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Economic Freedom and the Determinants of the Bank Spread in South America

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Abstract

This paper performs panel data analysis to test the existence of an inverse relationship between bank spreads and the degree of economic freedom in South American countries between 2000 and 2020. In the late 1990s, South America began a process of financial sector reforms, which included in almost all countries the liberalization of interest rates (instead of capping) and the elimination of direct credit allocation mechanisms. By hypothesis, it is expected that the greater the economic freedom, the lower the degree of financial regulation. This would reduce the transaction costs of financial institutions and contribute to reducing the banking spread (assuming constant credit risk). The traditional methodology is applied here, complemented by unit root and cointegration tests, in addition to impulse-response function analysis, in the context of panel autoregressive vectors (VAR). The results show that economic freedom and monetary credibility (component area of the EFW, Economic Freedom of the World index) negatively affect the value of the spread, with long-run effects as well.

Keywords

Banking Spread, Economic Freedom, South America, Panel Data, VAR

1. Introduction

Bank *spread* is one of the main determinants of the cost of credit, since it represents the difference between the rate charged in lending operations and that related to fundraising. Thus, it is one of the essential components of credit demand in economies. Low spreads are usually associated with lower interest rates, which stimulates aggregate consumption and investment in the short term.

In the late 1990s, South America began a process of reforms in the financial sector, which included, in almost all countries, the liberalization of interest rates (rather than capping) and the elimination of direct credit allocation mechanisms. In some cases, the changes went far beyond the elimination of interest rate controls, and included a review of the regulatory and supervisory systems of financial institutions (Ono et al., 2005).

Thus, it is understood that one of the factors that can influence the spread determination is economic freedom, because it relates to institutional variables that influence the behavior of the credit market. Specifically, by hypothesis, it is expected that the greater the economic freedom, the lower the degree of financial regulation. This would reduce the transaction costs of financial institutions and contribute to reducing the bank spread (assuming constant credit risk).

This paper therefore performs panel data analysis to test the existence of an inverse relationship between bank *spreads* and the degree of economic freedom of South American countries between 2000 and 2020. The traditional methodology is applied here, complemented by the performance of unit root tests and cointegration, in addition to the analysis of impulse-response functions, in the context of autorregressive vectors (VAR) in the panel.

The article is divided into four sections, in addition to this introduction and the final considerations. Section 2 deals with financial liberalization in South America and reviews the applied literature on the subject. Section 3 presents the adopted data and the analysis methodology. Section 4, in turn, performs the estimation of the model and analyzes the results.

2. Financial Liberalization in South America and Review of the Applied Literature

Financial liberalization is a subset of measures adopted by the monetary and regulatory authority that is aligned with the concept of economic freedom and affects banking efficiency. It moves towards the autonomy of monetary authority, simplification and reduction of regulation and reduction of interference in the financial sector (such as setting interest rates etc.). The regulation and state ownership of banks and other financial institutions, such as insurers, reduces competition, and generally reduces the level of services available (Almeida, 2013).

In a banking and financial environment, with minimal level of government interference and independent supervision by Central Bank, the regulation of financial institutions is limited to fulfilling contractual obligations and preventing fraud. Credit is allocated through market mechanisms and the public sector does not have financial institutions owned by it, and it is exclusively up to the private sector to provide various types of financial services for individuals and companies. Banks are free to grant credit, accept deposits and carry out currency transactions in other countries. Foreign financial institutions operate freely and are treated in the same way as their domestic counterpart (Oreiro et al., 2006).

Until very recently, in most countries, the concept of financial liberalization was limited to the elimination of targeted credit programs and interest rate controls. In addition to the authorization to operate new banks, that increases competition in the sector. However, the rules and regulations that allow the participation of new players were generally not accompanied by strict exit rules and promptly applied to banks with unsatisfactory performance (Manhiça & Jorge, 2012).

Moreover, financial liberalization did not mean the removal of barriers to the operation of foreign institutions. Moral risk problems arising from the existence of implicit or explicit safety nets have not been considered by governments and have created incentives for excessive risk-taking by banks (Almeida, 2013).

The combination of increased competition between domestic banks, the lack of appropriate regulatory and supervisory procedures, broad government guarantees and, most importantly, the lack of political will to close bankrupt banks, have prompted poorly managed financial institutions to try to increase their market share by rapidly expanding their operations by lending through risky borrowers. These elements tend to distort the spread in countries such as Brazil (Dantas, Man, & Capelletto, 2011).

In a financially free environment, with clear rules and enforcement procedures which determine which banks are allowed to operate in the system and which need to be intervened by the monetary authority or else closed, increased competition would reduce the average level of spreads, resulting in a safer and healthier banking system. In addition, the spreads of individual banks would also reflect the true risk of their portfolios (Manhiça & Jorge, 2012).

It is not surprising, therefore, that traditional literature, produced in developed countries, predicts a positive relationship between spreads and risk measured in the banks' portfolio. This was not the case in South America, where, in many situations, the activities of regulatory agencies culminated in distortions, such as the excessively permissive attitude towards the entry of new banks, the lack of desire to close undercapitalized institutions and reluctance to restrict the broad guarantees offered by the government (Nakane, 2003).

Considering thar better quality clients are served by the most capitalized institutions, undercapitalized banks tend to operate with low spreads. Two are the reasons: 1) these banks often have incentive to reduce loan rates and increase deposit rates, to capture greater market share; 2) the lack of provisioning for loan losses causes reported spreads to decrease when the loan portfolio and/or customer income deteriorates. Because of these two reasons, the relationship between spreads and portfolio risk may differ from that observed in developed countries (Afanasieff, Lhacer, & Nakane, 2002).

An additional example of the difficulties associated with the direct application of traditional literature to the understanding of bank spreads in South America is provided by the predicted relationship between them and capital for asset indices. In developed countries, with adequate rules and regulations for the functioning of the banking system, an increase in capital for asset indices generally increases the cost of intermediation, due to unfavorable fiscal treatment of equity capital in relation to debt and dilution of the controlling interest of managers. The usual response of banks to this increase in cost is to cover it, at least in part, from an increase in spreads. In contrast, in countries with regulatory distortions, this result does not present itself, they mean a lot.

