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Identifying Discretionary Actions Taken by Managers in Credit Unions: An Application of Benford's Law

ABSTRACT

Objective: To investigate whether Benford's Law can be a tool to improve the credit union supervision process performed by Brazil's Central Bank. That is, we will determine whether its application will increase the bank's assertiveness in identifying credit unions whose managers have taken discretionary actions which diverge from regulatory standards

Method: Benford's Law was applied to all singular Brazilian credit unions from 2006 to 2017 – which is a relevant timeframe due to regulatory changes - for Operating Income, Operating Expenses, Cash, and LPCSL (Loss Provisions for Client/Credit accounts which have Suspicious Liquidations) accounts over various timeframes.

Relevance: The discussed evidence offers elements that can improve regulation mechanisms, and it can also indicate whether managers are using their discretionary power to influence singular credit union performance

Results: Time is an important factor in the use of this tool. Applications applied over a long period of time do not capture discretionary actions taken by managers due to potential adjustments made to variations over time. An annual timeframe makes it possible to use this technique to capture potential discretionary actions taken in the examined accounts. In addition, this technique generates a consistent list of credit unions which require more intense surveillance and/or investigation. It also indicates that the norms revised in 2015 have helped reduce incentives to manage earnings and/or commit fraud in these organizations.

Methodological Contributions: This study fills a gap in the credit union literature because there are few studies of discretionary actions in these organizations such as accounting choices, earnings management, fraud, or errors. Our findings may also indicate adjustments made by credit unions to comply with the sector standard due to the adoption of Resolutions No. 4,434 and No. 4,454. Benford's Law is useful as a tool in selecting audit samples, and it can also improve the work of supervisory bodies.

Keywords: Bank Accounting; Credit Unions; Regulation; Discretionary Actions; Benford's Law.

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1 INTRODUCTION

Credit unions are relevant to the National Financial System because they play an important social role as a financial intermediary for its members; they also provide, for example, rural credit to producers who are not of interest to commercial banks (Rostirolla & Sachser, 2016).

In addition, as pointed out by Banerjee, Besley and Guinnane (1994), they contribute to gains in economic well-being, given that they offer lower interest rates than commercial banks. In theory, their lower marginal costs are derived from their greater interaction with their members and self-monitoring among the members.

The Brazilian Central Bank (BACEN) has stimulated this kind of organization due to its potential benefits which can make the financial system more competitive. The Grow Program, for example, promotes an expansion of their credit operations, increasing the number of their members, and reducing the average value of these operations (Santos, Barros, Takeda, & Gonzalez, 2019). Since 2003, the program has also allowed these credit unions to increase the number of their partners and use public funds, and it does not require them to maintain mandatory deposits, which promotes the expansion of their membership and their participation in the National Financial System. The total number of credit union members increased by 15.9% between 2018 and 2019, and participation in their credit portfolio increased to 76% of their members considering the base year 2015.

However, this growth has increased agency problems, because they almost make it a requirement to separate ownership and control (Leggett & Strand, 2002), which has been encouraged by the national regulator and the promulgation of Resolutions No. 4,434 of 2015 (Banco Central do Brasil [BACEN], 2015a) for certain types of credit unions.

Nonetheless, this separation allows managers to make choices that prioritize their well-being to the detriment of the owners. Maia, Bressan, and Lamounier (2013), Bressan, Bressan and da Silva (2016), and Santos and Santos (2020), for example, suggest that there are indications of this type of behavior in these organizations.

To minimize the chances of fraud, the Central Bank conducts its supervision through internal and/or external auditing of credit unions (BACEN, 2015b). However, in recent years, some credit unions have presented financial irregularities and have ceased operations due to judicial orders.

In light of this, this article seeks to investigate whether the statistical technique known as Benford's Law can be used as a tool to assist the Central Bank in its supervision of credit unions. In other words, can this technique contribute to the process of selecting credit unions, which due to the discretionary behavior of their managers, are candidates for additional surveillance and/or investigation. Our findings are consistent in indicating that employing Benford's Law, which has already been applied in various areas, increases the assertiveness of the identification of organizations whose managers have practiced earnings management.

2 A REVIEW OF THE LITERATURE

The institutional framework of credit unions mainly consists of two laws: No. 5,764 of 1971 (Brasil, 1971) the General Law of Credit Unions (GLCU), and Complementary Law No. 130 of 2009 (BACEN, 2009). There are also other resolutions made by the National Monetary Council (NMC). In this study, we will focus on the following resolutions: 4,194/2013, 4,434/2015 and 4,454/2015 (BACEN, 2013; BACEN, 2015a; BACEN, 2015b).

The GLCU establishes that only members can participate in the Board of Administration and the Supervisory Board. If instead of a Board there is a Directory, this

body should only be made up of members. In addition, the members of these bodies should be elected by the owners in a General Assembly (Costa *et al.*, 2012). Finally, according to the authors, members of the Board or the Directory have formal authority over the administration of the organization, while members of the Supervisory Board have the right to control, that is supervise the activities of the administrators. It is still possible for credit unions to appoint people with no prior experience to supervise the administration and/or the people responsible for producing information, which can be hidden (Vilela, Neto, Bernardes & Cardoso, 2015).

