

Benford Law: A Fraud Detection Tool Under Financial Numbers Game: A Literature Review

¹Alaa Shamsallah Noorullah, ²Dr-Ahmed Saad Jari, ³Anwar Mustafa Hasan, ^{4*}Hakeem Hammood Flayyih

^{1,2}Accounting Department, College of administration and economics, Mustansiriyah University, Iraq

^{3,4}Lecturer at Department of financial and Banking Sciences, College of Administration and Economics, University of Baghdad, Iraq

Abstract:- *The research aims to define the role of Benford's Law, how it is used, the nature of its digital analysis, its role in detecting the manipulation of financial numbers in the financial records and statements of companies, as well as the most important studies that dealt with the subject of the research, as well as dealing with the importance of this tool is one of the judicial accounting tools In detecting fraud, and the most important findings of studies in this regard, and from our analysis of previous studies, it was found that the Benford Law is an important means in detecting fraud and should focus on it in multiple operations, including detecting fraud in income in joint-stock companies, Likewise, Manipulation with instruments, sales, and other financial items. however, this law is also considered a statistical method for auditors that can be relied upon to perform their work.*

Keywords: *Penford Law, Financial Numbers Game, Fraud.*

Introduction

It requires from the management of companies to report financially on their financial position through comprehensive disclosure and with high transparency, in order to fulfill the agency contract concluded between them and the owners, but this does not prevent their desire to play the financial residence game in the financial statements, with a view to achieving their own earnings, The term financial numbers game is the term equivalent to earnings Management, and because of ownership separation from management, in addition to that, investors may have limited experience in the field of understanding what is included in the financial statements in the company, or they do not have the necessary time and knowledge to identify the result of the company's business and its financial position, This requires a neutral body to determine the credibility and fairness of the company's financial statements.

The problem is the weakness of the ability of auditors to discover the game of financial numbers from the company's management because they have adopted

the traditional methods of controlling and auditing, In addition to not using modern controlling mechanisms that would accelerate the discovery of these practices, which exposed several auditors to legal procedures on the one hand, and loss of investor confidence and the rest of the stakeholders in the financial statements approved by them on the other hand.

Accounting systems are a common goal of financial fraud, wherever there is money, fraudsters utilize a common method to carry out fraud, by creating fake entities, such as fake employees 'records or a fake payment record for suppliers, and then manipulating these fake records to achieve their own earnings, and that success or the failure of such fraud depends on the ability to mix fake restrictions with the correct data, thus making it difficult for the auditor to notice, however, the interesting observation is that most people are unable to create fake data that is natural, which makes it easy for auditors to apply Easy statistical methods to discover that counterfeit humans are not able to create natural data and that

one of these tests is Benford's law. Which has become another technique that can be used by judicial accountability for the possible emergence of fraud in the records, according to the International Accounting Standard (SAS NO.99) (taking fraud into consideration in the auditing of financial statements) requires auditors, in addition to completing the auditing process that includes procedures, Previously described, they determine the possibility that the financial statements have been affected by fraud.

Financial numbers game concept: There are several definitions of the game of financial numbers in the accounting literature, the authors of which came from different points of view, as they used a wide range of expressions to describe the same phenomenon in its various aspects (Mohammed, Flayyih, Mohammed & Abbood, 2019). It was previously defined by (Schipper, 1989) as "a meaningful intervention in the external financial reporting process in order to obtain some special gains" (Fudenberg & Tirole, 1995). As for (Mulford & Comiskey, 2002), it was defined as "a profit manipulation activity to achieve a predetermined goal, which can be determined by management, to meet analyst expectations, or amounts that flow with a smoother or more sustainable earnings stream" (Talab, Flayyih & Ali, 2018).

While the US Securities Exchange Commission (SEC) focused its definition of the game of financial numbers on the issue of manipulation in the application of accounting principles, which it defined it as "a distortion of the application of generally accepted and trusted accounting principles" (Al-Taie, Flayyih, & Talab, 2017). By the same token, (Flayyih, 2013) defined it as "manipulating account numbers that fall within the range of generally accepted accounting principles (GAAP)". (Schroeder, Clark & Cathey, 2019) defined the financial numbers game as "Management's attempt to influence the reported income in the short term". In the same direction, (Scott, 2003) defined it as "the selection of accounting policies by management to influence profits, in order to achieve some of the specific goals for reporting them". Whereas,

(Flayyih, Salih, Rahma & Mohammed, 2020) Summarize a definition of the financial numbers game to income-generating practices when they defined it as the planned timing of revenues, expenses, gains and losses to pave the rise and fall in income (Tamimi & Flayyih, 2017).

