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Window Dressing in Reported Earnings

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Can seemingly small rounding manipulations influence financial statement users' perception of credit quality?

From an accounting perspective, the term "window dressing" refers to a wide range of techniques that an audit client might use to enhance the financial position of an entity through manipulated disclosures. For the purposes of this article, the term will be more strictly defined. Window dressing, as used in this article, refers to the reporting practices adopted by some firms to intentionally distort earnings and the statement of position by changing the way the financial figures are *perceived* by stakeholders. This occurs when a stakeholder is presented with a manipulated earnings figure that is marginally greater than the actual value. For example, if a firm's income for the year is $5.99 million, management may fraudulently increase the reported earnings figure to one that is slightly above $6.0 million. Because of the way the human brain processes how numbers are perceived, this practice has a strong tendency to manipulate stakeholders' perceptions concerning the profitability of a firm. Stakeholders may perceive a more favorable financial position than is warranted under the circumstances. While the fraudulent alteration of the reported amounts can be relatively immaterial, the impact on users' perceptions can be substantial. As found by the authors, such rounding behavior is a common practice in companies both in the United States and around the world.[1]

The research to date on the subject suggests two primary economic incentives for firms to engage in this type of manipulative behavior. One incentive relates to perceptions of earnings figures as key cognitive reference points in the eyes of financial statement users. For example, general sales practice holds that pricing a product at $1.99 encourages consumers to view a product at this price to be significantly cheaper than one marked, say, $2.00. Science theorizes that this perceptual discontinuity is most likely caused by the way the human brain perceives numeric data. In essence, the brain tends to store what it perceives to be the most relevant bits of information about a number (or the price of a product as in the previous illustration). In the eyes of a consumer, a price of $698 is more likely to be perceived to be "six hundred and something" rather than "almost seven hundred." This is because the process of rounding up is a more complex process for the human brain than that of rounding down.[2] Extrapolating this concept to

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the financial markets can help explain the incentive management might have in manipulating the reported earnings of a firm. From a financial statement perspective, earnings of $598,000 may be perceived by investors to be much lower than $600,000. There would be a distinct tendency for stakeholders to view the earnings as "five hundred and some thousand" rather than "nearly six hundred thousand." Knowing that marginally modified earnings figures could change an investor's perception of a firm's future earnings, it would be in management's best interest to round up financial totals whenever possible to positively influence the behavior of stakeholders.

A second incentive for management to round up various financial figures relates to the use of contracts. Contracts dealing with lending agreements, compensation contracts related to budgets, *etc.*, normally tend to be created using *ex ante* estimates. In practice, these contracts tend to be based on rough figures that emphasize the *first* digit in the contractual figure. Because of this, small changes in the contractual parameters may have large cash flow effects.[3] Ironically, this practice has come to be known as "earnings management."

The process of rounding up reported financial figures for a company normally won't be challenged by the firm's external auditors because it is likely to be viewed as "immaterial."[4] However, such practice obviously impairs the quality of reporting for the company's financial statements. This impairment is evidenced by comments by Arthur Levitt, former Chairman of the Securities and Exchange Commission (SEC). In a speech delivered at New York University, he warned that earnings management by corporate America was significantly eroding the quality of the financial reporting process.

The incentive to report rounded earnings to meet the requirements of debt covenants is a particularly important issue in the lending industry. Lenders, by necessity, are concerned not only with a borrower's operating and financial risks but also with the representational faithfulness of the borrower's financial statements. The prevalence of earnings manipulation creates a significant risk burden on the lending industry. In addition, this incentive to marginally increase financial totals to meet contractual agreements may not be homogeneous for firms in different industries. Therefore, in forming day-to-day lending decisions, lenders would also be interested in evidence of the extent of earnings manipulation across industry groups.

