Camel e Pearls: Comparativo entre Metodologias de Análise de Desempenho Financeiro de Cooperativas de Crédito

Camel and Pearls: Comparison Between Methodologies for Financial Performance Anaysis of Credit Unions

Camel y Pearls: Comparación entre Metodologías de Análisis del Rendimento Financiero de Las Cooperativas de Crédito

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PALAVRAS-CHAVE
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Resumo: O cooperativismo de crédito brasileiro vem apresentando um expressivo crescimento, e diante disso torna-se cada vez mais importante avaliar o desempenho econômico-financeiro dessas cooperativas. Nesse cenário destaca-se a Sicoob Credichapada, localizada em Minas Gerais, que é reconhecida pelos seus impactos na localidade onde atua, devido à execução de diversos programas sociais. O presente estudo teve como objetivo comparar os modelos de avaliação de desempenho CAMEL e PEARLS, aplicando-os simultaneamente aos balancetes mensais da Credichapada no período entre agosto de 2011 e maio de 2019. Com relação à comparação entre os modelos, os resultados indicam que o sistema PEARLS aborda uma avaliação econômico-financeira minuciosa dentre as várias vertentes do sistema, e o CAMEL possui uma análise similar, porém sucinta e menos detalhada. Adicionalmente, os resultados obtidos sugerem que a cooperativa apresenta desempenho satisfatório para quase todo o período, apesar de evidenciar um aumento do risco da carteira de crédito.

Abstract: *Brazilian credit cooperatives have shown significant growth, and face in that it is increasingly important to assess the economic and financial performance of these cooperatives. In this scenario Sicoob Credichapada stands out, located in Minas Gerais, which is recognized for its impacts in the locality where it operates, due to the execution of several social programs. The present study aimed to compare the CAMEL and PEARLS performance assessment models, applying them simultaneously to Credichapada's monthly balance sheets between August 2011 and May 2019. In relation to the comparison between the models, it was found that the PEARLS system addresses a thorough economic-financial assessment among the various aspects of the system, and the CAMEL has a similar, but succinct and less detailed analysis. Additionally, the results obtained indicated that the cooperative has a satisfactory performance for almost the entire period, despite an increase in the risk of the credit portfolio.*

Resumen: *Las cooperativas de crédito brasileñas han mostrado un crecimiento significativo, y se enfrentan a que es cada vez más importante evaluar el desempeño económico y financiero de estas cooperativas. En este escenario se destaca Sicoob Credichapada, ubicada en Minas Gerais, la cual es reconocida por sus impactos en la localidad donde opera, debido a la ejecución de varios programas sociales. El presente estudio tuvo como objetivo comparar los modelos de evaluación de desempeño CAMEL y PEARLS, aplicándolos simultáneamente a los balances mensuales de Credichapada entre agosto de 2011 y mayo de 2019. En relación a la comparación entre los modelos, se encontró que el sistema PEARLS aborda una evaluación económico-financiera exhaustiva entre los diversos aspectos del sistema, y el CAMEL tiene un análisis similar, pero sucinto y menos detallado. Además, los resultados obtenidos indicaron que la cooperativa tiene un desempeño satisfactorio durante casi todo el período, a pesar de un incremento en el riesgo de la cartera crediticia.*

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Introduction

Credit unions play an important role in the financial systems of many countries. It is an entity that does not have as its main objective the maximization of profit, but rather focuses on maximizing the benefits for its members and, in this way, aims to guarantee the continuity, popularity and sustainability of credit unions (McKillop, French, Quinn , Sobiech & Wilson, 2020). In this context, these institutions act in the provision of financial services to their members, being an alternative to supply the demand for credit in the market at a more attractive cost of capital for individual borrowers (Bressan, Braga, & Lima, 2003).

In general, cooperatives operate regionally in order to allocate financial resources in a way that makes it possible to offer alternatives that lower the cost of capital for their members when compared to the cost of capital offered by banks. Among the functions of these entities are the granting of financial loans at different rates and the provision of banking services in general. Therefore, the efficiency of credit unions is associated with the ability to maximize benefits to members, materialized in credit operations and net benefits, in return for the resources used to obtain them (Ferreira, Gonçalves, & Braga, 2007).

In addition to providing services, cooperatives are instruments of socioeconomic development in the locations where they operate. According to Ferreira, Gonçalves and Braga (2007), credit unions with better economic-financial performance could also present better social and economic actions for their scope of action. Among credit unions, as a tool for socioeconomic actions, the Free Admission Credit Union of Urucuia and São Francisco Ltda., Sicoob Credichapada, created in 2011 and which has been recognized for its impacts on the area of acting. Credichapada develops a Cooperative, Entrepreneurial and Financial Education Program that has been gaining prominence for the social and economic transformations it generates in the community, having been awarded 1st place in the Social

Harmony category of the Concred Verde Award in 2016 and 2nd place in 2018 in the same award.

Several studies (Trindade, Ferreira Filho & Bialoskorski Neto, 2008; Rosalem, Silva, Silva, & Alcântara, 2010; Almada, Abreu, Cunha, & Silva Filho, 2011), highlight that credit cooperatives are aligned with the need to generate performance in its activities, providing cooperative members with returns on their investments or financing conditions, in the portfolio of products and services. Thus, the financial performance of credit unions indicates how satisfactory the management of these institutions' operations is. And although credit unions do not aim to make a profit (Helmberger & Hoos, 1962), they need to present economic results that help their social function and survival in the market (Sales, 2010).