A Brief Introduction to Penford Law:

In 1938 the American physicist Frank Benford, who worked as an engineer in the General Electric Company since the year 1920, made a unique discovery in the field of numbers and discovered that many lists of numbers derived from real data about It has the number (1) in the first place for the number from the left side, which has a very large frequency, compared to the number (9) (Johnson, 2005). Benford tested this theory by studying 20,229 groups of numbers that included Baseball statistics, stock market prices, urban residents, death rates, cost data, etc. (Benford, 1938). The data came from random sources as well as from the sources that followed the mathematical rules, but the data that a person entered were excluded, such as house numbers, phone numbers, and postal codes, and the experimental observation from the tables record that he liked, confirms the possibility of the number (1) as a first-rank higher than the number (9). These expected iterations appear below with D1 representing the number one rank (2009; Nigrini & Miller, 2012 Nigrini & Wells,):

$$\text{Prob}(D1 = d1) = \log\left(1 + \frac{1}{d1}\right); \quad d1 \in \{1,2,3, \dots 9\} \quad (1.1)$$

$$\text{Prob}(D2 = d2) = \sum_{d1=9}^9 \log\left(1 + \frac{1}{d2d1}\right); \quad d2 \in \{0,1,2,3, \dots 9\} \quad (1.2)$$

$$\text{Prob}(D1D2 = d1d2) = \log\left(1 + \frac{1}{d2d1}\right); \quad d2 \in \{10,11,12, \dots 99\} \quad (1.3)$$

As:

prob: represents the probability that the view will occur.

D1: represents the first column in probability.

d1: represents the number.

Table (1) shows the expected possibilities for all numbers from (0) to (9) for each of the four columns. Table (1) Expected Prospects for Benford Law .

Digit Fourth	Digit Third	Digit Second	Digit First	Digit
.10018	.10178	.11968		0
.10014	.10138	.11389	.30103	1
.10010	.10097	.10882	.17609	2
.10006	.10057	.10433	.12494	3
.10002	.10018	.10031	.09691	4
.09998	.09979	.09668	.07918	5
.09994	.09940	.09337	.06695	6
.09990	.09902	.09035	.05799	7
.09986	.09864	.08757	.05115	8
.09982	.09827	.08500	.04576	9

In 1961, mathematics professor Roger Pinkham studied the phenomenon of the distribution of numbers in some natural phenomena and reached mathematical proof (Pinkham, 1961). Finally, the mathematician came in 1995, and in another way proved the validity of this law. The mathematician Theodor Hill reached the conclusion that if he The numerical distribution is random and unbiased, and the random samples are taken from those distributions, so we will approach the logarithmic distribution of Benford, and this helps in interpreting and anticipating the aspects of digital signs in various practical experiments and helps in achieving modern computer applications, mathematical models, accounting fraud detection (Hill, 1995). In fact, the Benford Act is counting accepted evidence in the United States in criminal cases of a financial character at the state or local level, and this embodies the reason for the benefit of using this law (2011, Singleton).

Literature Review:

This law was first discovered by the American astronomer (Newcomb, 1881) in 1881 when he noticed that the numbers found in logarithmic books are distributed from (1) to (9) according to an unfamiliar mathematical law called the Repetitive Distributions Law. As for a study (Benford, 1938), He tested this theory by studying (20,229) a set of numbers that included baseball statistics, stock

market prices, urban residents, death rates, cost data, etc. The law was called to distribute numbers according to In his name (Benford) although he did not elaborate on this distribution as Newcomb did. (Carslaw, 1988) a study which notes for example that the number (5984 or 6020), there will be a tendency to round it up or down towards the nearest reference point in estimating its size, and there is a trend to estimate it to 6000, this phenomenon has been used in pricing within the Marketing field by numerous companies and they are known for several years. however, Carslaw found that many of the numbers were the second rank of them include the number (0) while there are fewer numbers that include the second rank number (9) compared to what is expected according to the law of Benford, and this supports that the net income numbers have been rounded upward.

A study (Thomas, 1989) reached a similar pattern to the study of Carslaw in the profits of American companies, and it was a study of the earnings per share before the exceptional items, unusual items, and non-continuous operations, as it was found that there is an increase in the second rank of zeros in the quarterly net income of the American companies, and as it found that there was a negative impact in the companies that reported losses, and found that the earnings numbers for each share in the United States were multiples of 5 cents, and this is often more than

expected, and that the numerical frequency of the number (9) Less than expected, As for the results, they suggested that the net income for the earnings per share was recycled towards the increase, and that the net losses were recycled towards the reduction, in an attempt to raise profits and reduce declared losses, and the results also presented evidence of income manipulation, where there was an increase in the frequency (0) and (5) and a decrease of (9).

