


Impact of macroeconomic conditions on presidential approval ratings

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Abstract

This paper investigates the relationship between macroeconomic indicators and presidential approval ratings in Brazil spanning from 1996 to 2023. Employing the Two Stage Least Squares technique of instrumental variables estimation to mitigate endogeneity issues within domestic macroeconomic indicators, the study explores the impact of the output gap, food inflation, real exchange rate and terms of trade on presidential approval. Controlling for each president's term and major political developments in the country, the analysis reveals statistically significant relationships between these macroeconomic factors and presidential approval, underscoring the profound link between the economy and the success of an incumbent administration.

Keywords

Politics, Presidential approval, Macroeconomics, Instrumental variables, Two stage least squares

Impacto das variáveis macroeconômicas na aprovação presidencial

Resumo

Esse artigo investiga a relação entre variáveis macroeconômicas e os índices de aprovação presidencial do período de 1996 até 2023. Utilizando a técnica de Mínimos Quadrados em Dois Estágios com variáveis instrumentais para mitigar problemas de endogeneidade, o estudo explora o impacto do hiato do produto, inflação de alimentos, da taxa de câmbio real e dos termos de troca na aprovação presidencial. Controlando pelo mandato de cada presidente e os principais acontecimentos políticos no país, a análise revela relações estatisticamente significativas entre esses fatores macroeconômicos e a aprovação presidencial, ressaltando a profunda ligação entre a economia e o sucesso de um governo em exercício.

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Palavras chave

Política, Aprovação presidencial, Macroeconomia, Variáveis instrumentais, Mínimos quadrados de dois estágios.

JEL Classification

E60, C32, F4.

1. Introduction

One of the pivotal themes in both Political Economy and Voter Behavior literature revolves around how the macroeconomic landscape can sway a president's chances of reelection, their popularity, and their overall accountability. This inquiry carries significant weight, as it delineates a roadmap for incumbent presidents in democratic nations, guiding their actions based on a distinct set of incentives. If the state of the national economy directly impacts presidential approval ratings, it becomes imperative for the incumbent to enact a series of economic policies aimed at fostering growth and curbing inflation. However, if it is evidenced that economic concerns do not weigh heavily on voters' minds when assessing an administration, the incumbent may opt against making challenging decisions to rectify the national economic trajectory.

The present study seeks to add to the existing literature on the relationship of macroeconomics and presidential approval in Brazil. The objective is to build a model incorporating key variables highlighted in literature on developed countries as significant factors influencing incumbent approval—namely, food inflation and domestic unemployment (investigated in our study through the output gap). This will be combined with variables previously identified in studies as impactful on Brazilian incumbent approval, with an additional focus on mitigating potential endogeneity issues in these indicators. The goal is to determine the effects of these variables withdrawing influences from government interventions on the approval rate.

Our main results underscore the well-established connection between presidential approval and the macroeconomic variables under examination, mainly output gap and food prices, along with the concept articulated by Ferreira and Sakurai (2013) as “personal charisma” an individual-specific

foundation for approval. In comparison to Ferreira and Sakurai, our main contribution was to add the variable food price, which has proved to be highly important to explain the presidential approval. However, these results are contingent upon addressing the endogeneity inherent in the indicators. This mitigation is achieved through the utilization of instrumental variables for the endogenous indicators and the application of the econometric technique known as Two Stage Least Squares.

The study unfolds as follows: Section 2 brings a lecture review and Section 3 entails a description of the model and an exposition of the variables employed. Section 4 deliberates on the treatments necessary for constructing a comprehensive database and conducts initial tests pertaining to the idiosyncrasies inherent in a time series database. Section 5 unveils the results of the estimations and engages in a discussion of some key features of these results; Section 6 conducts some robustness tests and Section 7, draws conclusions based on the findings and insights gathered throughout the study.

2. Literature Review

The notion that public satisfaction with governance and, consequently, electoral outcomes are influenced by economic factors has long been entrenched in both political discourse and scholarly investigation. Lewis-Beck and Stegmaier (2019), for instance, reference studies dating back to the 1930s that already explored this correlation. However, one of the seminal papers in this field is authored by Kramer (1971). In this work, the author analyses the correlation between economic metrics, particularly real income, and the percentage of votes garnered by the incumbent party in national elections in the United States. Kramer constructs his model on the premise that voters base their choice on the past performance of the incumbent party-opting for the status quo if the economy surpasses expectations and favoring the opposition if it does not.

Kramer merits providing a starting point for the analysis of the influence of macroeconomics in the electoral process not only by establishing an econometric model linking changes in the economic environment to votes received by the incumbent party, but also by identifying key indicators

in that relationship. And despite his results not showing the same strong effect for the relationship on presidential elections, the hypothesis that the satisfaction of the electorate with the incumbent continued to be explored and one key study in this subject was published in 1984 by Helmut Norpoth.

Norpoth (1984) devotes his paper to investigating the approval ratings of the United States president, a departure from focusing solely on the share of votes received in elections. Employing time series analysis, he assesses the influence of macroeconomic indicators on these approval ratings from 1961 to 1980, contrasting the impact of economic variables with political ones. Notably, Norpoth's selection of economic indicators diverges slightly from Kramer's. While Kramer emphasizes real income, inflation, and unemployment, Norpoth omits the income indicator and introduces a one-period lagged inflation variable to his analysis. This inclusion is motivated by the expectation that there is a delay in the impact of rising prices on presidential popularity.

The results of Kramer and Norpoth both pointed to an influence of inflation and a relative influence of unemployment in the political performance of the incumbent and their party in the United States.

