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INTERNAL AUDITING IN THE FACE OF BANKING FRAUD, APPLICATION OF THE BENFORD LAW ON ALGERIAN PRIVATE BANK

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Abstract
In this paper, we analyze the importance of internal audit against banking fraud in order to ensure banking stability, using mathematic approach. We explain the steps involved in setting up an anti-fraud plan. Then, we implement two phases of this plan, namely the evaluation of the degree of exposure to the risk of fraud in a large private bank in Algeria, and then we propose a tool for detecting fraudulent acts, the Benford law. The result confirms that internal audit is an indispensable function. It enables the bank to have a solid assurance that the risks, to which it is exposed, including the risk of fraud, are under control.

Keywords:Internal audit, banking fraud, benfrod law, Algerian bank

JEL classification: M42, M49

INTRODUCTION

Banking regulations require a strict supervision in the banking environment, especially after the failure of the banking sector because the 2008 financial crisis. The current health crisis Covid19 and the financial recession led to a drastic increase in banking fraud worldwide, which required the implementation of internal audit techniques. Furthermore, the audit function plays a crucial role in assessing banks' internal control, risk management and governance policies, adding value and helping to achieve management's objectives. The internal audit process is the key solution to the fight against bank fraud, as well as its importance in a bank's operations.

Banking fraud leads to financial losses, which in turn can lead to the failure of a bank. Fraud also seriously damages the reputation of a credit institution. For this reason, financial institutions must implement sufficient tools to control the risk of fraud in order to avoid the harmful consequences of such an act and to maintain a brand image with customers and shareholders. Internal auditors faced with fraud ask themselves how to prevent such a risk from occurring, but above all, what tool should

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be used to detect it in order to determine its impact and responsibilities (Pavlović, et al. 2019).

This article attempts to answer the following question: IsBenford's law effective as an audit tool to detect bankingfraud in Algerian private bank ?. To answer this question, we pose the hypotheses developed by (PAVLOVIĆ, KNEŽEVIĆ, JOKSIMOVIĆ, & JOKSIMOVIĆ, 2019, p. 227):

- H0: The sample audited for financial fraud satisfies Benford's law.
- H1: The sample audited for financial fraud does not satisfy Benford's law.

We proposed the Benford Act as an audit tool because audit firms such as KPMG have recommended the use of this law (Pavlović, et al. 2019). Nowadays, it is widely recognized that this law can be used as a relevant approach, i.e. it is effective to perform the Benford tests to detect falsified or fraudulent financial data, however this tool remains little known within Algerian banking institutions hence the importance of this topic.

First, in the first section, we develop a literature review that reflects the importance of internal audit and its impact on the fight against banking fraud. Then, we apply the principle of the Benford law on a major Algerian private bank, in order to test our hypotheses and thus propose a tool to help detect fraud.

1. LITERATURE REVIEW

The recent financial crisis has highlighted weaknesses in internal auditing at the bank level to reduce the negative effects (Ryder 2018). The outbreak of the banking crisis and the period of recession led to a dramatic increase in bank fraud, increasing the need for internal audit techniques. The crucial role of internal audit has been reinforced following the recent financial crisis in 2008 and the COVID 19 health crisis in the prevention, detection and investigation of fraud. As a result, internal audit faces new challenges in terms of expertise and international standards to better protect banks and improve the internal control system (Asante-Appiah 2020).

Vousinas (2015) determine the value of internal audit and then justified the interconnection between internal audit and banking fraud. The consequences of fraud are of great importance because they cause large economic losses that can lead to bankruptcy. Moreover, in the case of fraud affecting customers, the effects are numerous. In addition to fraud, risk is a major factor in banking transactions. The most well known is the operational risk which is caused by an operational failure which includes several possible events such as system failures, as well as acts due to excessive risk-taking. Consequently, operational risk includes fraudulent acts, which in turn generate losses. The author shows that fraud seriously damages the reputation of a bank, especially banks that deal with individuals. To reach this conclusion, the author relies on two studies. A study by Jason Perry, who examined the results of a large sample of financial companies in Europe and the United States, shows that fraud is the event that damages the reputation of a credit institution the most. According to this

study, the circle of fraud, as described by the authors, includes the occurrence of the fraud, the risk and finally the loss.