Thus, an appropriate understanding of *spreads behavior* during the transition from a "repressed" financial system to a "freer" financial system requires an examination of the institutional structure in which banks operate. On an analytical level, the initial quality of its assets, the regulatory structure of the government, and the willingness of authorities to react promptly to individual problems of these institutions affect the growth and consolidation of a free financial system.

Box 1 presents the methodology used and the main results of the main studies that try to explain the behavior of the bank spreads and interest rate in Latin American countries.

3. Data and Methodology

Box 2 presents the definitions of the variables used in the article, as well as their periodicity, the sources used and the number of observations, while **Table 1** presents the descriptive statistics for each variable. The sample used considers the bank spread data (spread), GDP per capita (pcgdp), exchange rate (exchange rate), real interest rate (real interest), economic freedom[1] index (EFW), sound money sub-index (EFW3) and credit, labor and credit regulation sub-index (EFW5) from twelve South American countries (Argentina, Brazil, Bolivia, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela) from 2000 to 2020.

Descriptive statistics show that variance is very high in the case of spread, GDP per capita, exchange and real interest (the latter two more than the others). EFW, EFW3 and EFW5 have close means (as they are normalized indicators) and smaller and similar variances (see table below).

In turn, **Figures 1-7** show the evolution of each of these variables during the period 2000-2020, from the combination of cross-sectional units (countries)[2]. In the case of spread, there is a general downward trend for most of South American countries (**Figure 1**), while the degree of total economic freedom (EFW), in

[1]The index of economic freedom (*Economic Freedom of the World, EFW*), calculated by the Fraser Institute, classifies countries based on five major areas: 1) Government Size, 2) Rule of Law and Property Rights, 3) Sound Money, 4) Freedom to Trade Internationally and 5) Regulation of Credit and Labor Markets and Business. To learn more about the index and its components see: <https://www.fraserinstitute.org/studies/economic-freedom>.

[2]Charts exclude missing values.

most cases, except Venezuela and Guyana, showed an increase (**Figure 2**) over the years. From a conceptual point of view, we should also expect an inverse relationship between these two variables, because the greater economic freedom, the better the business environment, leading to the reduction of transaction costs, and therefore the bank spread, and vice versa.

Box 1. Literature review on spread and interest rate in south America.

Author	Methodology	Results obtained
Gelos (2006)	Dashboard	*Intermediation* spreads in Latin America are high by international standards.
Sekkel & Alves (2010)	Near VAR	Estimations indicate close variances at 85% for 12-month interest rates, from shocks at the level of economic activity and inflation. Additional tests indicated the effects of country-risk-level shocks, so changes in this indicator could even change interest rates by 40% for 12 months.
Shousha (2008)	VAR, with application of likelihood functions and Kalman filter	It was found that cyclical variables, such as product gap, inflation rate and variation in nominal exchange rates, accounted for up to 53% of the variation in interest rates in 1999 and 2005. The difference is attributed to factors not observed, such as international risk aversion and inflationary expectations.
Bernz (2014)	Nelson-Siegel model, with main component analysis and extended Kalman filter	It was not possible to conclude that the inclusion of macroeconomic variables makes the models more accurate to estimate the term structure of interest, since the benefits obtained, with the inclusion of these, were marginal.
Morales (2003)	VAR, with Kalman filter application	The results support the dynamic interaction between latent factors of the interest curve and monetary and credit policies implemented by the Chilean Central Bank.
Ceballos et al. (2013)	Nelson-Siegel model and principal component analysis	The results suggest that announcements of macro-economic results have an impact on the determination of the movements of the Chile interest curve, both in the Nelson-Siegel Model approach and in the analysis of main components.

Source: authors.

Box 2. Variables, data sources, periodicity and number of observations.

Variable	Definition	Source	Frequency	Number of observations
spread	Interest rate spread (lending rate minus deposit rate, %)	World Bank	annual	226
GDP per capita	GDP per capita	World Bank	annual	246
exchange rate	Official exchange rate (annual average)	World Bank	annual	249
real interest	Real interest rate (annual average)	World Bank	annual	244
EFW	Economic freedom index	Fraser Institute	annual	242
EFW3	Sound money sub-index	Fraser Institute	annual	242
EFW5	Regulation sub-index	Fraser Institute	annual	242

Source: authors.

Table 1. Descriptive statisticss.

Variable	Obs	Mean	Std. Dev.	Min	Max
spread	226	19.41	14.11	0.07	118.38
GDP per capita	246	6415.28	4195.15	904.23	18703.86
exchange rate	249	353.94	955.31	0.68	6771.10
real interest	244	8.34	17.01	−85.73	93.92
EFW	242	6.50	1.05	2.72	8.04
EFW3	242	7.80	1.88	0.94	9.76
EFW5	242	6.28	1.13	2.50	7.89

Source: authors.

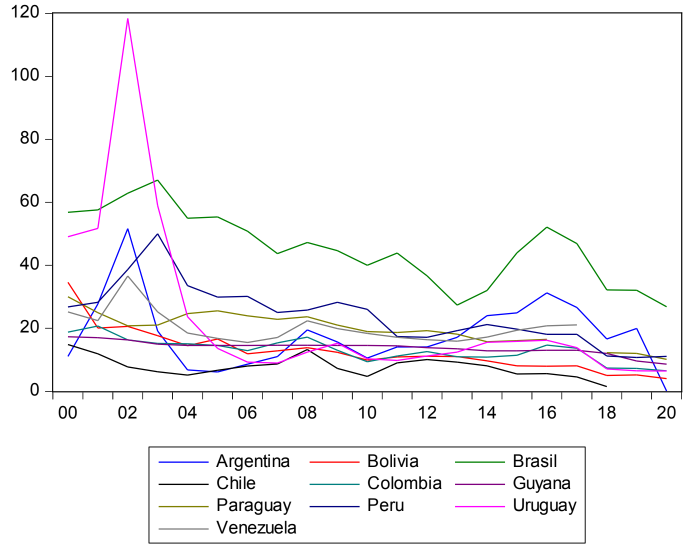

Figure 1. Bank spread for South American Countries: 2000 - 2020 (%). Source: World bank.

