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Using Benford's Law to Detect Suspected Creative Accounting: A Simple Tool for Small Accounting Firms in Emerging Economies

Carlos Daniel Milani[1] and Nicolas Epelbaum[2]

[1]Facultad de Ciencias Economicas, Universidad Nacional de Córdoba, Argentina.
E-mail: carlos.milani@unc.edu.ar
[2]Ted Rogers School of Management, Toronto Metropolitan University, Canada.
(Corresponding author: Email: nicolas.epelbaum@torontomu.ca)

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Abstract: Large data series collected over an extended period of time have a tendency toward conformity with Benford's law in the first few digits. According to this law, the first digit in a group of more than 1,000 numbers is equivalent to 1 in 30.10% of cases, 2 in 17.60% of cases, with the probability of appearance logarithmically decreasing as the first digit increases This study details a straightforward yet effective audit procedure employed by a small accounting firm in an Argentinean provincial economy to identify mistakes and raise concerns about possible creative accounting by clients. Through this assurance procedure, the audit firm examines client-provided data to determine whether Benford's law is being followed. Excel spreadsheets' automated features are employed for this. To illustrate the tool's usefulness, the annual sales of three of the firm's clients were examined. The findings indicate that every client has a distinct profile. Client 1 fully complies with Benford's law, leading to an unqualified opinion in the auditor's report; Client 2 continues to comply with Benford's law but raises some concerns that should be discussed with management before issuing the audit opinion; and Client 3 exhibits low conformance and raises several red flags that require discussion with management. This work introduces granular data, which allows for the development of tenable hypotheses for the observed nonconformity, such as product mix and inflation.

Keywords: Audit of Financial Statements, Small-Accounting Firm, Audit Procedures, Audit Risk, Benford's Law.

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1. INTRODUCTION

By creating financial statements, entities inform external stakeholders about their financial activity. Their primary goal is to facilitate economic decision-making by giving external users access to the issuing entity's financial data as of a certain date as well as its financial and economic development over the period they cover (FACPCE, 2000). Because the company's management issues its own financial statements, the financial information issued may not be trustworthy considering that management may have different goals and objectives as compared to other stakeholders such as creditors and investors. Before releasing the entity's financial statements to external users, an independent external auditor is appointed to conduct an audit of the financial statements in order to reduce the likelihood that the entity may present inaccurate information. In an external financial audit, the auditor applies professional judgment to collect sufficient and appropriate audit evidence. Consequently, the auditor's main consideration is to determine if the evidence obtained is sufficient to issue an opinion (ISA 200, 2006), as a wrong opinion could lead to professional (Code of Ethics) and criminal (Penal Code) sanctions.

During an audit, there is a risk that the data that the entity shares with the auditor contains errors, both inadvertent and voluntary. An example of the latter is creative accounting, which arises when the management of the audited organization manipulates the information, reporting data that does not reflect real operations (Vega Falcón, 2019). As such, part of the audit process requires the auditor to examine the reliability and integrity of the information using audit procedures including inspection, observation, confirmation, recalculation, reperformance, and analytical procedures.

According to International Standards on Auditing (ISA) 520, analytical procedures are defined as "evaluations of financial information through analysis of plausible relationships among both financial and non-financial data. Analytical procedures also encompass such investigation as is necessary of identified fluctuations or relationships that are inconsistent with other relevant information or that differ from expected values by a significant amount." (ISA 520 Para. A1–A3, 2009). ISA encourages auditors to perform analytical procedures during the planning, execution, and completion phases of the audit to identify, among others, the existence of unusual trends (ISA 300, 2009; ISA 315, 2016; ISA 330, 2006). In this study, we focus on a specific analytical

procedure, Benford's law, to detect the possible manipulation of the data received by the external auditor from the client. In this regard, the aim is to prove the veracity of the information sent by clients to a small-sized accounting firm in an emerging economy using Benford's law.

Formulated originally by Frank Benford, a physicist at GE Research Laboratories, Benford's law considers certain digits to appear more frequently than others in a naturally occurring data set (Benford, 1938). The law predicts that in a given dataset, 30.10% of the numbers begin with digit 1, 17.61% with digit 2, successively descending logarithmically to 9 with an incidence of 4.58% (Benford, 1938). If the observed frequency and the expected frequency show a significant difference, it is an indicator that the data has possibly been invented or modified (Vega Flores, 2012). In an accounting context, the law has been used to verify whether or not the behaviour of a set of numbers conforms to expectations, assuming no interference or manipulation (Nigrini, 2012). The digital analysis of numerical patterns allows auditors to detect anomalies in the numbers and combinations of digits. Indeed, empirical studies indicate that the digit patterns of numbers generated without any manipulation should conform to expected digital frequencies (Nigrini & Mittermaier, 1997).

This study documents the use of Benford's Law in a small accounting firm located in a regional economy of Argentina to detect errors and raise concerns on the potential use of creative accounting by clients. To illustrate the applicability of the tool, annual sales of three clients of the firm were considered. Results show each client with a different profile, with Client 1 fully conforming to Benford's law, Client 2 still conforming but raising some issues of concern that need to be discussed with management, and Client 3 with low conformity and raising several red flags that require discussion with management. These findings allow for the emergence of potential explanators for the nonconformity observed such as product mix and inflation.

