ECONOMIC ACTIVITY AND ITS IMPACT ON PRIVATE BANKING DELINQUENCY IN ECUADOR

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Abstract: The different economic activities as an alternative to enhance the development of the country, motivated the present research work, which has as main objective, to analyze the relationship between the economic activity measured by the Index of Economic Activity (IDEAC), and the delinquency of private banks in Ecuador 2013 - 2019, applying an econometric model of ordinary least squares, with data obtained from the Central Bank of Ecuador and the Superintendence of Banks. The results of the study show the existing relationship between the study variables, also shows a close relationship with GDP. When the IDEAC and GDP decrease, the delinquency rate of large private banks increases by 7.64% quarterly. On the other hand, an increase in the IDEAC decreases the delinquency of large private banks by -0.02%.

Introduction

Economic activity depends largely on the production, technology and geographical area of each country. In our region, the use of oil has been the main source of income since ancient times, so we see the need to make an alternative to measure economic growth.

It is also important to know the delinquency rate of financial institutions, to determine the level of liquidity that the bank possesses and if it can cover the delinquency of debtors. The viability of this project is ensured by the easy access to the data necessary for its analysis, which are

provided by reliable institutions such as the Central Bank of Ecuador and the Superintendency of Banks.

The objective is to analyze the behavior of economic activity in the delinquency of Ecuadorian private banks during a fixed period of six years and create an econometric model of multiple linear regression to show if it is related and to what extent the research variables are related. Within the short-term indices, the IDEAC index (Short-term Economic Activity Index) is analyzed, which describes the development of the country's various productive sectors. For the delinquency ratio in this study, it is represented with the total number of loan papers of each line of business of private banks according to size, that is, defaults of large private banks, medium private banks and small private banks.

It is necessary to know the relationships of the variables investigated, since it is necessary to have an overview of the current economic development of the country, in general for all; Merchants, citizens, workers, government agencies, knowing that the more money people have, the greater their ability to pay, otherwise the standard of living of citizens would fall and indebtedness would especially affect banking communities when they have a high delinquency rate, the institution has difficulty restoring the gross portfolio.

Research background

Consequently, to know what kind of relationship there may be between the information of microeconomic and macroeconomic variables with the delinquency of the consumer credit portfolio. Using the method econometric ARIMAX, working with stationary time series, they also used correlation and Granger causality analysis, obtaining as a result that the liquidity index is negatively sensitive to the delinquency index.(Uquillas & Gonzalez, 2017)

Similarly, in another research they proposed models with macroeconomic variables with the aim of assessing the relationship between changes in delinquency and indicators at the country level, proposing a descriptive methodology applying ARIMA models in each segment of delinquency where the private financial system grants credits, using as independent variables the money supply, GDP, commodity prices, wages, unemployment rate, inflation, currency depreciation, interest rates, debt ratio and disposable income, most of them reflect the country's economic growth. The conclusion indicates that the significant models are for the segments: productive business, productive SMEs, consumption, housing and microcredit, that is, five models all with the ARIMA model.(Guillen & Peñafiel, 2018)

The researchers, Nieto & Chudt (2018) They establish a first section where the variables associated with the economic activities of production are, such as the production of coffee and sugar cane, representing agricultural activity; the industrial production index representing the manufacturing sector; the energy demand of the National Interconnected System (SIN) characterizing the public services sector; crude oil production, as a variable of the mining and quarrying sector; cement production as a variable in the construction sector; total retail trade without fuels, retail trade without fuels or vehicles, and vehicle sales, which are part of the commercial sector (113).