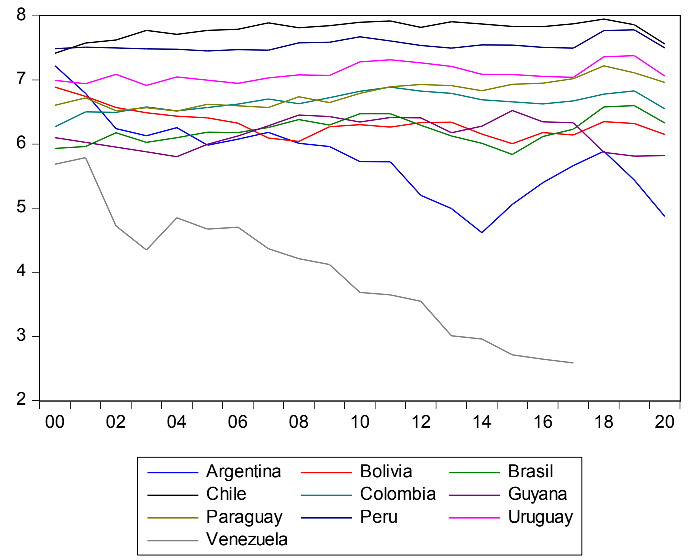

Figure 2. Economic freedom index for South American Countries: 2000 - 2020 (Index number). Source: Fraser institute.

The natural logarithm of GDP per capita (*lnpcgdp*, **Figure 3**) and the exchange rate (**Figure 4**) show a clearly increasing trend, while real interest rates (**Figure 5**) show a decreasing trend for most countries considered in the sample. Theoretically we should expect a negative relationship between income per capita and spread, because the higher (lower) this, the lower (higher) the default rate will be, decreasing (increasing) administrative costs, and therefore the difference between the borrowing rate and the one that is charged to borrowers. In turn, the relationship with the real interest rate, by the spread definition itself, should be straightforward.

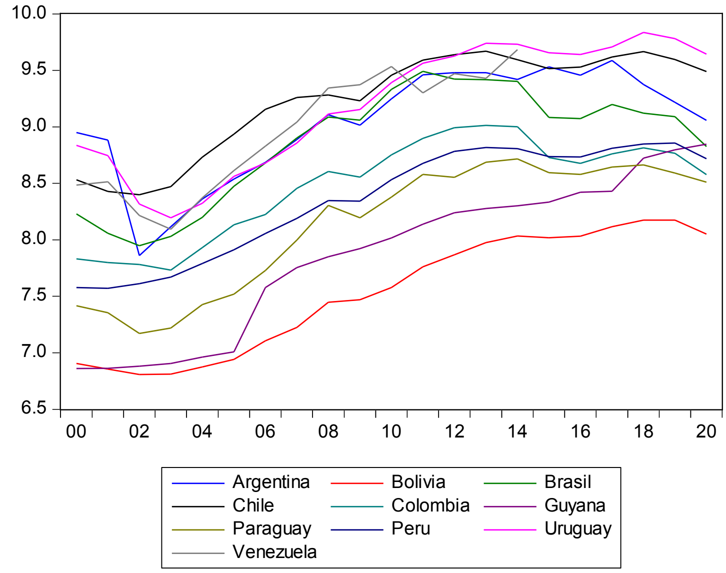

Figure 3. Natural logarithm of per capita GDP for South American Countries: 2000 - 2020 (US$). Source: World bank.

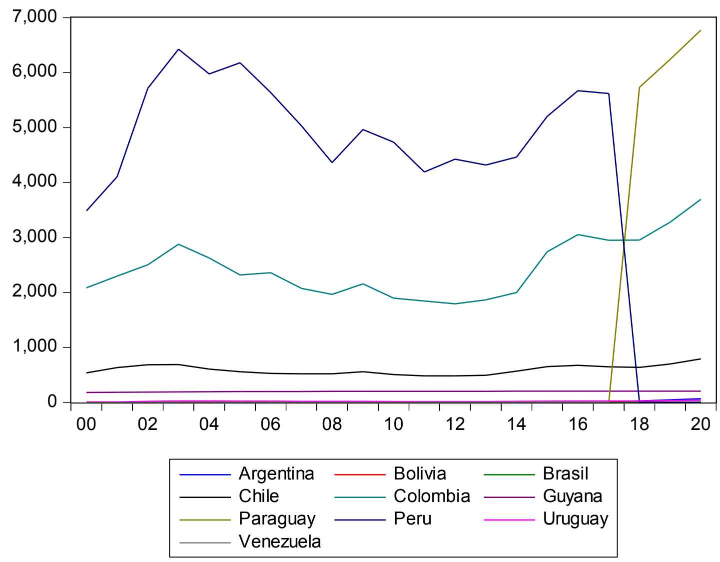

Figure 4. Exchange rate for South American Countries: 2000 - 2020 (local currency against the dollar). Source: World bank.

Finally, while **Figure 6** show the general trend of increase in the subindex relative to sound money (EFW3), **Figure 7** shows the decrease that occurred in most South American countries of the market regulation subindex (EFW5), which means that regulation increased during the period considered. In both cases, an inverse relationship with the bank spread should be *expected*, as this would rise both with the reduction of monetary credibility, due to the increase in expected inflation, and in the event of a higher level of regulation, generating *higher compliance* costs.

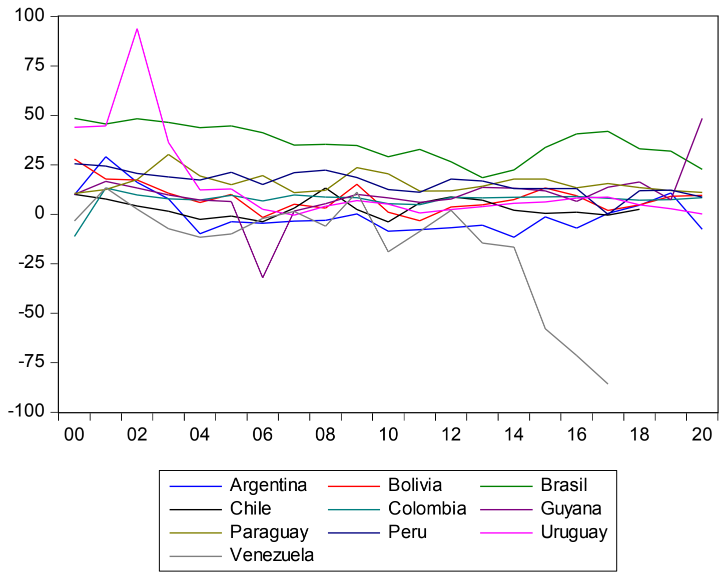

Figure 5. Real interest rate for South American Countries: 2000 - 2020 (%). Source: World bank.