This study's main contribution is to demonstrate how Benford's Law can be applied as a practical and affordable tool that small accounting firms that work with small and medium-sized businesses (SMEs) could use. Information opacity increases the likelihood that the auditor would receive inaccurate information during the audit of SMEs (Schlaps *et al.*, 2015). Given that SMEs make up 99.5% of the business universe in Argentina (Schlaps *et al.*, 2015), our case study demonstrates how Benford's law can be applied to evaluate the accuracy

of accounting data, particularly when an entity's internal control environments are insufficiently robust to support a reduction in substantive testing.

The remainder of this paper is structured as follows. The second section reviews the literature focusing on the use of Benford's law in assurance in Latin America. The third section reviews the details of the accounting firm and the methodology employed. The next section describes the data and analyses performed for the three clients. The last section provides some concluding remarks.

2. PRIOR LITERATURE REVIEW

Though creative accounting is a means of manipulating accurate accounting data in order to mislead financial statement users, accounting is an essential tool for understanding history since it enables us to see the economic, social, and symbolic elements of societies. This also applies to SMEs of emerging nations of regional economies, but these organizations do not adequately monitor their internal control frameworks and are not subject to external financial statement audits. The literature has a long list of objectives sought through the manipulation of accounting information; however, the reality of many SMEs in emerging economies is that they alter the data either to appear more robust and profitable when qualifying for debt or to minimize their tax bills either via tax avoidance and/or tax evasion. Small accounting firms that serve SMEs are caught in a difficult situation where, on one hand, they act as consultants to help clients be more profitable, and, on the other hand, they are legally liable for their clients' misstatements in audited financial statements that are submitted to lenders and tax authorities. In this context, Benford's law has been presented as an objective tool to analyze large data.

2.1. Benford's law in assurance and Latin America

Rather than examining individual transactions, auditors may find it helpful to analyze aggregate data. Numerous articles promote Benford's law analysis as a simple and effective way for auditors to identify operational discrepancies or creative accounting. Comparative review is one of the most effective methods used as substantive audit evidence as it is based on the observation of relationships between accounting data and logical behavior of change. In this way, horizontal and vertical analysis of accounting data is carried out. This type

of analysis allows the auditor to understand why an increase in sales would lead to a proportional change in the cost of goods sold.

Benford's law can be formally stated as follows where d_1 is the leading first digit that can take a value of 1 to 9 (Caputi Zunini, 2016):

$$\text{Prob}(D_1 = d_1) = \log\left(1 + \frac{1}{d_1}\right); \qquad d_1 \in \{1, 2, \ldots, 9\}$$

This formula explains that in a naturally occurring data set, we expect to see the number 1 as the first digit in 30.10% of the cases, the number 2 in 17.61% of the cases with this pattern logarithmically decreasing until reaching a frequency of 4.58% for 9 as the first digit. This same formula can be generalized to calculate the first-two, first-three, first-four, and so on digits (Nigrini, 2012):

$$\text{Prob}(D_1 = d_1, \ldots, D_k = d_k) = \log\left[1 + \left(\frac{1}{\sum_{i=1}^{k} d_i \times 10^{k-i}}\right)\right]$$

Benford's law has a long history, which is described in more detail by Etim *et al.* (2023). Pinkham (1961) conjectured that there must be a law explaining digit frequencies that was general, regardless of whether physical, chemical, monetary, or demographic magnitudes were measured. Raimi (1969) mathematically demonstrated the scale independence of Benford's law, confirming it is applicable regardless of the unit of measurement despite having no practical purpose in his view. Fortunately, Varian (1972) argued that Benford's law can be used to validate socioeconomic data, and since then a trove of publications has emerged, some of them using Benford's law for assurance procedures. Nigrini and Mittermaier (1997) were among the first to apply Benford's law to accounting with the aim of detecting fraud. The first author published various articles detailing practical applications of digital analytics for auditors that culminated in a comprehensive book (Nigrini, 2012). More recently, technological changes and an abundance of data availability have given a new impulse to Benford's law studies in fields of social sciences, accounting, and especially forensic audit (Öztürk & Usul, 2020), as well as its international generalization (Etim *et al.*, 2023; Sylwestrzak, 2023). Most recently, accounting studies have focused on applying Benford's law to study

earnings management (Tran *et al*., 2023; Tran, 2024) and its integration with artificial intelligence (Wiryadinata & Sugiharto, 2023).

In Latin America we documented several studies using Benford's law for various purposes. Cerani Orozco and Olivera (2015) studied a numerical set of the 2010 census compiled by the national statistical institute of Argentina (INDEC) and observed high conformity with Benford's law. Shi *et al*. (2018) analyzed the 2000-2014 financial data of 10 industrial sectors of Mexico compared with seven other developing countries (China, Brazil, India, Russia, Indonesia, Turkey, and Saudi Arabia), and results showed compliance with the law after the elimination of some abnormal values and unavailable data, leading to the conclusion that it does not prove the accuracy of the data, so deviations would not be conclusive evidence of data manipulation. Miranda-Zanetti *et al*. (2019) performed an analysis aided by Benford's law and noted that the Argentinean national government manipulated national inflation data from 2006 to 2015. However, the most recent publications that use Benford's law have focused on its applications in audit and assurance. Morales *et al*. (2022), showed that Benford's law is useful in assisting internal auditors in reviewing the integrity of high-volume datasets, Bagua *et al*. (2023) showed the application of Benford's law for audit purposes in the Ecuadorian financial sector, and de Oliveira *et al*. (2024) demonstrated the veracity of the law for the first, second, third and fourth digits for the balance sheets of a company in the State of São Paulo.