In view of this, it is necessary to use methodologies to assess the financial performance of these institutions, in a way that makes it possible to organize and condense the information, taking into account the volume of indicators and the different combinations of existing performance analysis (Ferreira & Macedo, 2011). In this scenario, there are methodologies that help in evaluating the performance of credit unions, among them the PEARLS model, which the World Council of Credit Unions (WOCCU), a global development agency for credit unions, developed in the 1980s specifically to the analysis of the performance of credit unions. Subsequently, there was a proposal to adapt this model to the Brazilian reality, with the specification of the accounts of the Accounting Plan of Financial Institutions of the National Financial System - COSIF by financial accounting indicator, which was suggested by Bressan, Braga, Bressan and Resende Filho (2010). In addition to PEARLS, there is also the CAMELS System, which represents a set of performance indicators and was initially studied by Meyer and Piffer (1970) and Altman (1971), and which is used internationally for monitoring institutions financial.

Due to the importance of cooperativism for sustainable development and the search for improvements in statistics regarding cooperatives, the effort to improve studies on credit cooperatives is justified, in order to understand and promote

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their economic and social role (Internacional Cooperative Alliance [ICA], 2021). In this context, this study seeks to answer the following research question: Should credit unions choose to use the PEARLS model or the CAMEL model to measure economic-financial performance? As a general objective, we seek to comparatively evaluate the two main performance evaluation models - CAMEL and PEARLS - identifying in which aspects they are similar or not. For this purpose, data from Sicoob Credichapada were used, as it was a prominent institution in 2016 and 2018 in the Social Harmony category of the Concred Verde Award.

The present study intends to contribute to the literature by empirically highlighting the delimitation of models for evaluating the financial performance of credit unions, and thus enabling discussions about employment and possible improvements of both models. Additionally, the research aims to contribute to the managers of these institutions in the sense of providing inputs on the performance measurement models, and mainly by providing a basis for decision-making that directs the cooperatives on which model best suits the respective institution, and consequently propitiates more assertive performance analyzes for cooperative members, regulatory bodies and society in general.

Theoretical elements of the research

Credit Union and Sicoob Credichapada

Credit cooperatives are the only financial institutions physically present in 594 Brazilian municipalities, and this reach qualifies these cooperative financial institutions as important agents of social and economic development (OCB, 2020). In this scenario, credit cooperatives are present in practically 100% of the Brazilian territory, and together they have the largest banking service network in the country and a portfolio of products and services similar to that of the other institutions that make up the National Financial System (SFN), but with interest and fees about 30% lower. In addition to savings, cooperatives offer inclusion and financial education to around 11

million Brazilians, many of them residents of one of the dozens of cities where they are the only financial institutions present. From 2008 to 2018, the number of people linked to a credit union grew by approximately 180% (Portal do CooperativismFinancial, 2019).

In this scenario, the Free Admission Credit Cooperative Sicoob Credichapada, the central object of this study, was inaugurated in September 2011, and has its headquarters located in the city of Chapada Gaúcha, north of Minas Gerais, with operations also in nearby municipalities such as Urucuia, Pintópolis, São Francisco, Bonito de Minas, Cônego Marinho and Januária. In 2017, Sicoob Credichapada already served more than 6,000 members, with the purpose of "enhance the economic and social development of members and their communities, through financial solutions of excellence", in addition to being recognized as a solid financial cooperative, inducing the economic and social development of cooperative members and their communities" (Sicoob Credichapada, 2018).

Sicoob Credichapada stands out for its development of projects that represent a great social impact in the municipality, such as the Cooperative, Entrepreneurial and Financial Education Program, which was recognized in 2018 by the Central Bank as a national reference in financial education, and which serves more than 7,000 students in more than 300 schools (municipal and state) in the area covered by Sicoob Credichapada (OCB, 2017). Due to the success of the program, Sicoob Credichapada also won recognition in 2016 and 2018 in the Social Harmony category of the Concred Verde Award (OCEMG, 2018). By analyzing the projects developed by Sicoob Credichapada, it is possible to see how much this cooperative impacts not only economic development, but also social development in its entire area of activity, by applying principles of cooperativism, promoting education, training and information to the local citizen. In this way "it is expected that the initiative will serve as an example for cities and citizens"

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(OCB, 2017). And so, given the importance and relevance that Sicoob Credichapada exercises in the environment in which it operates, the determination of criteria for measuring performance is relevant for the various stakeholders, whether they are the local market, cooperative members, managers, investors, government and the community.

Performance Assessment Models for Credit Unions

Performance assessment is essential for cooperative societies, as it enables comparisons with other institutions in the segment, as well as assessing the proportion in which their objectives are being achieved (Croteau, 1950; McKee, 1966). It is important to highlight the importance of measuring financial and economic performance in credit unions, which shows that, as much as credit unions have the need to reduce social inequalities and develop regionality, it is necessary to be concerned with the performance of these entities in terms of economic viability, which would guarantee their continuity (Meinen & Port, 2014).

In addition to performance related to social practices, the literature on performance in cooperatives points out that cooperative members expect a return on invested capital, and at the same time, a quality service at a more attractive cost than that offered by other institutions (Meurer & Marcon, 2011). To minimize the insecurity of related parties, systems emerge that offer support to indicate possible financial crises, and that contribute to the optimization of capital and resources available in the market (Bressan, Braga, Bressan, & Resende Filho, 2011).