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Micro-sized enterprises have greater opportunities to improve their financial performance when they have resources such as qualified personnel, fixed assets, generate income and have access to financing in public and private institutions. To improve the economic performance of those firms that due to their size are considered medium or large, they must also have inventories of raw materials and finished products. (60)(Sánchez & Lazo, 2018)

On the other hand, "the Delinquency Index measures which portion of the unproductive portfolio is in arrears. The lower the ratio is better" (p. 3) "and will be growing as a result of the economic recession" (180).(Asociación de Bancos del Ecuador, Sistema Bancario términos claves, 2019)(Muñoz & Lalangui, 2017)

The result of this research reflects the behavior of the portfolio quality indicator against GDP growth that results in a deterioration. With respect to liquidity, it does not support changes in portfolio quality. As a result of this research, a model is established with endogenous variables, delinquency (Mo), total liquidity (M2), gross domestic product (GDP) and the real exchange rate (RER).(Peñafiel, 2019)

As they argue, the percentage of delinquency is shown more in savings and credit cooperatives that in these entities have a greater number of placements in this segment unlike public-private banking that are focused on others, and as the financial system is the mirror of what happens in the real sector of the economy; A fall in economic activity, a contraction in sales, an increase in unemployment affects the microcredits granted by financial institutions causing the delinquency rate especially in the less favored sectors (146).(Vallejo & Ochoa, 2019)

In their research, they show us that "Cooperatives with financial activity boost the economy by providing economic resources to people and companies that cannot access the banking sector or prefer to belong to the cooperative sector" (1241).(Calvo, Brunal, Llanos, & Rodríguez, 2021)

The gross portfolio is the total amount of credit granted by a bank. This is made up of the maturing portfolio plus the unproductive portfolio. In turn, the unproductive portfolio is composed of the overdue portfolio and portfolio that does not accrue interest. In the overdue portfolio, the installments of the credits that stop earning interest or income for more than 30 days are recorded. Once the installment is transferred to the overdue portfolio, the other installments of that credit are transferred to the non-interest-bearing portfolio. (page 2)(Asociación de Bancos del Ecuador, 2019)

In their study, they show us that it is of vital importance to have knowledge of the dynamic capacity of private banks in our country, currently representing about 50% of total assets, which influences the monetary policies of Ecuador. Through the classification of banks carried out by the Superintendency of Banks, the following were taken into consideration for the study: Banco de Pichincha, Banco del Pacifico, Banco Guayaquil and Produbanco. The results demonstrate that the factors that affect the behavior of the commercial portfolio in the economy of Ecuador have had a variable behavior due to the fall in the price of oil and the appreciation of the dollar, resulting in a decrease in the commercial portfolio in the period 2016 (108).(León, Chamba, & Vega, 2021)

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A key aspect is as mentioned by Martínez, Bucio, & Ortiz (2021) the deterioration of banks' credit policies is due to various factors, among which the weak degree of competitiveness with which they operate both nationally and internationally, as well as the structural characteristics of the economy where they operate. Thus, weak banking lending practices lead to an increase in the non-performing loan portfolio of banks, which is a sign of fragility in the economic-financial activity of a country; In general terms, this situation affects the productive dynamics and inhibits its stability and growth (p. 3).

It is evident that the growth of microcredit credit operations is growing, but at a very low rate; however, the implementation of financial mechanisms with parameters that adjust to the reality that Ecuador is currently experiencing, such as the restructuring of credit operations that will generate a stabilization of both the issuance of credits and the delinquency rate. (Nieto F. , 2021, pág. 47)

(García, 2018) "The lack of economic policies that regulate risk management has a direct impact on the factors that fully affect the delinquency of financial institutions" (41). In another study, it refers to the fact that "public policies converge knowledge, means and ends that seek concrete results in overcoming a public problem" (57).(Silva, 2019)

(Gamez, Morales, & Ramirez, 2018) "Finally, a bad capital structure generates liquidity problems, affecting the fulfillment of companies' obligations, and an inadequate combination of debt and equity can increase risk levels" (89).

