Lack of transparency and uncertainty in expectations about monetary variables in Brazil

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Abstract Once opacity in the conduct of monetary policy is related to information asymmetry problems between the monetary authority and the general public, and due to the fact that opacity leads to uncertainties in the expectations formation process, this paper investigates the relation between monetary policy opacity and disagreements in expectations about inflation, monetary policy interest rate and exchange rate. Our results show that an increase on monetary policy opacity increases the uncertainty of those variables under central bank control. Given that our findings suggest that Central banks should avoid opaque practices, we believe that our paper will allow your readers to understand that central bank transparency can improve monetary policy conduction. The paper is the first to use the signal-to-noise ratio methodology to build a monetary policy opacity indicator, and the first to investigate the relations between monetary policy opacity and disagreements in expectations about monetary variables.

Keywords: Transparency; Monetary Policy; Disagreement in expectations.

Resumo: Uma vez que a opacidade na condução da política monetária está relacionada a problemas de assimetria de informação entre a autoridade monetária e o público em geral, e devido ao fato de que a opacidade leva a incertezas no processo de formação de expectativas, este artigo investiga a relação entre a opacidade da política monetária e desacordos nas expectativas sobre a inflação, taxa de juros da política monetária e taxa de câmbio. Nossos resultados mostram que um aumento na opacidade da política monetária aumenta a incerteza dessas variáveis sob controle do banco central. Dado que nossos achados sugerem que os Bancos Centrais devem evitar um comportamento pouco transparente, acreditamos que nosso artigo permitirá que seus leitores entendam que a transparência do banco central pode melhorar a condução da política monetária. O artigo é o primeiro a utilizar a metodologia da relação sinal/ruído para construir um indicador de opacidade da política monetária, e o primeiro a investigar as relações entre opacidade da política monetária e desacordos nas expectativas sobre as variáveis monetárias.

Palavras-chave: Transparência; Política Monetária; Desacordo nas expectativas.

Classificação JEL: E43; E52; E58

Área 4 - Macroeconomia, Economia Monetária e Finanças

1. Introduction

In recent decades, central banks have sought to ensure low and stable inflation, and guide expectations with respect to price stability. To reach such goals, the provision of information is one of the tools that central banks have developed to enhance the results of their operations, and it is based on the principle of constant improvement and search for an institutional framework that allows for increased levels of transparency (Montes et al., 2016). Therefore, central banks have improved transparency and increased the publication of macroeconomic projections as well as explanations[1] about monetary policy decisions (Geraats, 2009; Tillmann, 2021).[2]

Once opacity in the conduct of monetary policy is related to information asymmetry problems between the monetary authority and the public (Geraats, 2002), this transparency improvement effort is associated with the tasks of reducing information asymmetries and guiding expectations, and thus with the task of reducing uncertainties of the public regarding the goals and policies of the monetary authority. Transparency is a tool through which central banks interact directly with the public (Blinder et al.2008). In turn, in inflation targeting (IT) regimes, the monetary policy interest rate is a tool capable of driving expectations (Clarida et al., 2000). In this sense, opacity about the conduct of monetary policy may affect the expectations formation process of private agents and, thus, it may give rise to macroeconomic uncertainties and, as a consequence, create price instabilities.

However, one of the biggest obstacles to transparency research is the scarcity of data (Geraats, 2009). In order to get around this problem and contribute to the literature related to central bank transparency, we build a monetary policy opacity indicator, which represents one of the main contributions of this study. Therefore, in order to assess the effects of monetary policy transparency, one of the goals of this paper is to create a new opacity measure. Following the methodological ideas in Kholodilin and Siliverstovs (2009) and de Mendonça and Calafate (2021), this monetary policy opacity indicator will be based on the methodology that considers a signal-to-noise ratio of forecast errors of economic agents. In addition, as another goal of the paper, the study seeks to analyze the relationship between monetary policy opacity and uncertainty in the expectations formation process about variables that are within the scope of central banks, i.e., the study investigates the relation between monetary policy opacity and disagreements in expectations about variables considered as under central bank's control.