Furthermore, internal audit is closely linked to fraud, risk and loss because it is responsible for dealing with them. The audit department in a bank uses techniques and tools to combat fraud and prevent loss, while assessing risk. The author then presents the fraud and loss prevention methods used by internal audit. Rewards for whistleblowers, fraud training, an independent audit committee, the establishment of a code of conduct, an external audit of internal controls over financial reporting. Finally, the author presents risk assessment, one of the three pillars of the internal audit function, which covers the bank's value drivers and compliance objectives.

The risk assessment takes into account the impact of risks on shareholder value in order to plan the audit and risk monitoring plan; this is the top-down approach. The fundamentals of contemporary risk management require not only a risk assessment, but also the implementation of processes to address potential risks as well as an adequate internal control environment and the implementation of risk response through control and monitoring activities.

Vousinas (2015)notes that as the role of internal audit continues to evolve, banking management is increasingly relying on internal audit in their efforts to control fraud risks and protect their organizations. The responsibilities of internal audit include not only monitoring and detecting fraud, but also investigating the impact of fraud if it has occurred.

In another recent study, Vousinas (2018) attempts to assess and examine the effective role of the internal audit functions of major Greek banks in the fight against fraud. It points out that, despite the abundance of research on the role of internal audit in combating fraud, the literature on the banking sector is nevertheless recent and limited. Vousinas(2018)took as a sample four Greek banks: Alpha, Eurobank, NBG and Piraeus which, in 2017, represented, in terms of assets, more than 95% of the banking market. The results demonstrate a number of key features of the internal audit function in Greek banks in the fight against bank fraud. Such as the existence of a specialized department responsible for fraudwithin the internal audit function, unlimited access to the required accounts and data, monitoring the risk of conflict of interest, limited use of computer-assisted audit techniques, the need for anti-fraud training for auditors, the lack of audit software that is specific in detecting fraud, a channel for anonymous reporting of cases of fraud. The results also show that an external auditor periodically audits the internal control procedures for fraud risk and that strong anti-fraud controls are applied. The internal audit function of Greek banks is well organized but has some weaknesses, in particular the limited use of computer assisted audit techniques, which demonstrates a need for further automation. Furthermore, as regards fraud awareness, anti-fraud training is recommended for all staff of the internal audit function.

Petraşcu & Tieanu (2014) highlight the role of internal audit in the detection and prevention of fraud. Furthermore, the authors remind us that the role of internal auditing is to assist the company's management in order to increase the efficiency of its

activities and thus create benefit. They used different research methods within the company. First of all, a qualitative analysis based on the benchmarking method by making an analogy between fraud and internal audit. The authors draw the conclusion that all companies require an internal audit in order to ensure effective management of the company and its assets. That is, to reduce costs while maximizing profits and achieving medium- and long-term objectives. Furthermore, internal auditing should not be seen as a burden that generates expenses, but as a tool for fighting fraud and increasing benefit in the future.

Ahmed &Madawaki (2014) identify ways to reduce fraud and forgery by analyzing the causes and effects of fraud and forgery at the Central Bank of Nigeria and selected commercial banks. Two sources of data collection were used: 1- Primary data, collected through a questionnaire that was designed to solicit relevant information. It was addressed to senior, middle and lower level employees in order to respond freely. 2- Secondary data: This is published information that may be useful for a specific survey. The results of this study show that bank frauds have been on the rise despite stricter control measures in commercial banks than in investment banks. The study also suggests that banks need to strengthen internal controls to protect bank assets from fraudulent acts.

In addition, Halbouni (2015) examines the perceptions of internal and external auditors regarding their responsibilities in preventing, detecting and reporting fraud in the United Arab Emirates. The study sampled a population of 53 auditors and explored the procedures followed by internal and external auditors to detect fraud during an audit. On the internal audit side, the results indicate that internal auditors are primarily responsible for identifying fraud incidents and are therefore more concerned about reporting fraud-related incidents.

Cheversa, Lawrencea, Laidlawa, & Nicholsona (2016) examine the factors that influence the effectiveness of internal audit in Jamaican commercial banks. The authors conducted a quantitative study, where the unit of analysis is the firm, to determine the extent to which internal audit is perceived to be effective in Jamaican commercial banks. The study was conducted among 25 individuals (supervisors, middle managers and senior managers who had been in contact with internal auditors) from various departments of the JMMB Merchant Bank organization in Jamaica. The questionnaire was conducted using the Likert scale. The results show that the key factors contributing to the effectiveness of internal audit are the quality of audit work, organizational independence, professional skills and management support.

