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Auditing, integral approach to quarterly reporting, and cosmetic earnings management

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Abstract

Purpose – This study examines the effect of auditing and the integral approach to interim reporting on cosmetic earnings management, referred by Kinnunen and Koskela as earnings manipulative behavior to report earnings numbers to achieve key cognitive reference points represented by $N \times 10^k$.

Design/methodology/approach – Using Benford's Law, the analysis employs 182,278 positive quarterly earnings observations and 103,470 negative quarterly observations for all publicly listed US companies from 1993 to 2003.

Findings – The empirical results show that firms tended to engage in cosmetic earnings management in each of the four fiscal quarters. More importantly, it was found that the degree of cosmetic earnings management is significantly less severe in the fourth fiscal quarter, which is the only quarter audited, than any of the previous quarters. This result suggests that the auditor plays an important role in reducing the cosmetic earnings manipulative behavior.

Originality/value – The findings of the study add more evidence to the ongoing debate about the effectiveness of auditing in preventing earnings management.

Keywords Auditing, Financial reporting, Accounting standards

Paper type Research paper

Introduction

Earnings management is the manipulation of accounting numbers within the scope of the generally accepted accounting principles (GAAP)[1]. Since, earnings have been regarded as the most important item in the financial reports to investors, analysts, boards, and senior executives, standard setters are very concerned with how earnings numbers are derived (Beaver, 1998). The accounting accruals (or estimates) – adjustments to operating cash flows in calculating net income – are the most frequently used means for achieving a desired earnings figure (Jackson and Pitman, 2001). Levitt (1998), former Chairman of the US Securities and Exchange Commission, warned that earnings management by corporate America is eroding the quality of the financial reporting process. Following the debacle of Enron, earnings management has attracted unprecedented attention by regulators, accounting academics, and investment community. The passage of the Sarbanes-Oxley Act in 2002 makes one important step towards enhancing the quality of the earnings numbers.

While management is responsible for preparing financial statements, the auditor needs to determine whether they conform to GAAP. Although flexibility in GAAP allows managers the opportunity to manipulate earnings without violating GAAP, the auditor does have the power to question the assumptions (e.g. allowances for bad debt, and the economic life of fixed assets, etc.) made by management and to require changes before issuing an unqualified opinion. Thus, in theory, the auditor can significantly

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mitigate earnings management, in addition to detecting violations of GAAP. The existing empirical research, however, generates mixed results regarding the extent to which auditors prevent earnings management (Dechow and Schrand, 2004).

The purpose of this study is to examine the impact of auditing on deterring a particular type of earnings management among publicly listed US companies, i.e. reporting rounded earnings numbers. Prior research documents that managers tend to report earnings numbers to achieve key cognitive reference points represented by $N \times 10^k$ (Skousen *et al.*, 2004; Kinnunen and Koskela, 2003; Van Caneghem, 2002; Thomas, 1989; Carslaw, 1988; among others). Kinnunen and Koskela (2003) refer to this type of earnings manipulative behavior as *cosmetic* earnings management. Since, prior studies (except for Thomas, 1989) in this research focus almost exclusively on annual earnings, which are already audited, the auditor's role in mitigating such earnings manipulative behavior is obscured. In this study, however, we examine quarterly earnings numbers, noting that an integral approach to interim reporting is mandated by APB Opinion No. 28 (APB, 1973) and that only the fourth quarter earnings numbers are audited. By comparing the extent of cosmetic earnings management across quarters, the impact of auditing on curbing such behavior can be better investigated.

Our empirical analysis involves 182,278 quarterly net income observations for all publicly listed US companies from 1993 to 2003, obtained from the Standard & Poor's *Research Insight* annual database. Consistent with our hypotheses, we find that cosmetic earnings management is pervasive in the quarterly earnings numbers. Specifically, there are significantly more zeros and fewer nines in the second digit of the earnings numbers in each of the four quarters. Furthermore, our analysis suggests that the cosmetic earnings management in the fourth quarter, while still prominent, is much subdued as compared to each of the first three quarters. This result supports our hypothesis that the auditor plays a significant role in mitigating the cosmetic earnings manipulative behavior, and therefore, provides more empirical evidence to the ongoing debate about the auditor effectiveness in deterring earnings management.