Slack et al. (2002) point out that all organizations need performance measures to carry out the continuous improvement of their activities. However, it is important to highlight that the selection of critical indicators for measuring performance must be made according to the sector in which the organization operates (Macedo, Silva, & Santos, 2006). In this sense, the performance analysis of cooperatives could not follow the same evaluation parameters of other institutions, and therefore there are performance evaluation models

specifically applicable to financial institutions and credit unions such as CAMEL and PEARLS, discussed in this study.

CAMEL System

Meyer and Pifer (1970) proposed a model aimed at evaluating the performance of banking activities, initially composed of nine indicators for predicting bank failure, which measured the indebtedness of managers, the growth of loans, interest rates on deposits, cost growth, real borrowing, borrowing growth, borrowing returns, asset quality, and asset growth. After further adaptations, this model was called by the acronym CAMEL, composed of five key areas that each contain a group of indicators that represent: Capital Adequacy, Asset Quality, Management), Earnings (Results), Liquidity (Liquidity), and constitutes a banking supervision tool for assessing the soundness of financial institutions. In picture 1, information and explanations can be found regarding each of the CAMEL indicator groups.

Indicator Groups	Description
Capital Adequacy	Mitchell (1984) defined that capital adequacy should be determined in terms of equity over deposits, since the biggest risk for banks is to suffer a sudden outflow of bank deposits.
Assets Quality	Grier (2007) defines that the indicators referring to asset quality examine not only the assumed credit risk and the quality of the loans, but also the level of provisioning, resorting to the analysis of trends and comparison with the main competitors.
Management	Management Quality refers to the ability of the board of directors to identify, measure and control activity risks and ensure a stable, solid and efficient operation in compliance with applicable laws and regulations (Uniform Financial Institutions Rating System, 1996).
Earnings	According to Gomes (2012), the result is the best indicator of management success, regarding the strategy and leadership of a financial institution, and its index reflects not only the quantity and trend of results, but also factors that can affect its sustainability.
Liquidity	It is essential that a financial institution

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	has a variety of sources of liquidity, including cash that is immediately convertible into cash. Liquidity management policies should ensure that an institution is able to maintain a sufficient level of liquidity to meet its financial obligations while at the same time being able to liquidate assets quickly, with minimal loss. (Uniform Financial Institutions Rating System, 1996).

Picture 1
CAMEL's Key Areas Description
Source: Prepared by the authors based on the mentioned studies.

In the literature, there are studies that highlight the application of CAMEL in financial institutions in several researches. Among these studies are those of Meyer and Piffer (1970) who developed the CAMEL model by properly combining financial rates with the characteristics of banks, in order to prepare the prediction of their insolvency. In 1985, West (1985) used the CAMEL classification system in 1,900 US banks in the context of early warning systems for bank financial failures, using financial indicators similar to CAMEL as explanatory variables to use factors produced in estimating a logit model. In the Brazilian context, the study by Rosa and Gartner (2017) stands out, which sought to propose an early warning model for predicting financial distress events in Brazilian banking institutions. The author evaluated a set of economic and financial indicators and, among them, the CAMEL approach indicators, pointed by the risk management literature as a guide for discriminating bank insolvency situations, taking into account, exclusively, public information.

Scientific researches have also applied the CAMEL model specifically for the analysis of credit unions in the Brazilian scenario, and among them, the study by Carreiro and Cunha (2008), which evaluated the economic-financial performance of some cooperatives in the period from 2001 to 2005 through the CAMEL methodology. Guse, Gollo and Silva (2014) developed a study that aimed to analyze the financial economic performance of the largest Brazilian credit unions. This performance analysis was carried out using the indicators proposed by

the CAMEL model, and one of the conclusions reached was that the higher the economic and financial performance indices of the CAMEL model, the greater the performance regarding the capacity for growth in the lending activity to cooperative.

Simkhada (2017) employs the CAMEL and PEARLS methodologies to measure the performance of financial cooperatives in Nepal, with the aim of identifying and recommending different indicators to measure the economic performance of cooperatives in the country. In short, the results indicate that the calculated indicators attest to average standards similar to international recommendations.

PEARLS System

The World Council of Credit Unions (WOCCU) created the PEARLS system in the late 1980s, based on an adaptation of CAMEL for the environment of credit unions (Richardson, 2002). The name PEARLS is an acronym for the conjunction of the initials of the key operational areas evaluated through a set of indicators that make up each area: Protection; Effective Financial Structure; Assets Quality; Rates of Return and Costs; Liquidity; Signs of Growth (BRESSAN et. al., 2011). Picture 2 presents a brief description of each of the key areas of the PEARLS system, based on the WOCCU manual according to Richardson (2002) and translated by Vasconcelos (2006).

Key Areas	Description
Protection	Protection is measured in two ways: comparing the adequacy of provisions for loan losses on the amount of non-performing loans; and comparing the allowances for losses to the total amount of unregulated investments.
Effective Financial Structure	The credit union's financial structure is the most important factor in determining its growth potential, earning capacity and overall financial strength.
Assets Quality	An asset that does not generate cash is an unprofitable asset, and an excess of non-performing assets negatively affects credit union earnings.
Rates of Return and	To help manage the cooperative's investment income and assess operating

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Costs	expenses, the PEARLS system segregates key components of net income.
Liquidity	Effective liquidity management becomes a very important skill when the credit union exchanges its financial structure based on member dues for the volatility of savings deposits.
Signs of Growth	The only successful path to maintaining valued assets is through strong and accelerated asset growth, accompanied by sustained profitability. Growth by itself is insufficient.

