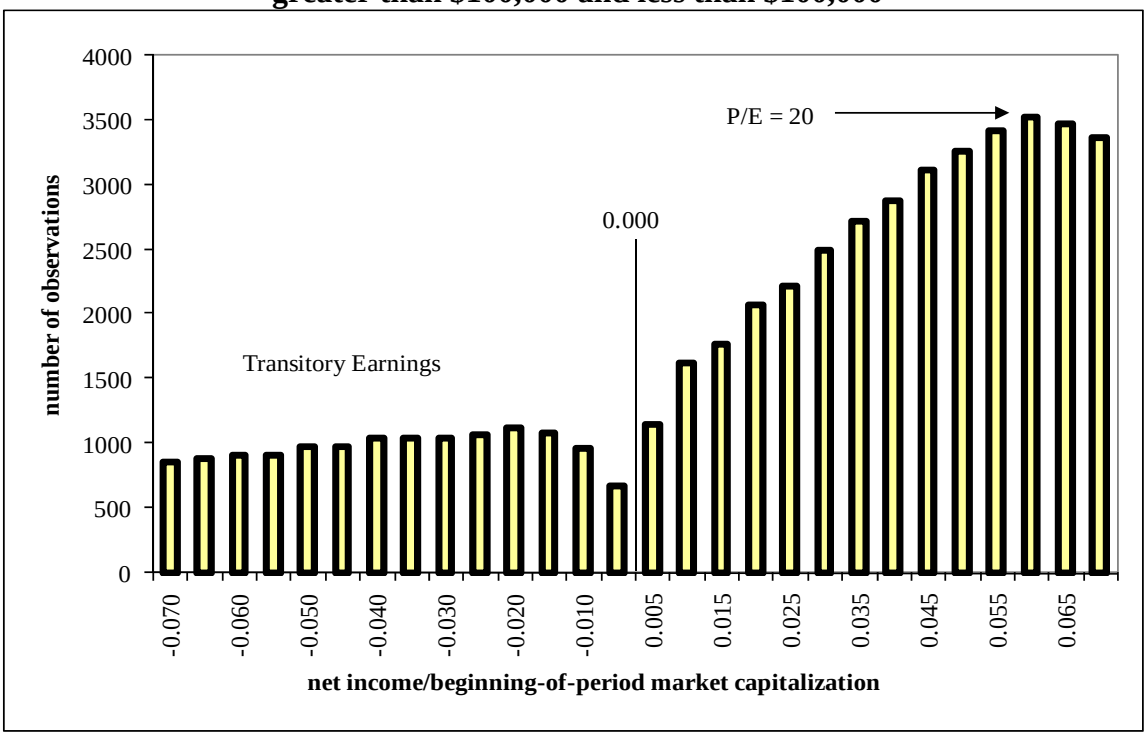
Panel A: Distribution of Deflated Net Income for Observations of Net Income between -$100,000 and $100,000; Number of Observations



Panel B: Distribution of Deflated Net Income for Observations of Net Income between -$100,000 and $100,000; Percentage of Observations



Panel C: Distribution of Deflated Net Income for Observations of Net Income greater than $100,000 and less than $100,000



