Surprise, the stock market is reacting to inflation shocks

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Abstract

This article aims to study how inflation surprises, defined as the difference between the announced changes in the Consumer Price Index (CPI) and the expected ones, affect intraday stock returns in Brazil. Specifically, I address three main questions: Does unanticipated CPI news affect Brazil's stock returns? Secondly, we investigate how long the impact of a surprise in inflation lasts on stock returns. Lastly, this paper analyzes how the market interprets inflation news depending on the economic state. Specifically, we aim to investigate the differences between positive and negative surprises that can affect stock market returns in each economic state. The results show that the market reactions statistically differ from zero to negative and pooled shocks in the first ten minutes after the inflation is disclosed. In your turn, positive shocks do not affect the stock market's return. Considering the last question, the results show that the economic state is relevant: Positive shocks do not affect stock returns in the rising economic state. However, negative shocks have positive responses in the stock returns until ten minutes after the surprise. In a stable economic state, the results show that positive shocks have only effects in 5 to 10 minutes, while negative shocks have no impact. Finally, in an economic slowdown, the findings show positive shocks negatively and significantly impact stock returns during the 10- to 15-minute interval after the surprise. Negative shocks positively affect stock returns up to 10 minutes after the announcement.

Keywords: Inflation surprise; Stock returns; Economic state.

JEL: E31, G00, G14

1 Introduction

The movement of stock prices directly impacts the wealth of investors. While many theories have emphasized how surprises in macroeconomic indicators can affect the stock market, few empirical attempts to link macroeconomic news and stock movements have produced consistent results. For instance, studies such as Jain (1988) and Schwert (1981) have found little to no inflation effect on daily stock returns. However, other studies have shown a significant impact when analyzing intraday stock returns, such as Adams, McQueen e Wood (2004), or in different economic states, as demonstrated by Knif, Kolari e Pynnönen (2008). Despite the importance of this topic, few papers have empirically tested this relationship in developing countries, including Gupta e Reid (2012), Díaz e Jareño (2013), Pal e Garg (2019), and Singh e Padmakumari (2020). Furthermore, most studies have focused on the impact on daily returns, which can result in more significant return noise.

This article aims to study how inflation surprises, defined as the difference between the announced changes in the Consumer Price Index (CPI) and the expected ones, affect intraday stock returns in Brazil. Specifically, we address three main questions: Does unanticipated CPI news affect Brazil's stock returns? Literature has produced mixed results, and as far as we know, this is the first paper to pose this question to Brazil. Secondly, we investigate how long the impact of a surprise in inflation lasts on stock returns. It is worth noting that most studies have used daily returns, which can introduce noise in returns not associated with inflation news. Intraday windows are more appropriate for analyzing the impact of inflation surprises. Additionally, some critical papers have used intraday returns and found that the effect is shorter than one day. For example, Jain (1988) found a significant impact only in the first hour after the inflation news, while Adams, McQueen e Wood (2004) observed substantial results within the first 10-20 minutes after the surprise shocks. It is also worth noting that in Brazil, more than one CPI is available from different statistical institutions. Therefore, considering a daily window would increase the number of CPI measures considered in this study, and not all of them are predicted by the weekly FOCUS report.

Lastly, this paper analyzes how the market interprets inflation news depending on the economic state. Specifically, we aim to investigate the differences between positive and negative surprises that can affect stock market returns in each economic state. For example, Knif, Kolari e Pynnönen (2008) analyzed how good and bad inflation news can affect stock market returns in different economic states. Our

central hypothesis is that, depending on the economic state, the market can interpret positive and negative inflation shocks as either good or bad news. This paper aims to test whether the current economic state in Brazil affects the interpretation of inflation surprises.

We will use the well-known event study methodology to examine how surprises in the IPCA, used as the measure of the CPI, affect the Ibovespa (IBOV) returns. We will classify economic states using the uncertainty index available from the Instituto Brasileiro de Economia (IBRE-FGV). The analysis period will be from April 2015, the first year of the Focus report, until October 2022.

The results for the first question show the market reacts, and the results are statistically substantial until ten minutes after the inflation is disclosed, considering the abnormal marginal returns, but only for negative shocks and pooled. In your turn, positive shocks do not affect the stock market's return. Addressing the last question, the results show that the economic state is relevant to the market reactions to the news. Analyzing the rising economic state context, the results show that positive shocks have no effects on stock returns. Considering negative shocks, we have positive responses in the stock returns until ten minutes after the surprise. However, the cumulative abnormal return shows impact until one hour after the news arrived. Considering the context of a stable economic state, the graphs show that positive shocks have only effects in the interval of 5 to 10 minutes after the surprise, while negative shocks have no effects. Finally, in an economic slowdown, the findings show positive shocks negatively and significantly impact stock returns during the 10- to 15-minute interval after the surprise. In contrast, negative shocks positively affect stock returns up to 10 minutes after the announcement. When considering the cumulative effects, the results indicate that the shocks significantly impact stock returns across all periods after the surprise.

2 Does unanticipated news affect stock returns?

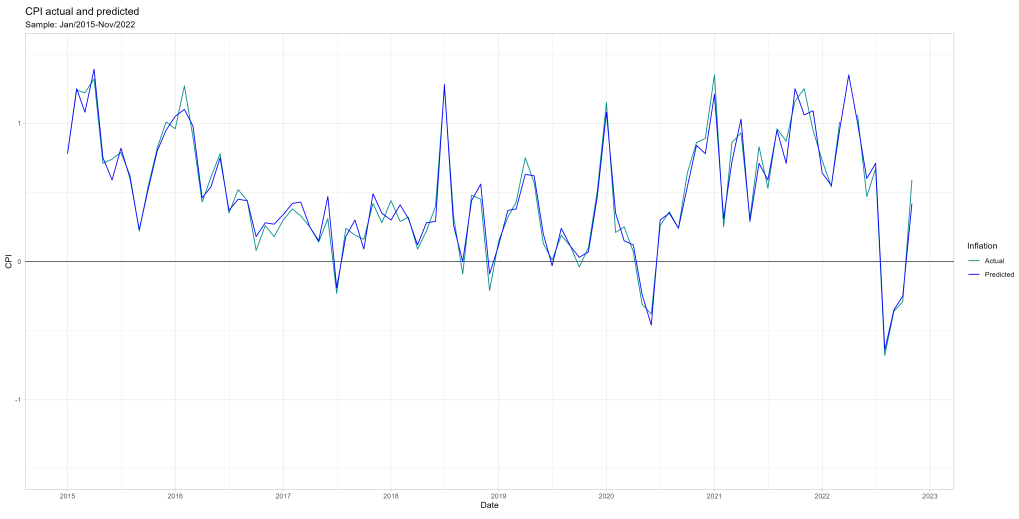
2.1 Data

The index used for inflation is the IPCA - *Índice Nacional de Preços ao Consumidor Amplo*, and its predictions used were the market expectation published by Focus. The report resumes the statistics of the main Brazilian economic index

according to the market's expectations collected until the previous Friday of the publication[1]. The report is weekly and available every Monday at the Central Bank's site. The document presents the expectation of the current month for inflation, exchange rate, and other variables beyond the short-run expectation for the same variables. To calculate the CPI Surprises, I considered the expectation for the current month of the report. Moreover, as the Focus is weekly, I only consider the last report before the publication of the actual inflation, and the shock is computed on the same day that the actual inflation is available to the market at 10 a.m. It's important to note that the announcements are made at 9 a.m.; however, the stock market opens at 10 a.m., so we consider the first impact of the news at the opening hour.

