A New Approach to Measure the Transmission Mechanism of Monetary Policy in the Intrinsic Value of Banks

Marcelo de Oliveira Passos[1], João Basilio Pereima Neto[2], Raul Cunha[1], Mathias Schneid Tessmann[3] & Alexandre Vasconcelos Lima[3]

[1] Organizations and Markets Graduate Program of Federal University of Pelotas (PPGOM / UFPel), Brazil

[2] Federal University of Parana (PPGDE/UFPR), Brazil

[3] Brazilian Institute of Education, Development and Research (IDP), Brazil

Correspondence: Mathias Schneid Tessmann, Brazilian Institute of Education, Development and Research (IDP). E-mail: mathias.tessmann@idp.edu.br

Received: March 5, 2025 Accepted: April 6, 2025 Online Published: May 9, 2025

doi:10.5430/ijba.v16n2p18 URL: https://doi.org/10.5430/ijba.v16n2p18

Abstract

This paper investigates the transmission channels of monetary policy in the economy. Therefore, an economic and financial simulation model was developed based on the five main valuation models to estimate the intrinsic value of the five largest Brazilian banks as basic interest rates vary. This approach, in short, attempts to complement the traditional analysis of the transmission mechanism through the asset price channel by considering the intrinsic value channel of assets. The results show that the impact of these changes on the banking sector does not tend to affect its intrinsic values negatively. In fact, in most situations, banks increase their intrinsic value with lower base interest rates and lose very little intrinsic value when those rates rise. These findings demystify the notion that the main Brazilian banks prefer a macroeconomic environment with high basic interest rates and are useful to policymakers, investors, and other economic agents.

Keywords: transmission mechanism, monetary policy, asset valuation, interest rate, bank sector

JEL Classification: E43, E52, E58, G12

1. Introduction

Many nations, at some point in their history, suffered from high rates of inflation and all the harm it entailed, such as uncertainty regarding the future that discourages medium and long-term negotiations. In some emerging countries, these realities are not so far away. Brazil is one of these cases, until 1994 it suffered cruelly from hyperinflation and this period remains very intensely present in the population's memory. In conversations between acquaintances and friends, this subject comes up in any signs of a more intense increase in general price levels.

Central Banks need to be aware of the problem and use monetary policy instruments to negatively influence inflation. According to the European Central Bank, the monetary policy transmission mechanism is "the process through which monetary policy decisions affect the economy in general and the price level in particular". Figure 1 illustrates the different transmission channels of monetary policy decisions (ECB).

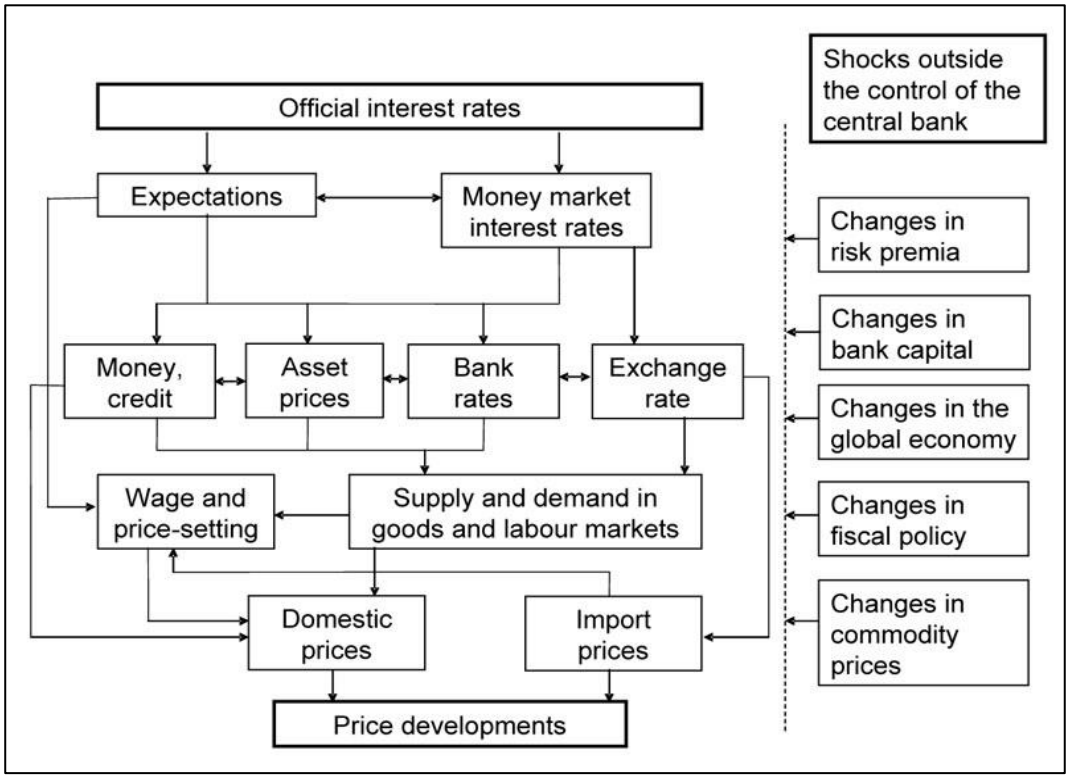

Figure 1. The channels of transmission mechanism

Source: European Central Bank (2017).

Loayza and Schmidt-Hebbel (2002) also state that there are five monetary policy transmission channels: (i) interest rates; (ii) exchange rate; (iii) financial and credit aggregates; (iv) asset prices; and (v) expectations. The first and most traditional of these is the interest rate channel (Loayza and Schmidt-Hebbel, 2002), which makes it important to reduce the presence of asymmetric information in the economy by understanding how the dynamics of transmission of its effects on companies occur. However, there is no reason to focus only on asset prices and interest rates as the only transmission channel for monetary policy, as the monetary authority's decisions can have important effects on the prices of shares, bonds, real estate, and exchange rates.

Thus, this work aims to investigate the effect of the monetary policy decisions of the Central Bank of Brazil in changing the basic interest rate (Selic rate) on the intrinsic values of the five most relevant banks that make up the Brazilian concentrated banking sector. To achieve this, a new methodology is used based on estimates from five of the main stock valuation models (Fernández, 2004; 2008). Using simulations, these models respond to how much increases or reductions in the Selic rate by the Central Bank's Monetary Policy Committee can increase or decrease the intrinsic value of Brazilian banks.