Panel D: Distribution of Deflated Net Income for all Observations of Net Income

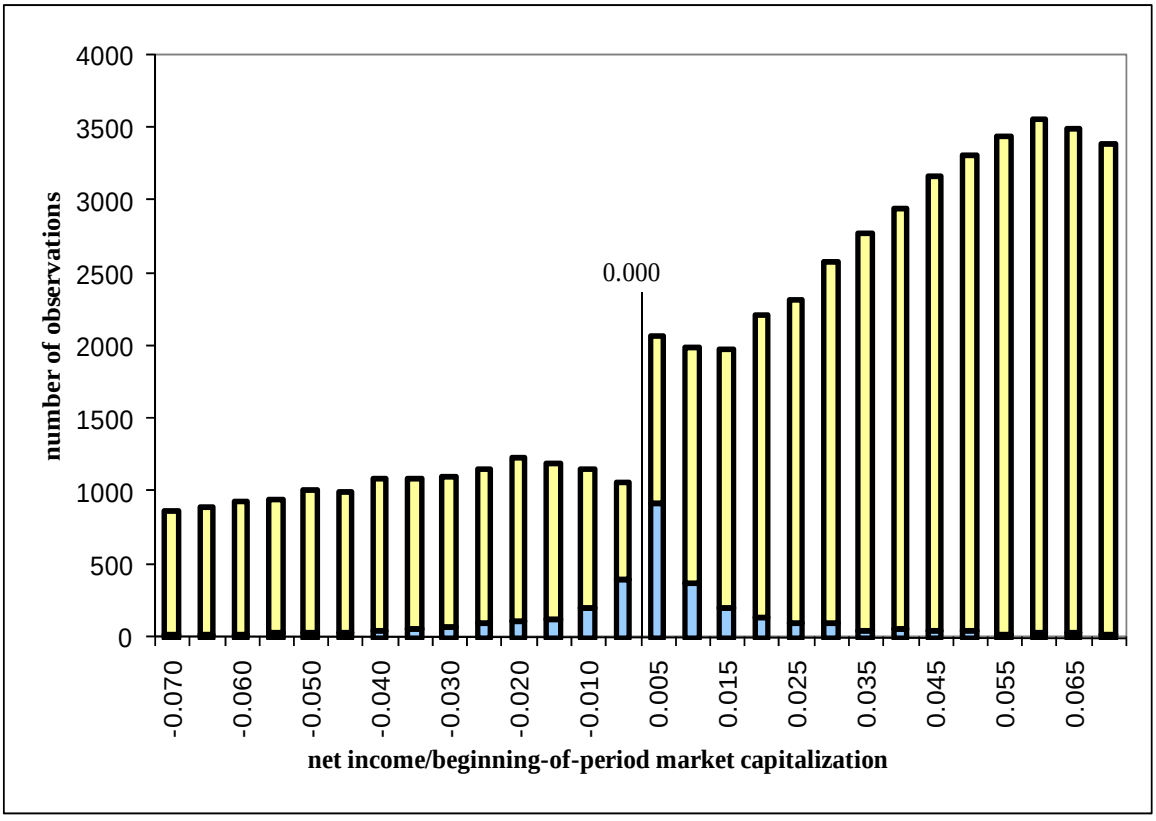


Figure 3 Panel A shows the frequency distribution of observations of net income between -$100,000 and $100,000 when those observations are deflated by their beginning of period market capitalization. Intervals are 0.005 wide as in BD. The numerator of each observation is Fundamental Annual Compustat variable "ni". The denominator is beginning-of-year market capitalization (that is, price – Fundamental Annual Compustat variable "prcc_f" times number of shares outstanding – Annual Fundamental Compustat variable "csho"). Panel B shows the distribution of the percentage of net income between -$100,000 and $100,000 that falls into each interval after deflation. Panel C shows the frequency distribution of net income less than -$100,000 and greater than $100,000 when those observations are deflated by their beginning of period market capitalization. Panel D combines Panel A and Panel C to recreate the distribution first documented by BD.

Figure 4: T**he Effect of the Integral Theory of Accounting**

Panel A: Illustration of the Effect of the Last Quarter's Income for Observations with Annual Net Income between $0 and -$100,000

Observations in the interval -$100,000 < Net Income < 0							
	Q2 (t-1)	**Q3 (t-1)**	**Q4 (t-1)**	**Q1 (t)**	**Q2 (t)**	**Q3 (t)**	**Q4 (t)**
"As-if" yr end Q1	**Sum is positive**			**63% neg**			
"As-if" yr end Q2		**Sum is positive**			**59% neg**		
"As-if" yr end Q3			**Sum is positive**			**55% neg**	
Fiscal yr, end Q4				**Sum is positive**			**70% neg**
The shaded area (last quarter of each "as-if" year and quarter four of the fiscal year) shows percentage of observations in the -$100,000 interval that became negative in the last quarter of each "as-if" year and of the fiscal year							

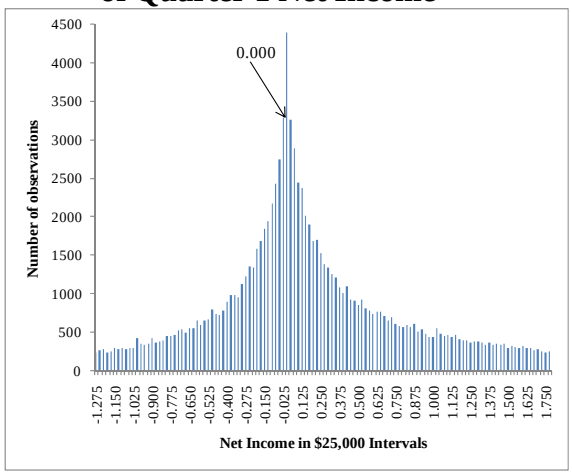
Panel B: Illustration of the Effect of the Last Quarter's Income for Observations with Net Income between $0 and $100,000

Observations in the interval 0 < Net Income < $100,000							
	Q2 (t-1)	**Q3 (t-1)**	**Q4 (t-1)**	**Q1 (t)**	**Q2 (t)**	**Q3 (t)**	**Q4 (t)**
"As-if" yr end Q1	**Sum is negative**			**57% pos**			
"As-if" yr end Q2		**Sum is negative**			**63% pos**		
"As-if" yr end Q3			**Sum is negative**			**66% pos**	
Fiscal yr, end Q4				**Sum is negative**			**52% pos**
The shaded area (last quarter of each "as-if" year and quarter four of the fiscal year) shows percentage of observations in the $100,000 interval that became positive in the last quarter of each "as-if" year and of the fiscal year							

