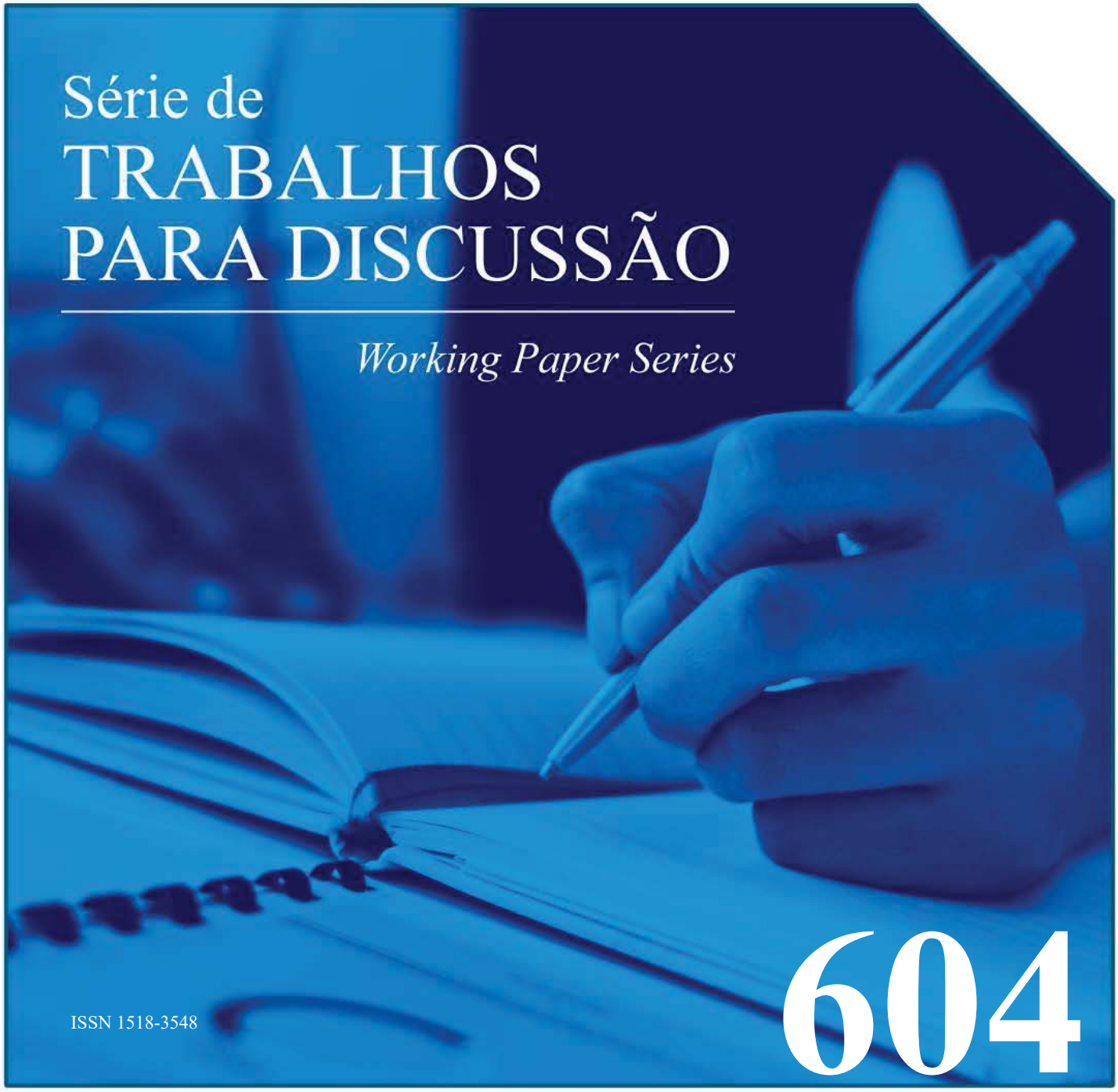

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Impact of the Disclosure of Survey Expectations of Macroeconomic Variables on Brazilian Interest Rates

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Non-Technical Summary

Since 2000, the Central Bank of Brazil has a system for collecting projections on the main economic variables provided by economists from banks, asset managements, consultancies (and others) that have areas dedicated to macroeconomic analysis. The expectations, disclosed in a bulletin called the Focus Report, are released on the first working day of each week.

The objective of this work is to identify whether there is a relationship between the survey expectations, disclosed in the Focus Report, and the Brazilian interest rates. The following expectations from the Focus Report were used: GDP, policy interest rate, exchange rate and CPI, while the interest rates are those negotiated in interest rate futures traded on the Brazilian stock exchange.

The interest rate change is calculated between before and after the publication of the Focus Report. However, the expectations published in this document are generated in the period prior to the calculation of the interest rate changes. Thus, if expectations generated in previous moments (but not disclosed) have some impact on interest rate variations, then expectations were not yet embedded in these rates.

To control for relevant news and facts that may have caused the interest rate change, we removed from the sample observations in which there were releases of relevant indicators. Furthermore, to reduce the interference of other news or events, the empirical strategy controls for changes in the stock market and the foreign exchange market. The sample covers the period from January 2010 to December 2019.

The results indicate that changes in expectations for GDP, policy interest rate, and CPI (all except the exchange rate) have an impact on the interest rate. Therefore, expectations disclosed in the Focus Report were not yet incorporated into the interest rate market. This result shows the relevance of survey expectations in the determination of financial market prices.

Sumário Não Técnico

O Banco Central do Brasil possui, desde 2000, um sistema de coleta de projeções sobre as principais variáveis econômicas junto a economistas de bancos, gestoras de ativos, consultorias etc. As estatísticas dessas expectativas, publicadas em um boletim denominado Relatório Focus, são divulgadas no primeiro dia útil de cada semana.

O objetivo desse trabalho é identificar a existência de uma possível relação entre a divulgação de pesquisas de variáveis macroeconômicas, presentes no Relatório Focus, e a curva da taxa de juros brasileira. As expectativas utilizadas são as do PIB, da taxa Selic, da taxa de câmbio e do IPCA.

Para entendermos bem o experimento do trabalho, devemos atentar para os eventos ao longo do tempo. As expectativas são formadas e reportadas ao Sistema Focus na semana anterior à divulgação do Relatório Focus pelo Banco Central do Brasil. Já a variação da taxa de juros é calculada utilizando os valores: a) após o fechamento da coleta das expectativas (ou seja, todas as informações que constarão no Relatório Focus já foram reportadas ao Banco Central), mas antes da divulgação do Relatório; e b) depois da divulgação do Relatório. Dessa forma, se as expectativas formadas em momentos anteriores (mas não divulgadas) têm algum impacto na variação das taxas de juros, então as expectativas ainda não estavam embutidas nessas taxas.

Para controlar por notícias e fatos relevantes que podem ter causado a variação da taxa de juros, retiramos da amostra observações em que houve divulgações de indicadores potencialmente relevantes. Além disso, a fim de reduzir a interferência de outras notícias ou eventos, sejam eles de cunho político ou econômico, doméstico ou internacional, a estratégia empírica controla o experimento para variações no mercado de ações e no mercado cambial.

Os resultados indicam que as alterações nas expectativas divulgadas no Relatório Focus referentes ao PIB, à taxa Selic e ao IPCA (portanto, todas exceto a taxa de câmbio) têm impacto na taxa de juros. Verifica-se, portanto, que as expectativas divulgadas no Relatório Focus ainda não estão incorporadas ao mercado de juros e só são incorporadas após a divulgação dessas expectativas. Esse resultado mostra a relevância das pesquisas de expectativas na formação de preços do mercado financeiro.

Impact of the Disclosure of Survey Expectations of Macroeconomic Variables on Brazilian Interest Rates*

Gustavo Silva Araujo†
Giancarlo Noel Caoduro‡

Abstract

The objective of this work is to determine whether there is a relationship between survey expectations and Brazilian interest rates. The following expectations from the Focus Report (a bulletin released by the Central Bank of Brazil) were analyzed: GDP, policy interest rate, exchange rate and CPI. The interest rates considered are those negotiated in interest rate futures market. The change in interest rate is calculated by comparing the rates before and after the publication of the Focus Report. However, the expectations published in this document are generated in the period prior to the calculation of these interest rate changes. Therefore, if expectations generated earlier (but not disclosed) impact interest rate variations, it indicates that these expectations were not yet embedded in the rates. The results indicate that changes in expectations for GDP, policy interest rate, and CPI (all except the exchange rate) affect the interest rates. This finding underscores the importance of survey expectations in determining financial market prices.

Keywords: Survey Expectations, Interest Rate Futures Market, Macroeconomic Expectations, Focus Report, DI Futures.

JEL Code: E37, E43, E44, G14.

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1. Introduction

People in general are always seeking ways to "predict" the future through projections. In the field of economics, it is no different. Moreover, forecasts in this area of knowledge are extremely relevant. Evans and Honkapohja (2001) recognize that the central difference between economics and the natural sciences lies in the forward-looking decisions made by economic agents.

The more accurate the economic forecasts of a market agent, the greater their advantages over others and, consequently, the greater opportunities to make a profit. This motivates economic agents to allocate time in order to achieve good forecasts on various economic factors, such as inflation, exchange rates, and economic activity, and thus, make allocation choices more appropriate to their degree of risk aversion.

Furthermore, the importance of market agents' expectations in guiding monetary policy by central banks and in the investment decisions of companies and the consumption decisions of households is also widely recognized.

Bernanke (2003) argues that, in conducting economic stabilization policy, it is crucial for central banks to maintain a strong commitment to keeping inflation and market expectations under control. Bernanke also notes that well-anchored inflation expectations not only make achieving price stability much easier in the long term, but also enhance the central bank's ability to stabilize output and employment levels in the short term.

