INTEREST RATES, WAGE INDEXATION AND INFLATION IN BRAZIL: AN ANALYSIS WITH NARDL FOR THE PERIOD 2012-2025

Author: Carlos Gabriel da Roza Sousa[1]

Co-author: Guilherme Jonas Costa da Silva

Institutional affiliations: Federal University of Uberlândia (UFU)

Área 6. Economia Monetária e Financeira e Dinâmica Inflacionária

RESUMO

Este ensaio analisa os efeitos da indexação econômica, especialmente da regra de reajuste do salário mínimo, sobre a política monetária e a inflação brasileira entre 2012 e 2025. Utiliza-se o modelo NARDL para investigar relações de curto e longo prazo e possíveis assimetrias nos choques monetários, além de uma comparação com o período 2004-2012. Os resultados indicam ausência de *price puzzle*, baixa resposta da inflação aos choques monetários e ausência de significância estatística do salário mínimo no curto e no longo prazo após 2012, diferentemente do observado entre 2004 e 2012. Os achados sugerem baixa relevância da variável salarial para explicar a inflação no período recente.

Palavras-chave: Inflação Inércia Inflacionária Indexação Política Monetária NARDL

ABSTRACT

This paper analyzes the effects of economic indexation, particularly the minimum wage adjustment rule, on Brazilian monetary policy and inflation between 2012 and 2025. The NARDL model is employed to estimate short- and long-run relationships and possible asymmetries in monetary shocks, alongside a comparison with the 2004-2012 period. The results indicate the absence of a price puzzle, low inflation responsiveness to monetary shocks, and no statistical significance of the minimum wage variable in the short or long run after 2012, unlike the findings for 2004-2012. These findings suggest limited relevance of wage dynamics in explaining recent Brazilian inflation.

Keywords: Inflation; Inflationary Inertia; Indexation; Monetary Policy; NARDL**.**

[1] The author acknowledges the financial support of the Research Support Foundation of the State of Minas Gerais (FAPEMIG)

1. Introduction

The first formal indexation process in Brazil occurred in 1964 through the creation of the National Treasury Adjustable Bonds (ORTNs). This resource mobilization mechanism initially functioned effectively, but it began to show problems in the following decade, which intensified in the late 1980s and early 1990s with hyperinflation. The solution would come through the Real Plan, which followed the Larida proposal, formulated in 1985 and implemented in 1994. In summary, the pair recognized that the inflation problem in Brazil was predominantly inertial in nature, sustained by indexation mechanisms. Therefore, a monetary reform would be necessary, creating an indexed currency that would help restore the functions of money by acting upon the inertial component of inflation. (Arida & Lara-Resende, 1985; Giambiagi et al., 2011)

The execution of the plan consisted of three stages. The first involved fiscal adjustment, with the objective of reinforcing the program's credibility. The second involved the creation of the Unidade Real de Valor (URV). Finally, the URV was converted into the Real, accompanied by the adoption of an exchange rate anchor, which established an initial parity of 1 to 1 for the Real. The plan succeeded in its objective of containing inflation, but its exchange rate structure had to be revised as early as 1999 with the exchange rate crisis, as stated by Lopreato (2002, p. 284): "The use of the exchange rate as an anchor was doomed to failure, given the risk of a balance of payments crisis." Consequently, it became necessary to alter the structure to the Macroeconomic Tripod, in which one of the pillars was the Inflation Targeting Regime (ITR), theoretically grounded in the so-called Washington Consensus. The Central Bank would then adopt explicit inflation targets, and its objective would be to use its instruments, particularly the Selic rate, to ensure the convergence of inflation toward the target.

In recent years, the debate surrounding Brazilian inflation has intensified due to its persistence above the target, even in a context of high interest rates. According to the Central Bank, since the implementation of the Inflation Targeting Regime (ITR) in 1999, inflation remained within the target in only seven years, while in another eight years it remained outside the tolerance bands. At the same time, the benchmark interest rate remained at high levels, including in comparison with other Latin American countries, raising questions regarding the effectiveness of monetary policy. Furthermore, high interest rates tend to discourage productive investment by increasing the opportunity cost of capital and encouraging the allocation of resources into financial assets. In this context,

the literature highlights that, since the Real Plan and the adoption of the ITR, the Brazilian economy has exhibited a stop-and-go growth pattern, characterized by weak and inconsistent expansion cycles. This low dynamism is evidenced by the average growth rate of 2.3% per year, below the global growth rate of 3.01% per year, according to the World Bank (2026). (Filho, Filho, Milan, 2016; Modenesi & Modenesi, 2012; Paes, 2019; Silva; Terra, 2013)

Considering, therefore, that the current conduct of inflation stabilization has proven problematic, the literature has sought to understand the origin of the issue. One theoretical strand is the idea of inflationary inertia, understood as a process of inflationary memory that propagates over time, displaying low sensitivity to the level of economic activity and a greater association with structural and historical factors (Paes, 2019). Furthermore, the dominant approach associates inertia with nominal rigidities and delays in the response of prices to exogenous shocks. On the other hand, as discussed by Carvalho (2015), the Latin American structuralist tradition emphasizes the mechanisms of propagation and self-reproduction of inflation, linked to indexation and distributive conflicts. Thus, it is currently understood that the indexation of contracts, public bonds, and the minimum wage constitute relevant elements in maintaining inflationary inertia (Oreiro & Santos, 2022).

The general objective of this study is to analyze the reasons why Brazilian monetary policy has faced difficulties in converging inflation to the established target. To this end, the study seeks to examine the phenomenon of inflationary inertia, analyze the recent conduct of monetary policy, and investigate contemporary evidence of indexation mechanisms, with emphasis on the minimum wage adjustment rule. In addition, the NARDL (Nonlinear Autoregressive Distributed Lag) model is applied to estimate the short- and long-run dynamics of the variables and identify possible asymmetries in the effects of monetary shocks. The central hypothesis of the study is to verify whether wage indexation explains the inflationary rigidity observed in Brazil over the last twelve years.

The study is divided into four parts. In addition to the introduction, there is the literature review, subdivided into three sections to discuss the current Brazilian context. The third part presents the methodology, database, and results obtained. Finally, the concluding remarks are presented alongside the references used.