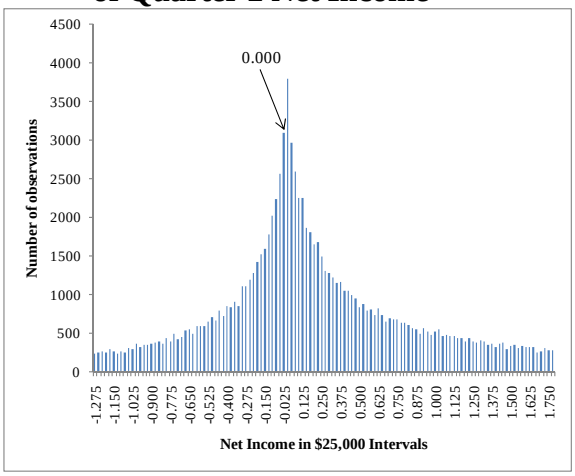
Figure 4 Panel A shows the percentage of observations in the interval -$100,000 < net income <$0 that became negative because of the final quarter of each "as- if" year, or the fourth quarter of the fiscal year. Net income is based on Fundamental Quarterly Compustat variable "niq". There are 2,913 observations that have four quarters of data ending in quarter 1, 2,939 observations that have four quarters of consecutive data ending quarter 2, 2,885 observations that have four quarters of consecutive data ending quarter 3, and 2,468 observations that have four quarters of consecutive data ending quarter 4. Panel B shows the percentage of observations in the interval $0 < net income <$100,000 that became positive because of the final quarter of each "as-if" year, or the fourth quarter of the fiscal year. Net income is based on Fundamental Quarterly Compustat variable "niq". There are 2,782 observations that have four quarters of data ending in quarter 1, 2,565 observations that have four quarters of consecutive data ending in quarter 2, 2,527 observations that have four quarters of data ending in quarter 3, and 3,380 observations that have four quarters of net income ending in quarter 4.

Figure 5: Frequency Distribution of Fundamental Compustat Quarterly Net Income

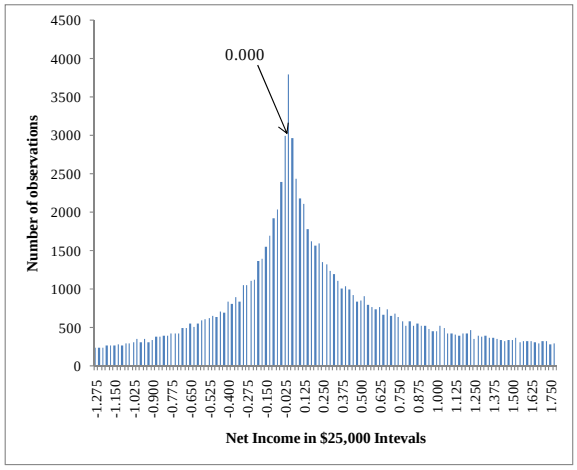
Panel A: Frequency Distribution of Quarter 1 Net Income



Panel B: Frequency Distribution of Quarter 2 Net Income



Panel C: Frequency Distribution of Quarter 3 Net Income



Panel D: Frequency Distribution of Quarter 4 Net Income

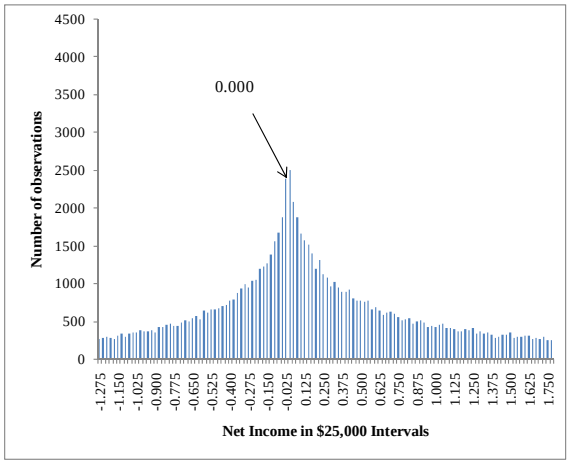


Figure 5 shows the frequency distribution for all available observations in the Fundamental Compustat Quarterly file for variable "niq", quarterly net income from January 1976 to December 2006. Panel A shows the frequency distribution of net income (niq) for quarter one and displays 102,112 of the 178,198 observations available. Panel B shows the frequency distribution of net income (niq) for quarter 2 and displays 97,906 of the 180,041 observations available. Panel C shows the frequency distribution for net income (niq) for quarter three and displays 94,123 of the 174,308 observations available. Panel D shows the frequency distribution of net income (niq) for quarter four and displays 83,650 of the 176,830 observations available.