The results indicate that interest rate changes do not negatively affect banks' intrinsic values, and in most situations, banks increase their intrinsic value with lower base interest rates while losing little intrinsic value when interest rates rise. The advantage in relation to the work already carried out is in replacing the traditional approach with the asset price channel with an alternative using the banks' intrinsic value channel. These insights generated are useful to policymakers and other market agents by bringing empirical evidence to Brazilian banks.

Several recent works continue to investigate the intrinsic value of banks, such as López-Penabad et al. (2022), Mehzabin et al. (2023), Heider et al. (2021), Abadi et al. (2023), Horobet et al. (2021), Saif-Alyousfi (2022), Sandhu and Arora (2022), Whited et al. (2021), and it is to this scientific literature that this study seeks to contribute, bringing findings with a new approach to identifying the influence of variations in Brazilian basic interest rates on the intrinsic value of financial institutions.

In addition to this introduction, the work has 4 more sections. The second section provides the theoretical framework and the third explains the methodology. Section 4 presents and discusses the results and, finally, section 5 concludes.

2. Theoretical Reference

2.1 Valuation Models

The focus of this review is on the literature on discounted cash flow valuation models. Bodie, Kane, and Marcus (2009) consider that the intrinsic value of a stock (the ultimate object of valuation techniques) corresponds to the present value of the cash payments to its buyer, which includes dividends and amounts arising from the final sale of the shares, discounted at an appropriate risk-adjusted interest rate. With a similar but broader view, Damodaran (2006) considers asset valuation to be at the heart of many analytical activities that are done in finance. It is useful both in the study of market efficiency and in the analysis of corporate governance issues or the comparison of different investment decision rules for the capital budget.

Analysts usually use a diverse set of valuation models. Some are simple and there are others well refined. Some examples: i) discounted cash flow model - the focus of this article - that relates the value of an asset to the present value of expected future cash flows in that asset; ii) settlement and accounting evaluation model, which aims to evaluate the existing assets of a company, using accounting estimates of value or the own book value as the beginning of the process; (iii) a model that estimates the value of an asset taking into account the pricing of other "comparable" assets in relation to a common variable (such as profits, cash flows, book value or sales); iv) a contingent valuation model that uses pricing options to measure the value of the assets that resemble, in general, or in part, the options (this class of models fits the theory of real options).

According to Parker (1968), the pioneering interest rate tables date back to 1340. And it is the same Parker who attributes the first publication on the subject, the "*Pratica della Mercatura*" of 1766, to Francesco Pegolotti, a Florentine businessman and politician. However, the truly seminal contributions to discounted cash flow valuation techniques were established by Alfred Marshall (1907) and Bohm-Bawerk (1903). Both explored the notion of present value in their works in the early twentieth century, influencing Irving Fisher, who developed and sophisticated it in *The Rate of Interest* of 1907 and *The Theory of Interest* of 1930.

In both works, Fisher Proposed four alternative approaches to analyzing investments. According to him, they would generate the same results. He argued that when faced with various investment alternatives, one should choose the investment: (i) which has the highest present value at the market interest rate; ii) whose present value of the benefits exceeds the present value of the costs; (iii) whose "rate of return on sacrifice" exceeds the market interest rate; or (iv) that compared to the next most expensive investment, generate a rate of return on the cost higher than the market interest rate. It should be noted that the first two approaches follow the net present value rule. The third is a variant of the internal rate of return (IRR) approach. The latter corresponds to the marginal rate of return approach.

As Fisher did not go deeply into the notion of the rate of return, other economists came to explore the idea better. Starting from the analysis of a single investment, Boulding (1935) deduced the internal rate of return of an investment from its expected cash flows and initial investment. Keynes (1936) argued that the "marginal efficiency of capital" could be calculated as the discount rate that makes the present value of an asset's returns equal to its current price and that is equivalent to the rate of return (the same as Fisher) of an investment. Samuelson (1937) explored the differences between the internal rate of return and net present value approaches. He also argued that rational investors should maximize the net present value, not the IRR.

In the past 50 years, discounted cash flow models have spread and expanded their scope for insurance and business valuation. There is no doubt, according to Damodaran (2006), that this impulse was stimulated by the developments of portfolio theory. For fundamentalists (and unlike chartists) the value of a stock is different from the price of it, and investors seek to know how the value oscillations occur and try to anticipate possible price swings. The classic form for this type of approach is the dividend discount model, which is the basis of corporate finance theory. The value of a company is the sum of all expected dividend payments, discounting their present net value. However, these components are affected by uncertainty.

2.2 Five Main Models

These five models described in this subsection are the most important and researched in the valuation literature. According to Fernández (2008), the models of discounted cash flows that are historically receiving the most attention from financial researchers, fundamental analysts, and valuation experts are the ones we will use to estimate our bank system intrinsic values': Myers (1974), Miles and Ezzell (1980), HPR (Harris and Pringle, 1985, and Ruback, 1995), Damodaran (1994) and Fernández himself (2004 and 2008).

Table 1. Equations used in all five valuation models

Equations
1) $VAC_0 = \sum_{t=1}^{\infty} \frac{CFac_t}{(1+Ke_1)...(1+Ke_t)}$
2) $D_0 = \sum_{t=1}^{\infty} \frac{CFd_t}{(1+Kd_1)...(1+Kd_t)}$
3) $CFd_t = D_{t-1} \cdot Kd_t - (D_t - D_{t-1})$
4) $VAC_t = VAC_{t-1}(1+Ke_t) - CFac_t$
5) $D_t = D_{t-1}(1+Kd_t) - CFd_t$
6) $VAC_0 + D_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC_1)...(1+WACC_t)}$
7) $CFac_t = FCF_t + \Delta D_t - D_{t-1} \cdot Kd(1-T_t)$
8) $WACC_t = \frac{VAC_{t-1} \cdot Ke_t + D_{t-1} \cdot Kd_t \cdot (1+T_t)}{VAC_{t-1} + D_{t-1}}$
9) $VAC_0 + D_0 = Vu_0 + VTS_0$
10) $Vu_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+Ku_1)...(1+Ku_t)}$
11) $Ke = R_F + \beta_L \cdot P_M$
12) $Ku = R_F + \beta_u \cdot P_M$
13) $Kd = R_F + \beta_d \cdot P_M$

Source: Elaborated by authors.

