Empirical evidence of financial statement manipulation during economic recessions

Cristi Tilden
Deloitte, LLP

Troy Janes
Rutgers University School of Business-Camden

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 numbers during recessionary times. The analysis shows that reported financial statement data generally conforms to Benford's Law. However, in periods surrounding recessions occurring since 1950, reported financial statement numbers fail to conform, 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 indicate 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 are not exposed by events such as 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, 2009).

Recent research on bankruptcy emergence provides further support for this idea. Bryan, Tiras, and Wheatley (2002) 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. Dates of recession periods were obtained from the website of the Economic Research Cycle Institute. Many recession periods 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 that are most prone to fraud and manipulation were selected. In its Fraud Examiners' Manual, the Association of Certified Fraud Examiners reports that their studies show that the following are the most common 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 adjusted recession periods 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

For each recession period, data for each test variable was analyzed for conformity with Benford's Law. As a baseline, data for the test variables for all companies from 1950 to 2006 was analyzed. The results of this analysis are presented graphically in Figures 1 through 4 (Appendix) and numerically in Tables 3 through 6 (Appendix), alongside the results of testing recession period data. The results of these tests indicate that the reported financial statement data complies with Benford's Law. Following Nigrini (2000), z-tests were also performed which indicate that there is no statistical difference between the distribution of test variables and the Benford's Law distribution. The results of the z-tests are also presented in Tables 3 through 6 (Appendix).

Figure 1 (Appendix) shows the results of tests on net sales. The bar graph compares the actual distribution of the first digits in reported net sales data during the test period (i.e. adjusted recession periods) to the distribution of all years' data and the Benford's Law distribution. Graphically, Figure 1 shows that reported data for all years follows the Benford's Law distribution. Net sales data, however, appears to deviate somewhat from the Benford's Law distribution.

Table 1 (Appendix) presents numerical data for net sales for all years and for the test period. A z-test of the difference between the data from all years and the expected occurrences under Benford's Law and the data from the test period and Benford's Law is also presented. The z-statistics reported in the table show that there is, statistically, no difference between the distribution of net sales data from all years and the distribution expected from Benford's Law. Z-statistics for the difference between the test period and the expected occurrences indicate only minor differences between the recession period data and the expected occurrences under Benford's Law. 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). The results show that the data from all years fits the Benford's Law distribution quite well. The results of z-tests on the difference between the observed net income data for all years and the expected occurrences under Benford's Law, presented in Table 4 (Appendix), also show that there is no statistical difference between the observed distribution of net income data and the expected occurrences. However, Figure 2 shows a large degree of noncompliance with Benford's Law during the recession periods examined. The graphical depiction in Figure 2 is supported by the results of z-tests presented in Table 4, which show that the difference between the recession period reported net income data and the expected occurrences is significant at the five percent level or better for almost all digits. 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 also manipulated during recession periods. Again, the bar graph and the z-statistics presented in Table 5 (Appendix) show that the data from all years behaves as expected. The bar graphs show that the distribution of inventory numbers during the test period does not comply with Benford's Law. Z-tests of the statistical difference between the recession period data and the expected occurrences, shown in Table 5, show that reported inventory numbers do differ significantly from the Benford's Law distribution.

Finally, Figure 4 (Appendix) reports the results of tests on reported allowance for doubtful accounts numbers. The results show very poor compliance with Benford's Law in the recession periods in the analysis, but strong compliance with the Law for the data from all years. The results graphically depicted in Figure 4 are supported by the data reported in Table 6 (Appendix), which shows no statistical difference between the data from all years and expectations, but strongly significant differences between the test period data and expectations. These results may not be surprising, given that the allowance for doubtful accounts is an estimate created by management. 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 1950-2006, 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 indicate 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 are not exposed by extreme events, 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
1950-2006