Cerda and Vergara's (2007) paper addresses the phenomenon of economic voting in Latin America, drawing inspiration from Kramer's methodology. They examine the impact of Chile's macroeconomic performance on the percentage of votes garnered by the incumbent party in the presidential elections of 1989, 1993, and 1999 across various Chilean regions, employing panel data analysis. Their aim is to determine whether factors such as the unemployment rate and the output gap exert any influence on the electoral performance of the incumbent. The authors, then, conclude that the short-term fluctuations on the output trend have an influence on the president's electoral performance, with a positive deviation from the trend helping the incumbent's prospects and unemployment has an opposite effect. It means that an increase resulting in less votes for the incumbent, but this trend has a nonlinear component in which the increase in unemployment is more harmful to a president when the unemployment rate is low.

Ferreira and Sakurai (2013) investigate how various domestic and foreign macroeconomic indicators influence presidential approval in Brazil

during the period from 1999 to 2010, spanning the tenures of Fernando Henrique Cardoso and Luiz Inácio Lula da Silva. Their objective is to detect whether the primary driver behind approval stems from macroeconomic fluctuations or if there exists a component related to the persona of the presidents, which they label as individual charisma. The paper works with survey data from *Datafolha* to obtain the monthly approval for each president. Here they ran into the first issue, that those surveys are not conducted in a regular fashion, and they had to interpolate between the points they had to obtain a full dataset. Their findings reveal significant coefficients for both the unemployment rate and the minimum wage. The coefficient for unemployment is negative, indicating that higher unemployment rates tend to lower presidential approval, while the coefficient for the minimum wage is positive, suggesting that increases in the minimum wage correspond to higher presidential approval ratings. These results underscore the potential impact of these economic variables on presidential approval. However, they have also found that there was a larger base approval for Lula than for Fernando Henrique after controlling for the economic and political variables, suggesting that there might also be a personality component to their dependent variable.

Campello and Zucco Jr. (2015) depart from the methodologies employed by Norpoth and Kramer, aiming to investigate whether Latin American voters possess the ability to attribute responsibility for their macroeconomic situation to the incumbent. To achieve this, they identify Latin American countries characterized by low savings and reliance on commodity exports (LSCE countries). They construct an index, termed the “Good Economic Times (GET) Index,” designed to gauge international macroeconomic conditions favorable to LSCE economies—such as low interest rates in the United States and high commodity prices. They then compare this index with both reelection outcomes and incumbent popularity across the region. Their findings unveil a positive and statistically significant relationship between the GET Index and presidential popularity in Brazil, as evidenced by a time series regression analysis. This suggests that fluctuations in international macroeconomic conditions, as captured by the GET Index, exert a notable influence on presidential popularity in the Brazilian context.

3. Methodology

The paper aims to develop a model that evaluates how major macroeconomic indicators influence Brazilian presidential approval ratings. While recognizing the established importance of variables like inflation and unemployment in shaping presidential approval, the study takes a different perspective. Instead of looking directly at the unemployment rate, the variable employed in the regression model will be the output gap – this short-term deviation of the potential output may have an influence on the approval as it can give the impression of higher income when the deviation is positive and the inverse when it is negative.

By incorporating the output gap into the regression model, the study aims to capture how short-term deviations from potential output influence public perceptions of the president's performance. Positive deviations may create the impression of economic growth and prosperity, potentially boosting approval ratings. Conversely, negative deviations may signal economic downturns or stagnation, which could lead to lower approval ratings. Output gap is linked to the labor market conditions. A positive output gap, indicating a tightening labor market, typically correlates with favorable conditions for presidential approval.

Including a variable representing food prices, especially in relation to headline inflation, is a significant addition to the regression model. Food prices are a crucial component of household budgets, and fluctuations in these prices can have a direct and noticeable impact on the household budget. By considering the deviation of food prices from headline inflation, the analysis accounts for the specific influence of food price movements on public perception of the president's performance. This variable that considers the difference between food prices and headline prices is a novelty of this model, given that any other paper includes only the headline inflation instead.

Incorporating terms of trade, the real exchange rate and US interest rate into the regression model expands the analysis to include factors reflecting Brazil's economic relationship with the global market. These measures of the international standing of the country are also supposed to influence the president's approval as they can influence the perception of income of the public – more favorable terms of trade and an appreciation of the real exchange rate can make it easier to access goods from other countries and, therefore, improve the approval rating.

These variables offer insights into how international economic conditions affect domestic perceptions of income and overall welfare, thereby influencing presidential approval ratings.

- **Terms of Trade:** The terms of trade represent the ratio of export prices to import prices. A favorable term of trade implies that the prices of a country's exports are higher relative to the prices of its imports. This can lead to higher income from exports and potentially improve access to goods and services from abroad. As such, a positive movement in the terms of trade could positively influence public perception of income and welfare, thereby enhancing presidential approval ratings.
- **Real Exchange Rate:** The real exchange rate reflects the relative price of domestic goods and services to foreign goods and services adjusted for inflation. An appreciation of the real exchange rate indicates that domestic goods and services have become relatively more expensive compared to foreign goods and services. This could potentially lead to increased purchasing power for imported goods and services, enhancing the overall standard of living. Consequently, an appreciation of the real exchange rate may contribute to higher approval ratings for the president.
- **US interest rate** – the 10-year Treasury bond in real terms represents the international monetary policy stance. Incorporating the US interest rate into the regression model allows the study to capture the indirect effects of international monetary policy on public sentiment towards the executive office in Brazil. It recognizes the interconnection of global financial markets and the importance of external factors in shaping domestic economic conditions and public perceptions.

By including these dummy variables in the regression model, the study effectively controls the short-term surge in presidential approval ratings that typically occurs immediately after a president's inauguration, in line with Norpoth (1984). This allows the analysis to isolate the effects of economic indicators and other factors on presidential approval, independent of the short-term impact of the inauguration period.