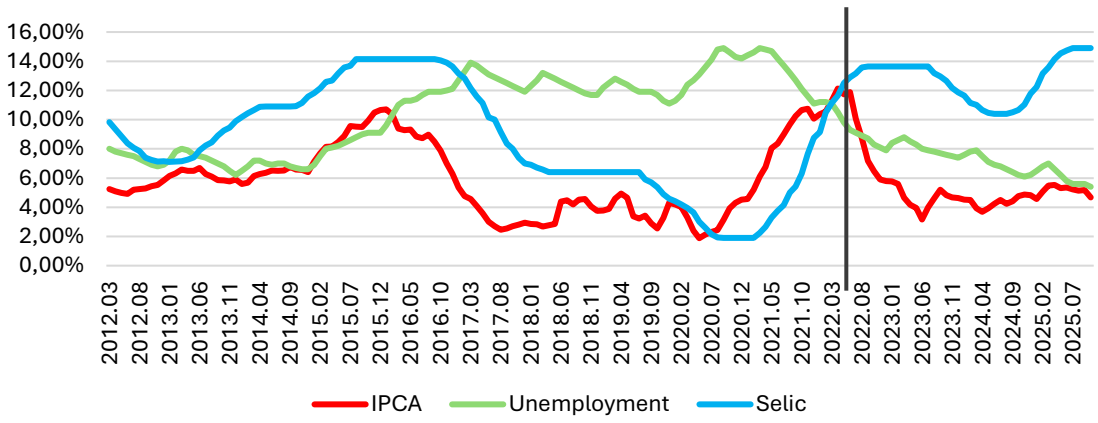
2. Literature

This section of the paper is subdivided into three blocks, aiming to develop the issues surrounding Brazilian inflation. In the first, the discussion focuses on presenting changes in the recent behavior of Brazilian inflation, with emphasis on the changing relationship between interest rates, unemployment, and inflation. The second block concentrates on the contemporary issue of indexation in the Brazilian economy, presenting recent data and evidence. Finally, the third is dedicated to the empirical literature on the subject, addressing the problem investigated, the models and variables employed, as well as the main results found.

2.1 Changes in inflation behavior

The starting point of the discussion lies in the relationship observed over recent years between inflation, the Selic rate, and unemployment. In New Keynesian models, both in traditional textbooks and in more sophisticated formulations such as the IS–PC–MR model, monetary policy operates fundamentally through the compression of aggregate demand and the output gap, affecting inflation with temporal lags. In practical terms, increases in the interest rate are expected to reduce inflationary pressure, although their effects on the labor market are neither immediate nor mechanical. However, the Brazilian case has proven adverse over the last five years. Figure 2 shows the trajectory of the three variables:

Figure 1 – Historical Behavior of the Selic Rate, IPCA, and Unemployment



Source: Institute of Applied Economic Research (IPEA); Brazilian Institute of Geography and Statistics (IBGE); Central Bank of Brazil (BCB), author's own elaboration.

The analysis begins in the 2013–2016 period, when the increase in the benchmark interest rate was accompanied by rising unemployment and a subsequent deceleration of

inflation, in line with the conventional prescription of monetary policy. In the following cycle, between 2016 and 2020, the data began to diverge from the expected behavior: the Selic rate reached historically lower levels, inflation remained close to 4% per year, and unemployment stayed high, contrary to expectations of a more robust labor market recovery. In the 2021–2022 biennium, the benchmark interest rate increased again in response to the adverse context resulting from the Covid-19 pandemic and its inflationary repercussions.

From 2022 onward, a considerable change occurred in the relationship among the variables. Regarding the Selic rate, it remained at elevated levels, while the IPCA stayed around 4.5% per year and the unemployment rate declined to the lowest levels in the historical series, reaching 5.1% in December 2025. This behavior deviates from what would be expected based on traditional macroeconomic theory.

To reinforce and better delimit the beginning of this dynamic, the structural break test of Clemente Montañés Reyes (1998) was employed. In summary, this test analyzes changes in the mean of the time series. In the case of the IO (Innovational Outlier) model, it captures gradual changes, whereas the AO (Additive Outlier) model focuses on abrupt changes. Given this, the Clemio (IO) test with two breaks was performed in Stata 11 using accumulated 12-month inflation data between January 2004 and December 2025. The results indicate two breaks, the first in December 2020 and the second in May 2022, both with a p-value of 0.000, ensuring the statistical significance of the results. The model with a single break was not reported due to its high p-value[2].

The first break refers to the context of the Covid-19 crisis and presented a positive beta of 0.36, meaning that this adverse scenario contributed to the increase in inflation. On the other hand, the second break, marked in May 2022, reinforces the argument regarding the possibility of changes in the behavior of the aforementioned variables, with a beta of -0.45. Finally, these findings contribute to the construction of a dummy variable that will be used in the final model of this study, assuming the value 1 for the months following May 2022.[3].

[2] The Clemio1 test with a single break was also performed using the inflation rate of change and presented statistical significance at the 10% level in February 2022. Since the dependent variable is accumulated inflation and a 5% confidence interval is adopted, the result was disregarded, although it reinforces the argument of a structural break at the aforementioned moment.

[3] The justification for not using the 2020 break in the model lies in two factors. The first is that the 2020 shock was strictly linked to the exceptional and temporary scenario of the Covid-19 pandemic. The second

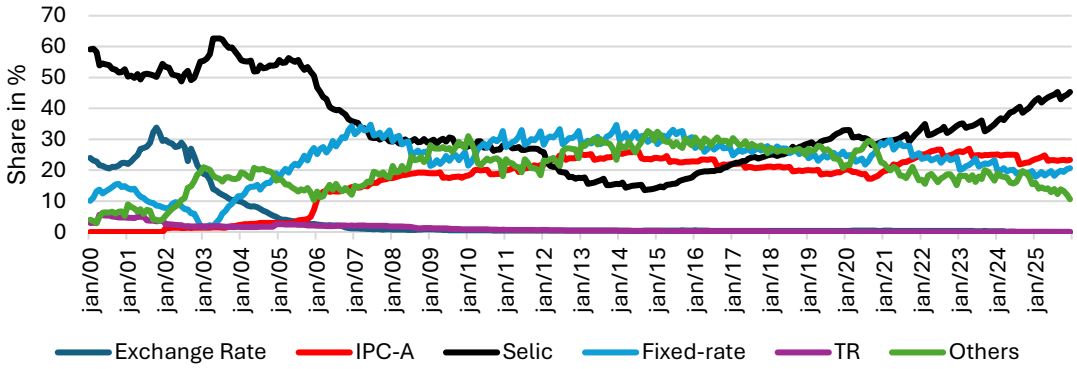
These stylized facts from the last five years, together with the econometric test, suggest the need to consider additional factors, such as supply shocks, indexation mechanisms, labor market characteristics, and the composition of inflation, in order to understand the limits of monetary policy in the recent context.

2.2 Contemporary Indexation in the Brazilian Case

As discussed in the first part of this chapter, Brazil presents several mechanisms of economic indexation that remain in place even after the Real Plan, with three standing out as the most emblematic. To briefly recall, indexation is a mechanism for the automatic adjustment of prices, wages, and contracts based on an index. In the aforementioned cases, this is formal indexation, although it may also be informal. In this case, price pass-through occurs even in the absence of an explicit contractual agreement, more commonly found in firms with high market power.

The first case concerns public debt itself. According to data from the Central Bank of Brazil, 45.27% of government bonds are indexed to the Selic rate (LFTs), an increase of 28 percentage points over ten years, while another 23.38% are indexed to the IPCA (NTN-B), totaling 68.25%. Figure 2 presents the composition of National Treasury (TN) bond indexation. Consequently, whenever the BACEN raises interest rates to contain inflation, it indirectly increases both the public debt and the remuneration of bondholders. In this regard, part of the literature discusses the "Reverse Financial Income" effect.

Figure 2 – Composition of Brazilian Public Debt



Source: Central Bank of Brazil, author's own elaboration.

reason is that, when estimating alternative NARDL models, one with the 2020 dummy and another with the 2022 dummy, the dummy referring to 2020 did not present statistical significance, indicating that its inclusion would not add explanatory power to the research.

