Revista Cadernos de Finanças Públicas

03 | 2025

TESOURONACIONAL

Subordinated Financial Notes: An analysis of the factors that explain their price

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ABSTRACT

Subordinated Financial Notes (LFS) are a type of instrument that enables fundraising with an effect on the composition of a bank's capital. Investing in these notes is considered high risk for investors, as there is the possibility of loss of income if the issuing bank does not generate profits and loss of principal in the event of bankruptcy. To understand the characteristics of LFS, the legislation and regulations governing this financial instrument were analyzed. Subsequently, the trading value of LFS on the secondary market was estimated based on economic and credit variables, using multiple linear regression. The correlation analysis showed that the variables of LFS value are more correlated with credit variables than with economic variables. The result of the main regression showed that the bank's credit portfolio stock and the GDP level have the greatest explanatory power over the price of LFS.

Keywords: Subordinated Financial Letter. Capital composition. Basel Index. Hybrid investment.

SUMMARY

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1. INTRODUCTION

Subordinated financial notes (LFS) are an important fundraising instrument used by financial institutions to improve liquidity or compose their capital. These securities allow banks to raise funds from investors as an alternative to other forms of fundraising, such as issuing shares. The issuance of these securities began in Brazil in 2010 with Central Bank regulation and the implementation of new Basel III rules.

The issuance of subordinated financial bills is regulated by the Central Bank of Brazil and helps banks comply with the requirement to maintain a minimum level of capital to ensure the institution's solvency. The purpose of issuing financial bills is, therefore, to raise funds to strengthen the bank's capital and enable it to meet its financial and regulatory obligations.

According to CMN Resolution 5,007/2022, subordinated financial bills may be issued by multiple, commercial, development, and investment banks, credit, financing, and investment companies, savings banks, mortgage companies, real estate credit companies, credit cooperatives, and the National Bank for Economic and Social Development (BNDES).

Table 1 shows the stock of LFS issued by the 15 largest issuers on December 30, 2022. Among these financial institutions, Bradesco stands out with 45.15% of the total stock of issues on December 30, 2022.

Table 1. Stock by issuer of the 15 largest LFS issuers on December 30, 2022.

Position	IF/Conglomerate	LFS (R$ Millions)	%
1º	BRADESCO	51 643	45,15%
2º	ITAU	17 342	15,16%
3º	SAFRA	7 052	6,17%
4º	SANTANDER	6 365	5,57%
5º	BTG PACTUAL	4 538	3,97%
6º	VOTORANTIM	2 664	2,33%
7º	BB	2 453	2,14%
8º	CAIXA ECONÔMICA FEDERAL	2 336	2,04%
9º	ABC-BRASIL	2 245	1,96%
10º	BCO VOLKSWAGEN S.A	1 952	1,71%
11º	BRB	1 802	1,58%
12º	NUBANK	1 700	1,49%
13º	BCO COOPERATIVO SICREDI S.A.	1 112	0,97%
14º	DAYCOVAL	1 042	0,91%
15º	XP	810	0,71%

Source: Central Bank

Investors who purchase financial bills issue a loan to the bank, receiving interest payments and the return of the principal in exchange. Investors can be individuals or legal entities, including investment funds and other financial institutions. According to data from the Central Bank of Brazil, in 2022, investment funds held 73.4% of the LFS issued.

Table 2. Stock by nature of holders on 12/30/2022.

Type of Holder	LFS (R$ Millions)	%
Investment funds	84 008	73,4%
Clients (individuals and legal entities)	22 109	19,3%
Banks	3 099	2,7%
Others Institutional investors	3 977	3,5%
Other legal entities	251	0,2%
Financial institutions financial non-banking	933	0,8%
Total	114 377	100,0%

Source: Central Bank

The amounts, terms, and conditions of remuneration negotiated in the issuance of financial bills vary according to the profile of the issuing bank and its need to obtain funds through this instrument. In general, large banks with a good reputation in the market are able to issue financial bills with lower interest rates, while smaller banks with less credibility need to offer higher rates to attract investors.