The findings of our study have important implications to external auditors as well as the audit committees of the firms. In particular, if a rounded quarterly earnings number is observed, the auditor and the audit committee should be concerned about why such a number is reported. Does the management intend to manipulate the perception of the market participants regarding the value of the firm's stocks? Or does the management intend to use the rounded earnings number to affect the outcome of various contracts, e.g. debt covenants, or the incentive compensation plans? The answer to the latter question is particularly important since although the details of these contracts are not observable by the researchers, they are available to the auditor and the audit committee. If the auditor and the audit committee have determined that the rounded earnings number is not reflecting the true performance of the firm, they can then look for areas where management could have abused to attain the reported number. Furthermore, based on our observation that the auditing process helps mitigate cosmetic earnings management, the audit committee and the board of directors may need to consider additional audit services in the interim financial reporting periods when rounded earnings numbers are about to be released to the financial markets. While this work will increase the overall cost of audit, it may be worthwhile because the quality of earnings for the firm, and, therefore, the credibility of the firm's financial statements, will be improved in the process.

The rest of the paper is organized as follows. The next section describes the hypotheses and mathematical model of our study, followed by the section that presents the empirical results. The final section summarizes the study.

Background literature and hypotheses

Benford's Law and cosmetic earnings management

A number of studies examine the distribution of reported earnings and hypothesize that managers have incentives to round up reported earnings when the pre-rounded earnings are slightly below key cognitive reference points represented by $N \times 10^k$. Carslaw (1988) used Benford's Law[2] to document an anomaly in the distribution of income numbers appearing in the financial statements of New Zealand firms. These numbers reflected a bias towards earnings numbers in excess of key cognitive reference points of $N \times 10^k$. Carslaw's work provides evidence of rounding earnings upward when earnings are just below the reference points denoted by $N \times 10^k$. Thomas (1989) extended Carslaw's (1988) study by investigating the rounding of earnings phenomenon of the US firms. Thomas' results confirm that similar patterns are not peculiar to New Zealand firms. More recent studies found that such cosmetic earnings management behavior also exists in the UK (Van Caneghem, 2002), Japan (Skousen *et al.*, 2004) and many other countries (Kinnunen and Koskela, 2003).

Thomas (1989) proposed two general reasons why managers may choose to round earnings numbers. One reason relates to earnings numbers as key cognitive reference points in the eyes of financial statement users. The pricing phenomenon of "$1.99" in marketing suggests that consumers view a product priced at $1.99 to be significantly cheaper than a product priced at $2.00. This perceptual discontinuity is most likely caused by the biological constraint that human beings have only a limited amount of memory, which tends to store the most relevant bits of information about a price (Brenner and Brenner, 1982). Thus, in the eyes of a consumer, a price of $698 is more likely to be perceived to be "six hundred something" rather than "almost seven hundred." This is because the process of rounding up is more complex than that of rounding down (Carslaw, 1988). Similarly, earnings of $598,000 may be perceived by investors to be much lower than $600,000. Therefore, if lower perceived current earnings change the investors' expectation of the distribution of future earnings, which leads to lower share prices, managers have incentives to report rounded earnings numbers in the desire to change the behavior of the investors.

The use of contracts provides another reason why managers occasionally round earnings numbers. Owing to uncertainty related to managers' productive efforts, budgeting, lending, and compensation contracts tend to be based on *ex ante* estimates and rounded to rough figures that emphasize the first digit in the contractual number (Carslaw, 1988). Thus, small changes in such contractual parameters may have a large cash flow effect (Thomas, 1989).

As an empirical matter, prior studies hypothesized that if managers manipulate earnings so that earnings numbers achieve certain key reference points denoted by $N \times 10^k$, one would expect to observe an abnormal distribution of the digits in the second place of the reference points. In particular, there would be more zeros and fewer nines in the second place of positive earnings numbers[3]. While these studies documented pervasive evidence of such cosmetic earnings management in various countries, they invariably examined annual earnings numbers[4]. If managers' incentives to report

rounded earnings do not change dramatically over time, we should expect to observe the same patterns of cosmetic earnings management in quarterly earnings numbers. Therefore, our first hypothesis is stated as follows (in the alternative form):

H1. The occurrence of numbers in the second place of key reference points in quarterly income numbers does not conform to the expected distribution and there will be evidence of managerial efforts to round earnings numbers.