The second example of indexation is found in the contracts prevailing in the economy. In the Brazilian case, several contracts are linked to some type of indexation mechanism. Inspired by the work of Santos & Oreiro (2022), Table 1 was prepared to summarize the contracts, their indexers, and the type of price involved.

Table 1 – Contracts and Their Indexers

Contracts	**Indexer**	**Price Group**
Consumer energy prices	IGP-M ou IPCA	Administered prices
Telecommunications service prices	IGP-M ou IPCA	Administered prices
Water services	IPCA	Administered prices
Individual medical assistance	80% IVDA, 20%	Administered prices
Property rental contracts	IGP-M ou IPCA	Housing prices
Drug price ceiling	IPCA	Administered prices
Pensions	INPC	Not a price
Real estate financing	TR, IPCA	Financial price

Fonte: Santos & Oreiro (2022), author's own elaboration.

The Extended National Consumer Price Index (IPCA), calculated by the Brazilian Institute of Geography and Statistics (IBGE), is the main indicator of consumer inflation in Brazil and serves as the reference for the inflation targeting regime. The General Market Price Index (IGP-M), calculated by the Getulio Vargas Foundation (FGV), tracks price developments across different stages of the economy and is composed of 60% IPA-M (wholesale), 30% IPC-M (retail), and 10% INCC-M (construction sector) (Portal FGV, 2025). The IVDA is the Healthcare Expenditure Variation Index, used in the health sector as a reference for adjusting health insurance plans and hospital costs (GOV.BR, 2025a). The INPC, also calculated by the IBGE, measures inflation for essential goods and services consumed by families earning between 1 and 5 minimum wages (IBGE, 2026a). Finally, the TR, or Reference Rate, is used in savings accounts, pension adjustments, and some long-term loans (Santander, 2025).

Given this context, Abrita and Dathein (2019) demonstrate how Brazil possesses an institutional organization that enables these indexation mechanisms, resulting in inflationary inertia. The authors show how adjustments based on past inflation remain present, especially in administered prices, wages, and long-term contracts, contributing to inflationary rigidity and reducing the effectiveness of conventional monetary policy.

Following this discussion, it is possible to return to the article by Santos & Oreiro (2022) and highlight three problems. The first is that if one sector faces no cost pressure

while another does, the former will still experience a type of price contamination. The second is that, due to indexation, even in a context without shocks, there will still be an inertial effect resulting from past shocks that continue to propagate over time. Finally, when a temporary shock occurs, it tends to become incorporated into the time series because of its slow dissipation, when it dissipates at all. The direct consequence is that it hinders the functioning of the instruments used to contain inflation.

The last case deserving emphasis is the formal indexation of the minimum wage. Starting in 2006, a rule was adopted, later enacted into law in 2011 and remaining in force until 2019, which guaranteed that the minimum wage would be adjusted according to inflation plus the highest economic growth rate recorded in the previous two years, provided that growth was positive. However, Law No. 14,663/2023 was enacted in August 2023, establishing that, as of January 1, 2024, the minimum wage would follow a new adjustment rule, according to the Federal Government of Brazil website (2025b):

> ... the annual adjustments of the minimum wage will take into account the inflation measured by the National Consumer Price Index (INPC) over the previous 12 months, plus the real growth rate of the Gross Domestic Product (GDP) from the second year prior to the current year. If the GDP does not present real growth, the minimum wage will be adjusted according to the INPC.

However, in 2024, Bill No. 4614 was introduced (and enacted in the same year), aiming to limit the real increase of the minimum wage to a maximum of 2.5% (SENADO, 2024). Considering this ceiling, the wage adjustment rule could be formalized as follows:

$$w_t = w_{t-1}(1 + INPC_{t-1} + \min\{\max[g_{t-2}, 0]\,, 2{,}5\%\}) \qquad (2.1)$$

Therefore, if economic growth exceeds this value, the pass-through is capped at 2.5%. On the other hand, if there is no growth, the adjustment will consist only of the National Consumer Price Index (INPC). Finally, growth may fall between zero and 2.5%, in which case this value is added to the INPC to generate the real increase in the minimum wage.

Undeniably, the rationale for maintaining a minimum wage for the population is of utmost importance. According to Arantes (2020), ensuring a minimum income over the last 20 years has been crucial for improving people's quality of life. However, having the minimum wage indexed may generate spillover effects on prices, as previously discussed. Bresser & Nakano (1984) already pointed out that, in the Brazilian context, firms had the

ability to pass their costs[4] on to prices, which would prevent inflation from declining regardless of aggregate demand, and wages constitute one of these costs. On this issue, Abrita and Dathein (2019) deepen the discussion by demonstrating that, in a context of distributive conflict, cost increases arising from wages may contribute to the perpetuation of inflation through inertial mechanisms. Such mechanisms would operate as instruments of protection for economic agents, allowing them to preserve their share of income and secure their portion of wealth.

The traditional framework assumes that, when inflation does not converge to the target, the Central Bank raises interest rates in order to affect variables such as the exchange rate and long-term interest rates, thereby reducing aggregate demand and inflationary pressure. However, since the Real Plan, inflation has frequently remained above the target, even in an environment of high interest rates. Part of this difficulty is attributed to the persistence of indexation, since automatic adjustment mechanisms reduce the effectiveness of orthodox monetary policy measures. Thus, it is argued that the Real Plan did not promote a complete deindexation of the economy, preserving residual elements of this practice, whose maintenance was also linked to the political viability of the plan (Carvalho, 2014; Paes, 2019).

2.3 Empirical Review

In recent years, several studies have been presented to analyze the behavior of Brazilian inflation. In this sense, the purpose of part two is to conduct a literature review of selected studies in order to bring to light their theses, models, variables employed, and the results obtained. The justification for this section lies in assisting the development and execution of the model proposed in this study.

Summa e Macrini (2014) and Braga, Malher e Paula (2023) investigate the determinants of Brazilian inflation, highlighting the role of inflationary inertia, imported inflation, and domestic costs. The first article employs variables such as inflation acceleration, output gap, imported inflation, and interest rates, using an artificial neural network system capable of capturing both linear and nonlinear relationships. The results point to inflationary inertia, imported inflation, and variations in the Selic rate as the main

[4] A relevant detail concerns the impact of labor costs on firms' balance sheets. According to Giovani and Carvalho (2015), this type of variable proves to be more influential in labor-intensive sectors, especially in the service sector (non-tradables), in which, according to the tests conducted by the authors, labor cost pass-through exerted a greater influence on price acceleration. To provide a clearer perspective, in 2024 the service sector accounted for approximately 60% of GDP in Brazil (IBGE, 2026b).

determinants of inflation. Along the same lines, Braga, Malher e Paula (2023) argue that Brazilian inflation is predominantly explained by cost pressures. Using a VEC (Vector Error Correction) model, the authors analyze the 2000–2022 period based on wages, external costs, and aggregate demand. The results indicate that the main determinants of inflation were imported inflation, administered prices, and wage inflation, in addition to the statistical significance of lagged inflation in explaining inflation itself, reinforcing the presence of inflationary inertia.