Figure 6: The Effect of Combining Quarterly Net Income Observations across Consecutive Fiscal Years

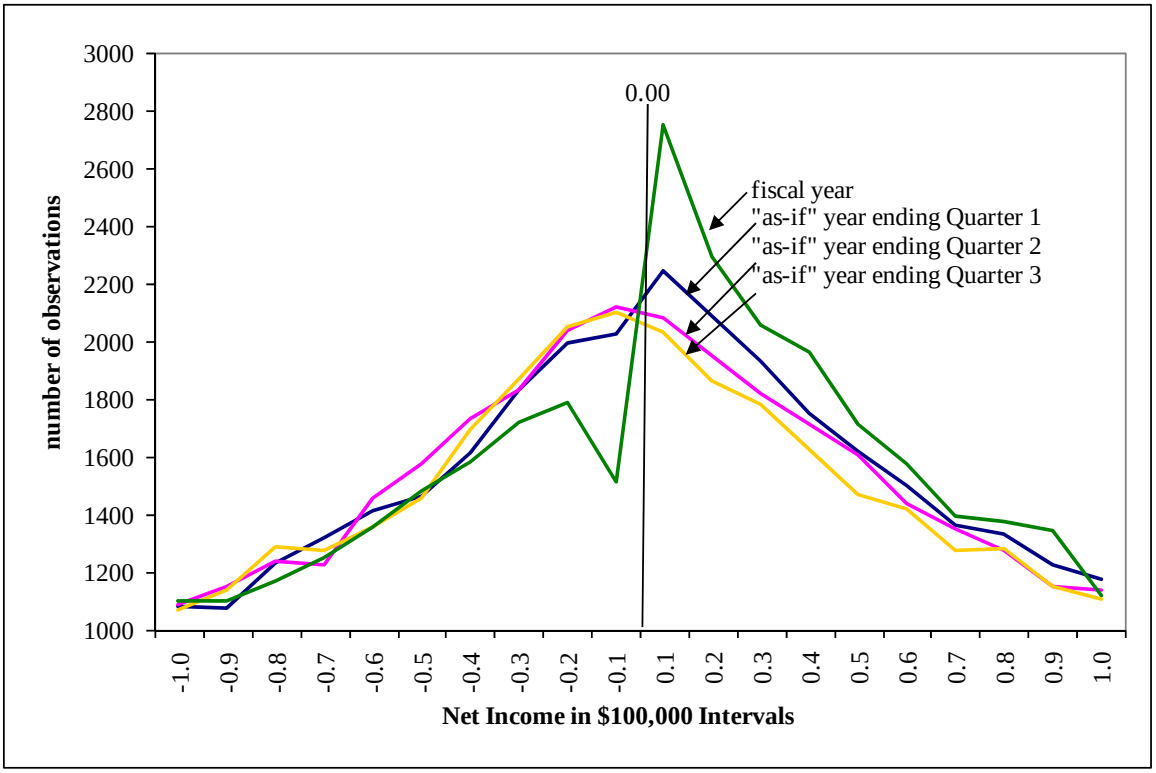


Figure 6 compares the distribution of "as-if" years of net income and the distribution of fiscal year net income. The sample is all observations with seven consecutive quarters of quarterly net income observations available on the Legacy Compustat Annual file from 1976 to 2006. The three "as-if" years end in quarter one year t, quarter two year t and quarter three year t. The figure shows the observations that fall into the net income intervals between -$1,000,000 and $1,000,000. The "as-if" years ending in quarter one, quarter two and quarter three show 31,273, 30954, 30285 observations, respectively. The fiscal year shows 31,628 observations.

Figure 7: **Depiction of the JJ Method for Constructing the Numerator for the Weighted Average Net Income Benchmark**