Recent studies have paid increasing attention to the existence of disagreements in expectations.[3] The studies focus on the fact that expectations formed for different economic variables differ among agents, causing them to disagree in relation to their future results (Mankiw et al., 2003; Oliveira and Curi, 2016). For this reason, disagreements in expectations have been the main object of several studies, and have been representing a good proxy for the uncertainty related to the future behavior of a variable (e.g., Bomberger, 1996; Giordani and Soderling 2003; Boero et al., 2008; Montes et al., 2016).

Disagreements in inflation and interest rate expectations represent a concept contrary to what is thought of as one of the main goals of the IT regime: to reduce uncertainties about both future inflation and interest rates, and to guide and make inflation expectations converge to the inflation target. Guiding the market participants' expectations about future inflation and interest rates is a key task of central banks following an IT regime. Besides, due to the pass-through effect from exchange rate to inflation and the existence of fear of floating, central banks should also care about disagreements in exchange rate expectations (Montes and Ferreira, 2018 and 2019). In turn, the success in this task of guiding

[1] According to Tillmann (2021): "*The outcomes of central bank meetings drive financial markets. Market participants closely monitor decisions to change interest rates, the amount of asset purchases or the extent of forward guidance. In order to better understand current policy and anticipate future policy decisions, observers pay attention to every detail of the decision. They carefully parse the press release and hang on every word during post-meeting press conferences*".

[2] As highlighted by Geraats (2002 and 2009), transparency is a multidimensional concept, where we can highlight: monetary policy transparency, economic transparency, procedural transparency, political transparency, and operational transparency. Particularly, the present paper deals with monetary policy transparency and economic transparency.

[3] Although several studies investigate the determinants and consequences of disagreements in expectations of financial market participants, some studies investigate disagreement among policymakers (e.g., Detmers, 2016; Tillmann, 2021). Our study does not belong to the literature on disagreement among policymakers and their determinants or consequences.

expectations will depend on some institutional characteristics able to affect the central bank's ability to influence and coordinate the expectations of market participants (Falck et al., 2021).

Among the institutional characteristics that IT countries should have, we can highlight increased transparency and communication by the central bank through the provision of relevant information about the conduct of monetary policy and the state of the economy (Blinder et al., 2008; Montes et al., 2016; Montes and Lima, 2018; Montes and Gea, 2018). This characteristic is expected to influence the expectations formation process since it affects agents' perception about the conduct of monetary policy and the state of economy. Due to the fact that transparency is a key aspect to IT countries, it is important to investigate and provide evidence regarding the effect of monetary policy opacity on the expectations formation process of financial markets forecasters about variables that are under central banks' control. Hence, given the theoretical relationship between monetary policy opacity and the uncertainties about the goals of central banks and the conduct of monetary policy, changes in the levels of monetary policy transparency would be able to affect the understanding of private agents about central banks' goals and policies and, as a consequence, the disagreements in market expectations about inflation, interest rate and exchange rate.

In short, we can summarize the main novelties brought by the study as follows: (i) it builds a new measure of monetary policy opacity, and; (ii) it contributes to the central bank transparency literature as well as to the literature addressing the determinants of disagreements in expectations by providing evidence for the effects of monetary policy opacity on disagreements in expectations about variables that are within the scope of central banks (inflation, interest rate and exchange rate).

The study uses Brazilian monthly data from January 2002 to December 2020.[4] With the adoption of IT, transparency increased, and the Central Bank of Brazil (CBB) started to disclose information about market expectations of macroeconomic variables, and in particular, through survey-based forecasts, it started to monitor and disclose the expectations about different macroeconomic and financial variables. In this sense, Brazil is an interesting case study as the country adopts IT, and the CBB is considered as one of the most transparent central banks of the world, and one of the few to systematically provide information about market expectations through its website, making it possible to carry out this type of research for an emerging country.[5]

The findings are based on time series analysis through both ordinary least squares (OLS) and generalized method of moments (GMM) estimates. The results suggest monetary policy opacity is positively related to all disagreements in expectations analyzed in this study, i.e., an increase in monetary policy opacity leads to increases in disagreements in interest rate, inflation and exchange rate expectations.

