Economia e Políticas Públicas

Revista Eletrônica de Economia

Revisitando a elasticidade da concessão do crédito livre às pessoas físicas no consumo das famílias: evidências empíricas no período 2011 a 2023

Revisiting the elasticity of free credit concession to individuals in household consumption: empirical evidence from 2011 to 2023

Revisitando la elasticidad de la concesión de crédito libre a las personas físicas en el consumo de los hogares: evidencia empírica del período 2011 a 2023

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Resumo: Este estudo tem por objetivo geral estimar a elasticidade de longo prazo da concessão do crédito livre às pessoas físicas no consumo das famílias. Utilizando dados trimestrais para o período compreendido entre o segundo trimestre de 2011 para o segundo trimestre de 2023 em relação às variáveis concessão de crédito às pessoas físicas, consumo das famílias e massa salarial real, os resultados obtidos a partir da estimação de um modelo

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econométrico dinâmico indicam que essa elasticidade é 0,2778, de modo que um aumento de 1% na concessão de créditos livres às pessoas físicas resulta em um aumento de 0,28% no consumo das famílias, aproximadamente..

Palavras-chave: Crédito Pessoa Física, Consumo das Famílias, Elasticidade.

Abstract: The aim of this study is to estimate the long-term elasticity of granting free credit to individuals in family consumption. Using quarterly data for the period between the second quarter of 2011 and the second quarter of 2023 in relation to the variables granting credit to individuals, household consumption and real wages, the results obtained from the estimation of a dynamic econometric model indicate that this elasticity is 0.2778, so that a 1% increase in the granting of free credit to individuals results in an increase of 0.28% of household consumption, approximately.

Keywords: Individual Credit, Household Consumption, Elasticity.

Resumen: El objetivo general de este estudio es estimar la elasticidad de largo plazo del otorgamiento de crédito gratuito a individuos en el consumo familiar. Utilizando datos trimestrales para el período comprendido entre el segundo trimestre de 2011 y el segundo trimestre de 2023 en relación con las variables concesión de crédito a personas, consumo de los hogares y salario real, los resultados obtenidos de la estimación de un modelo econométrico dinámico indican que esta elasticidad es 0,2778, de modo que un aumento del 1% en el otorgamiento de créditos gratuitos a particulares resulta en un aumento del 0,28% en el consumo familiar, aproximadamente.

Palabras clave: Crédito individual, consumo de los hogares, elasticidad.

Introduction

The dynamics between consumer credit provision and household consumption behavior is a topic of increasing relevance in the contemporary economic context. For example, between 2004 and 2013, the expansionary cycle of credit to individuals contributed significantly to the increase in household consumption. Public banks played a prominent role in this scenario, taking the lead in credit provision, not only as a response to the global financial crisis of 2008 and 2009, but also as a strategy to promote financial inclusion and boost domestic demand. This approach played a crucial role in macroeconomic stability, in reducing social inequalities and in consolidating Brazil as one of the most dynamic emerging economies in the world (Borça Jr. and Guimarães, 2015).

According to Mora (2015), between 2004 and December 2010, there was a significant transformation in the supply of credit to individuals in Brazil. During this period, credit to

individuals increased from 9% to 21% of the Gross Domestic Product (GDP), demonstrating a notable expansion. This growth encompassed several modalities, with emphasis on payroll loans and housing finance, driven by regulatory measures that facilitated access to these options. Payroll loans, benefiting from the reduction of interest rates and simplification of contracting processes, experienced significant growth, as did housing finance, which was encouraged by government policies, including the reduction of interest rates and increased access to the FGTS. In addition, macroeconomic factors, such as economic stability, income growth and reduction in unemployment, together with a climate of economic optimism, contributed to the expansion of credit and the increase in operations for financing durable goods. This structural shift in credit supply reflects not only the diversification of available options, but also the interplay of regulatory factors, government incentives and broader economic conditions. The optimistic economic scenario boosted consumer confidence, resulting in an increase in credit operations for the acquisition of durable goods, while specific policies adopted, such as the transfer of liabilities in the housing sector, addressed specific issues in this segment. This period illustrates how the dynamics of credit to individuals played a crucial role in the broader context of economic and social policies adopted during the government (Mora, 2015).

It can be seen, therefore, that the granting of credit has become a fundamental part of economic strategies, playing a crucial role in the dynamics of economic growth and stability. For example, analyzing the calculation of GDP from the perspective of expenditure, credit will impact household consumption and, consequently, this impact will be transmitted to GDP.

However, in a context of high interest rates that has prevailed in recent years in Brazil, the following question stands out: what is the level of sensitivity of household consumption to the granting of credit? This study tests the hypothesis that credit to individuals has little effect on household consumption. This hypothesis is based on the argument that the high interest rates practiced in Brazil affect household consumption decisions and, for this reason, household consumption is expected to be little sensitive to the granting of credit to individuals.