In the five models, we have a nomenclature of the variables:

VTS is the *value of tax shields*, which is the value of the reduction of the taxable income of an individual or legal entity. This reduction is obtained through legal deductions arising from interest payments, medical expenses, philanthropic donations, depreciation and amortization, etc. Such deductions affect part of the taxpayer's taxable income in a given year or differ in future years' due payments (Fernández, 2004 and 2006). With this, the tax benefit reduces the total amount of taxes payable by a company or taxpayer;

D_0 is the value of the debt in the current period, which in this model is equal to VA_0, the current value of the expected flows for the shares;

Kd is the required return of the company's debt;

T is the tax rate on the company;

Ke is the required profitability of the company's shares (or the cost of own resources);

Ku is the required profitability of the shares of the company not leveraged (with D_0=0);

Vu is the value of the shares of the company not leveraged (with $D_0 = 0$);

VAC_0 is the value of the shares in the present (when t = 0);

WACC is the weighted average cost of capital;

β_L is the beta for a leveraged (with debt) company $Ke = R_F + \beta_L \cdot P_M$;

β_u is the beta for an unleveled company (without debt) $Ku = R_F + \beta_u \cdot P_M$;

β_u is the beta for the debt of a company $Kd = R_F + \beta_d \cdot P_M$;

R_F is the risk-free rate;

P_M is the prime market risk rate;

$CFac_t$ is the expected cash flow for the stocks in t;

CFd_t is the expected flow for the debt in t;

FCF_t is the free cash flow in t or $CFac_t$ (for an unleveled company).

Table 2. Myers (1974) - First model

Equations
$$VTS = T \cdot Kd \cdot \sum_{t=1}^{\infty} \frac{Dt-1}{(1+Kd)^t}$$
$$Ke = Ku + \frac{Vu - VAC_0}{VAC_0} \cdot (\beta_u - \beta_d)$$
$$VA_0 = \frac{\Delta D_t}{(1+Kd)^t}$$
$$WACC = Ku - \frac{[(VTS \cdot (Ku - Kd) + D_0 \cdot Kd \cdot T]}{VAC_0}$$
$$\beta_L = \beta_u + \left(\frac{Vu - VAC_0}{VAC_0} \right) \cdot (\beta_u - \beta_d)$$

Source: Elaborated by authors.

Table 3. Miles and Ezzel (1980) - Second model

Equations
$VTS = Kd \cdot T \cdot \frac{(1+Ku)}{(1+Kd)} \cdot \sum_{t=1}^{\infty} \frac{D_{t-1}}{(1+Ku)^t}$
$Ke = Ku + \frac{D_0}{VAC_0} \cdot (Ku - Kd) \cdot \left[1 - \frac{Kd \cdot T}{1+Kd} \right]$
$VA_0 = \frac{D_t}{(1+Ku)^t} - \frac{D_{t-1}}{(1+Ku)^{t-1} \cdot (1+Kd)}$
$WACC = Ku - \frac{D_0 \cdot Kd \cdot T}{VAC_0 + D_0} \cdot \frac{1+Ku}{1+Kd}$
$\beta_L = \beta_u + \frac{D_0}{VAC_0} \cdot (\beta_u - \beta_d) \cdot \left(1 - \frac{Kd \cdot T}{1+Kd} \right)$

Source: Elaborated by authors.

Where *D-1* is the debt in the previous period that is equal to *Vt-1*, the value of the share income flow also in the previous period (In the same way as Fernández (2004 and 2008) and opposition to the models of Myers (1974), HPR (1985 and 1995) and Damodaran (1994), where this identity is defined for both variables at *t = 0* and not at *t-1*). In the model of Miles and Ezzell (1980), we also have the following identity:

$$Kd = R_F + \beta_L \cdot P_M$$

Where it is possible to observe that the definition of the *Kd* is (apparently) the same in the four models. But in fact, the calculation of β_L is modified from model to model, which causes the results to differ, even though R_F and P_M are the same for all models.

Table 4. HPR - Harris and Pringle (1985) and Ruback (1995) - Third model

Equations
$VTS = \frac{[(D_{t-1} = VA_{t-1}) \cdot Kd \cdot T}{(1+Ku)^t}$
$Ke = Ku + \left[D_0 / VAC_0 \right] \cdot (Ku - Kd)$
$VA_0 = \frac{\Delta D_t - D_{t-1}(Ku - Kd)}{(1+Ku)^t}$

$$WACC = Ku - \frac{D_0 \cdot Kd \cdot T}{VAC_0 + D_0}$$
$$\beta_L = \beta_u + \frac{D_0}{VAC_0} \cdot (\beta_u - \beta_d)$$

Source: Elaborated by authors.

Table 5. Damodaran (1994) – Fourth model

Equations
$$VTS = \frac{D_0 \cdot Ku \cdot T - D_0 \cdot (Kd - R_F) \cdot (1-T)}{Ku}$$
$$Ke = Ku + \frac{D_0 \cdot (1+T)}{VAC_0} \cdot (Ku - R_F)$$
$$VA_0 = \frac{\Delta D_t - D_{t-1}(Kd - R_F)(1-T)/T}{(1+Ku)^t}$$
$$WACC = Ku \cdot \left(1 - \frac{D_0 \cdot T}{VAC_0 + D_0}\right) + \frac{(Kd - R_F)(1-T)}{VAC_0 + D_0}$$
$$\beta_L = \beta_u + \frac{D_0(1-T)}{VAC_0} \cdot \beta_u$$

Source: Elaborated by authors.

Table 6. Fernández (2004 and 2008) - Fifth model

Equations
$$VTS = Ku \cdot T \sum_{t=1}^{\infty} \frac{D_{t-1}}{(1+Ku)^t}$$
$$Ke = Ku + \frac{D_0(1-T)}{VAC_0} \cdot (Ku - Kd)$$
$$VA_0 = \frac{\Delta D_t}{(1+Ku)^t}$$

$$WACC = Ku\left(1 - \frac{D_0 \cdot T}{VAC_0 + D_0}\right)$$

$$\beta_L = \beta_u + \frac{D_0(1-T)}{VAC_0} \cdot (\beta_u - \beta_d)$$

Source: Elaborated by authors.

These five models estimate the intrinsic values of the largest multiple banks (which have activities as commercial banks) that are part of the theoretical portfolio of the Bovespa Index (B3). Together, they add 65.3% of the total assets of the whole financial system, as well as 69.6% of systemic net equity, 65,7% of total funding, 77% of net profits, 63.7% of credit operations, 71.8% of agencies and 79.2% of bank service points. Details of the Banks considered are in Table 7.