Trading takes place in the primary market, when it is offered by the issuing the LFS, with direct prospecting to investors or in a public offering, and also on the secondary market, when the holder of the paper sells the asset, with a possible premium or discount, to another interested party.

As shown by data from the Annual Report – Central Bank Financial Bills, banks have increasingly resorted to issuing financial bills to finance their operations. Some of these banks have less capacity to raise funds from investors, which can lead to higher interest rates on the issuance of securities.

As shown in Figure 1, the stock of Subordinated Financial Bills grew from its creation in 2010 until 2016. In 2017, there was a decline in the value of its stock, remaining at lower levels until 2020 and only returning to growth from 2021 onwards.

Figure 1. Evolution of the stock of LFS

Source: Central Bank Own elaboration

Investors who purchase subordinated financial bills should assess the risk involved in the transaction, considering the financial health of the issuing bank, market conditions, and the terms involved. In addition, subordinated financial bills are not guaranteed by the issuer or the Credit Guarantee Fund (FGC), which protects investors in the event of bankruptcy or liquidation of the issuing bank.

B3[1] states on its website that "in the case of LF issued with a subordination clause, its holders have their credit rights conditioned on the payment of other debts of the issuing institution in the event of bankruptcy or default." In other words, in this case, the financial institution issuing the LFS can only make the due payment to its holders after paying the rest of its liabilities.

One of the benefits of subordinated financial bills for issuing banks is that these securities are considered long-term capital, which contributes to compliance with the capital requirements established by regulatory agencies. This means that financial bills can be used by banks to compose their capital levels, which increases these institutions' ability to grant credit and expand their operations.

However, the issuance of financial bills also entails costs for banks, such as registration and custody fees, in addition to the payment of higher interest rates than other types of funding, such as savings accounts, CDBs, LCAs, and LCIs. For this reason, banks carefully assess market conditions and demand for these securities before issuing new financial bills. Investors also conduct their own analysis, given the inherent risks of LFS.

Other countries have similar funding instruments such as *CoCo Bonds (contingent convertible securities)*, also known as AT1 (*Additional Tier 1*). According to Mendes, L. S. (*Essays on Contingent Convertible Bonds and Bank Regulation*, 2021), *CoCos* are a type of financial instrument that protect banks from *default* risks. They are considered a type of hybrid investment because they are reflected in the liabilities and equity on the bank's balance sheet, and for the investor, the securities initially pay regular coupons but can be converted into shares and even depreciate.

AT1 was used by the European bank Credit Suisse to improve its leverage ratio, but left its creditors with losses of approximately $17 billion due to its financial crisis. AT1 is similar to the LFSC (Complementary Subordinated Financial Note) traded in Brazil and has a market in Europe of $275 billion, as reported in the newspaper O Globo[3].

With the financial crisis at Credit Suisse in March 2023, it is clear that hybrid investments, such as subordinated financial notes, are risky and can cause major losses to investors and even a crisis in the banking system. Even with such a risk, large amounts are traded on the Brazilian market.

The purpose of the research is to verify whether there is an economic scenario that conveys more liquidity or risk appetite for the purchase of LFS. In the event of a banking crisis that threatens a bank's solvency, creditors of subordinated financial bills may lose their entire investment and respective returns. Therefore, it is important to study the trading of subordinated financial bills to understand whether there are variables that explain the trading value of this type of financial instrument. Knowing what makes the market more conducive to trading subordinated financial bills can help an issuing bank decide on the best time to trade this type of financial instrument.

This research assesses which economic and financial variables influence the value of LFS traded on the secondary market and which variables have greater explanatory power. To this end, a statistical model was created based on historical economic, credit, and LFS data. All data was obtained from public data provided by the Central Bank of Brazil and Anbima – Brazilian Association of Financial and Capital Market Entities. The trading of LFS began in 2010, but data from 2013 to 2022 was used to develop the regression model, as from 2010 to 2012 the trading volume of this product was not so relevant and the market was still getting to know this product.