Introducing dummy variables to account for major political episodes that led to sudden shifts or jumps in the approval series is a prudent approach to capturing non-economic factors influencing presidential approval rat-

ings. In other words, these dummy variables serve to control for the effects of significant political events or developments that may have affected public sentiment towards the president beyond the scope of economic conditions.

Considering the specifications described above, the base model to be estimated is defined as follows:

$$d(\text{approval}_t) = b_0 + b_1 \text{gap}_t + b_2 \text{ifoodprice}_{t-3} + b_4 \text{US10yr}_t + b_5 \text{tot}_t + \left(\sum_{i=0}^n a_i \text{inaug}_{it} \right) + \left(\sum_{i=0}^n c_i \text{polit}_{it} \right) + \epsilon_t$$

Where t represents the specific moment in time of the observation; $d(\text{approval})$ is the first difference of natural logarithm of the incumbent's approval (good and great) in time t and $t-1$; *food price* is the Brazilian twelve-month difference between food inflation and headline inflation; *gap* represents the output gap of the Brazilian economy. *US10yr* is the real rate of the 10-year US Treasury bond; and *tot* is the first difference of the natural logarithm of the terms of trade. The *inaug* variables are dummies representing the effect that the inauguration of a president's term has on the approval, it assumes the value 1 on each of the president's inauguration and 0 in all other periods – presidents who are reelected receive two dummies. The *polit* variables are the *dummies* representing political events that could have had an influence – either rapidly increasing or decreasing – in the popularity of the incumbent.

Using instrumental variables (IV) and the two-stage least squares (2SLS) technique is a robust approach to address endogeneity issues in regression analysis, particularly when dealing with variables that may have a simultaneous relationship with the error term and the dependent variable, such as those chosen for the model of presidential approval ratings.

Exactly, instrumental variables are chosen precisely because they are correlated with the endogenous variables of interest but are not correlated with the error term in the regression model. By using instrumental variables and the two-stage least squares (2SLS) technique, the study seeks to address endogeneity concerns and obtains more accurate estimates of the coefficients.

The two-stage least squares approach allows for the estimation of the coefficients in a way that accounts for the potential endogeneity of certain variables, such as the output gap and food inflation. In the first stage, the

instrumental variables are used to predict the potentially endogenous variables. Then, in the second stage, these predicted values are included in the regression model as explanatory variables.

4. Data

The dataset was constructed using quarterly data spanning from the first quarter of 1996, which coincides with Fernando Henrique Cardoso's presidency, to the fourth quarter of 2023, which overlaps with Luiz Inácio Lula da Silva's third term as president of Brazil. This data was gathered from Datafolha, a prominent institution known for conducting opinion polls in Brazil. It represents the combined percentages of respondents who rated the president's administration as either "great/good". Essentially, it provides a measure of public approval with the president's performance.

A characteristic of the polls on presidential approval in Brazil is that they are not conducted on a regular basis – different from most economic indicators that are collected by the State's statistical institutions –, therefore, the data obtained for the approval is just a set of scattered points not always coinciding with the end of the quarter. Interpolating the data points for the other quarters to create a complete dataset is a common technique used to address missing data or uneven time intervals in time series analysis. Linear interpolation, as described by Ferreira and Sakurai (2013), involves estimating the values of the missing data points by assuming a linear relationship between the available data points.

For the interpolation, we use all the months when there was data available and the following month's datapoint was built according to the following equation:

$$approval_{notavailable} = approval_{lastavailable} + \frac{distance_{nonavailable-lastavailable} * (approval_{nextavailable} - approval_{lastavailable})}{distance_{nextavailable-lastavailable}}$$

where $approval_{nonavailable}$ is the approval on a quarter end for which there is no data; $approval_{lastavailable}$ is the approval on the last available month. $Approval_{nextavailable}$ is approval on the next month for which there is data; $distance_{nextavailable-lastavailable}$ is the distance between the last available month and the next available month; and $distance_{nonavailable-lastavailable}$ is the distance between the last available month and the quarter end in question.

The figure below show the scattered incomplete data and the data after the interpolation.

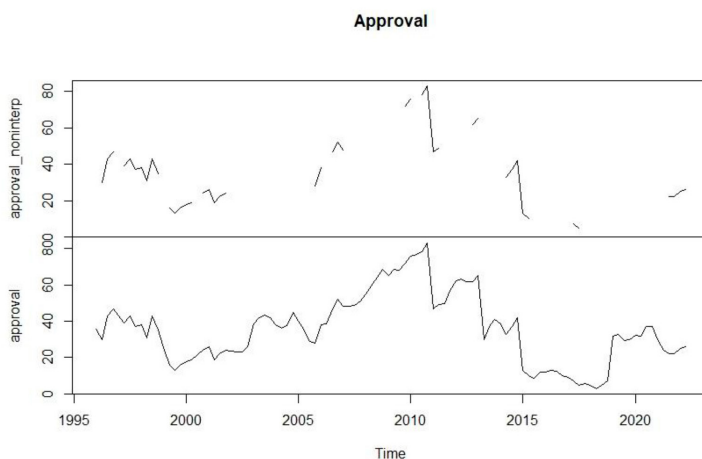


Figure 1 - Presidential Approval Data without interpolation and interpolated.

From the plotted graph, it is possible to see the change of incumbent by the sudden drops or growths in popularity. To capture those effects of sudden drops and increases due to the changes in incumbent, the series of *inaug-dummy* variables was created – one for each president – to establish their term.

A second set of approval data is gathered from CNT-MDA. This data set started in 2005, and it also has some gaps that were filled by linear interpolation. A third set is assembled using both polls, Datafolha and CNT-MDA (composite), which decreases the necessity of interpolation. This composite measure of presidential approval presents the best results in terms of significance of the independent variables. The correlation among the sets that encompass the two series (composite) and the one that has Datafolha is 99%. In regards, the CNT-MDA and the one that aggregate both series the correlation is 98,5%. In the annex, one can see the 3 datasets.