Taylor (1993) highlights that deviations of inflation (or inflation expectations) from the inflation target and of the output gap should be addressed through the determination of interest rates. Additionally, Taylor states that the inflation expectations of economic agents and changes in output affect firms' pricing and, consequently, inflation.

Precisely because of the importance in forecasting macroeconomic variables, the Central Bank of Brazil (BCB) has, since the year 2000, conducted a survey among financial institutions, asset managers, and consulting firms regarding expectations about various important economic variables, such as inflation and exchange rates. The results of this survey are released weekly by the monetary authority in the Focus Report.

Given that market agents quickly respond to changes in scenarios and projections,

understanding how economic expectations are formed and revised, and how they impact interest rates, is crucial both for policymakers in monetary policy and for the market agents themselves.

The objective of this work is to assess whether the disclosures of macroeconomic variable expectations present in the Focus Report can explain changes in interest rates traded on the Brazilian stock exchange, specifically in the DI Futures market.[1]

It is common to find news articles linking variations in interest rates to some change in the expectations originating from the Focus Report. Below are some examples

> *Future interest rates are operating with a downward bias on the morning of this Monday, the 12th, supporting the scenario for a Selic rate cut this month amid statements from the Central Bank president and following the Focus survey.*[2]
>
> **Future interest rates decline with Ilan and after Focus** – Jovem Pan. March 12, 2018.

> *Future interest rates are declining on the morning of this Monday, the 17th, following the movement of the dollar and Treasury yields, and after new downward revisions in the Focus survey for the IPCA for 2017 and 2018, as well as for the 2017 GDP, on the eve of the release of the COPOM minutes.*[3]
>
> **Interest rates decline with the dollar and IPCA revisions in the Focus survey** – ISTOÉ Dinheiro. April 17, 2017.

> *Future interest rates started the week of the release of the Central Bank's Monetary Policy Committee (COPOM) minutes with a downward bias, reacting to the downward revision in the financial market's projection for the Selic rate at the end of 2013, contained in the Focus bulletin...*

[1] The futures contract for the one-day interbank deposit rate (DI Futures or DI1 Future) is the instrument on the stock exchange where the nominal interest rate in Brazilian reais is traded. For more information about the contract, see section 2.

[2] The SELIC rate is the one-day interest rate set by the Central Bank of Brazil for the Brazilian economy. It is the main tool used by the Central Bank in the inflation targeting system.

[3] IPCA is the Broad National Consumer Price Index. It is the inflation index used in the inflation target system of Brazil. COPOM is the monetary policy committee of the Central Bank of Brazil.

Future interest rates open lower with the release of the Focus – Exame. April 22, 2013.

With low trading volume and concentrated in longer-term contracts, future interest rates are rising this Monday (28) on BM&F (Commodities and Futures Exchange), reflecting the changes shown in the Focus Report, released this morning by the Central Bank.

Future interest rates rise, reacting to data contained in the Focus Report – Infomoney. April 28, 2008.

In our work, the variation in interest rates is calculated between before and after the release of the Focus Report, while the expectations published in this document are formed prior to this period. More specifically, the collection of expectations closes on the last business day of the week, while the interest rate variation used in this study is between the market close on this day and immediately after the release of the Focus Report on the morning of the following business day.[4]

The data used covers a 10-year period from 01/01/2010 to 12/30/2019. The expectations utilized, extracted from the Focus Report, include those for the Gross Domestic Product (GDP), Selic rate (the basic interest rates, set by the Central Bank of Brazil), exchange rate, and the variation of the Broad National Consumer Price Index (IPCA). The database was refined to remove from the sample any dates with occurrences that could interfere with the results for reasons other than changes in expectations. Dates were removed when important economic indicators were released in the period between the closing of data collection for the Focus Report and the market opening the following week, as they could have impacted interest rates.

Additionally, to reduce the interference of other relevant news or events, whether political or economic, domestic or international, and that by themselves are sufficient to affect interest rates, the empirical strategy controls the experiment for variations in the stock market and the foreign exchange market.

For defining the interest rate vertices and the Focus Report expectations used in the

[4] The expectations collection system does not close. However, if an expectation is entered after 5 PM, it is not valid for the statistics of the following business day.

database, we applied a cut-off rule based primarily on the liquidity of the DI Futures market.[5]

The results indicate that changes in the expectations of three out of the four variables studied, IPCA, Selic, and GDP, impact short-term interest rates, which shows that the variations in expectations from the previous week were not yet embedded in the interest rates traded on the exchange. They are only incorporated after the release of the Focus Report. In other words, the Report provides information that market participants were not yet aware of, specifically what other agents think about the expectations. These results, which are robust across various tests, highlight the importance of survey expectations for price formation.

This work fits into the literature on macroeconomic expectations, asset pricing, and the relationship between macroeconomic indicators and financial variables. Stock and Watson (2003), Claessens and Kose (2017), Val and Araujo (2019), and Araujo and Vicente (2018) study how financial indicators can anticipate macroeconomic variables. Even closer to our study, Ang and Piazzesi (2003), Stona et al. (2015), and Shousha (2008) examine the inverse relationship, i.e., how the disclosure of macroeconomic variables affects the financial market. In this sense, our work is different, as it examines how variations in expectations (and not the variables themselves) influence asset prices (in our case, the interest rate).

There are also studies that analyze the expectations themselves, focusing on their rationality (Clements, 1995; Laster, Bennett, and Geoum, 1999; Aggarwal and Mohanty, 2000), accuracy (Carvalho and Minella, 2012; Dovern and Weisser, 2011), biases (Batchelor, 2007; Clements and Galvão, 2017; Dovern and Weisser, 2011), and anchoring (Hess, 2012; Dovern and Weisser, 2011). In our case, we study how the disclosure of previously formed expectations alters the interest rate market solely through their announcement. There is also the work by Mendonça (2004), which measures the credibility of the Central Bank of Brazil by analyzing the effect of economic policy announcements on survey expectations, and the work by Correa and

[5] This rule stipulates that if the release date of the Focus Report occurs by the last business day of September, the variations in expectations for the end of the current year will be analyzed, and the DI contract with maturity on the first business day of January of the following year will be used. If the date is in October or later, the expectations used will be for the end of the next year, and the DI contract will be the one maturing on the first business day of January two years ahead. For more details, see section 3.

Picchetti (2016), which examines the impact of new information on inflation expectations.

The work of Costa Filho and Rocha (2010) studies how the communication from the Central Bank of Brazil (BCB) affects the futures interest rate market. In this case, communication can reveal new information to the market, similar to our study. The main difference in this work is the object communicated: survey expectations, in our case.

As far as we know, this work is groundbreaking in studying how the disclosure of changes in expectations impacts asset pricing.

The importance of this topic is also related to the relevance of the DI Futures contract in the Brazilian financial market. Many financial institutions hold public and private securities that are either pre-fixed or post-fixed (indexed to variations in the Selic rate). These agents use this derivatives market to transfer the risks of rate variations to other financial agents interested in speculating on this variation or simply with an opposing risk exposure.

In this extremely dynamic market, small fluctuations in rates represent large financial values involved. Just to give a sense of the amounts involved in this market, on April 7, 2020, there were 53,672 trades involving DI Futures contracts with a total quantity of just over 1.4 million contracts traded and a notional value of 131 billion reais (approximately 25 billion dollars). For this reason, the correct interpretation of factors that can impact the yield curve or influence the decisions of agents operating in this market is of utmost importance.

The work follows this structure: in section 2, we present a short literature review, with emphasis on studies about the DI Futures market and the Focus Report; in section 3, we describe the methodology and sample; in section 4, we present the results and robustness tests; and section 5 brings the final considerations of the article.

2. Theoretical Framework

In this section, we discuss studies on the impact of macroeconomic variables on the yield curve, with an emphasis on the Brazilian market. Additionally, we cover the DI Futures market, which we will use to observe interest rate variations, and the Focus Report, from which we extract market expectations about macroeconomic variables.

2.1. Impact of Macroeconomic Variables on the Yield Curve

The correct interpretation of factors that can impact the yield curve is of great interest to market agents and monetary authorities. The existing dynamics between the term structure of interest rates and macroeconomic variables has been the subject of several studies.

Ang and Piazzesi (2003) used a term structure model with inflation and economic factors to investigate how macroeconomic variables affect bond prices and the dynamics of the U.S. yield curve. The results indicate that macroeconomic factors, such as the level of economic activity and inflation rates, explain up to 85% of the variations in the yield of short-term maturity bonds.

Some studies on the Brazilian market relate macroeconomic factors to the yield curve. Coelho (2014) assesses how the Brazilian futures interest rate market reacts to the release of surprises in certain macroeconomic indicators. He identifies that, for GDP, industrial production, retail sales, and economic activity indicators, a surprise in the release of these indicators truly represents new information that is not priced into interest rate market transactions.

Stona et al. (2015) investigate how changes in inflation, output, and unemployment levels affect the yield curves for Brazil, Chile, and Mexico between 2006 and 2014. They concluded that, for Brazil and Mexico, GDP and inflation factors are relevant for altering the yield curves, with GDP more significantly affecting the level of the yield curve and inflation exerting greater influence on the slope of the yield curve. For Chile, inflation had a more significant impact on the level, and specifically for Mexico, the unemployment variable also altered the slope of the yield curve.