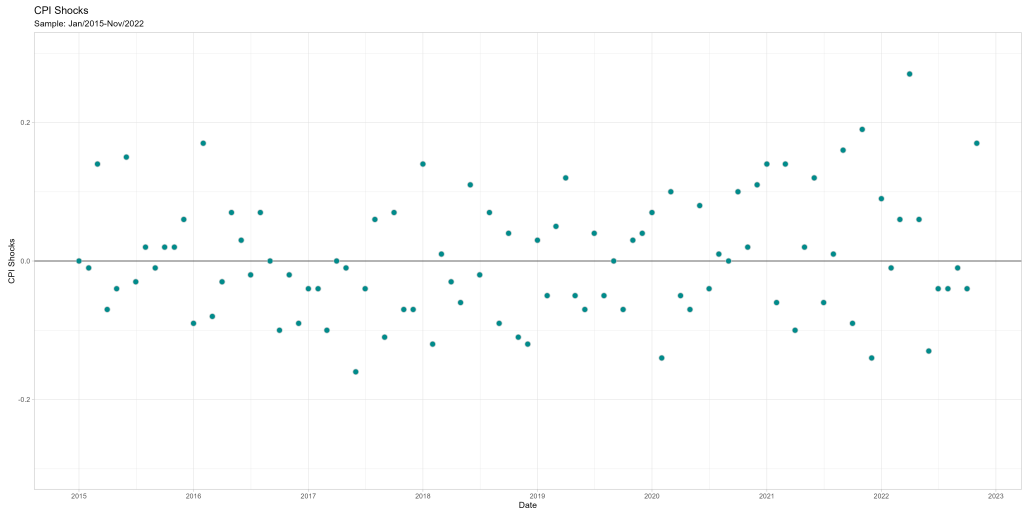
Figure 1 shows the difference between the actual and predicted monthly inflation. Figure 2 presents the difference between the actual and the expected inflation, named inflation shocks. The figure shows that the inflation forecast by the market differs and hits the actual number in only five months. The incidence of negative and positive surprises is almost the same, with 42 positives against 47 adverse shocks. However, the shocks' sizes differ, with positive shocks' modulus higher than adverse shocks. In other words, the market is usually surprised by a more considerable inflation than expected.

Figure 1: Actual x Predicted Inflation



[1]It is important to note that Focus publishes the forecast for IPCA and IGP-M. However, IGPM is an aggregate index that considers three other indexes, *Índice de Preços no Atacado – IPA* (60%), *Índice de Preços ao Consumidor – IPC* (30%) and *Índice Nacional de Custo da Construção – INCC* (10%). IPCA was used over IGPM since it represents more of the consumer price than IGP-M, which is more than half composed by a measure of producer price.

Figure 2: CPI Surprises Dispersion



We measure the returns of the stock market considering the Ibovespa (IBOV) returns in each 5-minute horizon. The market opens at 10 am, and the announcement happens at 9 am; the first return, already considering the impact of news inflation, is at 10:00 am. The placebo sample is the returns on the last hour of the day before the news, considering 5-minute returns. Figure 3 illustrates the main idea.

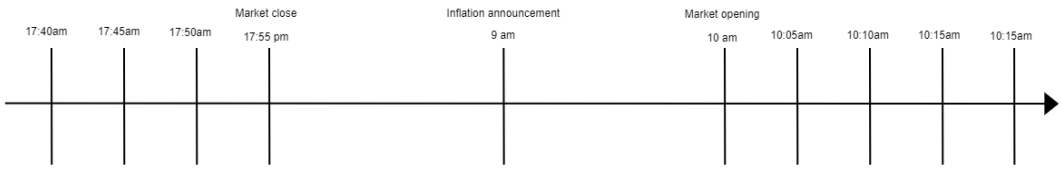


Figure 3: Diagram

Table 1: Monthly Descriptive Statistics for the Whole Sample Period

	Monthly IBOV	Monthly CPI changes		CPI Surprises
		Actual	Predicted	
Panel A. Overall Sample (number of observations = 91)				
Mean (%)	0.633	0.472	0.469	0.002
Standard deviation (%)	7.025	0.332	0.311	0.071
Minimum (%)	-35.61	-0.68	-0.64	-0.16
Maximum (%)	15.67	1.62	1.39	0.27
Kurtosis (%)	5.947	1	1.024	0.542
Skewness (%)	-1.353	0.226	0.159	0.368

To address the first main question, the following event study regression is proposed:

$$R_t = \alpha + \sum_{\tau=-10}^{10} \gamma_\tau^p u_t^p(\tau) + \sum_{\tau=-10}^{10} \gamma_\tau^n u_t^n(\tau) + \sum_{j=1}^{p} \beta_j X_{j,t} + \varepsilon_t, \tag{1}$$

where $R_t = 100 \times (\ln I_t - \ln I_{t-1}), I_t$ is the IBOV value on day t. Also, $u_t^p(\tau) = \max\left(\Delta CPI_{t+\tau}^{\text{actual}} - \Delta CPI_{t+\tau}^{\text{pred}}, 0\right)$ is the positive inflation shock and $u_t^n(\tau) = -\min\left(\Delta CPI_{t+\tau}^{actual} - \Delta CPI_{t+\tau}^{\text{pred}}, 0\right)$ is the negative inflation shock. Note that here, we are considering the aggregate shocks, not considering different economic states. $X_{j,t}$ = control variables. The only control is a dummy for COVID-19 pandemic shock for a while. However, it is important to note that as the data is intraday, the control variables should affect returns one hour after or before the inflation announcement.