Stambaugh, Tipgos, Carpenter, & Smith (2012)insist that internal auditors are, by virtue of their function, called upon to participate in the detection and prevention of fraudulent acts. Auditors must have a professional conscience in this respect because of the numerous media fraud scandals in recent years. The authors provide a fraud detection method based on Benford's law, which is a mathematical technique, which uses data to identify irregular patterns that may give us cause for alarm about fraudulent

acts. (Stambaugh, et al. 2012)conclude that this method provides a mathematical basis for internal auditors to identify material errors as well as potential fraud.

In another recent study, Pavlović, Knežević, Joksimović, & Joksimović (2019) recall that Benford's law is primarily a relevant audit tool to detect fraud in financial statements. In this study, the authors analyze the section entitled "Work performed by the company on its own account and capitalized" which was reported in the income statement under item 203, and this by applying the Benford Act. The authors took, as data, all financial reports of companies registered in the Serbian Commercial Register Agency for the period 2008-2013. They selected 1001 observations of the item "Work performed by the company on its own account and capitalized" in the above-mentioned period, while only 327 reported a figure other than zero. The authors also conclude on the multitude of existing tests that are used to apply Benford's law on numerical data such as the chi-square test, the last two digits test, the absolute deviation test, the distortion factor test.

Pavlović, Knežević, Joksimović, &Joksimović(2019) with the help of the above mentioned tests check whether the significant numbers in the numerical data set follow Benford's law or not. The results show that there is a high probability that the frequency distribution of the second digit does not follow Benford's law, which means that financial statement frauds are often carried out using the second digit. These results are not surprising, as fraudulent schemes with the first digit will lead to the opening of a financial fraud investigation and seriously damage confidence in financial information. The authors also point out that numerical and graphical analysis of a random variable that follows Benford's law shows that from the fourth significant digit onwards, almost everything is distributed uniformly. The same is true of the likely distribution of the third digit. This implies that in practice, the application of Benford's law is often limited to the analysis of the probability distribution of the first two significant digits, and sometimes the analysis includes the third significant number in the numerical data set.

Pimbley(2014) analyzes that Benford's Law enforcement is successful in some analyses; however, auditors should always be curious and skeptical when analyzing data integrity. The author then recommends a set of best practices in the application of Benford's Law, such as analyzing initial data to ensure that the values extend over several orders of magnitude. It also recommends that an additional and comparable data set be incorporated into the Benford analysis. Finally, the author points out that this method is a warning signal of potential fraud but not a stand-alone indicator of fraud.

2. METHODOLOGY AND DATA

In this section, we explain the steps involved in setting up an anti-fraud plan. Then, we implement two phases of this plan, namely, the evaluation of the degree of exposure in a major private bank in Algeria to the risk of occurrence of fraud, and then we propose a tool to detect fraudulent acts: The Benford law.

In order to assess the degree of exposure to the risk of fraud of the targeted bank, we propose a questionnaire (Vousinas 2018).It submitted to the various department heads,

which will help us to:- Delimit the perimeter of risk – Assess the degree of risk exposure of this bank – Verify the degree of risk control- Ensure the existence of security procedures and their strict observance – Ensure that the environment is not conducive to the occurrence of fraudulent acts.

In order to respond to these concerns, we will use a simple evaluation method, after reviewing all the elements that have a direct or indirect impact on the degree of control of the risk of fraudulent acts. Our diagnosticis based on the following elements: - Ethical policy of the bank – The way the bank manages the risk of fraud – The environment through the analysis of the risks related to the activity and the risks due to the pressure on the management of the bank – The implementation of internal control mechanisms (permanent and periodic) – Human resources management – Information systems (IS)- Means of detecting fraud.

We opt for a column graph created in Excel, in order to identify the most significant risk elements, to identify the bank's weak points and to evaluate the degree of exposure to fraud. In the following graph, each column represents one of the elements taken into account. The quantification of the questionnaire responses resulted in a breakdown of the bank's fraud risk, illustrated in the graph below:

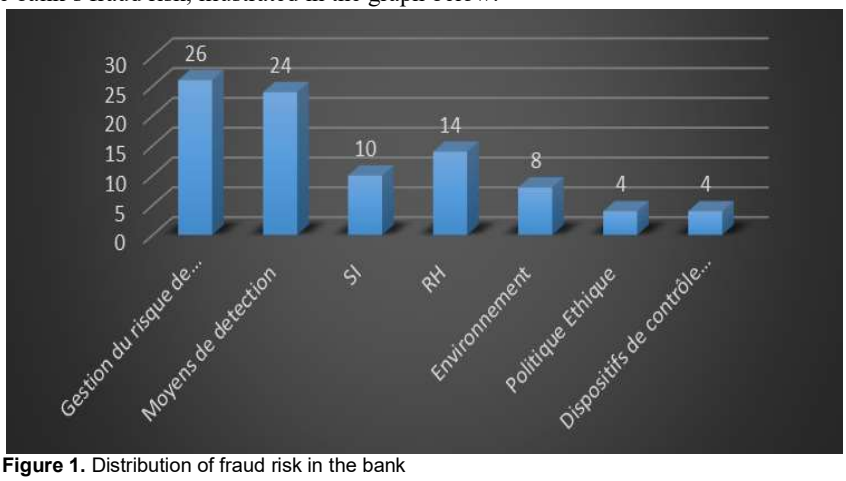

Figure 1. Distribution of fraud risk in the bank

This figure shows, on the one hand, the Bank's strengths in the fight against fraud, which materialize through prevention thanks to the Bank's ethics policy and the effectiveness of its internal control systems. On the other hand, its shortcomings in this area due to poor fraud risk management and virtually non-existent means of detection. Furthermore, as indicated (Vousinas 2018), it is advisable to strengthen the interest given to human resources management by organizing fraud awareness training.

It is also useful (Stambaugh, et al. 2012) to use efficient information systems that allow for the management of file access rights, which reduces the risk of fraud, as well as to use auditing techniques using analytical auditing tools such as ACL (Audit

command Language) or IDEA (Interactive Data Extraction and Analysis). These tools allow large samples of data to be extracted and analyzed to detect irregularities in transactions that may provide early warnings of possible fraud.

2.1. ESTABLISHMENT OF MEASURES TO DETECT FRAUD (BENFORD'S LAW)

The universal numerical system uses numbers from 0 to 9. The first non-zero digit to the left of a number that is used to give its scientific writing is called the first digit. It is the first significant digit of the number under consideration, so it can only be 1, 2, 3, 4, 5, 6, 7, 8 or 9. For example, 8 is the first digit of the numbers: 81, 8.89, 0.08 and 8×10^{-3}. Instinctively, the firsts digits all have the same probability of occurrence: Let the probability of occurrence of the first digit d : p(d) knowing that : d = 1, 2, ..., 9

$P(1) = P(2) = ... = P(9) = 1/9 = 11.11\%$, such as: $0 \leq P(d) \leq 1$

This is true for numbers simulated or obtained from a random number generator, but not for those in "real life"; these follow a strange law called Benford's Law or Law of Abnormal Numbers (Stambaugh, et al. 2012). Benford's law suggests that in a sample of data, the most frequent non-zero first digit is 1, for almost a third of the observations, then 2 itself more frequent than 3 ... and 9 is the least recurrent with a probability of 4.6%, as shown in the table below:

Table 1. Probability distribution according to Benford's Law

First digits(d)	1	2	3	4	5	6	7	8	9
P(d)	30.10%	17.60%	12.50%	9.70%	7.90%	6.70%	5.80%	5.10%	4.60%

2.2. UTILITY OF BENFORD'S LAW

Benford's law is more of an empirical observation made by the astronomer Simon Newcomb in 1881, He had observed a preferential wear of the first pages of logarithmic tables that were grouped in books but his discovery did not meet with any interest for 57 years. Nowadays Benford's law is used in many countries as a tool to detect fraud such as tax evasion as an example.Science has recognized the work done by Benford and this statistical law has seen the name of this engineer attributed to him (Pavlović, et al. 2019).This law was of potential value in detecting fraud in a database(Varian 1972). In the banking industry, the Benford Act could be very useful as a fraud detection tool for internal auditors, whether these fraudulent acts are internal (frauds committed by employees) or external (frauds committed by customers in order to defraud or launder money) (Pavlović, et al. 2019).

2.3. PHASES OF APPLICATION OF THE BENFORD TEST

The implementation of the Benford test on a sample of data consists of several steps:

A. Analysis stage: This step consists of choosing a target, collecting, and filtering the data.

B. Choice of target: We took as a sample the cash transactions carried out by 14 randomly selected agents in order to test this law.