Picture 2
PEARLS Key areas description
Source: Adapted from Richardson (2002).

WOCCU considers the PEARLS system as a management tool for credit unions, providing predictive signals for managers about problems that may become harmful to the institution. Bressan et al. (2011) report that the use of the PEARLS method allows the identification of cooperatives with weak capital structure and also to identify the causes of the problem; and Zhingre (2012) points out that PEARLS allows identification of the problematic areas of cooperatives, in order to allow them to make the necessary adjustments before the problems become more serious.

In the Brazilian context, the study by Bressan et al. (2010) who presented a proposal to adapt the PEARLS system to the Brazilian reality, with the specification of the accounts of the Accounting Plan of the Financial Institutions of the National Financial System - COSIF, totaling 39 financial accounting indicators with the objective of enabling the use of indicators in order to perform comparisons and financial analyzes between Brazilian credit unions and also comparative analyzes with cooperatives abroad that use the PEARLS System. Bressan et al. (2011) sought to evaluate, via the logit model, which indicators of the PEARLS System would be the main predictors of insolvency, for 510 credit unions affiliated to Sicoob-Brasil in the period from January/2000 to June/2008, and for 117 cooperatives affiliated to Sicoob-Brasil. Sicoob-Crediminas in the period from January/1995 to May/2008, respectively. Still in this line, the research by Gozer et al. (2014) also evaluated insolvency in 62 credit unions in Paraná, using the PEARLS System.

Finally, Silva, Santos, Santos and Neto (2020) studied the financial sustainability of credit unions based on the relationship of PEARLS indicators on three performance indicators: ROA (return on assets), ROE (return on equity) and CPLA (adjusted equity growth). The results indicate that there is a negative relationship between ROE and ROA, with P1 (protection); and positive with E1 and E9 (financial structure indicators); in addition to a significant and positive relationship between the CPLA and the indicator A1 (asset quality) and E1 (financial structure).

Methodological elements of the research

The present research can be defined as descriptive, as it presents the economic and financial characteristics of Sicoob Credichapada, based on the financial statements, composed of information from the COS 4010 balance sheet, provided by the institution itself, and which were evaluated through the indicators of the CAMEL Systems and PEARLS and, additionally, the results obtained through the two systems were compared. The study carried out can be considered ex post facto, since the financial structure of the cooperative was evaluated between August 2011 and May 2019. The data from the balance sheets provided by Sicoob Credichapada were organized and separated month by month from August 2011 to May 2019 in an electronic spreadsheet, and thus all the necessary accounts were identified and extracted according to the study by Rosa and Gartner (2017) for the CAMEL indicators, as shown in Picture 3.

Indicator	Description of COSIF Accounts	Recommended Performance
C	(Shareholders' Equity) / (Bonds and Securities and Derivative Financial Instruments + Interbank Relations + Interdependence Relations + Credit Operations + Leasing Operations + Other Credits + Other Assets and Assets)	The higher the better.
A	(Provisions for Credit Operations) / (Total	The lower the better.

	Portfolio)	
M	(Funding Expenses) / (Current and long-term liabilities)	The lower the better.
E	(Operating Revenue – Operating Expenses) / (Current and Long-Term Receivables + Permanent)	The higher the better.
L	(Cash + Interbank Liquidity Investments + Financial Segment Index of Free Securities) / (Deposits + Obligations for Repurchase Agreements)	The higher the better.

Picture 3
CAMEL Indicators
Source: Adapted from Rose and Gartner (2017)

The indicators that make up the PEARLS system were calculated based on the work by Bressan et al. (2010) who prepared 39 financial indicators adapted from the PEARLS System to the Brazilian reality, combined with the availability of information extracted from the COSIF plan accounts, specifically arranged in the monthly COS 4010 balance sheets. Picture 4 shows the PEARLS indicators.

Protection Indicators
P1 = Allowance for loan losses / Total Classified Portfolio
P2 = Overdue loan operations / Total Classified Portfolio
P3 = Level D to H Risk Operations / Loan portfolio classification
P4 = Level D to H Risk Operations – Estimated Provision Percentage for levels D to H / Adjusted Shareholders' Equity

Effective Financial Structure Indicators
E1 = Net loan operations / Total Assets
E2* = Financial Investments / Total Assets
E3 = Share Capital / Total Assets
E4 = Institutional Capital / Total Assets
E5 = Income from financial intermediation / Average Total Assets
E6 = Total Assets / Adjusted Shareholders' Equity

Asset Quality Indicators
A1 = Permanent Assets + Assets not allocated to the cooperative's core activity / Adjusted Shareholders' Equity
A2 = Fixed Assets = Fixed Assets / Adjusted Shareholders' Equity
A3 = Assets not directed to the core activity of the cooperative /Total assets
A4 = Total Deposits / Total Assets