This article is structured in five chapters, including this introduction. Chapter 2 presents the regulatory framework, analyzing the Central Bank resolutions that deal with Subordinated

Financial Bills. Chapter 3 covers the methodology, highlighting the processes, databases, and quantitative analyses that led to the success of the econometric model. Chapter 4, on results, will disclose the model's response to the research problem. The conclusion will come in Chapter 5 with the outcome of the study and the author's understanding.

2. REGULATORY FRAMEWORK

The main standards governing the issuance of Subordinated Financial Bills were developed by the CMN (National Monetary Council) and the Central Bank. The regulatory framework for this article is set out in:

a. BCB Resolution 122/2021: Provides for the deposit of Financial Bills with an entity authorized by the Central Bank of Brazil and for the authorization to use funds raised through Financial Bills in the composition of Reference Equity.

b. CMN Resolution 5.007/2022: Provides for the conditions for the issuance of Financial Bills by financial institutions.

c. CMN Resolution 4,955/2021: Provides for the methodology for calculating Reference Equity (PR).

d. Law 12,249/2010: (...) provides for Financial Bills and Structured Operations Certificates (...) and other measures.

REFERENCE EQUITY

Reference Equity (PR) is the regulatory capital measure used to support Risk-Weighted Assets (RWA), ensuring the institution's solvency. PR is the sum of Level I PR and Level II PR.

Tier I PR is the sum of Core Capital and Supplementary Capital. Core Capital consists mainly of the sum of share capital plus capital reserves and profits, minus deductions and prudential adjustments required by the regulator. Tier I PR is the highest quality portion of reference capital and is best suited to absorb losses.

Complementary Capital, in turn, consists of hybrid capital and debt instruments authorized to comprise Level I. Complementary Subordinated Financial Letters (LFSC) have characteristics of perpetuity, subordinate to all other instruments.

Level II PR, on the other hand, consists of debt instruments capable of absorbing losses

in the event of financial liquidation. Under Brazilian regulations, the security authorized for this purpose is the Subordinated Financial Note (LFSN).

Figure 1. Composition of Reference Equity

CHARACTERISTICS

The Subordinated Financial Note is a debt security that offers above-average returns among fixed-income securities. It may be linked to the CDI, the IPCA, or be pre-fixed. Its redemption or repurchase can only occur after a minimum term of five years. The minimum amount required for this investment is R$ 300,000. Investors should be aware that there is a 15% income tax on returns and that there is no guarantee from the Credit Guarantee Fund (FGC).

This fixed income instrument was authorized by the Central Bank of Brazil in 2010 and allows banks to raise long-term funds to finance projects and operations or to guarantee capital protection.

LFSN – DECAY FACTOR

To be included in Level II PR, LFSNs must meet the requirements listed in CMN Resolution No. 4,955/2021, with attention to the minimum interval of five years between the issue date and the maturity date, and may not provide for payment and amortization before that interval has elapsed.

The aforementioned standard also informs the decay factors according to the remaining term to maturity of the LFSN. The deductions are shown in the table below:

Table 1. LFSN deduction in the reference equity interest

Deduction	Maturity
20%	between 4 and 5 years (60th to 49th month)
40%	between 3 and 4 years (48th to 37th month)
60%	between 2 and 3 years (36th to 25th month)
80%	between 1 and 2 years (24th to 13th month)
100%	less than 1 year (12th to maturity)

In addition to decreasing their share of capital due to the remaining term to maturity, LFSNs may be repurchased and their balance extinguished if the issuing institution discloses that the Principal Capital is less than 4.5% of the RWA amount (CMN Resolution No. 4,955/2021).

Furthermore, early redemption of the security is not subject to authorization by the Central Bank of Brazil, provided that the Financial Bill placed in substitution for the redeemed security has an interest rate equal to or lower than that of the redeemed Financial Bill and maintains the other characteristics of the redeemed Financial Bill.

LFSN – PRACTICAL EXAMPLE

If an LFSN is issued with a term of 7 years, its balance will be considered in full for capital only in the first two years. In the third year, when there are 5 years remaining until maturity (60 months), there will be a 20% deduction from the balance, i.e., only 80% of the balance will count toward capital.

Each year, the deduction increases by 20 p.p. In the last year, with 12 months remaining until maturity, the deduction is 100%, meaning that no amount is considered capital.

