

Empirical Evidence of the Rounding Phenomenon in Reported Pro Forma Earnings

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ABSTRACT

Pro forma earnings are earnings which often exclude non-recurring items and are defined by each individual firm rather than under the general accepted accounting principle (GAAP). They have received increasing focus recently and are perceived as a better measure of permanent earnings. However, managers may use the flexibility to opportunistically influence the market's perception of the company's recurring earnings. This study finds that managers deliberately round up the reported pro forma earnings and that the rounding manipulation of pro forma earnings is more severe than that of GAAP earnings.

JEL Classifications: G14, M40, M41

Keywords: pro forma earnings; rounding phenomenon; Benford's law; financial reporting quality

I. INTRODUCTION

Pro forma earnings are earnings which often exclude non-recurring items and are defined by each individual firm rather than under the general accepted accounting principle (GAAP). Pro forma earnings reporting is commonplace in the U.S. (Doyle et al., 2013; Bentley et al., 2016). Items such as nonrecurring gains and losses, depreciation and amortization expenses, write-downs, restructuring and merger costs, stock compensation expenses, and interest expenses are often excluded in pro forma earnings figures. Since many of these exclusions are likely to be transitory in nature, pro forma earnings can be viewed as a better measure of permanent earnings and have received increasing focus recently. Research studies found that pro forma earnings are more value relevant, informative, and better associated with stock prices than GAAP earnings (Bradshaw and Sloan, 2002; Bhattacharya et al., 2003; Brown and Sivakumar, 2003; Entwistle et al., 2010). However, exclusion of the non-recurring items is completely discretionary (Doyle et al., 2013) and managers may use the flexibility to opportunistically influence the market's perception of the firm's recurring earnings (Dechow and Schrand, 2004). Managers may have strong incentives to manipulate the reported pro forma earnings to influence investors' perceptions about the firm's future performance. This study investigates whether managers opportunistically round up the reported pro forma earnings and whether the rounding manipulation of pro forma earnings is more severe than that of GAAP earnings.

Previous literature documents that managers tend to round their reported earnings and revenues upwards to achieve key reference points represented by $N \times 10^k$ (Carlsaw, 1988; Thomas, 1989; He et al., 2013). Empirically, this phenomenon is demonstrated by an excess of zeros and a lack of nines as the second digit of reported earnings and revenues numbers. Researchers cite this phenomenon as evidence that managers engage in earnings management to mislead those who use their financial reports.

Current literature postulates two competing explanations for the rounding phenomenon. Brenner and Brenner (1982) suggest the valuation perspective supported by the arguments that human beings tend to store only the most relevant bits of information about a price due to their limited amount of memory. In the same way that consumers perceive a product priced at \$2.00 to be much higher than one priced at \$1.99, investors perceive reported earnings or revenues of \$2,000 to be much higher than that of \$1,990. Thus, managers may have incentives to round up the reported earnings and revenues in order to raise investors' perception of the firm's future performance. In addition, Carlsaw (1988) proposes the contracting perspective believing that lending and bonus contracts tend to be based on ex ante estimates and are rounded to rough figures that emphasize the first digit in the contractual number, which provides managers strong incentives to round up the reported earnings and revenues to meet the contractual numbers. Current studies on rounding phenomenon in earnings and revenues are not able to differentiate between these two perspectives since earnings and revenues are considered for both valuation and contracting purposes. Since pro forma earnings are often viewed as a valuation factor and seldom used in the contract approach, the findings on rounding manipulations of reported pro form earnings can add some insight to the discussions.

This study examines managers' incentives and rounding behaviors in the reported pro forma earnings and finds that U.S. public listed firms engage in rounding

manipulation in their reported pro forma earnings. Since loss firms may demonstrate different patterns of rounding², this study focuses on profit firms only.

This study also compares the magnitude of rounding manipulation of reported pro forma earnings with that of GAAP earnings of all the profit firms listed on U.S. stock exchanges and documents that rounding manipulations of the reported pro forma earnings is on average more severe than that of reported GAAP earnings.

To eliminate the possible explanation that sample firms reporting pro forma earnings generally tend to engage in more overall rounding manipulations than the rest of the listed firms, this study compares the rounding behaviors of sample firms on reported revenues with those of all other U.S. listed firms³. This study documents that, consistent with the previous studies, both sample firms and all other U.S. listed firms tend to round up their reported revenues. However, it provides no evidence that the sample firms engage in more severe rounding manipulations than other listed firms. The result supports the explanation of the findings that the rounding manipulation of the reported pro forma earnings is more severe than that of GAAP earnings.