Rate of Return and Cost Indicators
R1 = Income from credit operations / Average Credit Operations
R2* = Net income from financial investment / Average financial investment
R3 = Term Deposit Expenses / Term Deposits
R4 = Expenses on Borrowings and Onlendings / Average Borrowings and Onlendings
R5 = Gross Margin / Average Total Assets
R6 = Operating Expenses/Average Total Assets
R7 = Surplus / Average total assets
R8 = Surplus / Average Adjusted Equity
R9 = Result of Financial Intermediation / Operating Revenue
R10 = Surpluses / Operating Revenue
R11 = Income from services rendered / Administrative expenses
R12 = Management Expenses / Administrative Expenses
R13 = Administrative Expenses / Average Total Assets

Liquidity Indicators
L1 = Availability / Demand Deposits
L2 = Short-term assets / Total deposits
L3 = Free Cash / Total Assets

Growth Rate Indicators
S1 = Operating Revenue Growth = (Operating Revenue for the current month / Operating Revenue for the previous month) – 1
S2 = Total Funding Growth = (Total Funding for the current month / Total Funding for the previous month) – 1
S3 = Growth in Loan Operations with risk level D-H = (Loan operations with risk level D-H in the current month / Loan operations with risk level D-H in the previous month) – 1
S4 = Growth of Non-Organized Assets with core activity of the cooperative (Andaf) = (Andaf of the current month / Andaf of the previous month) – 1.
S5 = Growth in Provision for Loan Operations = (Provision for Loan Operations in the current month / Provision for Loan Operations in the previous month) - 1
S6 = Growth in administrative expenses = (current month's administrative expenses / previous month's administrative expenses) -1
S7 = Adjusted Shareholders' Equity Growth = (current month's PLA / previous month's PLA) -1
S8 = Total Assets Growth = (Total Assets of the current month / Total Assets of the previous month) -1
S9 = Growth in credit operations = (Current month's credit operations / Previous month's credit operations) -1

Picture 4
PEARLS Indicators
Source: Adapted from Bressan et al. (2010)
*Note: *Adapted indicator. The account "Deposits from Affiliated Cooperatives" was excluded from the composition of "Financial Investments", since this type of operation does not occur at*

Credichapada, since it is a singular cooperative, and therefore does not receive deposits from affiliated cooperatives.

Presentation and discussion of results

For the comparative analysis between the Systems, we sought to identify the main similarities between the CAMEL indicators in relation to the PEARLS indicators, and in general, it was found that the results obtained through the CAMEL indicators are equivalent to the results found by the PEARLS system indicators.

The "C" indicator of the CAMEL System (C=Net Equity/(Total Assets – Available Cash – Interbank Liquidity Applications) aims to measure the use of own resources in financing assets held by the credit union; it is expressed in the PEARLS system as a composition of the E3 indicators (E3=Social Capital/Total Assets) and the E4 indicator (E4=Institutional Capital/Total Assets), differing in the inclusion of Availability and Interbank Liquidity Applications accounts and in the Permanent Assets account that composes o Total Assets of PEARLS. However, in general terms, the analysis of both indicator C and indicator E3 and E4 bring the same conclusion regarding the financial structure of the cooperative, which can be seen in Grafhic 1.

From the analysis of indicators C, E3 and E4, it can be attested that E3 meets the recommendation suggested by WOCCU (Richardson, 2002) which the percentage should not exceed 20%; In the same sense, E4 despite the fact that for most of the analyzed period it was below the 10% recommended by WOCCU (Richardson, 2002), it can be seen graphically that there is an upward trend of E4 over the years, so much so that the indicator reaches the mark of 10% in 2019, with a strong indication that it will remain within the recommended range. Finally, indicator C corroborates the analysis of E3 and E4, which shows an upward trend in equity participation financing the assets of the cooperative itself, better for it, thus reducing the need for third-party capital, indicating a healthy situation and lower risk for the institution.

The "A" indicator of the CAMEL System (A= Provisions for Loan Operations/Total Loan Portfolio), is similarly expressed in the PEARLS system as the P1 indicator (P1=Provisions for Loan Operations/Total Loan Portfolio). That is, both indicators (A and P1) measure the relationship between Provisions for Loan Operations and the Total Loan Portfolio, and aim to detect, measure and monitor the credit risks associated with a portfolio. The recommendation, according to Richardson (2002) is that the lower the P1 indicator, the better. Because, the smaller the provision in relation to the total portfolio, the better the quality of the assets. The indicators are replicated in both systems, as shown in Grafhic 2.

In this context, the analysis of A and P1 shows that the Cooperative has an upward trend in both indicators, which reached a peak of 14% in 2019, which, in theory, serves as a warning for Credichapada to increase the ratio of the doubtful provision account when compared to its credit portfolio. This observed upward trend indicates a reduction in the quality of its credit operations if the amounts provisioned for loan losses are verified, and thus there is an increase in the credit risk associated with the total portfolio over the analyzed period.

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Grafhic 1
Comparison of Indicators C x E3 x E4
Source: research results.

Grafhic 2
Comparison of Indicators A x P1
Source: research results.

CAMEL's "M" indicator (M= Funding Expenses/Current Liabilities and Long-Term Liabilities) aims to identify, measure and control activity risks and ensure a stable, solid and efficient operation. This indicator in the PEARLS system is partially reflected by indicator R3 (R3= Expenses on Time Deposits/Time Deposits), which aims to measure the cost of time deposits.