The purpose of this article is to use digital analysis based on Benford's Law to investigate and compare the extent of window dressing (that is, reporting rounded earnings) among U.S. firms in a number of specified industries. The existence of these practices within the various firm categories and their homogeneity across these industries are also addressed.

Benford's Law and Digital Analysis

Benford demonstrated that the expected distributions of naturally occurring numbers are skewed toward the number one for the leading digit in a multidigit number and toward the number zero in the second position of a number.[5] This law, also known as the first-digit law, maintains that for many diverse types of numerically based data, the number one occurs more than 30 percent of the time as the first digit in a multidigit number. Ancillary to this axiom is that the larger the digit is, the less chance it has of being in the first position. For example, as can been seen from Exhibit 1, the number nine has the *least* chance of being the first digit in a discrete number stream. Intuitively,

Exhibit 1. Expected Frequency Occurrences for Each Digit in the First and Second Places

Digit	First Digit Expected Frequency Percentage	Second Digit Expected Frequency Percentage
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)

one would guess that all numbers would have an equal chance of being the first number, that is, each would have an 11.1-percent chance of being in that position. As unintuitive as it may seem though, per Benford's Law, the real probability of a first digit being either a one, two or a three is more than 60 percent. Exhibit 1 shows the expected occurrences of each digit in the first and second places.

Benford's Law applies to many different types of data that describe the relative sizes of similar phenomena, such as market values, earnings or daily trading volumes of New York Stock Exchange (NYSE) firms. As long as there are no externally imposed constraints, such as arbitrarily imposed maximum and/or minimum values (as would be the case for union-based minimum hourly rates, for example), Benford's Law will hold true. For example, one would expect a higher number of ones as the first digit than the numbers two, three, four and so on in the population of any given city over time.

Benford's Law also provides the basis for digital analysis of a sequence of numbers of similar nature. For example, such analysis has been used in a wide variety of ways to identify instances of employee theft and tax evasion.[6] In addition, software that incorporates digital analysis based on Benford's Law has been adopted by many large international audit firms. And, as discussed above, it has proved helpful in identifying instances of window dressing among various firms in the United States and other countries.

Data and Methodology

The Standard & Poor's *Research Insight* database was used to supply the primary data used in this study. The analysis included the annual net incomes of both active and inactive firms listed on the NYSE, American Stock Exchange (ASE) and NASDAQ for 1950 through 2005. The final sample consisted of 194,720 positive earnings observations.

Exhibit 2. Distributions of the Second Digits of Positive Annual Earnings by Industry Groups

	Second Digit									
Industry Group	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Energy	2.47 ***	-0.08	0.20	-0.09	-0.52	0.18	-0.76 **	-0.30	-0.23	-0.88 ***
(n = 7,899)	*6.76*	*0.22*	*0.54*	*0.24*	*1.53*	*0.53*	*2.28*	*0.91*	*0.69*	*2.78*
Construction	2.22 ***	0.09	-0.78 **	-0.05	-0.11	0.77 **	-0.30	-0.40	-0.39	-1.06 ***
(n = 8,378)	*6.25*	*0.25*	*2.29*	*0.13*	*0.32*	*2.39*	*0.93*	*1.24*	*1.24*	*3.47*
Capital goods	2.02 ***	-0.02	-0.31 **	-0.13	-0.18	-0.04	-0.03	-0.21	-0.16	-0.94 ***
(n = 39,308)	*12.36*	*0.12*	*1.98*	*0.83*	*1.18*	*0.27*	*0.20*	*1.42*	*1.10*	*6.70*
Transportation	1.73 ***	-0.20	0.00	0.15	-0.74 **	-0.45	0.18	0.11	-0.30	-0.50
(n = 7,549)	*4.61*	*0.52*	*0.00*	*0.41*	*2.14*	*1.30*	*0.54*	*0.34*	*0.88*	*1.53*
Finance	1.65 ***	0.24	0.17	0.02	-0.27	-0.13	-0.27	-0.32 *	-0.35 **	-0.75 ***
(n = 30,833)	*8.92*	*1.33*	*0.92*	*0.09*	*1.56*	*0.74*	*1.61*	*1.91*	*2.17*	*4.68*
Consumer goods	1.57 ***	-0.03	0.10	-0.14	-0.23 **	-0.03	-0.11	-0.09	-0.24 **	-0.81 ***
(n = 71,930)	*12.96*	*0.23*	*0.82*	*1.21*	*2.05*	*0.26*	*0.96*	*0.81*	*2.27*	*7.75*
Basic Industries	1.52 ***	-0.06	-0.33	0.27	-0.15	0.04	0.29	-0.40	-0.11	-1.09 ***
(n = 12,334)	*5.20*	*0.20*	*1.18*	*0.96*	*0.53*	*0.15*	*1.11*	*1.50*	*0.40*	*4.32*
Utilities	0.68 ***	0.27	-0.01	-0.38	0.29	0.13	-0.30	-0.16	-0.31	-0.23
(n = 16,489)	*2.69*	*1.09*	*0.02*	*1.60*	*1.23*	*0.56*	*1.31*	*0.66*	*1.36*	*1.06*
Expected proportion (%)	11.97	11.39	10.88	10.43	10.03	9.67	9.34	9.04	8.76	8.50