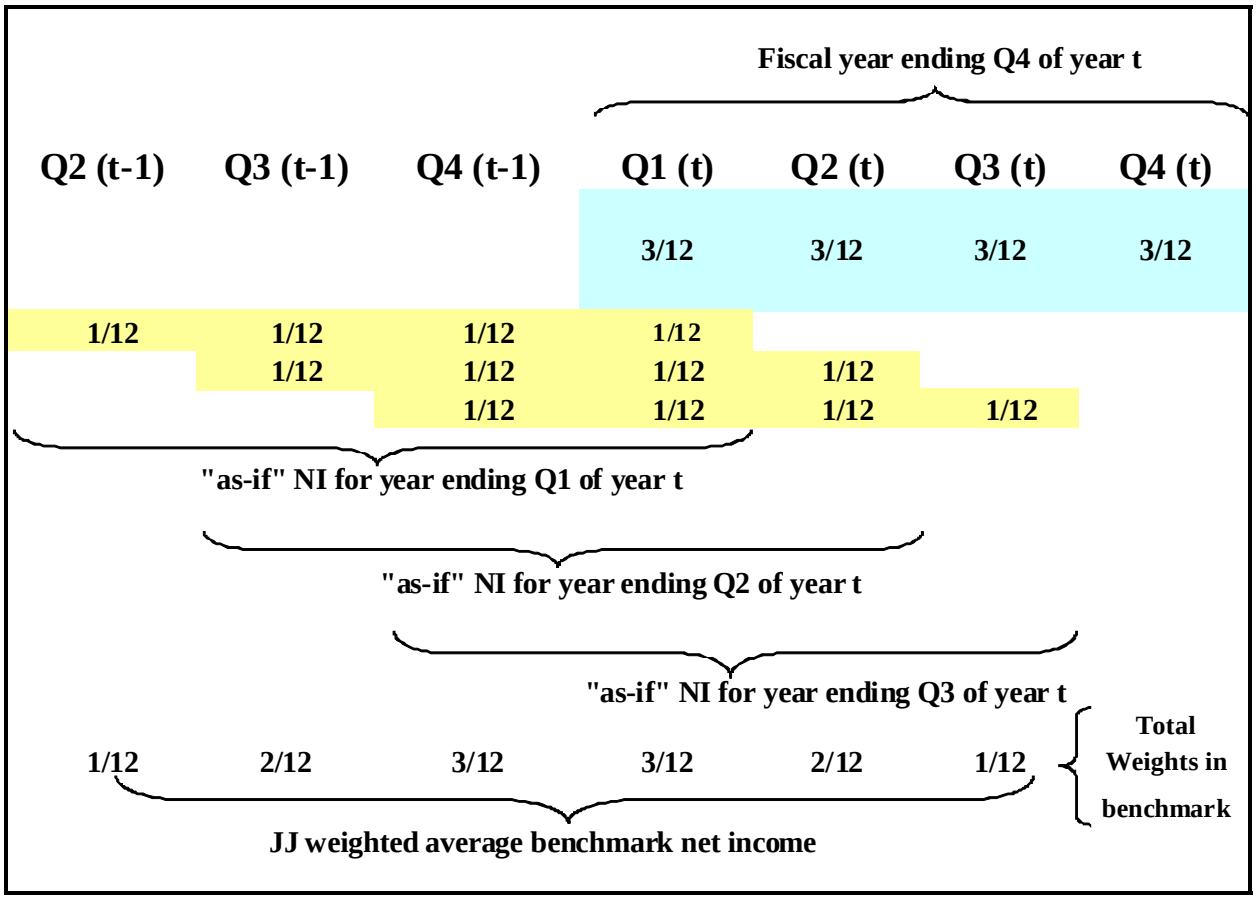


Figure 7 shows how JJ create the numerator used in their analysis. Fiscal year net income is the sum of quarterly net income for quarters one through four of a fiscal year (Legacy Compustat Quarterly data item 69), divided by beginning of year market capitalization: price (Legacy Compustat Quarterly data item 14) multiplied by number of shares outstanding (Legacy Compustat Quarterly data item 61). This fiscal year is compared to the average of net income calculated for three "as-if" years. These three "as-if" years of net income are the sum of all available four consecutive quarters of Legacy Compustat Quarterly data item 69 ending in quarter 1, quarter 2, and quarter 3 of year t. The income of each "as-if' year is deflated by the respective beginning-of-as-if-year market capitalization. Since there are different numbers of observations for each "as-if" year, percentages are used and averaged. In other words, JJ assign a weight of 1/12 to earnings of quarter two of year t-1, 2/12 to earnings of quarter three of year t-1, 3/12 to earnings of quarter four of year t-1, 3/12 to earnings of quarter one of year t, 2/12 to quarter two of year t and 1/12 to quarter 3 of year t. The sample selection process requires seven quarters of continuous quarterly net income data.

Figure 8: **Comparison of the Benchmark Average of the Three "as-if" Years and the Actual Fiscal Year**