From the visual comparison of Grafhic 3 with Grafhic 4, it is clear that there is a positive correlation between them when observing the same behavior over the period, however it is noted that the R3 indicator has higher values and is less volatile than the indicator M. In any case, the analyzes resulting from some of the indicators in group R, more specifically R3, are similar.

In this sense, the analysis of the "M" indicator shows a practically negligible percentage throughout the period, less than 1%, of Liabilities related to Funding Expenses, which indicates an adequacy of the course of business and a

comfortable position of the cooperative. In parallel, the analysis of indicator R3 - whose function is to protect the nominal value of time deposits - indicates that this rate is higher than the inflation rate (Richardson, 2002). With the drop in the inflation rate below 7% as of 2016, it can be seen that Credichapada has complied with the suggested limits and manages to maintain, as of 2017, a protection of the nominal value of time deposits in relation to inflation.

CAMEL's "E" indicator (E= (Operating Revenue – Operating Expenses)/(Current and Long-Term Assets + Permanent Assets)), it can be seen that in the PEARLS system it is exactly reflected by the R5 indicator (R5= (Operating Revenue – Operating Expenses)/Average Total Assets). Differing only due to the use of Average Total Assets by PEARLS. The similarity of the indicators is evidenced when viewing Grafhic 5 – Comparison of Indicators E x R5, in which both indicators were plotted together.

The objective of both indicators (E and R5) is to identify and measure whether the revenue generated is sufficient to cover expenses and still provide capital increase, as recommended by WOCUU (Richardson, 2002). In other words, this indicator is directly related to the generation of positive and continuous results that define the cooperative's ability to create value, support growth strategies and absorb possible losses, and allocate part of these results to the composition of the regulatory capital.

Grafhic 3
M Indicator
Source: research results.

Grafhic 4
R3 Indicator
Source: research results.

From the analysis of Grafhic 5, it is possible to verify a cyclical behavior of this

indicator, always with drops in the months of June and December, with the calculation of results. Therefore, the income accounts, creditors and debtors, are closed when the June and December balance sheets are calculated. In general, it is worth highlighting the sharp drop in this indicator from December 2019, which indicates that the cooperative is not managing to cover its expenses from the revenue generated in the period, and which should serve as a warning for the management of Credichapada.

CAMEL's "L" indicator (L=(Cash + Liquidity Interbank Investments + Free Real Estate Financial Segment Index)/(Deposits + Obligations for Repo Operations)), suggests that in the PEARLS system it is partially reflected by the indicator L2 (L2=(Cash + Interbank Liquidity Investments + Free Real Estate Financial Segment Index)/ (Deposits)). Differing only due to the exclusion of the Obligations for Repo Operations account from the denominator of L2.

By including in Grafhic 6 – Comparison Indicators L x L2 both indicators simultaneously, it is clear that visually there is a certain positive correlation between them when observing the same behavior over the period, however it is noted that the L2 indicator has higher amounts, precisely

due to the exclusion of the Liabilities for Repurchase Agreements account from the denominator, which contains only the Deposits account. In any case, both indicators return practically the same conclusion regarding Credichapada's Liquidity.

Based on the analysis of Credichapada's results, it is possible to see that the L2 indicator indicates that in 2019 the cooperative has a positive scenario in terms of liquidity, since approximately 60% to 80% of Deposits are covered by Short-Term Assets. CAMEL's "L" indicator shows, throughout the entire period, an immediate liquidity of less than 20%, that is, a maximum of 20% of Obligations for Deposits and for Repurchase Agreements are covered by assets of immediate liquidity, which should not be necessarily evaluated as a negative point, since high liquidity values are not justified, since they are values not monetized by the cooperative, and it is presumed that this percentage can be considered sufficient for Credichapada in terms of liquidity. That is, it should be noted that liquidity reserves are important, but they also imply a lost opportunity cost. On the other hand, it is important to maintain liquidity buffers to a minimum that is acceptable to the institution.

Grafhic 5
Comparison of Indicators E x R5
Source: research results.

Grafhic 6
Comparison of Indicators L x L2
Source: research results.

After all the above, Picture 5 is then presented, which has the similarities for each of the evaluation systems, PEARLS and CAMEL, indicating their objectives, the corresponding indicators for each of the systems and the differences between them, considering all the observations already mentioned above.

General Purpose of Indicator Measurement	Corresponding CAMEL indicator	Corresponding PEARLS Indicators	Differences between the corresponding indicators CAMEL and PEARLS
Measure the percentage of Current and Long-Term Assets (excluding cash and interbank liquidity investments) financed by Shareholders' Equity.	C (Capital Adequacy)	Composition of E3 and E4 (Effective Financial Structure)	1) Indicators E3 and E4 include cash on hand and cash investments for calculating Long-Term Current Assets. 2) Indicators E3 and E4 also include Permanent Assets to measure the percentage of Total Assets financed by PL.
Measure the volume of provisions for loan losses in relation to the total classified portfolio.	A (Asset Quality)	P1 (Protection)	None.
Measure funding expenses in relation to Current Liabilities and Long-Term Liabilities.	M (Management Quality)	Partial R3 (Rate of Return and Costs)	1) The M indicator considers all funding expenses divided by Current Liabilities and Long-Term Liabilities. 2) Indicator R3 considers only the term deposit expense account (in module) divided by the term deposit account (liabilities)
Measure the difference between Operating Income and Operating Expenses in relation to Total Assets.	E (Results)	R5 (Rate of Return and Costs)	None.
Measure the institution's current liquidity, that is, the cooperative's immediate ability to adequately meet its financial obligations.	L (Liquidity)	Partial L2 (Liquidity)	1) The L indicator considers the account of deposits and the account of obligations for committed operations for the composition of the denominator of the liquidity indicator. 2) The L2 indicator considers only the deposit account for the composition of the indicator's denominator.