The inflation database is based on the *Índice de Preços ao Consumidor Amplo (IPCA)*, calculated by the *Instituto Brasileiro de Geografia e Estatística (IBGE)* monthly. The index value at each quarter's end was used to calculate the percentage change from the same quarter of the previous year, showing the twelve-month variation. Food price is a component of the IPCA.

The output gap is calculated as a weighted average between labor market and industrial capacity utilization slackness, as described in Muinhos and Alves (2003). The method described in the paper involves measuring the output gap by examining indicators in the labor market and industrial capacity utilization. Specifically, it computes a weighted average of the differences between particular logarithmic ratios.

$$gap_t = \alpha_t [\ln(icu_t) - \ln(icu_{fe})] + (1 - \alpha_t) [\ln(1 - u_t) - \ln(1 - \bar{u})]$$

- **Logarithm of Industrial Capacity Utilization (icu):** This refers to the natural logarithm of the actual industrial capacity utilization relative to its full employment level. Essentially, it's a measure of how much of the industrial capacity is being utilized compared to what it could be at full employment.
- **Logarithm of Employment Rate (ut):** This refers to the natural logarithm of the employment rate relative to its natural rate. The employment rate here likely refers to the proportion of the labor force that is employed, and the NAIRU -the level of employment consistent with stable inflation and potential GDP.
- **Weights:** The weights used in this calculation are derived from the powers in the Cobb-Douglas production function for the economy.

The terms of trade index were taken from the *IPEADData* website as a monthly indicator and the quarterly data is the three-month average on each quarter. Lastly, the real exchange rate index was taken from the *Banco Central do Brasil* website on the time series section – the quarterly information is composed of the three-month average of series #11752, “Índice de taxa de Câmbio real Efetiva (*realexch*)”.

For the political events, it was created a set of six *dummy* variables: *fhcelect* which take the value 1 on the third quarter of 1998 to account for the impact of the 1998 election campaign on Fernando Henrique Cardoso's approval. *fhc2000* takes the value 1 on the first quarter of 2000. *jun13* is to account for the protests of June 2013; *dilmacrisis1* – which takes the value 1 on the first quarter of 2015 – and *dilmacrisis2* – which takes the value 1 on the last quarter of 2015 – to account for the large protests of March and December of 2015 against Dilma Rousseff's presidency. The

bolsoelect takes the value 1 on the first quarter of 2019 – to account for the impact of the presidential race of 2019 which resulted in the victory of Jair Bolsonaro. *Covid* is self-explanatory.

5. Results

The basic model was estimated utilizing two distinct methodologies: initially through ordinary least squares (OLS), and subsequently via a two-stage approach incorporating instrumental variables (IV).

Table 1 presents the results obtained through OLS using the third dataset, the one that combines Datafolha and CNT-MDA. The first column presents the macro variables lacking any dummy variables. Four macro variables were applied as exogenous factors (output gap, food prices, terms of trade, US interest rate), each displaying the correct sign. However, only food prices and terms of trade exhibited statistically significant relationships.

In the second column, all dummy variables were included, and the real exchange rate was considered as an exogenous variable. The output gap exhibited a positive correlation with presidential popularity, indicating that in an overheated economy, the incumbent presidency experiences a positive impact. In Ferreira and Sakurai (2013), minimum wage and unemployment were the significant activity variables considered. Conversely, a surge in food prices was found to have a negative effect on political approval, likely due to the public's sensitivity to the impact of these price increases on disposable income. In comparison to Ferreira and Sakurai, only inflation has a negative, but not significant impact on presidential popularity.

Although the real exchange rate displayed the anticipated direction of influence, its significance was not observed. It is anticipated that an increase in the purchasing power of the domestic currency (real exchange rate appreciation) would positively affect presidential appraisal, as individuals would be empowered to obtain more tradable goods.

In the third column, the real exchange rate was substituted with alternative variables representing the external sector, specifically in terms of trade and the US interest rate. Terms of trade, which drive the real exchange rate towards appreciation, it indicates that a favorable shock in export prices benefits the incumbent president. Additionally, the real interest rate in the US exerts a significant influence on the domestic currency; an increase in the US real interest rate leads to a depreciation of the real exchange rate. This occurs due to capital flowing towards the US and away from emerging market economies such as Brazil.

In the OLS regressions using the composite approval ratings begin in the second quarter of 1997 and end in the fourth quarter of 2023 and include 107 observations. The R^2 are around 85% and the F test are significant at 1% level. The residual tests in columns 2 and 3 do not show serial autocorrelations.

An essential observation in these regressions relates to the significance of the inauguration phenomenon and political factors in determining presidential approval. The inclusion of inauguration dummies reveals notable insights. Except for two instances, these dummies exhibit statistical significance across most presidencies. Notably, during the second term of President Luiz Inácio Lula da Silva, the coefficient associated with the inauguration dummy was not statistically significant, suggesting that his victory in the 2006 election did not yield the anticipated surge in popularity. Similarly, the inauguration of President Michel Temer failed to produce a statistically significant coefficient. Additionally, the second terms of Presidents Fernando Henrique Cardoso and Dilma Rousseff commenced with a decline in popularity, contrary to the expected post-election surge. However, this phenomenon can be attributed to specific contextual factors: Cardoso's adoption of a floating exchange rate regime following the 1998 election, amidst pressure from the Russian crisis, resulted in a rapid deterioration of the Real, potentially explaining the observed coefficient sign. Similarly, Rousseff faced significant campaign pressure, nearly losing to the opposition candidate, which may have contributed to the observed decline in popularity at the onset of her second term.

