Attention to Macroeconomic Announcements: The Impact of Surprises on Brazilian Financial Markets

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Abstract

This paper investigates how macroeconomic announcements affect Brazilian financial markets, focusing on the impact of surprises in inflation and economic activity indicators. Using intraday data from 2016 to 2025, the study analyzes how Ibovespa futures returns (equity market) and DI futures returns (short-term interest-rate market) react in the post-announcement window after the release of key indicators such as IPCA, IPCA-15, and GDP. Macroeconomic surprises are measured as the difference between the announced value and market expectations, and their effects are estimated using nonlinear regressions that allow the sensitivity of returns to vary over time. The results show that higher-than-expected inflation or GDP announcements tend to reduce equity returns, while generating positive reactions in bond returns. The findings also indicate that market responses are stronger during periods of higher economic or political uncertainty, suggesting that macroeconomic announcements play an important role in shaping expectations and driving short-term price dynamics in Brazilian financial markets.

Keywords: Macroeconomic news, financial markets, surprises reaction, intraday responses, policy expectations.

JEL Codes: G14; G12; E31; E32.

1. Introduction

Macroeconomic announcements are important sources of information driving financial markets. In modern financial systems characterized by rapid information diffusion, integration and algorithmic trading, market participants continuously update their expectations about economic fundamentals, monetary policy, and risk premia in response to newly released macroeconomic data (Elenev et al., 2024; Martos et al., 2025; Rühl & Stein, 2015; Bobiceanu et al., 2026; Bulut & Wang, 2026; Pham et al., 2023; Lin et al., 2021). As a result, scheduled macroeconomic announcements—such as inflation releases, employment reports, and business activity indicators—frequently trigger immediate and sizable movements in asset prices and market volatility (Johannes et al., 2026; Kiriu & Hibiki, 2024).

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The literature documents that financial markets react to the unexpected component of macroeconomic news, reflecting revisions in expectations about future economic conditions and policy responses (Elenev et al., 2024; Wu & Gau, 2022; Gigante et al., 2024).

The literature generally focuses on the U.S. economy and on the impacts of macroeconomic news announcements on financial markets, particularly equity and bond markets (Li et al., 2025; Elenev et al., 2024; Kiriu & Hibiki, 2024; Rangel, 2011). Their findings show that higher-than-expected inflation and activity indicators negatively impact equity returns and bonds, mainly due to changes in monetary policy expectations (Elenev et al., 2024; Lucca & Moench, 2015; Faust & Wright, 2018). Macroeconomic announcements also play a central role in shaping the dynamics of foreign exchange markets, explaining a substantial share of intraday price variation and volatility, with exchange rates adjusting rapidly to newly released information (Ben Omrane & Savaşer, 2017). Other studies investigate spillovers from surprises in U.S. macroeconomic announcements to foreign economies. For instance, Ann Xing et al. (2024) find that U.S. announcements account for about 40% of the daily returns on two-year government bonds in Canada, the United Kingdom, and Sweden, and approximately 60% of the returns on ten-year bonds, with positive macroeconomic surprises exerting a bullish effect on these markets. Similarly, Hussain & Ben Omrane (2021) show that U.S. announcements affect both the intraday returns and volatility of the Canadian equity market, with these effects becoming significantly stronger during the 2008 financial crisis.

Other studies examine spillovers from U.S. announcements on emerging markets (Cakan et al., 2015). Hussain et al. (2020) find that equity returns in Brazil and Mexico respond significantly to announcements of U.S. macroeconomic indicators and Federal Open Market Committee (FOMC) monetary policy decisions, with these effects becoming more pronounced during U.S. and European crises. Ayadi et al. (2025) analyze how surprises from the U.S. economy and news related to the COVID-19 pandemic affect the equity markets of Argentina, Brazil, Chile, and Mexico. Their results highlight the negative and significant impact of newly confirmed COVID-19 cases on intraday volatility, although this effect gradually weakened over time as monetary and fiscal policies became more expansionary in response to the crisis.

While these studies contribute to the literature by examining international spillovers to emerging markets, their primary focus is not on the role of domestic macroeconomic announcements themselves. In emerging economies, macroeconomic news may have substantial effects on financial markets due to higher uncertainty, stronger macroeconomic volatility, and greater sensitivity of investors to new information (Ayadi et al., 2024; Moura & Gaião, 2014; Zehri et al., 2024; Andritzky et al., 2007). However, for Brazil—the country analyzed in this study—there is still no empirical evidence focusing specifically on the impact of domestic macroeconomic announcements on financial markets, especially using intraday data. Such an approach is important because high-frequency data allow the identification of the immediate effects of key announcements, such as inflation and economic activity indicators, on financial asset prices.

To address this gap in the literature, we investigate how Brazilian futures equity and bond yield returns react to domestic macroeconomic announcements using intraday data. Following the approach proposed by Swanson & Williams (2014) and adopted by Elenev et al. (2024), we estimate nonlinear regressions designed to identify time-varying effects of macroeconomic announcements, even in relatively small samples. This feature is particularly relevant in emerging markets, where specific economic and institutional factors may amplify the impact of macroeconomic information on financial markets.

Our analysis relies on intraday data in order to capture market sensitivity precisely around the time of the announcement. This high-frequency framework allows us to isolate the immediate response of asset prices to macroeconomic news and to identify the short-term dynamics that occur in the minutes surrounding the release of key economic indicators. Furthermore, the literature suggests that futures price returns measured around announcement times exhibit stronger and more significant responses than daily returns (Xu & You, 2025). The use of a data-rich intraday environment therefore allows us to capture the impact of macroeconomic surprises in Brazilian financial markets with a high degree of granularity, providing a more precise assessment of how new information is incorporated into asset prices.

To measure the impact of macroeconomic announcements on financial markets, we focus on two key dimensions of the Brazilian economy: inflation and economic activity. Specifically, we analyze how surprises in the announcements of these indicators affect returns in the Brazilian equity and bond markets. Inflation surprises are computed using the Extended National Consumer Price Index (known as IPCA, "Índice de Preços ao Consumidor Amplo"), the official inflation measure targeted by the Central Bank of Brazil ("Banco Central do Brazil", BCB). In addition, we consider the mid-month release of this indicator, the IPCA-15, which provides an earlier signal of inflation dynamics and is closely monitored by financial market participants. Economic activity surprises are measured using Gross Domestic Product (GDP), the benchmark indicator of economic performance in Brazil. Although GDP is released quarterly and with a delay of approximately three months after the reference period, it remains the most widely used measure of aggregate economic activity and plays a central role in macroeconomic analysis. In particular, GDP is commonly used to estimate the output gap, a key latent variable in the BCB's inflation-targeting framework. By focusing on these announcements, we capture the market response to new information about both inflationary pressures and overall economic activity.

The findings showed that Brazilian financial markets react quickly and systematically to macroeconomic news surprises, especially inflation announcements. When inflation or GDP is higher than expected, equity returns tend to decline, reflecting expectations of tighter monetary policy, while bond returns move in the opposite direction, indicating upward revisions in interest rate expectations. These effects occur within minutes after the announcement and are strongest in short time windows, dissipating over time. Importantly, the magnitude of these responses varies across years, becoming significantly stronger during periods of higher economic and political uncertainty.

This paper contributes to the literature in four main ways. First, to our knowledge, this is the first paper to jointly study intraday reactions of Brazilian equity and short-term interest-rate futures to domestic IPCA, IPCA-15, and GDP surprises. While a large body of research investigates the effects of macroeconomic news in developed economies, evidence for Brazil remains scarce, particularly when considering the joint response of equity and fixed-income markets. Second, this study contributes to the literature by focusing on the effects of domestic macroeconomic surprises, whereas much of the existing research on emerging markets primarily examines spillovers from U.S. macroeconomic announcements. By concentrating on domestic indicators, we provide new evidence on how local macroeconomic information is incorporated into asset prices in a large emerging economy. Third, the paper employs a data-rich intraday environment and nonlinear regressions to capture the immediate impact of macroeconomic announcements on financial markets. This high-frequency framework allows us to identify the real-time response of asset prices around the exact moment of the announcement, providing a more granular assessment of how macroeconomic news is absorbed by equity and bond markets. Fourth, our results also contribute to the literature on market frictions in emerging financial markets, particularly in Brazil. The way in which asset prices adjust to new macroeconomic information may reflect informational frictions, liquidity conditions, and market microstructure characteristics that are more pronounced in emerging economies. Finally, the findings have practical implications for market participants from an event-time risk management perspective. The results inform scenario analysis and pre-announcement positioning, supporting hedge calibration, inventory and risk limits, and execution design around scheduled macroeconomic releases. These insights are particularly relevant in emerging markets, where volatility and policy sensitivity amplify event-driven risks.

The remainder of the paper is organized as follows. Section 2 describes the modeling framework used to capture the impact of macroeconomic news on equity and bond markets. Section 3 presents the main results for the analysis of both inflation and economic activity announcements. Robustness tests are discussed in Section 4. Section 5 examines the asymmetric effects of macroeconomic announcements. Finally, Section 6 concludes and discusses directions for future research.

2. Methodology

This section describes the methodological procedures adopted in the study. First, we present how macroeconomic announcement surprises are computed. Next, we outline the data considered and the econometric approaches used to estimate the impact of these surprises on returns in the Brazilian equity and bond markets.

2.1. Macroeconomic announcements and surprises

This work investigates the announcement effects of two key macroeconomic variables in Brazil: inflation and economic activity. The main inflation indicators, as well as GDP, are

computed and released by the Brazilian Institute of Geography and Statistics ("Instituto Brasileiro de Geografia e Estatística", IBGE), the country's primary agency responsible for economic and social statistics.

Among the consumer price indicators, we consider two measures: the Extended National Consumer Price Index ("Índice de Preços ao Consumidor Amplo", IPCA), which is the main price index in Brazil and serves as the official inflation measure used by the Central Bank of Brazil in its inflation-targeting framework, and the IPCA-15, a mid-month version of the index that provides an earlier indication of inflation trends. Both influence market expectations about monetary policy, and, in turn, affect how market prices respond. While inflation indicators are released on a monthly basis (MoM), economic activity—measured by GDP—is published quarterly (QoQ). All three indicators are released at 9:00 a.m. (GMT–3).

