Empirical evidence of financial statement manipulation during economic recessions

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ABSTRACT

This paper uses Benford's Law, a mathematical law that predicts the frequency of naturally occurring numbers, to investigate the occurrence of the intentional manipulation of reported financial statement during recessionary times. Our analysis shows that, during recessions occurring in since 1950, reported financial statement numbers fail to conform to Benford's Law, indicating an increased level of manipulation. It is important to note that the data used in this study has been restated to correct the effects of financial statement manipulations that have been caught and corrected. Therefore, the results of this study indicates that during recessionary times, there is a certain level of financial statement manipulation that goes undetected—most likely because the manipulations are corrected when the economy improves and do not result in severe consequences, like bankruptcy. It is also important to note that the tests in this study cannot distinguish between manipulations that may be within the parameters of generally accepted accounting procedures and those that may cross the line into fraud.

KEYWORDS

Financial statement manipulation, earnings management, recession, Benford's Law, fraud

INTRODUCTION

Earnings management has been described as the opportunistic manipulation of reported financial statement numbers (Schipper, 1989). Prior studies have documented an association between earnings management and declining firm performance. For instance, DeFond and Subramanyam (1998) find evidence of earnings management preceding a change in auditors (auditor changes are generally interpreted as a negative signal about firm performance). Dechow, Sloan, and Sweeney (1996) document that firms that manage earnings are more likely to be subject to SEC enforcement actions for violations of generally accepted accounting principles. Xie (2001), Dichev and Skinner (2002) and DeFond and Jiambalvo (1994) have all shown that firms attempt to manipulate earnings to avoid problems such as debt covenant violations.

Other studies have shown that firms manage earnings to delay or avoid filing for bankruptcy. This concept is illustrated in the bankruptcy of the airline Swissair in 2001. Throughout the 1990s, Swissair utilized several methods, including income increasing accounting accruals, to create an inaccurate perception of financial strength. This perception of strength allowed the company to pursue a growth strategy instead of addressing its problems. This strategy ultimately resulted in bankruptcy and liquidation for the airline (Jorissen and Otley, 2004).

Recent research on bankruptcy emergence provides further support for this idea. Bryan, Tiras, and Wheatley (2004) find that bankrupt firms that made income increasing accounting choices prior to bankruptcy have a lower chance of emerging from bankruptcy. The authors theorize that the use of income-increasing accounting choices delays the filing of bankruptcy until the firm's financial problems are deeper, thus resulting in a lower likelihood that the firm will be able to successfully reorganize and emerge from bankruptcy.

In addition to the studies cited above, there have been many papers that document increases in levels of occupational fraud (e.g. employee theft) during economic declines (Pomeranz, 1995; Levisohn, 2009; Malamed, 2010). During economic downturns, corporate earnings decline, placing pressures on firms similar to those previously studied. However, no prior study formally documents an increased existence of earnings management during these periods.

Most of the academic studies cited above use a measure of discretionary accruals to proxy for earnings management, hypothesizing that increased discretionary accruals indicate the opportunistic manipulation of financial reporting numbers. This study uses a mathematical law known as Benford's Law to identify the presence of manipulated numbers. Benford's Law implies that, in a naturally occurring set of numbers, the leading digits of the numbers are discrete exponentially distributed rather than uniformly distributed; meaning that the numbers one through nine do not have equal probability of occurring (Phillips, n.d.). Table 1 (Appendix) shows the frequency of occurrence predicted by Benford's Law of the first digit in a series of data. Because Benford's Law shows that there is some predictability in the distribution of the first digit in a series of data, it can be used to indicate the presence of fictitious or artificially manipulated numbers. Benford's law analysis has been used to detect fraudulent scientific data (Diekmann, 2007), voter fraud (Bruenig and Goerres, 2011; Battersby, 2009), and campaign finance fraud (Tam Cho and Gaines, 2007), among other things.

In the context of financial reporting, the lack of compliance with Benford's Law may indicate fraud. Many times financial professionals use Benford's Law analysis as an investigative tool in the search for fraud (Blasi, 2010; Bowen, 2010; Gadawaski, 2010). An

example is using Benford's Law analysis to detect the presence of non-naturally occurring numbers (i.e. numbers that have been falsified) on a group of tax returns (May, 2010) or use of the analysis to detect check fraud (McConville, 1995).