Regarding the issue of the price-puzzle, namely the idea that, in the short run, an increase in the Selic rate would initially lead to higher inflation before subsequently causing it to decline, there are several studies focused on this topic. Among them are Kawamoto & Oreiro (2011), Paes (2019), and Ferreira (2017), all of which identify the effect in the Brazilian context, as well as the low magnitude of inflation's response to shocks in the benchmark interest rate. The main models employed were VAR, VEC, and FAVAR, with emphasis on the following variables: inflation, exchange rate, industrial production, SELIC, output gap, commodities, and inflation expectations.

With regard to the discussion on indexation and inertia, the theoretical logic of the inflation targeting regime assumes that, through the management of the short-term interest rate, inflation would converge toward the established target. However, acting strictly through this instrument proves to be limited, especially when only a single aggregate indicator for the entire economy is considered. In this sense, one theoretical strand proposes the decomposition of inflation, for example into free and administered prices, or by sectors of activity, as an analytical strategy. Such a procedure allows for greater precision in identifying the sources of price variation and in evaluating the transmission mechanisms of monetary policy. (Cerqueira e Martinez, 2011; Braga e Summa, 2014). Furthermore, these studies show how the IPCA is strongly influenced by the exchange rate and commodities, in addition to identifying the presence of inflationary inertia, especially Braga e Summa (2014).

Concomitantly, Oreiro & Santos (2022) also address the issue. An important difference from the previous studies was the use of GMM (Generalized Method of Moments) as the method, which allows for the analysis of endogeneity relationships among the variables. Regarding the variables, several price indicators are employed, such as: Free IPCA, Full Price IPCA, IGP-M (General Price Index – Market), and IPA (Broad Producer Price Index). For the explanatory variables, the following were selected:

effective import exchange rate with monthly values, output gap obtained through the HP filter applied to the IBC-Br, real short-term interest rate, and finally, the average inflation expectation for the next 12 months. The results showed a strong presence of inflationary inertia.

Finally, another essential study used in this work is that of Neto & Alves (2025), which employs the NARDL model to capture asymmetries in exchange rate shocks on inflation. The article develops both time series tests and those specifically related to the model, such as asymmetry, cointegration, ECM (Error Correction Models), and the graphs showing the behavior of shocks. Regarding the variables employed, the authors use 12-month accumulated IPCA rate of change, quarterly GDP growth, exchange rate, annualized overnight Selic rate, terms of trade index, and other price indicators, since they were also interested in analyzing the existence of asymmetry. Their results indicate that there is asymmetry between exchange rate depreciation and appreciation effects on inflation.

3. Methodology, Database, and Preliminary Results

The objective of this chapter is to present, in three parts, the empirical side of the study. It begins with the methodology, in which the model to be used is explained, including its theoretical construction, main aspects, advantages, and disadvantages. Next, the database is presented, discussing the studies that served as references for the selection of variables, which variables were chosen, and how they were prepared to estimate the model. Finally, the preliminary results and their economic interpretation are presented.

3.1 Methodology

The model employed in this study is the NARDL (Nonlinear Autoregressive Distributed Lag), a development of the ARDL (Autoregressive Distributed Lag) model. The ARDL provides consistent estimates of long-run coefficients, asymptotically normal, regardless of whether the regressors are I(0) or I(1), provided they are not I(2) or higher. In addition, it presents long-run superconsistency, in which the coefficients converge more rapidly to their true values, mitigating problems associated with small samples, which is possible due to the cointegration among the variables (Pesaran & Shin, 1997). Another relevant characteristic of the ARDL is its ability to reduce problems of endogeneity and serial autocorrelation of the residuals. This occurs because the inclusion of appropriate lags of the dependent and explanatory variables allows the model to capture

the dynamics of the system and reduce biases related to the correlation between the regressors and the error term (Pesaran & Shin, 1997).

However, nonlinear modeling was traditionally restricted to ECM (Error Correction Model) frameworks, mainly focused on short-run dynamics. In this context, Shin et al. (2014) developed the NARDL model, allowing the joint analysis of short- and long-run asymmetries. To achieve this, the model modifies the ARDL through the decomposition of the explanatory variables into positive and negative shocks, admitting that variations with different signs may generate different effects on the dependent variable. Therefore, the main difference in relation to the linear ARDL lies precisely in this decomposition, making it possible to identify asymmetries when the impacts of positive and negative shocks are not equivalent. In addition, the NARDL incorporates a more flexible structure to model dynamic relationships, reducing problems of serial correlation and allowing the simultaneous analysis of short- and long-run adjustments through the Error Correction Model (ECM).

Finally, the main tests associated with the NARDL model should be highlighted. The Error Correction Model (ECM) allows the separation of short-run dynamics from the long-run equilibrium adjustment through the correction term, COINTEQ, whose coefficient indicates the speed of return to equilibrium after deviations. To verify the existence of a long-run relationship among the variables, the Bounds Test is employed, whose null hypothesis indicates the absence of cointegration. Lastly, the Asymmetric Dynamic Multipliers describe the adjustment path of the dependent variable following positive and negative shocks, allowing the analysis of the speed of convergence, the persistence of the effects, and whether the observed asymmetries are transitory or permanent.

3.2 Database

The selected variables were: IPCA, the dependent variable; Selic Over, decomposed into positive and negative values to analyze the effects of monetary policy; the exchange rate, since, as highlighted in the literature, it generates a rapid and relevant impact on prices, capturing cost inflation through commodities and products from Brazil's trade basket; IPCA expectations, as both agents and the BACEN consider this information in decision-making; wages, one of the elements highlighted in the literature and part of this study's proposal; the IBC-Br, as a proxy for economic growth; and, finally, two

dummy variables. The first controls for crisis periods, considering the crisis cycles identified by Codace (Business Cycle Dating Committee), developed by the FGV, assuming value 1 for the last quarter of 2008 and the first of 2009. The second was constructed according to the Clemio test presented earlier, assuming value 1 for the months from May 2022 onward. Table 2 presents further details on the variables:

Table 2 - Variables, Data and Glossary

Variables	Description	Source
IPCA	Broad Consumer Price Index in % (12-month accumulated rate of change).	IBGE
Selic	12-month accumulated Selic Over Rate in %.	IPEA
IPCA Expectations	Average Inflation Expectations (Accumulated rate for the next twelve months in %).	BCB
Exchange Rate	Exchange Rate - U.S. Dollar - Buy Rate - End of Period.	BCB
Wage	Real Minimum Wage Adjusted by the INPC.	IPEA
IBC-Br	Central Bank Economic Activity Index, seasonally adjusted.	IPEA
DummyCrises	Captures the subprime crisis.	FGV
Dummy2022	Binary variable capturing changes from May 2022 onward.	Author

Source: IBGE: Brazilian Institute of Geography and Statistics; BCB: Central Bank of Brazil; IPEA: Institute for Applied Economic Research; FGV: Getulio Vargas Foundation.

All variables are monthly, with the sample beginning in January 2004 and extending to December 2025. Two models will be estimated, with March 2012 serving as the cutoff date. The justification is to econometrically demonstrate that this year is relevant to the discussion of inflation and unemployment. Given this, the models will be identical to each other, differing only in the sample period and the dummy variable employed.