For this study, we analyze changes in market returns relative to the interval immediately preceding the announcement of inflation and GDP using intraday market data, allowing us to capture the market reaction to the new macroeconomic information. We cover the period from January 2016 to November 2025, constrained by the availability of intraday financial data, comprising 121 IPCA announcements, 120 IPCA-15 announcements, and 40 GDP announcements. According to the Brazilian Business Cycle Dating Committee ("Comitê de Datação de Ciclos Econômicos", CODACE), there were two business cycles during that period, which adds robustness to our analysis by encompassing different economic cycle regimes.[1]

In addition to the official releases, we consider median market expectations for the inflation and economic activity indicators analyzed in this study. These expectations are obtained from Bloomberg Financial Services, which compiles and tabulates market forecasts based on surveys of professional economists at financial institutions and consulting firms. Forecasters can submit or revise their projections up to one day before the official release, ensuring that the forecasts incorporate all information available at the time (Elenev et al., 2024).[2] These data were collected for the same period as the macroeconomic announcements considered in the analysis.

As defined by Elenev et al. (2024), let $\text{MNA}_{i,t}$ denote the macroeconomic news announcement i at time t. Let $E_{t-\Delta}(\text{MNA}_{i,t})$ represent the median forecast from surveyed economists available at time $t - \Delta$, where Δ represents the window around the release time. Hence, the macroeconomic news announcement surprise, denoted by $X_{i,t}$, can be computed as:

$$X_{i,t} = \frac{\text{MNA}_{i,t} - E_{t-\Delta}(\text{MNA}_{i,t})}{\text{sd}(E_{t-\Delta}(\text{MNA}_{i,t}))}, \tag{1}$$

[1] Additional information on the methodology used to identify Brazilian business cycles and the chronology of expansions and recessions is available on the website of the CODACE: `https://portalibre.fgv.br/codace`. Accessed on 12 March, 2026.

[2] Brazilian macroeconomic indicators forecasts are available on Bloomberg Financial Services through the <ECO BZ> function.

where $\text{sd}(E_{t-\Delta}(\text{MNA}_{i,t}))$ is the standard deviation of all analyst forecasts for that specific announcement at that particular time. The key feature of this method is that the normalization factor varies over time in response to forecaster disagreement, making the surprises more economically interpretable (Elenev et al., 2024).

2.2. Modeling time-varying sensitivity to news

To evaluate the impact of inflation and GDP announcements on equity and bond markets following their release, we follow the approach proposed by Swanson & Williams (2014) and adopted by Elenev et al. (2024). Specifically, we estimate nonlinear regressions of equity and bond returns over a τ-subperiod in order to capture potential time variation in the sensitivity of asset prices to macroeconomic surprises. The empirical specification can be expressed as follows:

$$r_{t+\Delta h} = \alpha^{\tau} + \beta^{\tau}\gamma'\mathbf{X}_t + \epsilon_t. \tag{2}$$

The term $r_{t+\Delta h}$ measures the intraday future equity or bond returns in a Δ-minute window around the release time, $\mathbf{X}_t$ is a matrix composed by the announcement surprises, and the coefficient γ measures the average effect of each indicator's surprise, measure in across the entire sample, which can be positive or negative. Alternatively, β captures changes in that average impact over each calendar year (τ), since they can amplify or diminish it through multiplication in Eq. (2) and are common to all event types, indicating the same annual multiplicative factor. Because Eq. (2) is a nonlinear model, the identification restriction is that the sample average of β equals the unity (Swanson & Williams, 2014). If β is always statistically equal to one, Eq. (2) simplifies to an ordinary least squares (OLS) regression. The parameter α also varies with τ, whereas ϵ_t denotes the residual term capturing other factors affecting returns.

The approach in Eq. (2) is easier to understand in matrix notation. Following the illustration provided by Elenev et al. (2024), consider a setting with three years of data, quarterly announcements, and two macroeconomic variables. In this case, the nonlinear regression can be expressed as follows:

$$
\begin{bmatrix} r_{1,1} \\ r_{1,2} \\ r_{1,3} \\ r_{1,4} \\ r_{2,1} \\ r_{2,2} \\ r_{2,3} \\ r_{2,4} \\ r_{3,1} \\ r_{3,2} \\ r_{3,3} \\ r_{3,4} \end{bmatrix} = \begin{bmatrix} X_{1,1,1} & X_{2,1,1} & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ X_{1,1,2} & X_{2,1,2} & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ X_{1,1,3} & X_{2,1,3} & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ X_{1,1,4} & X_{2,1,4} & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & X_{1,2,1} & X_{2,2,1} & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & X_{1,2,2} & X_{2,2,2} & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & X_{1,2,3} & X_{2,2,3} & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & X_{1,2,4} & X_{2,2,4} & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & X_{1,3,1} & X_{2,3,1} & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & X_{1,3,2} & X_{2,3,2} & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & X_{1,3,3} & X_{2,3,3} & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & X_{1,3,4} & X_{2,3,4} & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \beta_1\gamma_1 \\ \beta_1\gamma_2 \\ \beta_2\gamma_1 \\ \beta_2\gamma_2 \\ \beta_3\gamma_1 \\ \beta_3\gamma_2 \\ \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \begin{bmatrix} \epsilon_{1,1} \\ \epsilon_{1,2} \\ \epsilon_{1,3} \\ \epsilon_{1,4} \\ \epsilon_{2,1} \\ \epsilon_{2,2} \\ \epsilon_{2,3} \\ \epsilon_{2,4} \\ \epsilon_{3,1} \\ \epsilon_{3,2} \\ \epsilon_{3,3} \\ \epsilon_{3,4} \end{bmatrix}.
$$

Note that in this case, the $\mathbf{X}_t$ matrix has three columns for each macroeconomic surprise and three columns for each calendar year, producing a single β^τ matrix and two distinct γ coefficients.

As discussed by Swanson & Williams (2014), a key advantage of this approach is that it mitigates the small-sample problem by incorporating additional observations into the estimation of β^τ. The main assumption underlying the specification is that, although the relative magnitude of γ remains constant, the responsiveness of returns to macroeconomic news announcement (MNA) surprises varies proportionally over the τ-subperiod. In other words, the model assumes a single-factor structure governing the time variation in return sensitivities.

A series of empirical tests supports the validity of this assumption in the baseline sample. The identification restriction imposes that the average value of β^τ equals one. Consequently, the sample mean of $\beta^\tau\gamma'\mathbf{X}_t$ coincides with $\gamma'\mathbf{X}_t$. In the special case in which β^τ is constant and equal to one, Eq. (2) reduces to the standard ordinary least squares (OLS) regression framework commonly employed in the macroeconomic announcement literature, including Gürkaynak et al. (2005).

We calculate returns over 10, 20, and 30-minute windows (Δh) following the release, emphasizing immediate market reactions and excluding the influence of prior-day movements. These intervals were previously chosen by Elenev et al. (2024), whose research tested various periods and reported results for 30-minute windows. However, unlike that study, because Brazilian markets open at 9 a.m., aligning with indicator releases, we do not compute returns in the same windows prior to the announcements. In addition, we assess the robustness of the results across different event windows, using 5- and 60-minute intervals in Section 4.

As mentioned earlier, our analysis covers the period from January 2016 to November 2025. Due to the availability of intraday financial data, the sample contains a relatively

limited number of macroeconomic announcements, totaling 121 IPCA, 120 IPCA-15, and 40 GDP releases. To mitigate potential small-sample issues and to explore different informational sets, the regression that captures the impact of announcement surprises is estimated under two alternative specifications. The first specification includes inflation surprises based on the IPCA and its mid-month version, IPCA-15, capturing the most relevant inflation announcements in Brazil. The second specification incorporates both inflation and economic activity surprises by including GDP announcement surprises alongside the inflation measures. Since GDP is released on a quarterly basis, a model based solely on GDP announcements would contain very few observations. Each specification is estimated separately for equity and bond returns.

Finally, in line with Elenev et al. (2024), we also investigate whether equity and bond markets respond differently to positive and negative inflation surprises.[3] In particular, we test whether market reactions differ when inflation is lower than expected (positive news) compared with higher-than-expected inflation (negative news). To this end, we modify Eq. (2) by introducing two separate time-varying coefficients for each year, allowing the magnitude of the response to differ depending on the direction of the surprise. The average effect, captured by γ, remains common across the specifications. The asymmetric news response model can therefore be described as follows (Elenev et al., 2024):

$$r_{t+\Delta h} = \alpha^{\tau} + \beta^{\tau}_{\text{good}}\,\gamma' \mathbf{X}_{\text{good},t} + \beta^{\tau}_{\text{bad}}\,\gamma' \mathbf{X}_{\text{bad},t} + \epsilon_t. \tag{3}$$

In this specification, β^{τ}_{good} and β^{τ}_{bad} represent the time-varying sensitivities of financial market returns to positive and negative macroeconomic surprises, respectively. These coefficients capture whether the magnitude of market reactions differs depending on the direction of the news. A higher value of β^{τ}_{good} (β^{τ}_{bad}) indicates a stronger response of asset returns to favorable (unfavorable) macroeconomic announcements relative to the average effect γ. If β^{τ}_{good} and β^{τ}_{bad} are statistically identical, the hypothesis of symmetric market responses to macroeconomic news cannot be rejected. Conversely, rejecting this equality provides evidence of asymmetric reactions to positive and negative surprises.

3. Impacts of macroeconomic news on financial markets

This section presents the main empirical results of the study, investigating how surprises in inflation and economic activity announcements affect financial markets. We begin by describing the data considered in the analysis, focusing on the intraday dynamics of equity and bond markets and the time evolution of macroeconomic announcement surprises. We then discuss the nonlinear regression results used to estimate the impact of these surprises

[3]The asymmetric response should ideally be examined separately in models that consider only inflation announcements and those that consider only economic activity announcements, as financial markets tend to react differently to higher-than-expected inflation and stronger-than-expected economic activity. However, given the relatively small number of GDP announcements in our sample, the asymmetric specification in this study focuses exclusively on inflation surprises.

on financial markets.

3.1. Intraday financial data

In this study, the impact of surprises in inflation and economic activity announcements is evaluated across two segments of the Brazilian financial market: the equity market and the fixed-income (bond) market.