Shousha (2008) studies the relationship between macroeconomic variables and the term

structure of interest rates in Brazil, concluding that macroeconomic variables such as inflation rate and exchange rate variation, along with unobserved variables like output gap, risk aversion, and inflation expectations, help explain movements in the yield curve. Furthermore, Shousha (2008) notes that despite all the issues related to the effectiveness of the monetary policy transmission mechanism in Brazil, the dynamics of the yield curve have shown to be closely linked to the macroeconomic environment.

Gimenes (2019) investigates the importance of macroeconomic expectations variables, focusing on fiscal expectations variables, as possible instruments to improve the adjustment and forecasting of interest rate curves. The results indicate that, for the Brazilian case, future fiscal expectation variables, together with expectations of output and inflation, are relevant for better forecasting yield curves.

Almeida and Faria (2014) demonstrate the importance of including macroeconomic factors for forecasting the Brazilian yield curve. The authors studied the prediction of the term structure of the Brazilian interest rate using common macroeconomic factors from January 2000 to May 2012. They conclude that there is better predictive performance of the term structure when macroeconomic variables are included.

As we can see, several studies have sought to evaluate the mechanism and macroeconomic factors that impact the Brazilian yield curve. However, to our knowledge, there are no studies that analyze the direct impact of variations in the expectations of these variables on the yield curve.

2.2. DI Futures Contract

In this study, we use the futures contract on the one-day interbank deposits (DI Futures) to observe variations in the interest rate. The DI Futures has as its underlying asset the daily average rate of Interbank Deposits (DI rate), calculated and published by B3, covering the period between the trading date and the maturity date.[6] Trades of this derivative occur daily on B3, making it one of the most traded derivatives on the Brazilian stock exchange.

[6] B3 is the company resulting from the merger between BM&FBovespa and Cetip. It is the official stock exchange of Brazil, headquartered in the city of São Paulo.

The DI rate, considered the benchmark for fixed income in Brazil, is the average rate of one-day loans in the interbank market and generally closely follows the Selic Rate, which is the basic interest rate of the Brazilian economy.

Suppose an investor buys DI Futures contracts and holds them until maturity. In this case, if the accumulated DI rate until maturity exceeds the negotiated rate, the buyer of the DI Futures contract makes a profit. Conversely, if the accumulated rate is lower than this rate, the buyer incurs a loss (and the seller makes a profit). Thus, it can be said that the buyer of a DI Futures contract is long on the DI rate (the buyer wants the economy's interest rate to rise).

Therefore, the DI Futures contract is the derivative instrument that reflects the fixed interest rate between the current date and the contract's end date. These rates, when aggregated and with the help of an interpolation method, form a continuous curve that, according to the Expectations Hypothesis, represents the path of future interest rates expected by the market. However, since the 1980s, several studies have suggested that the future rates implied in the yield curve differ from the corresponding expected future rates due to the existence of a risk premium. This premium varies over time and depends on the maturity of the interest rates. Thus, the rates negotiated in DI Futures contracts consist of the expected interest rate for the period and a risk premium.

Market participants rely on expectations of the main economic indicators to estimate the decisions of the Central Bank of Brazil's Monetary Policy Committee (COPOM) about the Selic rate and thus predict the effective rate during the DI Futures contract period. This reasoning is particularly valid for analyses and operations involving short-term DI Futures contracts, where it is possible to estimate and calculate scenarios involving upcoming COPOM meetings. For example, if economic growth expectations are high for the next 12 months and, consequently, inflation expectations raise for the period, the market may price in that COPOM will raise the economy's basic interest rate during this interval. As a result, future interest rate contracts for one year will be traded at a higher interest rate than those for a shorter term.

Figure 1 shows the yield curve formed by different DI Futures contracts on March 12, 2020. The interest rates extracted from the contracts are interpolated using the cubic spline methodology.

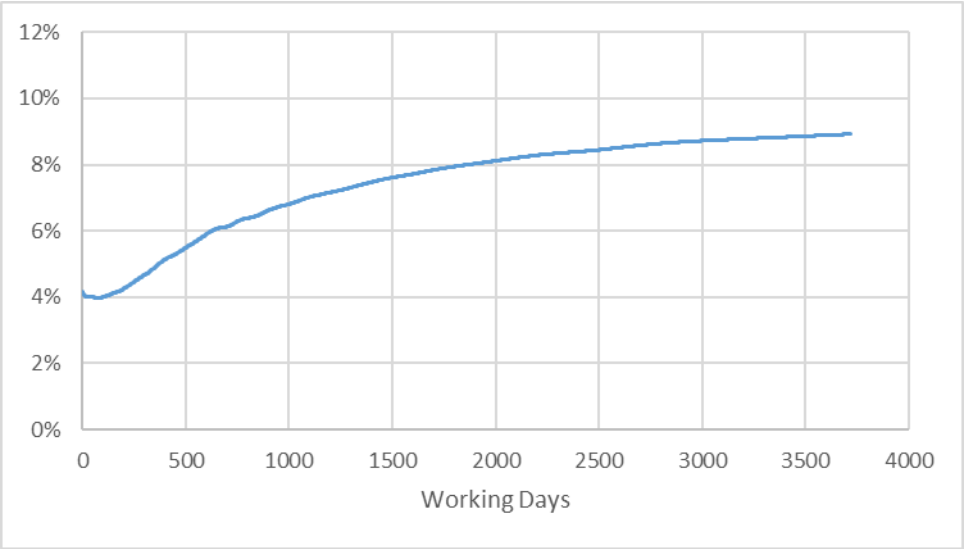

Figure 1: Brazilian interest rate curve extracted from DI Futures contracts on March 12, 2020 (the curve was interpolated using the cubic spline methodology).

2.3. Focus Report

The Focus Report is part of the Market Expectations System, developed by the Central Bank of Brazil (BCB), which has been collecting projections from market economists since the year 2000. The survey expectations is conducted daily, using forecasts on key economic variables from approximately 140 financial institutions, including banks, consultancies, brokerages, and distributors that have departments dedicated to macroeconomic analysis.

Based on data collected until 5:00 PM on the last business day of a given week, the System generates the "Focus - Market Report" weekly, which is released by the BCB on the first business day of the following week at 8:30 AM. It contains the averages, medians, and standard deviations of the economic institutions' forecasts for various variables, such as GDP, price indexes, exchange rate, Selic rate, among others.

As a way to encourage participation and the constant improvement of the forecasts by the participating institutions, the BCB recognizes and publishes the five institutions with the highest accuracy index in past predictions (Top 5 ranking), categorized by forecast type (inflation, exchange rate, among others) and also by the time period of their forecasts (short-term, medium-term, and long-term).

In this study, the series from the Market Expectations System of the Focus Report were

chosen as the source of macroeconomic expectations, given the significant role of these data in conducting monetary policy in Brazil by assisting the COPOM in setting the Selic rate at its meetings.

3. Methodology and Sample

The methodology of this study consists of event tests on the variation of rates traded in the DI Futures market to observe the impact of the release of macroeconomic expectations by the Focus Report on the interest rate.

We estimate variations of the regression:

$$\Delta DI_{Fut_t} = C + \beta_1 \Delta GDP_{t-1} + \beta_2 \Delta DOL_{t-1} + \beta_3 \Delta IPCA_{t-1} + \beta_4 \Delta SELIC_{t-1} + \gamma X_t + \varepsilon_t$$

where ΔDI_{Fut_t} is the variation in the fixed rate of the DI Futures between before and after the publication of the Focus Report, and the explanatory variables refer to the change in the medians of the expectations of the macroeconomic variables GDP, Dollar (the exchange rate between the real and the American dollar), Selic, and IPCA. The temporal indexing of these variables, $t - 1$, indicates that the change in expectations occurs before the change in the DI Futures rate at time t, even though the publication of the Focus Report is made just a few minutes before t. As noted in section 2, expectations are formed in the week prior to the release. X_t refers to the controls for the variation in the Ibovespa Futures and the dollar, as we will discuss further. Below, we detail the variables used.

3.1. Dependent Variable ($\Delta DIFut_t$)

The dependent variable in the model used in this study is the variation in the DI Futures rate between before and after the release of the Focus Report.

The Focus Report is always published on the first business day of each week at 8:30 AM, before the market opens, with data collected until the last business day of the previous week.

Meanwhile, the DI Futures contract is traded on the Brazilian exchange every business day, with its trading window starting at 9:00 AM and extending until 6:00 PM.

The variations in the DI Futures contract rates will be analyzed by comparing the average rate during the first 20 minutes of trading on the first business day of the week (immediately after the release of the Focus Report) with the average rate during the 20 minutes of trading immediately before the market closes, between 5:40 PM and 6:00 PM on the last business day of the previous week.[7] This average is simply the simple arithmetic mean between the maximum and minimum rates of the period.[8] It is noteworthy that the data collection for the Focus system occurs at 5:00 PM each day, therefore, before the close of the futures interest rate market. Figure 2 presents a diagram showing the information collection periods for the DI Futures and the timing of the Focus Report release.

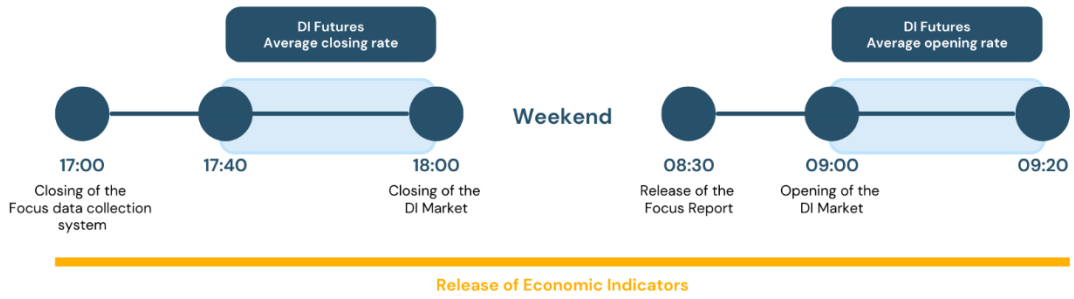

Figure 2: Collection periods for DI Futures information (in light blue) and the timing of the Focus Report release.