The total term of the LFSN does not interfere with the decay rule. What matters is not the total term, but rather the remaining term until maturity. The balance considered for capital is calculated based on the already adjusted balance of the LFS (contracted rate).

The adjustment of the transaction value is made on the total balance of the transaction, not just the balance considered for capital. In other words, with a high deduction for term, the expense is calculated on the total balance, while only a small portion is considered for capital.

LFSC

Subordinated Complementary Financial Bills are an important instrument for raising funds, as the eligible balance to compose the Complementary Capital is not reduced due to the proximity of maturity.

According to BCB Resolution No. 122/2021, the maturity of LFSC is conditioned exclusively on the dissolution of the issuing institution or the default on the obligation to pay the remuneration stipulated therein.

However, this rule provides for the possibility of repurchase and early redemption of LFSCs, even if carried out indirectly through a conglomerate entity or a non-financial entity controlled by the issuing institution. Repurchase is subject to authorization by the Central Bank of Brazil.

In addition to the repurchase by LFSC, the outstanding balance of securities issued by the Bank may be extinguished by order of the Central Bank. The criteria for this situation are listed in CMN Resolution No. 4,955/2021, with emphasis on Article 24-A, Paragraph 4, Item I, the extinguishment of the outstanding balance of an instrument that contains the extinguishment clause referred to in Article 15, Item XV, or Article 20, Item X, as established therein.

CMN Resolution No. 4,955/2021:

Article 15: To compose the Supplementary Capital, instruments must meet the following requirements:

XV - provide for the extinction, permanently and in an amount at least corresponding to the balance calculated in Level I, or, as defined in paragraphs 2 and 3 of this article, the conversion of the same amount into shares of the issuing institution eligible for Principal Capital, in the following situations:

> a) disclosure by the issuing institution, in the manner established by the Central Bank of Brazil, that its Principal Capital is below 5.125% (five and one hundred and twenty-five thousandths of a percent) of the RWA amount, calculated in the manner established by specific regulations;

CAPITAL INDICATORS

The issuance of Subordinated Complementary Financial Bills (LFSC) contributes to maintaining the Level I Index and the Basel Index at adequate levels, however, it does not impact the Core Capital Index, which measures the Institution's highest quality capital. The issuance of LFSN, on the other hand, only affects the Basel Index, without impacting the other indicators presented below.

Capital Core Capital	Level I Index	Basel Index
Principal Capital	PR Level I	PR
Risk-weighted assets	Risk-Weighted Assets	Risk-weighted assets

To meet the Basel Index required by the Central Bank, the bank must present an indicator above 10.50%, i.e., for every 100 risk-weighted assets, the bank must have a minimum of 10.50 in reference equity (PR).

Based on these indicators, it is possible to analyze the leverage ratio and how the bank finances itself. Using each bank's indicators, investors can assess where there is more or less risk in possible investments in subordinated financial bills.

3. DATA AND METHODOLOGY

The monthly data for the variables between 2013 and 2022 were downloaded from the Brazilian Central Bank (BCB) website and from Anbima – Brazilian Association of Financial and Capital Market Entities. Most of the level variables, including the dependent variable, which is the trading value of LFS on the secondary market, did not meet the assumption of normal distribution in the sample based on the Shapiro-Wilk test. Therefore, all variables analyzed were transformed into logarithms. The value of LFS was selected as the dependent variable rather than the quantity of LFS traded because the former is stationary while the latter is characterized by strong autocorrelation, complicating quantitative analyses. Table 2 presents the definition and acronyms for the selected variables.