According to , faced with this reality, finance increasingly takes a strategic approach because administrators or managers are faced with the situation of how to create value and increase it in a business environment with increasing uncertainty. It is not possible to know with complete certainty what the internal and external environments will be like that will influence both positively and negatively in the immediate or immediate future of the company (p. 349).(Mora, 2017)

They add, given the fundamental importance of household consumption for growth, fiscal, monetary or employment policies that tend to reduce it will have a significantly negative impact on the nation's economic growth. It is important that the government proposes policies and initiatives that articulate the public and private sectors. In a way that promotes adequate employment and job stability, the overall economy will be strengthened (p. 206).(Ruso, Contreras, & Villamar, 2020)

Methodology

After seeing information of theoretical and scientific bases about the variables related to the present study, which serve for the knowledge and better understanding of the reader. The scientific bases cited by other authors talk about credit, risk and types of risks, delinquency rate, and what consequences it could have, business activity and how it is measured. Next, we will develop our methodological aspects.

The independent variables of this study will be: Short-term Business Activity Index (IDEAC), Total liquidity of the economy (M2) and the Gross Domestic Product of Ecuador (GDP). On the

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other hand, we have the dependent variable, Delinquency Index of the total portfolio of private banks in Ecuador, these data will be collected, through official pages of institutions, such as the page of the Superintendency of banks, where we will obtain quarterly data of the total delinquency index of large, medium and small private banks. Similarly, the official website of the Central Bank of Ecuador provides data from the short-term activity index (IDEAC).

Finally, the econometric program Eviews 9 will be used to determine the possible relationship between the variables of this study, applying a multiple linear regression model, that is, an explained variable and various explanatory variables, which seeks the relationship between the dependent variable with the other independent variables. In addition, the tests of homoscedasticity, normality of residues and auto-correlation of the variables will be applied.

Unit Root Test

For the calculation, it is based on the estimation of the following general equation:

$$\Delta X_t = \beta_0 + \beta_1 t + \gamma X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t,$$

To corroborate the existence of a unit root, it is equivalent to contrasting the hypotheses Ho: Y = 0 against H1: Y <= 0.

For the present study, the Unit Root test will be performed for each of the variables.

The IDEAC, shows a probability of 0.0000, that is, we reject the Ho, this first model, has no unit root, is stationary or it is the same to say, that it does not have stochastic tendency.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.319835	0.0000
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

Author's own elaboration 2023

For the second total liquidity variable of the economy (m2), we obtain a probability of 0.0103, which indicates that we reject Ho, establishing that the variable is stationary.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.685638	0.0103
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	

10% level	-2.627420	

Author's own elaboration 2023

With respect to the delinquency variable, first differences were applied, resulting in a P value of 0.0182, where we reject the Ho, and say that this variable is stationary.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.449436	0.0182
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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Finally, GDP does not present a unit root because of its probability whose value is less than 0.05, that is, we reject Ho and we can say that the variable is stationary.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.648723	0.0011
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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Multiple Linear Regression Model.

This method is used when studying the possible relationship between two or more independent variables and a dependent variable. There are limitations that must be taken into account to use the multiple linear regression method, such as linearity, that is, the dependent variable is strictly related to one of the independent variables. Number of independent variables, it is believed that the more variables are placed in the model, the more accurate the answer will be, because that thinking is wrong. It is recommended to include at least 20 observations for each independent variable. Another limitation is collinearity, that is, if two independent variables are strictly related and are included in the model, there is a risk that none of the variables will be significant for the model.(Báron & Téllez, 2004)

An econometric model of Ordinary Least Squares is proposed, and its own correlation with macroeconomic and microeconomic aggregates at the country level. With the proposed objective of observing what are the factors that impact with the delinquency of the banking system. Reflecting a close relationship with factors such as liquidity, the passive and active rate, inflation, the loan portfolio, concluding that, the greater liquidity, profitability and an optimal result in the credit portfolio, results in a lower bank delinquency.(Altuve & Hurtado, 2018)

For this case the study model will be represented as follows:

$$MCT = \beta_0 + \beta_1 * X\_IDEAC + \beta_2 * X\_PIB + \beta_3 * X\_LBP + u_i$$

Where.

MCT: Value of the delinquency of the total portfolio.

X_IDEAC: Percentage value of the Short-term Economic Activity Index.

X_PIB: Percentage value of Gross Domestic Product.

X_LBP: Percentage value of liquidity of private banks.

Non-experimental design.