Note: The first number in each cell of industry groups represents the percentage deviation from expected proportion. For example, for firms in the energy industry, the expected proportion for zero in the second digit was 11.97 percent. The actual proportion was 11.97 + 2.47 = 14.44 percent. The second number reports the Z-statistic (in italics). The expected proportion in percentage of each number (0–9) in the second place of the earnings is reported in the last row.

*, ** and *** are statistically significant at 0.10, 0.05 and 0.01 level, respectively.

Benford's Law helps to predict the normal level of number duplication in a particular set of data. In other words, this makes it possible to identify numbers that don't "fit" the norm that is expected. By definition, this would include fraudulently generated numbers by managers wishing to alter the actual earnings figures to their own advantage. Statistically speaking, if managers manipulate earnings by altering the financial numbers, then one would expect to observe an abnormal occurrence of certain numbers in the second position for these disclosed figures. More specifically, there would be more zeros and fewer nines in the second digit position than predicted by Benford's Law.

To test the significance of an abnormal distribution, a comparison was made of each number in the second place of disclosed financial figures to the expected occurrences of those numbers as projected by Benford's Law. A normally distributed Z-statistic was used to perform a significance test of the observed deviations from the expected proportions.

Results

Earnings numbers for firms in eight industries were analyzed to try to discover any evidence of window dressing. The industry classification was based on one used by the Center for Research in Security Prices (CRSP) at the University of Chicago.[7]

Exhibit 2 presents the distributions of the second digits for these individual industry groups. The results are presented in descending order based on the magnitude of deviation of zeros as the second digit. The first number in each cell of the industry groups represents the percentage deviation from the expected proportion. The second number (in italics) reports the Z-statistic of the deviation, or Z-score.

As expected, there were systematically more zeros in the second place of reported earnings across all industries. This is substantiated by the highly significant Z-statistics generated for these values. A highly significant Z-statistic would indicate that the relationship being tested would have been very unlikely to have occurred by chance alone. The study also found that, except for the transportation and utilities classification, there were systematically fewer nines in the second place of the reported earnings figures across industries. This finding suggests that the practice of rounding final figures on financial statements is a fairly common practice among firms in all industries. It could be argued that the rounding activity is occurring because it is a practical, common practice for most industries when they present their final earnings figures in the financial statements. However, to the extent that the practice of window dressing may impair

Exhibit 3. Differences in the Observed Proportion of Zero as the Second Digit Among Industries

