

# Credit Unions: Analysis of the determinant factor of the credit risk

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**Abstract**— The credit unions are institutions that make financial resources feasible to their members assuring them access to the tools of the financial market. In Brazil in 2017, there were 9.6 million members. Another relevant element has been the growth of the total assets, credit portfolio and deposits. This study has the goal to investigate the determinant factors of the credit risk of the Brazilian credit unions through the application of data model in an unbalanced scoreboard stimulated by the analysis of the Ordinary Least Squares. The sample corresponded to 799 Brazilian credit unions in the quarters between 06/2014 and 09/2018. As a result of the research the Efficiency in Cost Management, Total Assets, GPD and ROE variables presented statistical relevance as factors of the credit risk.

**Keywords**— Credit unions, determinants, credit risk.

## I. Introduction

The Credit Unions are financial institutions that have as mission to provide by mutuality the financial service supply to their members assuring them access to the tools of the financial market. Thus the Credit Unions are important to the country's economy, mainly those ones that are developed in small cities for allowing access to the credit by the people who would not get it in the traditional banking system. Many people hire these enterprises' services that are more accessible, which facilitates the payment of the contracted debt.

According to Jacques and Gonçalves [1], the unions system of credit, despite having a minority position in the National Financial System, has shown significant relative growth in the composition of the assets in credit operations, deposits and equity.

When compared to countries that have used union credit longer, it is noticed there is room for Brazil to grow in this kind of credit. Therefore the history of cooperativism in Brazil shows a growing relevance, especially related to the fulfillment of the role of promoting the development and economic movement in the countryside.

According to the exposed above, it is noticed that the Credit cooperativism has grown substantially in the recent years, data of the 2017 Statistics Report of the World Council of Credit Unions (WOCCU) report the existence of 89.000 credit unions in 117 countries, serving more than 260 million members. There has been great growth due to the fact that the credit unions offer fund raising, credit granting and the guarantees that are restricted to the members. Therefore important benefits to them.

In the view of what was presented, the question is: What are the determinant factors of the credit risk of the credit unions? To answer this question through the Ordinary Least Squares analysis, this research aimed to investigate which the determinant factors of the credit risk of the Brazilian credit unions are. Therefore data of 799 Brazilian credit unions were analysed in the quarters between 06/2014 and 09/2018.

## II. Theoretical Reference

### A. Credit Cooperativism

According to the 2017 National Credit Cooperativism Panorama (PNCC), a decrease in the number of credit unions was noticed in recent years. However, this reduction does not mean weakening of the sector since this has occurred mainly due to the processes of incorporations in order to gain scale. Through the 2017 PNCC, it was observed that taking into consideration only own units (headquarters and PAs), all the regions registered increase in the percentage of cities served by the singular ones. Among the states, Rondônia State reached 98% of the cities served. Together with Santa Catarina, Espírito Santo and Rio Grande do Sul are the states with more than 90% of the cities served. On the other hand, the Northeast region continued with the lowest level of service with advancement in some states such as Maranhão, Pernambuco and Paraíba. So the number of service stations (PAs) grew by 5%. Thus the balance was positive related to the greater physical presence of the unions in the cities.

As a result, there was an expansion of the Credit Cooperativism that is related to the Resolution 3.106/2003 of

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Central Bank of Brazil (BACEN) that allowed the adhesion to this system by free admission, which Jacques and Gonçalves (2016) call the official opening of the operative credit aimed to the social inclusion enabling individuals, small, medium and large entrepreneurs join the membership of the cooperative financial institutions. Consequently the cooperative system of credit reached the quantity of 9,6 million members in 2017.

The credit unions promote the economic growth as they make the credit access to several social classes possible [2]. This way, they get relevance in the local development taking risks in favor of the Community where they are located. Bressan et al.[3] emphasizes that the demand of services provided by the unions have increased in a significant way mainly because of the offer of lower interest rates and service costs compared to the banking system.

In this context, according to Carvalho et al.[4] the credit unions feel the need to increase their operations to meet the increasing demand of size and scale in the financial market so many unions are merging or incorporating. The credit unions operate in a competitive environment composed by banks and loan institutions that offer similar products and services to the same borrower.

Diel and Silva [5] add that the credit unions stand out in the social economic context in Brazil since they can be seen as access ways to the microcredit. The empirical evidence indicates a strong relation between financial development and economic growth[1]. Therefore the bank credit appears as one of the main variables to be considered since it moves the economy of the locality where it is inserted. Then due to the fact that many cities are not still assisted by banking institutions the credit unions are filling this gap taking the risks of applications in favor of the Community [1].

According to Niyama and Gomes[6], the organizations continuously try to assure they comply with the applicable limits and norms. The credit operations represent the main application of resource of capital raised by the financial institutions and therefore they are the most significant source of income. Thus they also have the uncertainty of receipt as inherent characteristic which Sicsú [7] recommends to quantify the loss probability, allowing a better classification of clients to loans.