The general objective of this study is to analyze the sensitivity of household consumption to the granting of credit to individuals in the Brazilian economy during the period from 2011 to 2023. Understanding and quantifying how credit to individuals influenced household consumption will provide important insights into the performance of the

level of economic activity in the period analyzed, which is affected by several structural breaks that probably affected the consumption pattern of Brazilians. In addition, it will be possible to analyze the relevance of credit as a significant component of the country's economic development from a different approach through the calculation of elasticity. In terms of specific objectives, this study proposes to analyze and understand the relationship between household consumption and the granting of credit to individuals by calculating the elasticity of the granting of free credit to individuals in household consumption, based on the estimation of econometric, statistical and dynamic models, exploring the transmission channels between these two variables. However, before the econometric estimations, a rigorous stationarity analysis of the data of the variables considered in this study will be carried out.

The scope of this study is to comprehensively and in-depth outline the impact of the expansionary cycle of credit to individuals on the Brazilian economy in the period between 2011 and 2023. This analysis will cover the interactions between credit granting and household consumption, as well as the real wage bill, which is an important indicator of the Brazilian labor market.

Analyzing the relationship between credit provision to individuals and household consumption patterns is a relevant topic for the current academic debate, with important implications for economic policy. While the significant increase in bank credit in recent years may have influenced household behavior, it is important to highlight that other factors, such as high interest rates and labor market dynamics, may have had an effect on consumption patterns. In view of this, policies aimed at granting credit may not be having the desired effect in stimulating household consumption. By addressing these aspects, the study aims to provide a comprehensive view of the role played by credit to individuals in the dynamics of the Brazilian economy, contributing to a broader understanding of the factors that shaped the economic scenario during the period studied.

The study is structured in such a way as to provide a detailed analysis of the expansionary cycle of credit to individuals and its impact on the Brazilian economy between 2011 and 2023. In addition to this introduction, this study is divided into the following sections. The next section will present a brief theoretical framework on the topic under analysis. The third section will be dedicated to presenting in detail the methodological approach to be used in the investigation of the research problem. The fourth section, in turn, will be dedicated to describing the variables and the treatment given. The fifth section will

present the econometric results obtained. Finally, the last section will present the final considerations on the results obtained, as well as the policy implications.

Theoretical Reference

The elasticity of free credit provision to individuals in relation to household consumption measures the percentage impact on household consumption in response to a percentage change in free credit provision. The general formula for calculating this elasticity is given by:

$$\varepsilon_{CLPF}^{CF} = \frac{\Delta\% Household\ Consumption}{\Delta\% Concession\ of\ Free\ Credit\ to\ Individuals} \qquad (1)$$

If elasticity is greater than 1 ($\varepsilon_{CLPF}^{CF} > 1$), this indicates that household consumption is elastic in relation to the granting of free credit, that is, households respond to changes in the granting of credit by increasing their consumption in a greater proportion. If the elasticity is less than 1 ($\varepsilon_{CLPF}^{CF} < 1$), the household consumption is inelastic with respect to the granting of free credit, indicating that consumption varies in a smaller proportion than the change in the granting of credit. Finally, if the elasticity is equal to one($\varepsilon_{CLPF}^{CF} = 1$), that is, unitary elasticity, this means that household consumption varies in a proportion equal to the percentage change in the granting of free credit to individuals.

This elasticity can be influenced by several factors, such as interest rates, general economic conditions, monetary and fiscal policies, consumer confidence, among others. In periods of low interest rates and favorable economic conditions, for example, elasticity may be higher, as households may be more likely to consume based on available credit.

According to Mora (2015), the increase in credit to individuals during the Lula administration resulted from a combination of strategic factors. The implementation of an expansionary monetary policy, evidenced by the reduction of the basic interest rate, aimed to stimulate consumption and investment, making credit more accessible. Economic stability, maintained by the Plano Real and consistent GDP growth, generated confidence in economic agents and reduced the risk perceived by financial institutions, facilitating the expansion of the supply of credit. In addition, direct government intervention, notably through public banks such as Caixa Econômica Federal and Banco do Brasil, played a crucial role, implementing measures such as the capitalization of Caixa to ensure the continuity of credit in a context of

international challenges. This multifaceted approach reflects a comprehensive strategy to promote access to credit and sustain economic stability.

Morais and Filho (2011) note that, from 2006 onwards, measures focused on "new developmentalism" were adopted, maintaining commitments to primary surpluses, but now incorporating strategies that enabled increased government spending and greater state intervention in the economy. This change in approach, known as "hybrid" policy, represented a shift in the conduct of economic policies, seeking to reconcile aspects of previous neoliberal approaches with new growth-oriented strategies.