Industry Groups	Energy	Construction	Capital Goods	Transportation	Finance	Consumer Goods	Basic Industries	Utilities
Energy	—							
Construction	0.25	—						
Capital goods	0.45	0.20	—					
Transportation	0.74	0.49	0.29	—				
Finance	0.82*	0.57	0.37	0.08	—			
Consumer goods	0.90**	0.65*	0.45*	0.16	0.08	—		
Basic industries	0.95*	0.70	0.50	0.21	0.13	0.05	—	
Utilities	1.79***	1.54***	1.34***	1.05**	0.97***	0.89***	0.84**	—

Note: The numerical values in the cells of this exhibit are derived from Exhibit 2. Each cell holds the difference in observed percentage of zero as the second digit between the industry in column and the industry in row. For example, the Energy/Utilities cell value, 1.79, is the difference between the deviation of zero for firms in the energy industry (2.47 percent) and the deviation of zero for firms in the utilities industry (0.68). It suggests that energy firms engaged more often in window dressing than utilities firms.

Z-statistic (normal distribution) is used to test the difference in the observed percentage of zero as the second digit between any two industries.

*, ** and *** are statistically significant at 0.10, 0.05 and 0.01 level, respectively.

the quality of earnings numbers, lenders should be concerned with the rationale for such practices on the part of management. This practice could also be attributable to management's incentive to either change investor expectation of the firm's future prospects or to meet the requirements of various debt covenants.

The tabulated data in Exhibit 2 also show that the magnitude of window dressing is not homogeneous, or equally balanced, across industries. Finding an eight or a seven in the second digit is contrary to what Benford's Law would hold. If this occurs, it may be an indication that earnings have been manipulated in some way, that is, window dressing may be present. Likewise, if the data follows the pattern outlined by the law, then there should be a higher proportion of earnings figures that do not have higher numerical values in the second position. For example, in this study, firms in the finance and the consumer goods industries had a lack of eights in the second place of earnings. This would indicate that for those industries, the normal distribution, or ordering, of the digits in the number corresponded to what was *expected* to be found. The "pattern" of the individual numbers "fits" with what Benford's Law would predict.

There were systematically more zeros in the second place of reported earnings across all industries.

To empirically test for this possibility, the deviation of zeros in the second place of earnings was used to examine the degree of window dressing *across* industries. The resultant analysis indicates that firms in the energy industry have engaged in the practice of window dressing more often than any other industry category. The study also shows that firms in the utilities industry appear to engage least often in window dressing. The rest of the industry classifications—construction, capital goods, transportation, finance, consumer goods and basic industries—generated results that fell between these two extremes.

Because this is an empirical study, the statistical significance of the results must also be assessed. In essence, this means that for each value generated by the analysis, the research has to determine if the result is a reflection of mere chance or the finding actually represents the true underlying relationship in the overall data. To examine the statistical significance of the degree of difference in window dressing among industries, an analysis was performed to address the percentage deviation of zeros as the second digit of earnings between industries. Exhibit 3 presents these differences and builds on the results displayed in Exhibit 2. The analysis shows that firms in the energy industry have engaged in more pervasive window dressing than those in finance, consumer goods, basic industries or utilities. Firms in the construction and capital goods industries also show a higher level of window dressing than those in consumer goods and utilities. The results show that firms in each of the other industry categories tend to have engaged in substantially more window dressing than those companies in the utilities industry category. Finally, the analysis indicates that the utilities industry category reflects the lowest instance of window dressing. From a risk perspective then, if the quality of earnings is a factor affecting the lending decisions, the risk of firms in the energy industry appears to be the highest while the risk in utilities firms is the lowest.

Summary

Firms have a tendency to window-dress their financial statements by rounding up their reported earnings in a way that, while often immaterial in dollar amount, could significantly affect the decision-making processes of stakeholders. This practice of reporting rounded earnings figures is perpetuated for a number of reasons, including the following:

- Firms may believe that investors and creditors are more likely to perceive earnings figures as being significantly less than numbers that can be "managed" by an organization through a rounding-up process (that is, $1.99 million rounded up to a value of $2.0 million, which is perceived as significantly higher).
- Contracts between firms and stakeholders are likely to express earnings in round numbers.