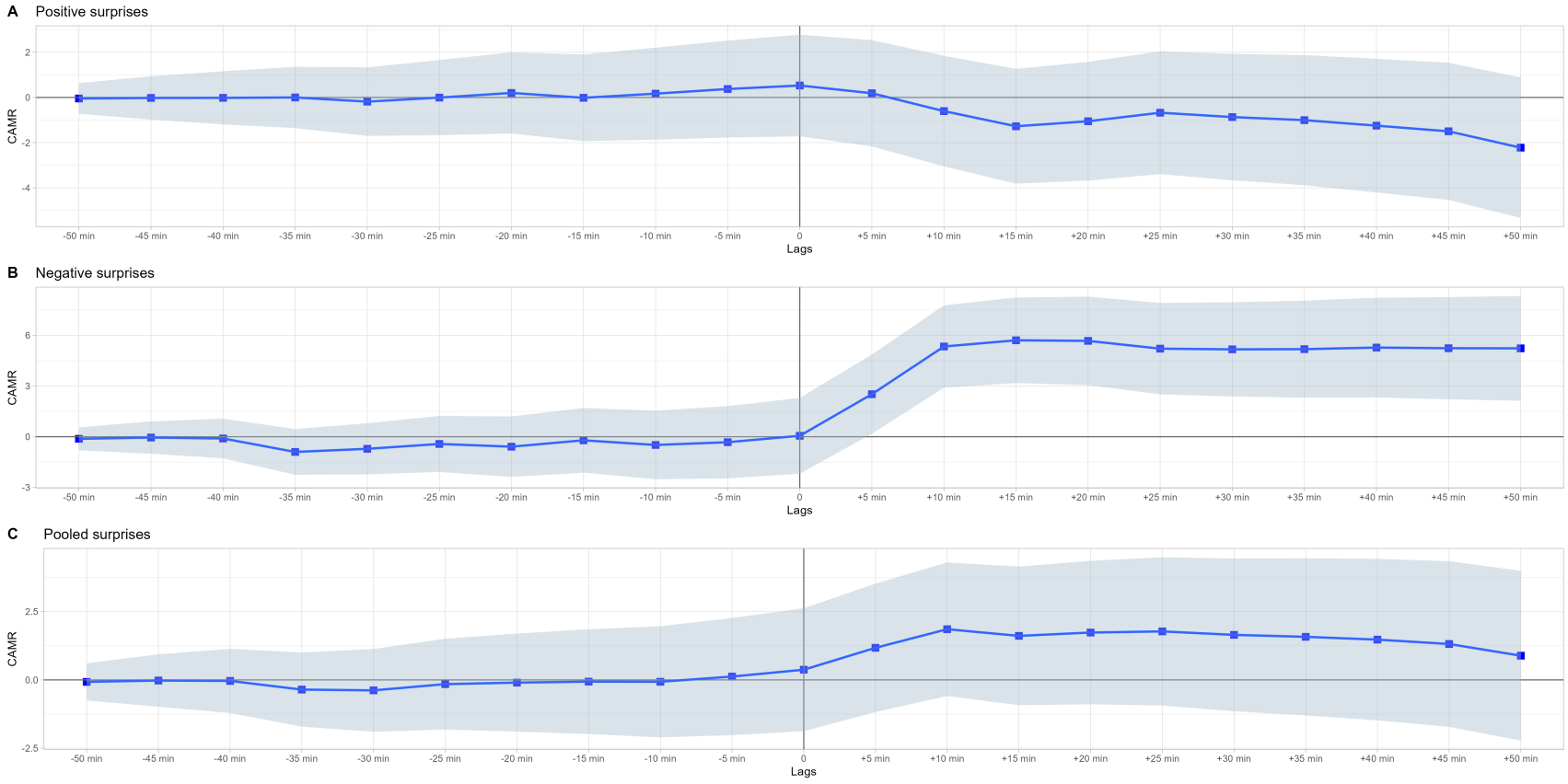
The γ regression coefficients measure the marginal effect of an inflation shock under the specific economic condition, as in Knif, Kolari e Pynnönen (2008). γ's can also be interpreted to measure AMRs (abnormal marginal returns), and summing AMR, we have cumulative abnormal marginal returns (CAMRs) that measure the cumulative return effect for a 1% inflation shock.

The results are shown in Table 2. The table presents Abnormal Marginal Return (AMR) and Cumulative Marginal Returns (CAMR) for the three types of unanticipated surprises: positive, negative, and pooled (negative and positive news), respectively. As expected, the results show no significant effects in intervals before the shock. After the announcement, the market reacts, and the results are statistically substantial until ten minutes after the inflation is disclosed, considering the abnormal marginal returns, but only for adverse shocks and pooled. In your turn, positive shocks do not affect the stock market's return. Figure 4 presents the cumulative abnormal effects for three shocks measured in the table above.

Table 2: Abnormal Marginal Returns (AMRs) and Cumulative Abnormal Marginal Returns (CAMRs) in Response to CPI Shocks

	Positive shocks		Negative shocks		Pooled shocks	
Interval	AMR	CAMR	AMR	CAMR	AMR	CAMR
-50 min	-0.04	-0.04	-0.12	-0.12	-0.07	-0.07
-45 min	0.024	-0.02	0.074	-0.04	0.049	-0.02
-40 min	0.004	-0.01	-0.05	-0.10	-0.01	-0.03
-35 min	0.017	-0.00	-0.79	-0.90	-0.31	-0.35
-30 min	-0.18	-0.18	0.184	-0.71	-0.02	-0.38
-25 min	0.179	-0.00	0.287	-0.42	0.227	-0.15
-20 min	0.205	0.199	-0.16	-0.59	0.055	-0.09
-15 min	-0.21	-0.01	0.378	-0.21	0.035	-0.06
-10 min	0.182	0.166	-0.27	-0.48	-0.00	-0.06
-5 min	0.205	0.372	0.162	-0.32	0.190	0.122
0 min	0.155	0.528	0.381	0.055	0.250	0.373
+5 min	-0.34	0.186	2.462***	2.517**	0.801*	1.174
+10 min	-0.79	-0.60	2.824***	5.342***	0.681	1.855
+15 min	-0.66	-1.27	0.368	5.710***	-0.24	1.611
+20 min	0.220	-1.05	-0.03	5.676***	0.121	1.733
+25 min	0.377	-0.67	-0.46	5.214***	0.041	1.774
+30 min	-0.19	-0.86	-0.04	5.173***	-0.12	1.648
+35 min	-0.13	-1.00	0.011	5.185***	-0.07	1.576
+40 min	-0.24	-1.24	0.093	5.279***	-0.10	1.474
+45 min	-0.25	-1.49	-0.03	5.240***	-0.15	1.314
+50 min	-0.72	-2.22	-0.00	5.233***	-0.42	0.886

