Revista de Educação e Pesquisa em Contabilidade
Journal of Education and Research in Accounting

Periódico de Publicação Contínua, digital e gratuito publicado pela Academia Brasileira de Ciências Contábeis | Disponível online em www.repec.org.br

REPeC, Brasília, v. 19, 2025 | DOI: http://dx.doi.org/10.17524/repec.v19.e3710 | ISSN 1981-8610

Relationship between compliance with Benford's Law and the timeliness of financial statement disclosure: an empirical analysis

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Abstract

Objective: This study aims to analyze the relationship between the compliance of accounting figures with Benford's Law (BL) and the disclosure time of Standardized Financial Statements (SFSs).

Method: A regression model with panel data was applied to a sample of 205 publicly traded Brazilian companies from 2010 to 2019.

Results: Companies that disclosed SFSs more quickly, including during audit rotations were found to be more compliant. The results suggest that Big Four firms may require additional time to ensure that the SFSs comply with BL, reflecting a greater monitoring effort. This finding was corroborated by evidence that non-compliance in previous periods, combined with audit rotation and the involvement of a Big Four firm, results in longer disclosure times.

Contributions: This study signals to the market that companies taking longer to disclose their SFSs may be facing greater uncertainty due to potential non-compliance. However, this interpretation requires caution, as longer disclosure times may also reflect Big Four firms' efforts to ensure the quality of accounting information. Stakeholders should consider that the accounting information of companies—especially those with delayed disclosures and that are not audited by a Big Four firm—may be less likely to comply with BL.

Keyword: Benford's Law, Timeliness, Big Four.

Published in Portuguese and English. Original Version in Portuguese.

Round 1: Received in 9/18/2024. Review requested on 1/6/2025. Round 2: Resubmited on 2/5/2025. Review requested on 3/11/2025. Round 3: Resubmited on 3/13/2025. Accepted on 3/16/2025 by Vinícius Gomes Martins, PhD (Assistant Editor) and by Gerlando Augusto Sampaio Franco de Lima, PhD (Editor). Published on 5/13/2025. Organization responsible for the journal: Abracicon.

1 Introduction

The market closely monitors news about accounting frauds that undermine the reliability of the financial information disclosed by companies. Such frauds can distort investors' perception of a company's actual value and, consequently, fraudulent and opportunistic behavior may cause information users to lose confidence in corporate reports, leading them to question the veracity of the financial information presented.

In this context, examples of events that affected the reliability of standardized financial statements (SFSs) include: a) the WorldCom case in 2002, which involved profit manipulation through fictitious results, destroying billions of dollars in shareholder value and eroding investor confidence (Sidak, 2003); b) the Enron case, which raised concerns about the credibility of financial reporting, particularly due to collusion with one of the largest auditing firms at the time (Unerman & O'Dwyer, 2004), leading to significant changes in accounting regulation; c) the Parmalat scandal, which involved manipulation of SFSs and the creation of shell companies to mislead investors about the company's actual value (Boland, 2008); d) the 2008 Lehman Brothers collapse (Bose *et al.*, 2011), which followed accounting write-downs after an investment review (BBC Brasil, 2008), resulting in the institution's bankruptcy and a broader deterioration of market confidence (Throckmorton *et al.*, 2015); e) the manipulation of accounting data by Toshiba in 2015, which involved overstating profits by approximately US$1.6 billion (Yamazaki, 2023); f) the case of Evergrande, a major Chinese real estate developer, which in 2023 inflated its 2019 and 2020 SFSs by around US$78 billion (He, 2024).

In Brazil, the reliability of SFSs has been called into question, mainly due to fraud and corruption scandals. Notable examples include: a) the Petrobras case in 2015, in which the company recognized a loss of R$6.2 billion related to corruption (Jiménez & Mendonça, 2015); b) in 2018, Oi S.A. admitted to fraud amounting to R$6 billion due to the recognition of non-existent assets (Vasconcellos, 2018); c) in 2023, the Americanas S.A. scandal emerged, involving accounting inconsistencies of approximately R$20 billion, confirmed in 2024.

In the context of these events, the Association of Certified Fraud Examiners (ACFE) estimates that companies lose 5% of their annual revenue due to fraud (ACFE, 2022). PricewaterhouseCoopers (PwC, 2022) found that 52% of companies with revenues exceeding US$10 billion experienced fraud between 2020 and 2021. Therefore, the monetary relevance and frequency of such occurrences serve as a warning sign regarding the reliability of SFSs and may generate uncertainty among investors.

In this context, manipulated information with compromised reliability distorts SFSs (Budiman *et al.*, 2021), affecting market functioning by introducing uncertainty in users' interpretations—either by altering expectations of future returns or by influencing perceptions of asset risk (Amorim *et al.*, 2012).

Thus, accounting plays a key role in the relationship between companies and the market. According to Agency Theory (Jensen & Meckling, 1976), it contributes to reducing information asymmetry. In this context, SFSs serve as a primary tool for communicating a company's operational performance, cash flows, and financial position (Kanapickienė & Grundienė, 2015), promoting credibility (Omar *et al.*, 2015) and comparability (De Franco *et al.*, 2011).

Given the previous discussion, tools with the potential to increase confidence in SFSs and assist in fraud detection, such as Benford's Law (BL), have been explored. By identifying anomalies in the digits of accounting balances (Nigrini, 1999), Benford's Law can indicate the presence of irregular behavior and signs of manipulation, fraud, or error (Balcıoğlu *et al.*, 2024; Hamida *et al.*, 2024).

In this sense, some studies have used BL as a proxy to assess the reliability of information through numerical variability. While some studies have applied BL as a technique for detecting signs of fraud (Durtschi *et al.*, 2004; Abdul *et al.*, 2017), others have focused on the behavior of public spending (Santos *et al.*, 2005; Costa *et al.*, 2012) or its application in the tax audit of the tax on services of any nature (ISS in its Portuguese acronym) (Santos *et al.*, 2009). Additional research has examined the level of error in SFSs (Amiram *et al.*, 2015), the enhancement of sample selection accuracy in continuous audit processes (Silva *et al.*, 2017), and the identification of manipulation or bankruptcy probability, particularly in financial institutions (Grammatikos & Papanikolaou, 2020; Patel *et al.*, 2022; Dutta *et al.*, 2023; Harb *et al.*, 2023). Overall, these studies conclude that BL is a technique capable of identifying potential fraud, errors, or manipulations through anomalies in reported figures, with a common focus on public expenditures, banking institutions, and bankruptcy cases. Such analyses demonstrate the usefulness of this law in identifying evidence of accounting nonconformities.

However, previous research has not explored the relationship between the detection of accounting irregularities through BL and the time it takes for audit firms to release their reports. Moreover, research on this topic remains incipient, particularly in emerging markets such as Brazil. This focus enables the connection of two informational qualities expected by users and defined in CPC 00 (2019): reliability and timeliness. This is relevant, as studies show that timeliness is the quantitative component of transparency in financial reporting (Mohsin *et al.*, 2021), while reliability refers to the trustworthiness of the information. The combination of these characteristics contributes to reducing the information asymmetry described by Jensen and Meckling (1976) and enhances the usefulness of information for analysis and decision-making (Farris, 2021).