As a proxy for the dynamics of the equity market, we consider quotations of the mini Ibovespa futures contracts, identified by the ticker WIN. The mini Ibovespa futures contract is a derivative traded on the Brazilian equity exchange (B3) whose underlying asset is the Ibovespa index, the main benchmark of the Brazilian equity market.[4] Compared with the standard Ibovespa futures contract, the mini contract has a smaller notional value and significantly higher trading volume, making it the most liquid instrument for capturing high-frequency movements in the Brazilian equity market. Quotations are collected for the contract closest to maturity on each trading date, as this contract typically concentrates the largest share of market liquidity.

For the fixed-income market, we construct a short-term Brazilian bond futures series based on One-day Interbank Deposit Futures contracts (ticker DI1).[5] Specifically, we follow the methodology proposed by Araujo & Caoduro (2024). This approach employs the DI futures contract—whose underlying asset is the Brazilian interbank deposit rate ("Depósitos Interfinanceiros", DI), the main benchmark for short-term interest rates in Brazil. We match each macroeconomic announcement with a DI futures contract based on its timing within the year. For announcements released between January and September, we use the contract maturing on January 1st of the following year. For announcements released between October and December, we use the contract maturing on January 1st two years ahead.

All price data consist of tick-by-tick transactions aggregated into one-minute intervals, using the last transaction price within each interval. This intraday approach enables a more sensitive identification of the impact of macroeconomic announcement surprises on both markets. The sample period spans from January 2016 to November 2025, constrained by the availability of intraday financial data.

The dataset used in this study, named *BTG-ATS-A26*, is provided by BTG Solutions Data Services[6] and is constructed from market data captured from B3. The raw data feed is collected via FIX/FAST protocols[7] and subsequently transformed into a structured format while preserving the original chronological ordering of events. From these data,

[4]For more details regarding mini Ibovespa Futures see: `https://www.b3.com.br/en_us/products-and-services/trading/equities/mini-ibovespa-futures.htm`. Accessed on 7 March, 2026.

[5]Details on One-day Interbank Deposit Futures contracts can be found at: `https://www.b3.com.br/en_us/products-and-services/trading/interest-rates/one-day-interbank-deposit-futures.htm`. Accessed on 7 March, 2026.

[6]Source: `https://dataservices.btgpactualsolutions.com/`. Accessed on 19 March, 2026.

[7]FIX (Financial Information eXchange) is a widely used industry protocol for the electronic communication of financial data, while FAST (FIX Adapted for STreaming) is a compression standard designed to efficiently encode high-frequency market data, reducing bandwidth usage and latency.

trade messages are used to construct one-minute candles, from which open, high, low, and close (OHLC) prices are obtained. In addition, for each interval, total traded volume, financial volume, and the number of trades are computed.[8]

Table 1 presents descriptive statistics for the 1-minute intraday returns of the equity and bond markets. The mean returns are close to zero for both series and, in terms of dispersion, bond returns exhibit a higher standard deviation than equity returns, indicating greater intraday variability in the interest rate futures market. Equity returns display negative skewness, suggesting a higher probability of extreme negative movements, while bond returns show positive skewness, indicating a greater incidence of large positive changes. Moreover, both series exhibit considerable high kurtosis, revealing pronounced fat tails and a strong presence of extreme observations, a common feature of high-frequency financial data.

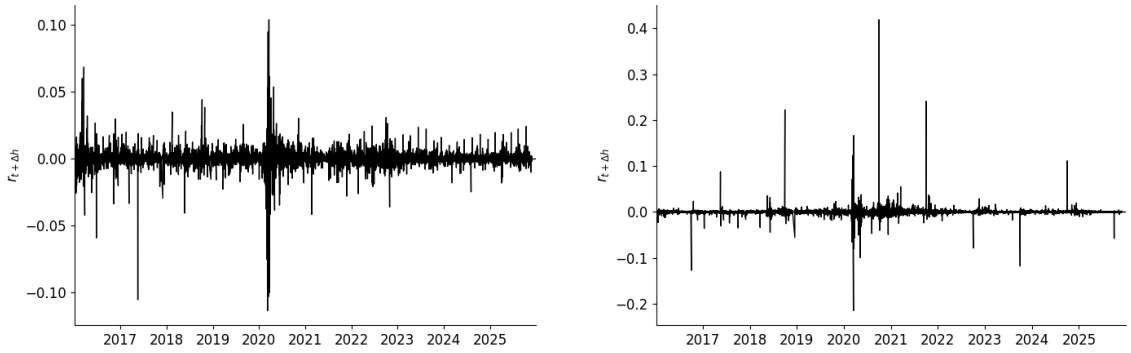
Table 1: **Descriptive statistics of intraday equity and bond returns**. This table reports descriptive statistics for intraday returns computed at 1-minute intervals over the period from January 2016 to November 2025. The equity market is proxied by mini Ibovespa futures (WIN), while DI futures returns (DI1) are used to capture the short-term interest-rate market.

Statistic	**Equity returns**	**Bond returns**
Mean	1.03×10^{-6}	-2.10×10^{-7}
Standard deviation	6.80×10^{-4}	1.12×10^{-3}
25th percentile	-2.33×10^{-4}	0.0000
Median	0.0000	0.0000
75th percentile	2.35×10^{-4}	0.0000
Skewness	-1.05×10^{1}	8.48×10^{1}
Kurtosis	3.82×10^{3}	3.38×10^{4}
Minimum	-1.14×10^{-1}	-2.15×10^{-1}
Maximum	1.04×10^{-1}	4.19×10^{-1}
# obs.	1.284,114	755,106

Figure 1 illustrates the return series os the equity and bond markets. For equity returns, Figure 1-(a), extreme returns are evident during the COVID-19 pandemic in 2020 and in May 2017, as a response to the so-called Car Wash Operation ("Operação Lava Jato", in Portuguese), a well-documented corruption and money-laundering investigation in Brazil. Additionally, a volatility cluster occurs in the first half of 2016, which may reflect external and domestic political events, specifically the approval of the United Kingdom's exit from the European Union ("Brexit") and the impeachment against the current Brazilian president at the time (see Figure 1-(a)). For bond returns, Figure 1-(b), larger returns are also observed in 2020 due to the pandemic. Other notable increases correspond to periods when short-term contracts with different maturities are aggregated, as in Araujo

[8] Appendix A provides detailed information on the construction, processing, and validation of the high-frequency dataset used in the empirical analysis.

& Caoduro (2024). Despite this limitation, none of these returns coincide with inflation and GDP release dates.[9]



(a) Equity returns.

(b) Bond returns.

Figure 1: **Temporal evolution of equity and bond returns**. This figure presents the Brazilian equity and bond returns computed at a 1-minute frequency from January 2016 to November 2025. The equity market is proxied by mini Ibovespa futures (WIN), while DI futures returns (DI1) are used to capture the short-term interest-rate market.

Once the financial market return series are defined, the macroeconomic news announcement surprise ($X_{i,t}$) series, defined in Eq. (1), are constructed. Two model specifications are considered. The first includes inflation surprises based on the IPCA and its mid-month version, IPCA-15. The second specification incorporates both inflation and economic activity surprises by adding GDP announcement surprises to the inflation measures.

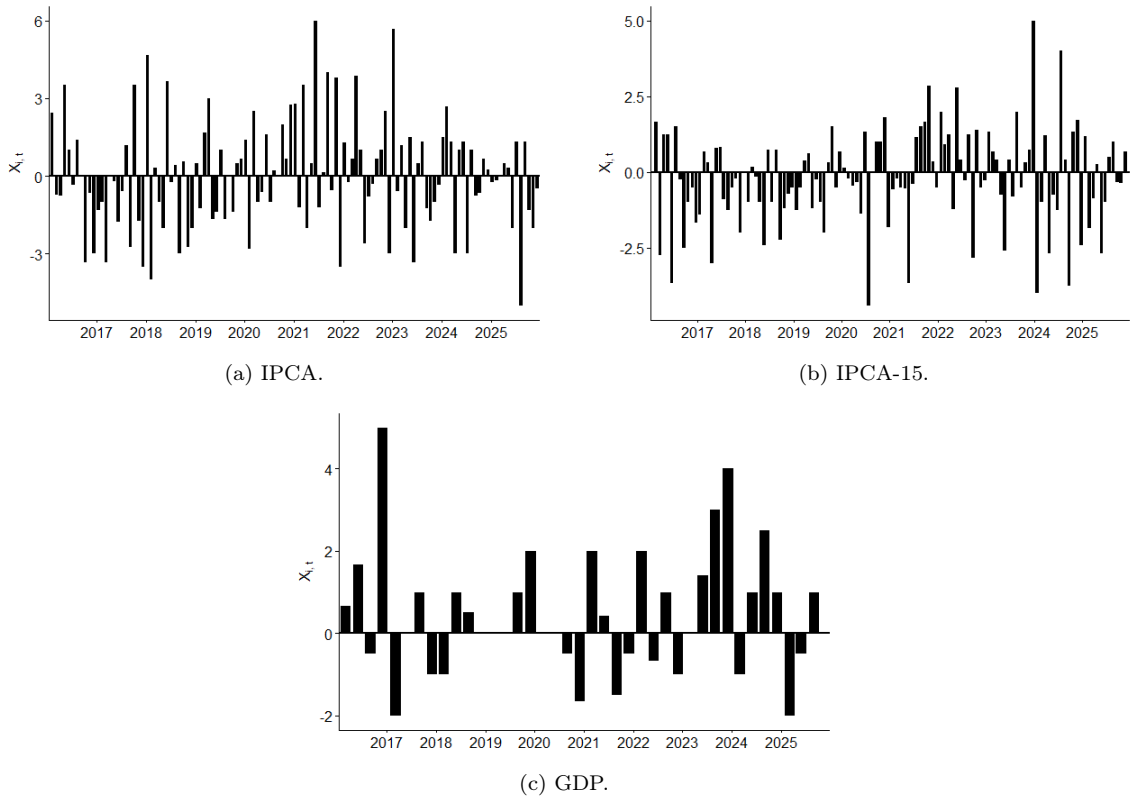
Figure 2 shows the series of IPCA, IPCA-15, and GDP surprises used in our analysis. It indicates that inflation-related macroeconomic surprises, IPCA and IPCA-15 in panels (a) and (b), respectively, display greater dispersion and magnitude over time compared to GDP surprises in panel (c) of Figure 2. In particular, IPCA exhibits more frequent extreme deviations, both positive and negative, suggesting higher volatility in inflation expectations around announcement dates. IPCA-15 shows a similar pattern, but with slightly smaller amplitudes and a tighter concentration around zero, indicating more moderate surprises. In contrast, GDP surprises are less pronounced and more sporadic, with lower overall variability, This may reflect the fact that a part of the information used to measure GDP was previously released on a monthly basis.[10] These patterns suggest that inflation announcements—especially IPCA—carry more informational surprise for the market than GDP releases.