Table 2: Definitions and acronyms of variables

ABBREVIATION	DEFINITION
SECONDARY_BUSINESS_VOLUME	Number of trading in secondary value
SECONDARY_TRADING_VALUE	Trading value on the secondary market
LFS_ISSUES	Issuance of subordinated financial bills
LFS_STOCK	Stock of subordinated financial bills
MONTHLY CDI	% of monthly CDI
CUMULATIVE_CDI	% of accumulated CDI over the last 12 months
IPCA_ACUM	Accumulated inflation over the last 12 months
TJLP_AA	Annual percentage of the long-term interest rate

CAGED_STOCK	Number of people employed
GDP_ACCUMULATED_12M_US	Accumulated GDP for the last 12 months in dollars
PIB_MENSAL_US	Monthly GDP in dollars
PIB_ACUM_12M_RS	Accumulated GDP for the last 12 months in reais
PIB_MENSAL_RS	Monthly GDP in Brazilian reais
IBC_BR	Economic activity indicator
IBC_BR_SAZONAL	Economic activity indicator without effects of seasonality
CONCESSAO_CREDITO_RSMM	Credit granted in millions of Brazilian reais in month
CUSTO_DO_CRED_ICC_%	Cost of the credit portfolio as a percentage
SPRED_MED_PP	Credit portfolio spread in points percentage
INADIMPLENCIA	Delinquent balance over 90 days and less than 360
PRE_INADIMPL_15A90	Delinquent balance over 15 days and less than 90
DURATION_CARTEIRAS	Average maturity of credit portfolios
SALDO_CRED_AMPLIADO	Credit portfolio inventory
CONC_REC_LIVRES_MM	Credit granted in millions of reais in the month of free resources
ICC_REC_LIVRES%	Cost of the free resources credit portfolio as a percentage
SPREAD_REC_LIVRES	Spread of the free resources credit portfolio in percentage points
INAD_REC_LIVRES	Delinquent balance of the free resources portfolio over 90 days and less than 360
PRE_INAD_REC_LIVRES	Delinquent balance of the portfolio of free resources above 15 days and less than 90
DIV_LIQ_%PIB	Brazil's net debt as a percentage of GDP
DIV_MOB_SALDO_STN_RSMM	National Treasury securities debt in millions of reais
DIV_MOB_DURATION_STN_MESES	Average maturity of the National Treasury's securities debt in months
REND_MED_PESS_OCUP_PNAD	Average income of employed persons according to PNAD
SALDO_CRED_REC_LIVR	Stock of the credit portfolio of free resources

First, Spearman's ρ (rho) coefficient was used to assess the correlations among the 32 variables investigated in this study, as it is an appropriate index for asymmetric data (Field, Miles & Field, 2012). The correlation table was presented using a heat map, in which positive values are shown in blue, while negative values are shown graphically in red. In addition, higher cor-

relations are illustrated by stronger colors, while weak associations are represented by lighter colors, closer to white. The correlations found help in choosing the explanatory variables most related to the dependent variable, the trading value of LFS in the secondary market.

In addition to the heat map, network analysis was used to investigate the degree of associations between variables using the correlation coefficient. Variables are represented by nodes, and their associations are illustrated by edges, where blue edges indicate positive associations, while red edges illustrate negative associations between variables. In addition, stronger colors indicate stronger associations, while weaker associations are represented by weaker colors. Furthermore, it is important to consider the centrality indices of the network model, which were analyzed based on: a) strength: which considers the sum of all correlation coefficients that a node has in relation to the others; b) proximity: which indicates the distance between a given node and all others in the network; and c) intermediation: which investigates the frequency with which a node appears on the closest path between two other nodes (Opsahl et al., 2010).

Finally, multiple linear regression models were used, considering the *backward* method of variable selection, by removing explanatory variables. The set of variables was divided into those related to credit (model 1) and macroeconomics (model 2). Finally, a third model was estimated to determine the significant variables of the first two models.

In addition to the correlation and significance in the regression model, it is worth noting the investigation of multicollinearity methods between independent variables, in which the Variance Inflation Factor (VIF) was used, which investigates the degree to which one variable is explained by the others. For the VIF, values of up to 10 were adopted, indicating the absence of multicollinearity (Hair et al., 2009). Finally, the standard errors of the regressions are robust to heteroscedasticity, i.e., non-constant variance of the errors (Figueiredo Filho et al., 2011).

