Working Paper | 470

CEQEF - Nº41
Working Paper Series
Março de 2018

FGV | SAO PAULO SCHOOL OF ECONOMICS

Effects of official and unofficial central bank communication on the Brazilian interest rate curve

Luis Fernando Pereira de Azevedo
Pedro L. Valls Pereira

Effects of official and unofficial central bank communication on the Brazilian interest rate curve

Luis Fernando Pereira de Azevedo
Sao Paulo School of Economics - FGV and MZK Investimentos

Pedro L. Valls Pereira
Sao Paulo School of Economics - FGV and CEQEF-FGV

February 28, 2018

Abstract

In order to provide greater transparency in their opinions and decisions, central banks around the world use both their official channels and the specialized media to communicate with the general public. Using an unique news dataset with intraday frequency, this paper finds evidence that the volatility of the long end of the interest curve in Brazil is higher in days of official publications on the website of the Central Bank of Brazil and that the short end is affected on days on which the president or any director of the institution is quoted in the specialized media. The effects are greater from 2014.

Key words: text data. central bank communication; volatility
JEL Code: C58, D80, E43, E58, G02.

1 Introduction

According to [Blinder et al., 2008], before the 1990s, there was a consensus among the monetary authorities "to speak as little as possible and in a codified way". Today, in addition to their own websites, central banks use media, blogs, social medias and live broadcasts to communicate with the general public.

[Fry et al., 2000] gives a brief summary of the central bank's communication path towards transparency. From 1945 to 1970, two types of economic structure operated in the world. In the first, on the Bretton Woods regime, countries maintained a fixed exchange rate in relation to the American currency, which limited the scope of monetary policy. In the second typical structure, countries used capital controls policies to isolate their economies from the prices of the rest of the world. The consequences of the controls led to fiscal pressure, with an increase in inflation and consequent depreciation of the currency. In this

case, the central bank operated as a sort of government collector through the inflationary tax.

After the collapse of Bretton Woods in the early 1970s, there was no clear pattern of monetary policy action for the next 10 years. From the 1980s onwards, the view grew that economic growth only occurred with price stability, and that this could only be achieved by better designing the role of monetary policy.

In the 1990s, developed countries began to set inflation targets, which should be pursued by relatively independent central banks. In the following decade, inflation targeting policies were also adopted by several emerging countries.

Inflation targets are only possible if the monetary authority communicates not only its value, but also the means it intends to use to achieve it. In his speech of transmission of role[1], held on June 13, 2016, the president of the Central Bank of Brazil (Bacen), Ilan Goldfajn, stated that: "An essential element of monetary policy, and of the inflation targeting regime in particular, is the continuous communication with society through the formal channels of the Central Bank. This communication needs to be simple, direct and concise in order to best convey the Central Bank's view, including the uncertainties regarding the perspective of different trajectories for the economic scenario. The Central Bank's communication also needs to make clear the necessary conditions for the perspectives presented."

In this line, [Bernanke et al., 2007] argues that the effectiveness of monetary policy transmission channels increases if people have a full understanding of the objectives and strategies of monetary policy.

This means that central banks should be more transparent in their decisions and rely on various means of communication for this.

However, despite the consensus that transparency is important for monetary policy, there are doubts about the degree of transparency that the central bank should adopt. [Morris and Shin, 2007] raise the hypothesis that much information may even affect the understanding of monetary policy. [Sims et al., 2010] argue that financial market participants are alert to every change in the language of monetary policy, but the average individual does not incorporate this information at the same speed.

Many of the information disclosed by the monetary authority have a technical touch. [Blinder et al., 2008] criticize this form of communication directed to these financial market participants, and point out that greater attention is needed in communication with the general public. One way to accomplish this is with media interviews.

On media and communication of central banks, [Hayo and Neuenkirch, 2015] studied through a questionnaire with 195 participants how financial market agents process information from the four largest central banks in the world[2].

The results of this research pointed out that the participants rely more on media reports than they do their own monitoring, with the exception of announcements of interest decisions in their own country. They also find evi-

[1] Available in http://www.bcb.gov.br/pec/appron/apres/Discurso_Ilan_Goldfajn_transmissao_cargo13060216.pdf

[2] The Federal Reserve (Fed) in the US, the European Central Bank, the Central Bank of England and the Central Bank of Japan

dence that the greater the reliability in the media, the lower the degree of self-monitoring and the greater the probability of using this media, especially for asset managers. On the other hand traders increase the degree of self-monitoring given the importance of the central bank event.

For the understanding of the general public, news releases in the media are important because they carry out a process of "translating" technical terms into a more accessible language. However, in this process, much information can be lost or misinterpreted and / or written, a consequence of the behavioral component present in news.

In the case of central bank communication and behavioral finance, the heuristic bias of representativeness draws attention.

Representation occurs when agents use informal rules of judgment. In general, members of monetary policy committees are classified by economic agents as hawk or dove against inflation. Some studies use quantitative measures to perform this classification.

Using a Bayesian approach to the Bank of England's monetary policy committee's voting history, they find evidence that there is heterogeneity among voting members with individuals who have made a career in the private sector with bias hawk [Sibert, 2003] constructs a theoretical model of reputation building, in which the central banker, knowing that he has his reputation at stake, changes his decision optimally to be classified as hawk.

With behavioral arguments, [Malmendier et al., 2016] show that the votes and inflation expectations of members of the Federal Open Market Committee (FOMC) of the Fed are affected by the inflation they themselves experienced in their personal life, given their time of life.

However, many of these classifications are made ad hoc, according to past decisions and speeches and even academic and professional background. In this way, biases can arise in the pricing of assets. A speech from a dove member will only be relevant to the market if it sounds hawk, for example.

Unlike papers such as [Ericsson, 2016], [Stekler and Symington, 2016], [Chague et al., 2015] and [Cabral and Guimaraes, 2015], the latter two for Brazil, which analyze the texts in technical reports of the central banks, such as communiqués, minutes and forecasts, the analysis carried out in this article focuses on the communication of Bacen in the specialized media.

[Carvalho et al., 2013] test the repercussion of the official communication of Bacen in the specialized media. Based on Copom's interest decision releases, the authors withdrew citations classified as hawk or dove and seek to pass these snippets on the media using as a measure the number of results returned by the Google search tool. They point out that short- and medium-term interests are impacted by the information content of the communiqués, but only for periods prior to the presidency of Alexandre Tombini.

In this article will be used the unpublished news archives of Broadcast, Agência Estado, to identify the days in which the president or any director of Bacen was quoted in the specialized media. The 2 section provides more details about these archives.

It has been found evidence that the volatility of short interest rates is higher

in these days, especially when considering more recent periods. The name of the president of the Bank is more relevant for the pricing of interest than names of directors of areas of the bank, such as the directors of monetary policy or economic policy.

The other publications, technical studies and speeches published on the institution's website (excluding communiqués and minutes of decisions) also lead to an increase in interest volatility, especially in longer periods.

As the news archive has intraday frequency, with three publications throughout the day, it was tested whether there is an increase in volatility if the name of the president of Bacen appeared only in the publication of the end of the day (which would indicate that the information was disclosed during the trading session), but it was not possible to find traces of increased volatility in this analysis.

This article is organized as follows: In the section 2 there is a brief description of the news archives to be used in the section 3. the evolution of the Central Bank's communication. The variables that identify the days in which the hypothesis of greater volatility is tested are in the section: 4, as well as the description of the interest vertices, the intraday interest calculation and the controls. The section 5 briefly outlines the GARCH family model that will be used in the tests. After the results in the section 6, the last section presents the conclusions.

2 News Archive - Broadcast

With more than 12 thousand users, Agência Estado's AE Broadcast platform represents Brazil's largest real-time online financial information distribution platform.

Its users consist of agents of the financial market, such as banks, brokers, investment funds and consulting, that is, agents that are among the main price makers of Brazilian assets.

Among its various products, AE News stands out, which, in addition to covering in real time and providing the main events relevant to the world financial market, presents three daily news summaries with the main facts that have driven the market.

Always for business days in Brazil, the "Opening" summary is disclosed before 8 am, i.e. before the beginning of the Brazilian trading session. In it, the news that were highlights over the previous night and in the markets already in operation on the day are listed. The summary "Scenario 1", released at approximately 1 pm, is complemented by the news that occurred in the period. After 6 pm, with the trading session closed, "Scenario 2" is published, with a complete summary of the news that influenced the economy in Brazil and in the world.

Starting in February 2005 and ending in April 2016, the database contains articles for 2,753 days, totaling, therefore, 8,259 articles.

Opening ("Op" for now on), Scenario 1 ("C1") and Scenario 2 ("C2") are

periodic summaries, that is, they do not provide new information. The release of unpublished news is made in the form of headlines, among the disclosures of the abstracts. Therefore, the present work does not seek to analyze whether Broadcast functions as a platform for the study of events, but rather can provide information about the feelings of price makers during three periods of the day.

Two facts mentioned above (target public specialized in the prices makers and three intraday summaries) present differentials in relation to other studies that seek to capture the variation of the sentiment of the economic agents through news.

The fact that the news is targeted to the target audience mitigates the problem of rational inattention. [Sims, 2003] assumes that people have limited attention, and allocate them optimally. There is, therefore, a difference in the speed of reaction to economic news between specialized and non-specialized agents. Because specialized agents are price-makers, the impact of Broadcast news on prices is faster.

On frequency, while Broadcast provides smaller and relatively regular time information (5 hours between Op and C1 or C1 and C2 and 10 hours between Op and C2), which allows to evaluate the price variation of assets only during the trading section, the works of [Matthies and Liu, 2014] and [Manela and Moreira, 2017] use only one set of news per day, in these cases the covers of The Wall Street Journal.

3 Communication from the Central Bank

The Collegiate Board of Central Bank of Brazil, the highest decision-making body responsible for formulating policies and directives necessary for the exercise of the competencies of the Central Bank, is composed by eight boards, in addition to the institution's chairmanship. These are: Economic Policy (Dipec), Monetary Policy (Dipom), Regulation (Dinor), International Affairs and Corporate Risk Management (Direx), Administration (Dirad), Organization of the Financial System and Control of Rural Credit Operations (Direm - Difip - Dilid - Diorf- Diorf), Inspection (Difis) and Special Affairs and Institutional Relations and Citizenship (Diasp - Direc).