2. Monetary policy opacity index

Monetary policy opacity is the main explanatory variable of the study. There are different measures of monetary (or central bank) transparency in the literature (e.g., Fry et.al, 2000; Chortareas et al., 2002; Eijffinger and Geraats, 2006; de Mendonça and Galveas, 2013; Dincer and Eichengreen, 2014; Al-Mashat, 2018). With the exception of the measure elaborated by de Mendonça and Galveas (2013), the other measures are not useful in time-series analysis, because they are available only for a certain time horizon and with a frequency equal to or greater than one year, limiting the analysis that seeks to investigate the main changes that have occurred over time. In general, the empirical literature on central bank transparency is based on transparency indicators that considers a number of questions related to information disclosure by the central bank or actual practice (de Mendonça and Galveas, 2013). Nevertheless, these indices are subject to subjectivity due to the fact that researchers attribute scores to each question. Furthermore, institutional features of the central banks do not change in short periods. As a

[4] Such as de Mendonça and Calafate (2021), the beginning of the data set corresponds to when the confidence crisis concerning the presidential election 2002 dissipated, and there was the consolidation of the disclosure of expectations of macroeconomic variables by the Central Bank of Brazil. In turn, the period in which the database closes corresponds to the availability of data when this study was started.

[5] The CBB was the winner of the "*Central Banking Awards 2019-2020*" in the risk management and website categories.

consequence, the use of this type of indices is not adequate for an analysis with time series data (de Mendonça and Galveas, 2013).

In order to overcome both the low frequency limitation and the unavailability for different time horizons related to the transparency indicators, we follow Öller and Teterukovsky (2007), Kholodilinin and Silverstovs (2009), Glass and Fritsche (2015), and de Mendonça and Calafate (2021), which use the signal-to-noise ratio to measure the information content of the data, and to check the quality and relevance of information in a communication, this study uses the signal-to-noise ratio related to the monetary policy interest rate to obtain the monetary policy opacity indicator (OPAC). According to Glass and Fritsche (2015), the signal-to-noise ratio is captured by a ratio of variances, i.e., the more information comes in, the lower the variance of revision, and the signal content improves compared to the noise level as measured by the variance of the final revision. In this sense, since the signal-to-noise ratio is used to verify the quality of data, it can be used as a measure of monetary policy transparency. As argued by de Mendonça and Calafate (2021) in relation to fiscal opacity, we argue that the use of this methodology represents a suitable alternative for measuring the opacity related to monetary policy since it enables the construction of a time-varying indicator. The idea behind the use of the signal-to-noise ratio is the ability of this method to identify which informational improvements make it possible to reduce the noise between the forecast of the monetary policy interest rate and the actual monetary policy interest rate. Hence, the greater the opacity in relation to the monetary policy interest rate, the greater the ignorance of market agents, and, therefore, the greater the forecast error. Such as de Mendonça and Calafate (2021), the indicator is obtained from four steps.

First, we build forecast error series showing the difference between the agents' forecasts about the monetary policy interest rate and the actual monetary policy interest rate. Hence, two monthly series for the forecast error are calculated: one considering a 12-month window, and another considering a 24-month window. The forecast error at t (FE_t) is the difference between the realized monetary policy interest rate at t (R_t) and the forecast of private agents formed 12 months (or 24 months) ago in relation to the monetary policy interest rate at t (R^e_t).[6] The larger is the magnitude of this error, the greater the degree of ignorance in relation to the monetary policy interest rate situation. Thus, as argued by de Mendonça and Calafate (2021), informational improvements can lead to a decrease in the noise, and consequently to a decrease in the forecast error. Equation (1) presents the forecast error (FE).

$$FE_t = R_t - R^e_t \qquad (1)$$

where R denotes the interest rate and R^e_t denotes the interest rate expectations.[7]

In fact, agents can overestimate ($R_t < R^e_t$) or underestimate ($R_t > R^e_t$) the interest rate in their forecasts. Due to the fact that both positive and negative forecast errors suggest opacity situations, it is appropriate to use the mean square error (Kholodilinin and Silverstovs, 2009; Glass and Fritsche, 2015; de Mendonça and Calafate, 2021). In this sense, the use of the mean square error (MSE) is suitable since both directions of the forecast error reflect opacity in the conduct of monetary policy. The MSE_t may be computed in a second step using Equation (3) and the forecast error (FE_t) from Equation (1):

$$MSE_t = \frac{1}{T}\sum_{t=1}^{T}(FE_t)^2 \qquad (2)$$

The number of observations in a given month is denoted by T.