4. RESULTS

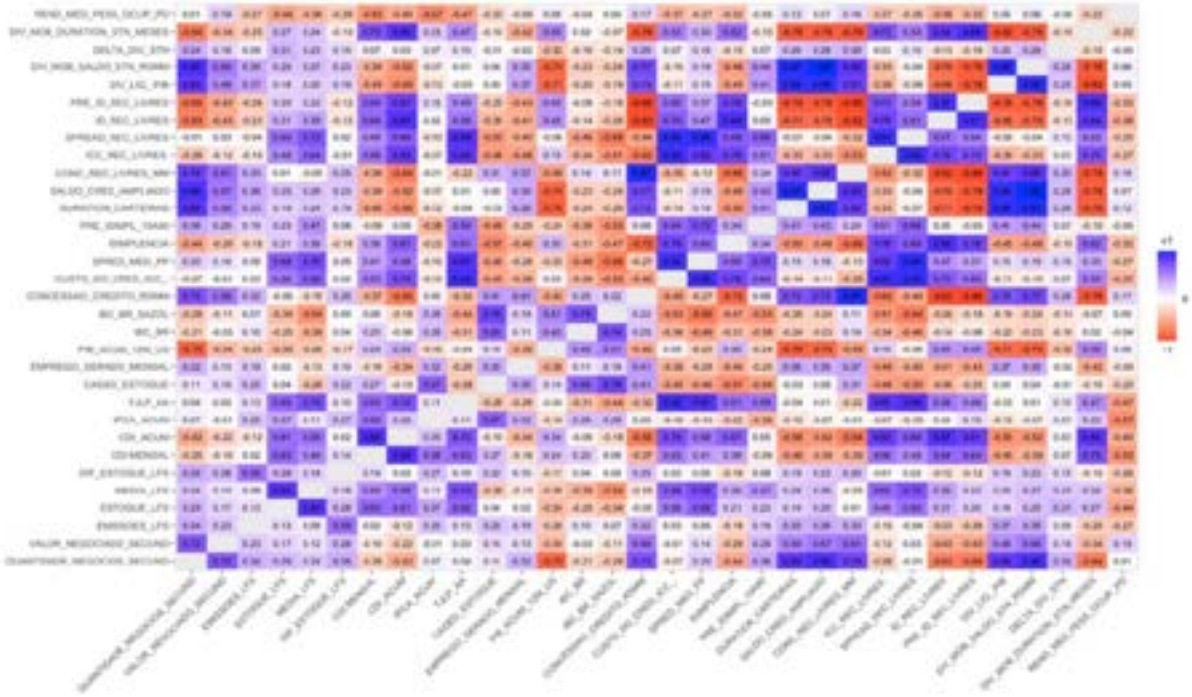
4.1 Descriptive analysis

Spearman's ρ (rho) coefficient was used to assess the association between the variables.

mentioned in Table 2. The results can be seen in the heat map illustrated in Figure 2, which shows that the variable LFS Value Traded on the Secondary Market presented strong positive correlations when associated with Securities Debt Balance, Net Public Debt as a percentage of GDP, Credit Granting, Expanded Credit Portfolio Balance, and Credit Portfolio Duration. On

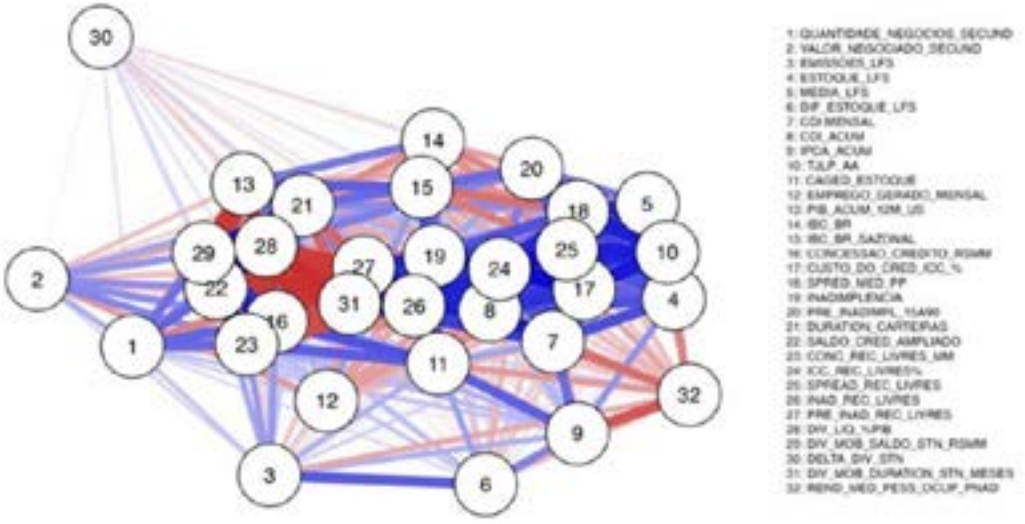
the other hand, negative associations were observed in the associations of the same variable with accumulated GDP in 12 months, Pre-Default of the Free Resources Portfolio, and Cost of Free Resources Credit.