In the next subsection, we estimate nonlinear regressions for equity and bond returns under three alternative specifications. The first includes only IPCA surprises, the second includes IPCA and IPCA-15 surprises, and the third incorporates inflation and economic

[9] Although such discontinuities can be addressed using interpolation methods, we do not explore this approach since they do not align with the announcement dates.

[10] For further details on GDP methodology, see `https://www.ibge.gov.br/estatisticas/economicas/industria/9300-contas-nacionais-trimestrais.html?=&t=conceitos-e-metodos`. Accessed on 20 March, 2026.

activity surprises by adding GDP announcements.



(a) IPCA.

(b) IPCA-15.

(c) GDP.

Figure 2: **Macroeconomic news surprises**. This figure presents the macroeconomic news surprises for IPCA, IPCA-15 (mid-month inflation), and GDP from January 2006 to November 2025. The surprise measure, Xi, t, is computed as the difference between the announced value and the median market expectation, standardized by the standard deviation of expectations. Positive (negative) values indicate that the announced statistics were higher (lower) than the median market expectations.

3.2. Financial market sensitivity to macroeconomic surprises

We first examine the effects of macroeconomic news on the equity market, using mini Ibovespa futures returns as a proxy for this market. Since the results may depend on the size of the return window, we consider 10-, 20-, and 30-minute windows (Δ_h) following the data release. Table 2 reports the estimates of the coefficients that measure the average sensitivity, that is, $\hat{\gamma}$. The response model in Eq. (2) is estimated using two different approaches. The first considers only inflation announcements (all announcements related to IPCA and IPCA-15 releases). The second approach, in addition to including inflation announcements, also incorporates announcements related to GDP.[11]

The results in Table 2 show a statistically significant negative impact of consumer inflation surprises across all three windows, indicating that inflation releases above market expectations are associated with lower equity returns (negative $\hat{\gamma}$ in inflation model). The estimated $\hat{\gamma}$ coefficients suggest that mid-month inflation (IPCA-15) has a stronger impact

[11] A specification including only GDP announcement surprises is not estimated due to the limited number of observations in the sample. Since GDP is released on a quarterly basis, the sample period from January 2016 to November 2025 would yield 40 observations, which is insufficient for reliable estimation.

across all three specifications, as the estimated coefficients for IPCA-15 surprises are consistently larger than those associated with IPCA. This may reflect the fact that IPCA-15 provides an earlier signal of inflation dynamics, although IPCA still contains relevant information for equity returns. The effect is strongest in the 20-minute window for IPCA-15 and in the 30-minute window for IPCA. Nevertheless, the results remain robust across alternative window lengths.

Table 2: **Macroeconomic surprise impacts on equity returns**. This table reports the estimates of $\hat{\gamma}$, which measure the average response of equity market returns to macroeconomic announcement surprises. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. The sample period is from January 2016 through November 2025. Returns are computed over alternative post-announcement windows of length Δ_h, corresponding to 10, 20, and 30 minutes after the release. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises. Values reported in parentheses correspond to the standard errors of the estimates. The symbols (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Inflation			**Inflation and economic activity**		
	10 min	20 min	30 min	10 min	20 min	30 min
$\hat{\gamma}_{\text{IPCA}}$	-0.0372***	-0.0439***	-0.0511***	-0.0327**	-0.0387***	-0.0459***
	(0.0141)	(0.0135)	(0.0137)	(0.0138)	(0.0125)	(0.0128)
$\hat{\gamma}_{\text{IPCA-15}}$	-0.0567***	-0.0688***	-0.0633***	-0.0503***	-0.0610***	-0.0530***
	(0.0151)	(0.0172)	(0.0196)	(0.0144)	(0.0168)	(0.0192)
$\hat{\gamma}_{\text{GDP}}$	-	-	-	-0.0377**	-0.0445*	-0.0444
	-	-	-	(0.0173)	(0.0252)	(0.0287)

The negative effect on equity returns—reflected in the negative $\hat{\gamma}$ coefficients reported in Table 2—can be linked to market participants' expectations regarding future monetary policy actions. In particular, inflation announcements above market expectations may lead investors to anticipate a more hawkish stance by the Central Bank of Brazil. This may involve raising the policy interest rate, known as the Selic rate ("Sistema Especial de Liquidação e de Custódia"), or postponing previously expected interest rate cuts. As higher interest rates increase the discount rate applied to future cash flows and reduce the attractiveness of risky assets relative to fixed-income instruments, equity prices tend to decline following such inflation surprises. These findings are consistent with those of Elenev et al. (2024) for the post-pandemic U.S. equity market, and with the results of Modugno & Palazzo (2025) and Cruz et al. (2023), whose analyses show a negative impact even in low-frequency data. According to the firm-level data used by these two studies, companies interpret negative inflation surprises as cost shocks, which justifies the negative equity return reactions.

GDP surprises also display a negative estimated coefficient ($\hat{\gamma}_{GDP}$). As shown in Table 2, the effect is statistically significant in the 10-minute window but loses statistical significance in the longer windows, particularly in the 30-minute specification. The partial

dissipation of the effect may be due to two reasons: (i) although it provides new information, the GDP indicator is only released three months after the reference date, with new information being absorbed faster than inflation data, and (ii) market economists usually take longer to analyze IPCA-15 and IPCA news, as most series provided by IBGE are neither the same aggregation used by the Brazilian Central Bank to assess inflation (such as services and industrial prices) nor are they adjusted data.

Figure 3 reports the estimates of the time-varying sensitivity coefficient $\hat{\beta}^{\tau}$ (solid black line), which measures how the impact of macroeconomic news on equity returns evolves over time, as described in Eq. (2). The results indicate that the effect of inflation announcements was stronger in 2018 than the sample average across all windows and specifications, as shown in panels (a), (b), and (c). This pattern remains broadly consistent when economic activity announcements are included, as reported in panels (d), (e), and (f). The impact becomes even more pronounced in 2022 for the 10- and 20-minute return windows, and in 2021 for the 20-minute window. During these periods, the estimated coefficients are statistically above one, indicating that the sensitivity of equity returns to macroeconomic news was significantly higher than its historical average. In contrast, most of the remaining estimates are not statistically different from one, suggesting no meaningful deviation from the average response. Overall, these findings indicate that equity markets reacted more strongly to macroeconomic announcements—both inflation and economic activity—in 2018, 2021, and 2022 compared to other years.

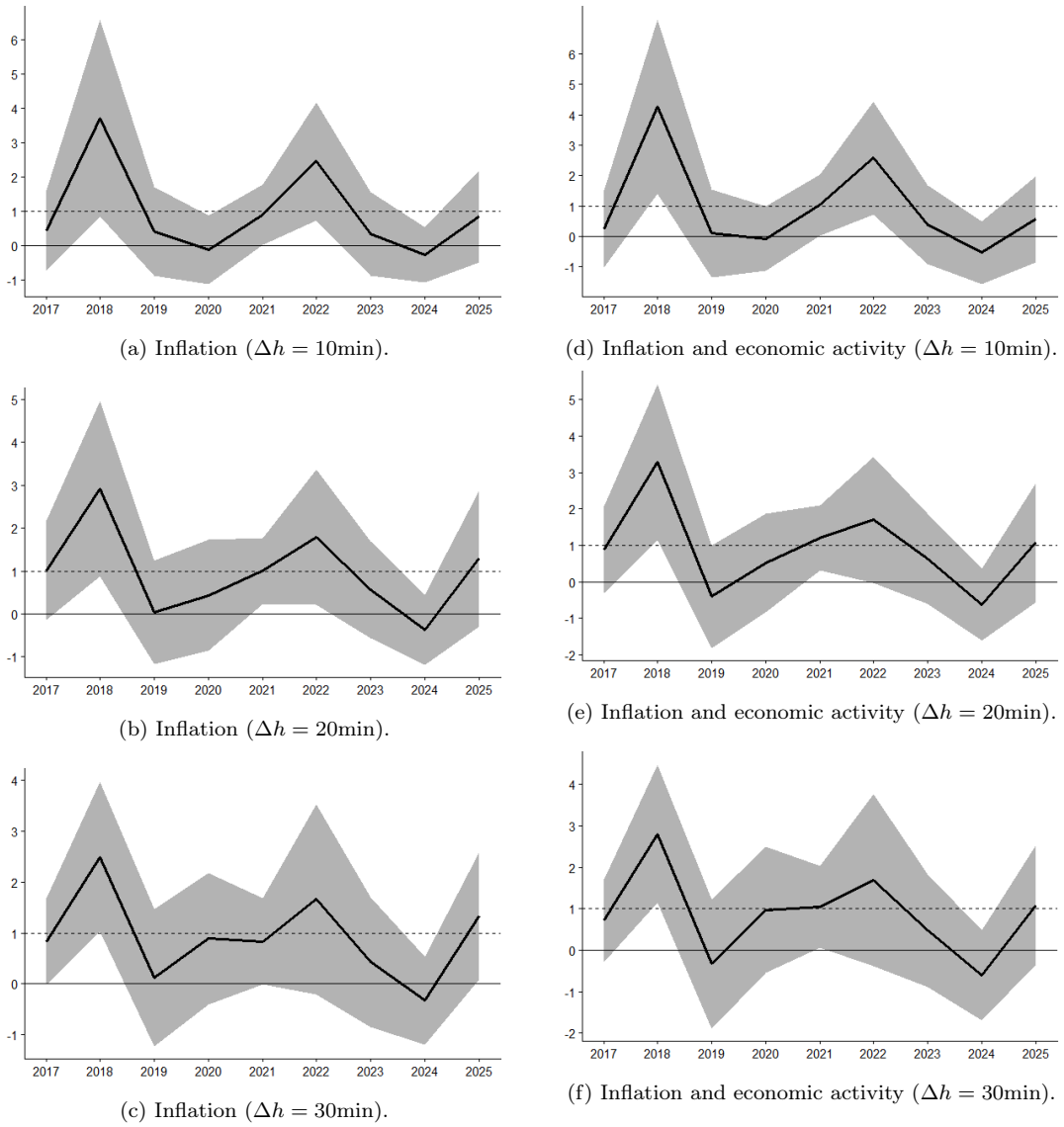
To better understand the dynamics of the equity market response to macroeconomic news, Figure 4 presents the temporal evolution of key macroeconomic conditions in Brazil, measured by two important variables: the output gap and the level of policy uncertainty. The latter is proxied by the economic policy uncertainty index, a widely used indicator of uncertainty related to economic and political developments in the country.[12] These variables help contextualize the empirical results and explain potential differences relative to those reported by Elenev et al. (2024), which point to a more pronounced effect of announcements when the output gap is negative, i.e., the impact is countercyclical, but do not explore high uncertainty levels as a possible source of nonlinearities. Even though we do not rule out a possible influence of the negative output gap on the stronger effects observed in 2018, 2021, and 2022—particularly in the latter two years, when the gap rapidly narrowed toward zero, which may have contributed to a more cautious stance in monetary policy—these periods were also characterized by higher levels of political and fiscal policy uncertainty.