C. Collect and filter the data: After having collected the operations carried out by the 14 agents using an extraction of the database, we then carried out a filtering in order to not take into account irrelevant data that could create interferences that could distort our results.

D. Sample: 14 bank agents

E. Data period: 30/06/2019 to 30/06/2020

F. Filtered data :We have not taken into account:

- Transactions that are automatically generated by the system.
- Auto-clearing of check.
- Foreign currency transactions.

We have also, in the case where two transactions are linked, kept only one of them (such as a credit and debit transfer) due to statistical constraints in order to ensure the independence of the data. If we were to use related transactions of an equal amount, one of which is entered at the beginning and one of which is credited, this would increase the frequency of the first digit of the amount and would make our test erroneous, since the amount represents only one transaction.

Banking agent	Number of operations performed
A 1	785
A 2	14110
A 3	4305
A 4	11330
A 5	11834
A 6	340
A 7	13932
A 8	7864
A 9	4361
A 10	4842
A 11	15689
A 12	16077
A 13	1358
A 14	13783

3. RESULTS

After filtering the data, we make a test to verify the adequacy to Benford's law. The purpose of this test is to compare the distributions of our sample with the theoretical distributions of this law in order to verify whether the deviations are significant or insignificant.

We decided to illustrate this test with a representative bank agent: the agent Number 12 who totals the largest number of cash transactions, i.e. 16077 transactions.

In order to test the starting hypotheses:

- H0: The sample, of audited data, satisfies Benford's law.
- H1: The sample, of audited data, does not satisfy Benford's law.
- Taking a significance level of β=95%.

3.1. CALCULATION OF EMPIRICAL NUMBERS

The A12 sample of 16077 cash transactions yielded the results shown in the table and histogram below:

Table 2. Sample size

Benford	Sample	FirstDigit
4839	4481	1
2829	2822	2
2009	2022	3
1559	1573	4
1270	1265	5
1077	1101	6
932	928	7
819	815	8
739	737	9

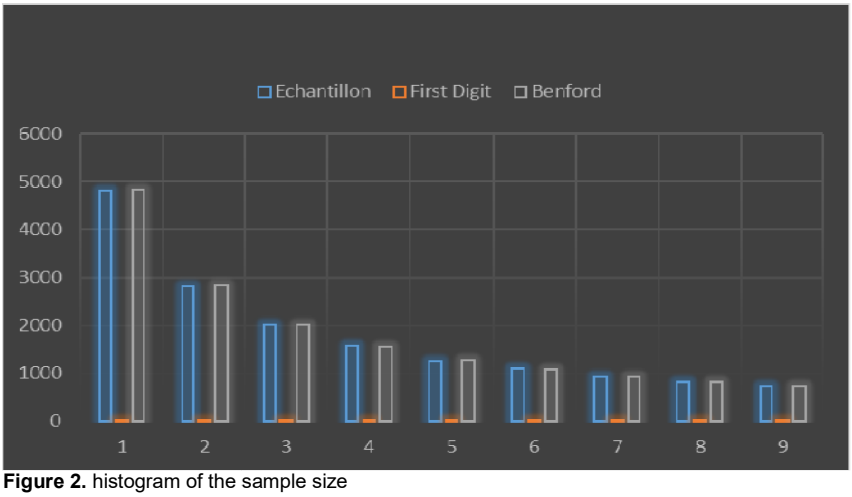

Figure 2. histogram of the sample size

The first column of table n°1 corresponds to the number of first digits, which one is supposed to have in a sample of 16077 numbers. While the second column corresponds to the number of appearance of the first digits of the amounts exchanged during these cash operations.

3.2. IMPLEMENTATION OF THE CHI-SQUARE TEST X^2

In order to highlight the differences that exist between the frequencies of appearance of a first digits in the distribution of our sample and the Benford distribution, we follow the method developed by (Nigrini 2011), by calculating the distances of Chi-Two χ^2 (at eight degrees of freedom) as shown below:

$$D(x^2) = \sum_{i=1}^{9} \frac{(n_i - N p_i)^2}{N p_i}$$

- *ni*: Frequency observed in the sample.
- *N*: Total number in the sample.
- *pi*: Probability of occurrence according to Benford's law.
- *Npi*: Frequency according to Benford's law.
- If D (χ^2)< threshold => we accept H0 and refuse H1
- If D (χ^2)> threshold => we refuse H0 and accept H1

After performing the Chi-Square test, we obtained the results shown in the table below. Indeed, the column distance from (χ^2) allows us to identify, in the sample, the Chi-square values that have the most impact in exceeding the threshold of the Chi-square table, with a confidence level of 95%. This is possible because the distance column of (χ^2) contains the Chi-square distance values that are evaluated individually by first digit.