This design is based purely on the observation of the behavior of the variables, especially the independent variables, in all cases it is difficult to manipulate it. For this observation, quantitative data must be available for greater observation of the behavior of the variables.(Sousa, Driessnack, & Costa, 2007)

The present research work is in the economic field, with a national scope of private banking, with indicators that reflect the economic activity of the country in quarterly periods of six consecutive years.

Results

After the run of the model (MCO) using the classification data of large private banks, comprised by Banco Guayaquil, Pacífico, Pichincha and Produbanco. We observe the values of the probability column are less than 0.05, in this case all values are less than the fixed value, therefore, this model of large private banks is useful for the present work.

With twenty-eight observations for each of the four variables, with time series and quarterly frequency. The probabilities or p-value is significant for the constant at 1%, likewise for the independent variables IDEAC and GDP. The total liquidity variable of the economy is not significant for the model.

Board 1 Ordinary Least Squares Model – Large Private Banks

Dependent Variable: MBG
Method: Least Squares
Sample: 2013Q1 2019Q4
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.562619	1.717617	4.985173	0.0000
IDEAC	-0.031729	0.011163	-2.842235	0.0090
PIB	-0.145245	0.034291	-4.235653	0.0003
M2	9.130622	5.370548	1.700129	0.1020
R-squared	0.570367	Mean dependent var		3.507399

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Adjusted R-squared	0.516663	S.D. dependent var	0.586173
S.E. of regression	0.407522	Akaike info criterion	1.174121
Sum squared resid	3.985784	Schwarz criterion	1.364436
Log likelihood	-12.43769	Hannan-Quinn criter.	1.232302
F-statistic	10.62054	Durbin-Watson stat	0.775874
Prob(F-statistic)	0.000124		

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We proceed to the application of the contrasts, the first place will be a partial correlation matrix to measure the multicollinearity between our study variables.

Board 2 Partial Correlation Matrix

	MBG	IDEAC	PIB
MBG	1.000000	-0.480467	-0.645596
IDEAC	-0.480467	1.000000	0.268021
PIB	-0.645596	0.268021	1.000000

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The matrix tells us that there is no multicollinearity between the variables, that is, they are not linearly related to each other, since the reflected values are less than the parameter 0.75.

Board 3 Test de While

Heteroskedasticity Test: White

F-statistic	0.744548	Prob. F(5,22)	0.5986
Obs*R-squared	4.052318	Prob. Chi-Square(5)	0.5419
Scaled explained SS	2.415021	Prob. Chi-Square(5)	0.7892

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2013Q1 2019Q4
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.44099	16.53831	0.691787	0.4963
IDEAC^2	0.000486	0.000663	0.732412	0.4716
IDEAC*PIB	-0.001625	0.002221	-0.731548	0.4722
IDEAC	-0.147888	0.209444	-0.706098	0.4875
PIB^2	-0.001957	0.007944	-0.246340	0.8077

PIB	0.227211	0.336948	0.674319	0.5071

R-squared	0.144726	Mean dependent var	0.159493
Adjusted R-squared	-0.049655	S.D. dependent var	0.198601
S.E. of regression	0.203472	Akaike info criterion	-0.159168
Sum squared resid	0.910818	Schwarz criterion	0.126304
Log likelihood	8.228357	Hannan-Quinn criter.	-0.071897
F-statistic	0.744548	Durbin-Watson stat	1.749750
Prob(F-statistic)	0.598589		

Author's own elaboration 2021

The second contrast is shown White's order, it helps us measure the heteroscedasticity of the model. We observe the probability, greater than 0.05, that is, we reject the null hypothesis of homoscedasticity and say that there is evidence that the model is heteroscedastic, that is, the variance of the errors is constant over time.