Benford's Law analysis has also been used in academic accounting studies. Quick and Wolz (2005) show that German financial reporting data complies well with Benford's Law. Carslaw (1988) and Skousen, Guan, and Wetzel (2004) have used Benford's Law analysis to provide evidence of earnings management in New Zealand and Japanese accounting data. Nigrini (2005) uses Benford's Law to identify wide-scale earnings management in the period around the Enron crisis, and in Enron's reported financial statement numbers, in particular.

This paper adds to the accounting literature by providing evidence from Benford's Law that documents that earnings management activity increases during economic downturns.

SAMPLE

Benford's Law can be used to perform fraud analysis on large sets of accounting data. However, there are certain criteria that contribute to the law being most accurate and applicable:

1. Variability in the data
2. No requirement of minimum, maximum, or repeating numbers
3. Large sample size
4. Results of standard transactions or calculations
5. Numbers that are created by humans will not conform (Kyd, 2007)

Criterion 4, which states that Benford's Law is applicable to the results of standard transactions or calculations, applies to "sets of numbers that result from mathematical combination of numbers or results that come from two distributions. An example of two distributions would be Accounts Receivable (price x amount sold)" (Durtschi, Hillison, and Carl, 2004). Criterion 5, referring to numbers created by humans, refers to items such as check numbers (Durtschi, et al , 2004). These items provide a basis for what type of accounts and data are appropriate for use Benford's Law analysis. Data meeting these criteria should conform to Benford's Law, and lack of conformity in data meeting the above criteria indicates the presence of manipulated or falsified data. As described in the previous section, prior studies have shown that financial reporting data meets these criteria.

To use Benford's Law to detect earnings manipulation during economic downtowns, this study examines financial reporting data from all available firms during economic recessions occurring since 1950. Recession years were obtained from the website of the Economic Research Cycle Institute. Some recession years lasted less than a full year, so for the purpose of this study, a window around the recession periods that included the December before and after the end of the recession period was examined. This was done to ensure that the sample included the last reporting period before and after the recession period for companies with the fiscal typical year end of December. Lastly, the years 1979-1980 were combined with 1981-1982 due to the double-dip recession during those years. Table 2 (Appendix) shows the adjusted recession periods.

To test for manipulation of financial statement amounts, accounts were selected that are most prone to fraud and manipulation. In its Fraud Examiners' Manual, the Association of Certified Fraud Examiners reports that their studies show that the following are the most indicators of financial reporting fraud: increasing expenses, increasing cost of goods sold, increasing receivables combined with decreasing cash, increasing inventories, increasing sales combined with decreasing cash, and increasing of sales returns and allowances (ACFE, 2010). Based on these findings, Net Sales, Net Income, Inventory, and Allowance for Doubtful Accounts were selected for testing.

Data was obtained from the Compustat database and includes all available data for the selected variables in the periods under examination. Note that prior to 1969, the Compustat database does not contain sufficient data on Allowance for Doubtful Accounts to conduct an analysis. Therefore, an analysis of that account was only conducted for the recession beginning in 1969 and after.

It is important to note that the data included in the Compustat database has been restated for companies that have published financial statements that were subsequently restated due to accounting errors or financial reporting fraud. Thus, results of tests using Compustat data will provide evidence of financial statement manipulations that have gone undetected.

RESULTS

Calculations were performed using Excel and Kirix Strata, a mathematical software program. For each recession period, data for each test variable was analyzed for conformity with Benford's Law. As a baseline measurement, data for the test variables for all companies from 1992-2000 was analyzed and there was no indication of fraud or nonconformity with Benford's Law.

Figure 1 (Appendix) shows the results of tests on Net Sales. The bar graph compares the actual distribution of the first digits in the sample to a Benford's distribution. In general, Net Sales appears to follow a Benford's distribution.

As additional analysis, a measure of noncompliance with Benford's Law has been constructed. The measure shows how well, or poorly, the test variable complied with Benford's Law during each recession period tested. For example, if there were 858 observations, that number was multiplied by the percentage expected under the Law (30% for the first digit being a one, according to Benford's Law) which would result in 257 expected occurrences. Then the absolute value of the difference between the actual occurrences and the expected occurrence was computed. Once summed up, the total is divided by the number of observations to scale the number. Scaling the number adjusts for differences in sample size. The resulting number is a measure of how well, or poorly, each test variable complied with Benford's Law during each recession period. The higher the number, the greater the degree if noncompliance.