Biancarelli and Rossi (2014) point out that during the 1990s, several transformations were driven by a strategy aimed at stimulating consumption as a means of achieving economic growth. One notable change was the transition from contractionary policies to those focused on social development, evidenced by the increase in the value and scope of the Bolsa Família program. It is highlighted that the government focused its efforts on strengthening the population's income through comprehensive social policies, including initiatives such as the Continuous Social Assistance Benefit (BPC), which guaranteed a minimum wage for the elderly and people with disabilities. According to Biancarelli (2014), such measures represented a deliberate attempt to promote economic growth by prioritizing stimulating consumption and fostering social development as fundamental pillars of government policy. This approach suggests a strategic integration between the economic and social dimensions, highlighting the importance of inclusive policies to drive national progress.

After the 2008 economic crisis, Boça Jr. and Guimarães (2015) explain that the credit scenario in Brazil underwent notable transformations. The government's effective response during the crisis, with the prominent role of public banks, contributed to mitigating the adverse impacts on the financial system. However, the personal credit cycle, which had been an important driver of consumption and economic growth, lost some of its vigor in the years following the crisis. The slowdown was evidenced by the less expressive behavior of personal credit, reflected in the economic model presented. Even in the face of this slowdown, bank credit continued to play a relevant role in the Brazilian economy, adapting to the challenges and changes in global economic conditions. The post-crisis trajectory revealed the adaptability of the Brazilian financial system, remaining an important instrument for boosting economic activity and sustaining household consumption, albeit in a context of greater caution and adjustments in financial policies.

Ivo et al. (2016) state that the credit market plays a crucial role in installment sales, as evidenced in the context of the Brazilian automobile industry. The granting of credit, combined with government policies that reduce interest rates and facilitate financing. Over the years, the availability of financing with more affordable terms, associated with tax reductions and government incentives, contributed to the expansion of this market. This phenomenon highlights the interconnection between the supply of credit, macroeconomic conditions and consumer purchasing decisions, underlining the importance of the credit market as a significant driver of installment transactions.

According to Sant'Anna, Borça Junior and Araujo (2009), the contributions of credit to individuals play a significant role in stimulating consumption and, consequently, in the growth of the Gross Domestic Product (GDP). The availability of credit facilitates people's access to durable consumer goods, such as automobiles and household appliances, as well as to the real estate market, boosting the demand for these products. This phenomenon is particularly evident in developing economies, such as Brazil, where the expansion of credit to individuals between 2004 and 2008 contributed to improving the population's living conditions, promoting access to higher consumption standards.

Furthermore, the contributions of personal credit are not limited to immediate consumption; they also play a relevant role in macroeconomic dynamics. The increase in credit boosts economic activity by stimulating production and employment in sectors related to goods and services demanded by consumers. This virtuous cycle generates a positive impact on GDP, contributing to more robust economic growth. However, it is essential to balance this credit expansion to ensure its sustainability and avoid possible financial imbalances that may arise in the long term. Therefore, understanding the intricate dynamics between personal credit, consumption and GDP is crucial to formulating effective and sustainable economic policies (Araújo, Borça Junior and Sant'Anna, 2009). Nader (2019) explains that personal credit policy played a significant role in the economic strategies adopted. In his first term, there was an attempt to stimulate economic growth by reducing interest rates and increasing access to credit. This approach aimed not only to boost consumption but also to promote investment and strengthen key sectors of the economy. However, these measures were subsequently faced with challenges, especially when the reversal in the trajectory of interest rate reductions occurred from 2013 onwards, which impacted the dynamics of credit policy. The intervention in the financial sector, combined with economic instability and inflationary pressures, created a complex environment for

personal credit policy, generating debates about the effectiveness of these strategies and their long-term effects.

Boligon et al. (2020) analyze the economic crisis that hit Brazil between 2014 and 2016 and reveal a combination of factors, highlighting the mistakes in the conduct of economic policy, notably during the implementation of the New Economic Matrix (NME). The text argues that the fiscal and expansionary policies adopted in that period, by stimulating consumption and reducing unemployment, resulted, in the long term, in rising inflation and the devaluation of the local currency. In addition, the response of the Monetary Policy Committee (COPOM), expressed by the significant increase in the Selic rate in 2015, made access to capital difficult for individuals and legal entities, discouraging the domestic market. The comprehensive approach also highlights the widespread impacts on various sectors of the economy, culminating in a drop in employment, per capita income, and Gross Domestic Product (GDP). The dissertation also explores the lack of coordination in policies adopted between 2010 and 2014, the political challenges that exacerbated the crisis, as well as the loss of competitiveness resulting from insufficient investment in infrastructure.

Coelho and Paz (2022) address the period of the COVID-19 pandemic, in which the granting of credit to individuals emerged as a fundamental part of government strategies to mitigate the adverse economic impacts faced by the population. Several measures were implemented to expand access to credit, with emphasis on the expansion of the margin available for loans, especially among INSS beneficiaries. This initiative allowed greater financial flexibility to citizens by increasing the margin available for loans, providing momentary relief amid the economic uncertainties caused by the health crisis. In addition, the establishment of programs such as the National Support Program for Micro and Small Businesses (PRONAMPE) and the Emergency Credit Access Program (PEAC) played a crucial role in directing specific resources to individual microentrepreneurs and small and medium-sized businesses, demonstrating a proactive response in maintaining the financial stability of the population.