Thus, by identifying relationships between the timeliness of SFSs and BL, this study can contribute to the market and other users of accounting information by signaling companies that demonstrate greater transparency and reliability in their statements, which indicates higher information quality. Additionally, it highlights the importance of prudently assessing the value of a company based on the time it takes to disclose its SFSs, suggesting that longer or shorter reporting periods may reflect varying levels of reliability risk due to non-compliance with Benford's Law. This is supported by the literature, which confirms that BL can reveal transformations in the data presented by companies, indicating anomalies and potential risks related to continuity or bankruptcy (Santos *et al.*, 2005; Santos *et al.*, 2009; Costa *et al.* 2012; Dutta *et al.*, 2023; Balcıoğlu *et al.*, 2024; Hamida *et al.*, 2024).

By seeking to explain the impact on timeliness through the compliance of accounting figures, as assessed using BL, this study contributes to the literature on the qualitative elements of accounting information. The analysis identifies variables that can enhance models used to determine the time required for the disclosure of accounting statements, thereby addressing the qualitative characteristic of timeliness. Furthermore, it offers insights for regulatory and supervisory bodies, which may consider these factors when evaluating the quality of information disclosed by a company.

In practical terms, this study signals to analysts, investors, and creditors that one of the factors contributing to longer SFS disclosure times may be non-compliance with BL, suggesting aspects that audit firms should closely monitor due to the theoretical association of non-compliance with earnings management, errors, and even fraud (Durtschi *et al.*, 2004; Amiram *et al.*, 2015; Grammatikos & Papanikolaou, 2020; Harb *et al.*, 2023). Therefore, the time taken to disclose SFSs can be considered in investment assessments and may interact with company characteristics, such as performance.

Furthermore, the literature has widely explored the efforts of audit firms. For example, Raweh *et al.* (2021) argue that auditors with expertise in the client's industry can reduce the audit effort required to ensure information reliability and deliver it more promptly. From another perspective, Zhang (2018) suggests that the audit effort is associated with the client's risk level. Therefore, since BL can be used to assess data reliability and assist auditors in sample selection (Silva *et al.*, 2017), there is an opportunity for studies to examine the relationship between reliability, as measured by BL, and audit effort, which may influence the time required to complete the audit.

Therefore, by associating figure non-conformity with the type of audit firm and the time taken for disclosure, this study contributes to the literature on audit firms and their efforts. One example is the perception that audits conducted by Big Four firms may be associated with longer SFS disclosure times in contexts where there is an emphasis on ensuring compliance with BL, that is, on promoting reliability.

In the meantime, this study fills another gap in the literature by linking the time taken to disclose information with companies' compliance with BL, in the context of audit firms. This contribution can alert users of accounting information that companies with non-compliant balances may take longer to release their disclosures, and it can also assist auditors in their planning by supporting efforts to improve timeliness and its relationship with reliability—both fundamental characteristics of accounting information (Kazemi & Kola, 2015).

Therefore, the following research question emerged as a motivation for this study: What is the relationship between the compliance of Brazilian companies' accounting figures with BL and the time taken to disclose their SFSs? Accordingly, the general objective was to identify whether the disclosure time of SFSs is longer in publicly traded companies that tend to exhibit greater variability in accounting figures in relation to BL. The study also examined the relationship between disclosure time, the presence of a Big Four audit firm, and auditor rotation.

Section 2 presents the theoretical development of the study, followed by Section 3, which details the methodology. Next, Section 4 provides the analysis of the results, and the article concludes with the final considerations and the list of references.

2 Theoretical Development

2.2 Benford's Law

Simon Newcomb (1881) observed that numbers beginning with smaller digits occur more frequently than those starting with larger digits. This theory emerged from his analysis of logarithmic tables, where he noticed that the earlier pages were more worn than the later ones—indicating that numbers with smaller leading digits were referenced more often (Newcomb, 1881).

Later, Benford (1938) built on the same observation regarding the non-uniform frequency of digits and compiled 20,000 first digits from various sources. His data compilation confirmed that the digits followed a logarithmic distribution, particularly in datasets that had not been directly manipulated, such as collections of numbers extracted from newspapers (Benford, 1938). In this context, Benford formulated a numerical law that determines the probability of a digit "a", belonging to the set {1, ... , 9}, occurring as the first significant digit, as shown in Equation 1:

$$F_a = \log\left(\frac{a+1}{a}\right) \quad (1)$$

Thus, expected frequencies are established for each digit, as shown in Table 1:

Table 1
Frequencies expected according to Benford's Law

Natural number	Expected frequency
1	0,301030
2	0,176091
3	0,124939
4	0,096910
5	0,079181
6	0,066947
7	0,057992
8	0,051153
9	0,045757

Source: adapted from Silva, Travassos & Costa (2017).

Another result of the theory proposed by Benford (1938) allows for the analysis of the probabilities of digits 0 to 9 occurring as the second significant digit of a given number. However, because this analysis is more restrictive and requires larger sample sizes, the present study does not examine the second-digit distribution.

The study conducted by Benford opened the door to numerous other investigations into numerical variability, depending on the application of the Law. As a probabilistic law concerning the mantissas of logarithmic numbers, BL enables the analysis of significant digit frequency and can be applied across various fields, including accounting. In this context, accountants and auditors apply BL to large datasets to identify anomalies in numerical patterns, aiding in the detection of signs of fraud or significant deviations in the data (Nigrini, 1999; Santos *et al.*, 2005; Santos *et al.*, 2009; Costa *et al.* 2012; Dutta *et al.*, 2023; Hamida *et al.*, 2024).

One of the first studies to associate BL with the auditing of accounting figures was conducted by Carslaw (1988), who suspected that accounting techniques were being used to manipulate reported profit figures and, consequently, the perception of information users. The study was based on the idea that the first digits of a number are more cognitively salient and thus prioritized in human memory (Brenner & Brenner, 1982). In this context, Carslaw (1988) applied BL's expected frequencies to assess whether the distribution of second digits in company profit figures conformed to the law, or whether the digits "0" and "9" appeared more frequently than expected—indicating possible rounding practices aimed at shaping users' perceptions of company performance.

Accounting balances generally conform to BL; however, when large volumes of data are aggregated in a table, errors or fraud may be concealed within the overall dataset. Therefore, BL can function as a macro-level selection and analysis tool that, when combined with other forensic techniques, may help identify irregularities or fraud (Nigrini, 2012). In the observation and analysis of samples, if fraud has been committed, the presence of numerical variability that deviates from BL can serve as a red flag for auditors (Bhattacharya *et al.*, 2010). While this does not guarantee the existence of fraud, it helps in identifying suspicious samples, supporting auditors in selecting audit targets with a higher likelihood of containing irregularities (Silva & Carreira, 2013).

In this context, Harb *et al.* (2023), in their study of Lebanese banks, demonstrated through BL that there were signs of data manipulation related to capital adequacy, liquidity, and asset quality. From a similar perspective, Grammatikos and Papanikolaou (2020) applied the law to detect manipulation of loan loss provisions aimed at overstating revenue and profit. Following the same reasoning, Sylwestrzak (2023) used BL to investigate fraudulent companies and earnings management. This line of research is particularly relevant, as Patel *et al.* (2022) found that companies violating BL through statement manipulation were more likely to go bankrupt. Similarly, Dutta *et al.* (2023) investigated the bankruptcy of Silicon Valley Bank and found evidence of altered financial data based on Benford's Law. As shown by these studies, Benford's Law is capable of identifying anomalies in datasets, making it a valuable tool for both users and preparers of accounting information.