The members of these bodies are responsible for managing it or hiring a group of professionals to manage it in accordance with Complementary Law No. 130 of April 17, 2009 (Brasil, 2009). If they opt to hire managers, these managers will occupy an Executive Directory and their leader will be delegated formal and real authority over the management of activities (Costa, Chaddad & Azevedo, 2012; Chaddad & Iliopoulos, 2013).

The existence of an Executive Directory in a credit union makes the separation between ownership and control concrete (Costa, Chaddad, & Azevedo, 2013). The Board of Administration or the Directory assumes decisions regarding control and the Executive Directory assumes decisions of management, and the members of the Executive Directory cannot participate in the Board of Administration and vice-versa (Chaddad & Iliopoulos, 2013; BACEN, 2015a). The existence of an Executive Directory is encouraged by the Central Bank for specific types of singular credit unions.

This configuration implies that the Board of Administration has the authority to hire and “fire” the members of the Executive Directory (Aghion & Tirole, 1997). In this scenario, it is possible that the managers may have incentives to make choices that signal the Board of Administration, for example, that they are acting in accordance with its preferences, and it may even propose strategies to attract their support, such as attractive remuneration for board members (Becht, Bolton & Röel, 2003).

As a result of Resolution No. 4,434 in 2015, the Central Bank also issued Resolution No. 4,454 with auditing rules for credit unions (BACEN, 2015b) designed to improve the auditing process, such as making it mandatory to have auditing performed by external companies registered with the Central Bank. This final resolution may affect the chances of these managers being able to take suspect discretionary actions.

Even with this increase in regulation, the manager can still use discretionary action to manage earnings, make accounting choices, and commit fraud. Accounting choices are discretionary if they are listed as an option among a group of possibilities permitted by legislation (Fields, Liz & Vincent, 2001). This option can benefit the manager without harming the owners, even though it would not be selected if they were consulted.

The earnings management occurs when managers take decisions about activities whose accounting figures reveal a temporal preference, with there being the option to record these results earlier or later within accounting principles (Healy & Wahlen, 1999). Fraud is characterized by “fleeing” the established institutional framework, which increases the asymmetry of information (Healy & Wahlen, 1999; Dechow & Skinner, 2000).

Distortion tends to be smaller when there is more monitoring. However, according to Fontes Filho, Marucci, and Oliveira (2008), the incentives that a partner has to monitor vary according to the risks the credit union is running in its operations. This incentive is also affected by Article 11 of the GLCU, which states that the responsibility of the members for the credit union’s obligations is limited to the value of his or her capital in the organization.

Maia *et al.* (2013) and Bressan *et al.* (2016), used an econometric model and verified that managers of credit unions practiced earnings management both to smooth out their results and to avoid posting losses.

To mitigate the discretionary actions of managers, the Central Bank imposes legal obligations on credit unions. For example, their accounting processes have to follow the structure of the Chart of Accounts for Institutions of the National Financial System (CAINFIS) and they have to send these organization quarterly reports. In addition, members of the Board of Administration or the Directory, or the Supervisory Board or the Executive Directory, have to be approved by the Supervisory Department of Credit Unions and Non-Banking Institutions, and changes in their Articles of Incorporation must be approved by the Organizational Department of the Financial System, and due to the complexity of their operations they are obliged to have three forms of auditing: internal, independent, and credit union (Pinheiro, 2008; Brasil, 1964). In addition to the Central Bank, Credit Union Systems and the Credit Union Guarantor Fund also act as external mechanisms of control.

A Credit Union System is a group of singular credit unions, credit union federations and confederations which share this brand, visual identity, and information and control systems that enable them to share information, guarantees, and resources. In 2020, there were four Credit Union Systems in Brazil, each with its own rules and norms. These systems develop regulations which are applicable to all of their associated organizations. In addition, they possess auxiliary supervisory structures which are delegated to them by the Central Bank. Thus, they perform their own auditing and hire outside auditors. It is possible, therefore, that the managers of unions associated with these systems behave in a manner that is distinct from credit unions that are not associated with a system. In this work, however, this type of external control is not considered. It is highly recommended that future studies address this subject.

The Credit Union Guarantor Fund imposes rules in terms of the behavior and disclosure of the credit unions it is affiliated with, which helps minimize potential problems in terms of discretionary behavior on the part of the agent responsible for managing the credit union.

Forster (2006) in studying earnings management in non-profit organizations used the Operating Income, Operating Expenses and Cash variables. Chang, Kao and Chen (2018) point out that the managing of real earnings is associated with the behavior of the company's Cash account. Even though they were dealing with companies listed on the B3 Stock Exchange, Reis, Lamounier, and Bressan (2015) argue that managers can manage their operational activities only through the Operating Expenses accounts, because the production process is not very flexible and there are restrictions placed on the Cash account. Bressan *et al.* (2016), and Maia *et al.* (2013), among others, use the LPCSL (Loss Provisions account for Client/Credit accounts which have Suspicious Liquidations) account as a proxy for managing earnings, which is justified by the possibility that the manager has discretion in terms of the criteria and/or assumptions used in making this estimation.