The inclusion of political dummies also proved significant in capturing non-economic factors influencing presidential approval, as evidenced by their significant coefficients. Notably, the negative coefficients associated with the dummies representing June 2013 and the beginning of 2015 for

Dilma Rousseff's popularity are particularly noteworthy. In June 2013, Rousseff experienced a conspicuous decline in her approval rating, a phenomenon noted by Singer (2018), who suggests that economic issues alone cannot fully account for the massive protests and sudden decline in the president's popularity during this period. Similarly, the decline in popularity observed at the beginning of 2015 coincided with the deepening of the scandal initiated by "Operação Lava Jato". This period witnessed widespread protests, and the deterioration of her image ultimately culminated in her removal from office in 2016. These instances underscore the significance of non-economic factors in influencing approval ratings. The episodes related to the Covid-19 pandemic are also crucial to consider, necessitating the inclusion of two additional dummies for control purposes.

Given the initial findings, an alternative specification was pursued in response to concerns raised in the literature regarding potential endogeneity in the domestic explanatory variables. These variables, such as output gap and food prices, may exhibit correlation with the error term and could be subject to feedback effects from the executive policies. Hence, these factors may impact presidential approval ratings. Consequently, the incorporation of instrumental variables becomes essential to mitigate such influences. The instrumental variables utilized consist of lagged versions of the same variables, providing a methodological approach to disentangle potential correlations and feedback effects. The models estimated in two stages maintain identical structure, encompassing the same variables and dummies.

Table 1 - Regression results for the Composite models estimated with Ordinary Least Squares

	Dependent variable:		
	d(approval)		
	1	2	3
constant	0,028 0,04	0,46 0,26	0.046** 0,017
d(aproval(-1))	0.25*** 0,09	0.13*** 0,04	0.13*** 0,043
gap	0.29 1,23	2.77*** 0,64	3.46*** 0,66
foodprice(-2)	-1.22* 0,7	-0.54* 0,3	-0.67** 0,31
realexch		0,057	
d(tot)	1.44* 0,75		0.81** 0,33
US10yr	-1,55 1,91		-1,38 0,84
fhc1		-0.18*** 0,04	-0.13*** 0,04
fhc2		-0.34*** -0,143	-0.33*** 0,1
fhc3		0.37*** 0,1	0.38*** 0,1
lula1		0.7*** -0,107	0.67*** 0,1
lula3		0.29*** 0,105	0.26*** 0,1
dilma1		0.64*** 0,106	-0.6*** 0,1
dilma2		-0.82*** 0,104	-0.79*** 0,1
temer		0.48*** 0,105	0.48*** 0,1
bolso		1.45*** 0,11	1.48*** 0,1
bolso2		0.64*** 0,1	0.66*** 0,1
apagão		-0.28*** 0,106	-0.25*** 0,1
fhc2000			-0.26*** 0,1
protestos		-0.45*** 0,105	-0.43*** 0,1
dilmacrisis1		-0.544*** -0,11	-0.51*** 0,106
dumcovid		0.31** 0,127	0.37*** 0,12
dumcovid(-1)		0.31*** 0,1	0.28*** 0,1
Observations	107	107	107
R ²	0,12	0,859	0,87
Adjusted R ²	0,085	0,82	0,84
Residual Std. Error	0,23	0,1	0,099
F Statistic	2.99**	27.93***	28.236***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 2 - Regression results with Instrumental Variables

	Dependent variable:		
	d(approval)		
	1	2	3
constant	0,024 0,047	0.51* 0,27	0.047** 0,019
d(aproval(-1))	0.26*** 0,09	0.14*** 0,048	0.14*** 0,04
pred_gap	0 1,65	2.49*** 0,7	3.58*** 0,74
pred_food(-1)	-1.65* 0,88	-0.64* 0,36	-0.80** 0,37
realexch		-0.104* 0,058	
tot	1.52** 0,76		0.89** 0,34
US10yr	-1.75 2,17		-1.51* 0,89
fhc1		-0.189*** 0,045	-0.13*** 0,04
fhc2		-0.34*** -0,11	-0.33*** 0,108
fhc3		0.38*** 0,11	0.4*** 0,107
lula1		0.74*** -0,11	0.7*** 0,1
lula3		0.33*** 0,11	0.31*** 0,105
dilma1		-0.62*** 0,11	-0.58*** 0,1
dilma2		-0.82*** 0,11	0.79*** 0,1
temer		0.48*** 0,107	0.49*** 0,1
bolso		1.45*** 0,118	1.49*** 0,106
bolso2		0.64*** 0,11	0.67*** 0,1
apagão		-0.28*** 0,115	-0.27*** 0,1
fhc2000			-0.26*** 0,1
protestos		-0.44*** 0,1	-0.42*** 0,1
dilmacrisis1		-0.53*** -0,11	-0.5*** 0,107
dumcovid		0.29** 0,13	0.39*** 0,13
dumcovid(-1)		0.32*** 0,11	0.32*** 0,106
Observations	106	107	107
R ²	0,13	0,854	0,87
Adjusted R ²	0,08	0,82	0,84
Residual Std. Error	0,24	0,105	0,1
F Statistic	3.15**	26.78***	27.32***
J-Statistic		7,94E-40	6.89e-44

Note: *p<0.1; **p<0.05; ***p<0.01

Once again, in the first column of Table 2, we presented the basic model with no dummies included. While food prices and terms of trade exhibit statistical significance, the fitted regression demonstrates reduced results in terms of explained variance, as indicated by the relatively low R-squared value.