In summary, the literature has argued and determined empirically that a distribution of the first digits of a set of numerical values that does not conform to Benford's law could serve as a warning against manipulated, abnormal or duplicate data. An underlying premise is that people do not perform well at conceiving false numbers and trying to show that they are authentic (Nigrini, 2012). In practice, it has been proven that if someone falsifies records, they will invent data using mostly numbers that start with 5, 6 and especially 7, which belong to the middle of the scale, and few that start with 1. This distribution of the first digits, by deviating from the expected behavior proposed by Benford's law, could serve as a red flag to auditors. However, for Benford's law to be applicable, the ideal is to have at least 800 data points (Morales *et al*., 2022), which is very similar to Nigrini (2017) and significantly higher than Wallace (2002).

2.2. Auditing and auditors of SMEs in Argentina

In Argentina the work of the Public Accountant is carried out by independent professionals or professionals employed by accounting firms. Financial statement auditors are independent experts who hold accreditation from the province's Professional Council of Economic Sciences (García *et al.*, 2021). Being both a mental attitude and a normative issue, the auditor's independence is the foundation for the trust that is built in the auditing profession (Viloria, 2009). As long as they receive separate remuneration for their fees, the same professional who manages bookkeeping can also serve as the auditor, according to Technical Resolution No. 53. This highlights a unique aspect of the auditing profession in Argentina for SMEs, where self-review is accepted.

Within Argentina there are several regional economies outside the powerhouse of Buenos Aires, with the province of Cordoba being one of them. Most audits carried out in the province of Córdoba are on clients classified as SMEs. Indeed, more than 80% of the 31,178 procedures on financial statements legalized by the CPCE of Córdoba in 2021 (CPCE, 2022) were classified as small entities according to the guidelines of Technical Resolution No.41 of FACPCE. This reflects that not all SMEs prepare financial statements because in Argentina SMEs constitute 99.5% of the business universe (Schlaps *et al.*, 2015).

One of the characteristics of SMEs is the information opacity, which is manifested in the little trust generated by their financial statements. In general, accounting in this type of entities is usually carried out incompletely and at the wrong time even when small accounting firms or independent professionals are involved. This situation causes a lack of reliable and timely information that impedes external users from knowing the real financial and economic situation of the company. Consequently, the audit risk in SMEs increases inversely to the quality of internal controls by increasing the probability of errors in accounting records (FACPCE, 2021). Therefore, the auditor should increase the number of substantive audit tests and the scope of the audit tests when dealing with SMEs. Audits executed by independent public accountants use generally selective tests that assess the inherent, control, and detection risks that the independent public accountant is willing to assume. Inherent risk is the susceptibility of an account balance or transactions to contain a material misstatement. While control risk is the possibility that an error exists, and the

internal control system of the audited entity does not detect and correct it. Finally, the detection risk arises when the auditor fails to detect a misstatement that exists (ISA 200).

SMEs in regional economies of emerging countries like those in the province of Cordoba, Argentina, do not perceive the importance of investing in external audits of their financial statements. The public accountant in their auditing and assurance role adds value by examining the entity's records, accounting, and financial statements and producing a report that is informative for external users (Vasile & Croitoru, 2020). In summary, it is observed that in SMEs in Argentina, in general, the internal control system is deficient or non-existent. This situation increases control risk and generates the need to carry out audit procedures greater than those required if the controls were adequate. This also requires larger samples to be taken, increasing the number of items in each class, and in this context, an early warning tool such as Benford's law can be very useful and cheap to implement in accounting firms serving mostly SMEs.

3. METHODOLOGY AND RESEARCH DECISIONS

This descriptive study details a local accounting firm's assurance practice. One of the authors had complete access to all of the interviews and documentation, including official and informal records of the accounting firm's clients such as purchases, sales, and other pertinent transactions. This study follows the idea of interventionist research (Jönsson & Lukka, 2007) because one of the authors works as a consultant for the local accounting firm and is the one doing the data collection, interviews, the design and implementation of the Excel spreadsheet tool in-situ. Despite the lack of triangulation and use of secondary sources to increase the reliability of the study, it is accepted that this methodological approach generates useful results and conclusions for professionals and academics although it does not allow for theoretical generalization (Gil Robles, 2018; Yin, 2017).

Following Nigrini (2012, 2017), this study documents a simple assurance procedure for small and local accounting firms. The purpose was to detect errors or manipulations in the data sent to the firm by clients. These data are used in the external audit of financial statements and in checking the accuracy of tax preparer documents for national value-added tax (VAT), provincial gross income tax, and municipal commerce and industry fees. An Excel spreadsheet was designed to compare the distribution of the first digit of sales amounts with

the distribution of Benford's law. When designing the assurance procedure, we checked all required conditions for Benford's law to be applicable (Vega Flores, 2012). It was determined that the measurement of the data set was on the same scale, the numbers are not assigned (such as telephone numbers preceded by the area code), the number of small values must be greater than that of large numbers (done by executing a sorting by size), the size of the data set must be large enough (more than 1,000), and data of multiple periods of time. Having satisfied all conditions, we are ready to test if the distributions of the first digits of a set of numerical values conforms to Benford's law and use the tool as an early warning mechanism regarding manipulated, abnormal, or duplicate data submitted by clients.