The manager's choices interfere with the value of this account and influence the financial information which is revealed, and therefore, the decision making of the partners. Thus, it may be suggested that the LPCSL account represents a reasonable measure of the managers' exposure to risk. This suggests that this account is often used by banks to manage earnings (Bushman & Williams, 2012).

Even though it is traditional to use econometric models to identify earnings management (Paulo, 2007), there are other statistical tools that may prove useful in the identification of discretion over accounting figures.

Benford's Law has already been used by Carslaw (1988), Nigrini and Mittermaier (1997), Drake and Nigrini (2000), Forster (2006), Cunha (2013), Silva (2013), Nigrini (2017), Papanikolaou and Grammatikos (2021) in regard to other types of organizations and sectors. However, it has never been previously applied to credit unions.

Benford’s Law is a statistical property which states that the digits of the numbers in financial reports should follow a given theoretical distribution. If there is a divergence, it may be an indication of manipulation, and therefore, the composition of the digits or numbers which are the result of human interference. That is, these numbers are the fruit of a choice and not the result of a natural process. However, the use of this law does not indicate which type of discretionary decision making has been used in arriving at these financial figures.

Nonetheless, it indicates that certain numbers do not follow a natural distribution. Thus, accounting reports should be verified more carefully to detect potential deviations, and this tool can be used to indicate possible candidates for greater surveillance.

The process of finding discretionary numbers is accomplished in two steps. The first step uses the first digit on the left which will range from 1 to 9, and the second step uses the first two digits on the left which will range from 10 to 99.

According to Benford (1938), the expected distribution of each first digit is given by:

$$P_{(D_1=d_1)} = \log \left(1 + \frac{1}{d_1} \right); \quad d_1 \in \{1,2,\dots,9\} \quad (1)$$

where d_1 = the first digit; The calculation for a number between 10 and 99 being the first two digits of a given value is presented in Equation 2. The analysis of the first two digits is used to generate a sample of digits smaller than the previous sample according to Cunha (2013).

$$P_{(D_1D_2=d_1d_2)} = \log \left(1 + \frac{1}{d_1d_2} \right); \quad d_1d_2 \in \{10,11,\dots,99\} \quad (2)$$

with d_1 and d_2 representing the first and second digit respectively. The calculation presented in Equation 1 is the expected frequency of the first digit 1, which is 30% of the total of all digits. This value is reduced successively until the last digit 9, whose expected frequency is 4.5% of all digits. In terms of Equation 2, the expected frequency for the first two digits 10, is 4.1%. This value is reduced until we get to the digits 99, whose expected frequency is 0.04%.

Nigrini and Mittermaier (1997) say that given the assumptions of Benford’s Law, it can be applied to lists of numbers that describe relative sizes of similar phenomena. Hill (1995) indicates that a random sample, taken from a group of data that follows the distribution presented by Benford, also tends to follow this pattern. However, according to Krakar and Žgela (2009), the collected data should: describe values of the same phenomenon, should not have minimum and maximum values, and should not be involve series.

Given that there is an expected frequency, it is necessary to verify whether the collected numbers from the reports follow Benford’s Law. In this sense, Forster (2006) uses the Z and χ^2 tests, while Carslaw (1988) and Žgela and Dobša (2011) use only the former. In addition, Orth, Michaelsen, and Lerner (2020) report that other works also use the Kolmogorov-Smirnov (K-S) and Mean Absolute Deviations (MAD). However, Cunha (2013) and Barney and Schulzke (2016) suggest that this last technique is the most appropriate for extensive databases.

One of the assumptions of this article is that accounting reports are elements which demonstrate the revealed preferences of the manager. Therefore, analyzing their data lets us verify their discretionary choices. Thus, we have factual choices within regulatory/normative limits imposed by legislation, either through government regulation or the standardization of accounting entries in credit systems, in accordance with Silva (2007). Thus, any change outside of the norm, which does not follow some norm or custom, leads to a deviation in the distribution.

In addition, in terms of the adaptation of Benford’s Law, according to Forster (2006), if an account follows the distribution, this does not guarantee the inexistence of discretionary

actions, given that if there is a large group of observations, if there is just one divergent observation, it will not be captured by Benford’s Law.

3 METHOD

This work uses financial data for credit unions which is sent to the Brazilian Central Bank. This data was treated by the USP Cooperativism Observatory (OBSCOOP/USP) and ceded to us for research purposes. The treatment consisted of the transformation of quarterly data into annual data. Our opting for this frequency is due to the fact that shorter periods can be more susceptible to manager choices, but in theory they can be corrected in the annual document. This affects the supervision process by the central credit unions or the Brazilian Central Bank. The sample is made up of all singular credit unions which existed between 2006 and 2017, even if they first appeared or ceased their operations during this period.

It should be emphasized that the database used in this investigation was assembled from information made available in the reports presented to the Central Bank. This was a methodological choice that sought to observe the behavior of credit union accounting data with greater stability, minimizing any possible effects of the migration process on the international norms of accounting in the results generated by the Benford model (MARQUES, 2018; SILVA; JUNIOR, 2018).

Table 1 presents the number of credit unions each year as well as their descriptions. In this instance their average size is described for the year in question, as measured by Net Assets and Total Assets, and average age.