Figure 4: Cumulative Abnormal Marginal Returns concerning CPI Surprises



3 How does the market interpret inflation news depending on the economic state?

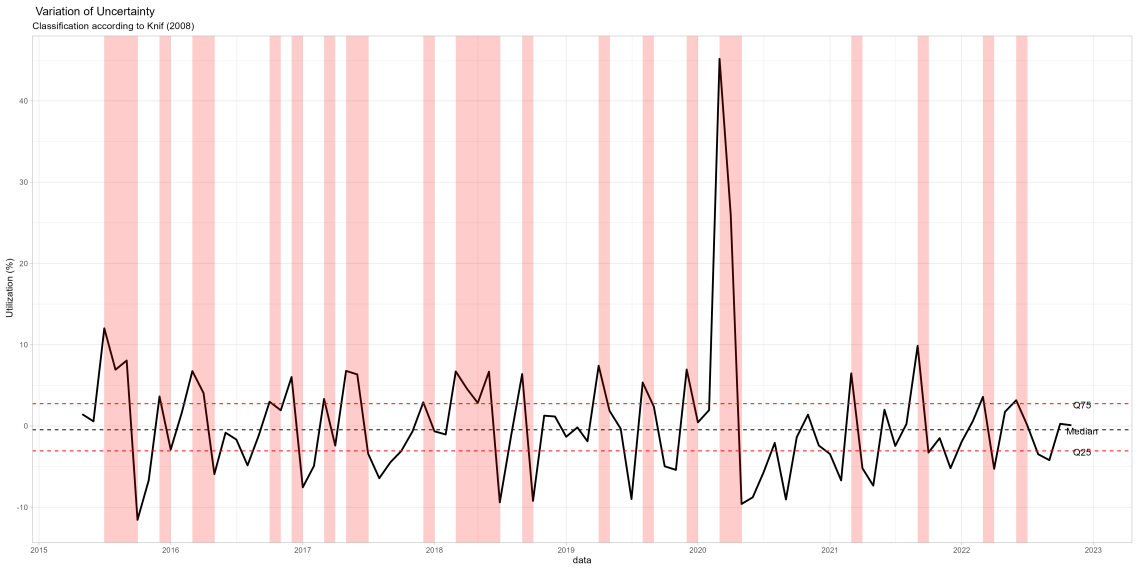
3.1 Economic States

To classify the economic states and address the third question, we adapted the measure suggested initially by McQueen e Roley (1993) and Knif, Kolari e Pynnönen (2008), but using a different index for Brazil. McQueen e Roley (1993) initially proposed to classify economic states in terms of quartile bands around the (log) level of industrial production or the manufacturing capacity utilization to delineate low, medium, and high periods of economic activity. In your turn, Knif, Kolari e Pynnönen (2008) use only the U.S. manufacturing capacity utilization (MCU) to define economic states, and instead of using the index in the level, they use the change of it. Then, using the index change, the authors classify the economy as rising, stable, or slowing. Stable economic activity is classified when the change in MCU is between high and low quartile bands, increasing activity is above the upper quartile, and slowing when the change in MCU is lower than the first quartile. [2] We are going to follow the Knif, Kolari e Pynnönen (2008) idea, but using the Economic Uncertainty Indicator - Brazil (IIE-Br) and only considering the divisions of economic activity based on variation and not level.

The Economic Uncertainty Indicator seeks to measure the uncertainty of the Brazilian economy based on information collected from the country's leading newspapers and financial market expectations regarding macroeconomic variables. It is important to note that the uncertainty level moves according to the market, which can better fit the economic states and how investors see surprises in each state. Figure 5 shows changes in index with the highlight areas following the Knif, Kolari e Pynnönen (2008)'s concept of recession based on the variation.

[2] According to Knif, Kolari e Pynnönen (2008), this measure can capture the economy's direction and discern between an economy that is entering versus exiting a prosperous period or a recession, for example. In the end, Knif, Kolari e Pynnönen (2008) also see whether there are many differences between using the index in the level or change, but the results are robust in both classifications. According to the authors, the rationale for using both approaches is that investors may be worried about the current level of the economy and changes in economic conditions.

Figure 5: Economic states



3.2 Inflation News

Table 3 reports sample statistics for IBOV monthly rates of return, Actual and predicted CPI monthly changes, and CPI Surprises for the whole sample period (Panel A) and classified by economic states. The monthly market stock returns for overall, rising, stable, and slowing economy averages are 0.63%, 1.66%, 1.06%, and -0.93%. It is essential to notice that monthly returns in a rising state are higher than in a stable economy state, which, in turn, are higher than in a slowing economy state. Also, as expected, skewness is positive only in stable economies and negative in rising and slowing states.

Actual and predicted CPI changes are shown in the third and fourth columns, and the difference is in the last column (CPI Surprises). We can see that in the Rising economy, the actual CPI is larger than the predicted CPI, on average, implying a positive CPI shock. In the Stable Economy state, CPI Surprises are more prominent than in a Rising Economy, 0.015% against 0.002%, and in the Slowing Economy, the signal of CPI Surprises is negative, -0.014%, meaning that actual CPI change is minor than predicted. Compared to the same table presented by Knif, Kolari e Pynnönen (2008), it is possible to note that CPI Surprises are smaller in Brazil. In the U.S., the mean of CPI Shock, considering the whole sample, is -0.06%, while in Brazil, it is 0.003%. Brazil's standard deviation is also minor (0.071 against 0.15,

considering the overall sample). Moreover, in the U.S., the mean in all scenarios of CPI Surprises is negative, while in Brazil, it is negative only in the Slowing scenario. This means that the actual CPI change in the U.S. is minor than predicted, and in Brazil, the market only overestimates CPI change in months of the slowing economy state.

Table 3: Monthly Descriptive Statistics for the Whole Sample Period and in Economic State Classes

	Montly IBOV	Montly CPI changes		CPI Surprises
		Actual	Predicted	
Panel A. Overall Sample (number of observations = 91)				
Mean (%)	0.633	0.472	0.469	0.003
Standard deviation (%)	7.025	0.332	0.311	0.071
Minimum (%)	-35.61	-0.68	-0.64	-0.16
Maximum (%)	15.67	1.62	1.39	0.27
Kurtosis (%)	5.947	1	1.024	0.542
Skewness (%)	-1.353	0.226	0.159	0.368
	Montly IBOV	Montly CPI changes		CPI Surprises
		Actual	Predicted	
Panel B. Rising Economy (number of observations = 28)				
Mean (%)	1.662	0.381	0.379	0.002
Standard deviation (%)	5.821	0.559	0.541	0.085
Minimum (%)	-10.652	-0.68	-0.64	-0.14
Maximum (%)	9.686	1.62	1.35	0.27
Kurtosis (%)	-0.705	-0.529	-0.816	1.464
Skewness (%)	-0.566	0.333	0.216	0.942
	Montly IBOV	Montly CPI changes		CPI Surprises
		Actual	Predicted	
Panel C. Stable Economy (number of observations = 37)				
Mean (%)	1.061	0.545	0.531	0.015
Standard deviation (%)	5.533	0.367	0.325	0.089
Minimum (%)	-9.807	-0.29	-0.25	-0.14
Maximum (%)	14.908	1.27	1.1	0.19
Kurtosis (%)	-0.285	-0.361	-0.443	-0.911
Skewness (%)	0.345	-0.007	-0.074	0.252
	Montly IBOV	Montly CPI changes		CPI Surprises
		Actual	Predicted	
Panel D. Slowing Economy (number of observations = 26)				
Mean (%)	-0.934	0.431	0.442	-0.01
Standard deviation (%)	9.773	0.321	0.284	0.087
Minimum (%)	-35.615	-0.09	0	-0.16
Maximum (%)	15.67	1.01	0.98	0.16
Kurtosis (%)	3.756	-1.138	-1.012	-0.982
Skewness (%)	-1.46	0.445	0.462	0.36

Table 4 reports sample statistics for the monthly market returns in the announcement month by the economic state and type of inflation shock (positive, zero/ no shock, and negative). We can see that the standard deviations are high in all states and types of shocks, making the means not statistically significant. Some means are significant in Knif, Kolari e Pynnönen (2008), especially those related to Negative shocks. But most of them are not different from zero.