In order to test this hypothesis, we need to identify the expected proportions of each of the ten digits (zero to nine) in each place of earnings numbers under the null hypothesis. Unfortunately, the true distribution of the digits absent of managerial manipulation of reported earnings is not publicly observable (Thomas, 1989). Therefore, we need an approximation for this distribution. Benford's Law provides such an approximation (Carslaw, 1988).

Benford (1938) demonstrated that, contrary to our intuition, the expected distributions of naturally occurred numbers are skewed towards one for the first digit (or the left-most place; also note that zero cannot be in the first place) and zero for the second place. Table I shows the expected occurrences of each number in the first and second places.

Benford postulated that the expected proportions or occurrence of a number as the first digit in a number series can be approximated by the following relation:

$$\text{proportion } (a \text{ is the first digit}) = \text{Log}_{10}(a+1) - \text{Log}_{10}(a) \quad (1)$$

Further, the expected proportion of a given number a as the first digit and the number b as the second digit can be found in the following relation:

$$\text{Log}_{10}\left(a + \frac{b+1}{10}\right) - \text{Log}_{10}\left(a + \frac{b}{10}\right). \quad (2)$$

Using the above equations and summing over all possible a values for any b value gives an overall expected proportion for b as the second digit. This equation is as follows:

$$\text{proportion (b is the second digit)} = \sum\left(\text{Log}_{10}\left(a + \frac{b+1}{10}\right) - \text{Log}_{10}\left(a + \frac{b}{10}\right)\right). \quad (3)$$

Digit	First digit expected frequency percent	Second digit expected frequency percent
0	–	11.968
1	30.103	11.389
2	17.609	10.882
3	12.494	10.433
4	9.691	10.031
5	7.918	9.668
6	6.695	9.337
7	5.799	9.035
8	5.115	8.757
9	4.576	8.500

Source: Nigrini and Mittermaier (1997)

Table I.
Expected frequency occurrences for each digit in the first and second places

The expected proportion of the numbers in the third, fourth, fifth digit and so on can be similarly derived.

To test our null hypothesis of no managerial effort to round earnings, we compared the observed frequency for each number x in the second place of earnings numbers to the expected occurrences of the number as predicted by Benford's Law (equations (1) through (3)). To perform a significance test of the observed deviations from the expected proportions, we used a normally distributed Z-statistic:

$$Z = \frac{|p - p_0| - \frac{1}{2n}}{\sqrt{\frac{p_0(1-p_0)}{n}}} \tag{4}$$

where p and p_0 are the observed and expected proportions, respectively. The sample size is represented by n. The second term in the numerator is a correction term, and should be applied only when it is smaller than $|p-p_0|$ (Thomas, 1989). These Z-statistics would reject the null hypothesis at the 10, 5, and 1 percent level if their values exceed 1.64, 1.96, and 2.57, respectively.

Integral approach to quarterly financial reporting[5]

The integral approach to interim reporting was mandated in APB opinion No. 28 (APB, 1973), SFAS No. 3 (FASB, 1974) and FASB interpretation No. 18 (FASB, 1977). These standards require that each quarterly reporting period be viewed as an integral part of the annual reporting period. Under the integral approach to interim reporting, firms are required to estimate many annual operating expenses and then allocate these estimates to interim period based on forecasted annual figures, such as sales. As the fiscal year progresses, estimates are revised, and estimation errors from earlier quarters are incorporated in earnings as they are realized. Expenses that are commonly estimated during the first three fiscal quarters include cost of goods sold, income tax expense, and many operating expenses[6]. Several studies provided evidence suggesting that the time-series properties of quarterly earnings are influenced by interim reporting requirements (see Rangan and Sloan, 1998, for a summary of these studies).

The inherent nature of the integral approach to interim reporting, i.e. estimating many annual operating expenses and then allocating these estimates to interim periods, creates much opportunity for management to manipulate earnings. Schipper and Vincent (2003) maintain that earnings management was achieved primarily by managing working capital. Most of the items in operating expenses (e.g. cost of goods sold, and income tax expense) would affect working capital. By "estimating" these items, management could potentially achieve certain earnings targets, such as the cognitive reference points.