Table 7. The size of Banks

Banks	Total Assets	Credit portfolio	Current liabilities	Funding	Net equity	Net profits
Itaú Unibanco	348,440,114.01	122,214,678.11	323,192,578.68	243,858,925.91	25,247,535.33	799,538.13
Banco do Brasil	311,229,607.10	118,432,851.72	291,268,145.60	243,134,264.64	19,961,461.50	550,818.60
Bradesco	248,434,420.67	86,731,875.85	223,740,691.30	183,490,626.41	24,693,729.37	747,996.67
Santander	175,927,396.85	70,582,618.39	161,896,101.66	119,406,802.36	14,031,295.19	672,833.82
BTG Pactual	50,547,528.59	8,394,568.36	45,938,067.06	28,475,070.65	4,609,461.71	182,530.63
The sum of the bank's indicators	1,134,579,067.22	406,356,592.44	1,046,035,584.30	818,365,689.97	88,543,483.09	2,953,717.84
The sum of the financial system	1,738,587,988.16	638,136,926.30	1,611,306,436.77	1,245,309,552.14	127,281,551.39	3,836,085.89
Percentages	65.3%	63.7%	64.9%	65.7%	69.6%	77.0%

Source: Source: Elaborated by authors.

3. Data Sources, Forecasts, and Cash Flow

The model was developed for forecasting sources/uses tables using the techniques of discounted value of future profits, as described by Dermine (2008). The projections of the banks' financial statements were made using the method proposed by Santos (2019). The analyzed period of such statements goes from the fourth quarter of 2011 to the third quarter of 2020. The standardized financial statements are by CVM rules. CVM is the "Comissão de Valores Mobiliários" or, roughly, the "Brazilian Security Exchange Commission - SEC". The following tables follow a methodology adapted to Brazilian accounting standards based on the definitions of Fernández (2008), Damodaran (2012), and Copeland, Koller, and Murrin (2001). Table 8 describes the sources of the model parameters.

Table 8. Sources of parameters used in the model

Parameters	Meaning and data used	Sources
R_F	R_F =12-month LTN return - Average IPCA expectations for the next 12 months. LTN is a national treasury bond.	Central Bank of Brazil (Banco Central do Brasil - BCB).
Kd	Required return on company debt.	Authors' calculations.
K_M	K_M = equity risk premium = $R_F + P_M$.	B3 S.A and Central Bank of Brazil – BCB.
βi	βi = quarterly beta of PETR3.	Authors' calculations based on data from B3 S.A.
βd	The beta of the company's debt, given by $Kd = R_F + \beta d.P_M$.	Authors' calculations based on data from B3 S.A.
βu	The beta of unleveled company's stocks, given by $Ku = R_F + \beta u.P_{M.}$	Authors' calculations based on data from B3 S.A.
β_L	The beta of the levered company's stocks, given by $Ke = R_F + \beta_L.P_{M.}$	Authors' calculations based on data from B3 S.A.
P_M	P_M = Brazilian prime rate (TPB or "taxa preferencial brasileira")	Central Bank of Brazil (Banco Central do Brasil - BCB).
T	Tax burden = total taxes paid / net sales revenue	Bank's income statements and Exame Magazine's "Best and Bigger Yearbook" ("Melhores e Maiores" - Revista Exame). The tax burden data were obtained from the yearbook and converted into BRL at the commercial exchange rate of BRL/USD = 5.6401 (Central Bank of Brazil - BCB, September 2020).

Source: Elaborated by authors.

In Table 9, we aggregated the sources/uses in a table for the bank sector, as defined by Copeland, Koller, and Murrin (2001). It is useful to highlight that this table is a proxy of a cash flow model, given that banks do not have cash flow demonstrations, only non-financial companies used to have to.

Table 9. Model of sources/uses table adapted for the bank sector

Financial income
(+) Revenue from services rendered
(-) Expenses on financial intermediation
(=) Gross profit from financial intermediation
(-) Provision for loan losses
(+) Non-financial revenue (includes foreign exchange income)
(-) Non-financial expense
(-) Taxes
(=) Net revenue
(+) Non-operational items
(+) Depreciation
(=) Operational cash flow
(+) Balance (sources)
Loans due (gross)
(-) Provisions and unrealized revenue
(=) Borrowings paid (net)
(+) Elevation of deposits
(+) Increase in external indebtedness
(+) Increase in other forms of liabilities
(+) Increase in accounts to pay
(-) Balance (uses)
New loans granted
(+) Increase in held securities
(+) Increase in receivable accounts
(+) Increase in net tangible assets
(+) Increase of other assets
(-) Decrease in deposits
(-) Decrease in external debt
(=) Free cash flow to the share capital

Sources: Balance sheet, income statements of Itaú Unibanco, Banco do Brasil, Bradesco, Santander and BTG Pactual. Elaboration of authors based on Fernández (2008), Damodaran (2012), and Copeland, Koller, and Murrin (2001).

4. Results

To estimate the intrinsic value of the Brazilian banking sector, all results were converted to US dollars using the following exchange rate: R$5.64 = 1 US$. This is the exchange rate on September 30, 2020, the day the latest financial statements used in the models were released. Assuming the interest rate of 2%, in force from September 2020 to January 2021, the results of the estimates of the intrinsic value of banks are in Table 10.

Table 10. Main valuations' results (in US$ billions)

Results of Valuations	Model 1 Myers (1974)	Model 2 M&E (1980)	Model 3 HPR (1995)	Model 4 Damodaran (1994)	Model 5 Fernández (2008)
VAC	799,371.8	799,389.9	799,390.3	787,015.0	799,396.7
WACC	0.17840	0.17838	0.17839	0.17863	0.17840
β_L	0.64858	0.69405	0.89784	0.65311	0.63680

Source: Elaborated by authors.

We note that the VAC results of almost all models are close to each other. The result of model 4, however, differs. Some assumptions of Damodaran's model, especially the formula he uses for calculating his VTS, explain the difference in results. However, we maintain the results of Damodaran's model, which is widely used by fundamentalist analysts worldwide and has a reputation for reliability in company and stock valuations. The results of the model simulations considering different basic interest rate scenarios are in Table 11.