Table 1

The Number of Singular Credit Unions and their characteristics over a 12 year period

Year	Number	Average Net Worth ^a	Stand. Dev. Net Worth ^b	Average Total Assets ^c	Stand. Dev. Net Assets ^d	Average Age
2006	1,424	R\$14,338,542	R\$34,470,771	R\$65,400,740	R\$238,961,355	10
2007	1,433	R\$16,575,169	R\$42,449,087	R\$77,411,294	R\$290,341,243	11
2008	1,427	R\$18,090,837	R\$49,092,403	R\$88,444,534	R\$321,323,550	11
2009	1,378	R\$22,991,730	R\$61,270,410	R\$101,767,341	R\$349,018,708	13
2010	1,325	R\$25,434,560	R\$68,297,903	R\$121,958,034	R\$428,622,547	14
2011	1,298	R\$30,887,714	R\$79,403,086	R\$167,954,228	R\$603,652,300	15
2012	1,245	R\$36,269,421	R\$90,291,329	R\$200,928,707	R\$688,571,342	16
2013	1,201	R\$42,843,846	R\$103,265,938	R\$233,749,864	R\$756,575,089	18
2014	1,143	R\$51,648,377	R\$118,593,451	R\$286,171,845	R\$875,798,120	19
2015	1,092	R\$57,589,914	R\$127,952,830	R\$326,148,109	R\$1,011,718,500	21
2016	1,065	R\$63,510,030	R\$139,727,125	R\$378,380,659	R\$1,182,989,217	22
2017	860	R\$56,398,896	R\$135,712,999	R\$323,160,505	R\$936,262,584	21
Total	14,891	R\$34,252,207		R\$184,348,747		15

Note. Values adjusted for inflation using the General Index of Market Prices (GIMP) for December 2017.

^aAverage Net Worth. ^b Standard Deviation for Net Worth. ^cAverage Total Assets. ^dStandard Deviation for Total Assets

We can see from Table 1 that Brazilian credit unions are going through a consolidation process. That is, even though the Average Net Worth of credit unions increased from R\$14 to R\$56 million, the number of credit unions decreased during this period from 1,424 to 860. We can also observe that their standard deviations in Net Worth as well as Total Assets have been elevated every year and grew until 2016, when they suffered a reduction in 2017. This indicates a great variation in the size of credit unions.

Initially, to verify whether the accounting figures reveal possible discretionary behavior on the part of the managers, we considered all of the credit unions every year, examining each balance sheet individually. Durante the entire period 14,891 singular credit

unions were evaluated with an Average Net Worth of R\$ 34.2 million and Average Total Assets of R\$ 184.3 million, and an average age of 15 years old.

During the examined period, changes occurred in the institutional environment that had a potential impact on credit union managers. To verify the impact of these resolutions on manager behavior, we performed analyses which considered the period from 2014 to 2017. This sample was selected because 2014 was the year before the issuing of Resolutions Nos. 4,434 and 4,454/2015, while 2017 was the year in which the credit unions were required to be legally compliant by adopting adequate governance structures.

Also in 2017, Resolution No. 4,606/2017 enforced changes in the LPCSL account which could affect manager choices (BACEN, 2017). During the period from 2014 to 2017, according to Table 1, we can see that despite the fact that the number of singular credit unions decreased, the size and average age of the credit unions increased. Net Worth increased from R\$ 51.6 to R\$ 56.4 million and the average age increased from 19 to 21 years.

The variables presented in the Review of the Literature were: OPI, OPE, CASH and LPCSL, and they are presented in Table 2.

Table 2

Accounts used, the account numbers in the CAINFS, and the works that reference them

Account	Number	Calculation	Works that Use It
OPI	7.1.0.00.00-8	BACEN Circular N° 1,273/87 (BACEN, 1987)	Carslaw (1988), Forster (2006) and Rubin, Overstreet, Beling, and Rajaratnam (2013)
OPE	8.1.0.00.00-5	BACEN Circular N° 1,273/87 (BACEN, 1987)	Forster (2006) and Rubin, Overstreet, Beling, and Rajaratnam (2013)
CASH	1.1.1.00.00-9	BACEN Circular N° 1,273/87 (BACEN, 1987)	Forster (2006) and Chang <i>et al.</i> (2018)
LPCSL	1.6.9.00.00-8	BACEN Circular N° 1,273/87 (BACEN, 1987)	Maia <i>et al.</i> ,(2013), Bressan <i>et al.</i> (2016), Papanikolaou and Grammatikos (2021)

The OPI account (Number 7.1.0.00.00-8) is defined as calculated in the instructions of BACEN Circular N° 1,273/87 (BACEN, 1987). Forster (2006) and Rubin, Overstreet, Beling, and Rajaratnam (2013) follow this procedure in a similar manner, and this is an account which can reflect discretionary actions taken by a manager.

It is made up of the sum of all operating income from active operations and the providing of services. This includes the account numbers ranging from 7.1.1.00.00-1 to 7.1.9.99.00-9. In the same manner, the OPE account (Number 8.1.0.00.00-5) is made up of the expenses related to the typical and habitual institution expenses including account numbers ranging from 8.1.0.00.00-8 to 8.1.9.99.00-6. According to Jensen (1986) and Chang *et al.* (2018), who associate the CASH account (Number 1.1.1.00.00-9) with potential earnings management, its value is determined by the sum of deposits in R\$ for a given period minus the sum of withdrawals during the same period. The CASH account is made up of account numbers that range from 1.1.1.10.00-6 to 1.1.1.90.00-2.