[6] Two series are utilized to compute the forecast error (FE). First, the observed monetary policy interest rate – Selic – (R_t), which is obtained from the Time Series System of the Central Bank of Brazil (CBB). The second series is based on private sector expectations for the interest rate in a particular year (R^e_t) (we use the mean values obtained from the answers provided by the experts surveyed), which are calculated monthly using the average of daily estimates available at the CBB.

[7] The series of expectations provided by the CBB are presented as fixed events because the forecasting horizon varies with the passage of time. Therefore, the expectations formed at the beginning of the year are more susceptible to forecasting errors than those formed at the end of the year. It is to avoid this seasonal behavior inherent to measures based on fixed event forecasts that studies use fixed horizon forecasts, in which the forecasting horizon does not vary with the passage of time (e.g., Patton and Timmermann, 2010; Dovern et al., 2012; Montes et al., 2016; Montes and Ferreira, 2019).

The third step is to calculate the signal-to-noise ratio (*SNR*). To calculate the *SNR*, we divide the *MSE* by the variance of the monetary policy interest rate ($\sigma^2_{R\,t}$).[8] Equation (4) shows how to calculate the *SNR*:

$$SNR_t = \frac{MSE_t}{\sigma^2_{R_t}} \qquad (3)$$

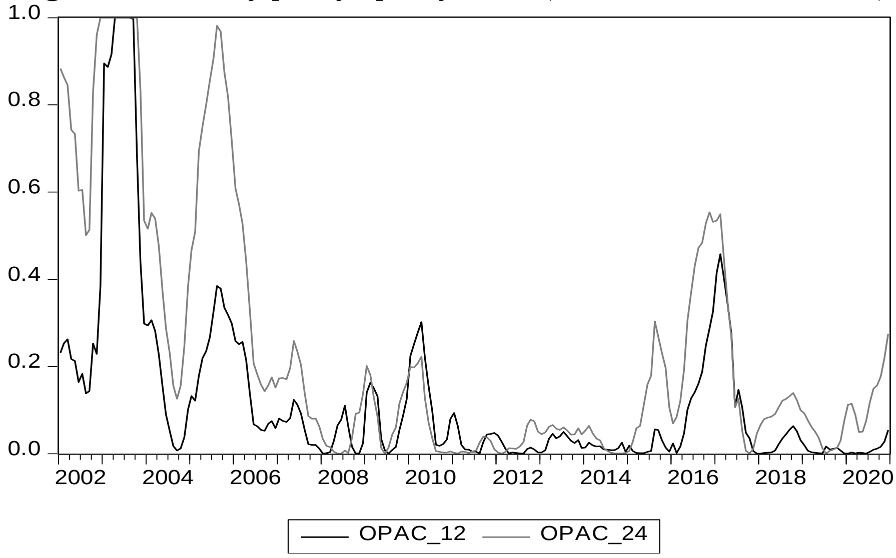
The signal-to-noise ratio is near to zero in conditions with minimal monetary policy opacity, implying that interest rate forecasts are close to the value of the realized interest rate. On the other hand, when the signal-to-noise ratio raises, monetary policy opacity increases. In this respect, the higher the *SNR*'s value, the more informational issues there are and the less transparent monetary policy is. Hence, when the *SNR* = 0, the forecaster has enough information for a perfect forecast of the interest rate ($MSE_t = 0$). In turn, when the $SNR \geq 1$ ($MSE_t \geq \sigma^2_{R\,t}$), the forecaster is completely ignorant of the final value of the interest rate.