3.1. Exploratory study of practical experience on a local accounting firm

The interventionist research was carried out in February and March 2023 in a small accounting firm founded in 1946 in the city of Córdoba (Argentina). One of the authors works as a consultant for the firm, and the motivation for this work was laid out in two interviews with the senior partner and heir of the founder. The senior partner explained they serve a multitude of clients, but clients are normally grouped by complexity level into two groups: 1) SMEs that are important and complex clients (although there is one that stands out above the others due to its magnitude), and 2) other clients with lesser complexity, such as independent professionals (architects, medical doctors, dentists, engineers, etc.), VAT-registered managers, and non-profit entities. For the first group, the accounting firm provides payroll services, labour and pension advice, tax planning and filling, compliance and audits, accounting and audit advice, advice on corporate matters, representation for procedures in the Inspection of Legal Entities, and financial advice. For the second group, most of the services are related to tax filing and audits. The accounting firm is organized around five areas of expertise: labor, tax, corporate, accounting, and auditing. The firm uses Holistor as their accounting system, with the following modules: Accounting, VAT Registration, Salaries and Wages, Companies Information Regime, Purchases and Sales Information Regime, Natural Persons, Legal Entities, and Administration of Firms. It also has the 3C Web ERP management system, which is used by some clients, allowing quick online access to their books.

The accounting firm provided the consultant doing the interventionist research with access to physical and electronic documents. From the initial interview, it emerged that the data sent by clients arrive separately and directly to the different areas of the firm: the labor area receives monthly updates on registrations, cancellations, vacations, and licenses; the tax area receives the data of its responsibility on a monthly basis, especially the purchase and sales data that feed the Value Added Tax (national), Gross Income (provincial), and Commerce and Industry (municipal) declarations; and the same applies to the accounting and auditing area, although in this case the information refers to annual financial years. We focus the study on the tax, accounting, and auditing areas, and we start collecting data in the tax area; specifically, purchases reported by the client are compared with the tax authority online reporting system (AFIP, Mis Facturas) as well as the sales reported by the company that are also cross-referenced with the AFIP page. Clients send their data to the accounting and auditing area in Excel or .pdf format (exported from their management systems), which is complemented with information coming from third parties, such as banks and investment fund account summaries. Once the data is consolidated in one Excel file per client, we proceeded with the analysis as reported in the following section.

4. RESULTS AND DISCUSSION

To implement the procedure, an Excel spreadsheet was used in which the data received from each client was entered. This was possible because most of the management systems (ERP) used by the firm's clients allow reports to be extracted in .xls format (account ledgers, trial balances of sums and balances, sales and purchase lists). Most clients have a custom-designed IT system, although many use Presea and Flexxus; in all cases the client's database was directly exported to Excel. The procedure starts with a list of monetary values of any item or account; normally the first one is the sales made. A second column is added where the automatic EXTRACT formula was applied to each of the cells of the first column to identify the first digit of each amount. The COUNTIF function is then applied to that second column to build a table that compares the theoretical distribution (from Benford's law) and the actual observed appearance of the first digit of the list. The comparison between the actual distribution and the expected as per Benford's law can be presented as a numerical table or a comparative bar graph.

A visual analysis of the table and graph might suggest deviations, but there is an unbiased analysis that can be performed. A goodness-of-fit test can help to determine if the actual data follow the probability distribution expected by Benford's law. Morales *et al*. (2022), following Nigrini (2012), consider that the goodness of fit analysis should be applied using the mean absolute deviation (MAD) test because it does not depend on the sample size. This value is obtained by adding the deviations in absolute value using the following formula:

$$MAD = \frac{1}{9}\sum_{d=1}^{9}|P_{obs}(d) - P_t(d)|$$

where $P_{obs}(d)$ is the frequency of occurrence observed and $P_t(d)$ is the expected frequency of occurrence according to Benford's law.

By performing the goodness-of-fit analysis using the MAD, the level of conformity of the large data set can be determined according to the range where the values obtained fall. The conformity of the data to Benford's law can be Close, Acceptable, Marginally or Nonconforming; the cut off points are presented in Table 1.

Table 1: MAD Conformity ranges for first digits (table 7.1., Nigrini, 2012: p.160)

MAD Critical values range	*Conformity Levels*
0.000 a 0.006	Close Conformity
0.006 a 0.012	Acceptable Conformity
0.012 a 0.015	Marginally Acceptable conformity
More than 0.015	Nonconformity

Three clients of the accounting firm were selected for this study because each one of them has a different conformity qualification. Client 1 reported 10,671 sales in the fiscal year, Client 2 reported 101,296 sales operations in the gastronomic business (due to a change in the computer management system in March 2022, the period between April 2022 and May 2023 was considered) and Client 3 had 491,613 retail sales. We set the minimum number of records with positive real numbers to be equal or greater than 1,000. Only Client 1 has some months with less than 1,000 recorded sales limiting the analysis to annual data. Considering only annual data, it is observed in Table 2 that

Client 1 has close conformity, client 2 acceptable conformity but client 3 has nonconformity.