However, it is clear that BL can be used in conjunction with statistical models to support conclusions that enhance accounting's ability to ensure the reliability of information disclosed by companies. Based on the interpretation of the aforementioned studies, numerous possibilities for applying this law can be identified. To reinforce the role of auditing in promoting the quality of accounting information, BL can serve both as a more efficient tool for selecting audit samples (Cunha *et al.*, 2016) and as a means of identifying anomalies that may indicate the presence of fraud or errors. In this context, it is essential to understand the role of auditing.

2.2 Role of auditing and study hypotheses

Auditing emerged in the mid-14th century in England as a response to the need to verify the accounting records of large companies (Comitê Regional de Contabilidade do Ceará – CRCCE). In Brazil, one of the earliest auditing activities was observed in 1862, when Decree No. 2,935 was enacted, establishing a statute that included auditors to examine the accounts of the Cia. de Navegação por Vapor. Subsequently, the first audit report in the country was issued by Clarkson & Cross—now known as EY—covering the period from 1899 to 1902 for the Brazilian subsidiary of a multinational company (Ricardino & Carvalho, 2004).

From another perspective, the Conselho Federal de Contabilidade (CFC) [Brazilian Federal Accounting Council] defines, through NBC TA 200 (R1) (2016), that auditing plays a key role in enhancing the reliability of SFSs. In this context, the auditor is qualified to express an opinion on whether the financial statements comply with applicable accounting standards. Therefore, since it is the auditor's responsibility to provide greater assurance regarding the SFSs, they are required—when issuing their opinion—to obtain reasonable assurance that the statements are free from distortion (NBC TA 200 R1, 2016).

In the meantime, accounting information exists to meet the needs of stakeholders. Therefore, certain qualitative characteristics, as outlined in CPC 00 R2 (2019), are necessary to ensure its usefulness, including faithful representation—which is essential to guarantee neutrality, completeness, and information free from error. This characteristic was examined using BL in a study that employed compliance with the law as a proxy for the reliability of accounting data (Filho, 2013).

In this context, BL is used to assess the reasonableness of accounting balances by examining the digits of accounts and identifying red flags for the audit based on the non-compliance of those digits with the frequencies expected under BL (Bugarin & Cunha, 2017). In this process, Benford's Law serves as a valuable tool in audit planning (Santos *et al.*, 2005), particularly because it can enhance the selection of audit samples in the search for fraud and errors (Hamida *et al.*, 2024).

Therefore, companies that present compliant accounting balances, due to the lower number of indications of irregularities, would be less susceptible to more auditing tests, since most of these firms use BL to determine the auditable samples. Consequently, companies with a greater number of red flags generally require extra efforts from audit firms (Cao *et al.*, 2020), that is, they require more complex audit tests and procedures, and, consequently, tend to take longer to deliver audit reports.

The time taken to deliver audit reports, defined as the number of days between the end of the fiscal year and the publication date of the audit report, can negatively affect the timeliness of accounting information disclosure (Turel, 2010). This aspect is relevant because the accounting standard CPC 00 R2 (2019) defines timeliness as a qualitative characteristic of accounting information. Timeliness is fundamental, as financial reports serve as a key source of market information about companies and are used to support investment decision-making (Roychowdhury *et al.*, 2019). Therefore, such reports are only relevant if disclosed in time to influence decisions (Aktaş & Karğın, 2011), making timely information essential.

There is also evidence in the literature that companies taking longer to disclose their financial statements tend to present less conservative, less timely, less relevant, and less persistent information, resulting in lower predictability of future results, reduced usefulness of the information, and higher costs for its users (Nardi *et al.*, 2019). These consequences reinforce the importance of studying disclosure timeliness, as financial statements are intended to inform users and, to fulfill this purpose, must be useful for decision-making and serve as a basis for the development of predictive models.

Once the importance of using Benford's Law in accounting statements and the timely provision of financial information has been established, these two characteristics are connected to the development of the first hypothesis. In this context, since BL can serve as a red flag for audit firms—indicating lower risk or greater reliability of accounting data, as highlighted in the literature (Santos *et al.*, 2005; Santos *et al.*, 2009; Costa *et al.*, 2012; Dutta *et al.*, 2023; Hamida *et al.*, 2024)—samples identified as lower risk would suggest a company profile that requires less extensive audit testing. Consequently, less time would be needed from auditors, resulting in shorter disclosure times for SFSs, positively influencing timeliness. Based on this reasoning, the first research hypothesis is proposed as follows:

> **H_1.** Companies whose accounting account balances comply with BL take less time to disclose their SFSs.

The first research hypothesis relates the time of SFS disclosure to the compliance of accounting figures with BL, indicating scenarios of greater uncertainty and revealing how disclosure timing may allow for the detection or prediction of abnormal returns, as discussed by Hamida *et al.* (2024). It is important to note that this relationship has not yet been explored in the literature, particularly in the Brazilian context.

Furthermore, studies indicate that Big Four auditing firms may be more efficient in providing information due to their greater expertise in performing audit processes (Baatwah *et al.*, 2019) and their specialization in specific economic sectors (Raweh *et al.*, 2021). This becomes particularly relevant when considering that BL serves as a warning sign to auditors, reinforcing the idea that non-compliant companies may pose a higher risk to audit firms, requiring closer monitoring (Morales *et al.*, 2022). Conversely, compliance with BL can serve as an indicator of reliability (Kaiser, 2019), a scenario that may be more common among companies audited by Big Four firms. In such cases, the audit procedures may be less complex, and when combined with the superior expertise, technology, and efficiency of Big Four firms (Rusmin & Evans, 2017), the audit process may become more streamlined, reducing the time needed to release the SFSs. Based on these considerations, the second hypothesis of this study is proposed as follows:

H_2. Companies whose accounting account balances comply with BL and are audited by a Big4 firm take less time to disclose their SFSs.

Subsequently, there is an understanding that the time taken to complete audit reports is related to the change of audit firm. Sharma *et al.* (2017) explain that when auditors have worked with the same company over a longer period, they tend to become more familiar with the organization, allowing them to streamline the audit process. This familiarity contributes to greater agility in report preparation. Additionally, Dao and Pham (2014) found that companies that changed audit firms took longer to release their audit reports, negatively impacting timeliness. Martani *et al.* (2021), however, conducted a comparative study between Big Four and non-Big Four firms and found that switching to a Big Four auditor significantly improved audit quality for companies previously audited by non-Big Four firms. This improvement can positively influence timeliness, as audit quality is associated with the time taken to complete reports, and Big Four firms tend to deliver their reports more quickly (Rusmin & Evans, 2017).

Therefore, given the mixed findings in the literature, and to assess whether audit firm rotation impacts the timeliness of information disclosure as significantly as the presence of a Big Four auditor, this variable will be incorporated into the model through the following hypothesis:

H_3. Companies audited by a Big Four firm that has recently replaced a non-Big Four auditor disclose their SFSs more quickly.

Finally, after evaluating whether audit completion time is more strongly influenced by the size of the audit firm or by auditor rotation, the final hypothesis is developed. The literature indicates that Big Four audit firms tend to be more diligent than others in detecting and reporting distortions (Hartmann & Martinez, 2020), as they aim to ensure the reliability of the information presented in their reports. Due to their greater expertise, resources, and reputational concerns, these firms typically perform more thorough analyses, which enhances the reliability of their audits (Afza & Nazir, 2014). However, this increased diligence may also reflect greater audit effort (Zhang, 2018), potentially extending the time needed to issue audit reports and, consequently, delaying the disclosure of financial statements.