The dependent variable of the model is:

$$\Delta DI_{Fut_t} = \text{Average rate of } \mathrm{DI}_{\mathrm{Fut}_t} \text{ after the Focus release} - \text{Average rate of } \mathrm{DI}_{\mathrm{Fut}_{t-1}} \text{before the Focus release}$$

3.2. Independent Variables

Among the indicators from the Focus Report, four indicators are used as explanatory variables in the model: Gross Domestic Product (GDP), USD/BRL Exchange Rate (DOL), End-of-Year Selic Rate Target (Selic), and Broad National Consumer Price

[7] We also used a 30-minute window for robustness. The results remain the same (in terms of statistical significance and similarity in coefficients).
[8] The simple arithmetic mean was used due to the ease of obtaining data and the operational limitations of Bloomberg, which allows viewing intraday data only for the last six months, making it impossible to calculate using the average of trades made during the period.

Index (IPCA). The measure used is the median of expectations, which is used in the Focus Report publication by the Central Bank of Brazil (BCB).[9]

These four indicators are the most important in the Focus Report. Additionally, Shousha (2008), in seeking to identify the relationship between macroeconomic variables and the term structure of the Brazilian interest rate with terms less than or equal to 1 year, concludes that, in an emerging economy context, macroeconomic fundamentals (represented in his work by output gap, inflation, and nominal exchange rate variation) explain up to 53% of the variation in short-term interest rates.

The definitions of each explanatory variable are detailed in the following equations.

$$\Delta GDP_{t-1} = \text{Expectation for } GDP \text{ in the FOCUS released in week } t - \text{Expectation for } GDP \text{ in the FOCUS released in week } t-1$$

$$\Delta DOL_{t-1} = \text{Expectation for } USD/BRL \text{ exchange rate in the FOCUS released in week } t - \text{Expectation for } USD/BRL \text{ exchange rate in the FOCUS from the previous week } t-1$$

$$\Delta IPCA_{t-1} = \text{Expectation for } IPCA \text{ in the FOCUS released in week } t - \text{Expectation for } IPCA \text{ in the FOCUS from the previous week } t-1$$

$$\Delta SELIC_{t-1} = \text{Expectation for the } Selic \text{ Target in the FOCUS released in week } t - \text{Expectation for the } Selic \text{ Target in the FOCUS from the previous week } t-1$$

It is worth noting that the expectations released in week *t* are entered into the system in the previous week.

3.3. Database

The data used in this study covers the 10-year period from 01/01/2010 to 12/30/2019. The series of expectations from the Focus Report was obtained from the Market Expectations System website.[10] The rates of the DI Futures contracts were obtained from the Bloomberg platform.

[9] On the same day as the Report's publication, the respective time series of the BCB's Market Expectations System are updated, providing the following statistics with the daily frequency of expectations collected in the previous week: median, mean, standard deviation, maximum, minimum, and number of respondents.
[10] https://www3.bcb.gov.br/expectativas/publico/consulta/serieestatisticas

3.3.1. Conjunction of Focus Dates with DI Futures Dates

We identified the final data collection date for each Focus Report and its official release date. Most often, these dates are Friday and Monday, respectively; however, national holidays can alter the schedule. As the frequency of the Focus Report release is weekly, there are a total of 522 releases in the period studied.

We also identified market holidays. On these dates, the stock exchange does not hold trading sessions: official national holidays, Christmas Eve, New Year's Eve, and holidays in the city of São Paulo, where the Brazilian stock exchange is located.

Unlike the stock exchange, the Focus data collection system is only closed for updates (and for release) on official national holidays. It remains open on holidays that occur only in the city of São Paulo, as well as on Christmas Eve and New Year's Eve. Thus, the weekly releases of the Focus Report can also occur on these dates.

Therefore, on certain specific dates, the Focus data collection may be open on a Friday while the stock exchange is closed. Similarly, the Focus may be released on a Monday when the stock exchange is also closed. Twenty-one such dates were identified, and these were excluded from the sample in this study. They are listed in Tables 1 and 2.

Table 1: Data collection dates for the Focus Report when the stock exchange was closed.

Last Day of Data Collection for the Focus	Day of the Week	Stock Exchange	Reason
December 31, 2009	Thrusday	Closed	New Year's Eve
July 9, 2010	Friday	Closed	Constitutionalist Revolution Day
December 24, 2010	Friday	Closed	Christmas Eve
December 31, 2010	Friday	Closed	New Year's Eve
December 30, 2011	Friday	Closed	New Year's Eve
January 25, 2013	Friday	Closed	Anniversary of São Paulo
November 20, 2015	Friday	Closed	Black Consciousness Day
December 24, 2015	Thrusday	Closed	Christmas Eve
December 31, 2015	Thrusday	Closed	New Year's Eve
December 30, 2016	Friday	Closed	New Year's Eve
December 29, 2017	Friday	Closed	New Year's Eve
January 25, 2019	Friday	Closed	Anniversary of São Paulo

Table 2: Focus Report release dates when the stock exchange was closed.

Day of the Focus Release	Day of the Week	Stock Exchange	Reason
January 25, 2010	Monday	Closed	Anniversary of São Paulo
July 9, 2012	Monday	Closed	Constitutionalist Revolution Day
December 24, 2012	Monday	Closed	Christmas Eve
December 31, 2012	Monday	Closed	New Year's Eve
January 25, 2016	Monday	Closed	Anniversary of São Paulo
November 20, 2017	Monday	Closed	Black Consciousness Day
July 9, 2018	Monday	Closed	Constitutionalist Revolution Day
December 24, 2018	Monday	Closed	Christmas Eve
December 31, 2018	Monday	Closed	New Year's Eve

It is worth noting that in situations where national holidays occur on a Monday, the Focus Report is released on the next business day. On these occasions, since the stock exchange was also closed during the holiday, the variation in expectations in the Focus Report and the variation in the DI Futures contract rates between Friday and the first business day of the week are normally included in the study. Similarly, the same rationale applies to national holidays on a Friday when both the Focus collection system and the stock exchange are closed.

3.3.2. Dates of Economic Indicator Releases

Coelho (2014) identified that for certain indicators, such as industrial production, IPCA, GDP, among others, a surprise in their release compared to market expectations can be considered new information, not yet priced into the interest rate market transactions. Therefore, to reduce potential interferences in interest rate variations, we identified dates on which important economic indicators were released during the period from the last 20 minutes before the data collection for the prior week's Focus Report closed to the first twenty minutes after the market opening.

The dates of economic indicator releases were obtained from the Bloomberg platform. Table 3 contains the dates along with their respective indicators, which were removed from the sample, totaling forty-three dates. Consequently, a total of 64 Focus Reports were removed from the sample, remaining 458 for analysis.[11]

[11] It is worth noting that the third date in Table 3 (April 20, 2011) is, unusually, a Wednesday. The removal of this date from the sample is due to the fact that in 2011, April 21st and 22nd were national holidays, and on April 20th, there was a COPOM meeting to set the Selic rate target after the market closed.

Table 3: Disclosure dates of relevant indicators released between the closing of the previous week's DI Futures and the opening of the next. Source: Bloomberg.

#	Date	Day of the Week	Indicator
1	August 30, 2010	Monday	IGP-M/FGV
2	November 29, 2010	Monday	IGP-M/FGV
3	April 20, 2011	Wednesday	SELIC – COPOM Definition
4	May 30, 2011	Monday	IGP-M/FGV
5	January 16, 2012	Monday	IBC-Br
6	January 30, 2012	Monday	IGP-M/FGV
7	February 27, 2012	Monday	IGP-M/FGV
8	March 26, 2012	Monday	IBC-Br
9	April 16, 2012	Monday	IBC-Br
10	July 30, 2012	Monday	IGP-M/FGV
11	October 11, 2012	Thrusday	IBC-Br
12	April 29, 2013	Monday	IGP-M/FGV
13	September 30, 2013	Monday	Central Bank's Quarterly Inflation Report
14	September 29, 2014	Monday	Central Bank's Quarterly Inflation Report
15	November 17, 2014	Monday	IBC-Br
16	December 15, 2014	Monday	IBC-Br
17	December 29, 2014	Monday	IGP-M/FGV
18	March 16, 2015	Monday	IBC-Br
19	March 30, 2015	Monday	IGP-M/FGV
20	June 29, 2015	Monday	IGP-M/FGV
21	September 21, 2015	Monday	IBC-Br
22	March 14, 2016	Monday	IBC-Br
23	May 30, 2016	Monday	IGP-M/FGV
24	September 19, 2016	Monday	IBC-Br
25	January 30, 2017	Monday	IGP-M/FGV
26	April 17, 2017	Monday	IBC-Br
27	May 15, 2017	Monday	IBC-Br
28	October 30, 2017	Monday	IGP-M/FGV
29	December 18, 2017	Monday	IBC-Br
30	January 15, 2018	Monday	IBC-Br
31	February 19, 2018	Monday	IBC-Br
32	March 19, 2018	Monday	IBC-Br
33	April 16, 2018	Monday	IBC-Br
34	July 16, 2018	Monday	IBC-Br
35	July 30, 2018	Monday	IGP-M/FGV
36	September 17, 2018	Monday	IBC-Br
37	December 17, 2018	Monday	IBC-Br
38	March 18, 2019	Monday	IBC-Br
39	April 15, 2019	Monday	IBC-Br
40	April 29, 2019	Monday	IGP-M/FGV
41	July 15, 2019	Monday	IBC-Br
42	August 12, 2019	Monday	IBC-Br
43	October 14, 2019	Monday	IBC-Br

Note: IBC-BR is the Monthly activity index calculated by the Central Bank of Brazil. IGP-M is an inflation index calculated by the Fundação Getúlio Vargas (FGV).