A Jarque-Bera normality test was performed, the result of which indicates that the errors can be distributed normally, that is, the null hypothesis is accepted, since the probability is greater than 0.05.
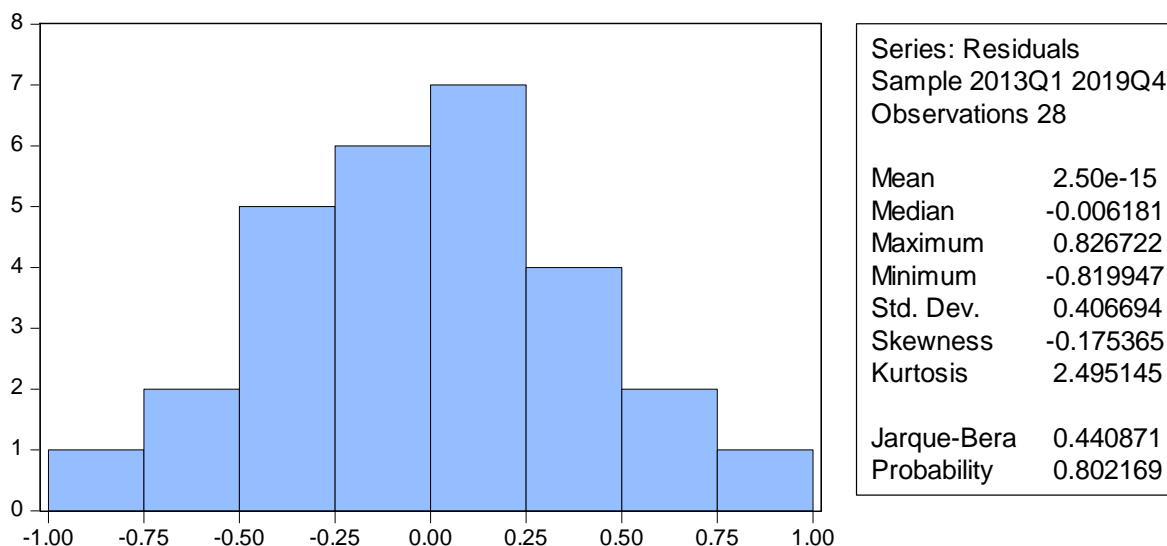
Illustration 1 Normality of errors

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The existing relationship between the study variables, the delinquency index and the IDEAC is evidenced, it also shows a relationship with the GDP of Ecuador, although the total liquidity of the economy does not influence the delinquency of private banks, corroborating the research works of the different authors.

As in the case of research based on stress tests, it indicates that the delinquency of banks increases when there is evidence of a decrease in the price of oil, that is, the delinquency rate grows when the amount of credit granted is greater than the economic activity of the country. In addition, the authors note that liquidity and intermediation margin are indifferent to a change in banks' delinquencies.(Uquillas & Gonzalez, 2017)

A study conducted by the previous authors was found, where they perform a comparison of the delinquency rates of Colombia and Ecuador, using the ARIMAX econometric method, working with stationary time series, they also used correlation and Granger causality analysis, obtaining as a result that the liquidity index is negatively sensitive to the delinquency index in both countries.

Finally, the study carried out by which it seeks to determine the components of delinquency and the private financial system reflecting the deterioration of portfolio quality compared to GDP growth, in addition the liquidity of the financial system does not significantly affect the degrees of delinquency.(Peñafiel, 2019)

Conclusion

There is a relationship between economic activity and delinquency of large private banks in Ecuador, responding to the hypothesis raised at the beginning of this study. With regard to medium and small private banks, there is no relationship.

When the IDEAC and GDP indices decrease, the delinquency of large private banks increases by 7.64% quarterly. On the other hand, an increase in the IDEAC, decreases by -0.02 the delinquency of large banks. Similarly, if we increase the Gross Domestic Product by 1%, the constant decreases by -0.13.

The significant model was the classification of large private banks, which showed us that both the Index of short-term economic activity and the Gross Domestic Product are significant for the model and that these variables explain the delinquency of private banks, on the other hand, the total liquidity of the economy does not explain the delinquency, did not contribute to the study of this article.

An external factor is economic activity, it is made up of productive sectors of the country, there is evidence of a decrease in the delinquency rate when these sectors demonstrate a greater weighting. In 2015 there was a notable decrease, as a result of the crisis in oil prices, which generalized a fall in demand affecting almost all industries in the country. This economic phenomenon also affected GDP, this being another factor that influences the delinquency of private banks.