Picture 5
Summary of Corresponding Indicators for PEARLS and CAMEL Systems
Source: Prepared by the Authors.

Analysis of PEARLS Indicators that do not have a direct correspondence with CAMEL Indicators

In search of a more complete analysis of the performance of Sicoob Credichapada and consistent with the PEARLS System, the analysis of the other PEARLS indicators that were not addressed in the previous section is briefly presented.

Protection Indicators

As seen in grafhic 7 – Protection Indicators, the other indicators of P2, P3 and P4 – except P1 previously analyzed – converge to the same conclusion. Credichapada is healthy in terms of protection and the indicators meet WOCCU recommendations (Richardson, 2002). As of the second half of 2016, there has been a considerable increase in the amounts of the overdue loan portion, as well as an increase in the Allowance for Loan Losses, and an increase in the portion not provisioned for in relation to PLA - Adjusted Shareholders' Equity , Credichapada, in general, complies with the WOCCU principle of protection against credit losses and has resources to cover its entire overdue credit portfolio; however, the Cooperative's management must warn about the high levels that the Protection indicators reached in 2019.

Grafhic 7
Protection Indicators
Source: Research Results.
Note. P2 = Overdue Credit Operations/Total Classified Portfolio. P3 = Level D-H Risk Operations/Loan Portfolio Classification. P4= [(Risk Operations level D-H) – (% of Estimated Provision level D-H)]/Adjusted Shareholders' Equity.

Effective Financial Structure Indicators

In general, indicators E1, E2, E5 and E6 associated with the analysis of Credichapada's Effective Financial Structure (excluding E3 and E4, previously analyzed) as shown in Grafhic 8 - Indicators of Effective Financial Structure, attest to a positive view in terms of the financial structure of the cooperative in the analyzed period. The levels found in E1 stand out, which indicates a considerable portion of the total assets invested in the credit portfolio of the cooperative, an operation which generates income for the institution itself. It should be taken into account that the E2 indicator still does not have consolidated values over the period analyzed and consistent with those recommended by WOCCU (Richardson, 2002) which suggests E2 below 10%, but a downward trend is perceived, and with this, the cooperative can reach the recommended values over time. As the recommendation for E5 is that the higher the better, it can be seen that it reaches around 20% in 2019, thus attesting to a good level relative to Income from Financial Intermediation.

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Grafhic 8
Effective Financial Structure Indicators
Source: Research Results.
Note. E1 = Net Credit Operations/Total Assets. E2 = Financial Investments/Total Assets. E5 = Income from Financial Intermediation/Average Total Assets.

Rate of Return and Cost Indicators

In general, the results presented by the Cooperative for the other Indicators of Rates of Return and Costs (excluding R3 and R5 analyzed in the previous section with the caveats), corroborate the recommendations of WOCCU (Richardson, 2002), by Bressan et al. (2010). As recommended by Bressan et. al (2010) and Richardson (2002) the analysis of indicators related to rates of return and costs should be performed jointly. And among the results of the other indicators presented by this key area, it can be concluded that the Cooperative has adequate levels for management and operating expenses, enabling an effective service to its members and also allowing an expansion of Credichapada's activities, the which generated a significant increase in the Cooperative's Total Assets in 2014 and 2015. It is also worth mentioning the rates of return both in relation to Total Assets and in relation to Shareholders' Equity itself, which enabled Credichapada to enable the increase in Institutional Capital from the Leftovers obtained. In general, and considering the Brazilian scenario of credit

unions and their short time of existence, it can be attested that Credichapada complies with existing recommendations in the literature.

Liquidity Indicators

The other Credichapada Liquidity indicators (excluding L2 analyzed above) differ from each other, since Richardson (2002) recommends that L1 be equal to or greater than 1, and L3 the smaller the better. Thus, L3 complies with the recommendations, but if L1 is analyzed separately, it presents a certain restriction related to the liquidity presented by the Cooperative. However, when expanding the analysis of Liquidity, it is possible to understand that the restriction of L1 does not necessarily mean a problem with regard to Credichapada's liquidity, being therefore inefficient in terms of profitability to have high values in the Cash and Cash accounts, and in this way it can It can be inferred that globally the cooperative has good levels of liquidity (Grafhic below).

Grafhic 9
Liquidity Indicators
Source: Research Results.
Note. L1 = Availability/Deposits on demand. L3= Free Cash/Total Assets.

Growth Signal Indicators

None of the indicators related to Signals of Growth of the PEARLS System are similar to any of the CAMEL indicators suggested by Gartner (2017). The results are shown in Table 1 – Growth Signal Indicators. It is worth mentioning the high values of growth indicators in June and December 2012, which is justified by the fact that Sicoob Credichapada was inaugurated in 2011, and therefore these are percentages of growth in the initial semesters of the Cooperative's activity.