The ability to manage earnings under the integral approach to interim reporting, however, decreases as the fiscal year progresses. This is because with the realization of annual sales, the estimation of operating expenses in later quarters should be more accurate than in earlier quarters. This suggests that management has the most flexibility to manage earnings in the first quarter, and progressively less in the second, third and fourth quarter. Assume that management's incentives to engage in cosmetic earnings management do not fluctuate significantly across quarters. If the integral approach to interim reporting is adopted by a firm, the degree of cosmetic earnings

management would decrease progressively from the first quarter down to the fourth quarter. However, without auditing, the firm may decide to deviate from complying to the integral approval in the fourth quarter in order to continue to report earnings to achieve key reference points. The auditor's role would be to require the firm to comply with the integral approach in the fourth quarter and, as a result, the firm may not have as much room in the quarter to manage earnings as compared to the first three quarters. Therefore, a drastic decrease in the extent of cosmetic earnings manipulative behavior in the fourth quarter would be indicative of the effective role of auditing in mitigating such behavior. Thus, our second hypothesis is stated as follows:

H2. The degree of cosmetic earnings management in the fourth quarter is significantly lower than that in the first three quarters.

Empirical results

Data used in this study were obtained from Standard & Poor's *Research Insight* database. The analysis includes quarterly net incomes of both active and inactive listed US firms from 1993 to 2003. Since, firms reporting earnings with only one digit do not contain the second digit, these quarterly observations are excluded from the analysis. The final sample consists of 182,278 positive quarterly observations and 103,470 negative quarterly observations.

Test of H1

Our first hypothesis predicts that the occurrence of numbers in the second place of key reference points in quarterly income numbers does not conform to the expected distribution as prescribed by Benford's Law. In particular, there would be more zeros and fewer nines in the second place of positive earnings numbers, and fewer zeros and more nines in the second place of negative earnings numbers. Table II reports the results of the distribution of digits in the second place of positive earnings numbers. In panel A, the proportion of zeros as the second digit, expected to be 11.97 percent of the sample, is actually higher by 0.91 percent (Z-statistic $= 11.93$) for all observations in the sample. The results in panel A also indicate a systematic lack of nines as the second digit of earnings. The proportion of nines, expected to be 8.5 percent of the sample, is actually lower by 0.38 percent. This result supports our first hypothesis. Additionally, we also find that rounding is not limited to cases with nines in the second place. Firms occasionally round earnings even when the second digit is six, seven and eight. The negative deviation of six, seven and eight from the expected proportion of the sample is significant at less than 10 percent. Interestingly, the sum of the positive deviations of zero as the second digit (0.91) is almost totally offset by the negative deviations of six, seven, eight, and nine as the second digit ($-0.12 - 0.22 - 0.18 - 0.38 = -0.90$).

By examining the distribution of the second digits across fiscal quarters, we find similar patterns of more zeros and fewer nines in the second place across all quarters. This corroborates our first hypothesis that the rounding behavior to achieve key reference points occurs in all quarters. However, quarter one appears to have the strongest rounding behavior, with zero in the second place being 1.12 percent more frequent than expected and with nine being 0.54 percent less frequent than expected. There appears to be larger-step rounding in the first fiscal quarter too. In contrast, the fourth quarter appears to have the weakest rounding behavior. This provides intuitive support to our *H2* (which will be formally tested shortly).