There are three departments subordinate to the Director of Economic Policy: Department of Studies and Research (Depep), Department of Economics (Depec) and Department of Investor Relations and Special Studies (Gerin). The latter, created in 1999 after the adoption of the inflation targets regime, and merged with the Management of Special Studies in 2011, aims to "improve communication between the Central Bank of Brazil and the private sector, focusing on domestic and external ".[3]

In addition to disclosing statements and minutes of interest rate decisions, the department is responsible for publishing texts, presentations and speeches at conferences and seminars, the Quarterly Inflation Report, thematic surveys and

[3] Available in http://www4.bcb.gov.br/pec/gci/port/sobregerin.asp

market expectation research, which seeks to capture the evolution of the main macroeconomic variables to generate subsidies for monetary policy decisions.

The institution's website also releases press releases. Specifically on the communication of Central Bank of Brazil, it is highlighted the note called "Communication Procedures of the Central Bank"[4], released on November 1, 2016. In it, two points draw attention. Regarding official and unofficial communication, the note states:

"The Central Bank's messages on monetary policy are primarily presented in the minutes of the meetings of the Monetary Policy Committee (Copom) and in the Quarterly Inflation Reports. Complementarily, Central Bank of Brazil messages on monetary policy are transmitted in the official manifestations of Copom members, for example in speeches and interviews. However, these manifestations are aligned with the messages conveyed in the official Central Bank of Brazil documents. Information or opinions attributed to members of the Copom or to the "technicians" of the Central Bank of Brazil do not compose the official communication of the Central Bank of Brazil and should not be seen as manifestations of this Authority".

That is, the official communication procedure does not occur via the media. There is at most only supplementary information in interviews.

However, a second point in the communique calls attention to:

"Communication privileges the message as a whole and not the use of keywords to convey their ratings or signalize future actions. Official documents should be analyzed as a whole".

Using communiqués released up to December 2013, [Cabral and Guimaraes, 2015] compared the size and the informational volume of the Bacen communiqué with that of 11 other central banks. They conclude that the Brazilian communiqué is the smallest in the sample and, unlike the others, did not disclose risk scenarios and balance sheets immediately after the decision.

The pattern continued until June 2016. The small changes in the communiques came from the inclusion, exclusion or exchange of a few words (like the word "parsimony", for example). However, since the 200th meeting, under the new chairman of the institution, Ilan Goldfajn, the pattern has moved towards the international central banks. The text no longer follows a particular pattern and incorporated the scenarios and risks inherent in them.

Thus, it can be understood that the press release disclosed signals a change of guidelines in the Central Bank of Brazil´s communication. That is, before the change, the interviews and comments "off the record" in the media had a relevant role in the conduct of the monetary policy, fact that no longer occurs.

This paper attempts to capture this possible influence of the Central Bank of Brazil's communication through the media in asset prices.

Before starting to analyze the data, it is worth commenting on another change in the Central Bank of Brazil's communication towards greater transparency with the general public. In May 2012, at its 167th meeting, the Copom began to disclose how each of its members voted, something that is not shared by

[4] Available in http://www.bcb.gov.br/pt-br/#!/c/notas/15982

all central banks ([Cabral and Guimaraes, 2015]). This change provides more information on the biases of each voting member of the Copom, helping the market in the dove / hawk classification quoted above.

4 Variables

In this article, no distinction was made on the topic covered in the Broadcast news. It searched in the database of more than eight thousand news only the name of the president and directors of the institution. A dummy was then created that assumes 1 on the day the name was quoted. The news can then refer to an unpublished interview, a speech made days before or even the agenda of the monetary authority.

The news, which began in February 2005, runs until April 2016. During this period, passed by the collegiate, two Presidents, five Directors of Administration (Dirad), eight Directors of International Affairs and Corporate Risk Management (Direx), three Directors of Inspection (Difis), two Directors of Organization of the Financial System and Control of Rural Credit Operations (Direm - Difip - Dilid - Diorf- Diorf), five Economic Policy Directors (Dipec), three Monetary Policy Directors (Dipom), five Regulation (Dinor), and six Directors of Special Affairs and Institutional Relations and Citizenship (Diasp - Direc).

Table 1 summarizes the names of the presidents and directors in the period.

< TABLE 1 - HERE>

4.1 Variables of Interest

Fourteen dummies were taken from the news database. Four of these dummies are retrieved if the name of the President of Central Bank of Brazil appears in the Op, C1, C2 summaries or at least one of them (that is, if the name appeared on the day). Four other dummies will be related to the names of the directors of Direx, Dipec, Dipom or Dinor (which appear most frequently in the database) on the day.

The other six dummies come from the other means of communication of Central Bank of Brazil, the publications and technical notes published on its own website. In addition to a dummy for days in which there were publications, whether signed or not by a president or director, dummies were built for studies signed by the President and the four Directors mentioned above.

The table 2 shows how often these names appear on the media or subscribe to Central Bank of Brazil publications in the 2, 753 days of the sample (February 2005 through April 2016). It is observed that the President is the member of the Copom with more quotations in the period (in 42% of the days there are quotes to his name), followed by the Director of Dipec, the Director of Direx, Dipom and Dinor. The distribution of the name of the President among the three abstracts (Op, C1 and C2) is slightly larger in the summary Opening.

< TABLE 2 - HERE>

There is some publication on the Bacen website on 15% of the days of the sample. The President is the member with the most publications signed, with 47% of the total. As well as the frequency of appearances in the media, the second place is the Director of Dipec, followed by the Director of Direx. The number of publications by the Director of Dinor is greater than the number of the Director of Dipom, contrary to what happens in the media.

By setting the date of interest decision by the Copom at $t = 0$, graphs of frequency of occurrences in the media were constructed from this date. As the Copom meetings are held every 40 days from 2006, and no more every 30 days, the charts start on this date. For year-end comparisons, the year 2016 was excluded.

Figure 1 shows that the President's appearances are distributed evenly over time. The Directors of Direx, Dipom and Dinor do not have a clear pattern of appearances. In addition, in both, no changes in frequencies have been observed over the years

< FIGURE 1 - HERE>

However, for Dipec, it is possible to observe an increase of citations of its director between 15 and 25 days after the decision. There seems to be a "quiet period" for his director until two weeks after the interest decision. In addition, appearances between days 5 and 15 after the decisions are more frequent in the years 2013, 2014 and 2015, which would signal that the director anticipated his appearance in the media in recent periods.

The figure 2 keeps the zero mark on the last day of the Copom meeting, but now it is analyzed on which days the probability of the Bacen site is higher to release a report. Publications signed by members or non-members of the Copom occur mostly 15 days after the decision of interest. Signed by the President take place mostly between 8 and 18.

< FIGURE 2 - HERE>

For the Director of Economic Policy (Dipec), the pattern is similar to the appearances of his name in the media, with a concentration between 14 and 25. This may mean that the media is only mentioning the studies and speeches of the director disclosed in the site of the Bacen, and that the news channel does not bring information to the market other than those already provided by the institution's website.

4.2 Explanatory variables and controls

As explanatory variables for the study of daily interest volatility, nine vertices[5] of the Pre-DI Swap, calculated by BM&FBovespa. The use of several

[5] 30, 60, 90, 120, 180, 360, 540, 720 and 900 days.

vertices seeks to capture if the communication has different effects along the Brazilian term structure of interest rate.

As there is no calculation of the swap throughout the day, it was necessary to construct interest series at three periods of the day in intraday regressions. The BM&FBovespa website provides, tick-by-tick, the values of the DI futures contracts. Interest rates were selected at the opening, at the closing and the closest to the 13 hours, approximate time of the disclosure of the summary Scenario 1.

With vertex prices, these were interpolated by the Spline method. In this way, it is possible to observe, at each intraday period, the theoretical interest rate for the cited vertices, keeping the duration constant. The data go from May 2014 to July 2015, totaling 927 observations (three per day).

The graphs of the daily series of the nine vertices are found in Figure 3, while the 360-day intraday interest series and the 360-Day Pre-DI Swap calculated by the BM&FBovespa are in Figure 4

< FIGURE 3 - HERE>
< FIGURE 4 - HERE>

As control variables, dummies were used for the day following Copom's interest decision, since the market is closed at the time of disclosure and the adjustment occurs on the following day, and on the day of the Copom Minutes[6], which can provide more details on the discussion at the meeting.

Two macroeconomic variables were added as controls. On days of inflation and industrial production (IPCA and seasonally adjusted monthly variation of the industrial production of the Monthly Industrial Survey, both of IBGE), there are changes in interest rates in the event of a surprise in the face of market expectations. To capture this possible surprise, an index was constructed as follows.

In research with members of the financial market, Bloomberg captures market expectations for certain indicators. There is, therefore, a distribution of expected values for the number. The median of this distribution is then deviated from the value actually reported. This difference is divided by the standard deviation of the projection distribution. Finally, this index is normalized.

In short, if there is a surprise in inflation or industrial production, but the distribution of expectations is dispersed, the surprise is minimized. But if the standard deviation is small, the surprise is considered high, which is reflected in interest.

5 Methodology

The model used to estimate interest volatility was the traditional EGARCH (1,1), by [Nelson, 1991], which allows asymmetry in volatility. The distribution

[6] Another change in the Bacen communication introduced by the Executive Board headed by Ilan Goldfajn was the anticipation of the release of the Copom Minutes for Tuesday of the following week, against Thursday previously.

used was t-Student. The models GARCH (1,1) of [Bollerslev, 1986] and the GJR(1,1) of [Glosten et al., 1993] were tested, as well as the Gaussian distribution instead of the Student-t, but the first specification presented the best information criterion. Models with higher orders were not tested.

In the chosen model, four dummies were included, besides the two series of macroeconomic surprise. In both the mean and the variance equations, one of the 14 variables of interest was included. As controls in the mean equation, surprises were added in the IPCA and industrial production. Finally, the dummies for the day after the decision of interest by Copom and the day of disclosure of the Minutes are included in the variance equation.

Therefore, the specification of the EGARCH (1,1) obeyed the following criterion:

$$\begin{aligned} r_t &= a + b_1 D_{VarInt,t} + b_2 S_{IPCA,t} + b_3 S_{PIM,t} + \epsilon_t \\ \epsilon_t &= \sigma_t \eta_t \\ ln(\sigma_t^2) &= \omega + \beta ln(\sigma_{t-1}^2) + \alpha \left| \frac{\epsilon_{t-1}}{\sigma_{t-1}} \right| + \gamma \frac{\epsilon_{t-1}}{\sigma_{t-1}} + + \delta_1 D_{VarInt,t} + \delta_2 D_{Copom,t} + \delta_3 D_{Ata,t} \end{aligned}$$

where r_t is the interest rate variation, σ_t^2 is the conditional variance of interest, $D_{VarInt,t}$ is the dummy of the variable of interest, $S_{IPCA,t}$ is the surprise of the IPCA, $S_{PIM,t}$ is the surprise of industrial production, $D_{Copom,t}$ is the dummy for the day after the Copom meeting and $D_{Ata,t}$ is the dummy for the Copom Minutes disclosure day. As stated above, η_t follows a t-Student distribution.