Hence, to investigate whether companies that were non-compliant at t-1—i.e., those showing signs of less reliable information—underwent greater audit effort to achieve compliance following a change in auditors, specifically when a Big Four firm assumed the audit, the final research hypothesis is proposed as follows:

> **H_4.** Companies whose accounting account balances did not comply with BL in t–1 and subsequently underwent auditor rotation, with a Big Four firm assuming the audit, take longer to disclose their SFSs.

3 Method

The study focused on Brazilian publicly traded companies over the quarterly periods from 2010 to 2019. The year 2010 marks the adoption of IFRS in Brazil; therefore, accounting data prior to that date were prepared under different regulatory guidelines. Using data based on a consistent normative framework helps avoid errors in results and interpretations, as supported by prior studies. For example, Ganz *et al.* (2019) investigated delays in the disclosure of independent auditors' reports using data from 2010 to 2015; Nardi *et al.* (2019) analyzed the relationship between the qualitative characteristics of accounting information and audit delay in quarterly data from 2010 to 2017; Wahyuni *et al.* (2020) studied improvements in accounting quality after IFRS adoption from 2010 to 2016; Yagui and Nardi (2021) examined the influence of disclosure timing on financial statements and stock returns from 2010 to 2017; and Morshed (2024) assessed the economic impact of IFRS adoption on the financial transparency of Arab companies over the period from 2010 to 2020.

Furthermore, the data were limited to the period from 2010 to 2019, prior to the COVID-19 pandemic, as studies have shown that the pandemic had an atypical impact on the timing of audit report issuance (Idawati *et al.*, 2023), as well as on key accounting figures such as revenue—which, in turn, affects related accounts like Accounts Receivable, Allowance for Loan Losses, Cash, among others (Kusuma, 2021). These changes in accounting data brought about by the pandemic also led to anomalies and deviations in the application and interpretation of Benford's Law in companies' financial statements (Balcıoğlu *et al.*, 2024). Therefore, to avoid distortions in the analyses of BL compliance and timeliness, the study period ends in 2019.

Additionally, the financial statements were obtained from the Economatica® database, covering a sample of 205 companies. Firms in the financial sector were excluded due to their accounting particularities and the distinct regulatory requirements established by the Central Bank of Brazil (Bacen) for financial reporting (Klapper & Love, 2004; Camargo & Flach, 2016), which could result in differing bases of comparison for the accounting data analyzed.

Based on previous research on variables that influence the time to disclose SFSs (Carslaw & Kaplan, 1991; Nardi *et al.*, 2019; Tanjung & Aida, 2022) and on the application of BL in auditing (Carslaw, 1988; Nigrini, 1999; Durtschi *et al.*, 2004; Nigrini & Miller, 2009; Nigrini, 2012; Amiram *et al.*, 2015; Goh, 2020), this study aims to identify the effect of BL while controlling for factors that are likely to affect disclosure time. These factors include: a) type of audit firm (Big4); b) liquidity (Liq); c) company age (Idad); d) indebtedness (Endiv); e) audit rotation (Rod); f) company size (Size); and g) performance (Desemp).

Thus, the first empirical model adopted to verify the relationship between BL and the time taken to disclose the SFSs is represented in Equation 2:

$$\begin{aligned} Tempo\_Div_{it} = \alpha_{it} + \beta_1 LB_{it} + \beta_2 Big4_{it} + \beta_3 LB\_Big4_{it} + \beta_4 Rod_{it} + \beta_5 Liq_{it} + \beta_6 Idad_{it} + \beta_7 Tam_{it} + \\ + \beta_8 Endiv_{it} + \beta_9 Desemp_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

Where:

Disclosure time (Time_Div): variable representing the number of days between the end of the accounting period and the signing date of the audit report, i.e., the official date of the independent auditor's opinion (Nardi *et al.*, 2019; Tanjung & Aida, 2022), which directly impacts the timeliness of SFS disclosure.

Benford's Law (BL): dummy variable assuming the value "1" if the company is in compliance with BL, and "0" otherwise. BL is considered a tool that can assist auditors in determining the nature and extent of audit procedures, supporting more effective planning (Nigrini & Mittermaier, 1997) and, consequently, improving the timeliness of audit report issuance. Companies with data in compliance with BL are expected to be more reliable, requiring less audit effort and scrutiny, and thus less time to disclose their SFSs.

Audit Type (Big4): dummy variable that takes the value "1" if the company is audited by a Big Four firm, and "0" otherwise. The Big Four firms, often used as a proxy for audit quality (Yasar, 2013), tend to have more resources and greater expertise in auditing procedures (Bugeja & Loyeung, 2015), which can enhance the reliability of data reflecting the company's economic and financial position. Moreover, their expertise may contribute to shorter report issuance timelines, as their familiarity with audit processes allows them to perform procedures more efficiently, resulting in a shorter time to disclose the SFSs.

BL and Big4 (BL_Big4): variable representing the interaction between BL compliance and auditing by a Big Four firm. It takes the value "1" when the company complies with BL in period t and is audited by a Big Four firm in the same period, and "0" otherwise. It is expected that, in order to ensure audit quality, Big Four firms will emphasize the reliability of the data, including compliance with BL. As a result, audit procedures may be revisited or extended to achieve such compliance, potentially increasing the time required to disclose the SFSs due to the additional processes needed to ensure the quality of the audit.

Audit rotation (Rod): dummy variable that takes the value "1" when there is a change in the audit firm, and "0" otherwise. Research has shown a positive relationship between audit rotation and the time taken to disclose SFSs (Ganz *et al.*, 2019), as the entry of a new audit firm typically involves a "learning" period, requiring more detailed procedures and a deeper understanding of the client's business, which may extend the audit process. This effect may be mitigated or even offset, however, when companies engage more experienced firms, whose expertise can accelerate the audit procedures and reduce the time needed to disclose the SFSs (Camargo & Flach, 2016).

Liquidity (Liq): calculated as the ratio between the difference in current assets and inventory, and current liabilities (Serrano *et al.*, 2020). Studies have found that companies taking longer to disclose their SFSs tend to have lower liquidity ratios, indicating a negative relationship between these variables (Serrano *et al.*, 2020). This may be attributed to the fact that companies with lower liquidity are considered riskier, as their asset/liability structure reflects a reduced ability to meet short-term obligations. Higher risk levels can complicate the audit reporting process by decreasing auditors' confidence in the reliability of the information disclosed (Idawati *et al.*, 2023), thereby increasing the time required to release the SFSs.

Company age (Idad): represents the number of days between the company's IPO and the date of observation. More mature companies are generally expected to have more structured and efficient internal processes, which could reduce the time required for audit procedures and, consequently, the time taken to disclose the SFSs (Dibia & Onwuchekwa, 2013). Additionally, longer operational companies may facilitate the detection of anomalies by auditors (Nardi & Nakao, 2009). However, Jura and Tewu (2021) found a positive relationship between company age and disclosure time, suggesting that newly listed companies tend to publish their financial statements more quickly in an effort to attract investors and enhance the visibility of their shares.

Company size (Tam): measured by the logarithm of total assets (Klapper & Love, 2004; Nardi & Nakao, 2009; Yagui & Nardi, 2021). Patel *et al.* (2022) suggest that company size can influence the interpretation of BL compliance. Larger companies are typically under greater pressure to provide timely information and often maintain stronger internal control systems, which may allow auditors to reduce the number of substantive procedures performed at year-end, thereby shortening the time required to deliver the SFSs. On the other hand, studies have also shown that larger firms tend to have more complex operations and a greater number of branches, which increases the scope and complexity of audit work, potentially leading to longer disclosure times (Turel, 2010).