Although Figure 3 does not show evidence of a distinct impact in 2020—a year strongly affected by the COVID-19 pandemic—it highlights more pronounced sensitivity in other periods. In particular, presidential elections took place in 2018 and 2022, events that are

[12]The policy uncertainty index is calculated by Getúlio Vargas Foundation ("Fundação Getúlio Vargas", FGV) and measures uncertainty based on newspapers and financial markets expectations. The methodology is described at: `https://portalibre.fgv.br/en/economic-uncertainty-indicator-brazil`. Accessed on 8 March, 2026.

typically associated with increased uncertainty and higher volatility in financial markets, which may help explain the stronger responses observed in those years. Specifically, in 2018, a major truckers' strike in May temporarily paralyzed several economic sectors, prompting the government to cut the diesel tax to address the situation and increasing fiscal concerns, as it implied a tax waiver.[13]

[13]For more information, see reports regarding the strike and its consequences, such as: `https://g1.globo.com/economia/noticia/bovespa-28-05-2018.ghtml` and `https://www.reuters.com/article/markets/us/brazils-bovespa-hits-2018-low-amid-truckers-protest-idUSL2N1SZ0ME/`. Accessed on 8 March, 2026.



(a) Inflation ($\Delta h = 10$min).

(d) Inflation and economic activity ($\Delta h = 10$min).

(b) Inflation ($\Delta h = 20$min).

(e) Inflation and economic activity ($\Delta h = 20$min).

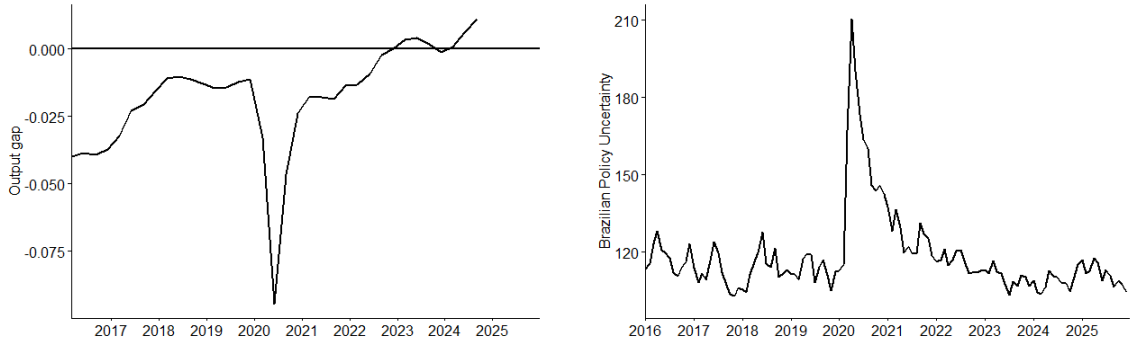
(c) Inflation ($\Delta h = 30$min).

(f) Inflation and economic activity ($\Delta h = 30$min).

Figure 3: **Time variation in equity return sensitivity to macroeconomic news**. This figure reports the estimated time-varying sensitivity coefficient β^{τ} (solid black line), whose sample average is normalized to one. The shaded area represents ± 2 standard-error bands around β^{τ}. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. The sample period is from January 2016 through November 2025. Returns are computed over alternative post-announcement windows of length Δ_h, corresponding to 10-, 20-, and 30-minute intervals following the data release. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises.

In addition, fiscal policy discussions were the main economic highlights in 2021 and 2022. Increased fiscal stimulus for households boosted consumption and accelerated the economic recovery after the lockdowns, leading to higher-than-expected inflation and, in turn, contractionary measures by the BCB. Discussions about replacing the fiscal ceiling, a strict rule to curb the public deficit, with a more flexible fiscal framework also raised market concerns at the time, amid higher public debt expectations. For example, Avila (2023) documented that the bond market exhibited volatility between 2021 and 2022 due

to changes in fiscal rules, including the exclusion of court-ordered payments (known as "precatórios" in Portuguese) from the fiscal target, and a constitutional amendment that authorized higher cash transfers in July 2022.[14]



(a) Brazilian output gap

(b) Policy uncertainty index.

Figure 4: **Macroeconomic conditions in Brazil: output gap and policy uncertainty**. This figure illustrates key macroeconomic conditions in Brazil during the sample period from January 2016 to November 2025. Panel (a) shows the estimated output gap, capturing fluctuations in economic activity relative to potential output. Panel (b) presents the economic policy uncertainty index, which reflects the level of uncertainty surrounding economic policy and political conditions.

In summary, the results obtained thus far indicate that the equity market responds adversely to inflation and to GDP releases that exceed expectations, potentially reflecting changes in expectations about the monetary authority's subsequent actions. This negative response is more pronounced in 2018, 2021, and 2022, which were characterized by economic activity below its potential and heightened political uncertainty.

We now turn to the analysis of the effects of macroeconomic announcements on the Brazilian bond market. Table 3 reports the results for interest rate futures returns. The estimates indicate a positive and statistically significant impact of IPCA-15 surprises across all time windows ($\hat{\gamma}_{\text{IPCA-15}}$)in both the inflation-only specification and the specification that additionally includes economic activity announcements. This response can be interpreted as a reassessment of inflation expectations: higher-than-expected inflation leads market participants to anticipate a more cautious monetary policy stance by the Central Bank. In contrast to the equity market results (refer to Table 2), DI returns yields do not appear to react significantly to IPCA announcements (see Table 3). This pattern indicates that the bond market, given its closer connection to monetary policy expectations, may already incorporate most available information about inflation dynamics before the official release of the IPCA. Consequently, market participants respond primarily to IPCA-15 surprises, which, as discussed earlier, are released before the IPCA and therefore provide earlier signals about inflation developments. The magnitude of the average effects of IPCA-15 surprises on equity and bond returns is broadly comparable (see Table 3). However, the response of interest rate futures returns tends to decline as the return window increases,

[14]For further details, see: `https://sl1nk.com/cBQVl` and `https://l1nq.com/S2h8p`. Accessed on 8 March, 2026.

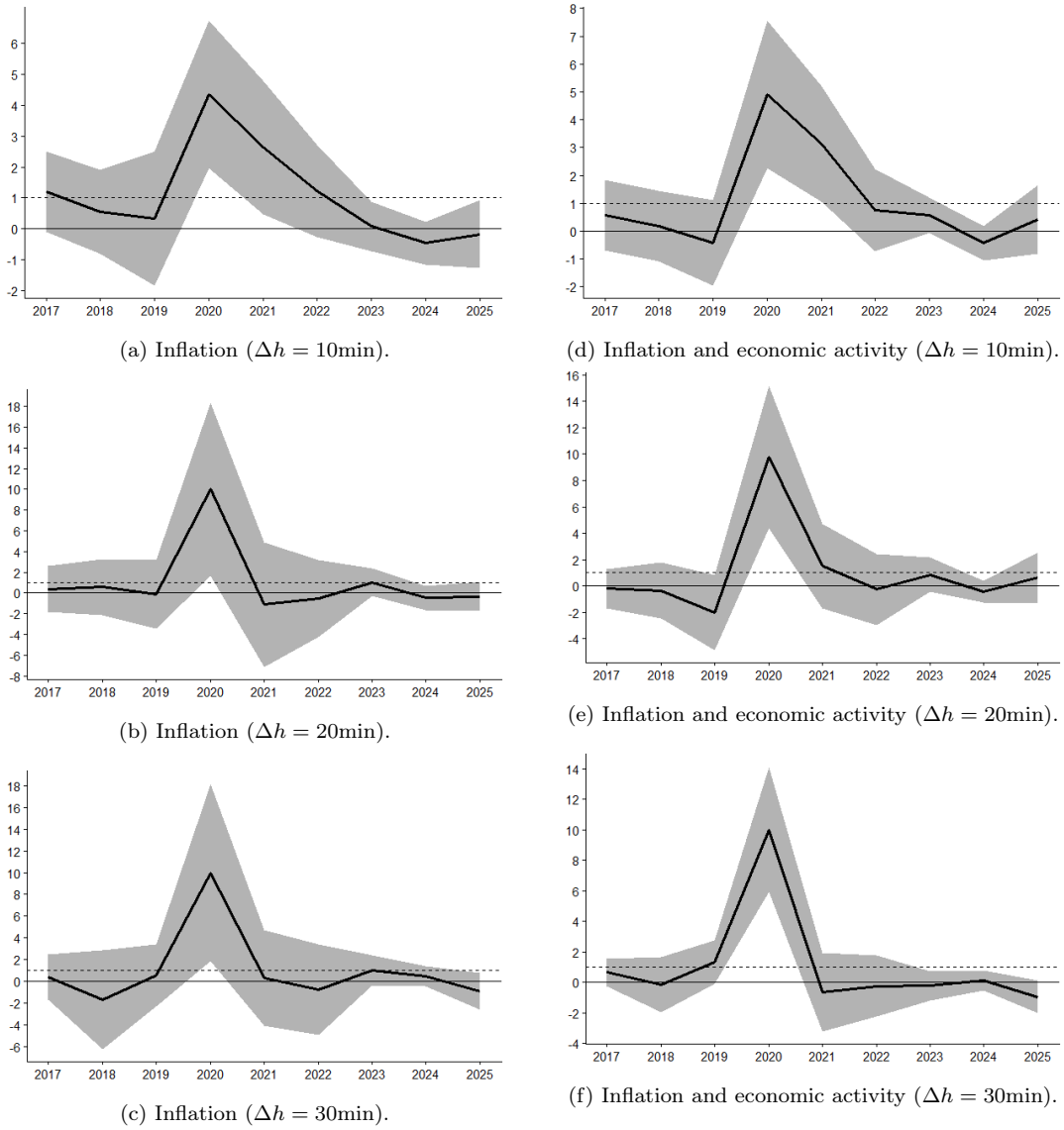
indicating that the adjustment in the bond market occurs rapidly after the announcement.