The LPCSL account (Number 1.6.9.00.00-8) is calculated in accordance with the instructions of BACEN Circular N° 1,273/87 (BACEN, 1987). It represents an accounting estimate of client credits which run a risk of default. It includes the account numbers ranging from 1.6.9.20.00-2 to 1.6.9.80.00-4.

The calculation of the distributions of the numbers (the first digit and the first two digits) was performed using Equations 1 and 2 presented above. We performed significance tests based on the Mean Absolute Deviation (MAD), as suggested by Drake and Nigrini (2000) and Nigrini (2017). Its utilization is appropriate due to this being an extensive database, and it also has the advantage of being, among the commonly used methods, the only one that provides evaluation parameters. It is calculated according to Equation 3:

$$MAD = \frac{\sum_{i=1}^K |PR - PE|}{K} \quad (3)$$

where: K = total of analyzed digits; RP = real proportion; EP = expected proportion; Note that K in Equation 3 is the number of digits analyzed, consisting of 9 for the first digit and 90 for the first two digits. RP is the real proportion of the digit, and EP is the expected proportion. When there is a sum of the differences between the RP and the EP, this sum may be positive or negative. Therefore, using the absolute value of this difference can be divided by the quantity of realized observations. For this sample, 3 was the average of all of the deviations. It is important to point out that even though there are no objective critical values for this test, Drake and Nigrini (2000) suggest the reference values presented in Table 3.

Table 3

Expected values for the Mean Absolute Deviation

Digits	Interval	Classification
First	0.000 – 0.004	Close Conformity (CC)
	0.004 – 0.008	Acceptable Conformity (AcC)
	0.008 – 0.012	Marginally Acceptable Conformity (MAcC)
	> 0.012	Outside of Conformity (OCo)
First Two	0.0000 – 0.0006	Close Conformity (CC)
	0.0006 – 0.0012	Acceptable Conformity (AcC)
	0.0012 – 0.0018	Marginally Acceptable Conformity (MAcC)
	> 0.0018	Outside of Conformity (OCo)

Note. Source: Prepared by the authors based on data from Drake and Nigrini (2000).

The larger the deviation, the greater the Benford distance is, indicating a greater suggestion of a discretionary action. Unlike these authors, instead of making a conclusion in terms of conformity, we classify the interval. Thus, for example, if the MAD of the first digit falls in the first interval, it receives a CC classification, and its distribution is closer to the Benford distribution than an account whose MAD is between 0.008 and 0.012 for the first digit which receives a MAcC classification. In other words, in terms of proximity to the Benford's Law statistical property, its classification can be given as: CC > AcC > MAcC > OCo.

If a given account is classified as OCo, an individual verification is recommended; Nigrini and Mittermaier (1997) propose that the deviations analyzed should be those which are above those expected by Benford, given that the digits which are below this value exist due to the excesses of the others.

Since the reading of the distribution results for extensive periods can hide the presence of earnings management because they do not capture variations over time and, taking into account that there are changes in the institutional environment which can potentially affect manager behavior, the results were analyzed in three blocks. In the first block, we considered all of the credit unions that existed during the entire period (2006 to 2017); then we considered those which existed for a medium period (2014 to 2017) and finally just those which existed for each year (the short period) beginning in 2014.

4 RESULTS

Table 4 displays a summary of our results over long, medium and short timeframes in terms of their number and classifications. The values are separated for the first digit and for the first two digits. An informal reading of it informs whether each account is close to or far away from the distribution expected by Benford’s Law.

Table 4

Summary of the MAD test results after the application of Benford’s Law

Digits	Account	Periods				Annual Period (Short Term)							
		Long Term		Medium Term		2014		2015		2016		2017	
		(2006 to 2017)		(2014 to 2017)		Value	Conf.	Value	Conf.	Value	Conf.	Value	Conf.
First	OPI	0.00265	CC	0.00460	AcC	0.00545	AcC	0.00930	MAcC	0.00647	AcC	0.00629	AcC
	OPE	0.00151	CC	0.00482	AcC	0.00811	MAcC	0.00705	AcC	0.00753	AcC	0.00675	AcC
	CASH	0.00408	AcC	0.00746	AcC	0.01185	MAcC	0.00829	MAcC	0.00712	AcC	0.01097	MAcC
	LPCSL	0.00178	CC	0.00371	CC	0.00570	AcC	0.00508	AcC	0.00462	AcC	0.00654	AcC
First Two	OPI	0.00060	AcC	0.00121	MAcC	0.00236	OCo	0.00268	OCo	0.00224	OCo	0.00245	OCo
	OPE	0.00068	AcC	0.00119	AcC	0.00198	OCo	0.00256	OCo	0.00251	OCo	0.00259	OCo
	CASH	0.00079	AcC	0.00172	MAcC	0.00303	OCo	0.00236	OCo	0.00273	OCo	0.00296	OCo
	LPCSL	0.00071	AcC	0.00109	AcC	0.00242	OCo	0.00236	OCo	0.00227	OCo	0.00259	OCo

Note. Conf = Conformity; CC = Close Conformity. AcC = Acceptable Conformity. MAcC = Marginally Acceptable Conformity. OCo = Outside of Conformity.