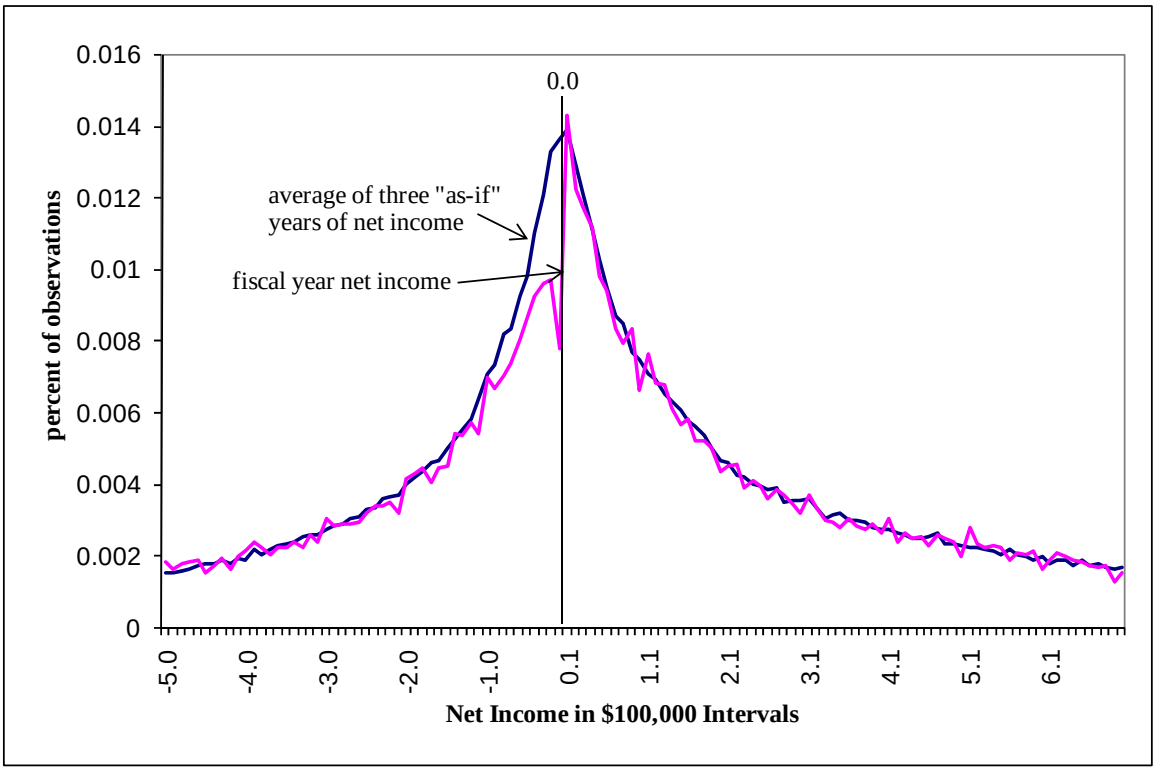


Figure 8 shows the frequency distribution of un-deflated net income for the fiscal year (light peaked line—which is the same line as represented by the black area in Figure 1 where the discontinuity was induced by sample selection) and the average of the three "as-if" years shown in Figure 6.

Figure 9: The Effect of Averaging on Scores from Australian Football League Games