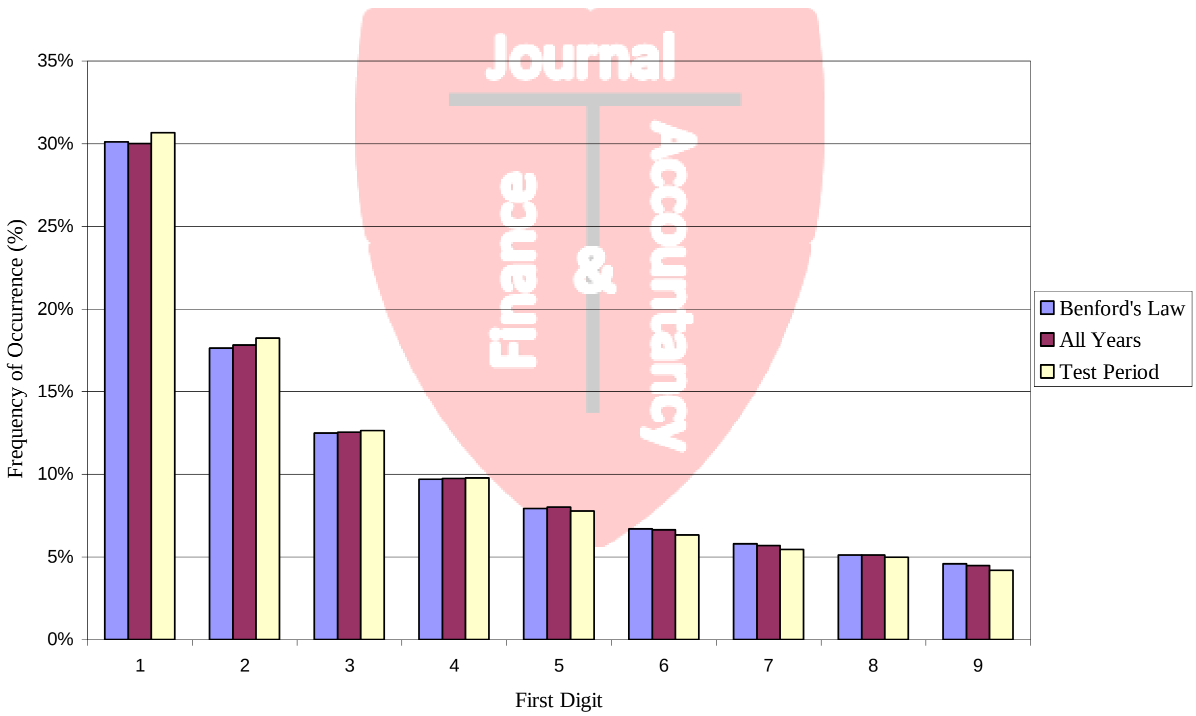

Figure 2
Frequency of Occurrence of First Digits in Reported Net Income Data
1950-2006