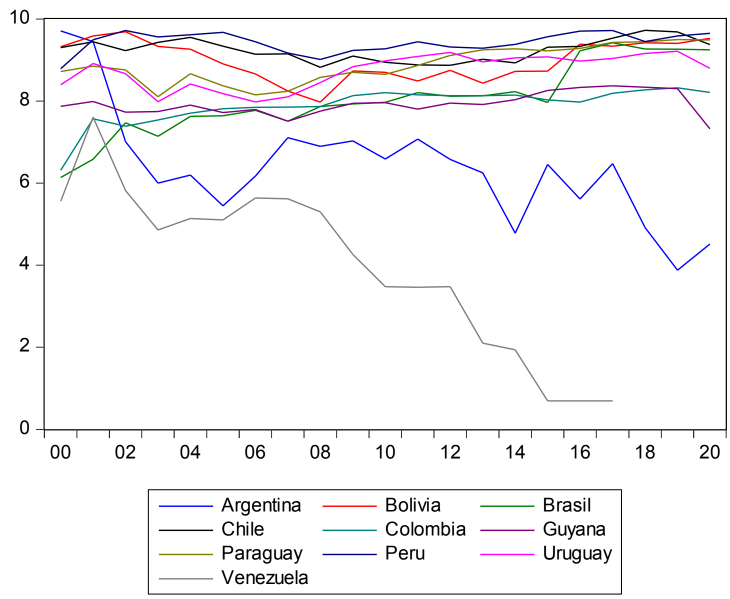

Figure 6. Sound money sub-index for South American Countries: 2000 - 2020 (Index number). Source: Fraser institute.

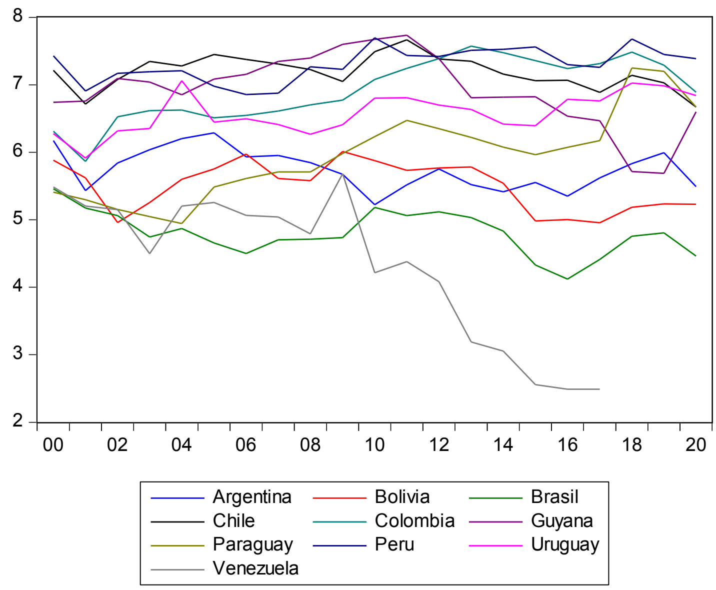

Figure 7. Regulation sub-index for South American Countries: 2000 - 2020. Source: Fraser institute.

The methodology adopted is panel data analysis. The data sample used was extracted from periodic publications of the Fraser Institute and the World Economic Outlook. The empirical model equation, under the inspiration of Gelos (2006), is presented below.

$$y_{en} = \delta + X'_{en}\beta + \mu_{en}$$

where: p and t respectively indicate the country and year. From this formula, we have:

δ = is a scalar

X'_{en} = vector of explanatory variables ($1 \times k$)

β = coefficient vector ($k \times 1$)

μ_{en} = term that displays the following error component:

$\mu_{en} = \mu_p + v_{en}$, where $\mu_p \sim \text{IID}\left(0, \sigma^2 \mu\right)$ and $\sim \text{IID}\left(0, \sigma^2 v\right)$

Given the relatively large temporal dimension of the sample used, before reaching a conclusion, it is necessary to perform unit root tests in the data panel, determining whether there is a stochastic tendency, which, as is known, would invalidate the previously inferences, due to the problem of spurious regression. If it is found that the data used have a unit root, the next step would be to test the existence of cointegration, with tests also adapted to the panel data structure.

For the unit root tests, the Hadri test was chosen, which is like the KPSS test used in time series analysis. The null hypothesis is the parking of all the series present in the panel, with statistic LM $\sim\chi^2$, formed from the residues of Equation (2), estimated by ordinary least squares ($\hat{\xi}$).

$$y_{it} = \delta_i + \eta_{it} + \xi_{it}$$

If the null hypothesis is rejected, concluding that the panel series are I (1), cointegration tests will be performed, following the version of the Fisher-

Johansen multivariate test, developed by Madalla & Wu (1999). Since IIi is the P-value of an individual co-integration test for cross-section *i*, under the null hypothesis of the panel, it is

$$-2\sum_{i=1}^{N}\log\left(\pi_i\right) \sim \chi^2_{2N}$$

The P-values can be determined by the stroke and maximum eigen-value tests.

Finally, according to the results of the cointegration tests, a model of autorregressive vectors (VAR) will be used in the panel, at the level or in first differences, determining the impulse-response functions, according to Cholesky's decomposition. The VAR model on the panel can be expressed by the following expression, following Canova & Ciccarelli (2013), and assuming G endogenous variables:

$$y_{it} = A_{0i}\left(t\right) + A_i\left(L\right)Y_{t-1} + u_{it},\ \ i = 1,\cdots,N;\ t = 1,\cdots,T$$

where u_{it} is a vector of $G \times 1$ vector of random errors and $A_{0i}(t)$ and A_i can depend on each unit of cross-section.