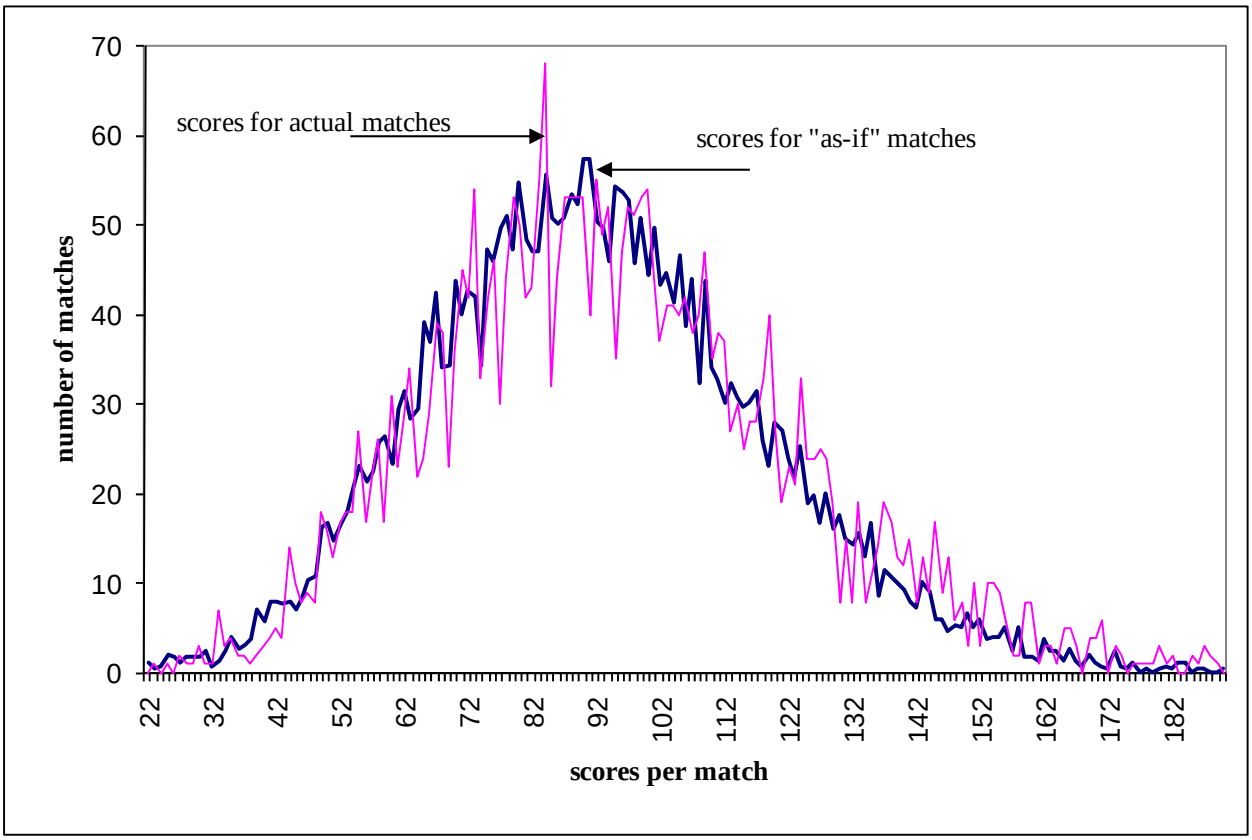


Figure 9 shows the frequency distribution of the scores for 22 matches between the 16 teams in the Australian Football League from 1997 to 2006: a total of 3,420 matches are in the sample. The dark line is the average of three "as-if" matches where the average is calculated in the same way as in JJ. Each "as- if" match consists of four consecutive quarters ending: (1) in quarter one of the match in week t; (2) in the second quarter of the match in week t; and (3) in the third quarter of the match in week t. The light line is the frequency distribution of actual match scores.

Figure 10: **The Distribution of the Deflator (beginning-of-period market capitalization) by whether the Deflator is for an "as-if" Year or Fiscal Year**

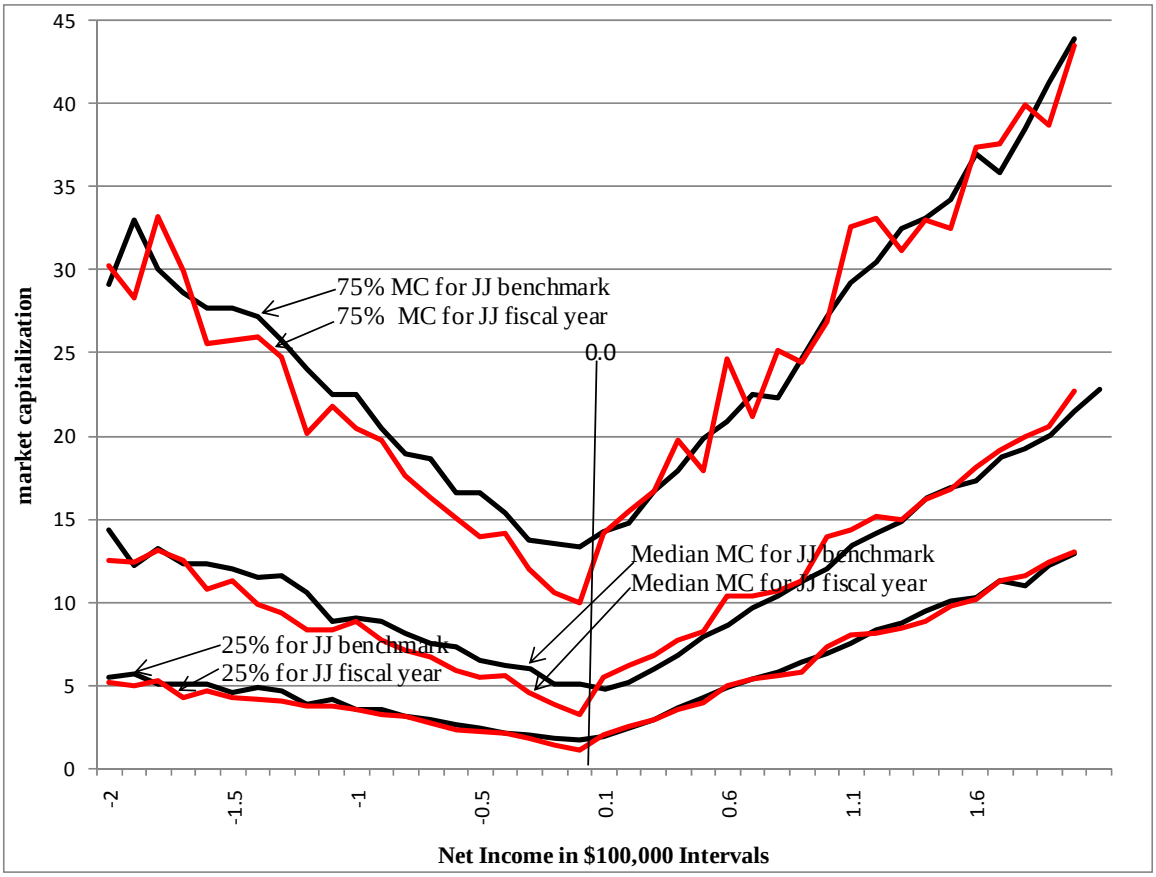


Figure 10 focuses on observations of net income between -$2,000,000 and $2,000,000 and plots both beginning-of-fiscal-year market capitalization and the average of the beginning-of-year market capitalization for the three "as-if" years, which are used as the JJ benchmark. The light lines represent the average of beginning-of-year market capitalization for the three "as-if" years ending in quarters one, two, and three of year t (price – Legacy Compustat quarterly data item 14 times shares outstanding – Legacy Compustat quarterly data item 61). The dark lines represent the beginning-of-fiscal-year market capitalization when using quarterly data (price -- Legacy Compustat quarterly data item 14 times shares outstanding – Legacy Compustat quarterly data item 61).