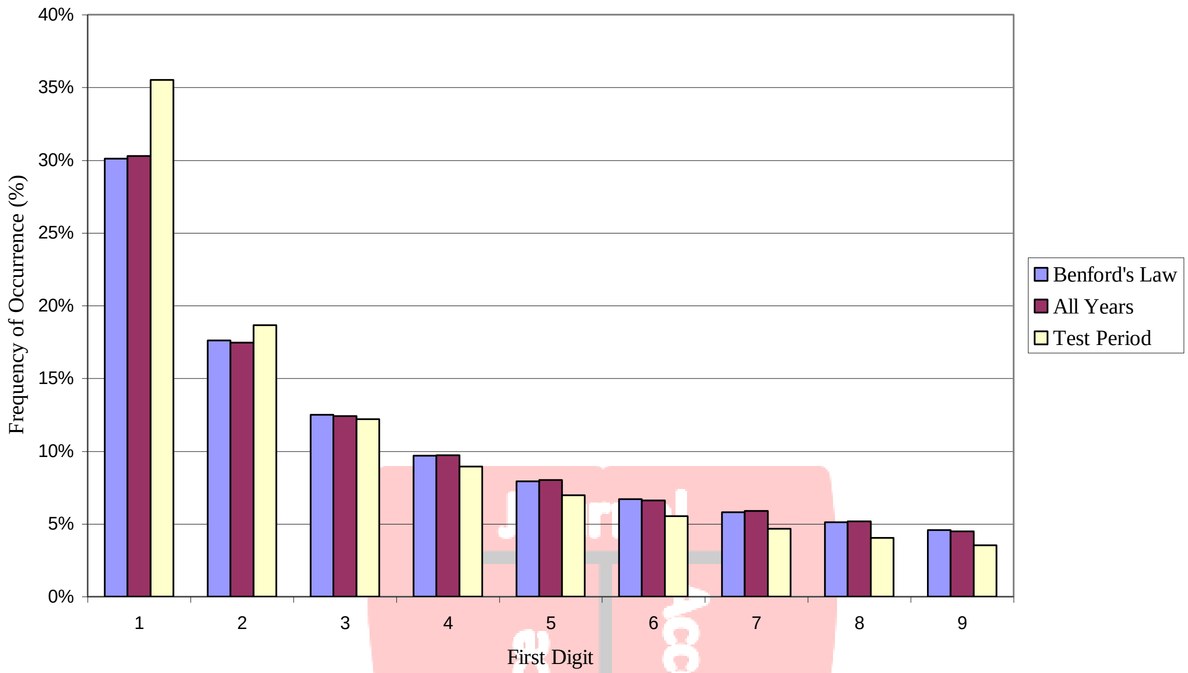

Figure 3
Frequency of Occurrence of First Digits in Reported Inventory Data
1950-2006

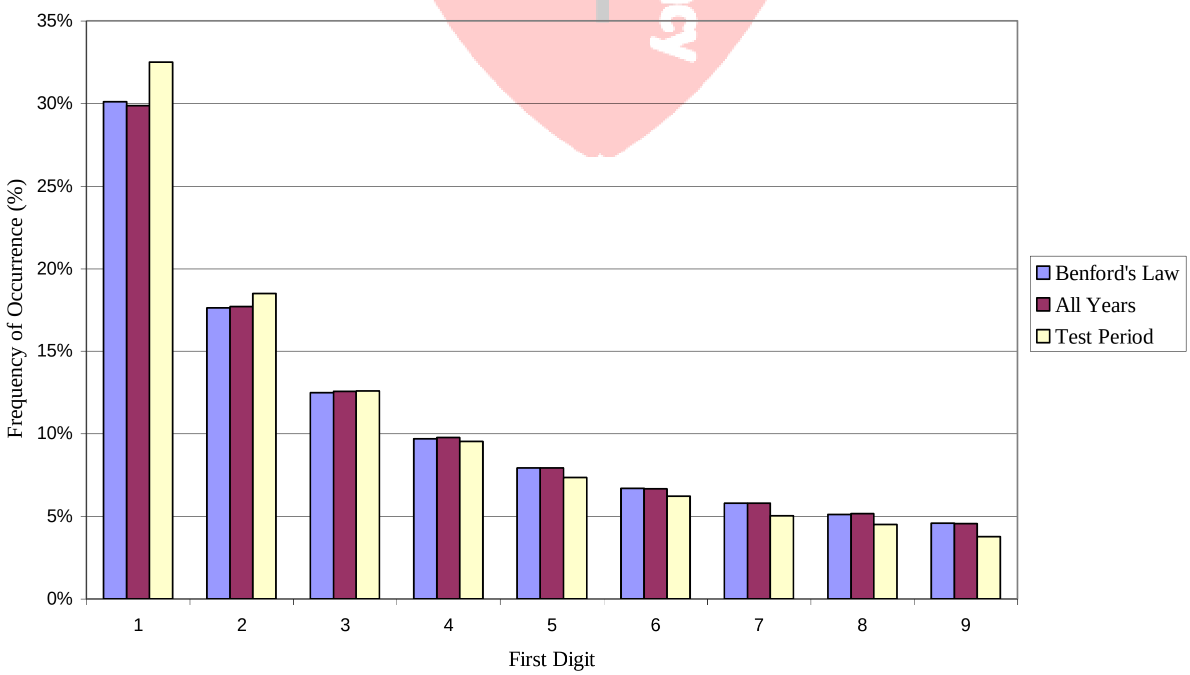

Figure 4
Frequency of Occurrence of First Digits in Reported Allowance for Doubtful Accounts Data
1950-2006