Table 11. Elasticities of the intrinsic values of the Brazilian bank sector about the variations in the basic Selic rate (in USD billions)

Interest rates SELIC	Model 1 Myers (1974)	Δ%	Model 2 Miles & Ezzell (1980)	Δ%	Model 3 HPR (1995)	Δ%	Model 4 Damodaran (1994)	Δ%	Model 5 Fernández (2004; 2008)	Δ%
2%	799,371.8	6.81%	799,389.9	6.74%	799,390.3	6.74%	787,015.0	6.60%	799,396.7	6.70%
3%	780,331.6	4.27%	780,577.1	4.23%	780,584.5	4.22%	768,861.5	4.14%	780,675.9	4.20%
4%	773,736.9	3.39%	774,052.3	3.36%	774,062.8	3.35%	762,562.0	3.29%	774,182.7	3.34%
5%	767,246.8	2.52%	767,626.5	2.50%	767,640.3	2.50%	756,356.4	2.45%	767,787.9	2.48%
6%	760,858.9	1.67%	761,297.7	1.65%	761,315.0	1.65%	750,242.9	1.62%	761,489.7	1.64%
7%	754,571.5	0.83%	755,064.0	0.82%	755,085.1	0.82%	744,219.9	0.80%	755,285.9	0.82%
8%	748,382,1	-	748,923.5	-	748,948.6	-	738,285.5	-	749,175.2	-
9%	742,288.8	-0.81%	742,874.5	-0.81%	742,903.6	-0.81%	732,438.1	-0.79%	743,155.3	-0.80%
10%	736,289.6	-1.62%	736,915.1	-1.60%	736,948.3	-1.60%	726,676.9	-1.57%	737,224.7	-1.60%
11%	730,382.4	-2.41%	731,043.6	-2.39%	731,081.1	-2.39%	720,997.8	-2.34%	731,381.7	-2.38%
12%	724,565.5	-3.18%	725,258.2	-3.16%	725,300.0	-1.76%	715,401.8	-3.10%	725,624.5	-3.14%

Source: Elaborated by authors.

As seen in Table 11, the elasticities of the intrinsic values of the financial sector about variations in the Selic base rate were similar in the calculations of all models. The interesting thing is to notice that the intrinsic values of the banking sector tend to fall with the increase in the basic interest rate (Selic rate) and vice versa. This goes against the common view in Brazil that banks become more profitable with an increase in the Selic rate. Heterodox economists, union leaders, presidents of business associations, and important businesspeople in the agricultural sector share this mistaken view of the effect of changes in the basic interest rate on the dynamism of the banking sector. Some translated quotes clarify this point:

> "Once again, with this measure [increase in the Selic rate], all sectors will be penalized, except one, which is the financial system. *For every 1% increase in the Selic rate, the financial sector profits from approximately R $ 12 billion to R $ 13 billion, with the rollover of public debt*. If the movement were reversed, the savings that the

government would make would be enough to make the total exemption from investments." (Neto, 2010, president of Brazilian Machine and Equipment Association – ABIMAQ)

"*The process of reducing the interest rate of the economy*, which tends to take the Selic to single digits this year, as signaled by the Central Bank (BC), *will affect the result of Brazilian banks*." (Union of Bank Employees in Campina Grande and Region – "Bancários CGR", February 2, 2012).

"If the Selic (basic interest rate in the economy) rises, as it has been, we will have an increase in the minimum remuneration of the financial market. Ultimately, if banks are unable to lend their funds, they can invest them in treasury bills. *Therefore, the higher the interest paid on these bonds, the more banks earn from this type of transaction*." (Rugitsky, a Professor of Economics at the University of São Paulo cited by Costas, March 23, 2015).

Although their intrinsic values do not fall much with higher interest rates, it is clear that when the Selic rate falls below 7% the elasticities show a considerable increase in their intrinsic values. This may be due to the expansion of its credit volume and, above all, the intensification of some types of credit granted that are more or less profitable for banks. In the range of 2% to 12% of the basic Selic rate, the elasticities in modulus are very close, according to simulations of the five models, with some small differences only in the Damodaran model. Figure 2 compares the intrinsic value of the banking sector with changes in policy interest rates.

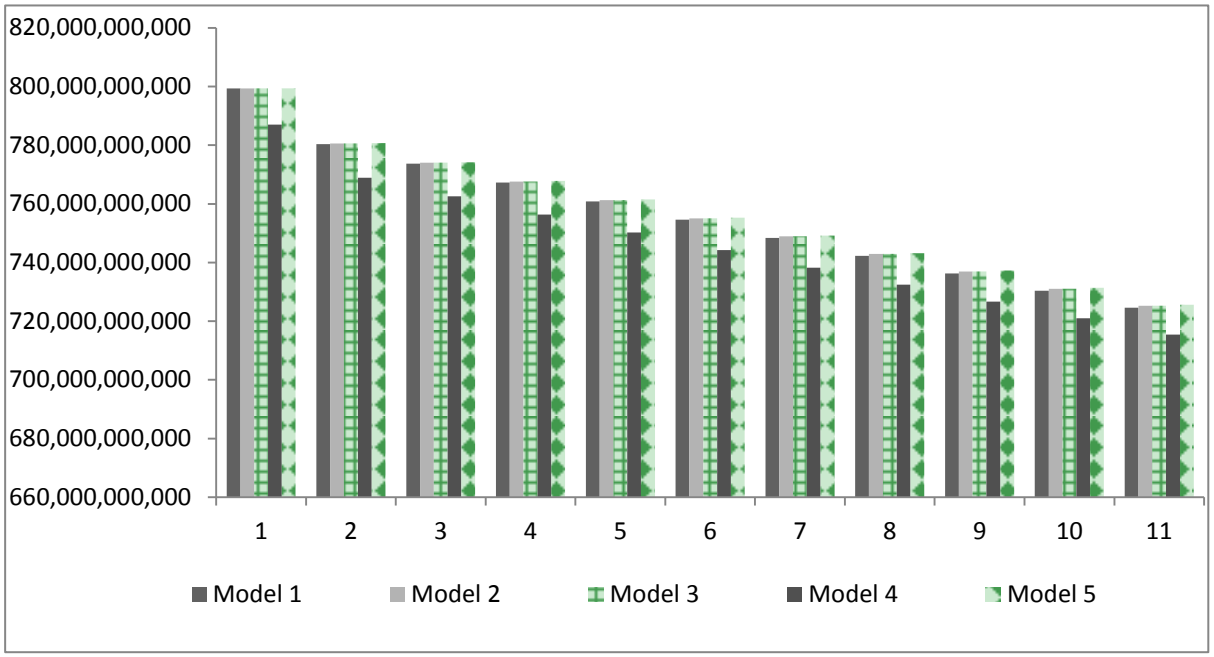

Figure 2. Intrinsic values of the Brazilian Bank Sector vs changes in interest rates (US$ billions)

Source: Elaborated by authors.