Table II. Distribution of second and first digits in positive quarterly earnings

Digit	Total ($N = 182,278$) Expected distribution percent	Observed deviation percent	Z-stat	First quarter ($N = 47,163$) Observed deviation percent	Z-stat	Second quarter ($N = 46,978$) Observed deviation percent	Z-stat	Third quarter ($N = 45,932$) Observed deviation percent	Z-stat	Fourth quarter ($N = 42,205$) Observed deviation percent	Z-stat
Panel A. Frequency of second digits in positive quarterly earnings numbers											
0	11.97	0.91	11.93***	1.12	7.52***	0.98	6.53***	0.99	6.52***	0.50	3.14***
1	11.39	0.10	1.35	0.13	0.90	0.16	1.09	−0.06	0.41	0.17	1.12
2	10.88	0.11	1.41	0.06	0.42	0.07	0.46	0.12	0.81	0.18	1.14
3	10.43	−0.06	0.92	−0.09	0.62	0.05	0.31	−0.22	1.57	0.01	0.04
4	10.03	−0.15	2.16**	−0.16	1.14	0.06	0.40	−0.19	1.32	−0.34	2.32**
5	9.67	0.00	0.03	0.29	2.16**	−0.27	1.93*	−0.01	0.07	−0.02	0.10
6	9.34	−0.12	1.68*	−0.22	1.58	−0.20	1.49	−0.09	0.61	0.05	0.40
7	9.04	−0.22	3.23***	−0.29	2.18**	−0.39	2.91***	−0.10	0.72	−0.08	0.56
8	8.76	−0.18	2.69***	−0.33	2.52**	−0.17	1.26	−0.10	0.69	−0.12	0.85
9	8.50	−0.38	5.89***	−0.54	4.17***	−0.29	2.26**	−0.35	2.69***	−0.36	2.62***
Panel B. Frequency of first digits in positive quarterly earnings numbers											
1	30.10	0.39	3.61***	0.48	2.24**	0.43	2.00**	0.54	2.51**	0.09	0.40
2	17.61	0.15	1.70*	0.14	0.80	0.25	1.43	0.04	0.24	0.17	0.90
3	12.49	0.03	0.34	−0.04	0.31	0.14	0.88	0.06	0.34	−0.04	0.24
4	9.69	0.00	0.06	0.07	0.51	−0.12	0.86	0.05	0.35	−0.02	0.14
5	7.92	−0.02	0.25	−0.06	0.42	−0.07	0.57	−0.05	0.35	0.12	0.91
6	6.70	−0.01	0.11	−0.05	0.41	0.02	0.19	0.13	1.13	−0.15	1.19
7	5.80	−0.20	3.55***	−0.17	1.61	−0.13	1.14	−0.30	2.74***	−0.18	1.58
8	5.12	−0.14	2.62***	−0.12	1.08	−0.29	2.84***	−0.18	1.69*	0.05	0.48
9	4.58	−0.21	4.28***	−0.26	2.62***	−0.24	2.39**	−0.30	3.02***	−0.05	0.41

Notes: *, **, ***: significant at the 0.10, 0.05 and 0.01 level, respectively, (two-tailed test)

Panel B of Table II reports the results of the distribution of the first digits in positive quarterly earnings numbers. While they do not provide direct evidence to our hypotheses, the results do show some interesting patterns regarding which reference points managers most likely try to achieve. We found that numbers one and two are observed more often than expected for all observations, suggesting that firms are more likely to round to numbers with one and two as the first digit. Additionally, numbers seven, eight and nine are observed less frequently than expected. The lack of these numbers as the first digit suggests that firms are more likely to round when the first digit is any of these numbers than they are to round to a figure that has any of these numbers as the first digit. By breaking down the data in each fiscal quarter, we found that the distribution of first digits is similar in the first three quarters. In particular, there are more ones and fewer nines in the first place, suggesting that firms tend to round to achieve 1×10^n and avoid 9×10^n. However, none of the digits significantly deviates from the expected distributions in the fourth quarter.

Table III reports the results of the distribution of digits in the second place of negative earnings numbers. As predicted, we observed a reversal of the pattern of distribution of the second digit as compared to positive earnings numbers. In panel A, there are 0.40 percent more nines than expected (Z-statistic $= 4.56$) for all quarters. Consistent to Thomas (1989), this pattern suggests that firms tend to avoid round figures when reporting losses and prefer to report losses that are just below $-N \times 10^k$ in absolute magnitude. Also, while the lack of zeros in the second place is not significant at 10 percent or better, the evidence suggests that there could be larger effort to avoid reporting round numbers when the firm experienced losses. In particular, digit 1 in the second place is 0.19 percent less than expected (Z-statistic $= 1.93$). This suggests that firms with a true loss of, say, $-$\$5.12 million could also involve earnings manipulation and have reported a loss of $-$\$4.92. Overall, the evidence of negative earnings of all quarters supports *H1*.