In the IV regressions using the composite approval ratings begin in the second quarter of 1997 and end in the fourth quarter of 2023 including 107 observations. The R^2 are also around 85% and the F tests are significant at 1% level in the second and third column. The J-statistics are very low in both cases, which means that P-value is high, and the instruments are valid. The residual tests in columns 2 and 3 do not show serial autocorrelations.

In the second column, we employed the exchange rate as the explanatory variable to capture the international impact on presidential approval. Food prices and the output gap were included as predicted variables, as they were regressed against their lagged values in the first stage. While this model yields coefficients with significance at the 10% level, it is not without its limitations. Specifically, we cannot definitively establish that the real exchange rate is exogenous and free from feedback effects coming from the dependent variable.

In the third column, we withdrew real exchange rate and included terms of trade and US interest rate to capture international influences. Interestingly, all four macroeconomic variables exhibit coefficients with expected signs and highly significant. Only the US interest rate shows significance at the 10% level. This regression is the most important result in this paper. Despite using 2SLS, both food prices and the output gap remain highly significant, a result not previously demonstrated in the literature.

The regression employing the 2SLS technique reveals a slightly altered pattern compared to the OLS model. While the direction and significance of the dummy variables remain consistent across both estimations, the elimination of endogeneity for the macroeconomic indicators in the first stage regressions resulted in a removal of bias in the estimation process. Consequently, the coefficients of the predicted indicators were rendered more robust. However, it is a noteworthy pointing that the coefficients reported in the second stage closely resemble those in Table 1. This similarity suggests weak evidence of biased coefficients, a problem that could arise with endogenous variables in OLS estimations.

These findings echo with the well-established results in the literature regarding the relationship between the economy and presidential popularity indicators, a relationship typically observed in developed economies. Unlike Ferreira and Sakurai (2013), this study demonstrates that macroeconomic indicators such as food inflation, the output gap, US interest rate, and terms of trade are pertinent in elucidating variations in presidential approval ratings.

As far, we know we are the first to demonstrate with 2-stage estimations that food price is an important feature of presidential popularity in Brazil. Another important finding remains the significance of the terms of trade. This measure consistently exhibited statistically significant coefficients across all estimations, suggesting that shocks to the external sector, as represented by terms of trade, exert a dominant influence on presidential approval ratings in Brazil. These results highlight a parallel dynamic between presidential approval ratings in Brazil and international markets, akin to the observations made by Campello and Zucco Jr. (2015). Specifically, the larger the positive variation in the Terms of Trade Index—indicating more favorable terms of trade—the greater the growth in presidential approval. The findings that terms of trade are positive and significant and US interest rate is negative significant are in line with the index of good time (GET) proposed by Campello and Zucco Jr. (2015).

6. Robustness Check

The regressions using the dataset that contains only Datafolha (Table 3) and also the Table 4 presents the results for CNT-Sensus in this section as robustness check.

In the regressions that use Datafolha as the dependent variable, as one can see in Table 3, the only variable that remains significant is the output gap in the OLS regression and the in the IV regression as well (columns 3 and 4). The regressions using the Datafolha approval rate starts in the second quarter of 1997 and ends in the fourth quarter of 2023 and includes 107 observations. The R^2 are around 81% the F tests are significant at 1% level in all cases. The J-statistics in the IV cases (columns 3 and 4) are very low in both cases, which means that P-value is high, and the instruments are valid.

Table 3 - Regression results using Data Folha (OLS and IV)

	Dependent variable: d(aprovalfolha)			Dependent variable: d(aprovalfolha)	
	1	2		3	4
constant	0.21	0.05*	constant	0.23	0.056**
	0,3	0,21		0,3	0,023
d(aproval(-1))	0.03	0.02	d(aproval(-1))	0.04	0.03
	0,05	0,051		0,05	0,05
gap	3.12***	3.49***	pred_gap	3,07***	3,70***
	0,73	0,78		0,8	0,89
foodprice(-2)	-0.47	-0.55	pred_food(-1)	-0.55	-0.67
	0,35	0,37		0,41	0,45
realexch	-0,03		realexch	-0.04	
	0,06			0,06	
d(tot)		0,57	tot		0,65
		0,4			0,41
US10yr		-0,74	US10yr		-0,86
		1			1,06
fhc1	-0.18***	-0.15***	fhc1	-0.189***	-0.15***
	0,05	0,049		0,05	0,05
fhc2	-0.33***	-0.31**	fhc2	-0.34***	-0.31**
	0,12	-0,12		-0,13	0,13
fhc3	0.32***	0.32**	fhc3	0.33**	0.34***
	0,12	0,12		0,12	0,12
lula1	0.27**	0.25**	lula1	0.29**	0.28**
	0,12	-0,12		-0,12	0,12
dilma1	-0.62***	-0.60***	dilma1	-0.60***	-0.58***
	0,12	0,12		0,12	0,12
dilma2	0.88***	-0.86***	dilma2	-0.88***	0.86***
	0,12	0,12		0,12	0,12
temer	0.36***	0.36***	temer	0.36***	0.37***
	0,12	0,12		0,12	0,12
bolso	1.57***	1.59***	bolso	1.58***	1.60***
	0,12	0,12		0,12	0,12
bolso2	0.61***	0.62***	bolso2	0.62***	0.64***
	0,12	0,12		0,12	0,12
apagão	-0.38***	-0.37***	apagão	-0.39***	-0.38***
	0,12	0,12		0,12	0,12
protestos	-0.82***	-0.80***	protestos	-0.81***	-0.79***
	0,12	0,12		0,12	0,1
dilmacrisis1	-0.43***	-0.41***	dilmacrisis1	-0.43***	-0.41**
	0,12	-0,12		-0,12	0,13
dumcovid	0.32**	0.36**	dumcovid	0.32**	0.39**
	0,15	0,15		0,15	0,15
dumcovid(-1)	0.28**	0.27**	dumcovid(-1)	0.30**	0.30**
	0,12	0,12		0,12	0,12
Observations	107	107	Observations	107	107
R ²	0,81	0,82	R ²	0,81	0,81
Adjusted R ²	0,77	0,78	Adjusted R ²	0,77	0,77
Residual Std. Error	0,118	0,118	Residual Std. Error	0,12	0,12
F Statistic	21,69***	20,9***	F Statistic	20.8***	20.02***
			J Statistic	4,08E-39	1,21E-44