### B. Credit Risk

In Saunders's understanding [8] credit risk is a potential loss when a commercial bank provides credit loan to a customer.

The volatility of the indicators of credit risk may be a result of internal and external factors [9]. The credit risk or risk of default involves the inability or the unwillingness of a client or counterpart to meet their commitments to loans, commercial operations, hedge, settlement and other financial transactions.

Evaluation of the efficiency of the banks of credit risk management is a very difficult task for an external analysis since data that are not available to the public are required and may be affected by the discretion [10].

To Carvalho et al.[11] reports that in credit unions the central goal is not the profit. That is why the efficiency is still more important than in other institutions. So the restructuring need, cost reduction and lending under better conditions demand high professional level and organization

Duong and Huong [12] analysed the main factors of credit risks in the Vietnamese commercial banks, applying the quantitative model given in unbalanced Panel of 20 banks between 2006 and 2014. With the survey of the dependent variable, default index in order to express the credit risks in the business activities of the banks. The study made conclusions about two determinant groups: the specific ones of banks and macroeconomic determinants..

## III. Methodology

The data collection was made by IF data system available in BACEN website. The spreadsheet of the information of the Credit Portfolio reports were selected by level of the operation risk, Reports of asset, liability and Accounting year result having as period of reference the quarters between 06/2014 and 09/2018 in a total of 18 quarters.

Based on the data, it was calculated as proxy for the credit risk, the proportion of values of the credit portfolio in the levels of risk E and H that correspond to loans in arrears in more than 90 days with the total value of the credit portfolio in the period.

Table 03-

<i>Risk classes</i>	<i>Delay (days)</i>	<i>Provisioning</i>
AA	-	-
A	Up to 14	0,5%
B	15 a 30	1%
C	31 a 60	3%
D	61 a 90	10%
F	91 a 120	30%
E	121 a 150	50%
G	151 a 180	70%
H	Above 180	100%

Source: own elaboration based in the Resolution 2682/99

According to Duong and Huong[12], the managerial capacity is based on cases resulting from the economic conjuncture as well as the efficiency clients' business, the credit risk can also be originated from the subjective causes of the commercial banks activities. In case of improvement in commercial banks, operational and managerial efficiency, information and risk management will minimize the credit risk.

There are two selected variables to represent the management capacity that are the efficiency of management and costs shown by the cost rate by total profitability (C) and profitability shown by ROE.

The relations between the operational size and credit risk in theoretical studies conducted in the past show an uncertain result [12]. Large size offers favorable conditions for the commercial banks to invest in the improvement of the credit process, the quality of the risk management and highly qualified human resources as well. At the same time large operational sizes with high market shares allow the commercial banks to diversify their credit activities

The following used model is presented with the formula of calculation of each variable in Table 01. The Hausman's test (Chi-Sq. Statistic = 454.1325, p value = 0.0000) indicated that the regression be estimated with fixed effects.

$$Credit Risk_{it} = \beta_0 + \beta_1 EGC_{it} + \beta_2 EC_{it} + \beta_3 AT_{it} + \beta_4 PCT AT_{it} + \beta_5 PIB_{it} + \beta_6 Clientes_{it} + \beta_7 ROA_{it} + \beta_8 ROE_{it} + \varepsilon_{it}$$

	Name	Calculation/definition
Dependent variable	Credit Risk	Default rate E-H/ C-T
Independent variables	Operational size	Size of the property Ln (total assets)
	Efficiency (Cost management)	Personal expense + Administrative + Tax expenses + Other expenses/ RIF + Service provision income + Bank fee income
	Profitability	ROE = Profit / PL
	Capital Structure	PL/ Total Assets
	GDP	Trimestrial GDP

Source: own elaboration with research data (2018)

### A. Dependent variable

The credit risk is the potential loss when the clients refuse or do not make the payment of the principal and/or the interest on the due date.

The authors Chi and Li [13] used as proxy to measure the credit risk, the index indicator of default obtained by the sum of loans in arrears divided by the total of loans on the credit risk in the system business of the financial institutions, the index of default is used to reflect the quality of credit.

### B. Explanatory variables

The explanatory variables are divided into two groups: group of microeconomic variables and group of macroeconomic variables.

The group of microeconomic variables show the effect of characteristic, capacity of operational management of the Credit Unions. The variables are selected based on previous studies about factors that affect the credit risk in bank business.

Regarding the specific variables of the Credit Unions, they were based on studies developed in banks that stood out among other factors the credit and default risk and quality of management [10] [14].