With Figure 2 it is possible to better understand the findings and this corroborates a very common practice of stock market investors in Brazil: when there is a recession or when interest rates rise, they usually protect their assets by buying stocks from banks. With this new approach to the analysis of the mechanism of transmission by the interest rate channel (and using discounted cash flow valuation models, which is an innovative method in financial and monetary literature), *we obtained results that showed that the Brazilian banks increased their intrinsic value when the basic rate of interest falls. Another point is they lose very little intrinsic value when this rate rises*.

The Central Bank of Brazil had to raise basic interest rates several times, because the country, like other Latin American ones, has a history of high inflation. Only since 2017, interest rates fell for the 10th consecutive time and reached 7% per year, the lowest level in history until then. In September 2020, the date of the last balance sheets and data we analyzed, the basic Selic rate reached 2%, a new historic low. According Rezende (2020) (Note 1), the steady decline in future interest rates in December 2020 and the inflationary pressures that were in the short term caused the

real interest rate to reach even lower levels. Estimated results by Valor Data (statistics department of Valor Econômico, the biggest and most influential business newspaper in Brazil) cited by this author, from the 360-day interest swap contract, discounting the one-year inflation projection, indicates a negative real rate of -1.17%, the lowest level since the beginning of the historical series, in 2002.

However, even with negative real rates and the Covid-19 pandemic that hit the country in March 2020, *the stocks of the five main Brazilian banks performed a resilient trajectory, given that the demand for credit has increased a lot and both Central Bank and Ministry of Economics, adopted policies to encourage the credit supply to micro and small compa*nies.

This dynamic was proposed by Maffilli, Bressan, and Souza (2007). They analyzed the relations between capital structure, credit, and treasury loans, spread, and the efficiency index with the profitability, measured as the ROE, of Brazilian banks between 1999 and 2005:

> "This relationship between macroeconomic environment, credit granting and spread is quite consistent, *since the lower the inflationary risks, the more the basic interest rates fall, the lower is the spread and with this, there is a tendency to increase the supply of credit in the economy resulting in greater profitability*. As the period was marked by circumstances other than these, the bank's profitability behavior followed the inverse rule, that is, to increase its profitability in the period, the best strategy was to charge more for the operation carried out." (Maffilli, Bressan and Souza, 2007).

Given the periods of greatest uncertainty in the Brazilian economy, we consider the analysis of Diamond (1984), Flannery (1994), as well Diamond and Rajan (2001). They stressed that banks make decisions aimed at a greater degree of liquidity (for example, treasury operations, mainly investments in federal government securities). They leave the decision to expand the credit portfolio in the background. Again, Maffilli, Bressan, and Souza (2007) found this result for the case of Brazilian banks, showing that increases in treasury and declines in the volume of credit were related to the higher profitability of commercial banks. When they investigated the application in federal government bonds, looking at the perspective of the banking sector, they saw two advantages: the liquidity of the bonds and the zero weight, signaling low risk, that they have in the allocation of equity in the sense of non-compliance with the rules of Basel Agreement.

They also considered that the fluctuation in the basic interest rate and the instability of the economy may affect the spread of investments in federal public securities. This can make them more profitable than credit operations, which occurred, according to the authors, in 2002 and 2003, during the economic crisis motivated by the speculative attack on the Brazilian currency, BRL.

Such considerations show that the flexibility and strength of Brazilian banks, combined with the highly concentrated structure of a system based on multiple (or universal) banks, helped to guarantee a high profitability history for many years. It is common knowledge that Brazilian banks are among the most profitable in the world. What is not so widespread, since the low-interest scenario is something recent in Brazil, is the notion that they tend to be more profitable precisely in this macroeconomic environment of lower basic interest rates. Figure 3 compares the trajectory of bank stocks with basic interest rates.

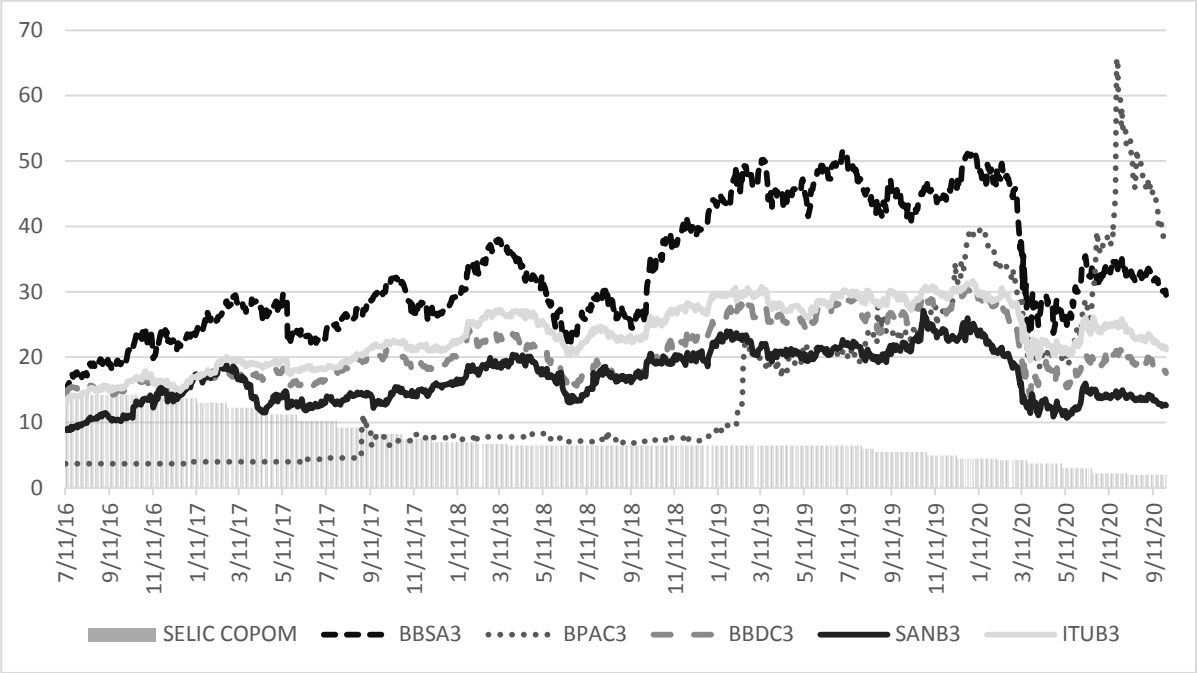

Figure 3. Closing prices of bank stocks compared to interest rates (% per day)

Source: Elaborated by authors.