Similar patterns of digit 9 in the second place of negative earnings were observed for the first three quarters. In the first quarter, there are 0.47 percent fewer nines in the second place than expected (Z-statistic $= 2.78$). The percentages of the lack of nines for the second and third quarters are 0.47 (Z-statistic $= 2.61$) and 0.64 (Z-statistic $= 3.58$), respectively. In the fourth quarter, however, none of the digits in the second place is significantly different from predictions. This also provides intuitive support of our second hypothesis.

Test of H2

Our second hypothesis predicts that if the auditor plays an important role in deterring cosmetic earnings management, the degree of such behavior would be less prominent in the fourth fiscal quarter (which is the only fiscal quarter that is audited) than any of the previous three quarters. Before proceeding to the empirical test, we should note that a comparison of number nine in the second place of positive earnings and number zero in the second place of negative earnings may not provide an appropriate test to the hypothesis. This is because, as shown in Table II for positive earnings, some firms engaged in rounding behavior even when the second digit is six, seven, or eight. Also, for negative earnings (Table III), some firms engaged in earnings manipulation to avoid report round losses even when the second digit is two. However, as long as management intends to achieve the key reference points, examining zero in the second place of positive earnings and nine in the second place of negative earnings will always

Table III. Distribution of second and first digits in negative quarterly earnings

Digit	Total ($N = 103,470$) Expected distribution percent	Total Observed deviation percent	Total Z-stat	First quarter ($N = 27,209$) Observed deviation percent	First quarter Z-stat	Second quarter ($N = 24,065$) Observed deviation percent	Second quarter Z-stat	Third quarter ($N = 24,612$) Observed deviation percent	Third quarter Z-stat	Fourth quarter ($N = 27,584$) Observed deviation percent	Fourth quarter Z-stat
Panel A. Frequency of second digits in negative quarterly earnings numbers											
0	11.97	−0.16	1.57	−0.28	1.42	−0.45	2.12**	0.03	0.14	−0.09	0.42
1	11.39	−0.19	1.93*	−0.20	1.04	−0.17	0.80	−0.20	0.99	−0.18	0.91
2	10.88	−0.03	0.35	−0.20	1.06	0.00	0.01	−0.04	0.20	0.13	0.65
3	10.43	−0.04	0.45	−0.14	0.74	−0.12	0.62	−0.09	0.44	0.18	0.94
4	10.03	0.04	0.41	−0.08	0.46	0.18	0.91	−0.04	0.20	0.12	0.67
5	9.67	−0.04	0.46	−0.11	0.60	0.22	1.15	−0.11	0.58	−0.14	0.74
6	9.34	−0.19	2.12**	−0.03	0.15	−0.51	2.69***	−0.17	0.87	−0.10	0.52
7	9.04	0.16	1.84*	0.41	2.35**	0.08	0.45	−0.13	0.67	0.26	1.50
8	8.76	0.06	0.73	0.16	0.94	0.28	1.55	0.10	0.57	−0.25	1.45
9	8.50	0.40	4.56***	0.47	2.78***	0.47	2.61***	0.64	3.58***	0.05	0.30
Panel B. Frequency of first digits in negative quarterly earnings numbers											
1	30.10	−0.26	1.84*	−0.54	1.96*	−0.18	0.62	−0.21	0.71	−0.05	0.19
2	17.61	0.03	0.23	−0.01	0.03	0.17	0.69	0.17	0.71	−0.17	0.74
3	12.49	0.20	1.88*	0.52	2.59***	0.08	0.33	0.02	0.07	0.16	0.77
4	9.69	0.00	0.01	0.14	0.79	−0.23	1.19	0.09	0.46	−0.01	0.05
5	7.92	0.12	1.45	0.15	0.90	0.13	0.76	−0.10	0.55	0.29	1.77*
6	6.70	0.06	0.88	−0.03	0.17	0.09	0.55	0.20	1.24	0.03	0.23
7	5.80	0.02	0.23	0.22	1.57	−0.09	0.55	0.05	0.33	−0.12	0.85
8	5.12	−0.11	1.50	−0.26	1.93*	−0.12	0.77	−0.05	0.30	0.01	0.10
9	4.58	−0.07	0.95	−0.20	1.53	0.14	1.03	−0.18	1.33	−0.14	1.09

Notes: *, **, ***: significant at the 0.10, 0.05 and 0.01 level, respectively, (two-tailed test)

capture such behavior. Therefore, our *H2* was tested by comparing the deviations of zero in the second place of positive earnings and nine in the second place of negative earnings for the fourth fiscal quarter to those in the other quarters. Table IV reports the results.