3.3.3. Definition of Interest Rate Vertices and Macroeconomic Expectations

For defining the vertices of DI Futures and of the Focus expectations, we based our approach on two aspects. The first is that the greatest liquidity in the DI Futures market is concentrated in contracts maturing on the first business day of January of each year.

The second aspect is that the Central Bank of Brazil (BCB), when analyzing projections of macroeconomic variables for setting monetary policy, considers a forward-moving horizon that does not include shorter terms. This is due to the recognized lag effect of monetary policy, which indicates that changes in the Selic rate take an average of 6 to 9 months to significantly impact inflation.[12]

Additionally, the market itself starts operating with a higher volume on longer-term DI Futures maturities as time progresses. As we can see in the charts in Figure 3, which contain the 30-day moving averages of the trading volumes of DI Futures on the stock exchange in some years, it is common for the change in the most traded vertex to occur sometime between July and November.

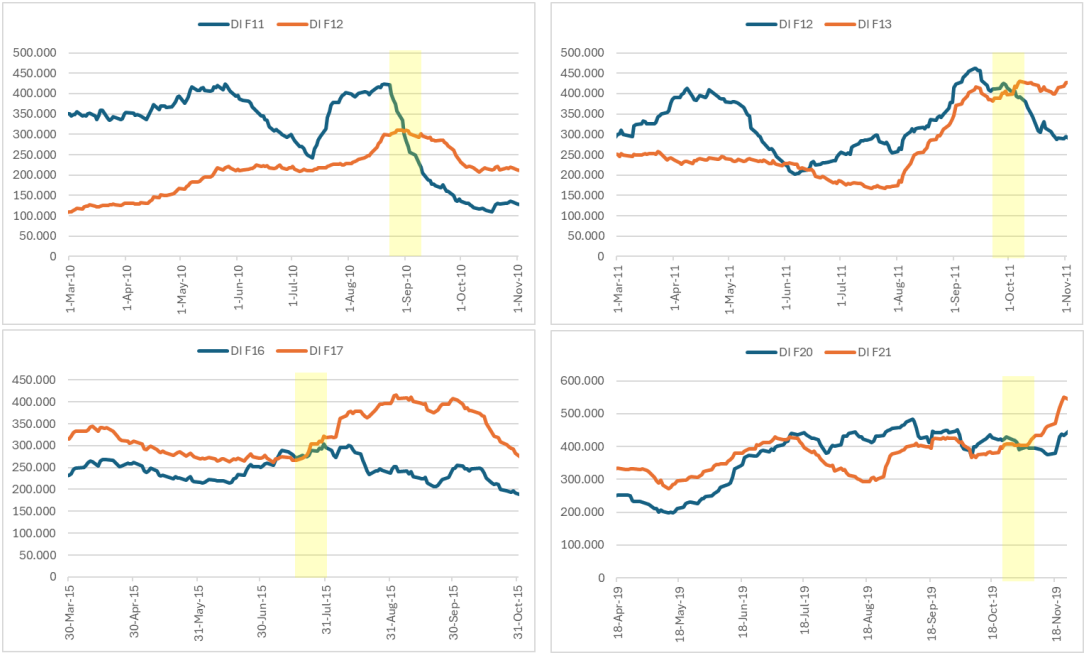

Figure 3: 30-day moving averages of DI Futures trading volumes for the months of March to November in 2010, 2011, 2015, and 2019. DIFYY refers to DI Futures contracts maturing in January, where YY is the expiration year. Source: Bloomberg.

[12] As informed by the Central Bank of Brazil (BCB) on www.bcb.gov.br/controleinflacao/transmissaopoliticamonetaria.

Thus, the following rule was used for selecting the DI Futures vertex and the years of the explanatory variables to be analyzed:

- If the Focus Report release date occurs by the last business day of September, the variations in expectations for the end of the current year and the DI Futures contract with maturity on the first business day of January of the following year were used.

- If the Focus Report release date occurs after the first business day of October, the expectations for the end of the following year and the DI Futures contract with maturity on the first business day of January two years ahead were used.

For example, if the Focus release date was August 5, 2019, the expectations analyzed are for the end of 2019, and the DI Futures contract used is the one maturing on the first business day of 2020 (this contract trades the rate between August 5, 2019 and January 2, 2020). If the Focus release date was November 19, 2019, the expectations are for the end of 2020, and the DI Futures analyzed is the one maturing on the first business day of 2021.

According to the definition above, the terms for both the interest rate and macroeconomic expectations are not fixed. To conduct a study using DI Futures variations for a stipulated fixed term (for example, one year ahead), it would be necessary to interpolate the curve using vertices with reduced liquidity, some even without actual trades within the observed 20-minute windows, which could lead to not very precise interpolations. For the analyses of the explanatory variables from the Focus Report, using the end of the year is relevant since institutions often only fill in expectations for these dates, leaving the monthly basis expectations incomplete.

Using a fixed date for the forecasts and interest rates could raise questions about whether the absolute variations in Focus expectations and DI Futures are very different between the analyzed dates. For example, for September data, the forecasts are for the end of the current year (3 to 4 months), while for October, the forecasts are for the end of the following year (14 to 15 months). One might think that with a longer term, there is greater uncertainty, and thus, greater absolute variations, which could impact the results.

To analyze this potential problem, the monthly averages of the absolute variations for each of the expectations and DI Futures over the 10 years analyzed were collected. As can be seen in Figure 4, no pattern was found in the variations.

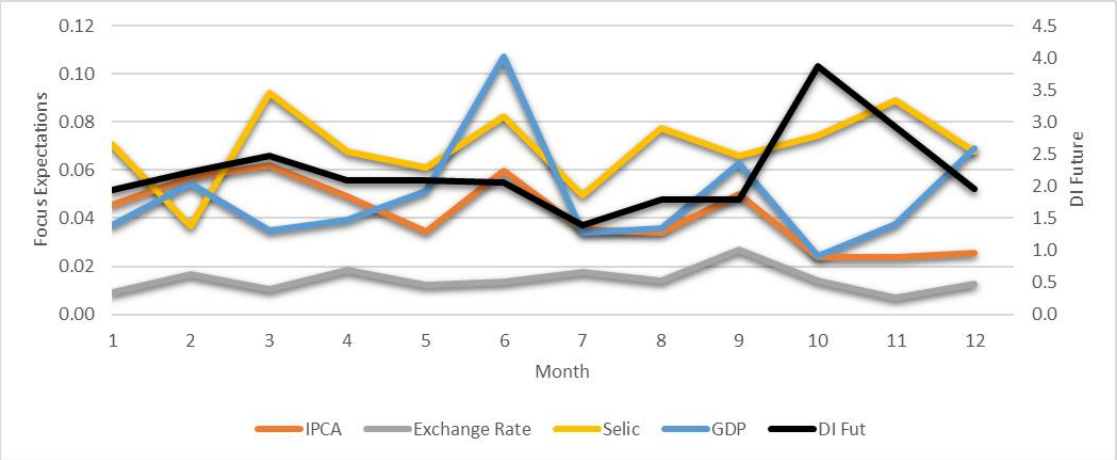

Figure 4: Monthly averages of absolute variations in DI Futures (in basis points) and Focus Expectations (in reais for Exchange Rate and in percentage points for IPCA, Selic, and GDP).

4. Results

4.1. Descriptive Statistics

Table 4 presents descriptive statistics of the variables used. Variations in the DI Futures are measured in basis points (bps). A change of 1 bp corresponds to a variation of 0.01 percentage points. Thus, a change in the DI Futures rate from, for example, 4.00% to 4.04% is recorded in the statistics as a variation of 4 bps.

On the other hand, variations in the expectations for the IPCA, Selic, and GDP are measured in percentage points. For example, a change in the IPCA expectation from one week to the next in the Focus report from 4.00% to 4.04% is recorded in the statistics as a variation of 0.04 percentage points.

The variations in exchange rate expectations are absolute changes in reais, meaning that a change in the expectation value of one dollar from one week to the next in the Focus report from, for example, 3.50 reais to 3.54 reais is recorded in the statistics as a variation of 0.04 reais.

Table 4: Descriptive statistics of DI Futures variations and variations in Expectations published by the Focus Report from 2010 to 2019 on the considered dates.

Variable	Obs.	Average	Median	Maximum	Minimum	Std. Dev.	Asymmetry	Kurtosis
DI1	458	-0.259	-0.50	19.00	-24.50	3.456	-0.280	10.241
IPCA	458	0.008	0.00	0.33	-0.24	0.065	0.863	4.985
Exchange Rate	458	0.003	0.00	0.15	-0.20	0.029	-0.348	10.874
Selic	458	-0.012	0.00	0.75	-1.38	0.163	-1.568	14.091
GDP	458	-0.026	0.00	0.39	-0.42	0.079	-0.787	5.212

Note: The variations in DI Futures (DI1) are quoted in basis points, the variations in IPCA, SELIC, and GDP expectations are quoted in percentage points, while the exchange rate variations are quoted in reais.

The following figures show the distributions of variations in the variables. In Figure 5, we can observe that the variations in DI Futures are almost symmetric and bell-shaped. The mean and median are slightly negative (it is the only variable where the mean and median are not so close to zero). This negative values occur because the downward cycles of the Selic rate were of greater magnitude than the upward ones: the Selic rate dropped from 8.75% at the end of 2009 to 4.50% at the end of 2019.