Results of this analysis for the Net Sales variable are presented in Table 3 (Appendix). The noncompliance measure ranges from 3% to 7%, with the low occurring twice, in the most recent recession periods of 2000-2001 and 1989-1991, and the high occurring in the 1956-1958 recession period. Taken together with the results depicted in Figure 1, there is only weak evidence from Benford's Law that Net Sales has been manipulated during recession periods.

Results of tests on Net Income are shown in Figure 2 (Appendix). These results show, graphically, a large degree of noncompliance with Benford's Law during all recession periods examined. The graphical depiction in Figure 2 is supported by the noncompliance measure

shown in Table 4 (Appendix). Noncompliance of Net Income number with Benford's Law was only 6% in the 2000-2001 period, but exceeded 13% in all other periods examined, with a high of 18% in the 1959-1961 period. These results provide strong evidence that reported Net Income was manipulated during recession periods.

As indicated in Figure 3 (Appendix), there is evidence that reported Inventory numbers were manipulated during recession periods. The bar graphs show that the distribution of Inventory numbers does not comply with Benford's Law in several of the recession periods tested. Table 5 (Appendix) shows that the noncompliance measure ranges from 6% to 13%, with the low occurring in multiple periods and the high occurring in 1959-1961. Most periods tested have noncompliance measures of under 10%.

Finally, Figure 4 (Appendix) reports the results of tests on reported Allowance for Doubtful Accounts numbers. The results show poor compliance with Benford's Law in all recession periods in the analysis. The noncompliance results reported in Table 6 (Appendix) support the graphical depiction in Table 9, with noncompliance in all periods near or above 20%, reaching 35% in the earlier periods. This result is not surprising given that, unlike the other accounts analyzed, Allowance for Doubtful Accounts is entirely a management estimate. However, the estimate is typically computed as a consistent percentage of credit sales or year-end accounts receivable, which meets the criteria for the applicability of Benford's Law. Thus, the conclusion is that Allowance for Doubtful Accounts was manipulated a great deal during recession periods.

CONCLUSION

Prior studies have shown that companies manipulate reported financial statement numbers (commonly referred to as earnings management) in response to declining firm performance. Although many studies have addressed the increased instance of occupational fraud during economic downturns, no study to date has addressed the question of whether financial statement manipulation increases during these times. Using Benford's Law, a mathematical law that is frequently used to detect the existence of falsified or manipulated data, this study provides evidence of increased financial statement manipulation during economic recessions. In an examination of financial reporting data surrounding recessions occurring from 1950-2001, results strongly indicate the presence of manipulated or falsified data in Allowance for Doubtful Accounts and Net Income. Results provide weaker evidence of manipulations in Inventories and Net Sales. These results provide evidence that firms turn to earnings management in response to economic downturns.

It is important to note that the data used in this study has been restated to correct the effects of financial statement manipulations that have been caught and corrected. Therefore, the results of this study indicates that during recessionary times, there is a certain level of financial statement manipulation that goes undetected—most likely because the manipulations are corrected when the economy improves and do not result in severe consequences, like bankruptcy. It is also important to note that the tests in this study cannot distinguish between manipulations that may be within the parameters of generally accepted accounting procedures and those that may cross the line into fraud.

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APPENDIX

Figure 1
Frequency of Occurrence of First Digits in Reported Net Sales Data
Recession Periods from 1950-2001