Figure 2. Heat map of the correlation between variables



On the other hand, when considering the network model taking into account the correlation coefficient (Figure 3). The results reinforce the strong associations between the variables, as mentioned above. In addition, Figure 3 shows that the variables Pre-Default of the Free Resources Portfolio, Cost of Free Resources Credit, and Default of Free Resources form the strongest nodes, indicating that they are variables with stronger associations with the other variables in the network model.

Figure 3. Network analysis



The variables Pre-Default on Free Resources, Duration of Securities Debt, and Delinquency on Free Resources showed the highest proximity indices between nodes, indicating that they are the variables with the highest centrality in the model, considering their proximity to other nodes. The variables Duration of Securities Debt, Monthly CDI Rate, and People Employed with a Formal Contract showed the highest levels of intermediation, being the variables that were most often in the path between two other nodes.

4.2 Model with credit variables

For the first model, which attempts to explain the dependent variable of LFS value traded on the secondary market, independent variables related to credit granted by financial institutions were chosen, namely the expanded credit balance, monthly credit granted from free resources, default rate, and pre-default rate.

The multiple linear regression model was tested considering all the independent variables in this analysis. The results showed that no independent variable presented multicollinearity problems, according to the criterion of having VIFs below 10.

Based on this, the adjusted multiple linear regression model indicated that the variables expanded credit portfolio balance, free credit granting, and default presented significant coefficients in the regression on the value of LFS traded on the secondary market. Thus, only the pre-default variable was removed from the model using the *backward* method, as it did not present significant effects on the dependent variable. The results of the multiple linear regression considering the credit model can be seen in Table 3. Thus, it was observed that a 1% increase in the

expanded credit portfolio balance is associated with a 0.59% increase in the LFS value, while a 1% increase in credit granting still seems to have a greater influence of 1.0% on the LFS value.

The sign of the three variables is in line with expectations. A high default rate indicates that the financial market is under stress, which implies greater refinancing difficulties for banks. Similarly, high credit volumes indicate that banks must pay more to place LFS on the market.

Table 3: Credit model

	coefficient	standard error	t-value	p-value
SALDO_CRED_AMPLIADO	0.588	0.285	2.07	0.041
CONC_REC_LIVRES_MM	1.005	0.346	2.91	0.004
IDIMPLENCIA	0.806	0.323	2.49	0.014
R^2	0.376		Observations	120
F-test	28.886		Prob > F	0.000
AIC	140.649		BIC	151.798

Notes: The dependent variable is the value of secondary financial bills (LFS) traded on the secondary market. The explanatory variables, in addition to the multiple linear regression constant, are the bank's credit portfolio stock, credit granted in millions of reais in the month of free resources, and delinquent debt balance above 90 days and less than 360. All variables are logarithmic.

4.3 Model with macroeconomic variables

When analyzing the economic model, with the same dependent variable (value of LFS traded on the secondary market), the results of the multiple linear regression model pointed to multicollinearity problems for the variables net public debt as a percentage of GDP and securities debt balance, according to the VIF. Therefore, we chose to exclude the variable with the lowest correlation coefficient, public debt.