As pointed out in the methodology, if the MAD of a number is classified as CC based on the interval it belongs to and another is classified as AcC, its distribution is closer to Benford’s expected distribution than the latter and so on successively. Thus, $CC > AcC > MAcC > OCo$. The reading of the MAD pointed out in the first column, or in other words, for the long period for the first digit as well as the first two digits, suggests that all of the accounts are close to Benford’s expected distribution, and do not suggest that there has been earnings management.

The conformity results are not surprising, because it is possible that economic effects and discretionary choices over long periods of time make the managed result a reference, given the existence of the Markovian process. Thus, deviations that occurred the previous year become a parameter for the following period.

Since it is of interest to verify whether reducing the period of analysis improves the technical capacity to predict discretionary behavior, we have analyzed the classifications of the accounts generated based on the obtained MADs for the first digit and for the first two digits for the medium period (2014 to 2017). A comparison of the classifications of the accounts presented for different periods shows that only the OPI, independent of how many digits are analyzed, became more distant from the Benford distribution. On the other hand, the LPCSL displayed no alteration. The others presented random results. This apparently suggests that the reduction of the period does not necessarily improve the assertiveness of the technique.

The table also presents the analysis results for each year from 2014 to 2017. When considering just the first two digits, in the bottom part of the table, we see deviations and increases in the classifications in relation to previous analyses, which is in line with the findings of Silva (2013), who found distortions just in individual periods, or in other words, a

deterioration in the (MAD) classification for Benford deviations. All of the accounts used in this work to represent earnings management were classified as outside of conformity (OCo).

Our findings suggest that the accounts were affected by discretionary actions taken by the managers, diverging from Forster (2006), who did not find deviations in the accounts of companies in the non-profit sector. Thus, credit unions whose accounts stand out in this analysis should be categorized by regulators as a group worthy of additional supervision and/or verification. In addition, the proportion of credit unions with divergent results in terms of the Benford distribution grew with each passing year in our study.

This result, a priori, makes it possible to infer that using this tool will suggest the presence of discretionary behavior on the part of managers and signal which organizations are candidates for more rigorous surveillance and monitoring on the part of the regulator. To sum up, this technique is more effective when the period of analysis is reduced.

To analyze credit unions and manager preferences in terms of managing earnings, the sample was divided into two groups: "suspect" and "normal". The former consisted of the credit unions with at least one account which was classified as OCo. The normal credit union group consisted of the companies whose accounts all had other classifications. The classification considered just the first two-digit analysis with three or more deviations on average.

The data is detailed in Table 5. An analysis of Table 5 demonstrates that in 2014, of the 1,143 credit unions in existence, roughly 30% of them were classified in the "suspect" group. In 2015 and 2016, this group represents 19% and 17.6% respectively of the reference years. However, the participation of "Suspect" firms increased again in 2017 reaching 24.6% of all the existing credit unions.

Table 5

The Number of Credit Unions which Deviated from Benford's Distribution for the First Two Digits

Year	Total No. of Credit Unions	Total No. of Credit Unions with OCo Accounts				Suspect Credit Unions / Year ^a		
		OPI	OPE	CASH	LPC SL	Total	(%)	Repeated the following year
2014	1,143	49	97	93	85	297	30	-
2015	1,092	70	86	37	47	208	19	73
2016	1,065	41	70	58	49	188	17.6	59
2017	860	65	55	43	68	212	24.6	49
Suspect Credit Unions / Account ^b		200	255	209	228	-	-	-

Note. ^aRepresents the sum of listed credit unions for each account per year, without double counting when the same credit union repeats in several accounts. ^bRepresents the sum of credit unions which were listed for the respective accounts during the examined time period, without double counting the same credit union when it appeared in more than one year.

The year 2014 was the year with the largest number of credit unions deserving of a closer look on the part of the supervising body, with there being an accentuated decline in the two following periods, followed by another increase in 2017. This occurs in absolute and relative terms. As mentioned above, two factors can explain this behavior: the dissolution of credit unions, by liquidation or incorporation; and the implementation of the Central Bank's Resolutions Nos. 4,434 and 4,454 of 2015 (BACEN, 2015a; BACEN, 2015b), which are factors which we will discuss below.

5 DISCUSSION

In terms of our findings, during the period from 2014 to 2017, 283 credit unions ceased to exist: 143 of them were incorporated and 140 ceased their activities. A verification of the eliminated credit unions in our "suspect" list indicates that for the period as a whole, there was an average reduction in the number of credit unions in the group.

Of the 297 credit unions classified in 2014, approximately 6% of them, that is 18 ceased to exist in 2015. Among the 208 in this group in 2015, just seven, or in other words, 3% of them ceased operations by the following year. For the years 2016 and 2017 the same pattern appears. Among the "suspect" credit unions in each year, 30 and 18 of them respectively ceased their operations by the following year. These results suggest that the dissolution process is an important factor in explaining the reduction in the number of credit unions whose managers were potentially taking discretionary actions that deviated from the sector's standards.