Table 2 – Summary of previous studies

AUTHORS	VARIABLES	RESULTS
DUONG and HUONG [12]	Credit Risk Operational Size Credit Growth Managerial Efficiency Structured Capital Economic Cycle Interest Rate Inflation	The bigger the size of the bank and its participation in the Market the bigger the credit risk.
CUCINELLE et al. [10]	NPL ROE Risco de Crédito	The banks that adopted the indicators proposed in the Agreement of Basilea II tend to manage the credit risks better.
LU and BOATENG [15]	NPLR LLPR ROA	The salaries paid to the CEOs and the independence of the council contribute to increase the credit risk while the size of the council and the presence of women reduce the credit risk.
KUSI et al. [16]	Credit Risk Size of the bank Lerner index Capital adequacy ROAA Tangibility GDP per capita	African credit agencies had credit risk reduced when information was shared between agencies from distinct countries.

Source: own elaboration with research data (2018)

## IV. Analysis of the Results

Based on the descriptive statistics (Table 02) it can be noticed that the medium value of the variables is positive, except for GDP, a possible explanation is that the economic retraction occurred in recent years.

Table 03 – Descriptive statistics

	minimum	medium	maximum	Standard deviation
EGC	-2.044897	0.644202	2.197802	0.198956
EC	0.015995	0.343883	0.995894	0.274238
AT	5.068904	11.17069	15.54453	1.534026
PCT AT	0.004106	0.656100	0.984091	0.274234
PIB	-5.520000	-1.042813	2.170000	2.294575
Client	14.00000	3904.518	224392.0	9129.349
ROA	1.66E-05	0.017980	0.273178	0.015307
ROE	0.061603	0.000102	2.520000	0.049294

Source: own elaboration with research data (2018).

Observing the matrix of correlation (Table 03) it is observed that most correlations are weak or moderate, except

for PCT AT and Structure that have strong negative correlation.

This means they move towards opposite directions when the value of one of them increases and the other one decreases. Excluding ROA, all the other explanatory variables present a positive relation with the dependent variable which indicates that their raise contributes to the increase of the risk.

Table 04 – Matrix of correlation

	EGC	EC	Risk	AT	PCT/AT	GDP	Client	ROA	ROE
EGC	1.00								
EC	-0.45	1.00							
Risk	0.22	-0.14	1.00						
AT	0.01	-0.58	0.11	1.00					
PCT/AT	0.45	-1.00	0.14	0.58	1.00				
GDP	0.00	0.04	0.03	-0.00	-0.04	1.00			
Client	-0.00	-0.11	0.08	0.46	0.11	0.03	1.00		
ROA	-0.66	0.57	-0.07	-0.29	-0.57	-0.01	-0.05	1.00	
ROE	-0.27	-0.23	0.03	0.15	0.23	-0.01	0.04	0.43	1.00

As Lu and Boateng [15] this research used as dependent variable the index of default to measure the credit risk. The variables (Table 04) that presented statistical relevance were EGC, AT, PIB and ROE. The two first have positive relation indicating that contribute to the increase of Credit Risk. While the two last revealed a negative relation which promotes a reduction of Credit Risk.

Table 05 - Result

Variables	Coefficient
Constant	-0.014379 (1.543083)
EGC	0.048515 (0.002502)***
EC	-0.157087 (1.543323)
AT	0.018441 (0.0000)***
PCT AT	-0.176807 (1.543180)
GDP	-0.000200 (0.000112)*
Client	1.17E-07 (1.16E-07)
ROA	0.053935 (0.033197)
ROE	-0.036656 (0.008039)***
R <sup>2</sup>	0.761062
Observation	11892

Source: own elaboration with research data (2018).  
 Between parentheses the standard error, \*\*\* significant to 1%,  
 \*\* significant to 5% and \* significant to 10%.

Chiaromonte, Poli, and Oriani [17] report that the Gross Domestic Product (GDP) is among the most used macroeconomic indicators and it is a measure of the total activity of an economy. The same way, the authors Duong and Huang [12] selected the growth of GDP (GDP t) to present the effects of the economic cycle on the credit risk. The results

indicate that the value of GDP contributes to the reduction of the Credit Risk.

To Kusi et al. [16] used the return on the medium Total Assets (ROA) to measure the profitability of the credit risk model.

According to Chaibi [14], the quality of the management by the Return on the Equity (ROE) and the Efficiency management in case they are not performed they form the “hypothesis of bad management”. Thus it is noticed that the low profitability and efficiency are due to the bad quality of management implying a scarce capacity of screening and monitoring the loans that in large extent end up becoming defaulters.

## v. Final Considerations

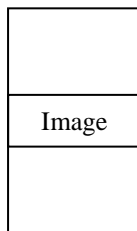
This paper aimed to investigate the determinant variables of the credit risk in the Brazilian credit unions. So 799 singular credit unions were studied, the period of analysis included quarterly information related to the years from 2014 to 2018. It had the purpose of contributing to the future discussions of credit risk since in the literature there is only focus on the credit provided by the banks. This way, it was seen how much the credit risk is inherent to the economy and the its importance to the credit unions. So, in this study, the results found can help in the elaboration of policies so that they minimize credit risks without reducing the credit supply.

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