Debt (Endiv): calculated as the ratio between short- and long-term financial liabilities and net equity. Debt contracts not only provide information that supports investors in evaluating operational decisions but also act as a mechanism for disciplining managers (Harris & Raviv, 1990). These contracts may also extend the duration of the audit process though, as they require detailed examination to mitigate the risk of fraud.

Performance (Desemp): calculated as the ratio between net income and equity. The literature suggests that profitability, measured by RO), can influence the time taken to disclose SFSs (Iksan *et al.*, 2021). Companies with stronger performance are understood to have greater incentives to report information promptly (Annisa & Hamzah, 2020).

The second model was developed to test the second hypothesis, aiming to clarify the notion of efficiency associated with the largest auditing firms by examining the moderating effect of replacing a non-Big Four firm with a Big Four firm (Equation 3).

$$Tempo\_Div_{it}=\alpha_{it}+\beta_1 LB_{it}+\beta_2 Big4_{it}+\beta_3 Rod\_Big4_{it}+\beta_4 Rod_{it}+\beta_5 Liq_{it}+\beta_6 Idad_{it}+\beta_7 Tam_{it}+ \\ +\beta_8 Endiv_{it}+\beta_9 Desemp_{it}+\varepsilon_{it} \quad (3)$$

Where:

Rod_Big4: dummy variable that takes the value "1" when the company underwent an audit rotation and the new auditor is a Big Four firm. As outlined in the Big4 variable, it is expected that when a Big Four replaces a non-Big Four auditor, the result may be a shorter disclosure time, given the greater expertise of larger audit firms in analyzing financial reports. The intent is to test whether there is a greater audit effort—reflected in the time taken to disclose the SFSs—by the Big Four to bring companies into compliance following auditor rotation. Thus, this variable helps determine whether a change of auditor alone, with the new auditor being a Big Four firm, necessarily leads to delays in disclosure, or whether such delays are more likely in cases where the company was non-compliant with BL in t–1.

Finally, the third model (Equation 4), developed to test the third and final hypothesis, aims to demonstrate the concept of audit effort by examining the interaction between prior non-compliance with BL and the rotation or change of audit firm, where the new auditor is a Big Four firm. This model is expected to reveal a positive relationship between non-compliance with BL in t–1, a subsequent change in audit firm, and the appointment of a Big Four auditor, with the time taken to disclose financial statements. In this way, the model will reflect the additional effort undertaken by Big4 auditors—despite their greater efficiency—when working to bring previously non-compliant statements into compliance, thereby requiring more time for disclosure.

$$Tempo\_Div_{it}=\alpha_{it}+\beta_1 LB_{it}+\beta_2 Big4_{it}+\beta_3 Rod\_Big4_{it}+\beta_4 Rod_{it}+\beta_5 Liq_{it}+\beta_6 Idad_{it}+\beta_7 Ta \\ +\beta_8 Endiv_{it}+\beta_9 Desemp_{it}+\varepsilon_{it} \quad (4)$$

Therefore:

Desc_Rod_Big4: dummy variable that takes the value "1" if the company was non-compliant with BL in t–1, underwent audit rotation in t, and the new auditor is a Big Four firm. This variable is expected to show a positive relationship with the time taken to disclose accounting information, indicating a greater audit effort to bring previously non-compliant companies into BL compliance—an indicator of reliability. The aim is to assess whether the results support the notion that Big Four auditors invest additional effort to ensure compliance with BL, thereby reinforcing the rationale behind the BL_Big4 variable.

To conduct the statistical tests, the assumptions of residual normality were verified using the Kolmogorov test. Descriptive statistics were analyzed, and Spearman's correlation was applied. Subsequently, a series of tests were performed to determine the most appropriate regression model: a) the Breusch-Pagan test, to compare the Pooled and Random Effects (RE) models; b) the Chow F test, to compare the Pooled and Fixed Effects (FE) models; c) the Hausman test, to choose between RE and FE; and d) the Robust Hausman test, to confirm the choice between FE and RE even in the presence of heteroscedasticity and serial autocorrelation. Additionally, multicollinearity was assessed using the VIF test; serial autocorrelation was tested using the Wooldridge test; and heteroscedasticity was verified using the White test. All analyses were performed using STATA®. Overall, the results supported the use of the Fixed Effects model, indicating the presence of both autocorrelation and heteroscedasticity. Therefore, the models were estimated with Newey-West correction (Cameron & Trivedi, 2005) and robust standard errors.

In order to assess data compliance with BL, the formulation presented by Nigrini (2012), adapted from Frank Benford's original 1938 work, was applied to calculate the expected frequencies of the first digit (Nigrini, 2012):

$$\text{Prob}(D_1=d_1)=\log\left(1+\frac{1}{d_1}\right) \; ; \qquad d_1 \in \{1,2,\ldots,9\} \tag{5}$$

After calculating the expected frequencies using Equation 5, the next step was to calculate the observed frequencies within the database.

The database was organized, the observed frequencies of the digits were determined, and the statistical tests were performed using Microsoft Excel, employing the following functions: =ESQUERDA(); =DIREITA(); =CONT.SE(); and =INV.QUIQUA().

The first digit test was selected because it is less restrictive and does not require as large a dataset as the second digit test. While the first digit test serves primarily as a screening tool and may not detect all anomalies, it effectively identifies potential irregularities in large samples, making it a useful resource for audit planning (Nigrini, 2012).

Based on the calculation of the expected and observed frequencies, two statistical tests were applied to assess the dataset's adherence to BL: the Z-test and the Chi-Square test (Santos *et al.*, 2009; Patel *et al.*, 2022). Both tests were conducted at a 5% significance level. Only the data that showed compliance in both tests—specifically for the first digit (with 8 degrees of freedom in the Chi-Square test)—were considered compliant with BL and were assigned a value of "1" in the BL dummy variable.

4 Presentation and analysis of results

Initially, descriptive statistics were examined for the numerical variables (Table 2) and the categorical variables (Table 3).

Table 2
Descriptive Analysis for Numerical Variables

Variables	Mean	Median	Standard deviation	Minimum	Maximum
Tempo_Div	44.80	43.00	21.32	0.00	99.00
Liq	1.34	1.16	1.00	0.00	9.88
Idad	21.85	17.93	14.72	0.00	77.96
Endiv	0.68	0.60	0.49	0.00	4.74
Tam	6.40	6.46	0.83	0.00	8.98
Desemp	0.08	0.03	0.17	0.00	2.00

Table 3
Descriptive Analysis for Categorical Variables

Variable	Frequency(0)	Percentage(0)	Frequency(1)	Percentage(1)
LB	4.288	53,04%	3.797	46,96%
Big4	2.130	26,35%	5.955	73,65%
Rod	7.340	90,80%	744	9,20%
LB_Big4	5.273	65,22%	2.812	34,78%
Desc_Rod_Big4	7.899	97,70%	186	2,30%
Rod_Big4	7.583	93,79%	502	6,21%

The descriptive analysis revealed that most of the numerical variables exhibited a high standard deviation, indicating a lack of homogeneity in the data around the mean. This variability may be due to the presence of outliers, which can distort statistical analyses (Nardi *et al.*, 2019), or to missing data in certain periods, given the breadth and diversity of information resulting from quarterly reporting.