In Figure 3, we can see such resilience and consistent rises with rapid recoveries after two critical events. The two critical events in this period are: In May 2017, Brazil's President Michel Temer was close to being toppled thanks to testimony given by J & F's owners, Joesley and Wesley Batista, under a suspicious plea bargain. President Temer talked with Mr. Joesley Batista about making hush-money payments to silence an ex-powerful politician, Eduardo Cunha, who was under arrest; and; The COVID-19 pandemic that arrived in Brazil in March 2019. It was only in January 2021 that vaccination began to be implemented. There were more than 200 thousand deaths in the country and the quarterly GDP growth rates in 2020 were -1.5% in the first quarter, - 9.6% in the second, and a recovery of 7.7% in the third.

In addition to their little variations of intrinsic values (Figure 2), the closing prices also tend to show very low volatility (Figure 3). One can also observe that the four largest banks with the most robust commercial portfolios have series with lower volatilities. Especially, when compared to volatilities of non-financial companies' stocks. Thus, only one bank does not fall into this category: BTG Pactual (BPAC3). It is the unique bank in this group that is more focused on its investment and credit portfolio for large companies than on the typical commercial bank's activities, as the other ones (Figure 3).

5. Conclusions

The present work sought to investigate the influences of monetary policy on the values of Brazilian banks. To do this, we calculate the intrinsic values of the main banks and aggregate the results to value the banking sector. We also estimate the elasticities of the Brazilian Central Bank's decisions to increase and decrease basic interest rates in the banking sector, based on an innovative approach that considers the intrinsic value of these banks. Five simulation models are used based on the main evaluation models, defined and described in Fernández (2004; 2008).

The results show that the five evaluation models generated different estimates of intrinsic values of the main financial institutions in the Brazilian banking sector - Itaú Unibanco, Banco do Brasil, Bradesco, Santander, and BTG Pactual - and brought important empirical evidence. The first one we found indicates that the estimates of the elasticities of the intrinsic values of the financial sector about variations in the basic interest rate defined by the Central Bank of Brazil (Selic rate) were very similar in all models.

The second piece of evidence shows that the intrinsic values of the banking sector show a downward trend as the aforementioned basic interest rate increases. This is evidence that goes against society's common sense, which assumes that banks benefit when the basic interest rate increases. Although their intrinsic values do not decrease much with

increasing base interest rates, when the Selic rate falls to levels below 7%, the elasticities show, in all valuation model calculations, non-negligible increases in the intrinsic value of bank assets sector.

This performance of the sector's intrinsic value is reflected in the series of closing prices adjusted by the dividends of the shares of the banks analyzed. These series have high resilience to critical events and low volatility. The exception is the share price series of BTG Pactual (BPAC3), which is a multiple bank more focused on investment banking activities than on typical commercial bank operations, like those of the other four banks in the sample. This explains why Brazilian investors often buy bank shares as a way of protecting themselves against rising interest rates. These findings also help to understand the high resilience and solidity of these banks, known as major debt creditors of the Brazilian federal government.

As a suggestion for future research, it could be investigated whether these results are associated with increases in the supply of credit and also which type of credit offered has the greatest impact on the intrinsic value of the Brazilian banking sector.

Acknowledgments

Not applicable.

Authors' contributions

Prof. Dr. Marcelo de Oliveira Passos and Prof. Dr. Jo ão Bas Ílio Pereima Neto were responsible for the study's design and review. Prof. Raul Cunha was responsible for data collection and estimations. Prof. Dr. Mathias Schneid Tessmann wrote and reviewed the manuscript together with Prof. Alexandre Vasconcelos Lima. All authors read and approved the final manuscript and contributed fundamentally to the realization of the research.

Funding

Not applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of Sciedu Press.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

References

Abadi, J., Brunnermeier, M., & Koby, Y. (2023). The reversal interest rate. *American Economic Review*, *113*(8),

2084-2120.

B3 S.A. Market Data – Bolsa, Brasil, Balcão (formerly BM&F/Bovespa). Retrieved from http://www.b3.com.br/en_us/market-data-and-indices/data-services/market-data/

BCB – Central Bank of Brazil (Banco Central do Brasil). *Informations for economic and financial analysis*. Retrieved from http://www.bcb.gov.br/pt-br/#!/n/INFOANAECOFINAN

Bodie, Z., Kane, A., & Marcus, A. J. (2009). *Investments* (8th ed.). New York: McGraw-Hill Inc.

Bohm-Bawerk, A. V. (1903). *Recent literature on interest*. London: Macmillan & Co.

Boulding, K. E. (1935). The Theory of a Single Investment. *Quarterly Journal of Economics*, *49*(3), 475-494. https://doi.org/10.2307/1883864

Costas, R. (2015). Why Brazilian banks profit so much? (Por que os bancos brasileiros lucram tanto?). *BBC Brasil*, March, 23. Retrieved from https://www.bbc.com/portuguese/noticias/2015/03/150323_bancos_lucros_ru

Copeland, T., Koller, T., & Murrin, J. (2001). *Valuation – measuring and managing the value of companies* (3rd ed.). New York: McKinsey and Co.

CVM – Security and Exchange Comission of Brazil (Comissão de Valores Mobiliários). Retrieved from https://www.gov.br/cvm/pt-br

Damodaran, A. (1994). *Damodaran on valuation* (1st ed.). New York: John Wiley and Sons.

Damodaran, A. (2006). *Valuation approaches and metrics – a survey of the theory and evidence*. New York: New York University Stern School of Business, 1-77, November. Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/papers/valuesurvey.pdf

Dermine, J. (2014). *Bank valuation & value-based management: deposit and loan pricing, performance evaluation and risk* (2nd ed.). New York: McGraw-Hill.

Diamond, D. W. (1984). Financial intermediaries and delegated monitoring. *Review of Economic Studies*, *51*, 393-414.