The OxMetrics software was used for estimating the coefficients, using the optimization algorithm MaxSA.

6 Results

With the methodology above, three groups of results were obtained. In the subsection 6.1, all $2,753$ days of the sample were included in the regression.

In the subsection 6.2, a rolling regression was performed, with a window of $1,000$ days, to analyze the evolution of the parameters of interest for both the mean and variance equations. In this analysis, only the interest of the vertex of 360 days, the most liquid, will be analyzed.

In the subsection 6.3 the results obtained for intraday volatility of the 360-day interest proxy are presented.

6.1 Daily Regressions

Comparing the value assumed by the coefficients of the controls in the 14 regressions, there was no great variability between them. Thus, we begin this subsection by analyzing the results of the controls and then compare the results obtained with the 14 variables of interest.

The table 3 summarizes 9 regressions arranged in columns, with 9 different interest vertices, contemplating short interest, from 30 days to long interest of 900 days.

As a variable of interest, we chose whether there was a quotation to the President of the Central Bank on the day.

As mentioned above, this particular variable will not be studied in the 3, but rather in the 4 and 5

< TABLE 3 - HERE>

The controls included in the mean equation are positive and significant. When inflation or industrial output is higher than expected, there is an increase in interest rates on the days of disclosure of the indicators. The surprise of the IPCA affects the entire term structure of interest rate, mainly interest over 540 days. Surprises in industrial production do not lead to interest increases in the short term, but affect pricing in longer periods, with a greater impact on interest of 540 days.

In the variance equation, as one would expect, there is a large increase in volatility at the short interest rate on the day after the interest decision. Although the entire curve is impacted, the highest coefficients are observed at the vertices of 30 to 180 days.

The Copom Minutes impact the middle of the curve with greater force. Until the date analyzed in this article, the communique of the decisions was concise and did not bring the projections of the Central Bank of Brazil on the inflation for the next years. This information is contained in the Minutes of the meetings. The result found is consistent with the incorporation of these medium-term projections into the scenarios of interest-market participants.

The table 4 summarizes only the 14 coefficients of the variables of interest obtained in the mean equation. The first four results refer to days in which the President was named in the Broadcast. The results indicate that, in these days, the variation of the interest is positive, and happens in greater magnitude in the long interest rates. In the opening of abstracts, it is observed that C2 is the periodical with the greatest impact. AB and C1 are less relevant, and only at the beginning of the curve.

< TABLE 4 - HERE>

The next set of regressions are for the four departmental directors. Except for the Director of Monetary Policy, days in which the other directors are mentioned in the reports present an increase in interest rates. While the Director of Dipec affects the whole curve, the greatest impact is felt when the Director of Direx is quoted.

The last group, with six parameters, refers to days in which there was some publication on the Central Bank of Brazil website, publications whether signed or not. This impact is reflected in the average interest rate changes. The President's studies are the ones that make the most impact, especially at the

long end. Studies of Direx, contrary to its name in the media, are not significant. Studies of the Director of Dipec are significant at the beginning and middle of the curve, as well as Director of Dinor. As in the news, there was no significance for the Dipom Director.

Already the volatility in the identified days is greater for only some of the regressions made. The table 5 shows the estimated coefficient of dummies in the variance equation.

< TABLE 5 - HERE>

Days in which the name of the President of Central Bank of Brazil is mentioned in the summary C1 show greater volatility at the beginning and middle of the curve. The middle of the curve undergoes increased volatility if its name appears on C2. There is no impact on swap volatility when the directors are quoted.

Considering the publications of the Central Bank of Brazil website, the final part of the curve has its volatility increased in days in which there are publicized studies, speeches or other publications attributed to the President of the institution.

There is some sign of increased volatility in the middle of the curve on days of Dipec Director publications. The only negative coefficients found, and the only significant ones for this director, are at the short end of the interest curve in days that the Monetary Policy Director publishes some study on the Central Bank of Brazil website. In these days, the volatility of short interest rates is reduced.

6.2 Rolling Regressions

While in the previous section the parameters were retrieved from the entire sample of 2.753 days, in this section were performed regressions with rolling window with a window of 1,000 days and graphs were constructed with the coefficients of the variables of interest in the mean and variance equations. Together with the coefficients, the 90% confidence interval was also presented. All regressions have as the dependent variable the 360-days Pre-DI Swap.

As there are few comments about the Central Bank's directors, both media citations and signed studies, only the President's graphics in the media and publications on the Bacen website, signed or not by the President, will be covered in this section.

In the figure 5, the dark line refers to the coefficient of the variable of interest in the mean equation. The light line is the coefficient of the variance equation. Note that the coefficient of the mean equation is positive and significant throughout practically the entire sample, in the six regressions performed.

< FIGURE 5 - HERE>

Regarding the volatility coefficient, it is interesting to note an increase in the sensitivity of interest rates to the media at the end of the sample (from the end

of 2014 to the Opening, mid-2015 to Scenario 2 and later this year to Scenario 1) .

The same goes for the sensitivity of interest volatility to Central Bank's publications. The coefficients of the total publications and those signed by the President become significant in August 2014.

The results suggest an increase in interest rate sensitivity on days when the Central Bank provides new information, either through the media or through studies published on its website. This sensitivity has increased in recent periods.

If on the one hand this may point to a more transparent central bank, which signals its perceptions more to the market, on the other hand it can also mean that the communication is generating many noises in the market. The press release published by Bacen and already discussed in the section 3 meets this last hypothesis.

6.3 Intraday Regression

In the regressions of this subsection, the dummies of the variables of interest were changed to try to capture the speech of the President or Directors throughout the day.

The first variable of interest takes into account if the name of the President of Central Bank appeared only in the summary Opening. On this day, as there was no mention of the President for the remainder of the day, there was theoretically no information from the media that could alter the interest rate.

The second and third dummies created would show if there was information throughout the trading session. They assume value 1 if the President did not have his name mentioned in the Opening summary, but was mentioned in Scenario 1 and Scenario 2 or only in Scenario 2. In the first case, it would mean that relevant information was released between 9am and 1pm, while in the second case the information would arise between 13h and 18h.

Finally, a dummy was built if the name of the President was mentioned in all three summaries, which would capture very relevant information disclosed to the market, but which may have occurred on the previous day or night.

The data extracted from the BM&FBovespa website ranged from May 2014 to July 2015, with a total of 927 observations (three per day: 9, 13 and 18 o'clock), as already mentioned in subsection 4.2. The table 6 indicates the number of observations of the four dummies.

< TABLE 6 - HERE>

As found in subsection 6.1, the controls did not show large variations among the four regressions. Therefore, its analysis will be made in only one regression, in the case that includes as variable of interest the appearance of the President in the media in the three summary. The table 7 shows the results.

< TABLE 7 - HERE>

The surprises of inflation and industrial production, and the control dummies of the day after the decision of interest rate and the day of the Minutes, assume value only at the time of 9 o'clock. It is assumed that the impact of this information is already included in the opening price of the trading floor.

For the surprise in the IPCA, the result is not as homogeneous as the one presented in the daily regressions, with some vertices in the middle of the curve showing no sensitivity to the surprise. However, the middle of the curve is positively impacted. Already surprises in industrial production do not impact interest rate as it did before.

The controls present in the variance equation follow positive and significant. Days after the Copom meeting show greater volatility, especially at the short end, while information from the Minutes affects the longer curve more.

The following tables show the coefficients of the variables of interest in the mean and variance equations, respectively: 8 and 9.[7]

Except for a few vertices in the regressions that include dummies for days that the President appears only at the Opening, or only in Scenario 1 and 2 (these still with negative signs), it was not possible to capture intraday volatility increase with news published in the media.

< TABLE 8 - HERE>
< TABLE 9 - HERE>

Two justifications are possible for the result. First, an intraday interest rate curve was obtained by simple interpolation of DI futures contracts. Some of these vertices are lower, which may have affected the result. The other explanation would be the short period of time for the time series available in the BM&FBovespa's website, only a little more than a year.

7 Concluding Remarks

Raising the central bank's powers to generate price stability has brought with it a consensus that transparency in its policies and thoughts is of crucial importance in achieving the objective.

The main transparency tool of central banks is their communication. Although central banks' main channel of communication occurs through official technical publications, media interviews are needed to explain the institution's actions as well as dedicated investors, as well as towards the general public. This expansion of knowledge strengthens the transmission channels of monetary policy.

In this article, we found evidence that these two types of communication carried out by the Central Bank of Brazil, official and by the media, influence the Brazilian interest curve. Days in which citations to the President of the institution in the media present greater volatility in relation to other days, especially considering the short end of the curve. The same situation occurs

[7] There was no convergence in two regressions for the 30 days Pre-DI Swap.

when there is the publication of official publications on the Bacen website which, in turn, affect the long end of the curve more.

In the intertemporal analysis, there is an increase of interest sensitivity to the communication of Bacen in the most recent period. The results show that the Brazilian central bank is more "vocal" and has been increasing its transparency with investors, using as communication both its technical studies and the specialized media for this.

References

[Bernanke et al., 2007] Bernanke, B. S. et al. (2007). Inflation expectations and inflation forecasting. Technical report.

[Blinder et al., 2008] Blinder, A. S., Ehrmann, M., Fratzscher, M., De Haan, J., and Jansen, D.-J. (2008). Central bank communication and monetary policy: A survey of theory and evidence. *Journal of Economic Literature*, 46(4):910–945.

[Bollerslev, 1986] Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of econometrics*, 31(3):307–327.

[Cabral and Guimaraes, 2015] Cabral, R. and Guimaraes, B. (2015). O comunicado do banco central. *Revista Brasileira de Economia*, 69(3):287–301.

[Carvalho et al., 2013] Carvalho, C., Cordeiro, F., and Vargas, J. (2013). Just words?: A quantitative analysis of the communication of the central bank of brazil. *Revista Brasileira de Economia*, 67(4):443–455.

[Chague et al., 2015] Chague, F., De-Losso, R., Giovannetti, B., and Manoel, P. (2015). Central bank communication affects the term-structure of interest rates. *Revista Brasileira de Economia*, 69(2):147–162.

[Ericsson, 2016] Ericsson, N. R. (2016). Eliciting gdp forecasts from the fomcs minutes around the financial crisis. *International Journal of Forecasting*, 32(2):571–583.