Table 4: Average Monthly IBOV Percentage Returns in the Announcement Month of the Inflation Event Classified by Economic Activity State (Rising, Stable, and Slowing) and Type of Inflation Shock (Positive, Zero, and Negative).

Economic Activity State	CPI Surprises					
	Positive		Zero		Negative	
	N	Mean (sd)	N	Mean (sd)	N	Mean (sd)
Rising	13	0.002 (0.013)	1	0.001 (-)	14	0.036 (0.099)
Stable	18	0.033 (0.068)	3	-0.015 (0.018)	16	0.022 (0.105)
Slowing	10	0.041 (0.063)	0	-	16	0.020 (0.044)
Mean/total	41	0.025 (0.056)	4	-0.012 (0.017)	46	0.026 (0.085)

3.3 Methodology

I estimate the regression:

$$R_t = \alpha + \sum_{j=1}^{p} \beta_j X_{j,t} + \sum_{k=1}^{3} \sum_{\tau=-10}^{10} \gamma_{k,\tau}^{p} u_{k,t}^{p}(\tau) + \sum_{k=1}^{3} \sum_{\tau=-10}^{10} \gamma_{k,\tau}^{n} u_{k,t}^{n}(\tau) + \varepsilon_t, \qquad (2)$$

Where $R_t = 100 \times (\ln I_t - \ln I_{t-1})$, I_t is the IBOV value at time t, and $X_{j,t} =$ control variables, including the difference between the true value and the median prediction for Selic rate and dummies for COVID19 pandemic shock. Following Knif, Kolari e Pynnönen (2008), $u_{k,t}^{p}(\tau) = \max\left(\Delta CPI_{t+\tau}^{\text{actual}} - \Delta CPI_{t+\tau}^{\text{pred}}, 0\right)$ is the positive inflation shock in economic state k ($k = 1$ rising economy, $k = 2$ stable economy, and $k = 3$ slowing economy), and $u_{k,t}^{n}(\tau) = -\min\left(\Delta CPI_{t+\tau}^{actual} - \Delta CPI_{t+\tau}^{\text{pred}}, 0\right)$ is the negative inflation shock in economic state k.

The γ regression coefficients measure the marginal effect of an inflation shock under the specific economic condition, as in Knif, Kolari e Pynnönen (2008). γ's can also be interpreted to measure AMRs (abnormal marginal returns), and summing AMRs, we have cumulative abnormal marginal returns (CAMRs) that measure the cumulative return effect for a 1% inflation shock.

The tables below present the daily CPI event study results using a one-hour window for all economic states: rising, stable, and slowing economic change periods. The CAMR results in each economic state are broken down by positive and negative shocks, and the last column corresponds to the pooled results for both positive and negative inflation shocks.