Furthermore, the high standard deviation (Table 2) may reflect the dispersion of characteristics among the companies in the sample, which can be attributed to the inclusion of firms from various economic sectors. Given this diversity, certain precautions were taken to mitigate potential distortions and bias in the regression model. These included tests to assess the normality of residuals, multicollinearity (VIF), autocorrelation (Wooldridge), and heteroscedasticity (White). Based on the results of these tests (Table 5), the most appropriate models were selected (Table 6).

An analysis of the categorical variable frequencies in the research sample revealed that approximately 47% of the companies complied with BL during the periods analyzed, indicating that most companies, in most instances, reported figures that did not comply with BL. The frequency data also show that most of the sample was audited by Big Four firms, while a smaller portion of the companies underwent audit rotation.

Next, the correlation between the variables was analyzed, with the results presented in Table 4. It is worth noting that the correlations among the control variables were not high enough to raise concerns about multicollinearity, a finding that was further supported by the low values obtained in the VIF test.

Table 4

Spearman's Correlation

	1	2	3	4	5	6	7	8	9	10	11
2	-0,036 (**)										
3	-0,174 (**)	0,008									
4	-0,096 (**)	0,776 (**)	0,437 (**)								
5	-0,129 (**)	0,030 (**)	-0,045 (**)	-0,001							
6	-0,051 (**)	-0,025 (*)	0,092 (**)	0,013	0,482 (**)						
7	-0,154 (**)	0,023 (*)	0,154 (**)	0,090 (**)	0,808 (**)	0,596 (**)					
8	-0,117 (**)	-0,004	0,236 (**)	0,115 (**)	0,000	0,016	0,051 (**)				
9	0,101 (**)	-0,038 (**)	-0,270 (**)	-0,156 (**)	-0,027 (*)	-0,024 (*)	-0,074 (**)	-0,138 (**)			
10	0,101 (**)	0,035 (**)	-0,174 (**)	-0,071 (**)	0,001	-0,012	-0,038 (**)	-0,525 (**)	0,153 (**)		
11	-0,147 (**)	-0,039 (**)	0,460 (**)	0,170 (**)	-0,035 (**)	0,048 (**)	0,045 (**)	0,114 (**)	-0,094 (**)	0,053 (**)	
12	0,048 (**)	0,014	-0,036 (**)	-0,002	-0,026 (*)	-0,023 (*)	-0,024 (*)	-0,169 (**)	0,015	0,264 (**)	-0,084 (**)

Where: 1 = Tempo_Div; 2 = BL; 3 = Big4; 4 = BL_Big4; 5 = Rod; 6 = Desc_Rod_Big4; 7 = Rod_Big4; 8 = Liq; 9 = Idad; 10 = Endiv; 11 = Tam; 12 = Desemp. ** and * indicate significance at the 1% and 5% levels, respectively.

The correlation study serves as a preliminary analysis of the sample's behavior, indicating the potential for linear relationships between variables. Accordingly, when examining the correlation matrix in Table 4, it is observed that Disclosure Time is correlated with all the variables included across the three models.

Thus, the correlation analysis provides evidence that the variables included in the model may be considered determinants of SFS disclosure time. Performance, company age, and debt exhibit a positive correlation with disclosure time, while the remaining variables show a negative correlation with the dependent variable.

It is worth noting that the variable with the highest correlation coefficient with the time to deliver the SFSs was Big4, which showed a negative coefficient. This supports the idea that the expertise of large auditing firms is associated with shorter report disclosure times. The next most relevant coefficient was for the variable representing company size, consistent with the findings of Klapper and Love (2004).

The variable that measures liquidity, as well as the debt variable, showed a significant correlation with SFS disclosure time. However, these two variables were negatively correlated with each other, confirming the intuitive notion—based on how the indicators are calculated—that companies with greater liquidity tend to have lower levels of debt. Thus, the assumption outlined in the description of the Endiv variable—that more heavily indebted companies may require more time for audit procedures, thereby increasing the time to disclose SFSs—is supported by the observed positive correlation. Conversely, liquidity, being inversely related to debt, shows a negative correlation with SFS disclosure time, confirming the findings reported by Serrano *et al.* (2020).

Furthermore, the variables of interest—Benford's Law and its derivatives (BL_Big4, Desc_Rod_Big4)—exhibited a significant and negative correlation with the time taken to disclose the financial statements. This finding aligns with the assumption that companies in compliance with BL tend to disclose their reports more quickly. However, it contradicts the expectation proposed in the moderating variables, which suggested that Big Four auditors would require more time to bring non-compliant companies in t–1 into compliance with the law in t.

This analysis shows that the moderated variables "BL_Big4," "Rod_Big4," and "Desc_Rod_Big4" exhibit high correlations with their respective base variables—"BL," "Rod," and "Rod_Big4." This is expected, as the moderation technique involves multiplying the original categorical variables to capture interaction effects on the dependent variable. While such correlations may suggest potential multicollinearity, which could affect the standard error estimates, the primary focus of the models lies in the interpretation of the interaction terms. Moreover, common strategies to reduce multicollinearity—such as removing non-significant variables—would not meaningfully affect the overall model fit (Dawson, 2014). Nonetheless, the models were tested for multicollinearity, and no significant issues were found, as reported in Table 5. Robustness checks and the exclusion of non-significant variables were also conducted to mitigate multicollinearity, and these adjustments did not alter the results of the models.

Finally, the Spearman correlation test revealed a significant positive correlation between the variables Big4 and company's size, which can be explained by the tendency of larger companies to engage larger audit firms due to the complexity of their operations. Also noteworthy is the negative correlation between Liq and Endiv, which is consistent with the nature of their calculations.

It is important to note, however, that the preliminary analysis of the variables using Spearman's correlation test provides only indicative evidence, which must be confirmed through regression analysis. In addition to the correlation matrix, statistical tests were conducted to assess the assumptions underlying the regression models, as presented in Table 5.

Table 5
Statistical Tests for Verifying Assumptions and Model Selection

		Model 1	Model 2	Model 3
Assumption to be verified	Teste aplicado	Coef.	Coef.	Coef.
Multicollinearity				
BL		3,82	1,01	1,01
Big4		2,27	1,56	1,45
BL_Big4		4,71		
Rod		1,01	3,15	1,32
Rod_Big4			3,22	
Desc_Rod_Big4	VIF (Variance Inflation Factor)			1,33
Liq		1,23	1,23	1,23
Idad		1,09	1,09	1,09
Tam		1,28	1,29	1,28
Endiv		1,34	1,34	1,34
Desemp		1,04	1,04	1,04
Model Mean Value		**1,98**	**1,66**	**1,23**
Serial Autocorrelation	Wooldridge	56,96***	58,70***	57,71***
Heteroscedasticity	White	23,11***	29,51***	14,34***
Choose between models	**Test**	**Coef.**	**Coef.**	**Coef.**
Pooled or RE	Breusch-Pagan	360,02***	355,52***	360,19***
Pooled or FE	F Chow Test	4,14***	4,13***	4,08***
RE or FE	Hausman's test	-203,06	-202,45	-191,44
RE or FE under heteroscedasticity	Robust Hausman Test	203,05***	202,44***	191,43***

Where: ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

An analysis of the tests performed shows that none of the models exhibit significant multicollinearity, as only VIF test values above 5 indicate potential multicollinearity issues, as explained by Marcoulides and Raykov (2019). The mean and individual VIF values remained below this threshold in all three models, indicating no concerns. The Wooldridge test results were significant, confirming the presence of serial autocorrelation, which was addressed using the Newey-West correction technique (Cameron & Trivedi, 2005). Heteroscedasticity was also detected across the models and was corrected through the application of robust coefficients.