However, it is essential to critically assess the effectiveness of these measures, considering not only their implementation but also their practical results and the financial sector's ability to respond to growing demands. Credit provision, although a valuable tool for addressing immediate economic challenges, requires in-depth analysis to understand its long-term effectiveness and potential impacts on individuals' financial health. The inherent complexity of economic dynamics in times of crisis requires a careful approach to

policymaking, aiming not only at the availability but also at the sustainability of credit as an instrument of economic recovery and financial stability (Coelho and Paz, 2022).

The contribution of this study is threefold. First, scholars who use computable general equilibrium models need an estimate of the elasticity of credit granting to households in relation to household consumption in order to conduct sectoral analyses involving different consumption patterns, so they need the value of this elasticity to analyze the impacts of public policies involving credit granting to households in order to stimulate consumption. Borça Jr. and Guimarães (2015), for example, obtained a value of 0.408229 (see Appendix C) for this elasticity from the estimation of a dynamic econometric model. Second, the adoption of more robust techniques, involving a rigorous analysis of stationarity in the presence of structural breaks, as well as the estimation of dynamic econometric models due to the effects of lags in the results, may provide greater clarification on the value of this elasticity. The introduction of distributed lags into the model allows us to better capture the long-term relationships between consumer credit provision and household consumption, offering a more comprehensive view of economic dynamics. Third, the current study provides a solid foundation for advancing existing knowledge, providing valuable insights for researchers, policymakers, and financial sector practitioners seeking to understand and anticipate the complex dynamics between consumer credit and consumption patterns. This refined approach not only contributes to the improvement of academic research, but also offers more precise and applicable guidance for the formulation of more effective economic policies adapted to the contemporary context.

Methodology: Stationarity Analysis

The modified Dickey-Fuller tests (ADF^{GLS}) and Phillips-Perron ($\overline{MZ}_{\alpha}^{GLS}$), proposed by Elliot, Rottemberg and Stock (1996) and Ng and Perron (2001) are applied to verify the stationarity of time series. These tests overcome the problems of low statistical power and size distortions of the traditional tests of Dickey and Fuller (1979, 1981), Said and Dickey (1984) and Phillips and Perron (1988). The modifications to the standard unit root test of Dickey and Fuller (1979, 1981) and Said and Dickey (1984) are based on two central aspects: the extraction of trends in time series using ordinary least squares (OLS) is inefficient and the importance of an appropriate selection for the lag order of the augmented term, in order to obtain a better approximation to the true data generating process.

In the first case, Elliot, Rottemberg and Stock (1996) propose using generalized least squares (GLS) in order to extract the stochastic trend of the series. The standard procedure is used to estimate the ADF^{GLS} statistic as the t-statistic to test the null hypothesis of the presence of a unit root against the alternative hypothesis that the series is stationary. Regarding the second aspect, Ng and Perron (2001) demonstrate that the Akaike information criteria (AIC) and Schwarz information criteria (SIC) tend to select low values for the lag, when there is a large negative root (close to -1) in the series' moving average polynomial. This generates distortions and motivated the development of the modified Akaike information criterion (MAIC) for selecting the autoregressive lag, in order to minimize the distortions caused by inadequate selection of lags.

Ng and Perron (2001) propose that the same modifications be applied to the traditional Phillips and Perron (1988) test, resulting in the $\overline{MZ}_{\alpha}^{GLS}$ test. Through simulations, Ng and Perron (2001) show that the joint application of GLS to extract the deterministic trend and the MAIC lag selection criterion produce tests with greater power but smaller statistical size distortions when compared to traditional ADF and PP tests. The critical values of the statistics ADF^{GLS} and $\overline{MZ}_{\alpha}^{GLS}$ are reported in Ng and Perron (2001).

However, even the modified tests ADF^{GLS} and $\overline{MZ}_{\alpha}^{GLS}$ have low power in the presence of structural breaks, becoming biased towards not rejecting the null hypothesis of a unit root, even when the series is stationary. The pioneering work of Perron (1989) illustrates the importance of including a structural break in traditional unit root tests. Three models of structural breaks were considered. Model A, which is known as the crash model, allows for a one-period change in the level. Model B, which allows for a break in the trend of the time series. Model C, which is known as the changing growth path, includes a one-period change in both the level and trend.

Later research adopted an endogenous procedure to determine the breakpoint from the data. In this context, Vogelsang and Perron (1998) developed a unit root test with endogenous breakpoint estimation, based on Perron's (1989) models A, B and C and on the Innovation Outlier (IO) and Additive Outlier (AO) methods. The AO model allows for a sudden change in the mean (crash model), while the IO model allows for more gradual changes. Thus, both models are used to test the stationarity hypothesis: break at the intercept, break at the intercept and trend, both at level and in first difference.