This statement is important and should be explored in greater depth in future studies, because earnings management can occur so that a company appears to others as a "good business" to be incorporated or to "distort" (Maia *et al.*, 2013, Bressan *et al.*, 2016; Santos & Santos, 2020) the vision of the partners about the real financial health of the organization, as occurs in other kinds of organizations, according to Schipper (1989), Healy and Wahlen (1999) and Dechow and Skinner (2000).

In addition, it is possible that the reduction in the total number of credit unions in the suspect group can be explained by Resolutions Nos. 4,434 and 4,454/2015 (BACEN, 2015a; BACEN, 2015b) which, respectively, impede managers from participating in the Board of Administration and require singular credit unions to be audited by a Credit Union Auditing Entity or an Independent Auditing Entity. An important point is that despite the imposition of this auditing, the institutes do not foresee a rotation of their employment. This makes this hypothesis plausible and worthy of future investigation.

The findings in Table 5 further the perception that the Central Bank's resolutions have had an effect. The last column presents the total number of credit unions classified as "suspect" one year which appeared again on this last the following year. The 59 in this column, for example, represents how many of the 208 "suspect" credit unions in 2015 – the year the resolution was issued, remained in this group in 2016, and this total represents 29% of the remaining credit unions once we subtract those that ceased to exist (which leaves a total of 201).

In 2016, the first year that the resolutions went into effect, we observe that 31% of the suspect credit unions remained in the group in 2017. In proportional terms this represented an increase in relation to the previous year. However, in 2018, the second year of the norm's application, just 9% of the identified credit unions remained in this group the following year.

As we have seen, there are indications that institutional changes have had an effect on the discretionary choices made by managers. For example, it is possible that the impossibility of a manager being a member of the Board of Administration diminishes the chances of winning the board members over, which is characterized by when an agent interferes with the actions of the principal. In addition, the new auditing rules may also have affected the willingness of the manager to make choices which differ significantly from the sector, or the auditors may have increased the scope of their investigation to meet the new reigning norms. It should also be mentioned that it is possible that the changes that have come with the country's adoption of the International Financial Reporting Standards (IFRS). However, credit unions follow the norms of the Central Bank, as mentioned above, and if they have had

an impact, our hypothesis is that it has been a marginal impact, which means that this does not affect this study's findings.

If we accept that the reported data reveals the preferences of the managers, the results displayed in Table 5 show their predilection for using one of the accounts mentioned in this work to manage earnings, or in other words, based on the deviations from the Benford distribution we can assume that managers choose which accounts to use in order to maximize their expected utility.

The results indicate that OPE was the preferred account to realize discretionary actions, because it was the one used most often by credit unions over the examined period; only in 2017 did the LPCSL account surpass it, which was also the account used to alter bank results according to Papanikolaou and Grammatikos (2021). Taking into consideration all of the years between 2014 and 2017, close to 255 credit union managers opted to use the OPE account. Even though this does not mean that managers do not use other accounts, it was used by 28% of the 905 credit unions classified as "suspect" to take their discretionary actions.

A possible explanation for this is given by the discretion of the agent in terms of defining the period for expenses or the freedom, for example, to define the interest rate offered on member deposits. The intertemporal issue is very important, because posting results earlier or later affects the results of, and the real information about, the organization. This indicates the possibility that, if managers want to show the market that their credit union is a "good business" for acquisition, posting expenses at a later date and reducing or raising interest rates are attractive options.

The LPCSL account was the second preference for managers, given that 25% of the credit unions, or in other words, 228 of the credit unions in the "suspect" group display distributions for the first two digits which are outside of conformity in terms of Benford's distribution. It is possible that the use of this account demonstrates varying appetites for risk on the part of these managers. For example, more risk averse managers will have a greater tendency to use the LPCSL account to improve their credit union's results. However, if the managing of results seeks to show the market that their credit union is a potential target for incorporation, it is possible that these accounts will be given lower figures. Bear in mind that this choice affects the credit union's results in a positive manner.

In 2014, the CASH account was the second most popular account for the "suspect" group in terms of the Benford distribution (93), which indicates that, at the time (before further regulation) it was the preferred account for the "management of earnings". However, in 2017 it was the least popular account in this group (43). This reveals that the preference for those managers who sought to manage earnings changed. This was the account that displayed the greatest variation between 2014 and 2017. It is possible that its use, as well as changes in its use, can be explained by the policy of remunerating deposits in central credit unions, if the singular credit union was an associated credit union, or represented the remuneration rate for capital investments in other banks. The combination of the results mentioned above indicates the use of these accounts by credit unions under surveillance, or in other words, management did not occur in the same manner in credit unions with distributions with greater deviations from Benford's distribution.

6 CONCLUSION

This work has sought to identify whether Benford's Law can be used as a tool to help improve the supervision of credit unions regulated by the Central Bank. It can be used, for example, to identify discretionary behavior on the part of their managers. To accomplish this, we have used financial data from the balance sheets of singular credit unions, or more

specifically the Operating Income, Operating Expenses, Cash and LPCSL (Loss Provisions for Clients/Credits with Suspicious Liquidations) accounts during three timeframes consisting of the years 2006 to 2017, 2014 to 2017 and annual results for 2014 to 2017.