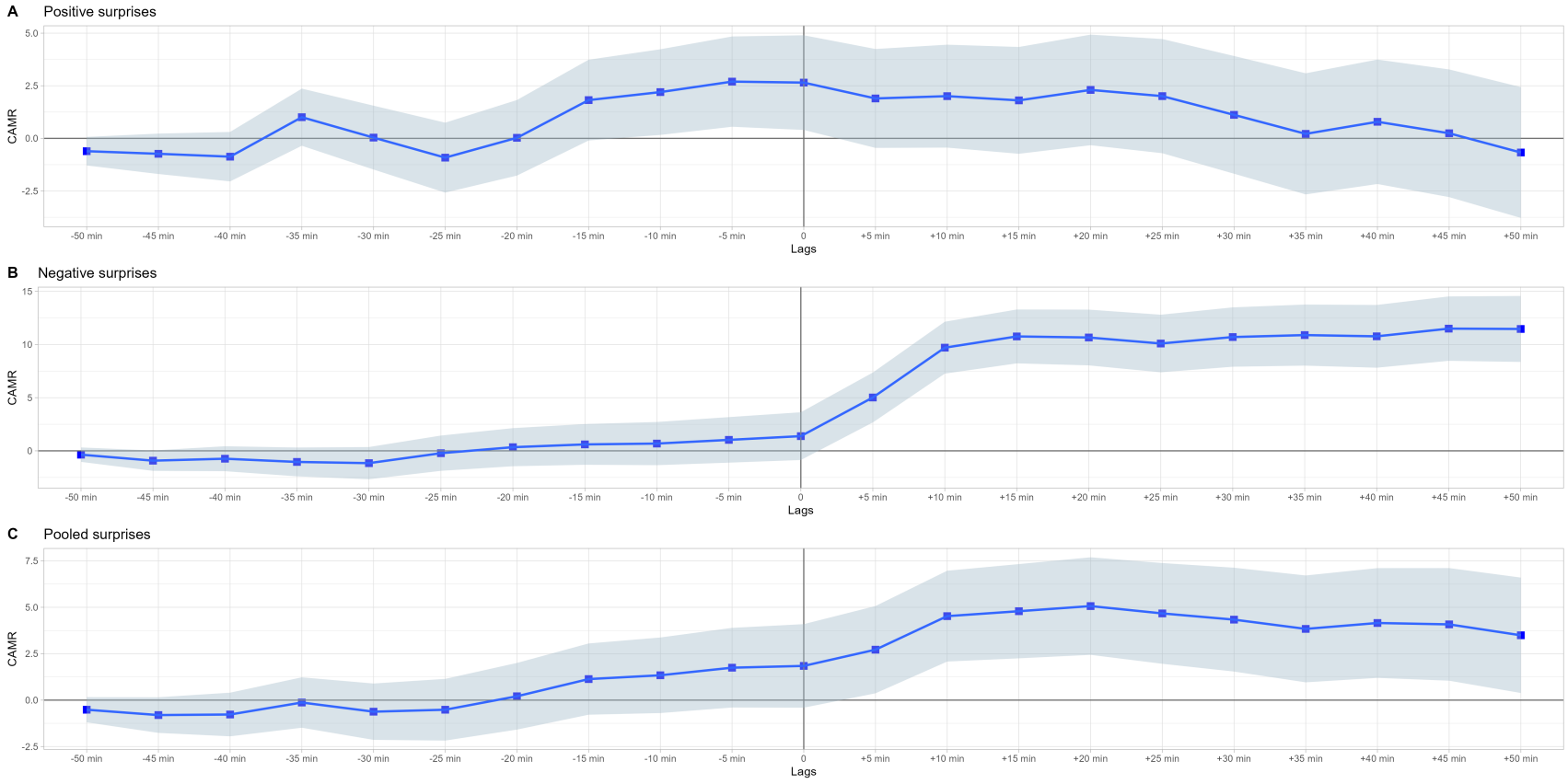
3.4 Rising Economic state

Table 5 presents the first results for event study analysis in the context of the rising economic state. The results show that positive shocks have no effects on stock returns. However, we can see that on the day before the announcement, there was a reaction in the market. Considering negative shocks, we have positive responses in the stock returns until ten minutes after the surprise. However, the cumulative abnormal return shows impact until one hour after the news arrived. Knif, Kolari e Pynnönen (2008) found similar results considering positive shocks in rising states. Figure 6 summarizes the above cumulative coefficients.

Table 5: Abnormal Marginal Returns (AMRs) and Cumulative Abnormal Marginal Returns (CAMRs) in Response to CPI Shocks in Rising Economic State

	Positive shocks		Negative shocks		Pooled shocks	
Interval	AMR	CAMR	AMR	CAMR	AMR	CAMR
-50 min	-0.61	-0.61*	-0.35	-0.35	-0.51	-0.51
-45 min	-0.12	-0.73	-0.56	-0.92*	-0.28	-0.80
-40 min	-0.13	-0.87	0.183	-0.74	0.030	-0.77
-35 min	1.876	1.006	-0.30	-1.04	0.645	-0.12
-30 min	-0.97	0.036	-0.11	-1.15	-0.49	-0.62
-25 min	-0.95	-0.91	0.936	-0.22	0.105	-0.51
-20 min	0.942	0.025	0.564	0.342	0.724	0.207
-15 min	1.792	1.818*	0.262	0.604	0.925	1.133
-10 min	0.380	2.199**	0.078	0.683	0.205	1.339
-5 min	0.497	2.697**	0.347	1.030	0.408	1.747
0 min	-0.04	2.650**	0.351	1.382	0.095	1.842
+5 min	-0.75	1.896	3.635***	5.017***	0.874	2.716**
+10 min	0.109	2.006	4.685***	9.703***	1.806**	4.523***
+15 min	-0.20	1.805	1.057	10.76***	0.265	4.789***
+20 min	0.496	2.302*	-0.09	10.66***	0.275	5.064***
+25 min	-0.29	2.007	-0.56	10.09***	-0.39	4.670***
+30 min	-0.89	1.116	0.608	10.70***	-0.33	4.335***
+35 min	-0.90	0.213	0.184	10.88***	-0.49	3.835***
+40 min	0.573	0.787	-0.11	10.76***	0.318	4.154***
+45 min	-0.54	0.241	0.724	11.49***	-0.07	4.079***
+50 min	-0.91	-0.67	-0.03	11.46***	-0.58	3.492**

Figure 6: Cumulative Abnormal Marginal Returns concerning CPI Surprises in Rising Economic State



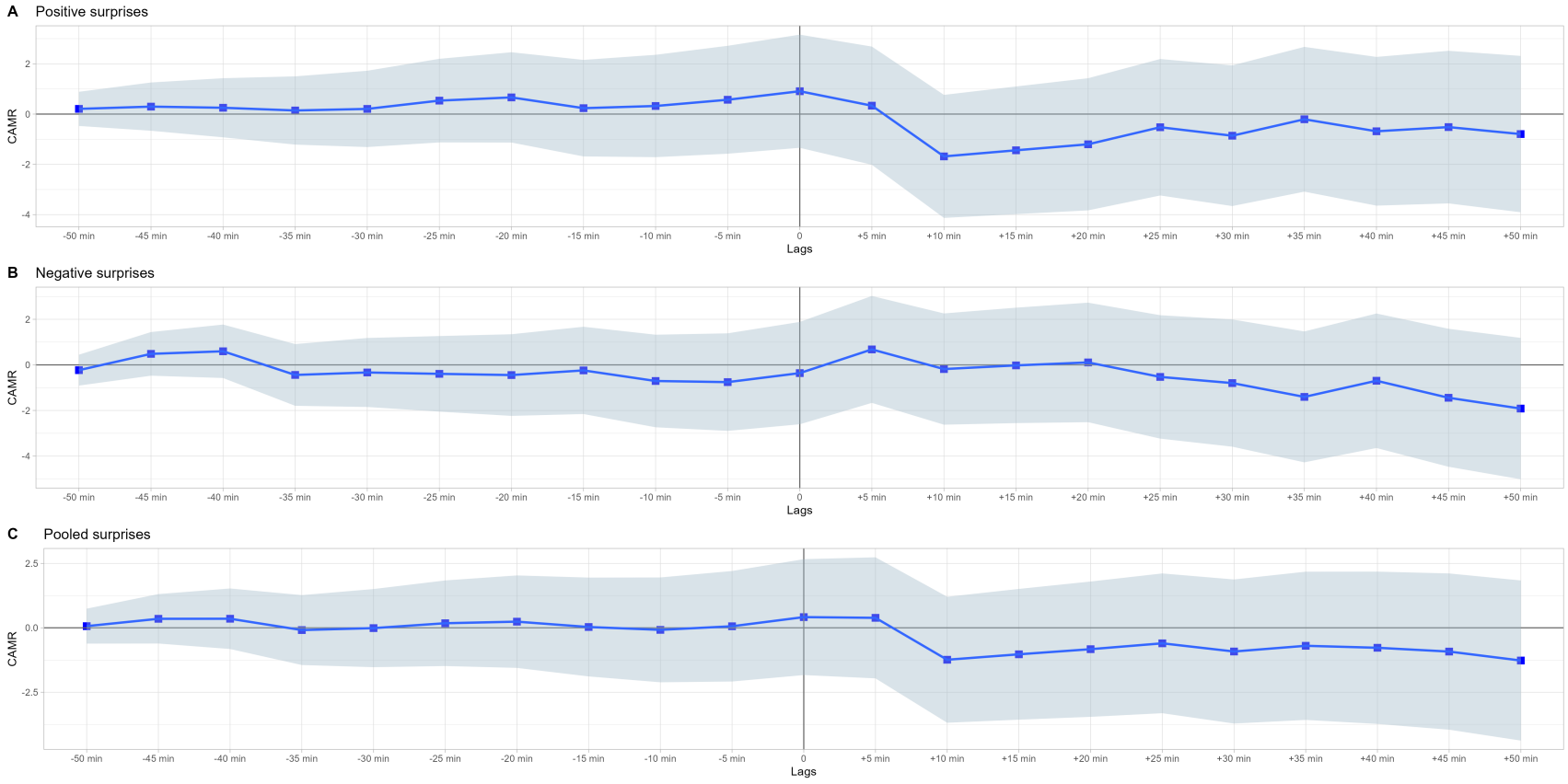
3.5 Stable Economic state

Table 6 presents the results for event study analysis in the context of a stable economic state. The results show that positive shocks have only effects in the interval of 5 to 10 minutes after the surprise. Negative shocks have no effects, in line with Knif, Kolari e Pynnönen (2008). Figure 7 summarizes the cumulative coefficients for a stable economic state.