This paper makes the following contributions to the literature: First, the study extends the existing literature on the rounding phenomenon on earnings and revenues. Unlike the discretionary accruals approach, another popular earnings management research method which relies on the accuracy of the estimate on the normal level of accruals, the rounding manipulation approach examines the distributions of each digit precisely and therefore provides direct evidence on earnings management. Second, the SEC has had persistent concerns regarding non-GAAP reporting over time and recently created a task force to identify misleading non-GAAP measures (Rapoport, 2013). This study documents firm managers' rounding behavior on reported pro forma earnings. The findings provide additional evidence for accounting standard setters and financial market regulators to improve reporting transparency while restricting firm managers' opportunistic behaviors. Third, existing studies are not able to determine whether the valuation perspective or contractual perspective have a greater influence on managers to engage in rounding. Because pro forma earnings are used only for valuation purpose rather than contracting purpose, the findings can help to distinguish between these two competing explanations for the rounding phenomenon. Finally, although the literature documents that earnings manipulation phenomenon exist in both reported GAAP earnings and pro forma earnings, this study provides the opportunity to compare the magnitudes of the manipulations between these two earnings.

The rest of the paper is organized as follows. The second section reviews the related literature and develops the hypotheses. The third section introduces the samples and methodologies. The fourth section discusses the empirical findings and the fifth section concludes the study.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The rounding phenomenon in reported earnings and revenues has been extensively examined across industries and around the world after the pioneering studies of Carslaw (1988) and Thomas (1989). Carslaw (1988) investigates the rounding phenomenon in reported earnings among New Zealand firms and documents the significant deviation of reported earnings numbers from expectations. Thomas (1989) analyzes reported earnings for U.S. firms and made similar conclusions. Das and Zhang (2003) extend Thomas

(1989) and document that managers exercise their discretion to round up earnings and that firms use their working capital accruals to round up earnings to meet the targets. Guan et al. (2008) investigate the pattern of rounding of reported earnings across U.S. industries and conclude that rounding manipulation occurs most frequently among high-tech firms and least among firms in regulated industries. He et al. (2013) examine the rounding phenomenon in reported revenues for U.S. firms and document that rounding manipulation is also prevalent in reported revenues. Kinnunen and Koskela (2003) investigate rounding behaviors in reported earnings on sample of 22,000 firms in 18 countries and document firms' tendency to conduct cosmetic earnings management worldwide.

This study extends the rounding phenomenon literature to pro forma earnings reporting. Pro forma earnings have received increasing focus recently. Bradshaw and Sloan (2002) find that stock returns are more highly associated with pro forma earnings than with GAAP earnings and that managers have increased their emphasis on pro forma earnings in their quarterly earnings announcements. Bhattacharya et al. (2003) also document that pro forma earnings are more informative and more permanent than GAAP earnings. Entwistle et al. (2010) find that pro forma earnings are more value-relevant than GAAP earnings. Whipple (2015) finds that managers exclude even those recurring non-GAAP adjustments (e.g. amortization expense) to create earnings metrics that are informative for investors to value firm performance. A recent study, Leung and Veenman (2016) document that pro forma earnings help investors understand the nature and implications of GAAP losses and are particularly informative in loss firms.

The freedom to report non-GAAP earnings capable of communicating their private information also provides opportunities for managers to employ such disclosure discretionally. Lougee and Marquardt (2002) find that firms with lower GAAP earnings quality and negative earnings surprises are more likely to release pro forma earnings information. Bhattacharya et al. (2004) document that pro forma announcements are often motivated by managers' desires to meet or beat analysts' forecast or to avoid earnings decreases. Doyle et al. (2013) also find evidence that firm managers opportunistically define pro forma earnings in order to meet or beat analyst expectations.

Market participants do not respond mechanically to the pro forma earnings disclosure (Young, 2014). Christensen et al. (2014) document that one group of sophisticated investors, short sellers, are particularly active in shorting stocks of firms that exclude recurring items in their reported pro forma earnings to gain profit, showing that short sellers can see through the pro forma window dressing to exploit ordinary investors' failure to understand the implications of recurring exclusions of pro forma earnings for future performance. However, the less wealthy and less sophisticated individual investors are the most at risk of being misled by manager reported pro forma earnings disclosure (Bhattacharya et al., 2007).