GDP surprises display a different pattern compared with the results obtained for equity returns (see Table 2) and vary across the return windows considered. As reported in Table 3, the estimated effect is positive and statistically significant in the 10-minute window, and its magnitude is even larger than that associated with IPCA-15 surprises. However, the effect becomes statistically insignificant in the 20-minute window and turns negative in the 30-minute window. Hence, when GDP growth exceeds market expectations, interest rate futures initially react positively, reflecting a reassessment of inflationary pressures and expectations of tighter monetary policy. As market participants process the information in greater detail, this initial reaction appears to be partially reversed, leading to lower returns in the longer window. One possible explanation is that economists and traders gradually analyze the underlying components of the GDP release and conclude that the headline figure provides limited additional information about future economic conditions. This interpretation is consistent with the nature of the GDP indicator, which is released with a substantial delay—approximately three months after the reference period.

Table 3: **Macroeconomic surprise impacts on bond returns**. This table reports the estimates of $\hat{\gamma}$, which measure the average response of bond market returns to macroeconomic announcement surprises. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025.Returns are computed over alternative post-announcement windows of length Δ_h, corresponding to 10, 20, and 30 minutes after the release. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises. Values reported in parentheses correspond to the standard errors of the estimates. The symbols (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Inflation			**Inflation and economic activity**		
	10 min	20 min	30 min	10 min	20 min	30 min
$\hat{\gamma}_{\text{IPCA}}$	0.0220	-0.0199	-0.0148	0.0179	-0.0117	-0.0136
	(0.0163)	(0.0186)	(0.0148)	(0.0154)	(0.0169)	(0.0179)
$\hat{\gamma}_{\text{IPCA-15}}$	0.0723***	0.0402**	0.0497**	0.0635***	0.0419***	0.0488***
	(0.0191)	(0.0186)	(0.0223)	(0.0175)	(0.0138)	(0.0139)
$\hat{\gamma}_{\text{GDP}}$	-	-	-	0.0970**	0.0864	-0.1357**
	-	-	-	(0.0388)	(0.0771)	(0.0553)

Turning to the bond market, depicted in Figure 5, the estimated time-varying sensitivities display a different pattern compared with the results obtained for equity returns.



(a) Inflation ($\Delta h = 10$min).

(d) Inflation and economic activity ($\Delta h = 10$min).

(b) Inflation ($\Delta h = 20$min).

(e) Inflation and economic activity ($\Delta h = 20$min).

(c) Inflation ($\Delta h = 30$min).

(f) Inflation and economic activity ($\Delta h = 30$min).

Figure 5: **Time variation in bond return sensitivity to macroeconomic news**. This figure reports the estimated time-varying sensitivity coefficient β^{τ} (solid black line), whose sample average is normalized to one. The shaded area represents ± 2 standard-error bands around β^{τ}. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over alternative post-announcement windows of length Δ_h, corresponding to 10-, 20-, and 30-minute intervals following the data release. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises.

As shown in Figure 5, inflation surprises exert a significantly stronger effect in 2020, a year heavily affected by the COVID-19 pandemic. This period coincides with the largest negative output gap and the highest level of policy uncertainty in the sample (refer to Figure 4). These conditions were driven by the rapid increase in COVID-19 cases and deaths, widespread lockdown measures that disrupted economic activity, and substantial uncertainty regarding the duration and economic consequences of the health crisis. The magnitude of this effect is particularly pronounced in the bond market. The estimated

$\hat{\beta}^{\tau}$ parameters indicate that the sensitivity of DI futures returns to inflation surprises was substantially higher during this period, reaching levels nearly ten times larger than the sample average in the 20- and 30-minute windows (see 5). This pattern suggests that macroeconomic announcements became significantly more informative for interest rate expectations during the peak of macroeconomic uncertainty.

Overall, the results show that both equity and bond markets respond to macroeconomic surprises, adjusting expectations about future monetary policy moves. While equity returns are negatively impacted by higher-than-expected inflation and GDP news, bond returns benefit. Additionally, these responses occur in the post-announcement window, indicating that markets react quickly to incorporate new macroeconomic information. Furthermore, the reactions of both markets are more pronounced in years with high uncertainty and a negative output gap.

These findings are particularly relevant for trading desks and execution teams, but mainly as inputs for event-time risk management rather than as mechanical arbitrage rules. First, the estimated sign and magnitude of the responses allow desks to map inflation and activity surprises into short-horizon adjustments in equity and interest-rate futures, improving scenario analysis and pre-announcement positioning around scheduled releases. Second, the evidence that announcement sensitivity varies over time implies that position sizing, hedge ratios, and inventory limits should be state dependent, with more conservative risk budgets in periods of elevated uncertainty, when the pass-through of surprises to prices tends to be stronger. Third, the opposite reactions observed across equity and interest-rate futures can support cross-asset hedging, relative-value decisions, and execution design, since market makers may reduce passive quoting immediately after releases to mitigate adverse-selection risk. These implications should be interpreted with caution, however, because realized profitability still depends on latency, liquidity, and transaction costs.

To further assess the robustness of the results, the following section presents additional empirical exercises under alternative choices of return windows. Next, we investigate potential asymmetries in market responses to macroeconomic news by distinguishing between positive and negative announcement surprises.

4. Robustness checks

To assess the robustness of the results across different horizons, we re-estimate the nonlinear model of Eq. (2) using alternative return windows of 5 and 60 minutes. Table 4 reports the estimates obtained using a 5-minute post-announcement return window. The results, which hold for both the inflation-only specification and the specification that additionally includes economic activity surprises, confirm the negative impact of inflation surprises on equity returns, with both IPCA and IPCA-15 announcements displaying statistically significant coefficients across specifications. In contrast, the bond market exhibits a different response pattern: while IPCA surprises are associated with negative yield returns, IPCA-15 surprises generate positive and statistically significant effects, indicating

that higher-than-expected mid-month inflation leads to an upward adjustment in interest rate expectations. GDP surprises, however, do not display statistically significant effects on either equity or bond returns in this short window.

Table 4: **Macroeconomic surprise impacts on equity and bond returns: 5-minute post-announcement window**. This table reports the estimates of $\hat{\gamma}$, which measure the average response of equity and bond returns to macroeconomic announcement surprises. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 5-minute post-announcement window (Δ_h = 5min). The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises. Values reported in parentheses correspond to the standard errors of the estimates. The symbols (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively.

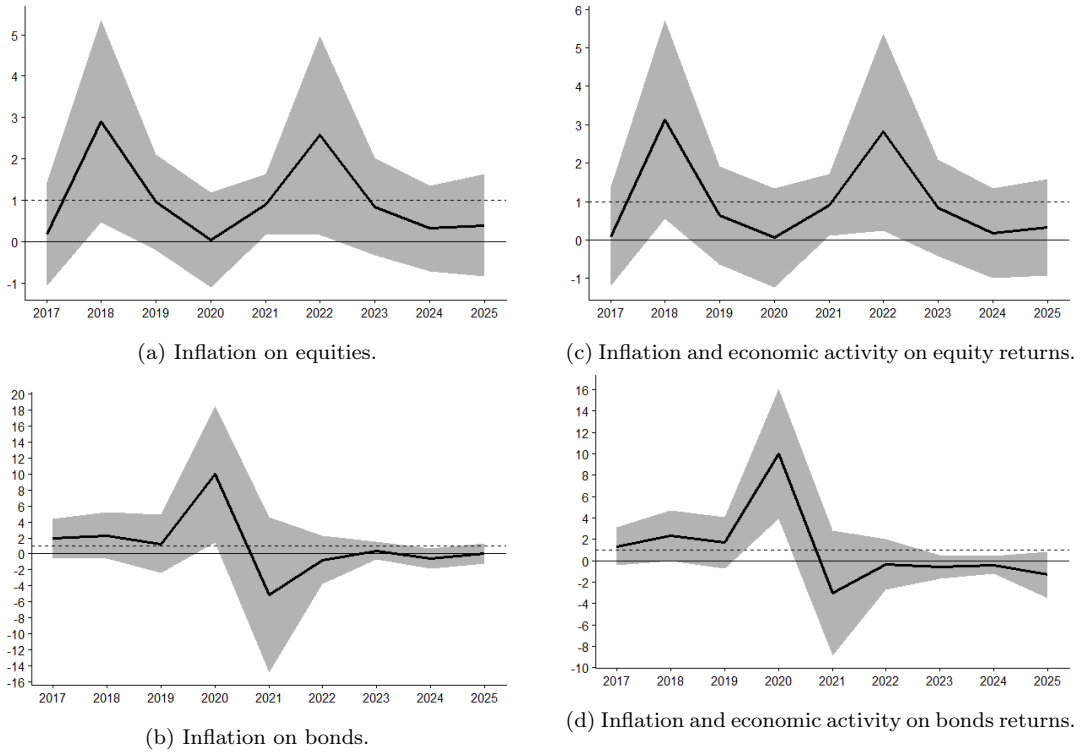
	Inflation		**Inflation and economic activity**	
	Equity returns	Bond returns	Equity returns	Bond returns
$\hat{\gamma}_{\text{IPCA}}$	-0.0336***	-0.0181*	-0.0314***	-0.0176*
	(0.0122)	(0.0106)	(0.0119)	(0.0092)
$\hat{\gamma}_{\text{IPCA-15}}$	-0.0397***	0.0265*	-0.0364**	0.0307***
	(0.0146)	(0.0142)	(0.0140)	(0.0115)
$\hat{\gamma}_{\text{GDP}}$	-	-	-0.0153	-0.0591
	-	-	(0.0146)	(0.0432)

Table 5 reports the estimates obtained using a 60-minute post-announcement window. The results indicate that only IPCA surprises remain statistically significant for equity returns, maintaining the negative effect observed in the baseline specifications. This pattern is robust to the inclusion of economic activity surprises. In contrast, neither IPCA-15 nor GDP surprises display statistically significant effects on equity returns at this longer horizon. For the bond market, the estimated coefficients are not statistically significant across all macroeconomic announcements, suggesting that the adjustment of interest rate expectations occurs rapidly after the release and dissipates within the first hour. Overall, the findings reinforce the view that the impact of macroeconomic news on financial markets is concentrated in shorter time windows, which aligns with other studies that generally observe stronger future price movements around the event time (Xu & You, 2025).