Furthermore, after reviewing the statistical tests used to determine the most appropriate model, we opted to perform a fixed effects regression model for panel data, the results of which are presented in Table 6. The fixed effects model assumes that variation is more pronounced across companies than within each individual company over time (Fávero, 2015). In other words, while there may be changes in the data over time within each company (intra-individual variation), these are relatively smaller compared to the differences observed between companies. Thus, the model aims to account for individual effects that capture the heterogeneity among firms, reflecting their time-invariant characteristics, as discussed by Fávero (2015).

Table 6
Panel Regression – Fixed Effects

Panel A	Model 1a				Model 1b	
Variables	Coef.	z			Coef.	z
BL					-1,801	-3,82***
Big4					-0,154	-0,14
BL_Big4						
Rod					-10,603	-13,03***
Rod_Big4						
Desc_Rod_Big4						
Liq	-0,505	-1,28			-0,361	-0,93
Idad	0,742	7,78***			0,630	7,16***
Tam	8,724	5,66***			8,083	5,43***
Endiv	1,694	1,48			1,720	1,52
Desemp	6,276	3,51***			5,554	3,12***
R^2	0,036				0,060	
Panel B	**Model 1c**		**Model 2**		**Model 3**	
Variables	Coef.	z	Coef.	z	Coef.	z
BL	-3,995	-4,04***	-1,810	-3,84***	-1,743	-3,70***
Big4	-1,508	-1,27	0,450	0,41	-0,584	-0,54
BL_Big4	3,013	2,69***				
Rod	-10,582	-13,01***	-7,333	-4,60***	-12,634	-12,51***
Rod_Big4			-4,783	-2,63***		
Desc_Rod_Big4					7,844	5,51***
Liq	-0,373	-0,96	-0,347	-0,89	-0,352	-0,90
Idad	0,627	7,12***	0,634	7,25***	0,607	7,00***
Tam	8,169	5,48***	7,975	5,43***	7,977	5,41***
Endiv	1,715	1,52	1,733	1,54	1,709	1,51
Desemp	5,543	3,10***	5,574	3,14***	5,562	3,13***
R^2	0,061		0,061		0,062	

Note: Models 1a and 1b, located in panel A, reinforce the fixed effects analysis for model 1c, as suggested by Dimic *et al.* (2015). In panel B, Model 1c, represented by Equation 2, has the primary objective of identifying the relationship between BL and the SFS disclosure time, and also to observe whether financial statements compliant with BL and audited by Big4 take more or less time. Model 2 was developed next, to understand whether the change in time consists of changing the audit firm, while Model 3, and the final one, seeks to relate compliance with BL and change of audit firm with disclosure time. Where: ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

In the regression analysis, across all models, BL showed statistical significance and was negatively associated with disclosure time. This finding confirms the first hypothesis: companies whose accounting balances comply with BL tend to disclose their SFSs more quickly. This result contributes a novel insight to the existing literature by introducing BL—a variable not previously linked to this specific topic—as an influencing factor in disclosure timeliness. The relationship offers a new perspective for future research and enhances the understanding of how timeliness relates to the reliability of accounting information.

Additionally, Models 1c, 2, and 3 provide the basis for analyzing Hypotheses 2, 3, and 4, respectively. The analysis showed that the isolated Big Four variable was not statistically significant in explaining the time taken to disclose SFSs. However, when moderated by BL compliance (Model 1c), it exhibited a positive relationship with the dependent variable. This suggests that companies compliant with BL and audited by Big Four firms take longer to publish their SFSs, possibly indicating greater audit effort to ensure that these statements meet compliance standards. This finding, however, contradicts theoretical expectations that Big Four firms, due to their greater expertise, would complete audits more quickly (Baatwah *et al.*, 2019). As a result, the second hypothesis of this research is not supported.

The Audit Rotation (Rod) variable, when analyzed without moderation, showed a high coefficient indicating a negative relationship with the SFS disclosure time—that is, companies that underwent audit rotation tended to release their financial statements more quickly. This finding supports the results of Camargo and Flach (2016), which suggest that audit firm changes may stem from the need to engage firms with greater sector-specific expertise, thereby reducing the time required for disclosure. Similarly, Martani *et al.* (2021) indicate that auditor rotation can enhance audit quality, which may, in turn, contribute to improved timeliness in the delivery of audit reports (Rusmin & Evans, 2017).

On the other hand, the negative relationship found with the audit rotation variable contradicts the expectation outlined in the methodology—that new audit firms would require more time to become familiar with company processes. Sharma *et al.* (2017) argue that auditor rotation tends to increase reporting time, as newly appointed firms may lack familiarity with the sector. Their findings also indicate that such delays are more pronounced though when the new auditors are non-Big Four firms. This aligns with the results observed for the Rod_Big4 variable in Model 2, where rotation did not lead to delayed disclosure, likely because the new auditing firm—being a Big Four—demonstrated greater efficiency and agility.

In Model 2, the analysis aimed to assess the effect of audit rotation combined with the appointment of a Big Four firm on the time taken to disclose SFSs. The variable Rod_Big4 was statistically significant with a negative coefficient, indicating that companies that changed auditors and engaged a Big Four firm disclosed their SFSs more quickly. This finding supports the literature suggesting that Big Four firms possess greater resources and expertise in audit procedures (Bugeja & Loyeung, 2015), which may enhance efficiency and shorten disclosure time. Therefore, even when audit rotation occurs, the presence of a Big Four firm appears to prevail, supporting the third hypothesis.

Finally, based on the understanding of the impact of having a Big Four audit firm, Model 3 was developed. This model shows that companies that were non-compliant with BL in the previous period (t–1), underwent audit rotation, and were audited in the current period by a Big Four firm exhibited positive coefficients. This indicates that these companies took longer to disclose their financial information, supporting the assumption that Big Four firms may require more time for analysis when prior data unreliability—reflected by BL non-compliance—is present. Since Big Four auditors are known to use BL in their testing procedures (Silva & Carreira, 2013), the extended disclosure time likely reflects the additional effort needed to bring non-compliant companies into compliance, thereby enhancing the reliability of the audited data (Afza & Nazir, 2014). These findings lead to the non-rejection of the fourth and final hypothesis. The results suggest that while auditing by Big Four firms tends to improve data reliability, the process of achieving this reliability—especially following prior non-compliance—may delay SFS disclosure and impact the timeliness of the information.

This context underscores the importance of analyzing the compliance of accounting figures with BL when studying the factors that influence data timeliness and concern audit firms—an aspect highly relevant to users of financial statements. The evidence presented in this research offers practical contributions by revealing characteristic relationships within accounting information in an innovative way, positioning BL as a proxy for data reliability and linking it to timeliness through disclosure time. As a result, stakeholders can incorporate these findings into their decision-making processes, enabling more rational and beneficial choices through improved assessment of information disclosure risk.

Furthermore, the findings of Model 3 highlight the importance of considering audit work in the preparation of SFSs, as well as its relationship with Benford's Law—not only within the Brazilian context, which serves as the sample for this study, but also in a broader, global perspective. This research addresses a gap in the literature and strengthens the understanding of the connection between reliability and timeliness by identifying previously unexplored relationships involving Benford's Law, audit firm size, audit rotation, and the time required to disclose accounting information.