In the model two assumptions of ordinary least squares, the first was a correlation matrix, this test allows us to know if there is multicollinearity between the study variables. Which showed us that they are not linearly related to each other, since the reflected values are less than the parameter 0.75. The second assumption was White's test, where we reject the null hypothesis of

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homoscedasticity and say that there is evidence that the model is heteroscedastic, that is, the variance of errors is constant over time.

It is recommended for future research to use the Short-term Economic Activity Index as an alternative to measure the country's economic activity, since the GDP variable has been used in many research works.

Additionally, it is suggested to carry out an investigation involving the variables total liquidity of the economy and the price of oil, in order to know the incidence between both variables.

Conduct research that includes other variables such as the interest rate of banks, to know what factor affects the delinquency of medium and large private banks.

Bibliography

Abreu, J. (2014). The method of the investigation. *Daena: International Journal of Good Conscience. 9(3)195-204. Diciembre 2014. ISSN 1870-557X*, 203. Retrieved from http://www.spentamexico.org/v9-n3/A17.9(3)195-204.pdf

Altuve, J., & Hurtado, A. (2018). Analysis of the factors influencing the delinquency of the Venzolano banking system 2005 - 2015. *Revista Venezolana de análisis de coyuntura*. Retrieved from https://www.redalyc.org/articulo.oa?id=36457129005

Association of Banks of Ecuador. (2019). Banking System - Key Terms. *DataLab ASOBANCA*, 2. Retrieved from https://datalab.asobanca.org.ec/resources/site/terminos/Principales%20Cuentas.pdf

Association of Banks of Ecuador. (2019). *Banking System key terms.* Retrieved from https://datalab.asobanca.org.ec/resources/site/terminos/Principales%20Cuentas.pdf

Baptista, M. d., Fernandez, C., & Hernandez, R. (2010). *RESEARCH METHODOLOGY FIFTH EDITION.* Mexico: McGraw-Hill Interamericana.

Báron, F., & Téllez, F. (2004). Biostatistics Notes: Third cycle in health sciences and medicine.

Calvo, A., Brunal, F., Llanos, J., & Rodríguez, M. (2021). Economic and social impact of cooperatives with financial activity: analysis from their determining attributes in two Colombian cities. *Scopus*. doi:10.52080/rvgluz.26.96.15

Camino, S., Uzcátegui, C., & Moran, J. (2018). Market structure of the Ecuadorian banking system: concentration and market power. *Cumbres Magazine Vol.4 Nº1*. Retrieved from http://investigacion.utmachala.edu.ec/revistas/index.php/Cumbres

Carballo, M., & Guelmes, E. (2016). SOME CONSIDERATIONS ABOUT THE VARIABLES IN THE INVESTIGATIONS THAT ARE DEVELOPED IN EDUCATION. *Scientific Journal of the University of Cienfuegos | ISSN: 2218-3620*, 143.

Cauas, D. (2013). Definition of variables, approach and type of research. *Journal of Clinical Update Volume 33 2013.* , 4.

Gamez, A., Morales, M., & Ramirez, C. (2018). State of the art on financial problems of SMEs in Bogotá, Colombia and Latin America. *Económicas CUC, vol. 39 no. 2, pp 77-94, July - December, 2018, 89.* doi:DOI: http://dx.doi.org/10.17981/econcuc.39.2.2018.05

Garcia, V. (2018). Analysis of the loan portfolio of Ecuadorian public banks (2008-2017). *Uisrael*, 41. doi:https://doi.org/10.35290/rcui.v5n3.2018.76

Guillen, E., & Peñafiel, L. (2018). Predictor models of delinquency with macroeconomic variables. *UNEMI SCIENCE.* doi:https://doi.org/10.29076/issn.2528-7737vol11iss26.2018pp13-24p

Hofmán, A., Mas, M., Aravena, C., & De Guevara, J. (2017). Economic growth and productivity in Latin America. *THE ECONOMIC QUARTER, vol. LXXXIV (2), no. 334, April-June,* 260. Retrieved from https://core.ac.uk/reader/80525668