Since managers believe that pro forma earnings are one of the most important performance metrics disclosed to investors (Graham et al., 2005) and investors perceive pro forma earnings to be more informative than GAAP earnings, firm managers will have strong incentives to round up their reported pro forma earnings if the numbers achieving the key reference point represented by $N \times 10^k$ can be valued by ordinary investors as significantly higher. This leads to the first hypothesis of the study:

H1: Managers tend to round up the reported pro forma earnings to achieve key reference points.

Pro forma earnings exclude some non-recurring items and are therefore perceived as more permanent than GAAP earnings. Existing literature documents that pro forma earnings are more value-relevant than GAAP earnings and market participants view pro forma earnings to be more representative of core earnings than GAAP earnings (Bhattacharya et al., 2003). To influence investors' perceptions about the firms' future performance, managers may have more incentives to manipulate pro forma earnings than GAAP earnings.

In addition, unlike net income, which is defined by GAAP, pro forma earnings are defined by each individual firm. There is no generally accepted guideline to follow when firms report their pro forma earnings. This flexibility in reporting incentivizes managers to deliberately report their pro forma earnings. Therefore, the second hypothesis is:

H2: The rounding manipulation of pro forma earnings is more severe than that of GAAP earnings.

III. SAMPLES AND RESEARCH METHODOLOGY

The initial sample is obtained from the LexisNexis Academic database, specifically from PR Newswire for the years of 2000 through 2015. The search term is "Pro forma or Proforma or Proforma and quarter". Most of the firms announce both pro forma net income and pro forma earnings per share. Firms only reporting pro forma earnings per share are excluded from the sample. To be qualified for the final sample, firms need to be listed on the U.S. stock exchanges and have available quarterly net income and revenue information on CAMPUSSTAT. The total number of qualified sample observations is 3,405. Furthermore, as previously explained, negative pro forma earnings firms may try to avoid to round up their earnings which is different from positive reporters. This study focuses on profit firms and excludes those samples reporting negative pro forma earnings. The final sample consists of 2,273 firm-quarter observations.

Table 1 describes the sample size by industry. Consistent with previous literature (Bhattacharya et al. 2004), business services and electronic equipment are the two industries with the most observations.

Table 1
Sample size by industry classification

Industry	Number of observations
Mining	68
Construction	14
Foods	49
Chemicals and Allied Products	134
Machinery and Computer Equipment	138
Electronic (except computer) Equipment	340
Other Manufacturing	305
Transportation & Communications	162
Wholesale	29
Retail	97
Finance, Insurance, and Real Estate	209
Business Services	508
Other Services	205
Others	15
Total	2,273

This study adopts Benford’s law to generate the expected frequency of each number in the second position of a multi-digit number. The law predicts that the expected distribution of naturally occurring numbers is skewed toward the number zero in the second position. Benford (1938) postulates that the expected frequencies of a number as the first digit in a number series can be estimated as the followings:

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

The occurrence of a given number a as the first digit and the number b as the second digit are approximated by the following relationship:

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

To sum over all possible a values for any b value based on the above equations produces an overall expected frequency for b as the second digit.

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

Table 2 presents the expected proportions for each digit in the second place of a naturally occurring number. If managers manipulate their pro forma earnings by altering the financial numbers, significant deviations from the expected proportions in the second position would be expected.

Table 2
Expected frequency percentage for each digit in the second places of a naturally occurring number

Digit	0	1	2	3	4	5	6	7	8	9
Second Digit Expected Frequency Percentage	11.97	11.39	10.88	10.43	10.03	9.67	9.34	9.04	8.76	8.5

Source: Nigrini and Mittermaier (1997).

To test the null hypothesis of no managerial effort to round pro forma earnings, the study compares the observed frequency for each number x in the second place of pro forma earnings numbers to the expected proportions 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 occurrences, the study uses 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 p₀ are the observed and expected frequencies respectively and n is the sample size. The second term in the numerator, as a correction term, should be applied only when it is smaller than |p – p₀| (Thomas, 1989). The null hypothesis would be rejected at the ten, five, and one percent level if the Z-statistics exceeds 1.64, 1.96, and 2.57, respectively.