[Fry et al., 2000] Fry, M., Julius, D., Mahadeva, L., Roger, S., and Sterne, G. (2000). Key issues in the choice of monetary policy framework. *Monetary policy frameworks in a global context*, 1:1–216.

[Glosten et al., 1993] Glosten, L. R., Jagannathan, R., and Runkle, D. E. (1993). On the relation between the expected value and the volatility of the nominal excess return on stocks. *The journal of finance*, 48(5):1779–1801.

[Hayo and Neuenkirch, 2015] Hayo, B. and Neuenkirch, M. (2015). Self-monitoring or reliance on media reporting: How do financial market participants process central bank news? *Journal of Banking & Finance*, 59:27–37.

[Malmendier et al., 2016] Malmendier, U., Nagel, S., and Yan, Z. (2016). The making of hawks and doves: Inflation experiences and voting on the fomc. Technical report, Working paper.

[Manela and Moreira, 2017] Manela, A. and Moreira, A. (2017). News implied volatility and disaster concerns. *Journal of Financial Economics*, 123(1):137–162.

[Matthies and Liu, 2014] Matthies, B. and Liu, Y. (2014). News-based macroeconomic asset pricing.

[Morris and Shin, 2007] Morris, S. and Shin, H. S. (2007). Optimal communication. *Journal of the European Economic Association*, 5(2-3):594–602.

[Nelson, 1991] Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica: Journal of the Econometric Society*, pages 347–370.

[Sibert, 2003] Sibert, A. (2003). Monetary policy committees: individual and collective reputations. *The Review of Economic Studies*, 70(3):649–665.

[Sims, 2003] Sims, C. A. (2003). Implications of rational inattention. *Journal of monetary Economics*, 50(3):665–690.

[Sims et al., 2010] Sims, C. A. et al. (2010). Rational inattention and monetary economics. *Handbook of monetary Economics*, 3:155–181.

[Stekler and Symington, 2016] Stekler, H. and Symington, H. (2016). Evaluating qualitative forecasts: The fomc minutes, 2006–2010. *International Journal of Forecasting*, 32(2):559–570.

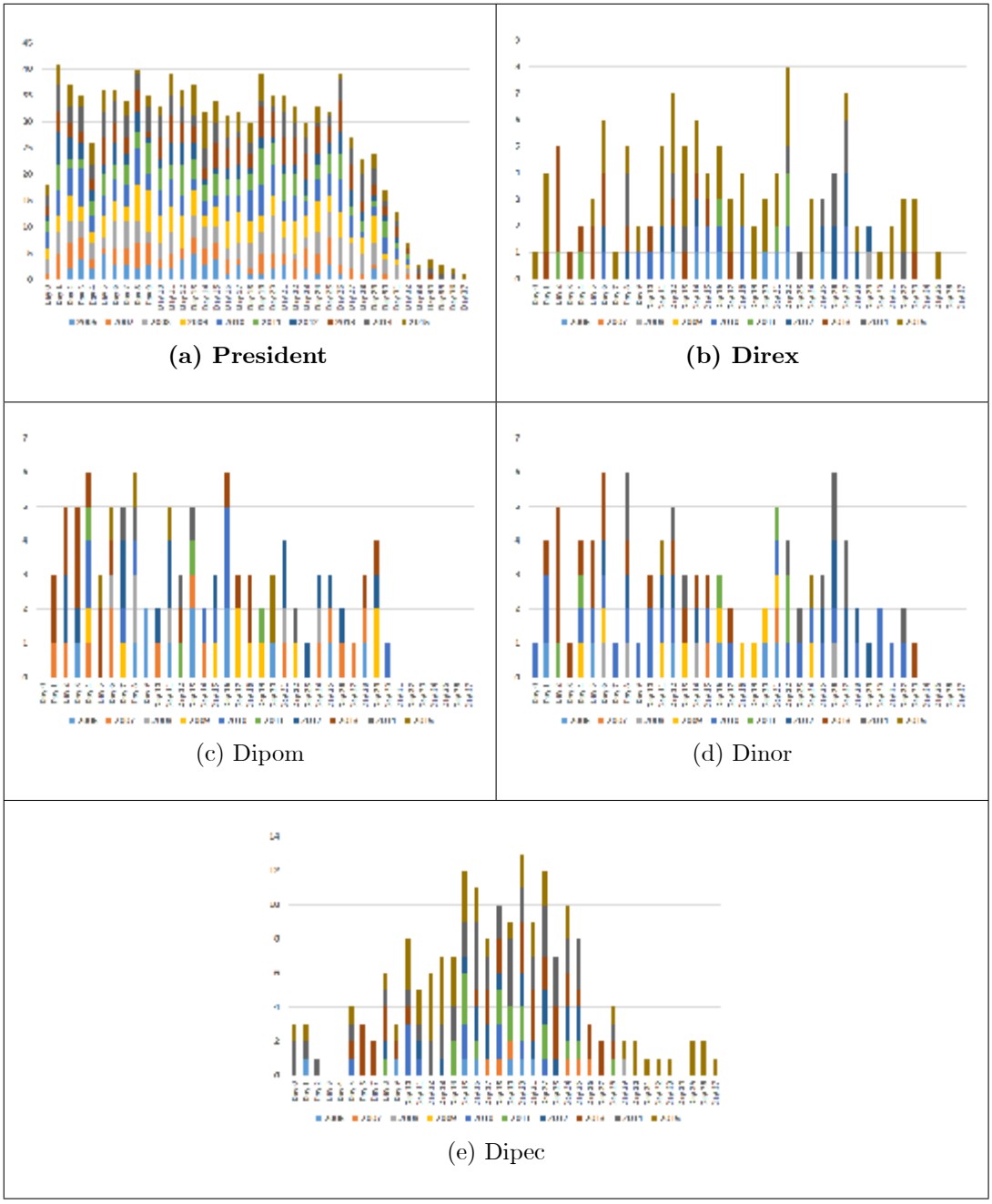
8 Appendix - Tables and Figures

President / Director	Names
President	Henrique de Campos Meirelles; Alexandre AntonioTombini
Administration(Dirad)	João Antônio Fleury Teixeira; Antonio Gustavo Matos do Vale Anthero de Moraes Meirelles; Altamir Lopes; Luiz Edson Feltrim
International Affairs and Corporate Risk Management(Direx)	Alexandre Schwartsman; Alexandre Antonio Tombini; Paulo Vieira da Cunha; Maria Celina Berardinelli Arraes Aldo Luiz Mendes; Carlos Hamilton Vasconcelos Araújo; Luiz Awazu Pereira da Silva; Tony Volpon
Inspection(Difis)	Paulo Sérgio Cavalheiro; Alvir Alberto Hoffmann; Anthero de Moraes Meirelles
Organization of the Financial System and Control of Rural Credit Operations(Direm-Difip-Dilid-Diorf-Diorf)	Antonio Gustavo Matos do Vale; Sidnei Corrêa Marques
Economic Policy (Dipec)	Afonso Sant'Anna Bevilaqua; Mário Magalhães Carvalho Mesquita; Carlos Hamilton Vasconcelos Araújo; Luiz Awazu Pereira da Silva; Altamir Lopes
Monetary Policy (Dipom)	Rodrigo Telles da Rocha Azevedo; Mario Gomes Torós; Aldo Luiz Mendes
Regulation(Dinor)	Sérgio Darcy da Silva Alves; Alexandre Antonio Tombini; Luiz Awazu Pereira da Silva; Anthero de Moraes Meirelles; Otávio Ribeiro Damaso
Special Affairs and Institutional Relations and Citizenship(Diasp-Direc)	Eduardo Henrique de Mello Motta Loyo; Alexandre Antonio Tombini; Sérgio Darcy da Silva Alves; Afonso Sant'Anna Bevilaqua; Mário Magalhães Carvalho Mesquita; Mario Gomes Torós

Table 1: Presidents and directors of Central Bank of Brazil - Feb / 2005 to Apr / 2016

Broadcast	**# Citations**	**% of the total days of the sample**	
President's name on Broadcast on the day	1166	42.4%	
President´s name on Broadcast on Op	766	27.8%	
President´s name on Broadcast on C1	605	22.0%	
President´s name on Broadcast on C2	637	23.1%	
Name of Director of Direx on Broadcast on the day	140	5.1%	
Name of Director of Dipec on Broadcast on the day	216	7.8%	
Name of Director of Dipom on Broadcast on the day	119	4.3%	
Name of Director of Dinor on Broadcast on the day	102	3.7%	
Central Bank of Brazil website	**# Publications**	**# total days of the sample**	**# of publications**
Publication disclosed on the Central Bank of Brazil website, whether or not signed by President and/or Director	417	15.1%	100.0%
Publication disclosed on the Central Bank of Brazil website, signed by President	196	7.1%	47.0%
Publication disclosed on the Central Bank of Brazil website, signed by Director of Direx	46	1.7%	11.0%
Publication disclosed on the Central Bank of Brazil website, signed by Director of Dipec	77	2.8%	18.5%
Publication disclosed on the Central Bank of Brazil website, signed by Director of Dipom	26	0.9%	6.2%
Publication disclosed on the Central Bank of Brazil website, signed by Director of Dinor	43	1.6%	10.3%