Diamond, D. W., & Rajan, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: a theory of banking. *Journal of Political Economy*, *109*(2), 287-326.

ECB – European Central Bank. (2017). *Transmission mechanism of monetary policy*. Retrieved from https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html

Fernández, P. (2008). *201 Errores em la valoración de empresas*. Barcelona: Ediciones Deusto.

Fernández, P. (2004, July). The value of tax shields is not equal to the value of the present value of tax shields. *Journal of Financial Economics*, *73*(1), 145-165. https://doi.org/10.1016/j.jfineco.2002.10.001

Fernández, P. (2006, May). The correct value of tax shields: an analysis of 23 theories. *Working Paper 608*, 1-28. Pamplona, Spain: IESE Business School, University of Navarra. Retrieved from http://www.iese.edu/research/pdfs/DI-0628-E.pdf

Flannery, M. J. (1994, March). Debt maturity and the deadweight cost of leverage: optimally financing banking firms. *The American Economic Review*, *84*, 320-31.

Fisher, I. (1907). *The rate of interest*. New York: Macmillan & Co.

Fisher, I. (1930). *The theory of interest*. New York: Macmillan & Co.

Fisher, P. (1960). *Common stocks and uncommon profits*. New York: Harper & Brothers.

Heider, F., Saidi, F., & Schepens, G. (2021). Banks and negative interest rates. *Annual Review of Financial Economics*, *13*(1), 201-218.

Horobet, A., Radulescu, M., Belascu, L., & Dita, S. M. (2021). Determinants of bank profitability in CEE countries: Evidence from GMM panel data estimates. *Journal of Risk and Financial Management*, *14*(7), 307.

Loayza, N., & Schmidt- Hebbel, K. (2002) *Monetary policy functions and transmission mechanism: an overview*. Santiago: Chile. Retrieved from http://siteresources.worldbank.org/DEC/Resources/MonetaryPolicyOverview.pdf

López-Penabad, M. C., Iglesias-Casal, A., & Neto, J. F. S. (2022). Effects of a negative interest rate policy in bank profitability and risk taking: Evidence from European banks. *Research in International Business and Finance*, *60*, 101597.

Keynes, J. M. (1936). *The general theory of employment, interest and money*. London: Macmillan & Co.

Maffili, D.W.; Bressan, A.A.; Souza, A.A. (2007). "Estudo de rentabilidade dos bancos brasileiros de varejo no período de 1999 a 2005". *Revista Contabilidade Vista & Revista. Belo Horizonte, 18*(2), 117-138, abr./jun. Retrieved from https://www.researchgate.net/publication/42586895_Estudo_da_Rentabilidade_dos_Bancos_Brasileiros_de_Varejo_no_Periodo_de_1999_a_2005

Marks, R. (1998, July). Evolved perception and behaviour in oligopolies. *Journal of Economic Dynamics and Control*, *22*(8-9), 1209-1233. Retrieved from http://www.sciencedirect.com/science/article/pii/S0165188998000104.http://dx.doi.org/10.1016/S0165-1889(98)00010-4

Marshall, A. (1907). *Principles of Economics*. London: Macmillan & Co.

Mehzabin, S., Shahriar, A., Hoque, M. N., Wanke, P., & Azad, M. A. K. (2023). The effect of capital structure, operating efficiency and non-interest income on bank profitability: new evidence from Asia. *Asian Journal of Economics and Banking*, *7*(1), 25-44.

Miles, J., & Ezzell, J. R. (1980, September). The weighted average cost of capital, perfect capital markets and project life: a clarification. *Journal of Financial and Quantitative Analysis*, *15*(3), 719-730. https://doi.org/10.2307/2330405

Myers, S. C. (1974, March). Interactions in corporate financing and investment decisions—implications for capital budgeting. *Journal of Finance*, *29*(1), 1-25. https://doi.org/10.2307/2978211

Neto, L. A. (2010). Aumento da taxa Selic: quem ganha com isso? (translation: Selic rate increases: who wins from it?) *Abimaq - Palavra do Presidente (translation: Brazilian Machinery and Equipment Association: word from the president*), edição 133, Abril. Retrieved from http://www.abimaq.org.br/site.aspx/Detalhe-Palavra-do-Presidente-nova?DetalheClipping=13&CodigoClipping=14

Parker, R. H. (1968). Discounted cash flow in historical perspective. *Journal of Accounting Research*, *6*(1), 58-71, Spring. https://doi.org/10.2307/2490123

Pegoletti, F., & Evans, A. (Eds.) (1936). *La Pratica della mercatura* (original publicado em Florença, 1776). Cambridge: Mediaeval Academy of America.

Rezende, V. (2020). Juro real aprofunda queda e fica negativo em mais de 1% (translation: Real interest deepens drop and is negative by more than 1%). *Valor Econômico*, December 8. Retrieved from https://valor.globo.com/financas/noticia/2020/12/08/juro-real-aprofunda-queda-e-fica-negativo-em-mais-de-1.ghtml

Ruback, R. S. (1995, January). A Note on Capital Cash Flow Valuation. *Harvard Business School Background Note 295-069*. Retrieved from http://www.hbs.edu/faculty/Pages/item.aspx?num=7567

Saif-Alyousfi, A. Y. (2022). Determinants of bank profitability: evidence from 47 Asian countries. *Journal of Economic Studies*, *49*(1), 44-60.

Samuelson, P. (1937, May). Some aspects of the pure theory of capital. *Quarterly Journal of Economics*, *51*(3), 469-496. https://doi.org/10.2307/1884837

Sandhu, S., & Arora, S. (2022). Customers' usage behaviour of e−banking services: Interplay of electronic banking and traditional banking. *International Journal of Finance & Economics*, *27*(2), 2169-2181.

Santos, J. O. (2019). *Valuation – um guia prático (translation: Valuation – a practical guide)* (2nd ed.). São Paulo: Saraiva.

Sindicato Dos Bancários De Campina Grande E Região. (Translation: Bank Worker's Union of Campina Grande and Region). Retrieved from https://bancarioscg.com.br/historia/

Whited, T. M., Wu, Y., & Xiao, K. (2021). Low interest rates and risk incentives for banks with market power. *Journal of Monetary Economics*, *121*, 155-174.

Note

Note 1.

https://valor.globo.com/financas/noticia/2020/12/08/juro-real-aprofunda-queda-e-fica-negativo-em-mais-de-1.ghtml