Table 1: Analysis of the Differences Between Various Potential Deflators for Loss Observations and for Profit Observations of the Same Magnitude

Compustat Fundamental File	Profits		Losses		t-statistics for difference between profit & loss	
Net Income Intervals:	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**
Market Capitalization						
+/- $0.00 to $100,000	4.37	15.31	2.24	10.41	5.10	4.44
+/- $100,001 to $200,000	5.36	19.92	3.34	12.13	5.49	2.26
+/- $200,001 to $300,000	5.57	18.52	4.09	12.81	2.24	3.63
+/- $300,001 to $1,000,000	8.64	25.37	5.93	19.41	5.85	4.59
+/- > $1,000,001	160.30	946.67	53.41	280.55	5.53	9.70
Net Operating Assets						
+/- $0.00 to $100,000	1.64	9.03	0.65	4.90	6.18	4.66
+/- $100,001 to $200,000	2.76	12.18	1.35	6.58	8.22	3.19
+/- $200,001 to $300,000	3.65	15.52	1.63	10.21	8.63	2.78
+/- $300,001 to $1,000,000	6.21	20.71	2.49	13.01	11.29	4.94
+/- > $1,000,001	97.55	556.58	15.44	207.13	7.02	10.28
Net Sales						
+/- $0.00 to $100,000	3.20	18.07	0.80	8.64	6.89	6.87
+/- $100,001 to $200,000	5.54	23.26	1.90	14.11	9.82	4.07
+/- $200,001 to $300,000	7.59	29.01	2.57	15.42	8.17	5.87
+/- $300,001 to $1,000,000	13.19	39.60	3.81	24.16	12.78	5.04
+/- > $1,000,001	189.18	976.14	24.64	325.42	9.26	13.41
Number of Employees						
+/- $0.00 to $100,000	0.05	0.21	0.02	0.12	10.97	5.71
+/- $100,001 to $200,000	0.08	0.29	0.03	0.16	12.22	4.74
+/- $200,001 to $300,000	0.10	0.36	0.04	0.19	8.96	5.60
+/- $300,001 to $1,000,000	0.17	0.49	0.05	0.29	14.23	4.51
+/- > $1,000,001	1.74	11.32	0.23	3.42	33.91	20.58
Total Assets						
+/- $0.00 to $100,000	2.92	14.27	1.41	7.69	6.14	5.58
+/- $100,001 to $200,000	4.59	19.02	2.46	10.96	8.69	2.77
+/- $200,001 to $300,000	6.18	22.93	3.11	14.45	7.05	3.86
+/- $300,001 to $1,000,000	10.39	32.01	4.60	20.40	9.85	5.21
+/- > $1,000,001	167.48	948.86	37.83	352.69	6.64	10.57
Shareholder Equity						
+/- $0.00 to $100,000	1.24	5.75	0.57	3.05	5.98	5.83
+/- $100,001 to $200,000	1.98	7.69	1.07	4.30	6.63	2.89
+/- $200,001 to $300,000	2.68	8.65	1.34	4.84	7.67	6.99
+/- $300,001 to $1,000,000	4.88	12.36	1.99	7.88	10.49	5.05
+/- > $1,000,001	74.16	367.05	14.27	116.98	7.10	12.36
Common shares used to calculate basic eps-end of period						
+/- $0.00 to $100,000	1.67	4.87	1.50	6.19	4.44	0.18
+/- $100,001 to $200,000	1.91	4.97	2.13	6.75	0.47	0.71
+/- $200,001 to $300,000	2.08	5.40	2.41	7.50	1.37	1.08
+/- $300,001 to $1,000,000	2.69	5.98	2.96	8.70	0.55	2.88
+/- > $1,000,001	16.15	60.92	8.33	25.44	13.56	33.20

Table 1 shows a variety of potential deflators that have been suggested for net income. The differences in deflators for negative versus positive net income observations are shown for the intervals $0 to +/- $100,000, from +/-$100,000 to $200,000; +/- $200,000 to $300,000, +/- $300,000 to $1,000,000 and for observations greater than $1,000,000 or less than -$1,000,000. Data is from the Fundamental Compustat file, January 1976 to December 2006. Deflators shown are: market capitalization which is common shares outstanding (csho) times fiscal year closing price (prcc_f), NOA is operating assets minus operating liabilities. Operating assets are defined as Total assets (at) – cash and short term investments (che). Operating liabilities are defined as total assets (at) – short-term debt (dlc) – long-term debt (dltt) – minority interest (mib) – preferred stock (pstk) – common equity (ceq). Also shown are Net Sales (sale), number of employees (emp) total assets (at), shareholder equity (ceq) and common shares used to calculate basic earnings per share (cashpri). t-statistics are Fama MacBeth t-statistics.