León, L., Chamba, J., & Vega, S. (2021). BEHAVIOR OF THE COMMERCIAL PORTFOLIO OF PRIVATE BANKS IN ECUADOR, 2010-2018. *Synergy.* Retrieved from Https://www.revistas.utm.edu.ec/index.php/ECASinergia

Martínez, D., Bucio, C., & Ortiz, E. (2021). Effect of oil prices on Mexico's sectoral economic activity. Analysis for the period 2002-2018. *Scopus*, 3. doi:10.21919/remef.v14i2.301

Mora, C. (2017). Sources of short-term financing as a strategy for increasing business productivity in SMEs. *Mastery of the sciences Dom. One hundred, ISSN: 2477-8818, 349.* doi:10.23857/dc.v3i1.401

Muñoz, J., & Lalangui, J. (2017). Study on the increase of credits in private financial institutions in Ecuador. *INNOVA Research Journal, ISSN 2477-9024,* 180. doi:https://doi.org/10.33890/innova.v2.n10.2017.383

Nieto, F. (2021). Credit operations of microenterprises in Ecuador, prior to the Health Emergency. PODIUM No. 39, June 2021, pp. 37-52*, 47. doi:http://dx.doi.org/10.31095/podium.2021.39.3*

Nieto, F., & Chudt, N. (2018). Construction of a coincident index for Colombian economic activity. 113. doi:10.15332/s2027-3355.2018.0001.06

Peñafiel, L. (2019). THE MACROECONOMIC DYNAMICS AND DELINQUENCY OF THE FINANCIAL SYSTEM OF ECUADOR (2009-2018). *ECONOMIC ISSUES Vol. 29, No. 1. doi:https://doi.org/10.47550/RCE/29.1.3*

Rendón, M., Villasís, M., & Miranda, M. (2016). Descriptive statistics. *Allergy Magazine Mexico*, 398.

Ruso, J., Contreras, E., & Villamar, D. (2020). Evaluation of the Impact of Various Macroeconomic Factors on Economic Growth in Ecuador, 1965-2018. *INNOVA Research Journal, ISSN 2477-9024,* 206. doi:https://orcid.org/0000-0001-9505-8237

Sabino, C. (1992). *THE RESEARCH PROCESS.* Caracas: Ed. Panapo, Ed. Panamericana, Bogotá, and Ed. Lumen, Buenos Aires.

Sanca, M. (2011). TYPES OF SCIENTIFIC RESEARCH. *Journal of Clinical Update ,* 621.

Sánchez, M., & Lazo, V. (2018). DETERMINANTS OF BUSINESS PROFITABILITY IN ECUADOR: A. *ECA Synergy Magazine. Faculty of Administrative and Economic Sciences. U.T.M. June 2018 Vol. 9 Nº1*, 60.

Silva, D. (2019). Participatory formulation of the Public Policy of Transparency in Bogotá. *Latin American Journal of Policies and Public Action • Vol. 6 No. 1 FLACSO Ecuador Headquarters • ISSN 1390-9193 • pp. 53-72, 57. doi:10.17141/mundosplurales.1.2018.3234*

Sousa, V., Driessnack, M., & Costa, I. (2007). REVIEW OF OUTSTANDING RESEARCH DESIGNS FOR NURSING. PART 1: QUANTITATIVE RESEARCH DESIGNS. *Rev Latino-am Enfermagem*, 3.

Uquillas, A., & Gonzalez, C. (2017). Macro and microeconomic determinants for credit risk stress tests: a comparative study between Ecuador and Colombia based on the delinquency rate. *Essays on Economic Policy 35; 245–259, 246.* doi:https://doi.org/10.1016/j.espe.2017.11.002

Vallejo, J., & Ochoa, J. (2019). Evolution of microcredit of the popular and solidarity sector against public-private banking in Ecuador. *Scopus*, 146. doi:10.33936/eca_sinergia.v10i2.1550

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