In general terms, similar behavior can be observed between some Growth indicators, that is, until mid-December 2017 and June 2018 there was growth in Operating Revenue (S1), Total Funding (S2), Credit Operations with risk level D-H (S3), Provision for Loan Operations (S5), Operating Expenses (S6), Adjusted Shareholders' Equity (S7), Total Assets (S8) and Loan Operations (S9); on the other hand, there is a warning about the percentage reduction of these same indicators in December 2018 and May 2019, and that despite such reductions, the average growth rates of these indicators remained high.

Table 1
Growth Signal Indicators (in %)

	2012		2013		2014		2015		2016		2017		2018		2019	Mean
	June	Dec	June	Dec	June	Dec	June	Dec	June	Dec	June	Dec	June	Dec	May	
S1	903	96	8	65	30	53	56	7	30	20	8	38	-12	-3	-26	85
S2	128	51	3	95	50	42	24	43	8	1	11	9	3	-8	-23	29
S3	-	1419	59	22	17	150	111	27	99	142	20	32	33	-30	60	154
S4	-78	44	-28	34	-4	32	7	180	-29	62	-25	51	17	36	55	24
S5	1104	278	86	21	56	108	73	6	99	103	36	17	53	-29	25	136
S6	60	67	14	23	65	17	21	32	11	11	17	24	8	-5	-16	23
S7	106	78	41	65	46	38	32	30	15	19	13	15	3	13	-25	33
S8	107	54	12	85	50	40	26	40	10	5	13	11	3	-2	-21	29
S9	906	88	19	69	83	49	42	34	17	2	7	15	6	-1	-25	87

Source: Research Results.

In general, it can be concluded that the results obtained through the analysis of the PEARLS System demonstrate that, during the period from 2011 to May 2019, the cooperative presented a sustainable result, with the growth of its assets, its deposits and the its credit portfolio, allowing to infer that Sicoob Credichapada was able to meet the demand of its members in credit operations.

Final considerations

The present work comparatively evaluated the CAMEL and PEARLS models based on the joint application of the two evaluation systems at the Free Admission Credit Union Sicoob Credichapada, from August 2011 to May 2019, highlighting that this cooperative is considered a reference national financial education. It is concluded that the PEARLS and CAMEL Systems are similar, however, credit unions should prefer the analysis via the PEARLS System as it is more complete in terms of performance measurement. The present work differs from other previous works by carrying out the simultaneous application of the PEARLS and CAMEL System, which allowed the visualization of the great similarities existing between the two models, and allows to indicate the PEARLS System for analysis of credit unions.

Regarding the performance of Sicoob Credichapada, it is observed that the cooperative complies with the principles of the PEARLS SYSTEM by aligning protection, growth, profitability and sustainability in its results and indicators. And that the CAMEL System endorses all analyzes and conclusions obtained through the PEARLS System. Based on the analysis of each group of indicators, it is possible to attest to Credichapada's solid, stable and efficient situation. However, attention should be paid to certain caveats such as: the growth of PECLD indicating a reduction in the quality of credit operations, and consequent increase in credit risk; the sharp drop in indicators E and R5, which indicate a loss of the Cooperative's ability to cover its expenses from the revenues generated in the period; low levels of immediate liquidity; and the drop in the percentage growth indicators of the Cooperative as of December 2018. In any case, for further conclusions it is necessary that the caveat points be studied more cautiously based on other internal information of the Cooperative which the study does not had access.

The use of the CAMEL System addresses a more general assessment of the cooperative, and consequently does not allow reporting specific and detailed aspects of the assessment that may influence the analysis of the institution as a whole. In addition, it is observed that the CAMEL indicators suggested by Gartner (2017) are, in general, absorbed by the PEARLS System suggested by Bressan et al. (2010). On the other hand, the use of the PEARLS system returns a complete and specific assessment of various aspects of the institution, permeating the groups of indicators of Protection, Financial Structure, Quality of Assets, Rates of Return and Costs, Liquidity and Signs of Growth, the PEARLS system allows a complete financial-economic analysis and is understood to be more efficient.

In this sense, it is worth highlighting how detailed the results obtained through the PEARLS System are, since while this, adapted to the Brazilian reality, has a total of 39 indicators to analyze each aspect of the cooperative's economic-financial structure, the CAMEL System adapted by Rosa and Gartner (2017) presents only 5 indicators for global analysis of the institution. Therefore, it is possible to conclude that if the Credit Union seeks a more complete evaluation, the PEARLS System is the most suitable, but if there is a need for a general and faster evaluation of the institution, the CAMEL System can meet this demand. In any case, the simultaneous application of both systems is not recommended because the CAMEL System is absorbed almost entirely by the PEARLS System.

In general, it was found that both systems are considered viable for the evaluation of Credit Unions in Brazil, depending on the type of analysis that the credit union wishes to obtain, however, it is worth mentioning that the PEARLS System proves to be most complete tool for analyzing the performance of credit unions.

In addition, the study raised management information that can be used not only by Sicoob Credichapada managers in decision-making for the course of business, but also by cooperative members, by regulatory bodies, and by people in general who are in some way benefited by the assistance and social programs that Credichapada develops. The present work presents some limitations, due to the analysis being restricted only to Sicoob Credichapada and that, despite the wide access to the balance sheets which the cooperative

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made available for the research, internal information was still necessary for a complete approach that helps in the analysis of some indicators. It is recommended for future studies, the comparison of other models for evaluating the economic performance of credit unions and the expansion of the object of study discussing the performance of several credit unions.

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