From this point on, the multiple linear regression model considering the economic variables pointed to significant results for the impact of debt on the real estate market and the level of GDP, as shown in Table 4. Thus, the seasonally adjusted IBC-BR index variable was removed from the final model using the *backward* method. Given this, it was possible to infer that a 1% increase in the GDP variable raises the value of LFS traded by 0.74%. This result can be explained by the greater need for capital by banks during periods of expansion of their financial

activities. The positive relationship between the value of LFS and debt in the real estate market was expected, since both measure the demand for resources in the financial system.

Table 4: Macroeconomic model

	coefficient	standard error	t-value	p-value
DIV_MOB_SAL DO_ STN_RSM	1.15	0.188	6.11	0.000
PIB_ACUM_12 M_ US	0.74	0.372	2.49	0.049
R^2	0.298		Observations	120
F-test	31.168		Prob > F	0.000
AIC	152.856		BIC	161.219

Notes: The dependent variable is the value of secondary financial bills (LFS) traded on the secondary market. The explanatory variables, in addition to the constant of the multiple linear regression, are the National Treasury's securities debt and the accumulated GDP of the last 12 months in dollars. All variables are logarithmic.

4.4 Complete model

Finally, multiple linear regression analysis was performed considering the five significant variables from models 1 and 2 in the previous subsections in order to investigate a joint model. The multicollinearity test presented problems for the variables expanded credit portfolio balance and securities debt balance. A more detailed comparison between the two explanatory variables revealed that the expanded credit balance has greater explanatory power and, therefore, was maintained in the model to the detriment of the securities debt balance.

As for the results of the final regression model, only the relationship between the expanded credit balance and GDP in terms of LFS traded on the secondary market was significant, as shown in Table 5. The estimated coefficients indicate that both explanatory variables have a positive relationship with the value of LFS. GDP appears to have a directly proportional relationship, while a 1% change in the credit balance increases LFS trading by 1.5%. It is interesting to note that these coefficients are higher than in previous models.

Table 5: Complete model

	coefficient	standard error	t-value	p-value
SALDO_CRED_AMPLIADO	1.527	0.190	8.05	0.000
PIB_ACUM_12M_US	1.033	0.329	3.14	0.002
R^2	0.356		Observations	120
F-test	42.954		Prob > F	0.000
AIC	142.373		BIC	150.736

Notes: The dependent variable is the value of subordinated financial bills (LFS) traded on the secondary market. The explanatory variables, in addition to the constant in the multiple linear regression, are the bank's credit portfolio stock and the accumulated GDP for the last 12 months in dollars. All variables are logarithmic.

5. CONCLUSION

Due to the small amount of research studying subordinated debt securities, preference was given to using Brazilian laws and regulations dealing with the subject as a regulatory reference rather than using other studies as the basis for a broad theoretical framework. The scarcity of research on the topic can be explained by the specificity of the subject, as it is a new financial instrument and there has been insufficient time to create a robust database.

In this study, it was possible to develop a linear regression model with data from 2013 to 2022 on a monthly basis, which makes it possible to estimate the price of subordinated notes in the secondary market using variables that measure economic activity (GDP) and credit (expanded credit balance).

The model showed that the greater the amount of credit granted, provided that the other variables remain constant, the higher the trading value of LFS will be. This can be explained by the fact that the larger a bank's credit portfolio, the more reference assets it will need to have in order to maintain the Basel indicator. As a result, the financial institution will need to raise subordinated financial bills to increase its capital.

The model met the statistical assumptions and can be considered valid for understanding the value of Subordinated Financial Bills traded on the secondary market based on data on credit granted by the financial system and the GDP accumulated over 12 months, these being the indicators among 30 selected variables with the greatest explanatory power.

The results of the research can be used to simulate the intensity of LFS trading in a pos-

sible scenario of change in the independent variables. Thus, the model proposes to reveal in which scenario an investment in LFS may have greater liquidity, as the demand for this type of financial instrument may grow and facilitate trading in this security. In addition, it was possible to verify through correlation analysis that credit granting variables are the ones that have the most positive impact on Subordinated Financial Bills.

For future studies, there is the possibility of developing research on the pricing of LFS based on accounting information and performance and risk indicators of banks.

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