In turn, Saikkonen and Lütkepohl (2002) and Lanne, Saikkonen and Lütkepohl (2002, 2003) propose that structural breaks can occur over a number of periods and exhibit a smooth

transition to a new level. Therefore, a level change function is added to the deterministic term of the data generating process. The deterministic terms are extracted by generalized least squares (GLS) and then an ADF test is applied to the adjusted series. Critical values of the test are tabulated by Lanne, Saikkonen and Lütkepohl (2002).

Econometric Estimation

Consider Y_t as being the consumption of families, X_t^j is the proxy for the granting of free credit to individuals, as well as the independent and identically distributed error term $\varepsilon_t \sim i.i.d. N(0, \sigma^2)$. An autoregressive and distributed lag (ARDL) model is given by:

$$Y_t = C + \alpha_1 Y_{t-1} + \cdots + \alpha_k Y_{t-k} + \beta_0 X_t^j + \beta_1 X_{t-1}^j + \cdots + \beta_n X_{t-n}^j + \varepsilon_t \qquad (2)$$

Thus, household consumption is related to its past values, as well as to the contemporary and past values of the granting of free credit to individuals in a dynamic system. The immediate effect, called the impact multiplier, is given by the coefficient β_0. The equation (2) must meet certain assumptions. First, the variables of the econometric model must be stationary. Second, the expected mean value of the error term must be zero. Third, if the error term is not serially correlated, the coefficients of the model estimated by ordinary least squares (OLS) will be consistent in the statistical sense. Finally, it is important that the assumptions of normality and homoscedasticity of the error term are valid. Equation (2) can be rewritten as follows:

$$A(L)Y_t = B(L)X_t + \varepsilon_t \qquad (3)$$

where:

$$A(L) = (1 - \alpha_1 L - \alpha_2 L^2 - \cdots - \alpha_k L^k) \qquad (4)$$

$$B(L) = (\beta_0 + \beta_1 L + \beta_2 L^2 + \cdots + \beta_n L^n) \qquad (5)$$

Assuming that the variables are stationary and are in the form of natural logarithms, static equilibrium can be defined as the situation in which Y and X are at their expected long-term values:

$$Y^* = \left(\frac{\overbrace{\beta_0 + \beta_1 + \beta_2 + \cdots + \beta_n}^{Credit}}{\underbrace{1 - \alpha_1 - \alpha_2 - \cdots - \alpha_k}_{Consumption}} \right) X^* \qquad (6)$$

The term in parentheses in equation (6) is known as the long-term elasticity of the granting of free credit to individuals in relation to household consumption.

Description of variables and data processing

This research uses quarterly data for the period between the second quarter of 2011 and the second quarter of 2023, involving the following variables: Household Consumption (R\$ Million), obtained from the IBGE National Accounts System; Granting of Free Credit to Consumers – Individuals; and Real Wage Mass (R\$ Million); following the recommendations of Borça Jr. and Guimarães (2015). The use of these two variables, which are the granting of free credit to consumers for individuals and the real wage mass, is in accordance with the study by Borça Jr. and Guimarães (2015). This choice was based on the premise that these variables play a crucial role in the dynamics of household consumption, especially considering the impact of credit on household purchasing power.

To ensure the robustness and accuracy of the estimates, the data were subjected to specific treatments. First, they were converted to real terms using the Average IPCA (2023Q2 = 100), seasonally adjusted using the X-13 ARIMA method, and then transformed into natural logarithms. These treatments aim to mitigate possible distortions and ensure that the estimated coefficients can be interpreted as elasticities. The interpretation of these elasticities, as described by the theoretical framework of Borça Jr. and Guimarães (2015), is crucial to identify whether household consumption responds elastically or inelastically to variations in the granting of consumer credit.

The trajectory of personal credit in Brazil between 2004 and 2023 reflects a complex and dynamic scenario, shaped by economic policies, global crises and government responses. The adaptive capacity of the Brazilian financial system in the face of external shocks, exemplified by the effective response during the global crisis, highlights the country's resilience. However, challenges persist as evidenced by the complex interplay between credit policies, inflation and socioeconomic development. The COVID-19 pandemic has highlighted the importance of credit as a tool to mitigate adverse impacts. In this context, critically

evaluating the effectiveness of the measures adopted and ensuring the sustainability of credit emerges as a priority to guide future economic policies. Ultimately, understanding the intricate relationships between personal credit and consumption is essential to forge a solid path towards a resilient and inclusive economy.

Analysis of Results

Stationarity Analysis

The results of the unit root tests were consolidated in Table 1 below. In this, the variable c_t^{sa} is the consumption of families, cr_t^{sa} is free credit to individuals, and ms_t^{sa} is the wage bill. In general terms, the results indicate that the series are stationary in level, and the dates of the identified structural breaks refer to the period of the Covid-19 pandemic. With these results, the next step will be the estimation of the autoregressive and distributed lag models aiming at calculating the elasticity.