Benford	Echantillon	First Digit	Distance du khi-deux	Anomalie/OK
4839	4814	1	0,129158917	OK
2829	2822	2	0,017320608	OK
2009	2022	3	0,084121453	OK
1559	1573	4	0,125721616	OK
1270	1265	5	0,019685039	OK
1077	1101	6	0,534818942	OK
932	928	7	0,017167382	OK
819	815	8	0,01953602	OK
739	737	9	0,00541272	OK
			0,952942697	

The Chi-square distance is the sum of the individual distances, in our case it corresponds to:D (χ^2)= 0.9529

3.3. CONCLUSION PHASE

In this stage, the results of the Chi-square adequacy test are analyzed. It is then observed that the individual distances are relatively small. Moreover, the critical threshold of Chi-square not to be exceeded for a sample of 16077 can be determined either by the Chi-square table at a confidence level of 95%, or by using the Excel function KHIDEUX.INVERSE (0.05;8), we find the critical threshold of Chi-square = 15.5073131. This confirms the H0 hypothesis. So, D (χ^2) < threshold => we accept H0, The audited sample, in order to detect fraud, satisfies Benford's law.

4. DISCUSSIONS

A priori, agent number 12 did not commit fraud, however, it is necessary to stress that Benford's law can only be effective if the fraud has been committed in a recurrent and repetitive manner. This law cannot detect an isolated act. Consequently, in the context of audit missions carried out with a view to combating internal fraud, it is essential to carry out additional checks. This law is therefore only a warning indicator. The auditor must therefore keep a critical mind and show curiosity and skepticism when analyzing the authenticity of data (Pimbley 2014).

Moreover, this law cannot be implemented on reduced samples. For example, if you test a bank account with only 15 checked over a period of one year, the sample selected will not satisfy Benford's law. You must select larger samples so that the test can be implemented.

In addition, the numerical data analysis also points out that numerical and graphical analysis of a random variable that satisfies Benford's law shows that from the fourth and subsequent significant digits, almost everything is distributed uniformly. The same is true for the likely distribution of the third digit. This implies that in practice, the application of Benford's law is often limited to the analysis of the probability distribution of the first two significant digits, and sometimes the analysis includes the third significant number in the numerical data set (Pavlović, et al. 2019).

Among other limitations of this Benford'slaw, it does not apply to all types of data; numbers assigned to accounts do not comply with this law. This law is applicable to socio-economic data but is not applicable to data such as the size of individuals because most data will begin with the number "1". Analysis of the initial data ensures that the values extend over several orders of magnitude, as well as the integration of an additional and comparable data set for Benford's analysis (Pimbley 2014).

CONCLUSION

Through our analysis, we confirm that internal audit is an indispensable function. It enables the bank to have a solid assurance that the risks, to which it is exposed, including the risk of fraud, are under control. As for the internal audit, in addition to acting as a deterrent function, it also plays a preventive role against fraudulent acts. The audit assesses the effectiveness of internal control and proposes various corrective measures to remedy any shortcomings found. The internal audit also has a preventive role in creating an ethical culture within the company, through the respect of a code of ethics within the banks. Protecting a financial institution against fraud is not an easy task; therefore, the internal auditor must have technical skills, critical thinking and skepticism in order to assess the degree of the bank's exposure to the risk of fraud.

We have proposed Benford's law as an audit tool because, as has been pointed out, its use is recommended by audit firms. Nowadays, it is recognized that this law can be used as a relevant approach, i.e. it is effective to perform the Benford tests to detect falsified financial data, as well as fraudulent financial data.

Our study confirmed the original hypothesis H0: the audited sample, in order to detect fraud, satisfies the Benford law and demonstrates the contribution of this tool in detecting fraud as well as its deterrent role. However, there is no such thing as zero risk because with each new anti-fraud tool, perpetrators of fraudulent acts show ingenuity in evading controls, hence the need to employ new tools for detecting fraud in the banking environment such as the Benford Law used in our study. Nevertheless, the internal auditor must conduct additional audit work and employ other analytical tools in the event that fraud is suspected and should not be limited to the results of the application of the Benford Act in its conclusions.

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