Table 6: Abnormal Marginal Returns (AMRs) and Cumulative Abnormal Marginal Returns (CAMRs) in Response to CPI Shocks in Stable Economic State

	Positive shocks		Negative shocks		Pooled shocks	
Interval	AMR	CAMR	AMR	CAMR	AMR	CAMR
-50 min	0.207	0.207	-0.23	-0.23	0.064	0.064
-45 min	0.089	0.296	0.714	0.483	0.285	0.349
-40 min	-0.04	0.251	0.113	0.596	0.002	0.351
-35 min	-0.10	0.143	-1.03	-0.44	-0.43	-0.08
-30 min	0.062	0.205	0.108	-0.33	0.075	-0.01
-25 min	0.330	0.535	-0.06	-0.39	0.189	0.177
-20 min	0.127	0.663	-0.05	-0.44	0.060	0.238
-15 min	-0.42	0.235	0.204	-0.24	-0.20	0.031
-10 min	0.086	0.321	-0.46	-0.70	-0.11	-0.07
-5 min	0.247	0.569	-0.04	-0.75	0.140	0.060
0 min	0.339	0.908	0.395	-0.36	0.355	0.415
+5 min	-0.57	0.334	1.039	0.678	-0.02	0.387
+10 min	-2.01**	-1.68	-0.86	-0.18	-1.62**	-1.24
+15 min	0.242	-1.44	0.161	-0.02	0.211	-1.02
+20 min	0.238	-1.20	0.130	0.107	0.198	-0.82
+25 min	0.678	-0.52	-0.63	-0.52	0.227	-0.60
+30 min	-0.33	-0.86	-0.27	-0.79	-0.31	-0.91
+35 min	0.654	-0.20	-0.60	-1.40	0.221	-0.69
+40 min	-0.47	-0.68	0.708	-0.69	-0.07	-0.77
+45 min	0.166	-0.51	-0.74	-1.44	-0.14	-0.92
+50 min	-0.27	-0.79	-0.47	-1.91	-0.34	-1.26

Figure 7: Cumulative Abnormal Marginal Returns concerning CPI Surprises in Stable Economic State



3.6 Recession Economic state

Table 7: Abnormal Marginal Returns (AMRs) and Cumulative Abnormal Marginal Returns (CAMRs) in Response to CPI Shocks in Recession Economic State

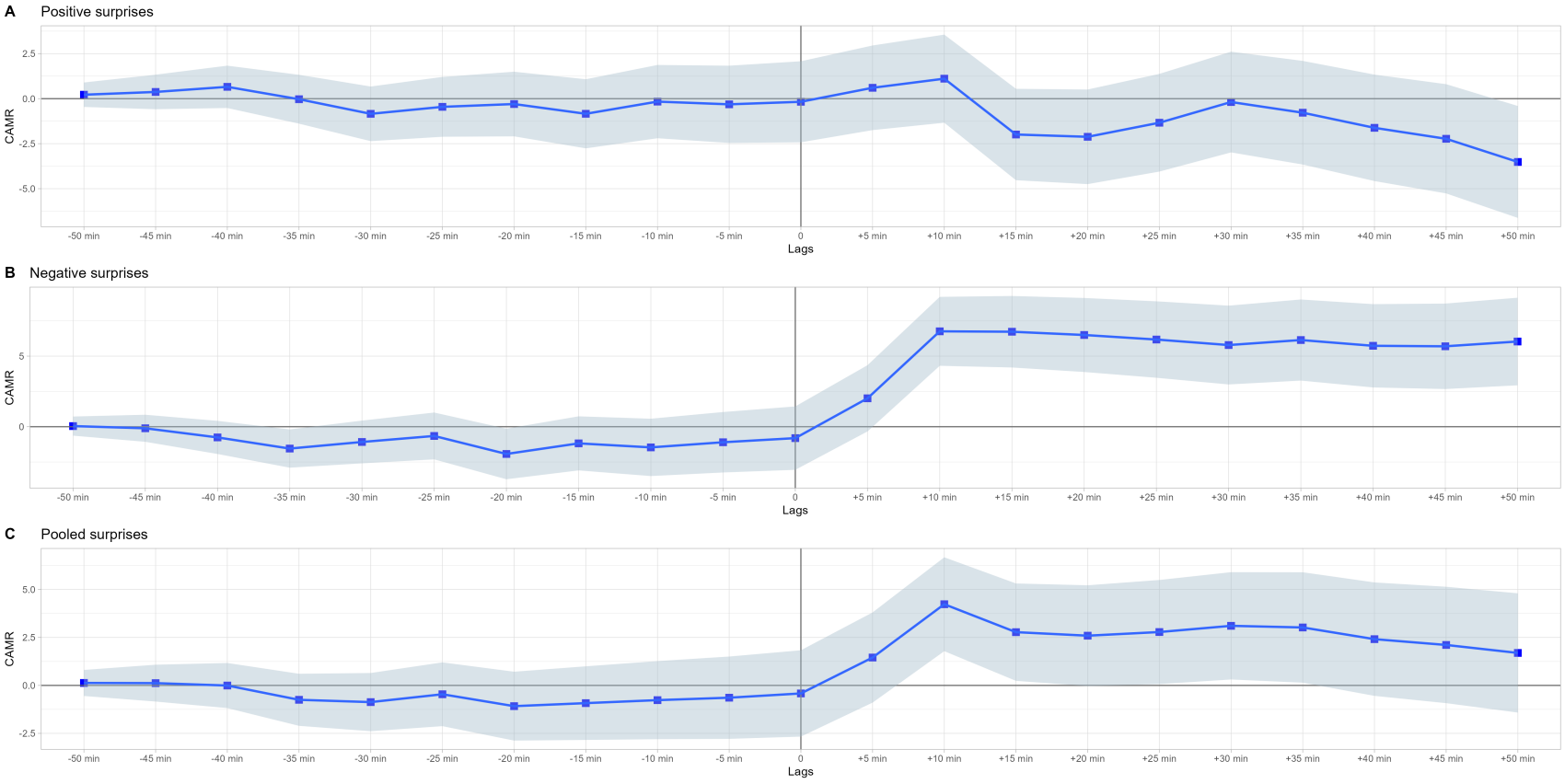
	Positive shocks		Negative shocks		Pooled shocks	
Interval	AMR	CAMR	AMR	CAMR	AMR	CAMR
-50 min	0.219	0.219	0.044	0.044	0.127	0.127
-45 min	0.154	0.373	-0.15	-0.10	-0.00	0.118
-40 min	0.283	0.657	-0.64	-0.75	-0.12	-0.00
-35 min	-0.68	-0.03	-0.79	-1.54**	-0.74	-0.75
-30 min	-0.81	-0.84	0.466	-1.08	-0.12	-0.87
-25 min	0.388	-0.45	0.426	-0.65	0.408	-0.46
-20 min	0.155	-0.29	-1.27	-1.92**	-0.61	-1.08
-15 min	-0.54	-0.83	0.750	-1.17	0.157	-0.92
-10 min	0.677	-0.16	-0.28	-1.46	0.156	-0.76
-5 min	-0.15	-0.31	0.363	-1.10	0.127	-0.64
0 min	0.141	-0.17	0.292	-0.80	0.221	-0.41
+5 min	0.777	0.604	2.820**	2.012*	1.872**	1.452
+10 min	0.506	1.110	4.744***	6.757***	2.777***	4.230***
+15 min	-3.10***	-1.99	-0.02	6.728***	-1.45*	2.775**
+20 min	-0.12	-2.11	-0.23	6.498***	-0.18	2.591*
+25 min	0.782	-1.33	-0.32	6.176***	0.189	2.781**
+30 min	1.149	-0.18	-0.39	5.785***	0.323	3.105**
+35 min	-0.59	-0.78	0.355	6.140***	-0.08	3.019**
+40 min	-0.83	-1.61	-0.40	5.732***	-0.60	2.410
+45 min	-0.60	-2.22	-0.03	5.697***	-0.30	2.108
+50 min	-1.28	-3.51**	0.338	6.035***	-0.41	1.692