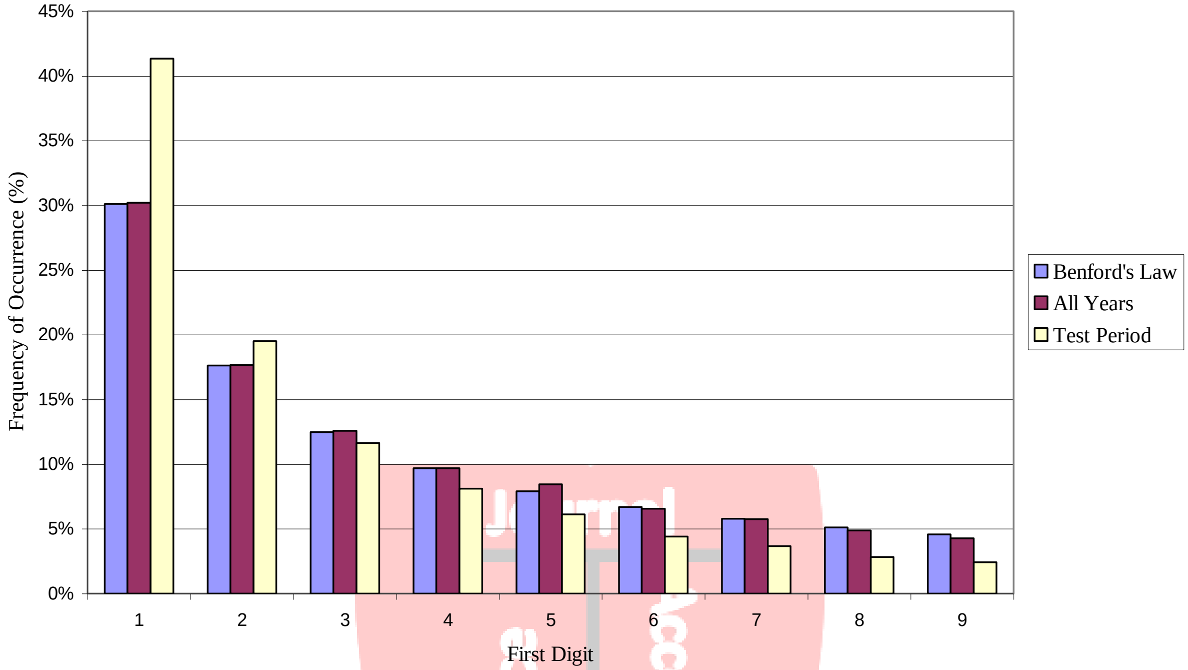

Table 1
Benford's Law Distribution

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	0.30103
2	0.17609
3	0.12494
4	0.09691
5	0.07918
6	0.06695
7	0.05799
8	0.05115
9	0.04576

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
1952-1954
1956-1958
1959-1961
1969-1970
1973-1975
1979-1982
1989-1991
2000-2001

Table 3
Compliance with Benford's Law in Reported Net Sales Data
1950 – 2006

This table presents data on how well the distribution of reported net sales data complies with Benford's Law. The body of the table presents information on the distribution of the first digit of reported data for all years in the period 1950-2006 and for the test period, which consists of a window around recessions occurring during that period (see Table 2). Reported z-statistics on the difference between the observed occurrence of first digits and the expected occurrence (according to Benford's Law) were computed following Nigrini (2000).

Digit	Expected Occurrence	All Years	Diff	z-stat	Test Period	Diff	z-stat	
1	0.30103	0.30007	0.00096	0.656	0.30650	0.00547	1.902	*
2	0.17609	0.17801	0.00192	1.220	0.18222	0.00612	1.975	**
3	0.12494	0.12542	0.00048	0.293	0.12629	0.00135	0.419	
4	0.09691	0.09738	0.00047	0.286	0.09783	0.00092	0.280	
5	0.07918	0.08011	0.00093	0.557	0.07760	0.00158	0.469	
6	0.06695	0.06648	0.00047	0.275	0.06327	0.00367	1.064	
7	0.05799	0.05679	0.00120	0.703	0.05457	0.00342	0.984	
8	0.05115	0.05100	0.00015	0.092	0.04986	0.00129	0.376	
9	0.04576	0.04474	0.00102	0.588	0.04185	0.00391	1.102	

*, **, *** Significant at the 10%, 5%, or 1% level, respectively

Table 4
Compliance with Benford's Law in Reported Net Income Data
1950 – 2006

This table presents data on how well the distribution of reported net income data complies with Benford's Law. The body of the table presents information on the distribution of the first digit of reported data for all years in the period 1950-2006 and for the test period, which consists of a window around recessions occurring during that period (see Table 2). Reported z-statistics on the difference between the observed occurrence of first digits and the expected occurrence (according to Benford's Law) were computed following Nigrini (2000).