Table 2: First digit distribution comparative of 3 clients and their ranking based on conformity (MAD)

First digit	*Benford's law*	*Client 1*	*Client 2*	*Client 3*
1	30.10%	29.43%	30.25%	51.66%
2	17.60%	17.58%	18.15%	9.69%
3	12.50%	11.58%	14.58%	3.85%
4	9.70%	10.07%	9.26%	3.62%
5	7.90%	7.01%	7.06%	5.48%
6	6.70%	6.55%	5.84%	7.46%
7	5.80%	6.78%	5.73%	6.13%
8	5.10%	5.73%	4.77%	6.52%
9	4.60%	5.25%	4.35%	5.58%
		100%	100%	100%
MAD		0.0059	0.0062	0.0557
Conformity		Close	Acceptable	Nonconformity

If data can be disaggregated by month or by another factor (e.g., region,

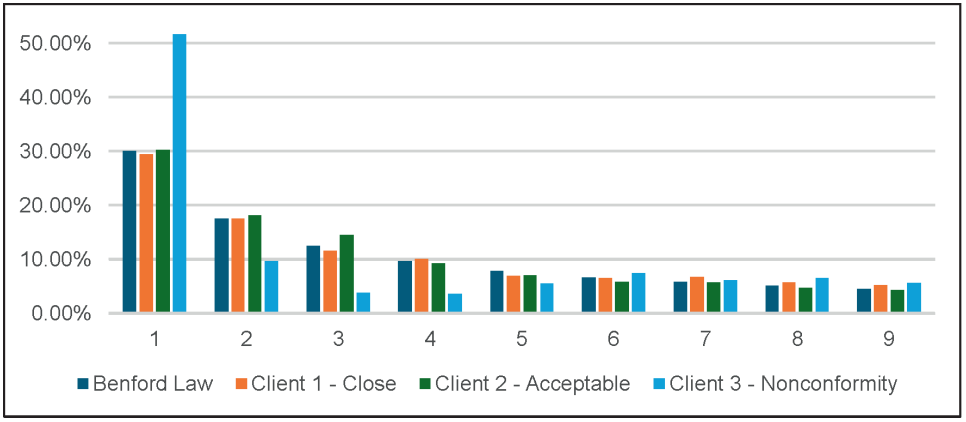

Figure 1: Distribution of first digit for all 3 clients - Yearly

client, etc.), a more granular analysis can be performed. Client 2 is a company in the gastronomic sector where the monthly data shows that in April 2022 the digit that most significantly deviates from the distribution proposed by Benford's law is 2, while in March 2023 the digit that most significantly

Table 3: Monthly distributions of Client 2 (Acceptable conformity) – Benford's law vs. observed

First digit	*Benford's law*	*Yearly*	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*	*January*	*February*	*March*
1	30.10%	30.25%	29.76%	28.49%	28.39%	27.40%	28.13%	29.62%	31.68%	30.28%	34.50%	28.13%	33.47%	31.07%
2	17.60%	18.15%	20.98%	21.30%	21.20%	22.30%	18.99%	18.33%	17.33%	14.97%	12.39%	14.97%	16.33%	15.91%
3	12.50%	14.58%	13.34%	12.94%	13.50%	14.60%	13.36%	13.56%	15.26%	18.76%	18.49%	15.06%	12.33%	13.06%
4	9.70%	9.26%	8.32%	9.19%	9.39%	9.54%	11.40%	9.30%	7.79%	7.30%	6.73%	9.38%	11.27%	12.91%
5	7.90%	7.06%	6.11%	7.10%	6.02%	6.55%	9.43%	8.61%	7.72%	7.10%	6.58%	6.36%	6.41%	6.15%
6	6.70%	5.84%	4.89%	4.10%	4.62%	5.32%	5.82%	8.08%	8.43%	7.20%	6.23%	5.25%	3.63%	3.41%
7	5.80%	5.73%	6.62%	6.93%	7.01%	5.64%	4.24%	4.22%	3.89%	5.57%	7.05%	4.25%	6.01%	6.90%
8	5.10%	4.77%	5.05%	5.39%	5.03%	4.40%	3.70%	4.18%	4.05%	4.48%	4.47%	4.80%	6.57%	6.18%
9	4.60%	4.35%	4.93%	4.56%	4.85%	4.26%	4.94%	4.10%	3.86%	4.34%	3.56%	4.23%	6.57%	4.40%

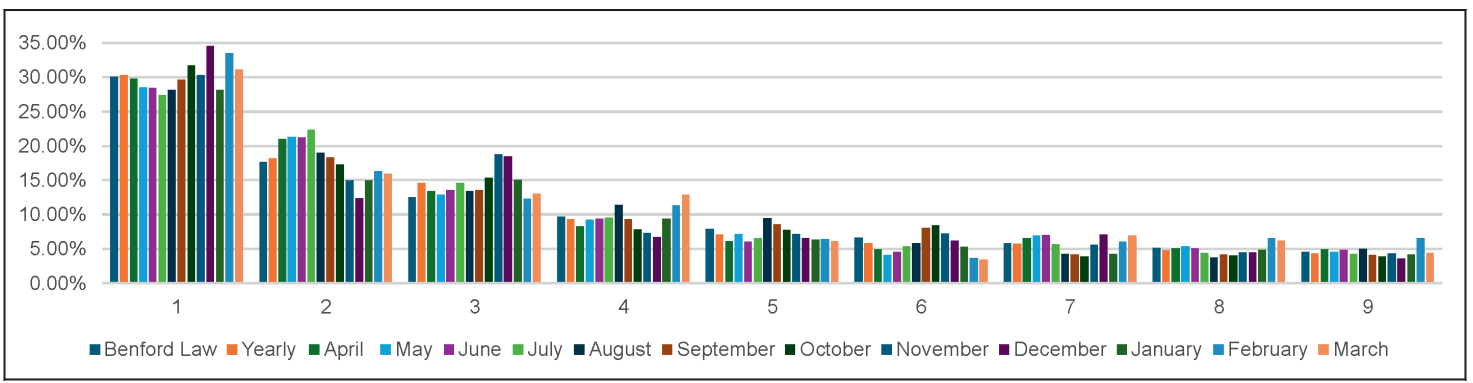

Figure 2: Distribution of first digits annual and monthly for Client 2

deviates is 4. This issue has to do with the price of the coffee cup, which is the client's best-selling product. At the beginning of the financial year, the cost of this product was $200 Argentine Pesos, while in the last month the price exceeded $400 Argentine Pesos due to inflation (see Table 3). After the analysis, the auditor can conclude that the acceptable conformity level is mainly explained by the change in price of the item they sell the most; therefore, the data submitted by Client 2 can be trusted.