The study adopts Fleiss (1981, p. 23) to calculate the Z-statistic of the difference in the deviation between two variables, such as pro forma earnings and GAAP earnings. The formula used to calculate the difference is:

$$Z = \frac{|p_i - p_j| - \frac{1}{2}(\frac{1}{n_i} + \frac{1}{n_j})}{\sqrt{pq(\frac{1}{n_i} + \frac{1}{n_j})}} \quad (5)$$

where $q=1-p$, $p = n_i/(n_i+n_j)$, n_i is the total number of the observations of variable i , n_j is the total number of the observations of variable j ; p_i is the proportion of zero as the second digit of variable i , and p_j is the proportion of zero as the second digit of variable j .

IV. EMPIRICAL RESULTS

The first part of Table 3 presents the distributions of second digits in reported pro forma earnings of the sample observations. Fifteen percent of the sample observations report zero as the second digit compared to the expected frequency of 11.97 percent. The 3.03 percent frequency deviation is statistically significant at the 0.01 level. The results show that firms reporting pro forma earnings have a lower frequency of 8 and 9 as the second digit and have significantly more zeros. Existing earnings management literature document that managers have strong incentives to manipulate earnings and revenues upward to issue securities at higher prices, to meet expectations of analysts or investors, to profit from insider trading, and/or to fulfill the contractual requirements, such as to increase the size of stock-based compensations (Dechow and Schrand, 2004). However, a few studies also provide evidence that managers sometimes manipulate their earnings and revenues downward to smooth the reported earnings and revenues. Fewer ones, twos, threes, and/or fours would be expected if rounding downward was prominent in reported pro forma earnings. Table 3 presents that the frequency distributions of second digits as two and three are less than the expected distributions, however, the deviations are not statistically significant. In addition, the total frequency deviations of second digits as one, two, three, and four are much less than the total deviations as five, six, seven, eight and nine, showing that almost all of the frequency deviation of the second digit as zero can be explained by rounding up from five, six, seven, eight, and nine. Therefore, the findings support the first hypothesis that managers tend to round up their reported pro forma earnings to achieve the key reference points.

Before comparing rounding manipulation of the reported pro forma earnings with that of GAAP earnings, the study first replicates previous studies on rounding manipulations in reported earnings of all U.S. listed profit firms from 2000 to 2015 and find consistent results reported in Table 3. Zero is reported in 12.84 percent of all of the firm observations in the second digit of GAAP quarterly earnings reported in COMPUSTAT and the deviation from the expected frequency is statistically significant.

The differences in the deviations between pro forma earnings of the sample observations and GAAP earnings of all U.S. listed firms are also reported in Table 3. The deviation in frequency of zeros in the reported pro forma earnings of sample observations is significantly greater than the deviation in GAAP earnings of all U.S. listed profit firms at the 0.01 level ($z = 3.04$). The findings support the second hypothesis that rounding manipulation of the reported pro forma earnings is more severe than that of GAAP earnings.

Table 3
Distributions of second digits in pro forma earnings and market GAAP earnings for profit firms

	0	1	2	3	4	5	6	7	8	9
Pro forma earnings	15.00	12.32	9.99	9.55	10.16	8.80	9.11	9.41	7.52	8.14
Deviation	3.03	0.93	-0.89	-0.88	0.13	-0.87	-0.23	0.37	-1.24	-0.36
Z statistics	4.42***	1.36	1.33	1.34	0.18	1.37	0.35	0.59	2.05**	0.58
GAAP earnings	12.84	11.40	10.90	10.40	9.92	9.57	9.20	8.91	8.57	8.29
Deviation	0.87	0.01	0.02	-0.03	-0.11	-0.10	-0.14	-0.13	-0.19	-0.21
Z statistics	14.71***	0.19	0.37	0.46	1.93*	1.90*	2.69***	2.44**	3.78***	4.20***
Pro forma vs GAAP										
Difference	2.16	0.92	-0.91	-0.86	0.24	-0.77	-0.09	0.50	-1.04	-0.15
Z statistics	3.04***	1.34	1.36	1.30	0.34	1.21	0.11	0.80	1.73*	0.22

Notes: Table 3 presents the distributions of second digits in reported pro forma earnings and market GAAP earnings, as well as their differences. *, **, and *** indicate significance at the 10, 5, and 1 percent levels respectively.