Table 2: Number of citations or publications - Feb / 2005 to Apr / 2016



(a) President

(b) Direx

(c) Dipom

(d) Dinor

(e) Dipec

Figure 1: Citation in the media - days after the interest rate decision

(a) Central Bank of Brazil **(b) President**

(c) Direx (d) Dipom

(e) Dinor (f) Dipec

Figure 2: Publications on the website - days after the interest rate decision

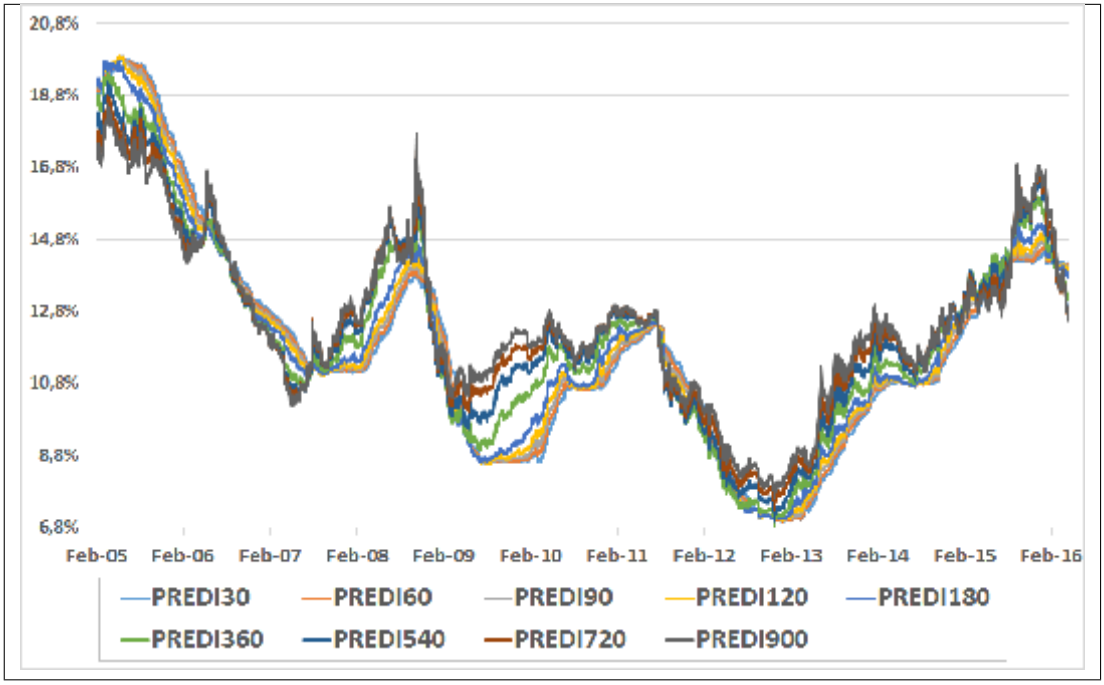


Figure 3: Swaps - BM&FBovespa

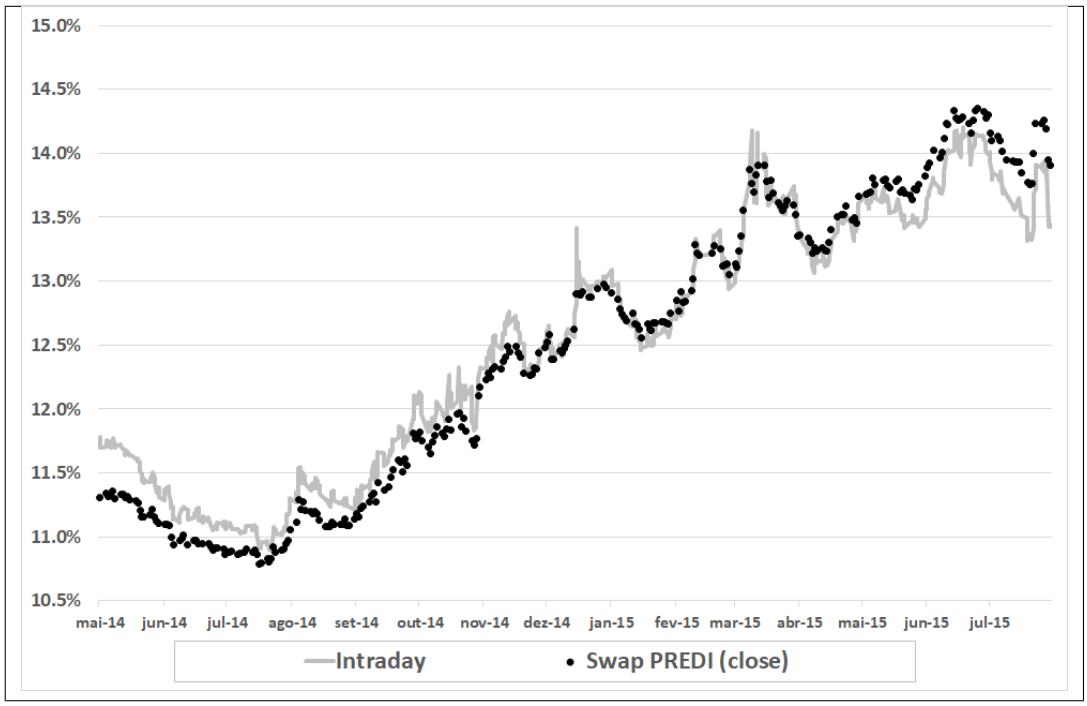


Figure 4: Interest Rate interpolated and Swap Pre-DI 360 days

Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Mean Equation									
Constant (a)	-0.0035 [0.0031] (-1.1104)	-0.0043 [0.0040] (-1.0883)	-0.0142^{***} [0.0048] (-2.9329)	-0.0198^{***} [0.0061] (-3.2605)	-0.0264^{***} [0.0067] (-3.9188)	-0.0425^{***} [0.0132] (-3.2061)	-0.0627^{***} [0.0138] (-4.5419)	-0.0657^{***} [0.0161] (-4.0743)	-0.0656^{***} [0.0124] (-5.3084)
Variable of Interest									
President's name on Broadcast on the day	0.0154^{***} [0.0045] (3.4624)	0.0119^{**} [0.0054] (2.2193)	0.0242^{***} [0.0048] (5.0179)	0.0303^{***} [0.0081] (3.7182)	0.0239^{**} [0.0107] (2.2410)	0.0546^{***} [0.0197] (2.7642)	0.0554^{**} [0.0228] (2.4272)	0.0708^{***} [0.0261] (2.7084)	0.0823^{**} [0.0248] (3.3190)
Controls									
Surprise on the IPCA	0.0307^{***} [0.0106] (2.9023)	0.0473^{***} [0.0135] (3.5174)	0.0891^{***} [0.0171] (5.2238)	0.1371^{***} [0.0223] (6.1444)	0.1735^{***} [0.0314] (5.5290)	0.2973^{***} [0.0452] (6.5728)	0.3526^{***} [0.0563] (6.2654)	0.3262^{***} [0.0755] (4.3220)	0.3142^{***} [0.0747] (4.2054)
Surprise on the Industrial Production	-0.0081 [0.0116] (-0.6997)	0.0141 [0.0101] (1.3903)	0.0235 [0.0151] (1.5608)	0.0452^{***} [0.0127] (3.5701)	0.0753^{***} [0.0185] (4.0672)	0.1025^{***} [0.0344] (2.9802)	0.1211^{***} [0.0448] (2.7058)	0.1057^{*} [0.0579] (1.8270)	0.0764^{***} [0.0057] (13.3880)
Variance Equation									
Constant (ω)	-3.4838^{***} [0.1513] (-23.0210)	-3.2146^{***} [0.2101] (-15.3010)	-2.9550^{***} [0.1520] (-19.4450)	-2.5101^{***} [0.1484] (-16.9110)	-2.1182^{***} [0.1478] (-14.3290)	-1.2744^{***} [0.1325] (-9.6168)	-0.8224^{***} [0.1236] (-6.6523)	-0.6089^{***} [0.1164] (-5.2315)	-0.4882^{***} [0.1274] (-3.8306)
EGARCH (β)	0.9362^{***} [0.0127] (73.8150)	0.9718^{***} [0.0095] (102.6900)	0.9507^{***} [0.0119] (80.2300)	0.9479^{***} [0.0138] (68.4890)	0.9521^{***} [0.0110] (86.6780)	0.9562^{***} [0.0111] (85.9560)	0.9553^{***} [0.0126] (75.9610)	0.9552^{***} [0.0135] (70.9970)	0.9667^{***} [0.0116] (83.0350)
EGARCH (α)	0.0063 [0.0125] (0.4995)	0.0002 [0.0092] (0.0185)	0.0032 [0.0113] (0.2781)	0.0240^{*} [0.0131] (1.8270)	0.0227^{*} [0.0135] (1.6816)	0.0396^{***} [0.0142] (2.7972)	0.0367^{**} [0.0156] (2.3485)	0.0432^{***} [0.0162] (2.6681)	0.0389^{***} [0.0144] (2.7043)
EGARCH (γ)	0.5301^{***} [0.0441] (12.0260)	0.3309^{***} [0.0458] (7.2281)	0.3814^{***} [0.0431] (8.8478)	0.3619^{***} [0.0481] (7.5166)	0.3443^{***} [0.0389] (8.8484)	0.2860^{***} [0.0327] (8.7583)	0.2852^{***} [0.0358] (7.9763)	0.2714^{***} [0.0376] (7.2118)	0.2377^{***} [0.0354] (6.7074)
Variable of Interest									
President's name on Broadcast on the day	0.1146^{*} [0.0678] (1.6897)	0.1640^{**} [0.0738] (2.2232)	0.0623 [0.0680] (0.9163)	0.0253 [0.0717] (0.3524)	0.1075 [0.0711] (1.5106)	0.1644^{**} [0.0683] (2.4071)	0.0797 [0.0677] (1.1761)	0.0899 [0.0665] (1.3530)	0.0907 [0.0658] (1.3799)
Controls									
Day after the Copom meeting	2.7640^{***} [0.1760] (15.7010)	2.4788^{***} [0.1897] (13.0670)	2.5223^{***} [0.1834] (13.7510)	2.5135^{***} [0.1740] (14.4450)	2.3220^{***} [0.1719] (13.5070)	1.7682^{***} [0.1872] (9.4473)	1.3062^{***} [0.1903] (6.8630)	0.9555^{***} [0.2025] (4.7197)	0.7463^{***} [0.1966] (3.7970)
Copom Minutes disclosure day	-0.5381^{***} [0.1528] (-3.5214)	-0.2079 [0.1953] (-1.0648)	0.5454^{***} [0.1465] (3.7225)	0.8370^{***} [0.1559] (5.3692)	1.1088^{***} [0.1869] (5.9329)	1.0113^{***} [0.1940] (5.2121)	0.7989^{***} [0.1868] (4.2759)	0.6074^{***} [0.1773] (3.4265)	0.5390^{***} [0.1668] (3.2304)
t-Student Distribution									
DoF	5.1596^{***} [0.5238] (9.8499)	4.1953^{***} [0.3772] (11.1230)	4.7167^{***} [0.4505] (10.4710)	4.2001^{***} [0.3531] (11.8930)	4.3927^{***} [0.3797] (11.5690)	5.1131^{***} [0.5308] (9.6322)	5.9413^{***} [0.6823] (8.7080)	6.6251^{***} [0.8097] (8.1818)	7.2490^{***} [0.9322] (7.7762)
Goodness of Fit									
Log Likelihood	824, 52	478, 87	68, 51	$-458, 21$	$-1106, 60$	$-2330, 30$	$-2930, 50$	$-3221, 50$	$-3396, 70$
AIC	-0.5645	-0.3134	-0.0152	0.3674	0.8385	1.7274	2.1635	2.3749	2.5022
BIC	-0.5903	-0.3392	-0.0411	0.3416	0.8126	1.7016	2.1376	2.3491	2.4764
# Observations	2753	2753	2753	2753	2753	2753	2753	2753	2753

Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
In the first part of the table are the coefficients of the mean equation with two controls and the variable of interest, besides the constant.
In the second part, the parameters of the variance equation are presented. Two controls are added, besides the variable of interest.
In third part of the table the Degrees of Freedom of the t-Student distribution and in the fourth part Goodness of Fit Statistics are presented
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$

Table 3: Results for controls

Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Variables of Interest - Mean Equation									
President's name	0.0154^{***}	0.0119^{**}	0.0242^{***}	0.0303^{***}	0.0239^{**}	0.0546^{***}	0.0554^{**}	0.0708^{***}	0.0823^{***}
on Broadcast	[0.0045]	[0.0054]	[0.0048]	[0.0081]	[0.0107]	[0.0197]	[0.0228]	[0.0261]	[0.0248]
on the day	(3.4624)	(2.2193)	(5.0179)	(3.7182)	(2.2410)	(2.7642)	(2.4272)	(2.7084)	(3.3190)
President's name	0.0092^{**}	0.0057	0.0120^{*}	0.0193^{**}	0.0105	0.0253	0.0298	0.0552^{*}	0.0584^{*}
on Broadcast	[0.0047]	[0.0058]	[0.0073]	[0.0088]	[0.0118]	[0.0183]	[0.0254]	[0.0286]	[0.0310]
Opening	(1.9624)	(0.9711)	(1.6589)	(2.1892)	(0.8961)	(1.3831)	(1.1751)	(1.9286)	(1.8816)
President's name	0.0243^{***}	0.0149^{*}	0.0201^{**}	0.0251^{**}	0.0096	0.0245	0.0131	0.0194	0.0257
on Broadcast	[0.0060]	[0.0078]	[0.0088]	[0.0109]	[0.0140]	[0.0227]	[0.0129]	[0.0303]	[0.0316]
C1	(4.0299)	(1.8948)	(2.2916)	(2.3037)	(0.6873)	(1.0762)	(1.0103)	(0.6397)	(0.8127)
President's name	0.0225^{***}	0.0256^{***}	0.0376^{***}	0.0466^{***}	0.0507^{***}	0.0899^{***}	0.0888^{***}	0.0868^{***}	0.0836^{**}
on Broadcast	[0.0056]	[0.0063]	[0.0079]	[0.0055]	[0.0130]	[0.0053]	[0.0292]	[0.0143]	[0.0340]
C2	(3.9999)	(4.0732)	(4.7476)	(8.4584)	(3.9012)	(16.8840)	(3.0451)	(6.0553)	(2.4577)
Director of Direx's name of	0.0139	0.0342^{***}	0.0510^{***}	0.0511^{**}	0.0804^{***}	0.1310^{***}	0.1245^{**}	0.0856	0.0742
on Broadcast	[0.0101]	[0.0108]	[0.0170]	[0.0223]	[0.0287]	[0.0423]	[0.0610]	[0.0654]	[0.0642]
on the day	(1.3682)	(3.1637)	(3.0059)	(2.2897)	(2.7983)	(3.1012)	(2.0401)	(1.3097)	(1.1548)
Director of Dipec's name of	0.0185^{**}	0.0299^{**}	0.0416^{***}	0.0531^{***}	0.0620^{***}	0.0919^{***}	0.0976^{***}	0.1021^{**}	0.0857^{*}
on Broadcast	[0.0092]	[0.0120]	[0.0149]	[0.0157]	[0.0077]	[0.0064]	[0.0116]	[0.0471]	[0.0520]
on the day	(2.0066)	(2.5016)	(2.8009)	(3.3881)	(8.0292)	(14.4410)	(8.4294)	(2.1670)	(1.6468)
Director of Dipom's name of	-0.0043	-0.0138	-0.0266^{**}	-0.0237^{***}	-0.0294	-0.0529	-0.0641	-0.0610	-0.0711
on Broadcast	[0.0030]	[0.0110]	[0.0122]	[0.0052]	[0.0242]	[0.0469]	[0.0532]	[0.0582]	[0.0627]
on the day	(-1.4302)	(-1.2571)	(-2.1879)	(-4.5614)	(-1.2162)	(-1.1281)	(-1.2040)	(-1.0490)	(-1.1339)
Director of Dinor's name of	0.0068	0.0369^{**}	0.0406^{*}	0.0405	0.0857^{***}	0.1341^{***}	0.0980^{*}	0.0679	0.0725
on Broadcast	[0.0170]	[0.0148]	[0.0224]	[0.0276]	[0.0329]	[0.0462]	[0.0579]	[0.0609]	[0.0614]
on the day	(0.4013)	(2.4894)	(1.8121)	(1.4674)	(2.6045)	(2.9015)	(1.6928)	(1.1160)	(1.1814)
Publication disclosed on the Central Bank	0.0156^{***}	0.0235^{***}	0.0336^{***}	0.0497^{***}	0.0504^{***}	0.0840^{***}	0.0956^{***}	0.2714^{***}	0.0991^{**}
of Brazil website,whether or not signed	[0.0058]	[0.0068]	[0.0089]	[0.0112]	[0.0150]	[0.0247]	[0.0352]	[0.0392]	[0.0426]
by President and/or Director	(2.6914)	(3.4589)	(3.7782)	(4.4489)	(3.3645)	(3.3999)	(2.7171)	(2.5315)	(2.3252)
Publication disclosed on	0.0198^{***}	0.0271^{***}	0.0228^{*}	0.0547^{***}	0.0479^{**}	0.0785^{*}	0.1196^{**}	0.1244^{***}	0.1325^{**}
the Central Bank of Brazil website,	[0.0076]	[0.0098]	[0.0124]	[0.0156]	[0.0227]	[0.0407]	[0.0529]	[0.0129]	[0.0631]
signed by the President	(2.5948)	(2.7646)	(1.8299)	(3.5150)	(2.1083)	(1.9306)	(2.2592)	(9.6336)	(2.1009)
Publication disclosed on	0.0037	0.0301	0.0504^{***}	0.0419	0.0414	0.1105^{**}	0.0817	0.0725	0.0486
the Central Bank of Brazil website,	[0.0035]	[0.0183]	[0.0191]	[0.0290]	[0.0390]	[0.0559]	[0.0887]	[0.1006]	[0.1080]
signed by the Director of Direx	(1.0614)	(1.6407)	(2.6428)	(1.4428)	(1.0635)	(1.9753)	(0.9204)	(0.7207)	(0.4505)
Publication disclosed on	0.0186^{*}	0.0228^{***}	0.0619^{***}	0.0706^{***}	0.0581^{***}	0.0906^{*}	0.1438^{**}	0.1227	0.1051
the Central Bank of Brazil website,	[0.0100]	[0.0056]	[0.0184]	[0.0239]	[0.0100]	[0.0522]	[0.0680]	[0.0821]	[0.0882]
signed by the Director of Dipec	(1.8644)	(4.0685)	(3.3730)	(2.9587)	(5.7875)	(1.7350)	(2.1135)	(1.4946)	(1.1905)
Publication disclosed on	0.0289	0.0189	0.0168	0.0210	0.0769	0.1353	0.1252	0.1613	0.1459
the Central Bank of Brazil website,	[0.0189]	[0.0237]	[0.0284]	[0.0389]	[0.0725]	[0.1073]	[0.1370]	[0.1325]	[0.1437]
signed by the Director of Dipom	(1.5287)	(0.7976)	(0.5892)	(0.5401)	(1.0609)	(1.2610)	(0.9140)	(1.2177)	(1.0153)
Publication disclosed on	0.0117	0.0605^{***}	0.0548^{***}	0.0692^{*}	0.0760^{*}	0.1329^{**}	0.1016	0.1161	0.0818
the Central Bank of Brazil website,	[0.0283]	[0.0034]	[0.0048]	[0.0353]	[0.0436]	[0.0608]	[0.0962]	[0.1004]	[0.1122]
signed by the Director of Dinor	(0.4118)	(17.9260)	(11.4490)	(1.9594)	(1.7435)	(2.1863)	(1.0562)	(1.1568)	(0.7290)

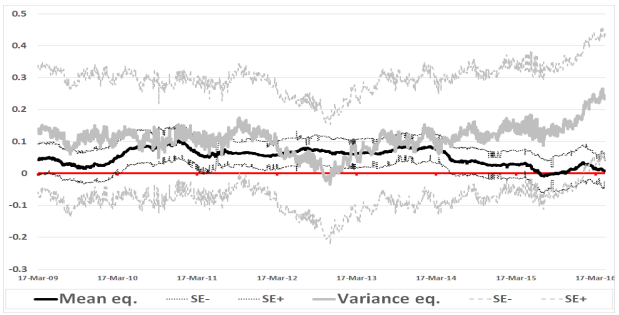
Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
The coefficients presented refer only to the parameters of interest in the mean equation in the 14 regressions performed
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Table 4: Variables of Interest - Mean Equation