Considering that the NARDL model allows the use of variables integrated of order I(0) and I(1), as well as the superconsistency property of the estimators, which mitigates limitations arising from relatively short samples, the decision was made to maintain the specification as simple as possible. Thus, no additional transformations were performed on the variables, such as deflation (the wage variable was already collected deflated by the IPEA) or conversion into indices.

In this study, inflation is understood as the general price level of the economy. Consequently, in a situation where the BACEN raises its benchmark interest rate,

representing a contractionary measure for the economy, the expected outcome is a reduction in the inflation level [represented by the negative sign in equation (3.9)]. Conversely, expansionary monetary policy implies the opposite effect [(represented by the positive sign in equation (3.10))]. These equations represent the asymmetric relationship captured by the model:

$$IPCA_t^- = \sum_{i=1}^{t} \Delta Selic_{i-j}^+ = \sum_{i=1}^{t} \max(\Delta Selic_{i-j}^+, 0) \tag{3.9}$$

$$IPCA_t^+ = \sum_{i=1}^{t} \Delta Selic_{i-j}^- = \sum_{i=1}^{t} \min\left(\Delta Selic_{i-j}^-, 0\right) \tag{3.10}$$

Next, the model becomes generically represented by the Conditional Error Correction Model equation (NARDL-ECM), recalling that μ represents the intercept and t a time trend, as shown below in (3.11):

$$\begin{aligned}\Delta IPCA_t = {} & \mu + \beta_0 t + \beta_1 IPCA_{t-1} + \beta_2 ExchangeRate_{t-1} \\ & + \beta_3 ExpectationsIPCA_{t-1} + \beta_4 Wage_{t-1} + \beta_5 IBC_{t-1} \\ & + \beta_6 Selic_{t-1}^+ + \beta_7 Selic_{t-1}^- + \sum_{i=1}^{p} \beta_8 \Delta(IPCA_{t-i}) \\ & + \sum_{i=1}^{p} \beta_9 \Delta(Selic_{t-i}^+) + \sum_{i=1}^{p} \beta_{10} \Delta(Selic_{t-i}^-) \\ & + \sum_{i=1}^{p} \beta_{11} \Delta(ExchangeRate_{t-i}) \\ & + \sum_{i=1}^{p} \beta_{12} \Delta(ExpectationsIPCA_{t-i}) + \sum_{i=1}^{p} \beta_{13} \Delta(Wage_{t-i}) \\ & + \sum_{i=1}^{p} \beta_{14} \Delta(IBC_{t-i})\end{aligned} \tag{3.11}$$

The first eight betas refer to the long-run relationships among the variables. They are used in the Bounds Test to analyze cointegration. On the other hand, the remaining coefficients capture the short-run dynamics, assisting in the study of, for example, transitory shocks and their propagation over time.

3.3 Preliminary Results

The objective of section 3.3 is to present the econometric results obtained. It is subdivided into two parts. In the first, a model covering the period between 2004 and 2012 will be estimated, with the main objective of showing that 2012 represents a relevant milestone for the study of inflation and that, from this year onward, inflation began to exhibit characteristics distinct from those previously observed. The second part contains the main objective of the study: the analysis of inflation dynamics and its relationship with the minimum wage from 2012 onward. This section presents all diagnostic tests, the correlation among variables, the tests specific to the NARDL model, and the final interpretations.

It is worth emphasizing that the same variables will be employed: IPCA, Selic, IPCA_Expectations, Exchange Rate, IBC-Br, and Minimum Wage. The only differences concern the dummy variables, since the first part will use the crisis dummy while the second will employ the Clemio2 break dummy, as well as the different sample periods of the series.

3.3.1 Analysis between 2004 and 2012

As stated in the introduction to subsection 3.3, the objective of this part is to econometrically demonstrate that, before 2012, inflation dynamics exhibited characteristics distinct from those observed after this date. In other words, to justify the starting point of the main model of this study.

The first necessary step is to perform stationarity tests on the time series. According to Bueno (2011), a series is stationary over time when it presents constant mean and variance. Thus, although the model allows for non-stationary variables, it is imperative to analyze their order to ensure that none exceeds I(1). Therefore, the ADF (Augmented Dickey-Fuller), PP (Phillips-Perron), and KPSS (Kwiatkowski-Phillips-Schmidt-Shin) tests will be employed. The results obtained indicated that all variables are at most I(1), satisfying a prerequisite of the NARDL model, with emphasis on the IPCA and IPCA Expectations, which were stationary at level according to the KPSS test.

Proceeding to the residual diagnostic tests, the model presents homoscedasticity, absence of serial correlation, and residuals that follow a normal distribution. Therefore, by satisfying the main consistency tests, the model reinforces the validity of the results obtained.

Concluding the diagnostic stage of the model before moving to the NARDL tests, it is of utmost importance to analyze the multicollinearity of the variables and the structural break tests CUSUM and CUSUM of Squares (CUSUMQ). Regarding the first issue, the Variance Inflation Factors (VIF) test is employed, with the results showing values below 3 for the short-run variables, which is an excellent indication. Finally, in the recursive sums, the model presented stability at a 5% significance level, although at the beginning of 2009, in the CUSUMQ test, the model reached the boundary of the interval.

With regard to the results of the NARDL tests, there are four in total: Bounds Test, Asymmetry, ECM, and Dynamic Multipliers. Their proper development and practical detailing will be addressed in the next section. At this stage, only the main results will be presented, highlighting a pattern of behavior among the variables between 2004 and 2012 that will not be found in the subsequent sample period.

The first test is the cointegration test of the variables. The reported F-statistic was 3.77, a value higher than the 5% critical bound for I(1), which was 3.28. Therefore, cointegration exists. This first test serves to satisfy a requirement of the model. Next comes the asymmetry test. The reported long-run value was 0.77, a result that does not reject the null hypothesis (H_0: symmetric). However, in the short run and in the joint short- and long-run analysis, the reported value was NA, meaning that the model was unable to conclude the relationship among the variables.

This result can be observed in the dynamic multipliers, where it was possible to conclude that inflation behavior following a Selic shock was consistent with macroeconomics textbooks. In other words, increases in the benchmark interest rate reduced inflation, by up to -0.15%, while cuts in the Selic increased inflation by 0.15%.

Finally, the “Error Correction” and “Conditional Error Correction” tests were performed. Regarding the first test, the COINTEQ found was 14.22% with a p-value of 0.000, indicating a low degree of inflation convergence toward equilibrium. Since the objective is to emphasize the differences, only the minimum wage variable will be discussed. In the short run, it presented statistical significance for Wage(0, -2), meaning that the variable in level and with two lags influenced inflation. Subsequently, the result found in the Conditional Error Correction was analogous, such that Wage(-2) was relevant both in the short run and in the long run. Other noteworthy results are that the Exchange Rate, IBC, and Selic were not reported in the short run.

Given the above, some results can be highlighted for comparison with the next section of the study. First, the absence of asymmetries in Selic shocks suggests that, before 2012, the interest rate instrument behaved as expected according to textbook theory. In addition, the ECM showed that the minimum wage, and its lagged values, were relevant in explaining inflation dynamics. It now remains to understand how this macroeconomic dynamic behaved from 2012 onward.