4. Model Estimation and Results[3]

In this section we make the initial estimates through linear regressions. The basic empirical model was inspired by Gelos (2006), being compatible with the common number of 184 observations and their respective degrees of freedom:[4,5]

$$\begin{aligned} Spread_{it} &= \alpha + \beta \cdot EFW_{it} + \gamma \cdot \ln\left(PCGDP_{it}\right) + \theta \cdot ExcRate_{it} \\ &\quad + \vartheta \cdot Interest_{it} + \partial \cdot COVID_t \end{aligned}$$

In that i indicates the country and t the year. *EFW* is the *economic freedom score*, *PCGDP* is the GDP per capita of the country, *ExcRate* is the inverse of official exchange rate (dollars per local currency unit), *Interest* the real interest rate and *COVID* is a dummy variable for 2020.

4.1. Regressions with Panel Data

The data structure is cross-sectional with time series (panel). The most appropriate in this case is to adopt techniques for panel data which can be of the type "fixed effects" (EF) or "random effects" (EA). Consider the base specification, the coefficients for EF and EA were estimated, see **Table 2**.

To know which of the effects is the one that best fits the data, we ran the Hausman test. The test indicated that the most appropriate structure for estimating the model is fixed effects, because $chi2\left(5\right) = \left(b-B\right)'\left[\left(V_b - V_B\right)^{-1}\right]\left(b-B\right) = 103.18$ and $Prob > chi2 = 0.0000$.

[3]Statistical package adopted were Stata 14 SE and Eviews 13.

[4]Disregarding the observations that have "missing values".

[5]Respecting the Central Limit Theorem which, according to Wooldridge (2006) states that the sample distribution of the mean of a random variable approaches a normal distribution if the sample size is "large" (greater than 30 observations). Thus, with 213 observations, the econometric model comprises a maximum of seven variables.

Table 2. Panel regressions: comparison between fixed effect and random effect.

Dep.var. *SPREAD*	fixed	random
Constant	96.0751***	66.4992***
	(13.7865)	(9.4191)
Economic freedom	−4.2458**	−4.2736***
	(1.8347)	(0.8510)
ln (GDP per capita)	−6.4098***	−3.1636***
	(0.9330)	(0.8773)
Exchange rate	−1.3481	4.5017
	(4.6487)	(2.9928)
Interest rate	0.6452***	0.7180***
	(0.0462)	(0.0449)
COVID	−9.1703***	−9.3697***
	(2.3035)	(2.5226)
sigma_u	7.6345703	2.3159616
sigma_e	6.5825307	6.5825307
rho	0.5735952	0.1101521
N	213	213

Source: authors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

According to Torres-Reyna (2007), The EF allows you to focus on the analysis of the impact of variables that vary over time. The model explores the relationship between the estimated variables and the results within an entity country in this case. Each country has its own individual characteristics that may or may not influence the estimated dependent variable.

Therefore, just as it was done for regressions with stacked data, we compared the different specifications, "full" economic freedom index (*efw*) versus component subindexes (*efw3* and *efw5*), see **Table 3**.

The signs followed in the direction we expected. That is, considering macroeconomic variables, the higher the *score of economic freedom*, whether total or in the components (regulation and sound money), the lower the average bank spread of the country.

4.2. Robustness and Dynamic Panel

The results analyzed in the previous section can be questioned about simultaneity and, therefore, endogeneity. So, we must check the robustness of the results from the previous section.

One way to deal with endogeneity in panel models was proposed by Arellano & Bond (1991), based on estimation using the generalized method of moments (GMM).

Table 3. Panel regressions with fixed effect.

Dep.var. *SPREAD*	**reg3**	**reg4**	**reg5**	**reg6**
Constant	96.0751***	84.5886***	79.1864***	91.4262***
	(12.7284)	(10.2745)	(10.3788)	(9.7267)
ln (GDP per capita)	−6.4098***	−5.8241***	−6.5793***	−5.8745***
	(0.9561)	(0.9517)	(0.9074)	(0.9648)
Exchange rate	−1.3481	−0.9517	−7.4817	0.0834
	(6.1331)	(5.4524)	(6.4036)	(5.2797)
Interest rate	0.6452**	0.6544**	0.6462**	0.6489**
	(0.2273)	(0.2184)	(0.2293)	(0.2175)
COVID	−9.1703**	−8.5446**	−8.7923**	−8.7014**
	(3.5075)	(3.5432)	(3.4118)	(3.5481)
Economic freedom	−4.2458**			
	(1.8441)			
Sound money		−2.6890**		−2.6485**
		(0.9468)		(0.9109)
Regulation			−1.3321	−1.0712
			(1.1265)	(1.1005)
sigma_u	7.6345703	6.4071254	8.6100247	0.6539
sigma_e	6.5825307	6.4508106	6.6509587	0.6587
rho	0.5735952	0.49660251	0.6262898	0.6472
R-squared				
within	0.6381	0.6525	0.6306	6.0257358
between	0.4500	0.6172	0.3462	6.4535966
overall	0.5390	0.6263	0.4879	0.4657547
N	213	213	213	213

Robust standard errors. Source: authors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

According to Cameron & Trivedi (2005), the dynamic linear panel SYS-GMM consists in introducing the first lag of the dependent variable as one of the explanatory variables (dealing with the temporal autocorrelation of residuals) and instrumenting the independent variables of the model by means of them through their respective differences in time, to circumvent the simultaneity problem.

The same SYS-GMM strategy is adopted by Bilotkach et al. (2012). It is important to note that the number of observations in the panel data explored here allows the asymptotic properties of the estimators proposed by Arellano & Bond (1991), so the estimations were done in single-stage estimations. See **Table 4**.

As in the case of the static panel, the signs of the estimated coefficients are consistent with the assumptions of economic theory and the hypotheses formulated about their behavior. The results obtained with the dynamic panel are in line with the static panel and point to the non-rejection of the null hypothesis that economic freedom negatively affects the bank spread.

Table 4. Dynamic panel regressions with sys-gmm estimators (Arellano-Bond).