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4 - Regression results using CNT-MDA with Instrumental Variables

	Dependent variable: d(approvalCNT)			Dependent variable: d(approvalCNT)	
	1	2		3	4
constant	-0,3	0.077***	constant	-0,58	0.082**
	0,38	0,022		0,43	0,024
d(aproval(-1))	-0,03	-0,027	d(aproval(-1))	-0,03	0,028
	0,046	0,042		0,046	0,052
gap(-1)	1.47**	3.10**	pred_gap(-1)	2.54**	3.72***
	0,7	0,8		1	0,89
food(-2)	-0,59	-0.96**	pred_food(-2)	-0.70*	-1.10**
	0,41	0,41		0,43	0,5
realexch	0,07		realexch	0,14	
	0,084			0,097	
tot		0.69*	tot		0.72*
		0,41			0,42
US10yr		-1,85	US10yr		-2,04
		1,2			1,31
dilma1	-0.60***	-0.63***	dilma1	-0.60***	-0.63***
	0,12	0,106		0,12	0,106
dilma2	-1.33***	1.33***	dilma2	-1.35***	-1.33***
	0,12	0,108		0,12	0,108
dilmacrisis1	-0.41***	-0.4***	dilmacrisis1	-0.43***	-0.4***
	-0,13	0,12		-0,13	0,12
bolso	2.26***	2.31***	bolso	2.28***	2.31***
	0,12	0,108		0,12	0,108
protestos	-0.46***	-0.46***	protestos	-0.47***	-0.46***
	0,117	0,106		0,12	0,107
d1703	-0.76***	-0.69***	d1703	-0.72***	-0.72***
	-0,12	-0,11		-0,12	-0,12
d1704	0.27**	0.31**	d1704	0.31**	0.31**
	0,12	0,11		0,13	0,13
dumcovid(-1)		0.44***	dumcovid(-1)		0.44***
		0,13			0,14
Observations	73	72	Observations	73	72
R2	0,9	0,93	R2	0,9	0,93
Adjusted R2	0,89	0,91	Adjusted R2	0,89	0,91
Residual Std. Error	0,118	0,1	Residual Std. Error	0,118	0,1
F Statistic	54.18***	68.44***	F Statistic	54.18***	59.13***
			J Statistic	0,00E+00	0,00E+00

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

In the regressions using CNT-MDA as dependent variable, presented in Table 4, not only output gap but also food price turns out significant as well in both cases (OLS and IV). Terms of trade are significant at 10% and real exchange rate and US interest rate are not different from 0 in any of the robustness cases.

The regression using CNT-MDA rate starts in the first quarter of 2006 and ends in the fourth quarter of 2023 and includes 73 observations. The R^2 are also above 90% and the F test are significant at 1% level in all columns. The J-statistics are very low in both cases (zero), which means that P-value is high, and the instruments are valid.

7. Conclusion

This paper aimed at expanding the literature on voter behavior in Brazil by analyzing the impact of macroeconomic indicators on an incumbent president's popularity. The research builds on previous studies that established the influence of inflation and the unemployment rate on an incumbent's ability on elect allies to legislative positions – as seen in Kramer (1971) – and to maintain popularity during his term – the object of Norpoth (1984). It also incorporates insights from other authors who have explored the Latin American context, such as, Cedro and Vergara (2007), and Ferreira and Sakurai (2013). Furthermore, it addresses criticisms raised by Campello and Zucco Jr. (2015) regarding the dominant role of external shocks compared to domestic factors in determining fluctuations in a president's approval rating.

This paper develops and test a model using data from the Brazilian economy. Besides the well-established indicators found in the literature which impact the presidential approval – food inflation and the output gap -, it is also the first to take into account the real exchange rate, US interest rate and the terms of trade on the estimation. To complete the model, a set of *dummy* variables representing the inauguration of each president and another for relevant political events were included.

The estimation process began by conducting a simple Ordinary Least Squares for the available data. However, due to the persistent concern present in the literature about the potential endogeneity issues with the domestic explanatory variables, particularly concerning the president's ability to influence policies that may affect these indicators, a second estimation approach was adopted. This involved the use of Instrumental Variables estimation with a Two Stage Least Squares technique. In the first stage, equations were set up for all the domestic endogenous indicators to address this endogeneity problem effectively. The instrumental variables used were the lagged variable of the domestic variables, output gap and food price.

The 2SLS technique yielded significant coefficients at a 1% confidence level for most of the presidential *dummies* and for all the political developments *dummies*. It also reveals that the output gap, food price, and terms of trade all displayed significant coefficients at the 5% confidence level. This suggests that a wider output gap and more favorable terms of trade contribute to increased presidential popularity, while an increase in US interest rate of a decline in approval ratings. The lagged twelve-month food inflation corrected by headline *IPCA* also had a significant coefficient, indicating that an increase on the food inflation produces a drop on the presidential popularity two quarters ahead.