Panel A reports the deviations of number zero in the second place of positive earnings numbers. It reveals a progressively decreasing pattern across quarters. For example, the first quarter has a deviation of 1.12 percent and the fourth quarter 0.50 percent. This is consistent with the implication of the integral approach to interim reporting in that the ability of managers' earnings management decreases as the fiscal year progresses. However, the deviations of number zero in the second place of earnings numbers do not show significant differences among the first three fiscal quarters. For example, while the deviation of zero in the second place is 1.12 percent more than expected in the first quarter, the difference of the deviation between the first quarter and the second quarter ($1.12 - 0.98 = 0.14$) is not statistically significant ($z = 0.63$, pr $= 0.529$). Most importantly, there is a significant decrease in the magnitude of deviation in the fourth fiscal quarter. The difference of deviation of zero in the second place is 0.62 percent ($= 1.12 - 0.50$) between the first quarter and the fourth quarter, which is significant at pr $= 0.006$ ($z = 2.76$). The decreases of deviation of zero in the second place are significant at less than 5 percent for both from the second quarter to the fourth quarter ($z = 2.14$, pr $= 0.033$) and from the third quarter to the fourth quarter ($z = 2.17$, pr $= 0.030$). Thus, our empirical results using positive earnings strongly support *H2*, suggesting that the auditor does play an important role in mitigating the cosmetic earnings manipulative behavior.

	First quarter	Second quarter	Third quarter	Fourth quarter
Panel A. Deviations of zero in second place of positive earnings numbers				
	(1.12)	(0.98)	(0.99)	(0.50)
First quarter	–			
Second quarter	0.63	–		
Third quarter	0.58	0.04	–	
Fourth quarter	2.76	2.17	2.18	–
Panel B. Deviations of nine in second place of negative earnings numbers				
	(0.47)	(0.47)	(0.64)	(0.05)
First quarter	–			
Second quarter	0.02	–		
Third quarter	−0.66	−0.64	–	
Fourth quarter	1.75	1.70	2.39	–

Notes: Numbers in parenthesis are percentage deviations from expected distribution. Numbers in each cell represents the *Z*-statistic (normal distribution) of the difference in the deviation between the two corresponding fiscal quarters. Formula used to calculate this difference is:

$$Z = \frac{|p_i - p_j| - (1/2)(1/n_i + 1/n_j)}{\sqrt{\bar{p}\bar{q}(1/n_i + 1/n_j)}}$$

where $\bar{q} = 1 - \bar{p}$, $\bar{p} = n_i/(n_i + n_j)$, n_i is the total observations in quarter i, n_j is the total observations in quarter j, p_i = proportion of zero as the second digit in quarter i, and p_j = proportion of zero as the second digit in quarter j. The formula is adapted from Fleiss (1981)

Table IV.
Comparison of deviations of key digits in second place of earnings among fiscal quarters

The pattern of zero in the second place of positive earnings across quarters is almost exactly mimicked by that of nine in the second place of negative earnings. Panel B of Table IV reports the comparison of deviations of nine in the second place of negative earnings. Similar to panel A, the deviations do not show significant differences among the first three fiscal quarters. However, there is a significant decrease in the magnitude of deviation in the fourth fiscal quarter. This result lends further support of *H2*.

Summary and conclusions

In this study, we examined the distributions of digits in quarterly earnings numbers in the US publicly listed companies from 1993 to 2003. We predict that if firms engage in cosmetic earnings management to try to either influence the investors' perceptions of firm value and/or affect the contractual outcomes, the distribution of digits in the second place of earnings numbers would deviate from the expected distribution prescribed by Benford's Law. Our empirical results suggest that there are significantly more zeros and fewer nines in the second place of positive quarterly earnings numbers, and significantly more nines and fewer zeros in the second place of negative quarterly earnings. Our results suggest that firms did tend to engage in cosmetic earnings management in the interim reporting periods.