Dep.var. SPREAD	reg7	reg8	reg9	reg10
Constant	87.1322***	60.0605***	58.9385***	68.3203***
	(16.4495)	(10.5889)	(12.4839)	(12.8486)
L.spread	0.2652***	0.2579***	0.2753***	0.2544***
	(0.0504)	(0.0506)	(0.0505)	(0.0504)
lpcgdp	−4.6480***	−4.1879***	−4.6073***	−4.3139***
	(1.0382)	(1.0349)	(1.0449)	(1.0355)
exchangeuss	−1.1366	−4.4549	−6.5269	−3.2649
	(5.0121)	(4.6624)	(4.6259)	(4.7608)
interest	0.5386***	0.5522***	0.5342***	0.5488***
	(0.0502)	(0.0498)	(0.0504)	(0.0500)
covid	−8.1719***	−7.1855***	−7.2018***	−7.4003***
	(2.0288)	(1.9580)	(1.9955)	(1.9657)
efw	−5.8379***			
	(2.0307)			
efw3		−1.8318**		−1.7507**
		(0.7650)		(0.7691)
efw5			−1.5460	−1.2397
			(1.1775)	(1.1660)
N	192	192	192	192

Robust standard errors. Source: authors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Instruments for differenced equations; GMM-type: L(2/.).spread; Standard: D.efw D.efw3 D.efw5 D.lpcgdp D.exchange D.interest D.covid; Instruments for level equations. Standard: _cons.

4.3. Unit Root and Cointegration Tests

Table 5 shows the results for each of the variables used, in which the null hypothesis of stationarity in all cases is rejected, even considering the consistent statistics under the presence of heteroscedasticity. For all the tests, the most general specification was considered, which assumes the existence of constant and trend, in addition to the Parzen spectral window.

As all series present in the panel have a unit root, cointegration tests were performed assuming the variables used in the regressions of Table 3, following the Fisher-Johansen methodology. As can be seen in Tables 6-8, the tests indicate that the cointegration matrix has a complete position for all cases, both from the point of view of the trace statistic and the maximum eigen-value. The most general specification is assumed, with constant in the VAR and in the cointegration vector (Model 3 of Eviews) and a lag.

Table 5. Unit root hadri tests.

	Z Statistics	p-Value	Z-Consistent Statistics	*p*-Value
spread	5.04	0.00	12.36	0.00
lpcgdp	3.91	0.00	3.56	0.00
exchange rate	5.28	0.00	4.70	0.00
interest rate	5.38	0.00	28.53	0.00
EFW	3.29	0.00	3.25	0.00
EFW3	4.20	0.00	4.31	0.00
EFW5	4.19	0.00	9.60	0.00

Source: authors.

Table 6. Fisher-johansen cointegration tests for spread, lpcgdp, exchange rate, interest rate and Efw.

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	343.3	0.0000	216.3	0.0000
At most 1	197.5	0.0000	127.7	0.0000
At most 2	110.1	0.0000	82.24	0.0000
At most 3	54.33	0.0000	43.17	0.0015
At most 4	44.67	0.0001	44.67	0.0001

Source: authors

Table 7. Fisher-johansen cointegration tests for spread, lpcgdp, exchange rate, real interest rate and Efw3.

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	276.3	0.0000	187.1	0.0000
At most 1	150.6	0.0000	104.0	0.0000
At most 2	80.9	0.0000	61.1	0.0000
At most 3	62.9	0.0000	46.3	0.0000
At most 4	51.2	0.0000	51.2	0.0000

Source: authors.

Table 8. Fisher-johansen cointegration tests for spread, lpcgdp, exchage rate, real interest rate, Efw3 and Efw5.

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	387.0	0.0000	184.0	0.0000
At most 1	219.8	0.0000	146.4	0.0000
At most 2	163.5	0.0000	97.7	0.0000
At most 3	92.0	0.0000	52.3	0.0000
At most 4	58.8	0.0000	48.3	0.0000
At most 5	43.8	0.0000	43.8	0.0000

Source: authors.

Thus, it can be affirmed that although all series are integrated in order one, the system is stationary, which allows estimating the VAR at the level for all of them and proceeding to define the impulse-response functions to corroborate the previous results. However, to solve the problem of var instability, which would make the previous year impossible, Venezuela and the observations of the year 2020 were removed from the sample, eliminating all sources of "missing data".

Figures 8-10 show the results of the shocks applied in the residues of all VAR equations, assuming the following Cholesky ordering: *efw*, *exchange rate*, *real interest rate*, *lpcgdp*, *spread* (VAR 1); efw*3*, *exchange*, *real interest*, *lpcgdp*, *spread* (VAR2); *efw3*, *efw5*, *exchange*, *real interest*, *lpcgdp* and *spread* (VAR 3) respectively.