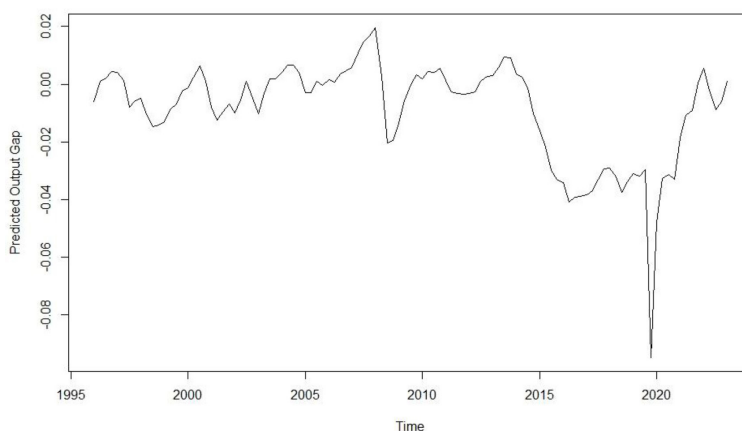
We are able to show in this paper, a model that despite using 2SLS, both food prices and the output gap remain highly significant. Terms of trade and US interest rate also plays a fundamental role as the transmission variable from the international conditions to the political environment in Brazil. As far as we know we are the first to demonstrate with 2-stage estimations that food price is an important feature of presidential popularity in Brazil. Another important finding remains the significance of terms of trade. This measure consistently exhibited statistically significant coefficients, across all estimations, suggesting that shocks to the external sector, as represented by terms of trade, exert a dominant influence on presidential approval ratings in Brazil.

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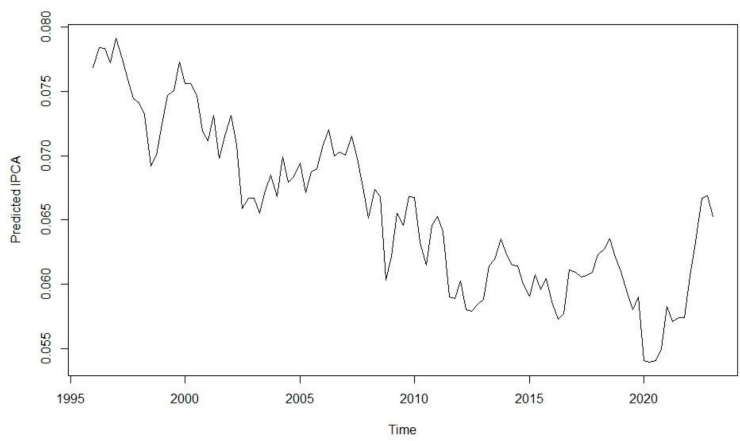
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APPENDIX – PLOT OF ESTIMATED DOMESTIC VARIABLES

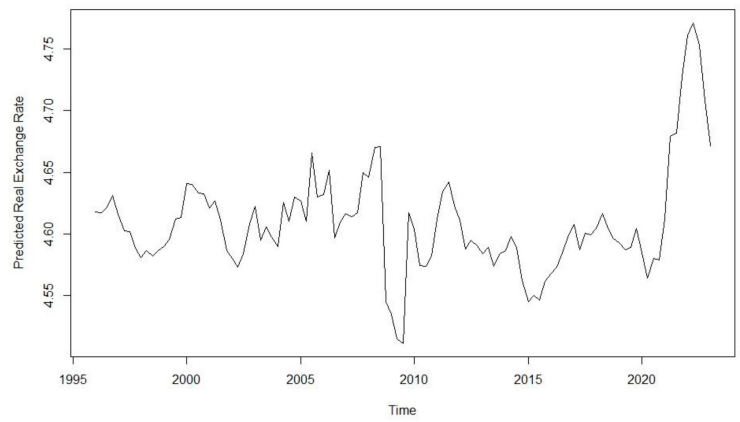
Predicted Output Gap:



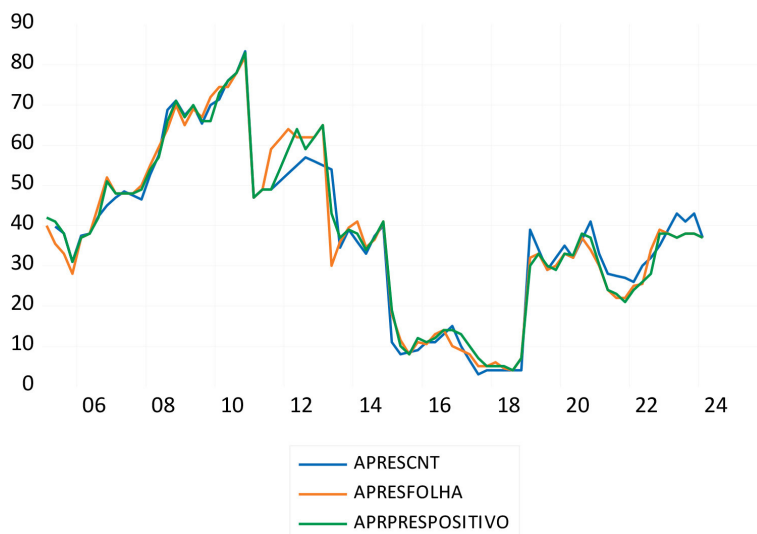
Predicted IPCA:



Predicted Real Exchange Rate:



The three datasets: Datafolha, CNT, Composite



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Os dados utilizados neste estudo estão disponíveis mediante solicitação ao autor. Dados adicionais e informações complementares também poderão ser fornecidos para fins de verificação ou replicação. A disponibilização está condicionada à inexistência de restrições de acesso público.

CONTRIBUIÇÕES DE AUTORIA

MM: Conceitualização, Programas, Supervisão, Validação, Escrita - rascunho original e Escrita - revisão e edição.

MR: Curadoria de dados, Análise formal, Investigação e Metodologia.

CONFLITO DE INTERESSE

Os autores declaram não terem quaisquer conflitos de interesse.

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