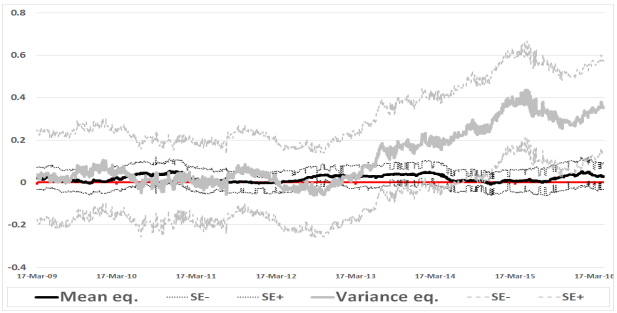
Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Variables of Interest - Variance Equation									
President's name	0.11464*	0.1640**	0.0623	0.0253	0.1075	0.1644**	0.0797	0.0899	0.0907
on Broadcast	[0.0678]	[0.0738]	[0.0680]	[0.0717]	[0.0711]	[0.0683]	[0.0677]	[0.0665]	[0.0658]
on the day	(1.6897)	(2.2232)	(0.9163)	(0.3524)	(1.5106)	(2.4071)	(1.1761)	(1.3530)	(1.3799)
President's name	0.0562	0.1378*	0.0032	−0.0542	0.1028	0.1438*	0.0825	0.1017	0.1186*
on Broadcast	[0.0728]	[0.0807]	[0.0746]	[0.0788]	[0.0774]	[0.0747]	[0.0733]	[0.0724]	[0.0716]
Opening	(0.7713)	(1.7081)	(0.0432)	(−0.6871)	(1.3280)	(1.9247)	(1.1249)	(1.4057)	(1.6570)
President's name	0.1588*	0.2206**	0.1711**	0.1490*	0.2140**	0.2082**	0.0531	0.0036	0.0120
on Broadcast	[0.0887]	[0.0908]	[0.0862]	[0.0881]	[0.0877]	[0.0838]	[0.0821]	[0.0807]	[0.0804]
C1	(1.7905)	(2.4292)	(1.9856)	(1.6916)	(2.4398)	(2.4830)	(0.6471)	(0.0447)	(0.1487)
President's name	0.0302	0.1044	0.0905	0.0902	0.1491*	0.2027**	0.1412*	0.1041	0.0868
on Broadcast	[0.0870]	[0.0911]	[0.0863]	[0.0886]	[0.0879]	[0.0831]	[0.0837]	[0.0819]	[0.0812]
C2	(0.3473)	(1.1465)	(1.0489)	(1.0181)	(1.6961)	(2.4394)	(1.6870)	(1.2701)	(1.0686)
Director of Direx's name of	−0.0685	−0.1534	−0.0635	0.1026	0.0749	0.0257	0.1175	0.1289	0.0009
on Broadcast	[0.1432]	[0.1845]	[0.1599]	[0.1718]	[0.1767]	[0.1727]	[0.1657]	[0.1620]	[0.1661]
on the day	(−0.4784)	(−0.8315)	(−0.3973)	(0.5970)	(0.4239)	(0.1488)	(0.7092)	(0.7959)	(0.0054)
Director of Dipec's name of	−0.0777	0.0498	0.0969	−0.0272	0.1439	0.0627	0.0248	0.0009	−0.0125
on Broadcast	[0.1186]	[0.1383]	[0.1267]	[0.1425]	[0.1417]	[0.1242]	[0.1165]	[0.1145]	[0.1117]
on the day	(−0.6556)	(0.3603)	(0.7651)	(−0.1912)	(1.0153)	(0.5049)	(0.2126)	(0.0075)	(−0.1122)
Director of Dipom's name of	−0.0516	−0.1709	−0.2203	−0.1425	0.0768	0.2817*	0.1090	0.0596	0.0994
on Broadcast	[0.1677]	[0.1854]	[0.1866]	[0.1907]	[0.1945]	[0.1577]	[0.1662]	[0.1704]	[0.1728]
on the day	(−0.3075)	(−0.9216)	(−1.1809)	(−0.7473)	(0.3949)	(1.7857)	(0.6562)	(0.3499)	(0.5755)
Director of Dinor's name of	0.0091	−0.1914	0.0450	0.1053	0.1599	0.0707	−0.0275	−0.0287	−0.0331
on Broadcast	[0.1657]	[0.2111]	[0.1941]	[0.2014]	[0.1965]	[0.1899]	[0.1879]	[0.1880]	[0.2062]
on the day	(0.0549)	(−0.9068)	(0.2316)	(0.5230)	(0.8140)	(0.3726)	(−0.1464)	(−0.1525)	(−0.1606)
Publication disclosed on the Central Bank	−0.1199	−0.1014	−0.0527	0.0329	01502	0.2219**	0.2098**	0.2167**	0.2365***
of Brazil website,whether or not signed	[0.0926]	[0.1091]	[0.1097]	[0.1083]	[0.1044]	[0.0968]	[0.0901]	[0.0872]	[0.0858]
by President and/or Director	(−1.2809)	(−0.9296)	(−0.4804)	(0.3040)	(1.4391)	(2.2927)	(2.3290)	(2.4842)	(2.7574)
Publication disclosed on	−0.1007	−0.1245	−0.1535	−0.0624	0.1356	0.3280**	0.3126***	0.3463***	0.3605***
the Central Bank of Brazil website,	[0.1329]	[0.1414]	[0.1515]	[0.1405]	[0.1354]	[0.1297]	[0.1206]	[0.1141]	[0.1149]
signed by the President	(−0.7582)	(−0.8810)	(−1.0129)	(−0.4444)	(1.0011)	(2.5297)	(2.5932)	(3.0345)	(3.1381)
Publication disclosed on	−0.2587	−0.3097	−0.5417	−0.1908	−0.3578	−0.2819	−0.0315	0.0498	0.0261
the Central Bank of Brazil website,	[0.2232]	[0.2808]	[0.3344]	[0.3397]	[0.3266]	[0.2853]	[0.2522]	[0.2349]	[0.2443]
signed by the Director of Direx	(−1.1593)	(−1.1031)	(−1.6200)	(−0.5615)	(−1.0956)	(−0.9878)	(−0.1249)	(0.2121)	(0.1070)
Publication disclosed on	−0.2126	0.1096	0.3055	0.3213	0.4978**	0.3920*	0.2926	0.2528	0.2503
the Central Bank of Brazil website,	[0.1787]	[0.2448]	[0.2247]	[0.2288]	[0.2316]	[0.2136]	[0.1949]	[0.1709]	[0.1630]
signed by the Director of Dipec	(−1.1899)	(0.4477)	(1.3598)	(1.4044)	(2.1496)	(1.8350)	(1.5015)	(1.4795)	(1.5359)
Publication disclosed on	−0.5629*	−0.9358**	−0.7038**	−0.2959	−0.1591	−0.1337	−0.0849	−0.1177	0.0081
the Central Bank of Brazil website,	[0.3188]	[0.3666]	[0.3181]	[0.3534]	[0.2500]	[0.2161]	[0.2108]	[0.2889]	[0.2698]
signed by the Director of Dipom	(−1.7659)	(−2.5527)	(−2.2126)	(−0.8373)	(−0.6213)	(−0.6188)	(−0.4028)	(−0.4073)	(0.0302)
Publication disclosed on	−0.1945	0.0542	−0.1347	0.1394	0.1628	0.1559	0.2503	0.1788	0.1841
the Central Bank of Brazil website,	[0.2378]	[0.3145]	[0.3139]	[0.3548]	[0.3540]	[0.3138]	[0.2739]	[0.2498]	[0.2623]
signed by the Director of Dinor	(−0.8182)	(0.1723)	(−0.4292)	(0.3930)	(0.4599)	(0.4970)	(0.9139)	(0.6887)	(0.7019)

Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
The coefficients presented refer only to the parameters of interest in the mean equation in the 14 regressions performed
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

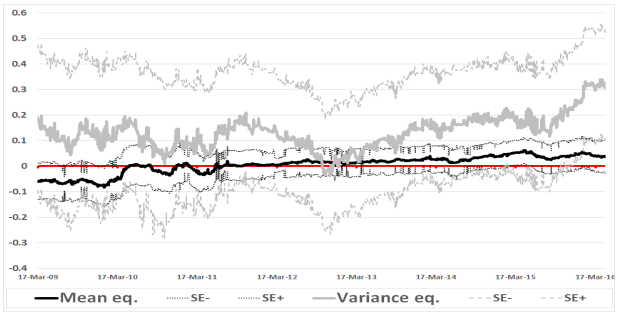
Table 5: Variables of Interest - Variance Equation



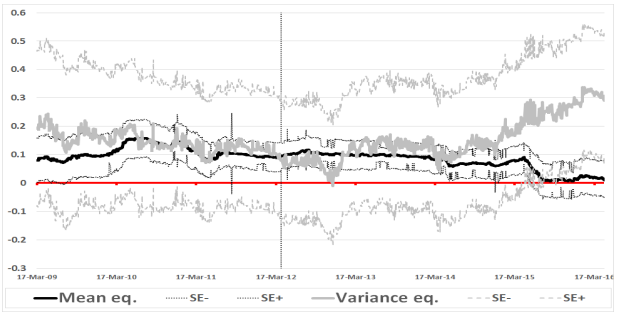
(a) President's Name on Broadcast on day



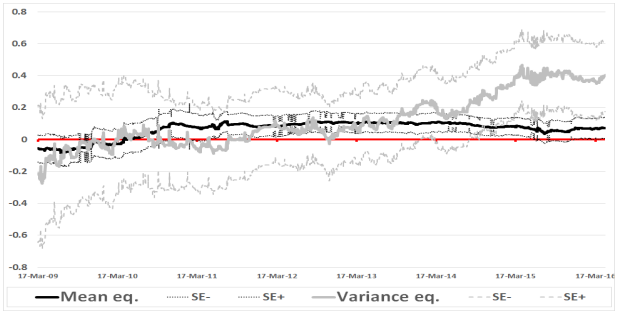
(b) President´s Name on Broadcast on Opening



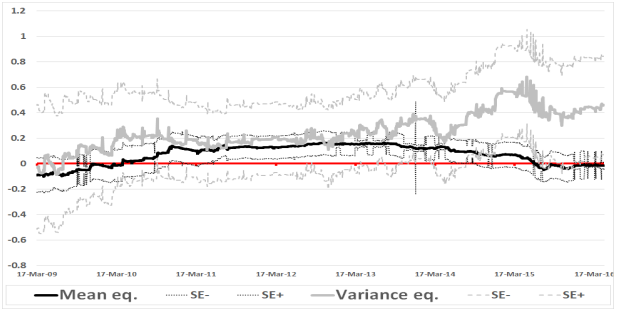
(c) President´s Name on Broadcast on C1



(d) President´s Name on Broadcast on C2



(e) Day with disclosure of studies on the Bacen website



(f) Day with disclosure of studies on the Bacen website signed by the President

Figure 5: Publications on the website - days after the interest rate decision

	# of Observations	% of Observations
President's Name only on Opening	29	3.1%
President's Name only on Scenary C1 and C2	46	3.9%
President's Name only on Scenary C2	12	1.3%
President's Name on Opening and Scenary C1 and C2	114	12.3%