We were able to determine that accounts from the credit union balance sheets follow Benford's distribution when they are evaluated in the data groups mentioned above. This suggests that the choices followed uses and customs captured by the accounting figures. However, this did not occur when this distribution was applied to shorter timeframes, and in this case, we observed that the distribution of values in some accounts diverged from the distribution expected by this statistical law, which may be related to discretionary actions taken by their managers.

Two hypotheses can be used to explain the conformity of the numbers analyzed over a given timeframe. The first involves the possibility that over time the discretionary actions taken by managers ended up becoming normal behavior, which is considered natural if it is in accordance with Benford's Law. The other hypothesis is related to the fact that when one manages earnings, it is expected that the original value returns to the account during future periods. In terms of the analysis of the figures for individual years which present possible discretionary behavior, the results also display a decrease in the number of singular credit unions whose figures are not in line with this statistical rule, which may be related to adjustments to Resolution No. 4,434 of 2015, which impedes managers from being members of the Board of Administration, or in other words, it impedes the agent from interfering in the actions of the principal, and Resolution No. 4,454 of 2015 (BACEN, 2015a; BACEN, 2015b) which requires that singular credit unions be audited by a Credit Union Auditing Entity or an Independent Auditing Firm every year.

This being so, this article has made an important contribution to the field by confirming that it is possible to apply the Benford's Law technique to verify discretionary behavior on the part of credit union managers by examining the financial data of these organizations during annual periods. So, this technique could prove useful to regulatory bodies such as the Central Bank or even associated singular credit union systems in the monitoring of their activities and the identification of possible irregularities.

These findings also indicate the pertinence of this technique for the Central Bank, given that Benford's Law can be used to select samples of suspect data for investigation by auditors and the accounts used in this work are used to analyze the performance of credit unions.

It should be emphasized that this study has potential limitations, such as, for example, the fact that the data made available to the Central Bank is generalized in terms of summary account data for publication, with there not being sufficient detail in the data to explore possible specific discretionary actions that may have been taken in managing these account figures. However, in practical terms, the Central Bank already has a wealth of detail for these accounts at its disposal. Another limitation is the fact that the sample decreases as the timeframes are reduced, leaving it close to the limit suggested by the literature which may cause distortions. Finally, two other points may be added: the association of these credit unions with credit union systems and the impact of the IFRS. Even though we do not believe that these points affect the results of this study, these subjects should be examined in future research.

We also suggest that future research verify which organizational characteristics, among those identified by Benford's distribution, explain the discretionary actions taken by these managers and how they do so. The changing of managers, for example, could also be examined, as well as non-credit union managers as well. We also recommend, if possible, to examine the composition of the suspicious accounts more deeply. Another suggestion for

future studies is to analyze the data based on the separation of the credit unions by system, given that a system may influence the possibility of discretionary actions, and the fact that unassociated credit unions are treated with greater care by the Central Bank.

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Identificação de Ações Discricionárias do Gestor em Cooperativas de Crédito: Uma aplicação da Lei de Benford

RESUMO

Objetivo: Investigar se a Lei de Benford poderia ser uma ferramenta que contribuiria para o aprimoramento do processo de supervisão das cooperativas pelo Banco Central do Brasil (BACEN). Isto é, se sua aplicação aumentaria a assertividade na identificação das cooperativas cujo gestor tem feito escolhas discricionárias que divergem do padrão regulatório.


Método: A Lei de Benford foi aplicada a todas as cooperativas de crédito singulares do Brasil, no período 2006 a 2017 - janela com relevante mudança regulatória, para as contas de Receita Operacional, Despesa Operacional, Caixa e Perda Estimada para Clientes/Créditos de Liquidação Duvidosa em diferentes janelas de tempo.

Relevância: As evidências discutidas oferecem elementos para aprimoramento de mecanismos de regulação, indicando a possibilidade de os gestores estarem utilizando de seu poder discricionário para influenciar os resultados das cooperativas de crédito singulares.

Resultados: O tempo é um fator importante para o uso da ferramenta. Aplicações em períodos longos não capturam as discricionariedades dos gestores devido as potenciais acomodações das variações ao longo do tempo. A periodicidade anual permite à técnica capturar potenciais ações discricionárias nas contas estudadas. Além disso, a técnica se mostrou consistente para gerar uma lista de cooperativas que deveriam ter um processo de fiscalização e/ou averiguação mais intensa. Ainda, indica que os normativos editados em 2015 contribuíram para reduzir o incentivo ao gerenciamento de resultado e/ou fraude nessas organizações.


Contribuições metodológicas: A pesquisa preenche a lacuna na literatura sobre cooperativas de crédito, dado que há poucos estudos sobre a prática de ações discricionárias nestas organizações incluindo escolhas contábeis, gerenciamento de resultados, fraude ou erros. As evidências encontradas podem ser um indício de ajuste das cooperativas de crédito ao padrão do setor em função da adoção das resoluções nº 4.434 e nº 4.454. A Lei de Benford também se mostra útil como ferramenta para seleção de amostras para auditorias, podendo aprimorar o trabalho dos órgãos de fiscalização.

Palavras-chave: Contabilidade bancária; cooperativas de crédito; regulação; ações discricionárias; Lei de Benford.

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