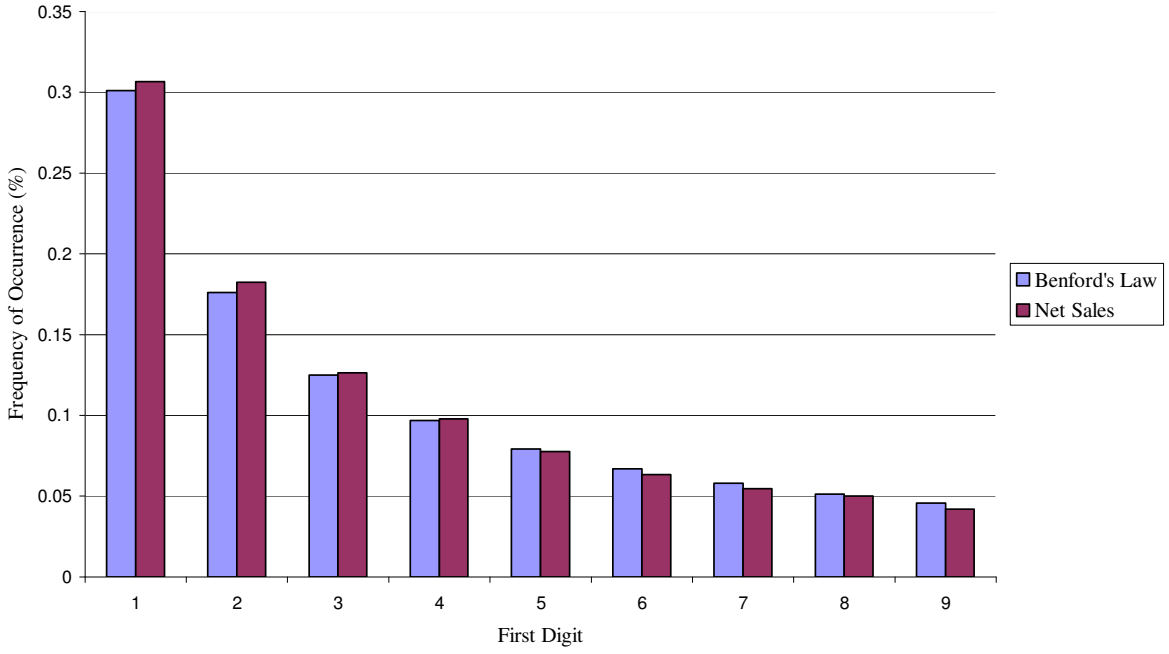

Figure 2
Frequency of Occurrence of First Digits in Reported Net Income Data
Recession Periods from 1950-2001

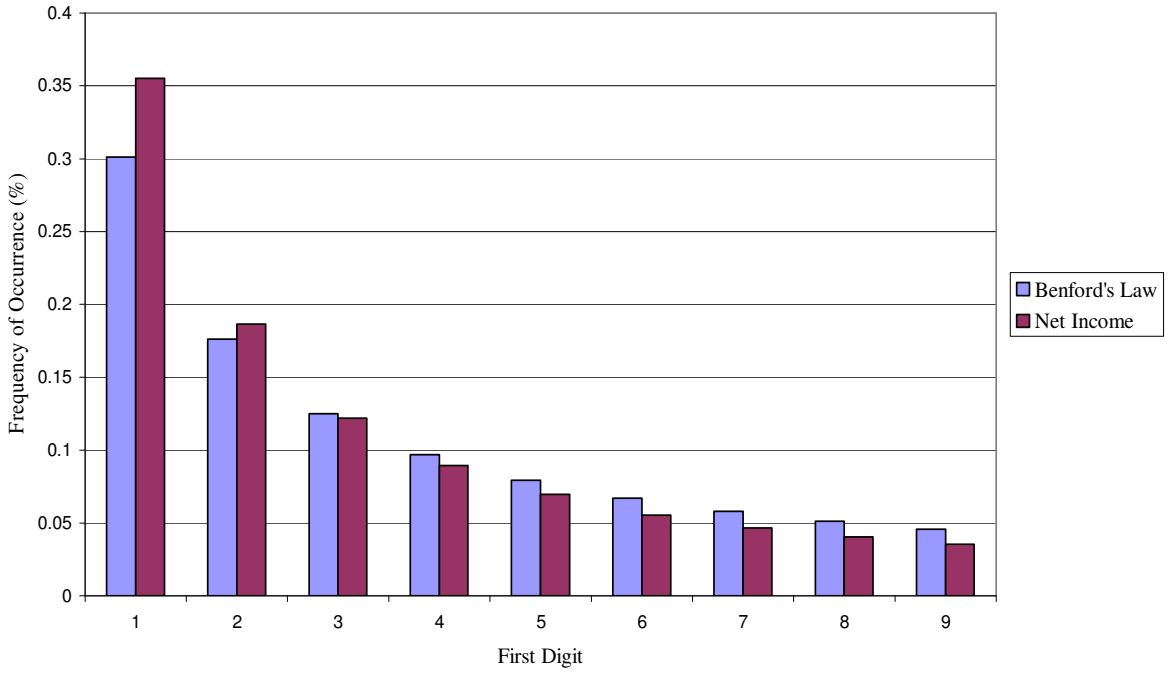

Figure 3
Frequency of Occurrence of First Digits in Reported Inventory Data
Recession Periods from 1950-2001