For nonconformity cases such as the one of Client 3, it is important to disaggregate the data in a meaningful manner to proceed with further analysis. Client 3 is a retail company that sells shoes; therefore, the impact of inflation is expected to be important as well as special discount periods such as Cyber Monday. Most sales correspond to the same product: one pair of shoes per transaction because there is no "buy one, get one" offers. In the first two months of the period analyzed, many pairs of shoes were sold for $5,000 to $6,000 Argentine Pesos and the number that most deviates in those months is 6. But starting in the third month (March), the nonconformity is driven by the digit 1 because by then the average price of shoes exceeded $10,000 Argentine Pesos due in part to inflation (see Table 4). During the year analyzed, the prices of the most sold product (a pair of shoes) began with the lowest value in January ($6,000 Argentine Pesos), showing an increase in March, exceeding $10,000 Argentine Pesos. During the rest of the year the amounts continued to rise gradually, although without reaching $20,000 Argentine Pesos. In this way, it is observed that 51.66% of the yearly sales amounts begin with the digit 1, showing that compliance is low. For an analysis to be valid, Benford's law compliance needs to be supplemented with another analysis, which might be the monthly inflation index or the price progression of the best-selling product.

5. CONCLUSIONS LIMITATIONS OF THE STUDY AND FUTURE RESEARCH

In order to demonstrate how Benford's law might be used to identify mistakes and raise concerns about clients' possible use of creative accounting, this study uses data from three SMEs that were audited by a small accounting firm in the province of Cordoba, Argentina. According to previous research, leading digits from a non-assigned dataset collected over an extended period of time have a propensity to follow Benford's law, making them suitable for use as an early

Table 4: Monthly distributions of Client 3 – Benford's law vs. observed

First digit	*Benford's law*	*Yearly*	*January*	*February*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*
1	30.10%	51.66%	16.01%	19.05%	35.05%	46.91%	52.64%	59.12%	60.34%	60.54%	63.35%	63.64%	59.77%	59.27%
2	17.60%	9.69%	7.25%	4.72%	6.07%	8.07%	7.41%	7.09%	9.53%	9.35%	10.90%	12.74%	14.14%	13.57%
3	12.50%	3.85%	6.19%	3.74%	3.86%	3.58%	3.09%	3.71%	4.01%	3.70%	3.62%	3.54%	3.60%	4.33%
4	9.70%	3.62%	6.72%	4.25%	3.85%	4.01%	3.72%	3.39%	3.20%	3.89%	4.30%	3.65%	2.55%	2.13%
5	7.90%	5.48%	11.17%	12.28%	8.25%	4.65%	4.17%	3.34%	3.34%	3.69%	3.46%	3.77%	5.05%	5.50%
6	6.70%	7.46%	24.85%	25.25%	10.99%	7.44%	6.79%	3.85%	2.71%	2.65%	3.22%	2.93%	3.73%	5.15%
7	5.80%	6.13%	13.25%	13.28%	9.54%	6.19%	5.95%	5.94%	5.41%	4.37%	3.83%	3.79%	4.26%	3.44%
8	5.10%	6.52%	8.42%	10.67%	12.50%	10.06%	6.98%	7.23%	4.88%	5.30%	4.06%	3.11%	4.24%	4.61%
9	4.60%	5.58%	6.14%	6.77%	9.89%	9.08%	9.25%	6.33%	6.58%	6.50%	3.26%	2.83%	2.66%	2.01%