3.3.2 Post-2012 Analysis

Entering the second part itself, its structure will follow a pattern similar to the first, although in greater detail. It begins with the stationarity and diagnostic tests, before moving to the NARDL model and the interpretation of its results.

In Starting with the first set of tests concerning the stationarity of the variables, the ADF, PP, and KPSS tests were performed. All indicate that the series are at most I(1), as shown in Table 3 below:

Tabela 3 Table 3 – Stationarity Tests

Discriminação	ADF	PP	KPSS	Ordem
IPCA	0,18	0,23	0,12*	I(1)
Selic	0,26	0,78	0,2*	I(1)
Expectations IPCA	0,37	0,35	0,63	I(1)
Exchange Rate	0,58	0,58	1,47	I(1)
Wage[5]	0,79	0,3	1,22	I(1)
IBC-Br	0,45	0,61	0,54	I(1)

Source: Author's own elaboration. Variables in Levels. Critical values at 5% ignificance. The reported values refer to the p-value for ADF and PP: H_0 = unit root; KPSS: H_0 = stationarity. The '*' indicates that the null hypothesis is accepted at 5%.

As can be observed, all variables are non-stationary according to the ADF, PP, and KPSS tests, with the exception of the IPCA and Selic. Usually, it would be necessary to apply the first difference, but since the chosen model is the NARDL, this will not be necessary.

Next, it is necessary to analyze the model residuals in order to provide greater robustness to the results obtained. Initially, the lags were selected according to the Akaike criterion (AIC), seeking to mitigate possible serial correlation problems and maintain the efficiency of the model. Regarding the LM (Lagrange Multiplier) test, which verifies the

[5] In the ADF test, the wage variable was only found to be stationary at the second difference. However, it was stationary at the first difference in both the PP and KPSS tests.

existence of serial correlation in the residuals, a Prob. F(1,14) of 0.32 was obtained, indicating acceptance of the null hypothesis at the 5% level, with no detection of serial correlation. As for the normality of the residuals, the Jarque-Bera test presented a p-value of 0.0469. Although the result indicates rejection of the null hypothesis at the 5% level, the value is borderline. Finally, homoscedasticity was evaluated using the Breusch–Pagan test (the White test was not applied because EViews indicated an insufficient number of observations), whose null hypothesis corresponds to the homoscedasticity of the residuals. The p-value obtained was 0.749, leading to acceptance of the null hypothesis. Thus, it is concluded that the model satisfies important econometric assumptions for a consistent and reliable estimation.

The next step consists of the CUSUM and CUSUM of Squares (CUSUMQ) tests, which aim to verify the structural stability of the model. The CUSUM graph indicates that the parameters remained stable, with the series staying within the 5% critical bounds. Similarly, the CUSUMQ test confirms this stability, since the trajectory of the squared residuals does not exceed the significance bands, despite a temporary approximation at the beginning of 2023. These results reinforce that no relevant structural breaks occurred.

In order to provide greater robustness to the model, multicollinearity among the explanatory variables was analyzed through the Variance Inflation Factors (VIF). The variables in levels presented high values due to sharing the same long-run behavior, something typical of time series data. In contrast, the variables in differences, which represent the short run, presented low values (smaller than 3), evidencing the absence of relevant multicollinearity in this dimension of the model. Thus, to assess in greater detail the relevance of the long-run relationships, a Wald test of joint restriction[6] was performed. The reported p-value was 0.000, indicating that the explanatory variables are not redundant. In other words, the set of explanatory variables exerts a statistically significant influence on inflation in the long run.

Proceeding to the NARDL tests, the first to be addressed is the Bounds Test, which analyzes whether the model presents cointegration, allowing an understanding of the long-run behavior of the variables. The test resulted in an F-statistic of 4.8, which exceeds the upper critical value I(1) at the 1% level. Therefore, the null hypothesis of no long-run

[6] The following null hypothesis was tested: H_0: $C(1) = C(2) = C(3) = C(4) = C(5) = 0$. Em outros termos, seria equivalente dizer se $IPCA(-1) = IBC(-1) = WAGE(-1)EXCHANGE_RATE(-1) = IPCAEXPECTATIONS(-1) = 0$. The constant term is represented in this model by C(6).

relationship is rejected, confirming the existence of cointegration among the variables in the model. Economically, this means that inflation is cointegrated with the vectors of the independent variables (Selic, Expectations, Exchange Rate, Wage, and IBC-Br).

Table 4 – Critical Values of the Bounds Test

	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Aymtotic	1,99	2,94	2.27	3.28	2,88	3,99

Source: Author's own elaboration. Generated in EViews 13.

Once the existence of long-run cointegration has been validated, it becomes possible to proceed to the analysis of short-run dynamics. Thus, the next element to be analyzed is the ECM, which provides the adjustment parameter of inflation toward its long-run equilibrium over time. Only the statistically significant variables and lags were reported in Tables 5 and 6.

As can be observed in Table 5, the speed of inflation correction is 11.74% per month, a value considered low. This result indicates that inflation presents high resilience in the process of convergence toward its long-run trajectory. Such a result is consistent with the literature developed throughout this study, which identifies how inflation faces difficulties converging to the target and ultimately requires high levels of the benchmark interest rate to ensure convergence to the target.

This inflationary resilience is also observed in the lag structure of the model. In the case of the IPCA, it is possible to note that past inflation influences current inflation for one month. In addition, Expectations deserve attention for exerting both a contemporaneous and persistent influence, as does the Exchange Rate.

Table 5 – Short-Run Dynamics – Error Corrections

COINTEQ*	Statistically significant variables
-0,1174 (0,000)	D(IPCA [-1]), D(Expectations [0, -2, -3]); D(Exchange Rate [0,-1,-2]), D(Selic[0]), D(IBC-Br [-1]), Dummy[0]

Source: Author's own elaboration. Generated in EViews 13. Lags in brackets.

Concomitantly, another result that deserves emphasis is the lack of statistical significance of the wage variable in the model. Economically, this means that minimum wage indexation did not prove individually relevant in the short run for explaining variations in the IPCA during the analyzed period.

Table 6 – Short- and Long-Run Dynamics – Conditional Error Correction

Statistically significant variables
IPCA(-1), Expectations (-1), D(IPCA [-1]), D(Expectations [0, -3]); D(Exchange Rate [0,-1,-2]), D(Selic[0]), D(IBC-Br [-1]), Dummy[0]

Source: Author's own elaboration. Generated in EViews 13. Lags in brackets.

Furthermore, in the Conditional ECM, which in addition to encompassing the short run provides a more detailed analysis of the long-run variables, as shown in Table 6, the wage variable again did not present statistical significance, including without the use of lags. Therefore, considering the results obtained, the minimum wage variable did not prove individually relevant, although the set of explanatory variables presents a statistically significant influence on inflation.

Next comes one of the most important NARDL tests, namely the symmetry test and the shock graphs for the variable. Table 5 presents the results of the symmetry test for the variables in both the short and long run. As can be observed, the null hypothesis was accepted in both the long run and the short run considering a 5% critical value, although it reaches a borderline value for the joint result. Given this evidence, the analysis of the accumulated dynamic multipliers becomes fundamental, as they allow a graphical visualization of the magnitude and response time of inflation to positive and negative shocks in the Selic rate.