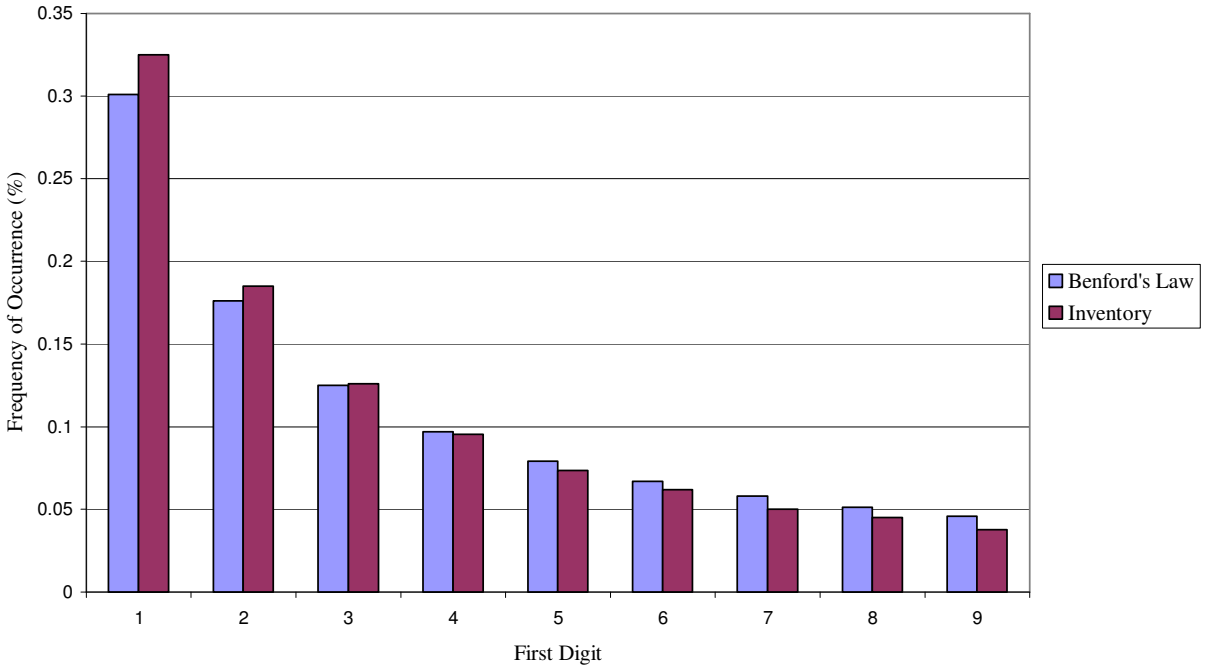

Figure 4
Frequency of Occurrence of First Digits in Reported Allowance for Doubtful Accounts Data Recession Periods from 1950-2001