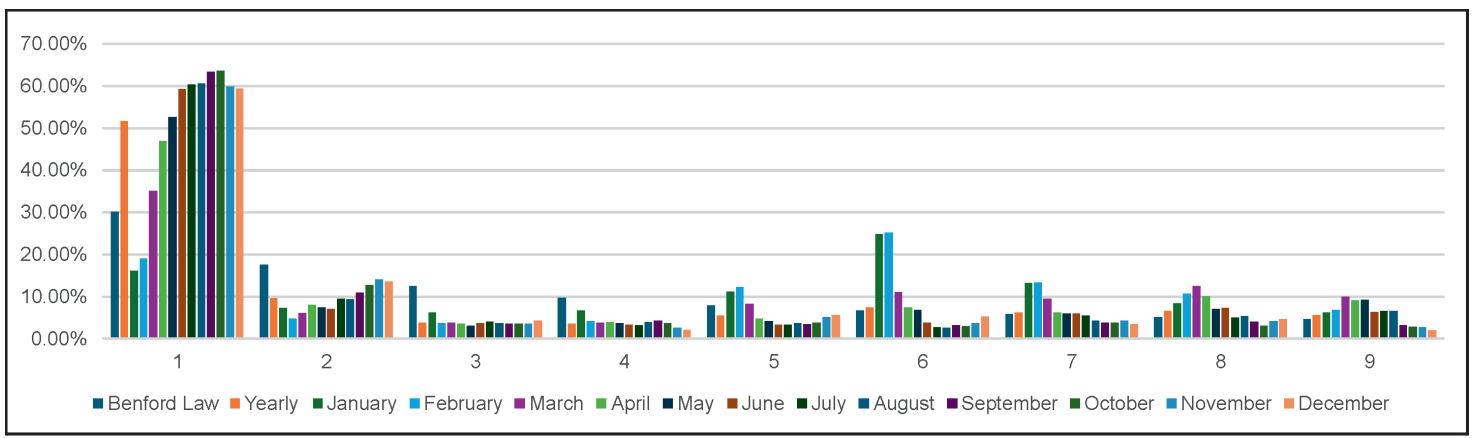

Figure 3: Distribution of first digits annual and monthly for Client 3

warning system for potential data manipulation (Nigrini, 2012). Compared to large accounting companies in established nations, local accounting firms and independent auditors in regional economies of emerging countries may lack resources and complex tools. Nonetheless, auditors in these regions must continue to provide assurance services while minimizing their legal risk. A straightforward yet useful tool like the one shown in this study can be beneficial in an environment where the majority of examined companies are SMEs and the majority of auditors are independent practitioners.

This study's results show three clients, each with a different profile. Client 1 closely conforms to Benford's law, Client 2 acceptably conforms with Benford's law, and Client 3 depicts non-conformance. The deviations for Client 2 and Client 3 prompted a dialogue between the auditor and the client that better informed the assurance process. In some cases, the explanation for the deviation with Benford's law was the product mix, where one type of product is the best-selling, and its price gets reflected in the nonconforming first digit distribution. Likewise, the effect of monthly inflation plays a significant role in Argentina in the years 2021 and 2022, because the nonconforming first digit changed as the average price of the best-selling item increased over time. Noticing that the digit that deviates is the one corresponding to the value of the best-selling product, additional analysis must be performed to rule out creative accounting or unintentional errors committed by the clients. Adding a variable such as the average price of the best-selling product in each month or the monthly inflation index might lead to valid conclusions regarding errors or misstatements.

Like all research, this study has some limitations that provide opportunities for future research. We assess data from SMEs received by a small-accounting firm located in a regional economy of Argentina. Future studies can examine whether the results obtained generalize to other SMEs in other emerging economies and/or Latin America. Another limitation of the study includes the fact that we are unable to rule out whether the observed results are not, at least partially, due to pre-existing tampering of the client's databases. Having said this, the objective of this study is not to utilize Benford's law to detect fraud but to assess the quality of client's information received by a small-sized accounting practice. Lastly, in our analysis, we focus on the leading first digit of Benford's distribution, future studies may explore the behaviour of the first-two, first-three, and/or first-four digits as a tool to prove the veracity of the information sent by SMEs in emerging economies.

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Conflict of Interest

There is no conflict of interest involved in the publication of this article.

References

Bagua, B. D. D., Orellana, D. B., & Rodríguez, F. P. (2023). Ley de Benford y su aplicación en la auditoría continua del sector financiero ecuatoriano: Benford's Law and its application in the continuous audit of the Ecuadorian financial sector. *Latam: revista latinoamericana de Ciencias Sociales y Humanidades*, 4(4), pp, 920-936.

Benford, F. (1938). The law of anomalous numbers. *Proceedings of the American Philosophical Society*, 78(4), pp. 551-572.

Cabeza García, P. (2019). Aplicación de la ley de Benford en la detección de fraudes. *Universidad y Sociedad*, 11(5), pp. 421-427.

Caputi Zunini, M. (2016). *Ley de Benford*. Master's Thesis, Universidad de la República, Uruguay.

Cerani Orozco, C., & Olivera, M. (2015). Ley de Benford. Estadisticas en acción. Universidad Nacional de la Pampa.

CPCE. (2022). Memoria Annual del LXXIII ejercicio – 1 de Diciembre 2020 al 30 de Noviembre 2021. Consejo Profesional de Ciencias Economicas de la Provincia de Cordoba. Available at https://cpcecba.org.ar/download/35589/?tmstv=1702522611 last consulted January 2025.

de Oliveira, J. A. J., Francischetti, C. E., Galeano, R., & Mandota, E. J. (2024). Comprovação das premissas da lei dos números anômalos ou lei de Newcomb-Benford para a contabilometria: uma análise em uma pequena empresa de máquinas e equipamentos. *Revista Caribeña de Ciencias Sociales*, *13*(6), pp. 1-22.

Etim, E., Daferighe, E., Inyang, A., & Ekikor, M. (2023). Application of Benford's Law and the Detection of Accounting Data Fraud in Nigeria. *International Journal of Auditing and Accounting Studies*, 5(2), pp. 119-163.

García, N., Werbin, E., & Quadro, M. (2021). Fundamentos de Contabilidad I. 4° ed. Escuela de Graduados. Facultad de Ciencias Económicas. Universidad Nacional de Córdoba.

Gil Robles, M. (2018). Sistemas de control administrativos: El uso del stage-gate process en un ambiente de innovación. *Contabilidad y Negocios*, 13(25), pp. 70-81.

Informe N°16-Área Auditoría (2009). *Riesgo de auditoría y significación*. Federación Argentina de Consejos Profesionales de Ciencias Económicas (F.A.C.P.C.E.).

International Standard on Auditing (ISA) Nº200 (2006), *Objective and General Principles Governing an Audit of Financial Statements*, International Auditing and Assurance Standards Board (IAASB), New York.