Table 6 – Symmetry Test

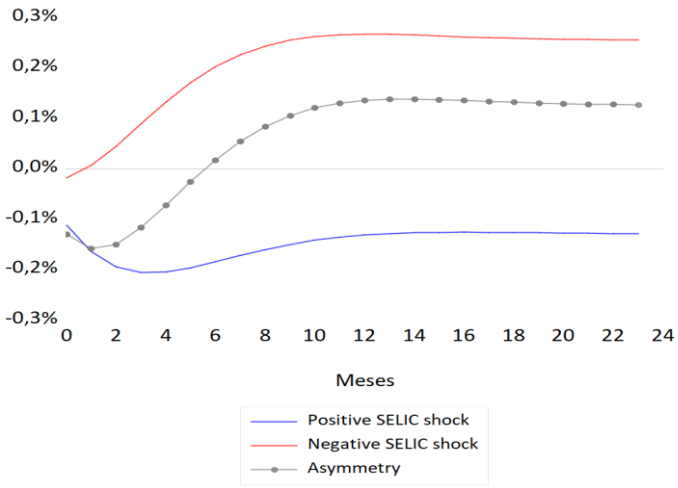
Long-Run	
Selic	0,0707
Short-Run	
Selic	0,0715
Long-Run and Short-Run	
Selic	0,0545

Source: Author's own elaboration using EViews 13; Note: H_0: Symmetric; the reported values refer to the p-value.

Finally, the last NARDL element to be presented is the dynamic multipliers. Figure 4 shows the inflation response to shocks from positive and negative Selic values. On the vertical axis are the accumulated inflation values, while the horizontal axis represents the months. The blue line represents the response to positive shocks, that is,

increases in interest rates. Analogously, the red line shows contractionary monetary policy. The last line, in gray, represents the asymmetry between the responses.

Figure 3 – IPCA Responses to SELIC Shocks



Source: Author's own elaboration using EViews 13

It is important to explain the concept of asymmetry within this type of modeling framework. Asymmetry refers to the behavior of responses to shocks. If the behavior of the shocks is similar, the result will be symmetric. Figure 4 shows that, in the short run, there is a difference between the response to positive and negative shocks, and this difference persists in the long run. As shown in Table 5, the Wald test rejects the null hypothesis of symmetry for the set of short- and long-run responses (p-value of 0.0545). This statistical result allows us to proceed with a detailed analysis of the dynamics of these responses.

Turning specifically to the values, what is being shown is the effect of a 1 p.p. shock to the SELIC. In the case of contractionary monetary policy, ceteris paribus, a 1 p.p. increase in the Selic rate would result, in the first six months, in a reduction of inflation, beginning at -0.1%, reaching -0.2% after four months, and stabilizing in the long run at -1.5%. The same interpretation applies to expansionary monetary policy, but in this case the effect starts from zero and rises to 0.25% during the first ten months, stabilizing at 0.2%. Therefore, in the short run, contractionary monetary policy appears stronger, whereas in the long run expansionary policy gradually becomes more relevant. In summary, the graph indicates that increasing the benchmark interest rate generates an immediate effect on the economy and scales more rapidly, whereas cutting interest rates shows a slower inflation trajectory with slightly higher cumulative values.

From an interpretative perspective, the model's failure to detect the puzzle suggests that the theoretical dynamics associated with the immediate pass-through of costs in the short run did not prove dominant during the analyzed period. Thus, increases in working capital costs or other cost components, such as the minimum wage, were not shown to be relevant over the last thirteen years in generating an initial rise in inflation during the first months after the monetary shock, followed only later by the expected behavior of the IPCA.

Continuing, even though the study did not find the puzzle, the magnitude of inflation responses to monetary shocks is quite small. For clarification purposes, no shock accumulated effects close to 1%, which is also observed in studies such as Paes (2019) and Kawamoto & Oreiro (2011). In other words, although the behavior of the shocks differs from what the empirical literature had indicated, the results converge toward evidence of the low power of monetary policy.

Thus, the first point to be considered in understanding these results is the difference in the time periods analyzed. Most empirical studies examine data up to 2018, using VAR models. In contrast, this study begins the sample in 2012 and employs a NARDL model, which allows the examination of asymmetries in the transmission of monetary policy. The change in time period and methodology alone, however, is not sufficient to explain the findings of the tests.

Indeed, it becomes imperative to discuss the roles attributed in the literature and in the economic debate to indexation mechanisms, especially wage indexation. The results obtained suggest that the minimum wage does not appear as a central factor in short- and long-run inflation dynamics, as shown by the ECM and Conditional ECM test results. This finding motivates a more careful analysis of the way indexation operates and of its influence on inflation.

In this context, recent evidence of persistently high interest rates (as shown in Figure 1), inflation resistant to convergence, and declining unemployment suggests that the monetary policy transmission mechanism may have changed over recent years. Thus, the absence of the price-puzzle in this study does not imply that the previous literature is mistaken, but rather points to the hypothesis of structural changes in the dynamics among interest rates, inflation, and economic activity in contemporary Brazil.

The proposed explanation for understanding this change lies in inflation persistence associated with indexation mechanisms, which tend to reduce the sensitivity of the IPCA to monetary shocks. Even after the implementation of the Real Plan, the literature points to the persistence of price pass-through and indexation mechanisms, suggesting that the plan did not completely eliminate the so-called "inflationary memory" of the Brazilian economy.

As discussed, the current Brazilian scenario presents several examples of the persistence of indexation and its negative consequences. As shown, public debt contains a large quantity of indexed bonds (LFTs in the case of the Selic), generating effects contrary to those expected. Concomitantly, there is an institutional organization that ensures indexation mechanisms remain lawful and applied in practice through contracts. Finally, despite initial expectations, the thesis that minimum wage adjustments would act as a central element in the propagation and rigidity of inflation did not find empirical support in the model estimated for the analyzed period.

4. Final Considerations

This study aimed to discuss and analyze the current difficulty faced by monetary policy in ensuring the convergence of inflation toward the target. It starts from the premise that formal and informal indexation mechanisms reduce the sensitivity of the economy to variations in the benchmark interest rate. The central hypothesis of the study was to evaluate whether the minimum wage plays a relevant role in the determination of inflation, especially in an environment marked by inflationary inertia.

To support this thesis, besides the historical development presented, an empirical analysis using the NARDL model was conducted, capturing asymmetries in shock transmission, the low magnitude of monetary policy impacts, and the absence of price-puzzle. Finally, the evidence indicated that minimum wage indexation did not prove to be a central element in explaining variations in the IPCA during the analyzed period.

5. Bibliography

ABRITA, Mateus Boldrine; DATHEIN, Ricardo. **Indexação e inércia inflacionária: uma interpretação institucional para o caso brasileiro**. *Revista Formação (Online)*, Presidente Prudente, v. 27, n. 51, p. 207-230, 2019. Disponível em: https://revista.fct.unesp.br/index.php/formacao/article/view/6506.

ARANTES, Daniel Jorge. **A dinâmica da política de salário mínimo e suas relações com o desenvolvimento econômico brasileiro**. *Economia em Revista,* setembro/dezembro 2022, v. 30, n. 3, p. 51-61, 2022.