Table 6: Dummies Intraday

Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Mean Equation									
Constant (a)	0.0154^{***} [0.0045] (3.4624)	0.0119^{**} [0.0054] (2.2193)	0.0242^{***} [0.0048] (5.0179)	0.0303^{***} [0.0081] (3.7182)	0.0239^{**} [0.0107] (2.2410)	0.0546^{***} [0.0197] (2.7642)	0.0554^{**} [0.0228] (2.4272)	0.0708^{***} [0.0261] (2.7084)	0.0823^{**} [0.0248] (3.3190)
Variable of Interest									
President's name on Broadcast on the day	0.0154^{***} [0.0045] (3.4624)	0.0119^{**} [0.0054] (2.2193)	0.0242^{***} [0.0048] (5.0179)	0.0303^{***} [0.0081] (3.7182)	0.0239^{**} [0.0107] (2.2410)	0.0546^{***} [0.0197] (2.7642)	0.0554^{**} [0.0228] (2.4272)	0.0708^{***} [0.0261] (2.7084)	0.0823^{**} [0.0248] (3.3190)
Controls									
Surprise on the IPCA	0.0307^{***} [0.0106] (2.9023)	0.0473^{***} [0.0135] (3.5174)	0.0891^{***} [0.0171] (5.2238)	0.1371^{***} [0.0223] (6.1444)	0.1735^{***} [0.0314] (5.5290)	0.2973^{***} [0.0452] (6.5728)	0.3526^{***} [0.0563] (6.2654)	0.3262^{***} [0.0755] (4.3220)	0.3142^{***} [0.0747] (4.2054)
Surprise on the Industrial Production	-0.0081 [0.0116] (-0.6997)	0.0141 [0.0101] (1.3903)	0.0235 [0.0151] (1.5608)	0.0452^{***} [0.0127] (3.5701)	0.0753^{***} [0.0185] (4.0672)	0.1025^{***} [0.0344] (2.9802)	0.1211^{***} [0.0448] (2.7058)	0.1057^{*} [0.0579] (1.8270)	0.0764^{***} [0.0057] (13.3880)
Variance Equation									
Constant (ω)	-3.4838^{***} [0.1513] (-23.0210)	-3.2146^{***} [0.2101] (-15.3010)	-2.9550^{***} [0.1520] (-19.4450)	-2.5101^{***} [0.1484] (-16.9110)	-2.1182^{***} [0.1478] (-14.3290)	-1.2744^{***} [0.1325] (-9.6168)	-0.8224^{***} [0.1236] (-6.6523)	-0.6089^{***} [0.1164] (-5.2315)	-0.4882^{***} [0.1274] (-3.8306)
EGARCH (β)	0.9362^{***} [0.0127] (73.8150)	0.9718^{***} [0.0095] (102.6900)	0.9507^{***} [0.0119] (80.2300)	0.9479^{***} [0.0138] (68.4890)	0.9521^{***} [0.0110] (86.6780)	0.9562^{***} [0.0111] (85.9560)	0.9553^{***} [0.0126] (75.9610)	0.9552^{***} [0.0135] (70.9970)	0.9667^{***} [0.0116] (83.0350)
EGARCH (α)	0.0063 [0.0125] (0.4995)	0.0002 [0.0092] (0.0185)	0.0032 [0.0113] (0.2781)	0.0240^{*} [0.0131] (1.8270)	0.0227^{*} [0.0135] (1.6816)	0.0396^{***} [0.0142] (2.7972)	0.0367^{**} [0.0156] (2.3485)	0.0432^{***} [0.0162] (2.6681)	0.0389^{***} [0.0144] (2.7043)
EGARCH (γ)	0.5301^{***} [0.0441] (12.0260)	0.3309^{***} [0.0458] (7.2281)	0.3814^{***} [0.0431] (8.8478)	0.3619^{***} [0.0481] (7.5166)	0.3443^{***} [0.0389] (8.8484)	0.2860^{***} [0.0327] (8.7583)	0.2852^{***} [0.0358] (7.9763)	0.2714^{***} [0.0376] (7.2118)	0.2377^{***} [0.0354] (6.7074)
Variable of Interest									
President's name on Broadcast on the day	0.1146^{*} [0.0678] (1.6897)	0.1640^{**} [0.0738] (2.2232)	0.0623 [0.0680] (0.9163)	0.0253 [0.0717] (0.3524)	0.1075 [0.0711] (1.5106)	0.1644^{**} [0.0683] (2.4071)	0.0797 [0.0677] (1.1761)	0.0899 [0.0665] (1.3530)	0.0907 [0.0658] (1.3799)
Controls									
Day after the Copom meeting	2.7640^{***} [0.1760] (15.7010)	2.4788^{***} [0.1897] (13.0670)	2.5223^{***} [0.1834] (13.7510)	2.5135^{***} [0.1740] (14.4450)	2.3220^{***} [0.1719] (13.5070)	1.7682^{***} [0.1872] (9.4473)	1.3062^{***} [0.1903] (6.8630)	0.9555^{***} [0.2025] (4.7197)	0.7463^{***} [0.1966] (3.7970)
Copom Minutes disclosure day	-0.5381^{***} [0.1528] (-3.5214)	-0.2079 [0.1953] (-1.0648)	0.5454^{***} [0.1465] (3.7225)	0.8370^{***} [0.1559] (5.3692)	1.1088^{***} [0.1869] (5.9329)	1.0113^{***} [0.1940] (5.2121)	0.7989^{***} [0.1868] (4.2759)	0.6074^{***} [0.1773] (3.4265)	0.5390^{***} [0.1668] (3.2304)
t-Student Distribution									
DoF	5.1596^{***} [0.5238] (9.8499)	4.1953^{***} [0.3772] (11.1230)	4.7167^{***} [0.4505] (10.4710)	4.2001^{***} [0.3531] (11.8930)	4.3927^{***} [0.3797] (11.5690)	5.1131^{***} [0.5308] (9.6322)	5.9413^{***} [0.6823] (8.7080)	6.6251^{***} [0.8097] (8.1818)	7.2490^{***} [0.9322] (7.7762)
Goodness of Fit									
Log Likelihood	$824,52$	$478,87$	$68,51$	$-458,21$	$-1106,60$	$-2330,30$	$-2930,50$	$-3221,50$	$-3396,70$
AIC	-0.5645	-0.3134	-0.0152	0.3674	0.8385	1.7274	2.1635	2.3749	2.5022
BIC	-0.5903	-0.3392	-0.0411	0.3416	0.8126	1.7016	2.1376	2.3491	2.4764
# Observations	2753	2753	2753	2753	2753	2753	2753	2753	2753

Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
In the first part of the table are the coefficients of the mean equation with two controls and the variable of interest, besides the constant.
In the second part, the parameters of the variance equation are presented. Two controls are added, besides the variable of interest.
In third part of the table the Degrees of Freedom of the t-Student distribution and in the fourth part Goodness of Fit Statistics are presented
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Table 7: Results for the controls - intraday

Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Variables of Interest - Mean Equation									
President's name	0.0055	0.0357	0.0080	0.0035	0.0039	0.0264	0.0179	0.0352	−0.0227
on Broadcast	[0.0067]	[0.0123]	[0.0159]	[0.0185]	[0.0201]	[0.0318]	[0.0244]	[0.0257]	[0.0189]
Opening, C1 and C2	(0.8130)	(0.3003)	(0.5016)	(0.1874)	(0.1933)	(0.8318)	(0.7347)	(1.3682)	(−1.1981)
President's name	NA	0.0529	0.0558	−0.0117	−0.0073	0.1158	0.1644*	0.2291	−0.0398
on Broadcast	NA	[0.0327]	[0.0361]	[0.0339]	[0.0621]	[0.0787]	[0.0938]	[0.1482]	[0.1166]
only on Opening	NA	(1.6206)	(1.5478)	(−0.3445)	(−0.1179)	(1.4702)	(1.7527)	(1.5463)	(−0.3416)
President's name	NA	−0.0030	0.0029	0.0044	−0.0112	0.0204	−0.0034	0.0173	0.0059
on Broadcast	NA	[0.0156]	[0.02011]	[0.0220]	[0.0255]	[0.0454]	[0.0375]	[0.0156]	[0.0069]
only on C1 and C2	NA	(−0.1937)	(0.1453)	(0.1978)	(−0.4414)	(0.4496)	(−0.0904)	(1.1098)	(0.8577)
President's name	−0.0283	−0.0632	−0.0793*	0.0072	−0.0870	−0.1448	−0.0340	−0.0414	−0.0306
on Broadcast	[0.0503]	[0.0486]	[0.0425]	[0.0672]	[0.0627]	[0.1187]	[0.0935]	[0.0673]	[0.0571]
only on C1 and C2	(−0.5622)	(−1.2994)	(−1.8658)	(0.1088)	(−1.3873)	(−1.2194)	(−0.3634)	(−0.6151)	(−0.5354)

Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
The coefficients presented refer only to the parameters of interest in the mean equation in the 4 regressions performed
There was no convergence on some regressions for the 30-day vertices
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$

Table 8: Variables of Interest in the intraday regression - Mean Equation

Variables	30 Days	60 Days	90 Days	120 Days	180 Days	360 Days	540 Days	720 Days	900 Days
Variables of Interest - Variance Equation									
President's name	−0.0811	0.0005	0.0047	0.4334*	0.1632	0.2949	−0.3210	−0.1011	0.2811
on Broadcast	[0.3500]	[0.2286]	[0.2207]	[0.2558]	[0.2576]	[0.2523]	[0.3332]	[0.3129]	[0.3625]
Opening, C1 and C2	(−0.2289)	(0.0021)	(0.0213)	(1.6948)	(0.6335)	(1.1691)	(−0.9632)	(−0.3232)	(0.7764)
President's name	*NA*	0.8707**	0.3340	−0.0107	0.3640	−0.1560	0.4459	1.1016***	1.9720***
on Broadcast	*NA*	[0.3977]	[0.3348]	[0.4170]	[0.3545]	[0.3639]	[0.4901]	[0.4070]	[0.5137]
only on Opening	*NA*	(2.1893)	(0.9978)	(−0.0256)	(1.0267)	(−0.4287)	(0.9097)	(2.7067)	(3.8389)
President's name	*NA*	−0.7177**	−0.4771	−0.7602**	−0.2719	−0.8554**	−0.5170	−1.4252**	−2.8934**
on Broadcast	*NA*	[0.3016]	[0.3480]	[0.3518]	[0.3220]	[0.3476]	[0.5172]	[0.6470]	[1.1821]
only on C1 and C2	*NA*	(−2.3797)	(−1.3710)	(−2.1610)	(−0.8442)	(−2.4612)	(−0.9996)	(−2.2029)	(−2.4476)
President's name	0.7747	−0.2013	−0.3419	0.2256	0.0924	−0.1869	0.7366	0.4421	0.4350
on Broadcast	[0.6272]	[0.5729]	[0.3992]	[0.3995]	[0.4922]	[0.4684]	[0.7430]	[0.7076]	[0.8319]
only on C1 and C2	(1.2352)	(−0.3513)	(−0.8564)	(0.5648)	(0.1878)	(0.3991)	(0.9914)	(0.6248)	(0.5230)

Note: The table above shows the result of estimates of an EGARCH (1,1) model, with t-Student distribution, for nine vertices of the Pre-DI Swap.
The coefficients presented refer only to the parameters of interest in the mean equation in the 4 regressions performed
There was no convergence on some regressions for the 30-day vertices
Below the estimate coefficient we have the standard error in bracketed and t-Statistics in parentheses. $^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Table 9: Variables of Interest in the intraday regression - Variance Equation