International Standard on Auditing (ISA) Nº300 (2009), *Planning an Audit of Financial Statements*, International Auditing and Assurance Standards Board (IAASB), New York.

International Standard on Auditing (ISA) Nº 315 (2016), *Identifying and Assessing the Risks of Material Misstatement through Understanding the Entity and its Environment*, International Auditing and Assurance Standards Board (IAASB), New York.

International Standard on Auditing (ISA) Nº 330 (2006), *The Auditor's Responses to Assessed Risks*, International Auditing and Assurance Standards Board (IAASB), New York.

International Standard on Auditing (ISA) Nº520 (2009), *Analytical Procedures*, International Auditing and Assurance Standards Board (IAASB), New York.

Jönsson, S., & Lukka, K. (2007). There and back again: doing interventionist research in Management Accounting, chapter 15 Vol. 1 in Chapman, Hopwood and Shields (eds.) *Handbook of Management Accounting Research*. Elsevier, Oxford, UK.

Miranda-Zanetti, M., Delbianco, F., & Tohme, F. (2019). Tampering with inflation data: a Benford law-based analysis of national statistics in Argentina. *Physica A: Statistical Mechanics and Its Applications*, 525, pp. 761-770.

Morales, H. R., Porporato, M., & Epelbaum, N. (2022). Benford's law for integrity tests of high-volume databases: a case study of internal audit in a state-owned enterprise. *Journal of Economics, Finance and Administrative Science*, 27(53), pp. 154-174.

Nigrini, M.J., & Mittermaier, L. (1997). The use of Benford´s Law as an Aid in Analytical Procedures. *Auditing: A Journal of Practice & Theory*, 16(2): 52-67.

Nigrini, M. J. (2012). *Benford's Law: Applications for forensic accounting, auditing, and fraud detection*. New Jersey: John Wiley and Sons, Inc.

Nigrini, M. J. (2017). Audit Sampling Using Benford's Law: A Review of the Literature with Some New Perspectives. *Journal of Emerging Technologies in Accounting*, 14(2), pp. 29-46.

Öztürk, M. S., & Usul, H. (2020). Detection of accounting frauds using the rule-based expert systems within the scope of forensic accounting. In *Contemporary issues in audit management and forensic accounting* (pp. 155-171). Emerald Publishing Limited.

Raimi, R. (1969). The peculiar distribution of first digits. *Scientific American*, 221 pp.109-119.

Resolución Técnica Nº16 (2000). *Marco conceptual de las normas contables profesionales distintas a las referidas en la Resolución Técnica nº 26*. Federación Argentina de Consejos Profesionales de Ciencias Económicas (F.A.C.P.C.E.).

Resolución Técnica Nº53 (2021). *Normas de Auditoría, revisión, otros encargos de aseguramiento, certificaciones, servicios relacionados e informes de cumplimiento*. Federación Argentina de Consejos Profesionales de Ciencias Económicas (F.A.C.P.C.E.).

Schlaps, K., Albanese, D., Briozzo, A., & Vigier, H. (2015). Principio de independencia en la auditoría de PyMEs: análisis comparativo de normativa nacional e internacional y evidencia empírica para la Argentina. *Contabilidad y Auditoría Investigaciones en Teoría Contable*, 42(21), pp. 110-114.

Shi, J., Ausloos M., & Zhu, T. (2018). Benford's law first significant digit and distribution distances for testing the reliability of financial reports in developing countries. *Physica A: Statistical Mechanics and its Applications*, 492, pp. 878-888.

Sylwestrzak, M. (2023). Applying Benford's law to detect earnings management. *Journal of Economics and Management*, 45(1), pp. 216-236.

Tran, A. M., M. D., Griffiths, & D. B. Winters. 2023. Small Bank Managers Are Prudent: A Benford's Law Approach to Analyzing Loan Loss Allowances. *Journal of Economics and Business*, 125-126, pp. 1-18.

Tran, A. M. (2024). What Deters Earnings Management? A Benford's Law Comparison Between Publicized Detection Methods and Increased Regulations. *Journal of Corporate Accounting & Finance*.

Varian, H. R. (1972). Benford's law. *The American Statistician*, 26, pp. 65-66

Vasile, E., & Croitoru, I. (2020). Financial statements-Object of the financial audit. *Internal Auditing & Risk Management*, 4(60), pp. 51-58.

Vega Falcón, V., Castro Sánchez, F., & Guaigua Vizcaíno M. (2019). Una mirada axiológica a la Contabilidad Creativa. *Dilemas Contemporáneos: Educación, Política y Valore*s, 44, pp. 1-24.

Vega Flores, C. (2012). La Ley de Benford y su Aplicación en la Detección de Fraudes Financieros. Instituto de Estadística Teórica y Aplicada. *Revista Varianza*, pp. 5-7.

Viloria, N. (2009). La importancia del concepto de independencia para la auditoría. Universidad de los Andes. *Actualidad Contable Faces*, 12(18), pp. 115-124.

Wallace, W. A. (2002). Assessing the quality of data used for benchmarking and decision-making. *The Journal of Government Financial Management,* 51(3), pp.16-22.

Wiryadinata, D., & Sugiharto, A. (2023). The Use of Machine Learning to Detect Financial Transaction Fraud: Multiple Benford Law Model for Auditors. *Journal of Information Systems Engineering & Business Intelligence*, 9(2), pp. 239-252.

Yin, R. (2017). *Case study research and applications: Design and methods (6th Edition)*. Sage Publication, Inc.