There is concern that the significantly greater deviation in frequency of zeros in the second digit in reported pro forma earnings may be due to those reporters being firms which already tend to engage in manipulative rounding in general, not just for their pro forma earnings. To eliminate this possibility, it is better to compare the frequency of pro forma earnings of sample firm observations with same firm observations' GAAP earnings. However, among the sample observations, about 30% report negative GAAP earnings, which have different rounding behaviors than the positive ones. To solve this issue, this study compares the revenues of the sample firms with the revenues of all U.S. listed firms. Table 4 reports the results.

Table 4
Distributions of second digits in revenue of sample firms and market revenue

	0	1	2	3	4	5	6	7	8	9
Revenue of sample firms	13.24	10.87	9.37	11.00	10.16	10.21	8.62	9.50	8.05	8.97
Deviation	1.27	-0.52	-1.51	0.57	0.13	0.54	-0.72	0.46	-0.71	0.47
Z statistics	1.84*	0.75	2.28**	0.85	0.18	0.83	1.14	0.73	1.16	0.77
Market revenue	12.90	11.35	10.74	10.39	9.99	9.68	9.30	8.91	8.51	8.24
Deviation	0.93	-0.04	-0.14	-0.04	-0.04	0.01	-0.04	-0.13	-0.25	-0.26
Z statistics	18.69***	0.91	3.01***	0.95	0.78	0.11	1.00	2.94**	5.64***	6.02***
Sample firms vs Market										
Difference	0.34	-0.48	-1.36	0.61	0.17	0.53	-0.67	0.59	-0.46	0.73
Z statistics	0.45	0.68	2.06**	0.92	0.23	0.82	1.06	0.95	0.75	1.23

Notes: Table 4 presents the distributions of second digits in sample firm revenues and market revenues, as well as their differences. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Zero is reported in 13.24 percent of GAAP revenues of the sample observations and in 12.90 percent of GAAP revenues of all U.S. listed firms. Both deviations from the expected frequency are statistically significant. However, the difference in the deviations of 13.24 percent and 12.90 percent is not statistically significant ($z = 0.45$). The results indicate that the sample firms do not have a statistically greater tendency to manipulate the rounding of their earnings numbers. The significantly greater deviations in frequency of zeros in reported pro forma earnings of the sample observations than in GAAP earnings of U.S. listed firms suggest that rounding manipulation of the reported pro forma earnings is more severe than that of GAAP earnings.

V. CONCLUSIONS

The flexibility for firms to define their pro forma earnings allows managers to deliberately manipulate their reported pro forma earnings numbers. Existing studies document that rounding manipulations are common in reported earnings and revenues. This study extends the literature to the reported pro forma earnings and finds evidence that managers tend to round up their reported pro forma earnings. The study also documents that rounding manipulation of the reported pro forma earnings is more severe than those in GAAP earnings.

Rounding manipulations in reported pro forma earnings decrease the earnings quality. The manipulations may mislead some stakeholders about firms' current period financial performance and their intrinsic value. Some researchers argue that the pro forma earnings are better than GAAP earnings in that the former can be used to better predict the firms' future performance. However, the relatively more severe rounding manipulations in reported pro forma earnings found in this study may hurt the ability to predict accurately.

The findings have important implications to the investors. The study provides evidence that about 20% of those firms reporting pro forma earnings with zero in the second digit probably engage in rounding manipulations, compared to only less than 7% of those reporting GAAP earnings. Even though pro forma earnings are perceived as a better measure of permanent earnings, investors should be aware of this rounding manipulation phenomenon and make their investment decisions cautiously.

The study is limited in that the findings can only lead the conclusions from a macro perspective. Among those firms with zero-second-digit earnings, it is unknown which of those naturally fall on zero and which of those are manipulated to zero. Further studies are needed using firm-specific earnings manipulation measurements and testing under what specific circumstances firms tend to manipulate their pro forma earnings.

ENDNOTES

1. N is a positive integer from one to nine and k is an integer.
2. Since investors may view earnings of -2,000 as greater loss than -1,990, unlike the positive pro forma earnings, managers may try to avoid rounding up their negative reported pro forma earnings.
3. About 30% of positive pro forma earnings reporters are loss firms, which demonstrate different rounding behaviors than profit firms. Therefore, the study cannot compare the reported pro forma earnings of sample firms with their own reported GAAP earnings directly.

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