In addition to the main variables, several control variables were significant across all models. Among them, the control variable Company Age (Idad) was found to have a significant positive impact on the time taken to disclose SFSs, confirming the results of the Spearman correlation test, which also indicated a positive correlation between these variables. This finding suggests that more mature companies tend to take longer to release their financial statements, contradicting the notion that older companies—with longer operational histories—facilitate the audit process and thus reduce disclosure time. The quicker reporting observed among newer companies may be driven by a strategic intent to enhance the attractiveness of their shares to investors (Jura & Tewu, 2021).

The variable Company Size (Tam) also produced results that diverge from prior literature and the Spearman correlation test, indicating that larger companies are slower to publish their financial statements. This delay may be attributed to the increased complexity of operations and the greater number of branches typically associated with larger firms, which can extend the time required to prepare and review the SFSs (Turel, 2010).

Finally, the last significant variable was Company Performance (Desemp), which had a positive impact on SFS disclosure time. Performance, measured by ROE, also showed a significant positive correlation in the Spearman test. This result contradicts previous studies, which suggest that companies with stronger performance are more motivated to report information promptly and would therefore take less time to publish their SFSs (Annisa & Hamzah, 2020). However, consistently high performance may lead auditors to conduct more extensive testing to verify the accuracy of the reported figures. This additional scrutiny could explain why companies with better performance take longer to disclose their SFSs, as indicated by the findings in this study.

4.1 Additional tests

In order to conduct a robustness analysis of the coefficient estimates, a panel regression model with random effects was applied, providing an alternative to the fixed effects technique used in the main models. The results are presented in Table 7.

Table 7
Panel Regression – Random Effects

Panel A	Model 1a				Model 1b	
Variables	Coef.	z			Coef.	z
BL					-1,855	-4,19***
Big4					-2,526	-2,45**
BL_Big4						
Rod					-11,871	-15,87***
Rod_Big4						
Desc_Rod_Big4						
Liq	-0,416	-1,06			-0,312	-0,81
Idad	0,172	5,42***			0,131	4,33***
Tam	0,178	0,27			0,293	0,43
Endiv	1,492	1,41			1,146	1,09
Desemp	7,297	3,60***	6,348	3,19***	6,348	3,19***
R^2	0,028				0,065	
Panel B	**Model 1c**		**Model 2**		**Model 3**	
Variables	Coef.	z	Coef.	z	Coef.	z
BL	-3,877	-3,95***	-1,865	-4,22***	-1,766	-4,01***
Big4	-3,780	-3,45***	-1,953	-1,92*	-2,938	-2,86***
BL_Big4	2,768	2,45**				
Rod	-11,849	-15,83***	-8,499	-4,81***	-14,279	-14,88***
Rod_Big4			-4,938	-2,52**		
Desc_Rod_Big4					9,472	6,93***
Liq	-0,324	-0,84	-0,303	-0,79	-0,310	-0,81
Idad	0,132	4,35***	0,131	4,34***	0,127	4,24***
Tam	0,304	0,45	0,251	0,37	0,263	0,39
Endiv	1,172	1,12	1,165	1,12	1,122	1,07
Desemp	6,341	3,16***	6,362	3,20***	6,353	3,19***
R^2	0,062		0,066		0,068	

Where: ***, ** and * indicate significance at 1%, 5%, 10% levels, respectively.

The results obtained using the Random Effects panel were generally consistent with those from the Fixed Effects models with Newey-West correction. The variables of interest—BL and its moderations—remained significant at least two of the three defined levels, and the direction of their relationship with disclosure time remained unchanged. Among the few differences, the interaction variable Big4 showed a change in sign in the second model and became significant at the 10% level, while the size variable lost its statistical significance.

5 Final Considerations

In pursuit of ensuring the qualitative elements of accounting information, this study aimed to verify whether compliance with Benford's Law is related to the time required for the publication of auditors' reports on financial statements, as well as to assess the effort of Big Four audit firms. For this purpose, a sample of accounting balances from 205 Brazilian companies was used, with quarterly data from 2010 to 2019, analyzed through panel data regression.

The results led to the non-rejection of the study's first hypothesis, indicating that Benford's Law can significantly explain the time required to disclose SFSs, within the established confidence levels. Furthermore, the remaining three hypotheses—examined through the inclusion of moderations—allowed for an interpretation of audit firm effort. It was found, with statistical significance, that companies non-compliant with BL in t–1 that changed auditors and were subsequently audited by a Big Four firm experienced longer disclosure times. This suggests that compliance with BL not only influences disclosure timeliness but also interacts meaningfully with the type of audit firm. To support this finding—namely, that BL non-compliance led to increased audit effort—Model 2 was tested and showed that only audit rotations involving the appointment of a Big Four firm were associated with shorter disclosure times, indicating greater efficiency in those scenarios.

Furthermore, among the seven control variables included, Size (Tam), Company Age (Idad), Audit Rotation (Rod), and Performance (Desemp) were statistically significant at the 1% level in explaining the time taken to disclose the SFSs. Among these, Rod exhibited a negative coefficient, indicating that companies undergoing audit firm rotation disclosed their SFSs in fewer days. In contrast, Size, Idad, and Desemp had positive coefficients, suggesting that companies with larger total assets, greater maturity, or higher ROE tended to take longer to release their financial statements.

This research offers several contributions to the maintenance and use of accounting information. From the perspective of investors—key users of such information—it provides insights into variables that influence the time required to disclose SFSs, a factor that can negatively affect the punctuality of financial disclosures and, consequently, the timeliness of information. From the standpoint of companies, the findings support more efficient investment decisions, particularly in mergers and acquisitions, by helping outline a company profile based on variables linked to more reliable, relevant, and timely reporting. Audit firms can also benefit by improving reporting efficiency, as understanding in advance the characteristics and factors that most influence SFS disclosure time enables better audit planning. The study's findings on the influence of Benford's Law compliance on disclosure time are uncommon in the literature and highlight the relevance of leveraging this law as a practical tool in audit procedures.

Furthermore, this study explores the relationship between audit firm size and two key qualitative aspects of accounting information—timeliness and reliability—which audit firms aim to enhance to improve the usefulness of the information disclosed to users. Ensuring these characteristics is essential for the development of predictive models, the establishment of accounting standards, the analysis of financial statements, and the assessment of investment feasibility. In this regard, this study contributes to the literature by reinforcing the importance of variables that influence these characteristics, including relationships that have not yet been thoroughly examined.

Finally, this study faced some limitations in calculating Benford's Law, particularly due to the decision to assess compliance based solely on the first digits. Including both the first and second digits in the analysis would have significantly reduced the number of periods classified as compliant, thereby restricting the model. One possible solution to this limitation would be to expand the sample by including more companies and time periods. Additionally, although the study identified a novel relationship, the overall explanatory power of the model was relatively low, which could be improved by incorporating additional variables that better capture the factors influencing the time taken to disclose accounting information.

Furthermore, a suggestion for future research is to follow Nigrini's (2012) recommendation by using larger samples and applying not only the first-digit test but also tests involving the second digit and the first-two-digit combinations. This approach could uncover additional relationships between Benford's Law, SFS disclosure time, and the other variables analyzed in this study. It is also recommended that these tests be replicated in other markets, such as the United States, where larger datasets may be available, thereby enhancing the robustness and generalizability of the findings.

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