Finally, Table 7 presents the results of an event study analysis in the context of an economic slowdown. The findings show positive shocks negatively and significantly impact stock returns during the 10- to 15-minute interval after the surprise. In contrast, negative shocks positively affect stock returns up to 10 minutes after the announcement. When considering the cumulative effects, the results indicate that the shocks significantly impact stock returns across all periods after the surprise. Furthermore, the effects are more significant than those observed in other countries. Compared to Knif, Kolari e Pynnönen (2008), the magnitude of the negative shocks

found in our study is twice as large as what was reported by the author. However, the impact is not statistically significant in Knif, Kolari e Pynnönen (2008).

Figure 8 summarizes the information in the tables above in a series of CAMR graphs.

Figure 8: Cumulative Abnormal Marginal Returns concerning CPI Surprises in Recession Economic State



4 Conclusion

The movement of stock prices directly impacts the wealth of investors. While many theories have emphasized how surprises in macroeconomic indicators can affect the stock market, few empirical attempts to link macroeconomic news and stock movements have produced consistent results. This article aims to study how inflation surprises, defined as the difference between the announced changes in the Consumer Price Index (CPI) and the expected ones, affect intraday stock returns in Brazil. Specifically, we address three main questions: Does unanticipated CPI news affect Brazil's stock returns? How long does the impact of a surprise in inflation last on stock returns? Lastly, How does the financial market interpret inflation based on the economic state? For the last question, the central hypothesis is that, depending on the economic state, the market can interpret positive and negative inflation shocks as either good or bad news.

Our research will employ the rigorous event study methodology to examine the impact of CPI surprises, measured by the IPCA, on Ibovespa (IBOV) returns. We will categorize economic states using the uncertainty index provided by the Instituto Brasileiro de Economia (IBRE-FGV). The analysis will cover the period from April 2015, the first year of the Focus report, to October 2022.

The results for the first question show the market reacts, and the results are statistically substantial until ten minutes after the inflation is disclosed, considering the abnormal marginal returns, but only for negative shocks and pooled. In your turn, positive shocks do not affect the stock market's return. The results show that the economic state is relevant to the market reactions to the news. The graphs show that positive shocks do not affect stock returns in the context of rising economic state. Considering negative shocks, we have positive responses in the stock returns until ten minutes after the surprise. However, the cumulative abnormal return shows impact until one hour after the news arrived. Considering the context of a stable economic state, the graphs show that positive shocks have only effects in the interval of 5 to 10 minutes after the surprise, while negative shocks have no effects. Finally, in an economic slowdown, the findings show positive shocks negatively and significantly impact stock returns during the 10- to 15-minute interval after the surprise. In contrast, negative shocks positively affect stock returns up to 10 minutes after the announcement. When considering the cumulative effects, the results indicate that the shocks significantly impact stock returns across all periods after the surprise.

References

ADAMS, G.; MCQUEEN, G.; WOOD, R. The effects of inflation news on high frequency stock returns. *The Journal of Business*, The University of Chicago Press, v. 77, n. 3, p. 547–574, 2004. ISSN 00219398, 15375374. Disponível em: <http://www.jstor.org/stable/10.1086/386530>.

DíAZ, A.; JAREñO, F. Inflation news and stock returns: Market direction and flow-through ability. *Empirical Economics*, v. 44, p. 775–798, 11 2013.

GUPTA, R.; REID, M. Macroeconomic surprises and stock returns in south africa. *Studies in Economics and Finance*, v. 30, 01 2012.

JAIN, P. C. Response of hourly stock prices and trading volume to economic news. *The Journal of Business*, University of Chicago Press, v. 61, n. 2, p. 219–231, 1988. ISSN 00219398, 15375374. Disponível em: <http://www.jstor.org/stable/2352901>.

KNIF, J.; KOLARI, J.; PYNNöNEN, S. Stock market reaction to good and bad inflation news. *Journal of Financial Research*, v. 31, p. 141–166, 06 2008.

MCQUEEN, G.; ROLEY, V. V. Stock prices, news, and business conditions. *The Review of Financial Studies*, [Oxford University Press, Society for Financial Studies], v. 6, n. 3, p. 683–707, 1993. ISSN 08939454, 14657368. Disponível em: <http://www.jstor.org/stable/2961983>.

PAL, S.; GARG, A. Macroeconomic surprises and stock market responses—a study on indian stock market. *Cogent Economics and Finance*, v. 7, 03 2019.

SCHWERT, G. W. The adjustment of stock prices to information about inflation. *The Journal of Finance*, [American Finance Association, Wiley], v. 36, n. 1, p. 15–29, 1981. ISSN 00221082, 15406261. Disponível em: <http://www.jstor.org/stable/2327460>.

SINGH, G.; PADMAKUMARI, L. Stock market reaction to inflation announcement in the indian stock market: A sectoral analysis. *Cogent Economics & Finance*, v. 8, 02 2020.