The integral approach to quarterly financial reporting provides firms with more opportunity to manage earnings in the earlier quarters during any fiscal year. Since, only the fourth fiscal quarter is audited, if the auditor was able to ensure that the firm complies to the requirements of the integral approach, the firm's ability to engage in cosmetic earnings management would be significantly diminished in the fourth fiscal quarter. Therefore, we expect that the degree of cosmetic earnings management in the fourth fiscal quarter is significantly lower than any of the previous three quarters. Our empirical results support this prediction.

Our study has a number of limitations. First, although we observed that firms tended to manage quarterly earnings to achieve certain key reference points, it is not clear whether such behavior is detrimental to investors. Further research may employ an experimental approach to examine whether market participants are indeed affected by the cosmetic earnings management in forming their expectations of the firms' future profitability. Second, we assume that the auditor's role in mitigating cosmetic earnings management is through requiring the firm to comply with the integral approach to interim financial reporting. However, the auditor may prevent managers from managing earnings from other perspectives. Future research could try to distinguish between the effect of auditor's requiring the firm to comply with the integral approach and that of other methods on preventing the cosmetic earnings management. Third, we only focused on the impact of auditing and the integral approach to interim reporting on cosmetic earnings management. Future studies can apply this analysis to a wider range of earnings management, e.g. beating analysts' earnings forecasts, or avoiding net losses, etc. Lastly, while we observe a significant decrease of cosmetic earnings management in the fourth quarter, we cannot completely attribute the decline to the auditing. The integral approach to interim reporting could also play some role. For example, when making the estimates, the financial report preparers are likely to use round estimates rather than precise estimates, i.e. in estimating a particular expense they might estimate the amount to be $200,000 rather than $206,439. In the fourth quarter the actual amounts are known so the actual amount will be used in preparing the financial statements rather than a round estimate. This would not be the same as cosmetic earnings management but could have the same effect.

Notes

1. Jackson and Pitman (2001) provide three definitions of earnings management. One definition is purposeful intervention in the external financial reporting process with the intent of obtaining some private gain. Another definition is an intentional structuring of reporting or production/investment decisions around the bottom line impact. A third definition is the use of judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the firm, or to influence contractual outcomes that depend on reported accounting judgments. Dechow *et al.* (1996) consider earnings management (management fraud) as earnings manipulation within (outside) the bounds of GAAP. For a review of literature on earnings management, refer to Schipper and Vincent (2003), and Healy and Wahlen (1999).
2. Formulated by Benford (1938), Benford's Law has recently been used to detect irregularities and tax evasions (Nigrini and Mittermaier, 1997; Nigrini, 1994, 1996). A mathematically rigorous proof of Benford's Law has unfortunately proven elusive. This is in part due to the fact that certain datasets, e.g. random numbers, do not follow Benford's Law (Leemis *et al.*, 2000).
3. Similar argument can be made for firms reporting losses. Thomas (1989) observes that firms tend to avoid round figures when reporting losses and prefer to report losses that are just below $-N \times 10^k$ (in absolute magnitude). As reported later, we found evidence supporting this prediction.
4. One exception is Thomas (1989), who used quarterly earnings before extraordinary items and discontinued operations. The fact that his quarterly results were not as significant as the annual results may be because earnings before extraordinary items and discontinued operations do not encompass all managerial effort to manipulate earnings. Recent studies found that managers also use extraordinary items and discontinued operations to manage earnings (Wells, 2002). Our study improves the Thomas (1989) analysis by examining the net income numbers, which captures the full impact of earnings manipulation.
5. Much of the discussion of the integral approach to interim financial reporting is based on Rangan and Sloan (1998).
6. Rangan and Sloan (1998) provide several examples of how the integral approach is applied in practice. For example, merchandise firms are permitted to use the gross profit method to estimate cost of goods sold for interim fiscal quarters. Under this method, an estimated gross profit margin is applied to reported quarterly sales to determine quarterly cost of goods sold in the first three quarters. At the year-end, physical inventory levels are counted and audited to determine annual cost of goods sold to prepare year-end financial statements.

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