BRAGA, Julia; SUMMA, Ricardo Figueiredo**. Estimação de um modelo desagregado de inflação para a economia brasileira.** *Revista de Economia Política*, São Paulo, v. 34, n. 4, p. 678–700, out./dez. 2014.

BRESSER-PEREIRA, Luiz Carlos; NAKANO, Yoshiaki. **Inflação e recessão**. São Paulo: Brasiliense, 1984.

CARVALHO, André Roncaglia de. ***The conceptual evolution of inflation inertia in Brazil.*** 2015. 239 f. Tese (Doutorado em Economia do Desenvolvimento) – Faculdade de Economia, Administração e Contabilidade, Universidade de São Paulo, São Paulo, 2015.

CLEMENTE, J.; MONTAÑÉS, A.; REYS, M. **Testing for a Unit Root in Variables with a Double Change in the Mean**. Economics Letters, Vol. 59, p. 175–182, 1998.

FERREIRA, Giuliano de Queiroz. **O price puzzle na economia brasileira no período de metas de inflação: evidência baseada na abordagem VAR e FAVAR.** 2017. Artigo acadêmico. Universidade Federal de Viçosa (UFV), Viçosa, 2017.

FILHO, M.; FILHO, F.; MILAN, M. **Por que a economia brasileira não cresce dinâmica e sustentavelmente? Uma análise kaleckiana e keynesiana.** Economia e sociedade, v. 25, p. 429-456, ago. 2016.

GIAMBIAGI, F.; VILLELA, A.; CASTRO, L. B.; HERMANN, J. (Org.). **Economia brasileira contemporânea: 1945-2010.** 2. ed. Rio de Janeiro: Elsevier, 2011.

GOV.BR. **Publicado decreto que reajusta salário mínimo para R$ 1.621 a partir de 1º de janeiro.** Disponível em: https://www.gov.br/ans/pt-br/assuntos/consumidor/reajuste-variacao-de-mensalidade/reajuste-anual-de-planos-individuais-familiares-1/metodologia-de-calculo. Acessado em: 30 jan. 2026b.

GOV.BR. **Reajuste anual de planos individuais/familiares/ Metodologia e cálculo.** Disponível em: https://www.gov.br/ans/pt-br/assuntos/consumidor/reajuste-variacao-de-mensalidade/reajuste-anual-de-planos-individuais-familiares-1/metodologia-de-calculo. Acessado em: 30 jan. 2026a.

GOV.BR. **Publicado decreto que reajusta salário mínimo para R$ 1.621 a partir de 1º de janeiro.** Disponível em: https://www.gov.br/ans/pt-br/assuntos/consumidor/reajuste-variacao-de-mensalidade/reajuste-anual-de-planos-individuais-familiares-1/metodologia-de-calculo. Acessado em: 30 jan. 2026b.

IBGE. **Índice Nacional de Preços ao Consumidor.** Disponível em: https://www.gov.br/planalto/pt-br/acompanhe-o-planalto/noticias/2025/12/publicado-decreto-que-reajusta-salario-minimo-para-r-1-621-a-partir-de-1o-de-janeiro#:~:text=O%20Di%C3%A1rio%20Oficial%20da%20Uni%C3%A3o,reajuste%20de%206%2C79%25. Acessado em: 30 jan. 2026a.

IBGE. PIB cresce 3,4% em 2024 e fecha o ano em R$ 11,7 trilhões. Disponível em: https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/42774-pib-cresce-3-4-em-2024-e-fecha-o-ano-em-r-11-7-trilhoes. Acessado em: 02 fev. 2026b.

KAWAMOTO, Carlos Tadao; OREIRO, José Luis. **Reavaliando a existência de um price puzzle no Brasil: implicações para o regime de metas de inflação**. *Anais do Encontro Nacional de Economia – ANPEC*, v. 1, p. 1–30, 2011.

LOPREATO, Francisco Luiz C. **Um olhar sobre a política fiscal recente**. *Economia e Sociedade*, Campinas, v. 11, n. 2 (19), p. 279–304, jul./dez. 2002.

MODONESI, Andre de Melo; MODONESI, Rui Lyrion. **Quinze anos de rigidez monetária no Brasil Pós-Plano Real: Uma agenda de pesquisa.** Revista de Economia Política, vol. 32, nº 3 (128), pp. 389-411, julho-setembro/2012.

NETO, Benito Adelmo Salomão; ALVES, Thaís Guimarães**. Efeitos assimétricos do câmbio para a inflação: evidência via NARDL para o Brasil.** Revista de Economia Política, São Paulo, v. 45, n. 3, p. e253679, 2025. Disponível em: http://dx.doi.org/10.1590/0101-31572025-3679.

OREIRO, José Luís; SANTOS, Julio Fernando Costa**. *The unfinished stabilization of the Real Plan: an analysis of the indexation of the Brazilian economy***. In: FERREIRA-FILHO, Fernanda; PAULA, Liuz Fernando de, (Org.). Central banks and monetary regimes in emerging countries. Cheltenham: Edward Elgar Publishing, 2022. p. 61-81. Disponível em: https://doi.org/10.4337/9781802203981.00010 .

PAES, Tânia A. G. **Falhas nos canais de transmissão da política monetária brasileira sob o RMI? Os casos do crédito do BNDES e das LFT**. Rio de Janeiro, 2019. Tese (Doutorado em Economia) – Instituto de Economia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2019.

PESARAN, M. Hashem; SHIN, Yongcheol. ***An autoregressive distributed lag modelling approach to cointegration analysis***. Cambridge: University of Cambridge, 1997. 33 p. Trabalho apresentado no *Symposium at the Centennial of Ragnar Frisch*, Oslo, 1995. Versão revisada: jan. 1997.

SHIN, Yongcheol; YU, Byungchul; Greenwood-Nimmo, Matthew. ***Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework***.

SUMMA, Ricardo Figueiredo; MACRINI, Leonardo. **Os determinantes da inflação brasileira recente: estimações utilizando redes neurais.** Nova Economia, Belo Horizonte, v. 24, n. 2, p. 279-296, maio/ago. 2014.

PORTAL FGV. IGP-M: Resultados 2025. Disponível em: https://portal.fgv.br/noticias/igp-m-2025. Acessado em: 30 jan. 2026.

SANTANDER. A Taxa Referencial (TR) é relevante ao investir? Disponível em: https://www.santander.com.br/blog/taxa-referencial-tr. Acessado em: 30 jan. 2026.

SENADO. Novas regras sobre reajuste do salário mínimo e acesso ao BPC vão à sanção. Disponível em: https://www12.senado.leg.br/noticias/materias/2024/12/20/novas-regras-sobre-reajuste-do-salario-minimo-e-acesso-ao-bpc-vao-a-sancao. Acessado em: 30 jan. 2026.

TERRA, Fábio Henrique Bittes; SILVA, Guilherme Jonas Costa da**. A armadilha ao investimento produtivo no Brasil: uma análise dos custos de oportunidade dos ativos financeiros.** In: ASSOCIAÇÃO KEYNESIANA BRASILEIRA. Dossiê da Crise IV: A Economia Brasileira na Encruzilhada. [S. l.]: Associação Keynesiana Brasileira, 2013. p. 123-130.