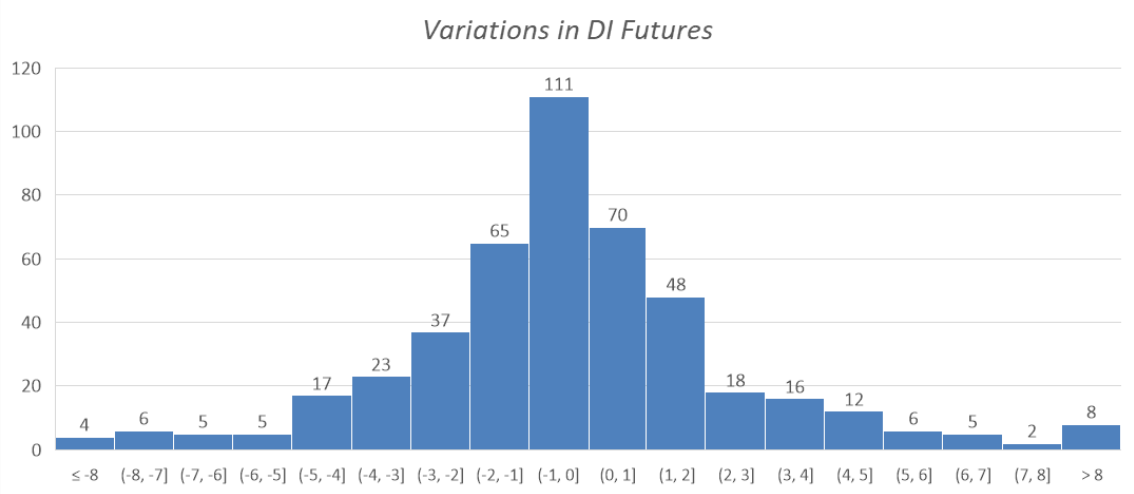

Figure 5: Distribution of variations in DI Futures (in bps).

In Figure 6, we present the distribution of variations in IPCA expectations. There is a positive skew in the distribution. On the other hand, variations in exchange rate expectations are the least frequent. Observing Figure 7 and Table 4, we can note that these expectations change little from week to week, and when changes occur, they are of lesser intensity. Despite this, we can notice that the distribution has a slightly negative skew and high kurtosis, indicating a high probability of extreme events.

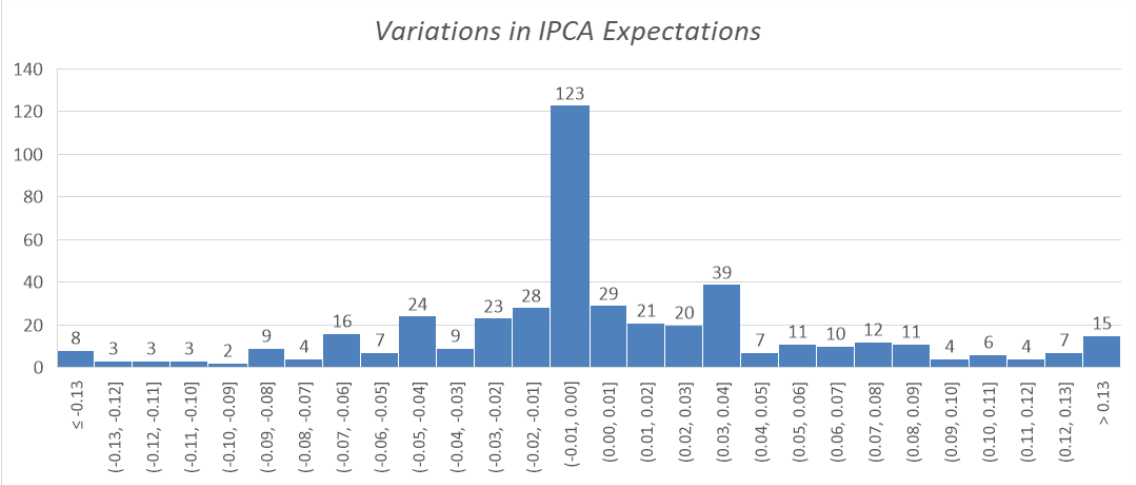

Figure 6: Distribution of variations in IPCA Expectations released by the Focus Report (in percentage points).

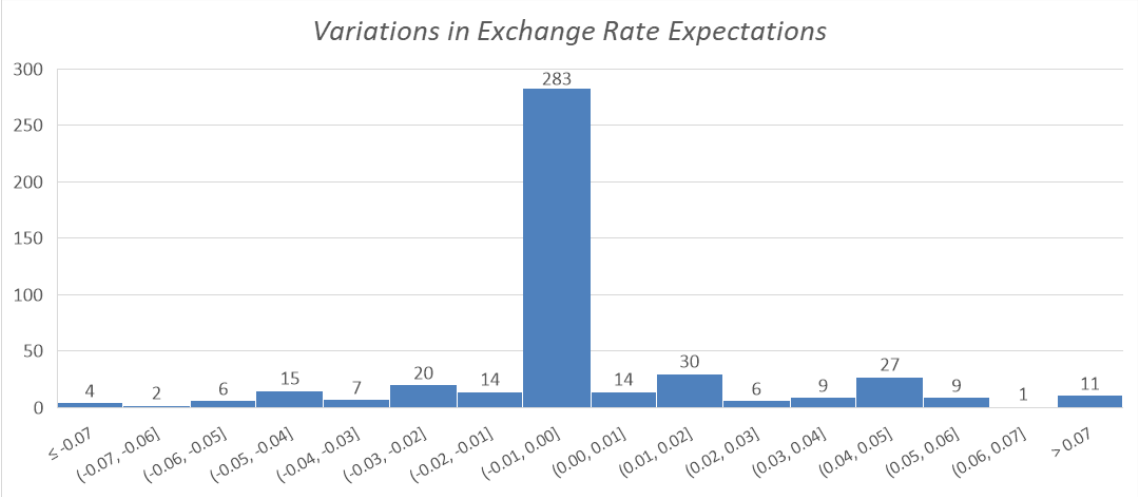

Figure 7: Distribution of variations in exchange rate expectations released by the Focus Report (in reais).

Like the DI Futures, the variations in the Selic Target expectations (Figure 8) have a negative mean (which makes sense in a period with downward cycles of greater magnitude than upward ones) and a slightly negative skew, indicating that extreme negative variations were more frequent than positive ones.

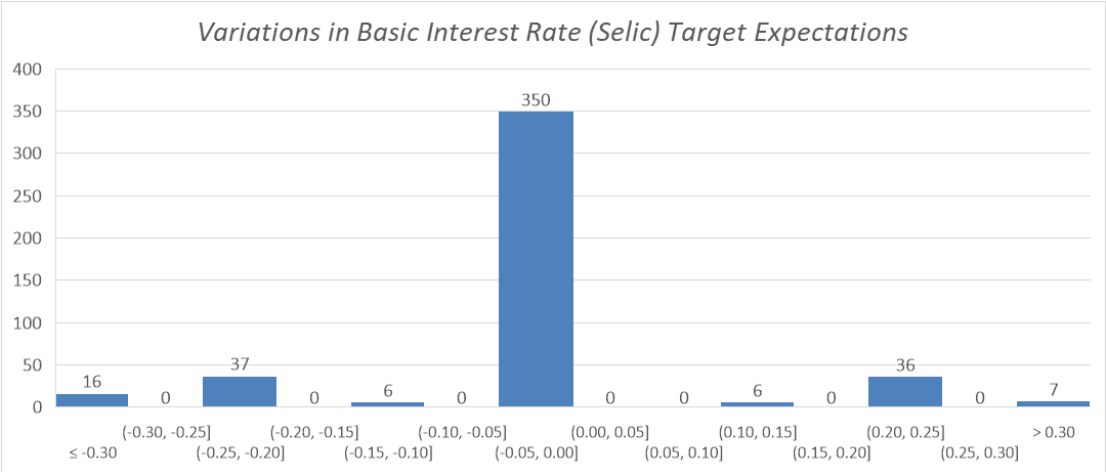

Figure 8: Distribution of variations in Basic Interest Rate (Selic) Target Expectations released in the Focus Report (in percentage points).

The variations in GDP expectations (Figure 9) have a negative mean, indicating greater downward revisions of economic activity during the studied period. These variations also exhibit negative skewness, indicating that extreme negative variations are more frequent than positive variations of the same magnitude.

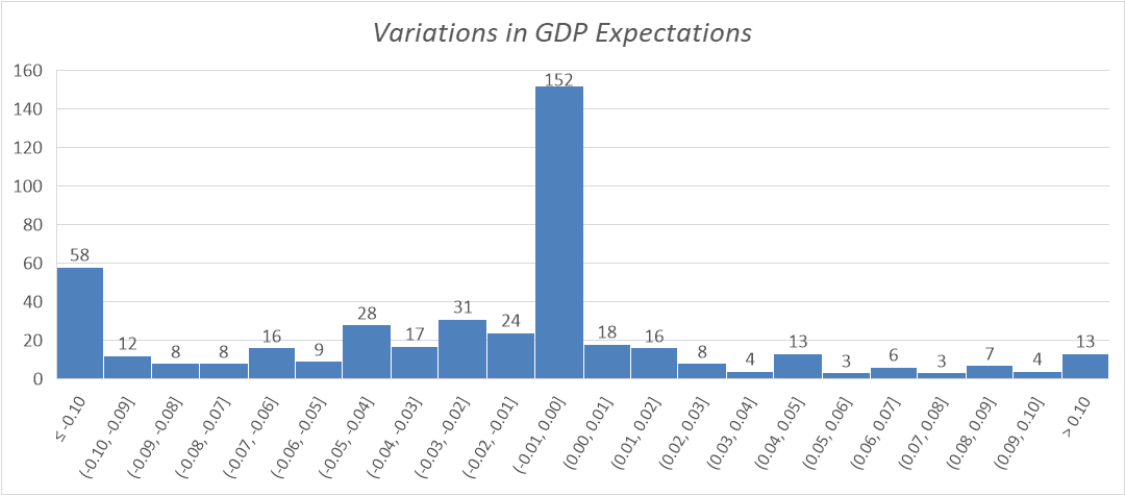

Figure 9: Distribution of variations in GDP Expectations released in the Focus Report (in percentage points).