Using digital analysis based on Benford's Law, this study investigated the rounding behavior among

firms in various industries. The findings of the study suggest that while the rounding behavior is observed in all industries, the pervasiveness of such behavior is not homogenous across industries, that is, the extent of this behavior varies depending on the industry classification. The rounding behavior tends to occur most often among firms in the energy industry and least often among firms in the utilities industry. Such findings have important implications for the lending decisions made by commercial banks that traditionally have concerns about the quality of the borrower's financial statements. With regard to lending risks based on the accuracy of the financials submitted to lenders, this study indicates that utilities firms tend to have the lowest risk and the energy firms tend to have the highest.

This study did not examine which earnings components are most likely to be manipulated or the general means employed by management to achieve the target reported earnings. This would be important data for lenders involved in debt covenants with firms in these industries. If management "successfully" achieves the earnings benchmarks, lenders should look into the most likely manipulated accounts for evidence of whether management has been involved in fraudulent reporting practices. Although there is little empirical evidence that window dressing is a harmful practice, future research may focus on the means used by management to round earnings numbers and the effect of such behavior on the decision making of financial statements users.

Endnotes

[1] C. Carslaw, *Anomalies in Income Numbers: Evidence of Goal Oriented Behavior,* 63 Accounting Rev. 2 (1988), at 321–27; J. Kinnunen and M. Koskela, *Who Is Miss World in Cosmetic Earnings Management? A Cross-national Comparison of Small Upward Rounding of Net Income Numbers among Eighteen Countries,* J. Int'l Accounting Research 2 (2003), at 39–68; C. Skousen, L. Guan and T. Wetzel, *Anomalies and Unusual Patterns in Reported Earnings: Japanese Managers Round Earnings,* 15 J. Int'l Fin'l Management & Accounting 3 (2004), at 212–34; J. Thomas, *Unusual Patterns in Reported Earnings,* 64 *The Accounting Review* 4 (1989), at 773–87.

[2] G. Brenner and R. Brenner, *Memory and Markets, or Why Are You Paying $2.99 for a Widget*, J. Business, Jan. 1982, at 147–58.

[3] J. Thomas, *supra* note 2.

[4] In practice, auditors typically use a materiality threshold between three percent and five percent of net income and use audit procedures designed to catch errors or misstatements that are greater than the threshold.

[5] F. Benford, *The Law of Anomalous Numbers,* Proceedings of the American Philosophical Society, Mar. 1938, at 551–72.

[6] M. Nigrini, *Using Digital Frequencies to Detect Fraud,* The White Paper, Apr. 1994, at 3–6; M. Nigrini, *A Taxpayer Compliance Application of Benford's Law,* J. American Tax'n Ass'n 18 (Spring 1996, at 72–91.

[7] The Standard Industry Code (SIC) used for the classification is as follows: *Basic Industries:* 1000–1299, 1400–1499, 2600–2699, 2800–2829, 2870–2899, 3300–3399; *Capital Goods:* 3400–3419, 3440–3599, 3670–3699, 3800–3849, 5080–5089, 5100–5129, 7300–7399; *Construction:* 1500–1999, 2400–2499, 3220–3299, 3430–3439, 5260–5219; *Consumer Goods:* 0000–0999, 2000–2399, 2500–2599, 2700–2799, 2830–2869, 3000–3219, 3420–3429, 3600–3669, 3700–3719, 3850–3879, 3880–3999, 4830–4899, 5000–5079, 5090–5099, 5130–5159, 5220–5999, 7000–7299, 7400–9999; *Energy:* 1300–1399, 2900–2999; *Finance:* 6000–6999; *Transportation:* 3720–3799, 4000–4799; *Utilities:* 4800–4829, 4900–4999.