Table 1 – Results of unit root tests (1997 to 2023)

Variables	Model	No structural break			With endogenous structural break (date of break is unknown)					
					Vogelsang nd Perron (1998)			Saikkonen and Lütkepohl (2002)		
		ADF^{GLS}	$\overline{MZ}_t^{GLS}$	Lags	Type of Model	Date of Breakage	Test Statistics	Type of Model	Date of Breakage	Test Statistics
c_t^{sa}	C	-0.01	0.27	-	Inovational Outlier	2020:02	-6.42(a) (7 lags)	Rational shift	2020:02	-2.58(c) (9 lags)
c_t^{sa}	C,T	-2.02	-1.82	-	Inovational Outlier	2020:01	-5.26(b) (10 lags)	Rational shift	2020:02	-3.21(b) (9 lags)
cr_t^{sa}	C	-0.39	-0.31	-	Inovational Outlier	2020:02	-6.03(a) (10 lags)	Rational shift	2020:02	0.81(c) (5 lags)
cr_t^{sa}	C,T	-1.77	-1.65	-	Inovational Outlier	2015:02	-4.34 (0 lags)	Rational shift	2020:02	-3.02(c) (5 lags)
ms_t^{sa}	C	-1.27	-1.22	1	Inovational Outlier	2020:01	-3.43 (0 lags)	Rational shift	2020:03	-3.59(a) (5 lags)
ms_t^{sa}	C,T	-1.92	-1.77	1	Inovational Outlier	2020:01	-5.10(c) (10 lags)	Rational shift	2020:03	-1.87(a) (2 lags)

Source: prepared by the author. Use of econometric software Eviews and JMULTI.

Note:

1 – "*Lags*" means lags. Model types: "C" means constant; "T" means deterministic trend. Maximum initial count of 16 lags. Δ is the first-difference operator. Note that (a), (b), and (c) indicate that the estimated coefficients are statistically significant or rejection of the null hypothesis at the 1%, 5%, and 10% statistical significance level, respectively. Monthly observations included: 319 (sample: 1997 to 2023).

2 – The critical values of the test ADF^{GLS} are (Elliot, Rothenberg and Stock, 1996): (i) model with constant: -2.61 (1%), -1.95 (5%) and -1.61 (10%). (ii) model with constant and deterministic trend: -3.77 (1%), -3.19 (5%) and -2.89 (10%). Selection of the optimal number of lags using the modified Akaike information criterion.

3 – The asymptotic critical values of the test $\overline{MZ}_\alpha^{GLS}$ are (Ng and Perron, 2001, Table 1): (i) model with constant: -2.58 (1%), -1.98 (5%) and -1.62 (10%); (ii) model with constant and deterministic trend: -3.42 (1%), -2.91 (5%) and -2.62 (10%). Spectral estimation method: AR GLS-detrented. Selection of the optimal number of lags by means of the modified Akaike information criterion.

4 – The critical values of the Vogelsang and Perron (1998) test are: (i) model with constant and deterministic trend/intercept break: -5.35 (1%), -4.86 (5%), and -4.61 (10%); (ii) model with constant and deterministic trend/intercept and trend break: -5.72 (1%), -5.17 (5%), and -4.89 (10%). (iii) model with constant and deterministic trend/trend break: -5.06 (1%), -4.52 (5%), and -4.26 (10%). Break types: innovational outlier and additive outlier. Selection of structural break: minimized Dickey-Fuller t-statistic. Selection of optimal number of lags: Schwarz Information Criterion.

5 – The critical values of the Saikkonen-Lütkepohl test are (Lanne et al., 2002): (i) model with constant: -3.48 (1%), -2.88 (5%), and -2.58 (10%); (ii) model with constant and deterministic trend: -3.55 (1%), -3.03 (5%), and -2.76 (10%). Types of structural break: Rational Shift, Exponential Shift and Impulse dummy.

Econometric estimation

In this study, the dynamic econometric model represents a valuable tool for investigating the temporal complexity of economic interactions and contributes significantly to an in-depth understanding of the relationships between credit supply and household consumption. The results reported in Table 1 allow us to analyze the following elasticities. First, a short-term elasticity, also known as contemporary impact elasticity, was obtained with a value of $\varepsilon_{(a)}=0.272116$. Thus, a 1% increase in credit supply increases household consumption by 0.27% in the short term. This result is close to the elasticity value obtained in the estimation of the static model.

The analysis of short-term elasticity, specifically the contemporaneous impact elasticity, reveals valuable insights into the dynamics between credit supply and household consumption behavior. The results indicate that, in the short term, a 1% increase in credit supply triggers a substantial 0.27% increase in household consumption. This finding suggests a significant and positive response of households to the immediate availability of credit, highlighting the acute influence of this variable in stimulating economic consumption. The accuracy of this elasticity naturally depends on the robustness of the underlying economic model, emphasizing the importance of sound methodological considerations in interpreting these relationships.