4.2. Regressions and Results

Table 5 presents the regressions and their results. The sample does not include observations where any relevant indicators were released, as mentioned in section 3. Models 1 to 4 regress the variation in interest rates traded in DI Futures (ΔDI_{Fut}) against each variation of each expectation (IPCA, Exchange Rate, Selic and GDP) for the entire

sample. Of the four variables, variations in the IPCA and Selic expectations are statistically significant. An increase of 1 percentage point in the IPCA expectation for the end of the year increases the DI Futures rate of 8.60 basis points (on average), without controlling for other variables. Meanwhile, an increase of 1 percentage point (or 100 basis points) in the Selic expectation for the end of the year would increase the DI Futures rate by 2.91 basis points. The adjusted R^2 of these regressions is low, indicating that there may be omitted variables or a lot of randomness in the interest rate variation.

Table 5: Regressions of interest rate variations (ΔDI_{Fut}) against the variation in IPCA, Exchange Rate, Selic, and GDP Expectations published by the Focus Report, and against the variation in the Future Ibovespa and spot dollar, from the previous week to the current week.

Dependent Variable: ΔDI_{Fut}													
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
C	-0.36 ** (-2.23)	-0.29 * (-1.69)	-0.25 (-1.51)	- 0.25 (-1.41)	-0.25 (-1.54)	-0.13 (-0.96)	-0.22 (-1.48)	-0.23 (-1.63)	-0.22 (-1.49)		-0.10 (-0.8)		-0.18 (-1.34)
ΔIPCA	8.60 *** (3.16)				8.13 *** (3.05)	6.69 ** (2.47)	7.08 *** (2.72)	7.14 *** (2.66)	7.04 *** (2.7)	6.76 *** (2.58)	7.66 *** (2.66)	6.53 ** (2.11)	7.53 *** (2.77)
ΔExchange Rate		2.59 (0.4)			-0.57 (-0.09)	-1.16 (-0.2)	-0.77 (-0.17)	-0.74 (-0.16)			-1.23 (-0.23)		-2.40 (-0.51)
ΔSelic			2.91 ** (2.15)		2.34 (1.61)	3.48 *** (2.63)	3.14 ** (2.5)	3.10 ** (2.45)	3.13 ** (2.53)	3.25 *** (2.61)	2.78 ** (2.46)	2.90 *** (2.71)	2.85 *** (2.71)
ΔGDP				1.63 (0.6)	2.89 (1.26)	4.12 * (1.79)	4.65 ** (1.96)	4.64 * (1.95)	4.72 ** (2.03)	5.49 ** (2.52)	3.34 (1.41)		3.00 (1.41)
Fut IBOV						-1.03 *** (-2.59)		0.07 (0.19)					
Dollar							3.14 *** (3.4)	3.26 *** (3.59)	3.14 *** (3.4)	3.15 *** (3.4)			
Adjusted R^2	0.03	0.00	0.02	0.00	0.04	0.14	0.22	0.22	0.22	0.22	0.07	0.07	0.06
BIC	5.18	5.21	5.19	5.21	5.20	5.11	5.01	5.03	5.00	4.99	4.69	4.66	4.83
Observations	458	458	458	458	458	458	458	458	458	458	377	377	438
Sample	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	observations where returns of |Fut IBOV|> 1% are removed.	observations where returns of |Fut IBOV|> 1% are removed.	observations where returns of |Dollar|> 1% are removed.

Value of the t-statistic in parentheses (calculated with the Newey–West HAC variance estimator).
*** p < 0,01, ** p < 0,05, * p < 0,10

Regression 5 includes all the expectation variables studied as independent variables. Unlike the individual regression, variations in the Selic expectation are not statistically significant in explaining interest rate variations. The IPCA coefficient remains significant at the 1% significance level. The adjusted R^2 increases compared to previous regressions, but it is still low.

In order to reduce the interference of news or significant events between the last business day of the previous week and the first business day of the following week, whether political or economic, domestic or international, and that by themselves are sufficient to affect interest rates, we included in regressions 6 to 10 the returns of the future Ibovespa (*Fut IBOV*) and the spot USD-BRL (*dollar*) as controls in the model.

The Ibovespa Future Contract is a derivative traded on the Brazilian stock exchange that allows the market to expose itself to the risk of the Ibovespa, the main Brazilian stock market index, without the need to buy/sell the entire basket of stocks that make up this index. Its trading hours are the same as those of DI Futures. The quotations for the Ibovespa Future were also obtained from the Bloomberg platform.

Júnior and Higuchi (2008) identify that three of the four selected variables (interest rate, measured by the Selic rate, exchange rate, measured by PTAX, and inflation, measured by IPCA) did not show a statistically significant causal relationship with the Ibovespa. Similarly, Araújo and Bastos (2008) state that there is low sensitivity of stock returns to economic activity and inflation variables. Thus, sharp variations in the Ibovespa Future right at the start of trading would not be a consequence of variations in the Focus Report expectations but highly likely a consequence of some significant news over the weekend.

By including the controls, the regressions assume a linear relationship between interest rate variations and the intensity of events reflected in the future Ibovespa and the dollar. Both returns (future Ibovespa and spot dollar) were calculated for the exact same period as the DI Futures variation. Regression 6 includes all expectation variables and adds the future Ibovespa as a control. Regression 7 includes only the spot dollar, and regression 8 adds both variables.[16] Regression 9 is similar to regression 8, except it

[16] Although the spot foreign exchange market has less liquidity than the futures market, Ventura and Garcia (2012) indicate that the exchange rate, which is first formed in the futures market, is quickly transmitted through

excludes the exchange rate expectation and the return of the future Ibovespa, as they were not significant in the previous regression. Regression 10 differs from regression 9 by not including the constant, which was only significant in regressions 1 and 2.

In almost all these regressions, the coefficients of IPCA, Selic, and GDP expectations are significant at 5% (in regressions 6 and 8, the variation in GDP expectation is significant at 10%). Variations in exchange rate expectations remain insignificant for changes in the interest rate. The added controls are also significant. However, the future Ibovespa loses significance when combined with the spot dollar in regression 8. When all non-significant variables are removed (regression 10), the expectations of IPCA and Selic are significant at 1%. It is worth noting the increase in the adjusted R^2 with the new controls, going from 4% in model 5 to 22% in models 7 to 10.

Changes in exchange rate expectations do not prove relevant for altering the short-term interest rate in any of the regressions. As observed in section 4.1, these projections are not frequently changed, which may have impacted this result.[17]

To check for a possible non-linear relationship between the future Ibovespa and DI Futures variations, in regressions 11 and 12, observations where the future Ibovespa index opened (average of the first 20 minutes) with an absolute variation greater than 1.0% compared to the previous business day (average of the last 20 minutes) were removed from the sample. Thus, more 81 days were removed from the sample, which decreased from 458 to 377 observations. Regression 12 differs from 11 by excluding the non-significant variables from the latter. In these regressions, the adjusted R^2 drops significantly compared to previous regressions, but the expectations of IPCA and Selic remain significant.

Regression 13 is similar to regression 11: to reduce the interference of news or significant events during the analysis period, the days when the spot USD-BRL opened with an absolute variation greater than 1.0% were removed from the sample. Twenty observations were removed from the sample (remaining 438). Comparing this

arbitrage to the spot market. Thus, and taking into consideration that the dollar futures market only has liquidity in the contract following the current month, which would complicate the creation of a daily database, this work uses data from the spot market.

[17] In 270 observations, exchange rate projections are not altered, compared to 92 for the IPCA and 136 for GDP. It is interesting to note that changes in Selic expectations are even less frequent (Selic expectations are not altered in 350 observations), yet there is evidence that changes in Selic expectations (year-end) cause changes in DI Futures rates (these variables are naturally related).

regression with 11 and 12, we can note that the significant variables are the same, and the coefficients are quite stable. The adjusted R^2 is slightly lower than those of the previous regressions.

The results of all these regressions suggest that changes in projections for the IPCA, Selic, and GDP have an impact on the short-term interest rate, indicating that expectations prior to the release of the Focus Report are not yet fully incorporated into this market and strongly highlight the importance of survey expectations in price formation in the financial market.[18]

This result is even more significant when considering that not all institutions participating in the Focus survey update their expectations weekly, and therefore, there is the possibility that the Focus Report does not perfectly reflect the current expectations of all institutions.

4.3. Robustness

In the regressions from the previous section, we use the last 20 minutes of the business day preceding the release of the Focus Report to calculate the variation in DI Futures and the returns of the controls. The choice of this period was *ad hoc*. Additionally, in regressions 11 to 13, we only used interest rate variations on days when the future Ibovespa or the spot dollar varied by less than 1%. The choice of the 1% threshold was also *ad hoc*. In this case, the sample decreased much more for the future Ibovespa (regressions 11 and 12) than for the spot dollar (regression 13).