Digit	**Expected Occurrence**	**All Years**	**Diff**	**z-stat**	**Test Period**	**Diff**	**z-stat**	
1	0.30103	0.30293	0.00190	1.316	0.35501	0.05398	17.870	***
2	0.17609	0.17454	0.00155	0.987	0.18658	0.01049	3.032	***
3	0.12494	0.12399	0.00095	0.587	0.12193	0.00300	0.809	
4	0.09691	0.09703	0.00012	0.072	0.08940	0.00751	1.934	*
5	0.07918	0.08003	0.00085	0.513	0.06954	0.00964	2.399	**
6	0.06695	0.06621	0.00074	0.439	0.05541	0.01154	2.769	***
7	0.05799	0.05875	0.00076	0.456	0.04653	0.01147	2.697	***
8	0.05115	0.05158	0.00043	0.257	0.04038	0.01077	2.504	**
9	0.04576	0.04495	0.00081	0.474	0.03521	0.01055	2.414	**

*, **, *** Significant at the 10%, 5%, or 1% level, respectively

Table 5
Compliance with Benford's Law in Reported Inventory Data
1950 – 2006

This table presents data on how well the distribution of reported inventory data complies with Benford's Law. The body of the table presents information on the distribution of the first digit of reported data for all years in the period 1950-2006 and for the test period, which consists of a window around recessions occurring during that period (see Table 2). Reported z-statistics on the difference between the observed occurrence of first digits and the expected occurrence (according to Benford's Law) were computed following Nigrini (2000).

Digit	**Expected Occurrence**	**All Years**	**Diff**	**z-stat**	**Test Period**	**Diff**	**z-stat**	
1	0.30103	0.29869	0.00234	1.404	0.32493	0.02390	7.085	***
2	0.17609	0.17687	0.00078	0.433	0.18501	0.00891	2.402	**
3	0.12494	0.12573	0.00079	0.427	0.12589	0.00095	0.242	
4	0.09691	0.09773	0.00082	0.437	0.09544	0.00147	0.367	
5	0.07918	0.07920	0.00002	0.009	0.07360	0.00558	1.338	
6	0.06695	0.06669	0.00026	0.132	0.06206	0.00489	1.163	
7	0.05799	0.05803	0.00004	0.022	0.05018	0.00781	1.787	*
8	0.05115	0.05149	0.00034	0.175	0.04515	0.00600	1.380	
9	0.04576	0.04556	0.00020	0.100	0.03776	0.00800	1.775	*

*, **, *** Significant at the 10%, 5%, or 1% level, respectively

Table 6
Compliance with Benford's Law in Reported Allowance for Doubtful Accounts Data
1950 – 2006

This table presents data on how well the distribution of reported allowance for doubtful accounts data complies with Benford's Law. The body of the table presents information on the distribution of the first digit of reported data for all years in the period 1950-2006 and for the test period, which consists of a window around recessions occurring during that period (see Table 2). Reported z-statistics on the difference between the observed occurrence of first digits and the expected occurrence (according to Benford's Law) were computed following Nigrini (2000).

Digit	**Expected Occurrence**	**All Years**	**Diff**	**z-stat**	**Test Period**	**Diff**	**z-stat**	
1	0.30103	0.30197	0.00094	0.458	0.41325	0.11222	19.226	***
2	0.17609	0.17654	0.00045	0.200	0.19491	0.01882	2.667	***
3	0.12494	0.12571	0.00077	0.335	0.11643	0.00851	1.074	
4	0.09691	0.09670	0.00021	0.088	0.08116	0.01575	1.854	*
5	0.07918	0.08440	0.00522	2.279**	0.06109	0.01809	2.024	**
6	0.06695	0.06560	0.00135	0.561	0.04389	0.02305	2.362	**
7	0.05799	0.05761	0.00038	0.160	0.03673	0.02126	2.131	**
8	0.05115	0.04876	0.00239	0.972	0.02824	0.02292	2.137	**
9	0.04576	0.04271	0.00305	1.225	0.02429	0.02147	1.957	**

*, **, *** Significant at the 10%, 5%, or 1% level, respectively