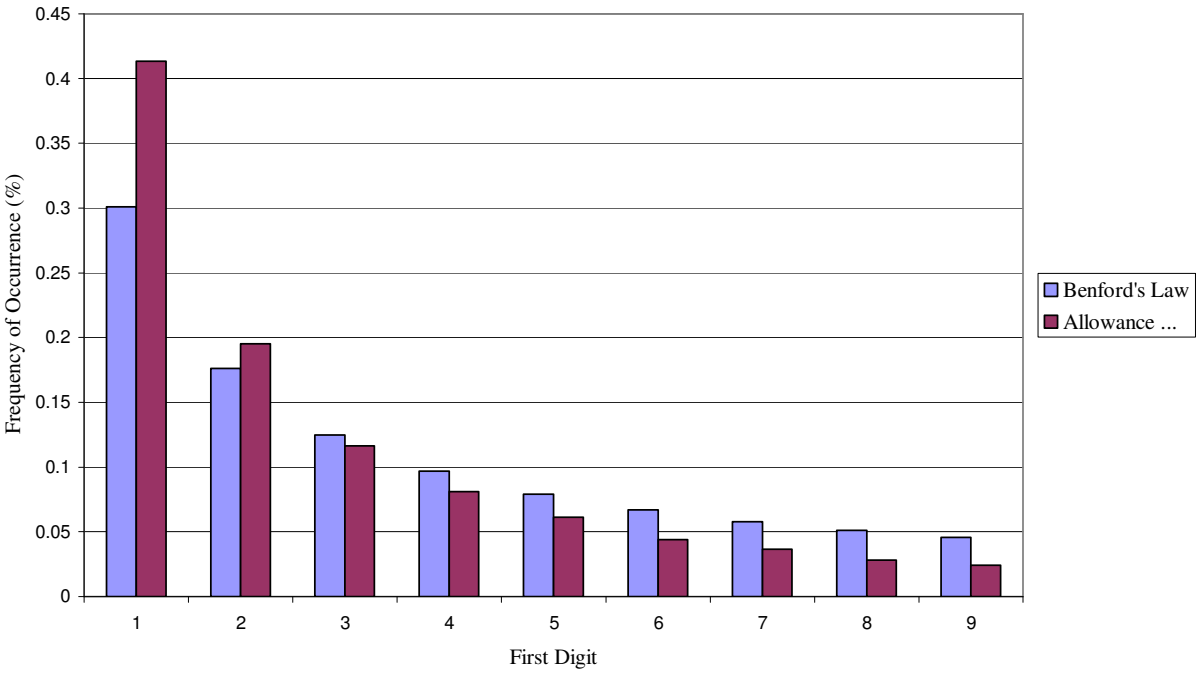

Table 1
Benford's Law Distribution

Benford's Law states that in sets of naturally occurring numbers, the frequency of occurrence of the first digits of the numbers will occur as shown in this table (Benford, 1938).

Digit	**Probability**
1	.30103
2	.17609
3	.12494
4	.09691
5	.07918
6	.06695
7	.05799
8	.05115
9	.04576

Table 2
Adjusted Recession Periods Used in Tests

This table lists the recession periods used in tests. Data on when recessions occurred was obtained from the website of the Economic Cycle Research Institute. Periods were adjusted to include the calendar year ends before and after the end of each recession in order to capture financial reports issued in close proximity to recessions, when economic growth was likely to be slow.

Adjusted Recession Periods
12/1952-12/1954
12/1956-12/1958
12/1959-12/1961
12/1969-12/1970
12/1973-12/1975
12/1979-12/1982
12/1989-12/1991
12//2000-12/2001

Table 3
Scaled Percentage of Noncompliance with Benford's Law in Reported Net Sales Data
Recession periods from 1950 – 2001

This table presents a measure of noncompliance with Benford's Law. The measure shows how well, or poorly, the test variable complied with Benford's Law during each recession period tested. The body of the table presents the absolute value of the difference between the actual occurrence of the first digits in the data and the expected occurrence under Benford's Law. The bottom line of the table presents the absolute value divided by the number of observations to scale the number for differences in sample size. The resulting number is a measure of how well, or poorly, each test variable complied with Benford's Law during each recession period. The higher the percentage, the greater the degree if noncompliance.

	Recession Period							
Digit	1952-1954	1956-1958	1959-1961	1969-1970	1973-1975	1979-1982	1989-1991	2000-2001
1	10.11	26.25	6.19	88.05	259.20	196.68	28.94	66.75
2	36.73	28.47	7.83	17.06	21.95	224.56	137.58	126.88
3	12.39	31.28	14.98	38.01	67.86	69.13	49.36	5.13
4	5.33	4.24	31.42	11.86	5.59	3.04	59.18	15.76
5	11.94	28.71	43.74	12.20	0.35	170.40	4.61	3.88
6	6.76	12.96	27.52	26.55	76.15	53.68	72.94	80.89
7	17.86	25.76	17.46	36.46	70.71	104.20	31.70	52.24
8	2.66	15.81	9.14	29.93	5.09	54.57	49.78	18.00
9	14.67	3.43	22.72	1.79	11.50	104.47	116.03	49.25
Total	118.45	176.91	181.01	261.91	518.39	980.72	550.12	418.76
	Scaled Percentage of Noncompliance							
	5%	7%	4%	4%	4%	5%	3%	3%

Table 4
Scaled Percentage of Noncompliance with Benford's Law in Reported Net Income Data
Recession periods from 1950 – 2001

This table presents a measure of noncompliance with Benford's Law. The measure shows how well, or poorly, the test variable complied with Benford's Law during each recession period tested. The body of the table presents the absolute value of the difference between the actual occurrence of the first digits in the data and the expected occurrence under Benford's Law. The bottom line of the table presents the absolute value divided by the number of observations to scale the number for differences in sample size. The resulting number is a measure of how well, or poorly, each test variable complied with Benford's Law during each recession period. The higher the percentage, the greater the degree if noncompliance.