Table 5: **Macroeconomic surprise impacts on equity and bond returns: 60-minute post-announcement window**. This table reports the estimates of $\hat{\gamma}$, which measure the average response of equity and bond returns to macroeconomic announcement surprises. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 60-minute post-announcement window ($\Delta_h = 60$min). The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises. Values reported in parentheses correspond to the standard errors of the estimates. The symbols (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Inflation		**Inflation and economic activity**	
	Equity returns	Bond returns	Equity returns	Bond returns
$\hat{\gamma}_{\text{IPCA}}$	-0.0621***	-0.0182	-0.0546***	-0.0175
	(0.0181)	(0.0175)	(0.0181)	(0.0167)
$\hat{\gamma}_{\text{IPCA-15}}$	-0.0190	0.0446	-0.0166	0.0444
	(0.0159)	(0.0271)	(0.0141)	(0.0267)
$\hat{\gamma}_{\text{GDP}}$	-	-	-0.0470	0.0154
	-	-	(0.0270)	(0.0286)

Figures 6 and 7 present the estimated β^{τ} for 5 and 60-minute windows, respectively. Particularly for the 5-minute interval, the results are similar to those obtained from 10-, 20-, and 30-minute windows in Section 3, suggesting that equity returns respond more intensely to announcements in 2018, 2021, and 2022, whereas bond returns are more sensitive to surprises in 2020. In the 60-minute window estimations, there is evidence of a more pronounced effect of the news on equity returns only in 2018, while there is no statistically significant β^{τ} for bond returns, which is aligned with the non-significance of all $\hat{\gamma}$.



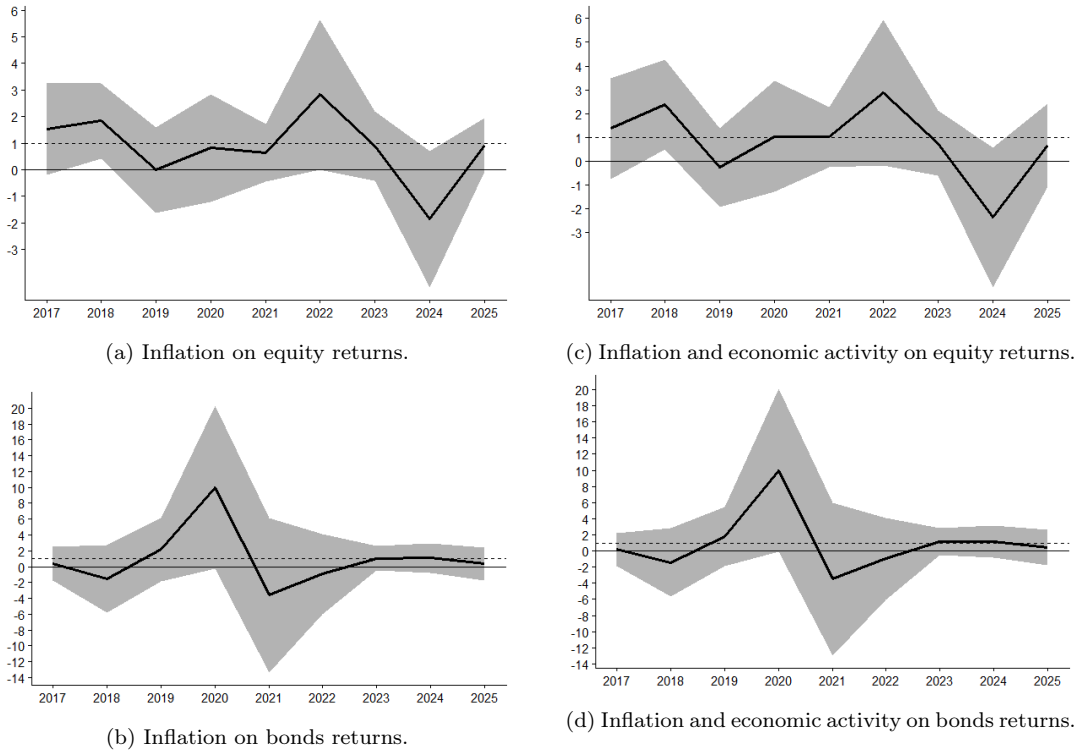
(a) Inflation on equities.

(c) Inflation and economic activity on equity returns.

(b) Inflation on bonds.

(d) Inflation and economic activity on bonds returns.

Figure 6: **Time variation in equity and bond returns sensitivity to macroeconomic news: 5-minute post-announcement window**. This figure reports the estimated time-varying sensitivity coefficient β^{τ} (solid black line), whose sample average is normalized to one. The shaded area represents ± 2 standard-error bands around β^{τ}. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 5-minute post-announcement window. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises.



(a) Inflation on equity returns.

(c) Inflation and economic activity on equity returns.

(b) Inflation on bonds returns.

(d) Inflation and economic activity on bonds returns.

Figure 7: **Time variation in equity and bond returns sensitivity to macroeconomic news: 60-minute post-announcement window**. This figure reports the estimated time-varying sensitivity coefficient β^{τ} (solid black line), whose sample average is normalized to one. The shaded area represents ± 2 standard-error bands around β^{τ}. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 60-minute post-announcement window. The response model is estimated using two specifications. The first specification includes only inflation announcements, namely the releases of IPCA and IPCA-15. The second specification incorporates both inflation and economic activity announcements by additionally including GDP surprises.

5. Asymmetric impacts

In this section, we investigate whether equity and bond returns react differently to positive (lower-than-expected) and negative (higher-than-expected) inflation announcements, i.e., whether responses to news vary by the surprise's direction, by running the regression 3 for IPCA and IPCA-15 news. We provide the results only for a 30-minute window, as they are similar to those for 10 and 20-minute intervals.[15] When examining asymmetric effects, it is not appropriate to combine inflation and economic activity announcements in the same specification, as markets may react differently to surprises in these variables. Given that economic activity is proxied by GDP, which has only 40 announcements in our sample period, the asymmetric analysis focuses exclusively on inflation surprises.

Table 6 reports the test statistics for asymmetric sensitivity to inflation surprises, computed as the difference between the responses to "bad" and "good" news. Positive values indicate a stronger response to adverse inflation surprises, while negative values suggest a

[15] Results for the other event windows are available from the authors upon request.

stronger reaction to favorable ones. As previously reported, the results for equity returns indicate time variation in some of the estimated β^{τ} coefficients. However, such variation is not systematically accompanied by statistically significant asymmetry between positive and negative surprises. The exception is 2018, in which, in addition to a temporally distinct coefficient, the difference between the responses to positive and negative shocks is itself statistically significant. This finding suggests that, in most periods, the effect varies primarily in magnitude over time, whereas in 2018 the underlying transmission mechanism also becomes asymmetric with respect to the sign of the announcement.

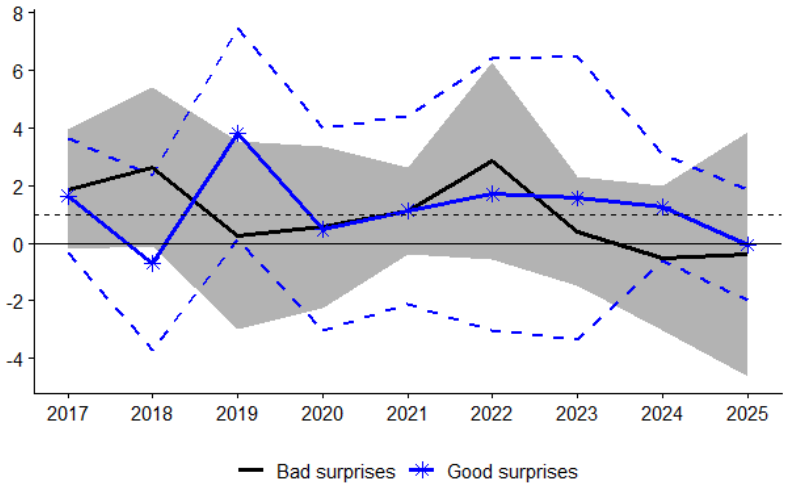
Table 6: **Test statistics for asymmetric sensitivity to inflation surprises: 30-minute post-announcement window**. This table reports the estimates of asymmetric sensitivity to macroeconomic news, with H0: $\beta^{\tau}_{bad} = \beta^{\tau}_{good}$. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market. DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 30-minute post-announcement window (Δ_h = 5min). The response model is estimated using a single specification that includes only inflation announcements, namely the releases of IPCA and IPCA-15. Values reported in parentheses correspond to the standard errors of the estimates. The symbols (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Equity returns	**Bond returns**
Year	$\left(\hat{\beta}^{\tau}_{bad} - \hat{\beta}^{\tau}_{good}\right)$	$\left(\hat{\beta}^{\tau}_{bad} - \hat{\beta}^{\tau}_{good}\right)$
2017	0.2162	-0.3598
	(1.9940)	(2.8559)
2018	3.3331**	-0.2265
	(1.5791)	(2.2060)
2019	-3.5278	-3.0244
	(2.1535)	(3.3914)
2020	0.0949	-1.7754
	(1.6955)	(2.8177)
2021	-0.0122	8.0000***
	(1.3516)	(2.2170)
2022	1.1588	1.9771
	(1.6274)	(2.6662)
2023	-1.1483	-2.8717
	(1.5270)	(2.3984)
2024	-1.7490	-2.0640
	(1.3428)	(2.5714)
2025	-0.3134	0.2822
	(2.6020)	(4.1506)

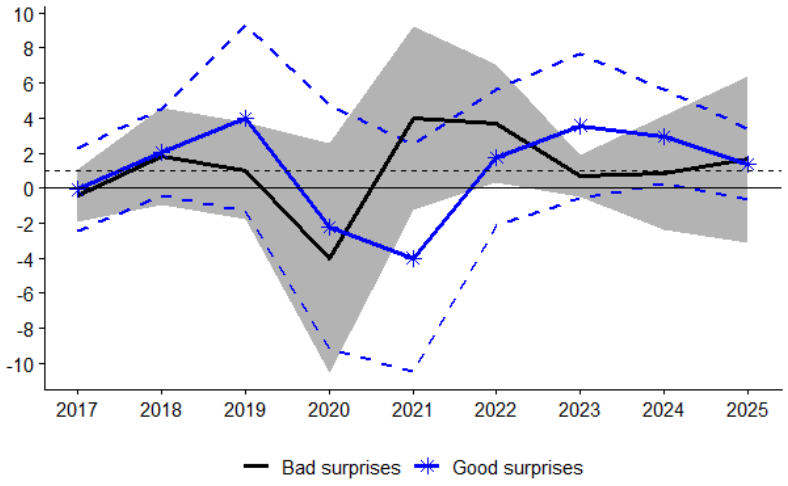
For bond returns, the results indicate that the year in which the overall effect is strongest does not coincide with the year in which the asymmetric response becomes statistically significant (see Figure 6). In particular, while 2021 exhibits a positive and statistically significant asymmetry, no such evidence is found for other years. This pattern suggests that the magnitude of the effect and its directional asymmetry capture distinct features of the underlying transmission mechanism. In other words, a given year may display a statistically meaningful response without evidence of differential reactions to shocks of opposite signs, whereas asymmetry may emerge in another period even when the overall effect is not strongest. Accordingly, the results indicate that statistical significance in the baseline specification should not be interpreted as sufficient evidence of asymmetry, which appears to arise only under more specific conditions.