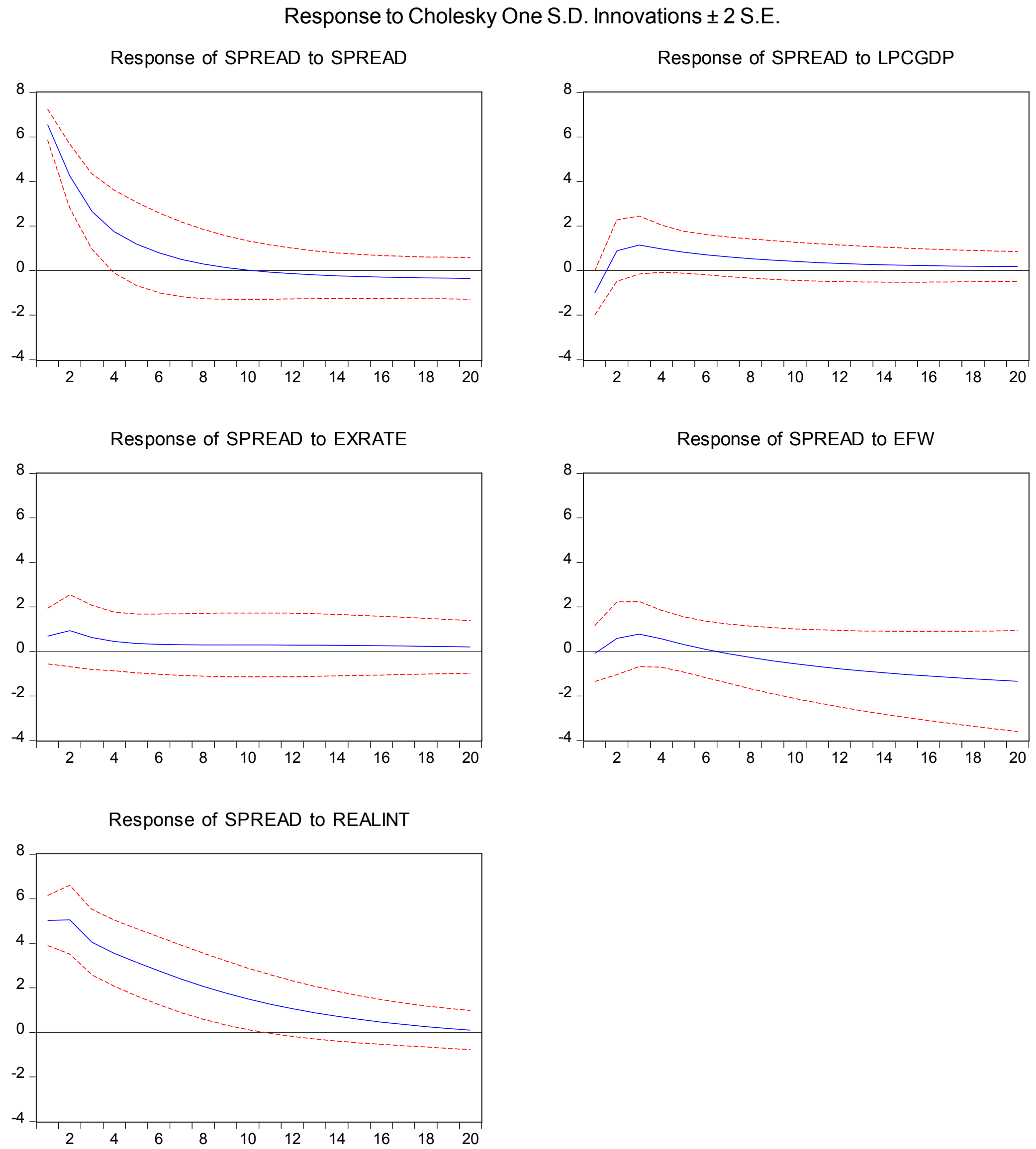

Figure 8. Impulse-response function for var 1. Source: authors.

The results generally confirm the previous conclusions of the fixed effects model. Thus, for the three definitions of Cholesky's decomposition, one can see that shocks in spread, exchange rate and real interest rate positively affect the bank spread, while shocks in economic freedom and monetary credibility negatively affect it. The effect of GDP per capita was positive, mainly in the first six months, on the contrary to what was expected.

For all cases considered, the positive effects of shocks related to the bank spread itself are concentrated in the short term, dissipating completely, or becoming statistically insignificant over the period considered. In the case of the change in the real interest rate, the impacts on the three decompositions are decreasing, over time, disappearing completely before the twentieth year.

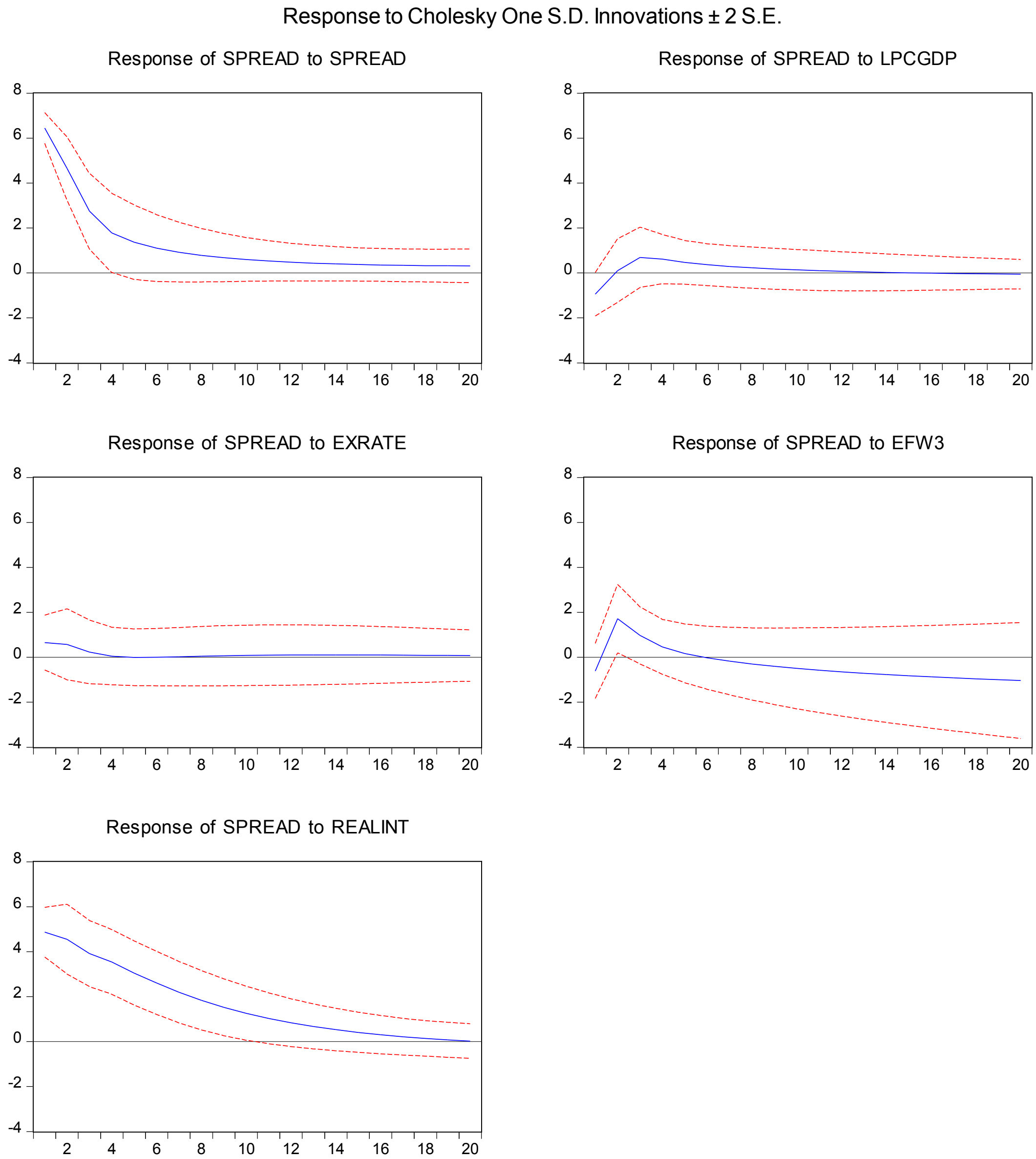

Figure 9. Impulse-response function for var 2. Source: authors.