Absolute Value of the Difference of Expected vs. Actual Occurrences								
Digit	1952-1954	1956-1958	1959-1961	1969-1970	1973-1975	1979-1982	1989-1991	2000-2001
1	89.26	49.79	161.48	350.43	694.80	910.94	855.74	393.76
2	12.30	48.81	72.20	17.78	169.70	168.84	123.06	68.66
3	3.04	10.98	23.72	11.35	27.89	60.90	54.32	24.90
4	4.77	3.64	1.44	34.29	129.41	179.82	109.23	32.28
5	3.07	34.84	28.36	69.93	135.89	157.34	126.71	76.05
6	31.79	24.47	43.25	52.47	173.77	197.95	157.73	67.98
7	25.25	21.56	47.47	54.88	161.12	164.96	197.59	71.93
8	26.66	18.17	37.08	75.87	140.41	143.26	167.62	90.43
9	13.11	14.19	52.36	69.42	96.00	175.56	165.61	98.85
Total	209.24	226.43	467.36	736.42	1729.00	2159.56	1957.61	924.85
Scaled Percentage of Noncompliance								
	15%	14%	18%	16%	17%	16%	13%	6%

Table 5
Scaled Percentage of Noncompliance with Benford's Law in Reported Inventory Data
Recession periods from 1950 – 2001

This table presents a measure of noncompliance with Benford's Law. The measure shows how well, or poorly, the test variable complied with Benford's Law during each recession period tested. The body of the table presents the absolute value of the difference between the actual occurrence of the first digits in the data and the expected occurrence under Benford's Law. The bottom line of the table presents the absolute value divided by the number of observations to scale the number for differences in sample size. The resulting number is a measure of how well, or poorly, each test variable complied with Benford's Law during each recession period. The higher the percentage, the greater the degree if noncompliance.

Absolute Value of the Difference of Expected vs. Actual Occurrences								
Digit	1952-1954	1956-1958	1959-1961	1969-1970	1973-1975	1979-1982	1989-1991	2000-2001
1	63.73	21.13	167.49	140.31	273.67	183.53	273.61	236.82
2	17.62	1.51	13.56	49.65	145.89	152.84	74.62	86.97
3	15.35	2.61	9.93	2.66	33.78	10.69	2.01	19.16
4	2.81	18.38	52.47	31.92	47.00	51.41	7.83	19.55
5	24.43	30.89	31.97	0.43	75.11	74.57	112.55	29.58
6	15.59	5.84	40.05	13.50	61.07	33.01	60.37	48.98
7	7.06	19.55	31.02	48.84	113.15	73.29	55.64	96.17
8	6.97	9.10	13.38	41.01	72.89	119.86	22.36	55.87
9	10.22	3.28	22.10	56.91	84.11	97.73	87.46	93.57
Total	163.78	112.28	381.97	385.23	906.67	796.94	696.46	686.68
Scaled Percentage of Noncompliance								
	10%	6%	13%	8%	8%	6%	6%	7%

Table 6
Scaled Percentage of Noncompliance with Benford's Law in Reported Allowance for Doubtful Accounts Data
Recession periods from 1969 – 2001

This table presents a measure of noncompliance with Benford's Law. The measure shows how well, or poorly, the test variable complied with Benford's Law during each recession period tested. The body of the table presents the absolute value of the difference between the actual occurrence of the first digits in the data and the expected occurrence under Benford's Law. The bottom line of the table presents the absolute value divided by the number of observations to scale the number for differences in sample size. The resulting number is a measure of how well, or poorly, each test variable complied with Benford's Law during each recession period. The higher the percentage, the greater the degree if noncompliance.

Absolute Value of the Difference of Expected vs. Actual Occurrences					
Digit	1969-1970	1973-1975	1979-1982	1989-1991	2000-2001
1	88.93	338.22	416.41	483.48	350.07
2	22.89	15.47	116.58	17.85	108.52
3	0.96	31.25	46.17	17.37	31.46
4	13.80	65.66	69.23	55.43	31.20
5	17.31	36.87	78.19	86.72	51.28
6	26.38	53.17	97.75	102.55	64.68
7	14.58	55.09	72.42	80.82	94.78
8	20.15	58.28	85.25	85.78	93.02
9	18.65	53.38	83.98	72.65	92.18
Total	223.65	707.38	1065.98	1002.65	917.18
			Scaled Percentage of Noncompliance		
	35%	35%	31%	24%	19%