In addition, Figure 8 provides a visual decomposition of the asymmetric responses by reporting the time-varying coefficients associated with bad and good macroeconomic surprises separately. For equity returns, the responses to both types of shocks largely move together over time, with only limited and short-lived deviations between the two series, most notably around 2018, consistent with the evidence of statistically significant asymmetry in that year. Outside this episode, the overlap of confidence bands suggests no systematic difference in the reaction to positive and negative surprises. In contrast, the bond market exhibits more pronounced divergences between bad and good surprises, particularly around 2020–2021, where responses to favorable and unfavorable news move in opposite directions and with different magnitudes. This pattern reinforces the notion that asymmetry in bond returns is more episodic and driven by specific macro-financial conditions, whereas equity market responses are largely symmetric, with occasional departures during periods of heightened uncertainty.

These findings can be relevant to trading desks, as they do not necessarily need to anticipate asymmetric responses to announcements in all years. However, some of the more uncertain periods (see Figure 4) also exhibit varying responses depending on the surprise signal, particularly in 2018 and 2021, even though these are not the most uncertain years.



(a) Equity returns.



(b) Bond returns.

Figure 8: **Time variation in equity and bond returns sensitivity to macroeconomic news: asymmetric responses**. This figure reports the estimated time-varying sensitivity coefficients β^{τ}_{bad} (solid black line) and β^{τ}_{good} (blue line with markers), which measure the response of financial market returns to negative and positive macroeconomic surprises, respectively. Shaded and dashed areas represent ± 2 standard-error bands around the estimated coefficients. Panel (a) presents the results for equity returns, while panel (b) shows the results for bond returns. Mini Ibovespa futures returns are used as a proxy for the Brazilian equity market, and DI futures returns (DI1) are used to capture the short-term interest-rate market. The sample period is from January 2016 through November 2025. Returns are computed over a 30-minute post-announcement window.

6. Conclusion

This paper examines the impact of macroeconomic news surprises on Brazilian financial markets using high-frequency intraday data. We analyze how unexpected announcements related to inflation (IPCA and IPCA-15) and economic activity (GDP) affect equity and bond returns, proxied by mini Ibovespa futures and DI futures. Using tick-by-tick data aggregated at one-minute intervals from January 2016 to November 2025, we estimate

nonlinear regressions to capture the immediate market response to announcements and investigate potential asymmetric reactions to inflation surprises.

The empirical results indicated that inflation surprises negatively affect future equity returns, whereas short-term bond yields are positively affected. These findings are consistent with the literature, which has documented the link between changes in expectations of the monetary policy stance and asset prices. Using different time windows after the announcement release, our results suggest that inflation news dissipates faster in bond yields than in equity returns. GDP responses vary across periods. The estimates also indicate a more pronounced effect than the average in certain sample years. Years with higher impact are more strongly associated with episodes that increased uncertainty than with output gap behavior. However, in 2020, both uncertainty and the output gap were at their respective highest and lowest levels. These findings are consistent with the literature, including Elenev et al. (2024) and Modugno & Palazzo (2025), which also reported similar responses in the U.S. market. Unlike Elenev et al. (2024), our study finds evidence of asymmetric effects of inflation announcements in certain years, suggesting that reactions vary with whether the surprise is positive or negative.

Although the literature has extensively examined the relationship between asset prices and macroeconomic news, most studies focus on spillovers from major developed economies, particularly the United States, to other markets. In contrast, this study contributes to the literature by analyzing how domestic macroeconomic announcement surprises affect the financial market of the same country considering emerging economies. To the best of our knowledge, this is the first study to investigate this relationship for Brazil using intraday data. In addition, our analysis combines Brazilian high-frequency financial data, domestic macroeconomic news, and nonlinear models capable of capturing time-varying effects, following the methodologies proposed by Swanson & Williams (2014) and Elenev et al. (2024). Our findings also highlight the importance of rapid macroeconomic interpretation for market participants, particularly trading desks operating in high-frequency environments. More broadly, the results emphasize the relevance of this research for the development of trading algorithms designed to respond to very short-term market reactions following macroeconomic announcements.

Future research could extend this analysis by examining the effects of inflation and GDP surprises on other dimensions of financial markets, such as market volatility and market efficiency. Additional studies may also consider a broader set of macroeconomic indicators beyond inflation and GDP. Finally, further robustness checks could investigate using alternative return frequencies, such as 5-minute intervals instead of 1-minute data, to reduce noise and assess the stability of the results.

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Appendix A. High-frequency data ingestion, processing and validation

The dataset *BTG-ATS-A26*, obtained from BTG Solutions Data Services[16], is constructed using market data captured from B3, the Brazilian stock exchange ("Brasil, Bolsa, Balcão"), covering trading sessions from January 4, 2016 to November 28, 2025. The market data feed was captured via FIX/FAST protocols and transformed into a structured format while preserving the original chronological ordering of events.

Candles were constructed from trade messages extracted from the raw data and grouped into fixed one-minute time windows. For each interval, the opening, highest, lowest, and closing prices (OHLC) were computed. Additionally, the total traded volume, financial volume, and number of trades were calculated for each interval. Figure A1 illustrates the candle aggregation process, while Table A1 presents the final dataset schema.

[16]Source: https://dataservices.btgpactualsolutions.com/. Accessed on March 20, 2026.

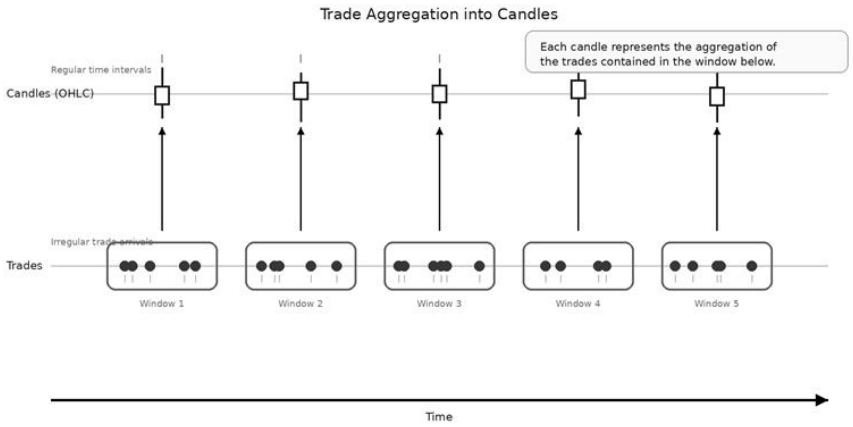

Figure A1: Construction of one-minute candlestick bars from tick-by-tick trade data (OHLCV aggregation).

Table A1: **Structure of the constructed intraday dataset.** The table describes the variables generated from tick-level data aggregated into one-minute intervals.

Field	**Type**	**Description**
symbol	string	Ticker symbol (B3)
candle	timestamp	Start time of the one-minute interval (UTC)
date	date	Trading day
open	float	First traded price in the interval
high	float	Highest traded price in the interval
low	float	Lowest traded price in the interval
close	float	Last traded price in the interval
volume	int	Total traded quantity in shares or contracts
financial_volume	float	Total traded notional value
num_trades	int	Total number of trades

For DI1 contracts, the maturities considered correspond to the January expiration of the two subsequent years for each trading date. For WIN and WDO, the contract selected for each day is the one with the highest liquidity, defined as the contract with the highest volume traded on that day. Although the data set consists of one-minute candles, in this work the candles are further aggregated into longer time intervals.

To validate the quality of the dataset, two complementary analyses were performed: temporal coverage of trading days and integrity of the trade sequences.

To determine the set of expected trading days, we used the list of exchange holidays published by B3. Weekends and the reported non-trading dates were excluded for the analysis. For the period considered, this resulted in 2461 trading days.

Table A2 reports, for each instrument analyzed, the number of days with available data, the temporal coverage relative to the total number of trading days, and the proportion of

trades present in the observed sequences.

Table A2: **Data coverage and integrity diagnostics.** The table reports the proportion of trading days covered and the percentage of trades captured in the reconstructed trade sequences for each instrument.

Instrument	**Days with Data**	**Total Trading Days**	**Coverage (%)**	**Trades Present (%)**
WDO	2391	2461	97.16	99.94
WIN	2403	2461	97.64	99.99
DI1	2398	2461	97.44	99.49

To evaluate the integrity of the trade sequences, the *trade_id* field available in the raw trade messages from B3 was used. This field represents a sequential identifier for trades within the market data stream. While not included in the final released dataset, it was leveraged during the data construction and validation stages. Gaps in this sequence enable the identification of potential missing trades in the capture or processing pipeline used to construct the candles.

The results indicate coverage above 97% of trading sessions for all analyzed instruments. In addition, the proportion of trades present in the sequences exceeds 99%, demonstrating high fidelity in the capture and tick-by-tick processing of the trade flow. Further details regarding the validation procedures are available alongside the dataset.