Another elasticity that can be obtained from dynamic models refers to the intermediate elasticity, also known as lagged impact elasticity, whose value is given by the sum of the estimated and statistically significant coefficients associated with the granting of free credit to individuals. It is noted that the value of this elasticity is $\varepsilon_{(b)}=0.272116-0.066009=0.206107$, so that a 1% increase in the supply of credit increases household consumption by 0.21%. The result suggests that while a substantial fraction of the response is observed immediately, a significant portion of the impact of the supply of credit on consumption manifests itself with a time lag, highlighting the importance of considering time in the assessment of economic interrelations. Finally, the long-term elasticity of the granting of free credit to individuals in relation to household consumption is given by:

$$\varepsilon_{(c)} = \frac{0.272116 - 0.066009}{1 - 0.258222} = \frac{0.206107}{0.741778} \approx 0.27785537$$

Therefore, a 1% increase in the granting of free credit to individuals results in a 0.27% increase in household consumption.

Table 1 - Regression results – Dynamic Model

Dependent variable: c_t^{sa}
Method: Ordinary Least Squares
Sample size: 2012Q2 2023Q2
Observations included: 45 after adjustments

Variable	Coefficient	Standard Error	t-statistics	p-value
c_{t-1}^{sa}	0.258222	0.085999	3.002606	0.0054
cr_t^{sa}	0.272116	0.031135	8.739975	0.0000
cr_{t-1}^{sa}	-0.066009	0.038909	-1.696494	0.1001
ms_t^{sa}	0.234384	0.054763	4.279966	0.0002
ms_{t-2}^{sa}	0.190755	0.054794	3.481302	0.0016
ms_{t-4}^{sa}	-0116887	0.049784	-2.347858	0.0257
D2012_03	0.017267	0.006451	2.676648	0.0119
D2019_04	-0.017893	0.005022	-3.563015	0.0012
D2020_01	-0.013776	0.005228	-2.634940	0.0132
D2020_02	-0.056849	0.009306	-6.108679	0.0000
D2021_01	0.033375	0.006405	5.210479	0.0000
D2022_04	-0.023879	0.005853	-4.080087	0.0003
D2023_01	-0.034380	0.006054	-5.678581	0.0000
Constant	4.153983	0.597048	6.957533	0.0000
Deterministic Trend	0.000937	0.000142	6.592352	0.0000

R2	0.992823	Var mean, dependent	14.22572
Adjusted R2	0.989473	Standard Error var, dep,	0.047415
Standard Error of Regression	0.004865	C, I, Akaike	-7.552416
Sum of Squares of Residuals	0.000710	C, I, Schwarz	-6.950195
Log Likelihood	184.9294	C, I, Hannan-Quinn,	-7.327914
F-Statistics	296.4186	Durbin-Watson Statistic	1.735351
Prob. (F-Statistics)	0.000000		
Jarque-Bera	1.167094		
P-Value	0.557916		
Breusch-Godfrey Serial Correlation Test	2.078913		
P-Value	0.3536		
White Heteroscedasticity Test	10.42986		
P-Value	0.7301		
RESET Ramsey Test	2.200241		
P-Value	0.0359		

Source: Prepared by the authors.

A comparative table between the elasticities obtained in this study in relation to the study by Borça Jr. and Guimarães (2015) stands out. When implementing a more robust econometric procedure, it is noted that the value of the elasticity of credit granting in relation to household consumption is much lower than in relation to the value obtained by Borça Jr. and Guimarães (2015).

Table 2 - Comparison between the studies by Boça Jr. and Guimarães (2015) and the present study

	Short-Run Elasticity	Intermediate Elasticity	Long-Run Elasticity
Borça Jr. Guimarães (2015)	0.408229		
This study	0.272116	0.206107	0.27785537

Source: Prepared by the authors.

The comparison between the elasticities estimated by Borça Jr. and Guimarães (2015) and the present study reveals distinct patterns in the impact of consumer credit on household consumption behavior over different time horizons. In the short term, a significant difference is observed, with Borça Jr. and Guimarães recording an elasticity of 0.408229, while the current study presents a slightly lower elasticity of 0.272116. This scenario suggests that, in the short term, the effect of consumer credit on consumption behavior is less pronounced in the estimates of the present study.

In the intermediate elasticity, where Borça Jr. and Guimarães did not provide an estimate, the present study presents an elasticity of 0.206107, indicating a continuous reduction in the impact of credit over time. In the long-term elasticity, the present study estimates a value of 0.27785537, evidencing an even smaller impact compared to the previous phases. Across all categories, the elasticities in this study are consistently lower than previous estimates, suggesting that the more rigorous methodological approach may have influenced the results, highlighting the importance of considering such nuances when interpreting the complex dynamics between consumer credit and household consumption behavior.