In this section, robustness tests with some variations of the estimates from the previous section are presented to verify if the explanatory power observed in the expectation variations is maintained.

There is another relevant point: one might think that the dispersion of agents' expectations, rather than the variation in expectations, would be related to the variation

[18] We performed this same experiment with the median of the expectations from the Top 5 institutions published in the Focus Report (except for GDP variable expectations, for which these data are not available). For the IPCA and Selic expectations, the results are similar (both in terms of magnitude of impact and statistical significance). In Section 4.3, we present, in more detail, the results only for exchange rate expectations, since this is the only variable for which changes in expectations do not have a statistically significant impact on the short-term interest rate.

in interest rates. We also ran regressions with the dispersions to see if the results hold. Table 6 presents the results of the robustness studies.

4.3.1. Change in the DI Futures Collection Period

To calculate the variation in the interest rate (DI Futures) and the return of the spot dollar, we used averages for (a) the first 20 minutes of trading on the first business day of the week (right after the release of the Focus Report); and (b) the 20 minutes of trading just before the close on the business day prior to the Focus Report release. As a robustness check, we changed (b): we used the average DI Futures from 20 minutes before the close of the Focus Report collection (4:40 PM to 5 PM) in models 9 and 10 so that any news released during this period could still be incorporated into the Focus (when using the period after the Focus closure for DI Futures collection, data collection for the release has already ended). Models 14 and 15 in Table 6 show that the results remain, with all expectations in regression 15 significant at 1%, and a R^2 slightly lower than in regressions 9 and 10.

4.3.2. Samples Where the Future Ibovespa/Spot Dollar Varied Less Than 1.5% (Less Restrictive) and Less Than 0.5% (More Restrictive)

The choice to use samples of interest rate variations where the future Ibovespa or the spot dollar varies in absolute terms by less than 1% was *ad hoc* (regressions 11 to 13). Thus, we conducted robustness tests for samples with absolute variations less than 0.5% and 1.5%. It is worth noting that these regressions have low explanatory power (R^2 around 7%) when compared to the regressions with future Ibovespa and spot dollar controls (regression 10, for example, has an R^2 of 22%).

In regression 16, which does not contain absolute variations of the future Ibovespa greater than 1.5% (less restrictive sample, with 426 observations), the coefficients of the statistically significant variables, IPCA and Selic, are quite similar to those in regression 11.

Regression 17 contains the most restrictive sample regarding the future Ibovespa (only

observations with absolute variations less than 0.5%, totaling 268 observations). The coefficients of the IPCA and Selic variables also remain statistically significant.

Regressions 18 and 19 contain the less restrictive and more restrictive samples, respectively, based on the spot dollar. In both, the variations of IPCA and Selic remain statistically significant. GDP expectations become significant in the less restrictive sample.

Table 6: Robustness Regressions of interest rate variations (∆DI) against the variation in IPCA, Exchange Rate, Selic, and GDP Expectations released by the Focus Report, and against the variation in the Future Ibovespa and spot dollar, from the previous week to the current week.

Dependent Variable: ΔDI_{Fut}											
	(14)	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**	**(20)**	**(21)**	**(22)**	**(23)**	**(24)**
C	-0.19 (-1.12)		-0.19 * (-1.75)	-0.11 (-0.78)	-0.16 (-1.16)	-0.20 * (-1.9)	-0.81 (-1.4)	-0.80 (-1.39)	-0.22 (-1.61)	-0.22 (-1.61)	-0.24 * (-1.69)
ΔIPCA	7.74 *** (2.72)	7.50 *** (3.22)	7.73 *** (3.02)	5.62 ** (2.12)	4.50 ** (2.04)	6.78 *** (3.16)	5.86 ** (2.18)	5.80 ** (2.19)	7.13 *** (2.65)	7.11 *** (2.62)	7,21 *** (2,69)
ΔExchange Rate			3.02 (0.55)	-3.81 (-0.31)	3.50 (0.69)	-5.31 (-1.08)	0.31 (0.07)		- 1.49 (-0.70)	- 1.39 (-0.52)	4.47 (1.42)
ΔSelic	3.11 ** (2.51)	3.21 *** (3.64)	2.82 ** (2.46)	3.35 *** (3.55)	2.70 *** (3.11)	2.01 ** (2.11)	2.93 ** (2.28)	3.02 ** (2.41)	3.11 ** (2.51)	3.11 ** (2.50)	2,88 ** (2,27)
ΔGDP	5.08 * (1.91)	5.74 *** (2.85)	3.47 (1.57)	1.58 (0.62)	3.95 ** (2.19)	2.66 (1.11)	4.39 ** (2.11)	4.40 ** (2.16)	4.60 ** (1.97)	4.61 ** (1.96)	4,93 ** (2,10)
Fut IBOV							0.12 (0.35)		0.07 (0.19)	0.06 (0.16)	0.09 (0.24)
Dollar	2.95 *** (3.39)	2.95 *** (3.39)					3.43 *** (3.63)	3.22 *** (3.47)	3.25 *** (3.58)	3.23 *** (3.63)	3,27 *** (3,55)
SD IPCA							2.17 (0.65)	2.01 (0.6)			
SD Exchange Rate							-4.93 (-1.56)	-4.76 (-1.5)			
SD Selic							0.61 (0.46)	0.62 (0.46)			
SD GDP							0.61 (0.58)	0.66 (0.62)			
Adjusted R^2	0.21	0.21	0.07	0.06	0.04	0.06	0.22	0.22	0.22	0.22	0.22
BIC	5.14	5.13	4.78	4.51	5.00	4.43	5.06	5.04	5.03	5.03	5.03
Observations	458	458	426	268	451	391	458	458	458	458	458
Sample	All obs., but with the variations of DI-Fut and Dollar calculated in relation to immediately before the closing of the Focus.	All obs., but with the variations of DI-Fut and Dollar calculated in relation to immediately before the closing of the Focus.	observations where returns of |Fut IBOV|> 1.5% are removed.	observations where returns of |Fut IBOV|> 1.5% are removed.	observations where returns of |Dollar|> 1.5% are removed.	observations where returns of |Dollar|> 0.5% are removed.	All observations, after removing the dates on which indicators were released.	All observations, after removing the dates on which indicators were released.	Exchange Rate Expectations: "Top 5 Short-Term" instead of "Reported in the last 30 days".	Exchange Rate Expectations: "Top 5 Short-Term" instead of "Reported in the last 30 days".	Exchange Rate Expectations: "Top 5 Short-Term" instead of "Reported in the last 30 days".

Value of the t-statistic in parentheses (calculated with the Newey–West HAC variance estimator). *** p < 0,01, ** p < 0,05, * p < 0,10

4.3.3. Could the dispersion of expectations be related to variations in interest rates?

We checked whether, even when controlling for the discrepancies in expectations extracted from the Focus Report, the variations in Focus expectations remain significant. It is possible that interest rate variations are related to the dispersion of expectations rather than the change in expectations.

To perform the test, we added the standard deviations of the Focus Report expectations to regression 8 (Table 5). These deviations are also released by the BCB in the Market Expectations System. Regression 20 in Table 6 presents the results. The variables for variations in IPCA, Selic, and GDP expectations remain significant, and all the added variables are not significant.

In regression 21, we added the standard deviations of the Focus Report expectations to regression 9 (Table 5). The variations in IPCA, Selic, and GDP expectations continue to explain variations in the interest rate, and the deviations do not have statistical significance. The results indicate that the dispersion of expectations is not related to the variation in interest rates.

4.3.4. Sample with the Median of Top 5 Institutions Expectations instead of the Median of All Institutions Expectations for the Exchange Rate

Since changes in the median of expectations for the exchange rate do not have a significant impact on the short-term interest rates (Table 5), we conducted regressions to determine if replacing this measure with the median expectations of the Top 5 institutions for the same variable would result in a statistically significant impact. As noted in Section 2.4, the Top 5 is a ranking from the Focus Report based on the accuracy of an institution's projections, and their expectations can be short, medium, or long-term.

The results for the exchange rate expectations of the Top 5 institutions are shown in Table 6 in regressions 22, 23, and 24, respectively, for the short, medium, and long-term Top 5. All these regressions are similar to regression 8 in Table 5. The coefficients

of the significant variables continue to have similar magnitudes. The coefficient related to exchange rate expectation in none of the three regressions is statistically different from zero, being negative for short and medium-term expectations and positive for long-term.

5. Final Considerations

This study seeks to identify the existence of a relationship between the variations in market analysts' expectations published in the Focus Report and changes in the short-term interest rate in Brazil. The interest rate used is the one traded in the interest rate futures market (DI Futures).

The variation in the interest rate is calculated by the difference between before and after the release of the Focus Report, but the expectations published in this document are formed beforehand. Thus, if expectations formed at earlier times (but not disclosed) have some impact on the variation of the interest rate, then the expectations were not yet embedded in these rates.

To control for news and relevant events that could have caused the variation in the interest rate, we removed from the sample observations where there were announcements of relevant indicators and where the Ibovespa, the main indicator of the Brazilian stock market, and the USD-BRL exchange rate showed significant variation. The period from January 2010 to December 2019 constitutes the sample, and the Focus expectations used are those for GDP, the Selic rate (the one-day interest rate set by the Central Bank of Brazil for the Brazilian economy), the exchange rate, and the IPCA (the Broad National Consumer Price Index).

The results indicate that changes in expectations for three of these four variables (all except the exchange rate) have an impact on the short-term interest rate. Therefore, the information released by the Focus Report (expectations formed in the previous week) is not yet incorporated into the interest rate market and is only incorporated after the disclosure of these expectations in the following week by the Focus Report. This result highlights the importance of survey expectations in the price formation of the financial market

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