A study (Nigrini, 1997) which is a PhD thesis in Accounting, and its main objective was to find a relationship between tax evasion and the amounts published or reported by taxpayers using the Benford Law. Individual Tax Model Files (ITMFs) for the year (1985) and the year (1988) were tested to detect unintended tax evasion. The researcher reached the conclusion that there is evasion of the tax in the statements submitted by taxpayers for the year 1985 and 1988. A study (Johnson, 2009), a research published in the Journal of Judicial Studies in Accounting and Management, the aim of the research to determine whether the characteristics of the selected companies are related to deviations resulting from the possibilities of Benford law for the first figure of numbers, to determine the characteristics of companies with the greatest risk on the game of financial numbers. The researcher used a sample of well-known companies worldwide, consisting of (24) companies for a period of six years from 1999 to 2004, and published their financial statements on the Edgar site (EDGAR), and the research reached a set of conclusions, most notably: The companies that manipulate through the financial numbers game is at risk of bankruptcy or failure more than those that do not manipulate the results of its business, and the Sarbanes Oxley Act (2002) was designed to address the risk of the financial numbers game, and added more protection to the market capital, as the companies that are the most dangerous in the financial numbers game are characterized by the characteristics that the total market value of its shares shall be It is low in relation to the market size, which has less than (45) billion dollars in market capital. And companies with a high level of internal trading, which has more than (3%) of the level of total trading. New public joint-stock companies, which

are companies whose shares are traded by the public for a period of less than (25) years. A study (Jordan & Clark, 2011) which is research published in the journal (The CPA), affiliated with the American Institute of Certified Public Accountants, the research included a sample of net profits for (400) companies, and the research-tested two financial periods, the first from 1997 to 2000, While the second spanned from 2003 to 2006, which followed the application of the Sarbanes-Oxley Act (2002) and the research reached a set of conclusions, the most important of which is that the implementation of Sarbanes-Oxley's law contributed to limiting the practices of the financial numbers game, and the researchers reached a great match between Earnings declared for the study sample companies and the Benford Law for the period from 2003 to 2006 compared to the period that preceded it from 1997 to 2000.

A study (Flayyih, 2013) in which it found the existence of earnings management practices in companies listed on the Iraq Stock Exchange, was discovered using the Benford law. However, Earnings management is used to mislead shareholders and other financial data users, the aim of which is to mislead and withhold the truth, which involves unethical actions, as it is a set of activities, means, and procedures taken by the management of the company, in order to maximize its benefits.

Results: Benford law benchmark data includes four columns for numerical analysis, where the first column corresponds to the probability of the first rank of numbers starting from the number (1) to the number (9), and the second column represents the probability of the second order of numbers, and for each rank starting from the number (0) To the number (9), and so on for the third and fourth columns.

The calculations in the first column are clear and easy, and what is required is to obtain the probability of the numbers appearing {9,, 3,2,1} at the beginning of the number, i.e. the first rank of numbers, whereas the numbers with two ranks begin with the number (10) And end with the number (99), and that the numbers are limited to the group

{10,11,12 ... 99} When we try to calculate the probability of second-order occurrence of numbers. As for the numbers with three ranks starting from {999, ..., 102,101,100}, therefore the calculation of the probability of the appearance of the number (1) as a third rank will be confined between the numbers {991,, 121,111,101}, As for the totals for the fourth column, the numbers start from {9999, ..., 1003,1002,1000}. Thus, when applying the law, as in the previous method, we find the expected duplicates of the Benford Law as in Table (1). As for the fifth column, the probability of appearing is equal to all numbers, i.e. it appears at a rate of (0.1000) and for all ranks, as shown in Appendix No. 1, and this reason which called for not focusing on the fifth column in the Benford Law. All the research that dealt with Benford Law did not explain how to extract the expected duplicates of this law, and as explained in the above, the goal of extracting these equations is to illustrate how to extract the table of probabilities of the Benford Law that will be compared with the actual possibilities of the net profits numbers of the companies in the research sample.

Conclusions

We conclude from our study from the literature review that the Benford Law is an effective way to detect fraud, and this is what most studies have found in this regard, as the Benford Law provides a powerful tool to recognize the nature of the financial statements presented, and gives an accurate picture of the possibility of how they appear. What distinguishes tests under Benford law is that they are straightforward and easy to apply and do not need additional software, but only need knowledge of Excel. It should be noted that it is important to remember that not all financial statements are subject to Benford law, so consideration must be given to the homogeneity of an item of the material being tested and the sample size of at least 40 views for testing and analysis.

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