From the point of view of the shocks associated with the degree of economic freedom, it is interesting to note that the negative effects remain over the 20 years considered in the financial year for VAR 1, while changes in sound money indexes and regulation show the same behavior in the cases of VAR 2 and VAR 3, respectively.

In relation to the disturbances of GDP and the exchange rate, for VAR 1 and VAR 2, its direct effects are only relevant, from the statistical point of view, in the first years, while for VAR 2, the fluctuation of exchange rate does not generate significant impact.

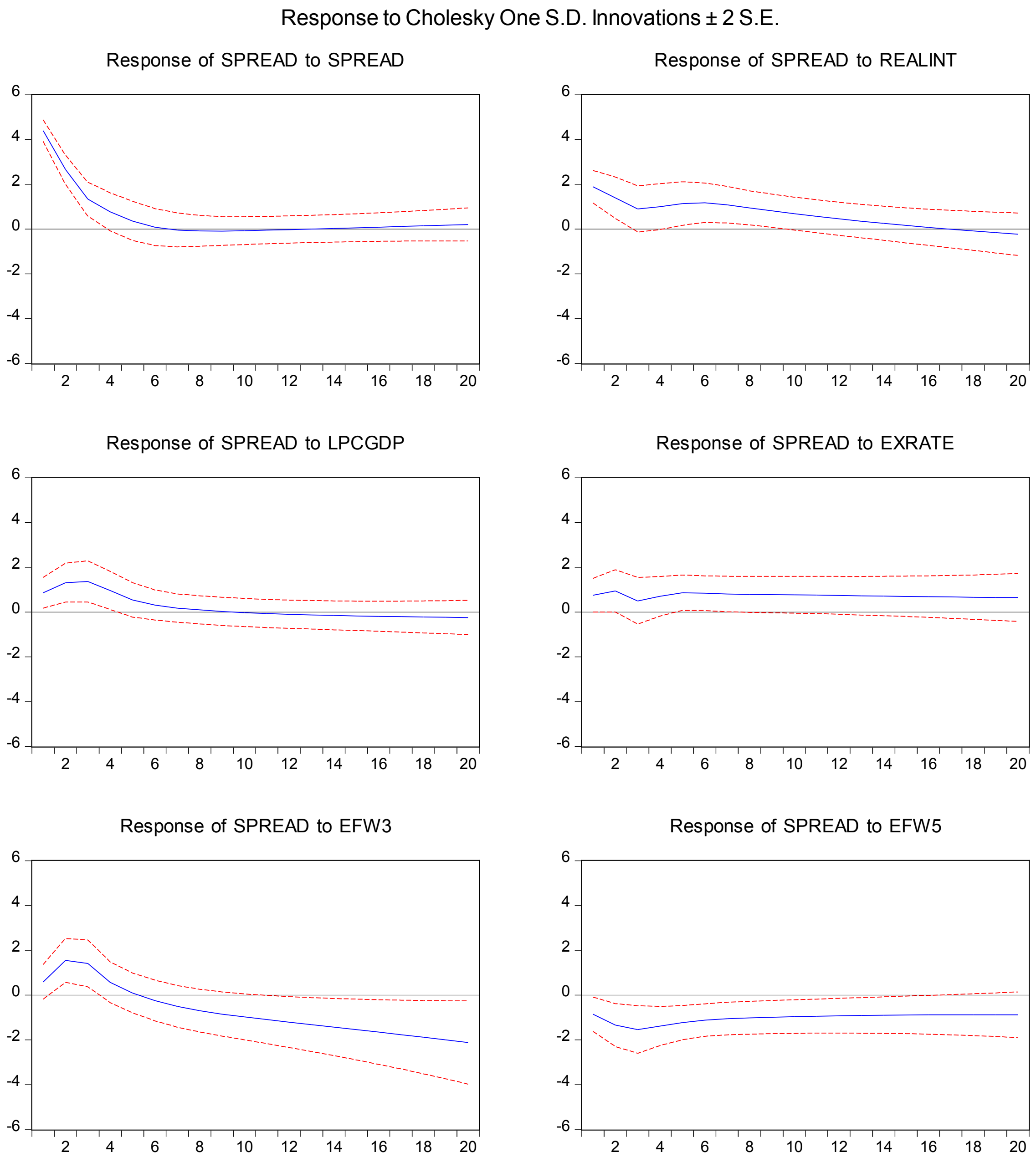

Figure 10. Impulse-response function for var 3. Source: authors.

5. Final Remarks

The results presented in this work were obtained through econometric exercises that show that regulatory and macroeconomic factors are important in determining the bank spread. We have several panel techniques and these indicate that the measures of economic freedom, total and subcomponents, are negatively related to the bank spread.

The analysis of impulse-response functions, in the context of autoregressive vectors (VAR) in the panel, allows us to conclude that economic freedom, regulation and sound money (component area of the EFW, Economic Freedom of the World index) negatively affect the spread value, and that they also have long-term effects.

That is, the lower the economic freedom, the greater the spread. We have identified that there is a negative relationship between bank spread and economic freedom. That is, when the business environment has greater economic freedom, implying greater legal certainty, less regulation, larger monetary credibility, etc., the difference between borrowing cost and loan rate tends to be smaller. These results are compatible with that obtained by Gelos (2006) and show that the explanation of the average bank spread in South America is higher than the world average can be explained by its lower economic freedom. The isolated performance of Chile, which is a South American country, but with a high level of economic freedom, is an outlier, but not out of results and theory, because its bank spread is the lowest among the countries analyzed.

In this sense, even if slowly and unequally among countries, the measures adopted with the purpose of liberalizing the financial market, as part of measures to expand economic freedom and improve the business environment, have been able, over time, to contribute to reducing the bank spread in South America and to expand access to credit (consumption and investment) and efficient performance of companies.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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