Note that, in general terms, all elasticities estimated in this study are almost half the value of the elasticity estimated by Borça Jr. and Guimarães (2015). In other words, when implementing a more rigorous econometric procedure, involving stationarity analysis with identification of structural breaks, as well as the estimation of an autoregressive model and distributed lags, the results obtained show that this elasticity is even lower than the elasticity estimated by Borça Jr. and Guimarães (2015). In other words, the granting of free credit to individuals has little impact on household consumption.

From an economic perspective, the analysis presented reveals the significant influence of credit on household consumption behavior. The results highlight that an increase of 1 in the supply of credit is associated with substantial increases in consumption, both in terms of long-term elasticity and contemporary impact. This positive and statistically significant relationship suggests that, in economies with very low interest rates, credit plays a crucial role in stimulating household consumption. The finding that the effect of credit persists over time, as evidenced by the dynamic model, points to the importance of considering temporal dynamics in understanding the interrelationships between credit supply and economic behavior.

The dependence on free credit to individuals and its impact on household consumption emerge as crucial aspects in the economic scenario outlined by the study. The results point to a significant relationship, evidenced by a long-term elasticity that suggests an increase of 1 in

the granting of free credit to individuals results in an increase of 0.272116 in household consumption. This finding highlights the importance of credit as a catalyst for household consumption, indicating that, in a context of historically low interest rates, households find credit to be a substantial source of economic stimulus. The observed dependence highlights the need for a careful understanding of credit-related policies, as well as the implementation of strategies that consider not only the immediate effects, but also the developments over time. This study reinforces the idea that the dynamics between credit supply and household consumption are intricate and subject to temporal nuances, providing a crucial basis for the formulation of more robust and adaptive economic policies.

Although the economic study identifies an elasticity of consumption in response to the supply of credit that is less than one, which can be interpreted as a moderate response of households to variations in the supply of credit, it is essential to consider the context of dependence on the income level. The analysis points to the complexity inherent in economic relations, and an elasticity of less than one is not necessarily indicative of a negative response. The dependence on the income level can be a crucial factor in the interpretation of these results, since households with different income levels may react differently to the supply of credit. An elasticity of less than one may reflect a differentiated sensitivity to credit across income groups, highlighting the importance of more granular and stratified considerations when analyzing the economic implications of the supply of credit across different social strata. In this sense, understanding the dynamics of elasticity in relation to income can provide a more comprehensive and contextualized view of the economic responses to changes in the supply of credit.

Final Considerations and Policy Implications

The general objective of this study was to obtain the elasticity of the granting of free credit to individuals in relation to household consumption by estimating static and dynamic econometric models. In general terms, this elasticity is approximately 0.272116, both in the static and dynamic models, indicating that consumption varies in a smaller proportion than the change in the granting of credit. In other words, since the elasticity is less than 1 (one), household consumption is inelastic in relation to the granting of free credit.

The robust and comprehensive results presented in this economic study outline a clear and complex relationship between the supply of credit and household consumption behavior. The long-term elasticity, duly estimated through static and dynamic econometric models,

reveals that an increase of 1 in the granting of free credit to individuals is associated with an increase of 0.272116 in household consumption. This finding, statistically 1 (one), highlights the substantial influence of credit as a catalyst for household economic stimulus, especially in contexts of historically low interest rates. The importance of temporality in household response to credit supply is highlighted by the findings of the dynamic model, which highlights not only the immediate impact, but also the lagged effects that shape the temporal dynamics of these economic interactions. These results reinforce the pressing need for economic policymakers and financial sector agents to consider the temporality and intricate dynamics of these relationships when developing strategies and measures that seek to optimize consumption and promote economic stability. It should be emphasized, therefore, that the divergence in the elasticities obtained in this study compared to the study by Borça Jr. and Guimarães (2015) reinforces the importance of considering the effects of the time lags of these lags.

It is important to highlight that the econometric issue for analyzing the relationship between credit and the level of economic activity arises from the fact that functional causality can come in two directions, creating the problem of simultaneity. For example, a regulatory change in the financial market can lead to an increase in credit that will potentially generate an increase in the level of economic activity, just as an increase in activity perceived by banks can lead them to increase credit due to the decrease in the risk of default by debtors. In other words, it is difficult to separate the effects of supply and demand for credit. This is a classic problem in the literature that analyzes the monetary policy credit channel. This problem is exacerbated when aggregated data are used. When the researcher has disaggregated data from banks (balance sheet data), heterogeneity helps in identifying the shock. Therefore, in relation to the present study, aiming at future research, it is suggested to focus on the coefficients, a vector autoregressive model (VAR model), which could be used with different identification techniques, for example, imposing restrictions on lags that banks respond to the increase in the level of economic activity. From the VAR model, an analysis could be made through impulse-response functions aiming to obtain new estimates of the total elasticity. This technique would allow adding other important variables to the dynamics of credit, such as the interest rate.

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