The final step is to obtain the measure of monetary policy opacity (*OPAC*) by normalizing the *SNR* to a restricted index between 0 and 1. Thus, the higher the signal-to-noise ratio, the greater the degree of monetary policy opacity, i.e., *OPAC* tending to 1. On the other hand, the lower the SNR, i.e., *OPAC* tending to zero, the lower the degree of monetary policy opacity. In order to normalize the values between zero and one, we proceed as follows:

$$OPAC_t = \begin{cases} 1 & if \quad MSE_t \geq \sigma^2_{R\,t} \\ \frac{MSE_t}{\sigma^2_{R_t}} & if \quad 0 < MSE_t < \sigma^2_{R\,t} \\ 0 & if \quad MSE_t = 0 \end{cases} \qquad (4)$$

Figure 1 shows the monetary policy opacity index considering a 12-month window (*OPAC_12*) and a 24-month window (*OPAC_24*).

Figure 1 Monetary policy opacity index (*OPAC_12* and *OPAC_24*)



3. Data and Empirical Strategy

[8] The variance of the monetary policy interest rate ($\sigma^2_{R\,t}$) is the variance of the whole sample of the observed monetary policy interest rate – Selic – (R_t).

Besides monetary policy opacity, the other variables of interest are the disagreements in expectations. Since disagreements in expectations about a variable may reflect uncertainties about the variable's future behavior (Bomberger, 1996; Boero et al., 2008), several studies use disagreement in expectations about a variable as a proxy for uncertainty about that variable (e.g., Mankiw et al., 2003; Söderlind, 2011; Montes and Curi, 2017; Montes and Ferreira, 2019). In particular, disagreements in inflation, interest rate and exchange rate expectations were obtained based on the same methodology used in other studies in the literature (e.g., Oliveira and Curi, 2016; Montes et al., 2016; Montes and Curi, 2017; Montes and Acar, 2018; Montes and Ferreira, 2019). These disagreements are built from data obtained from the Focus report and made available by the Central Bank of Brazil (CBB), i.e., the CBB offers market expectations, which may be accessed through its site. Thus, based on a survey of expectations provided by the CBB, it is possible to calculate series of disagreements in inflation expectations for 12, 24, 36 and 48 months ahead. In this paper, we calculate disagreements in inflation, interest rate and exchange rate expectations for 12 and 24 months ahead as these are time horizons of greatest concern for the CBB.

In order to understand how disagreements are calculated, we follow the literature (e.g., Montes et al., 2016; Oliveira and Curi, 2016; Montes and Acar, 2018; Montes and Ferreira, 2018) and present the following notation: t is the instant at which the projection is made, i identifies the agent that releases the forecast ($i \in I$, where I is the set of agents surveyed), X is the variable to be forecasted (i.e., inflation, interest rate and exchange rate), then $E_{i,t}X^{a+j}$ represents the projection that the *i-th* agent calculated in instant t about the value that inflation, interest rate and exchange rate will reach at the end of year $a + j$.[9] In turn $E_t^{max}X^{a+j} = \max\left(E_{i,t}X^{a+j}, i \in I\right)$ denotes the maximum value of the distribution, while $E_t^{min}X^{a+j} = \min(E_{i,t}X^{a+j}, i \in I)$ denotes the minimum value of the distribution.[10]

The measures of disagreement we use throughout this paper is $Disag\_X_t^{a+j}$, which is calculated from the interval of the distribution defined as:[11]

$$DisagX_t^{a+j} = E_t^{max}X^{a+j} - E_t^{min}X^{a+j} \quad (5)$$

Forecasts such as $E_{i,t}X^{a+j}$ are known as fixed events because the forecast horizon varies with the passage of time. In fact, the prospective period for forecasts made in t for the value that the variable X will assume at the end of the year $a + j$ decreases as t progresses within the year in which the expectations are made.[12] This pattern of decreasing forecast horizon as t progresses through the year brings about seasonal behavior in disagreement measures based on fixed event forecasts, as the dispersion of expectations tends to decrease as the forecast horizon narrows.[13]

To avoid the seasonal behavior inherent in disagreement measures based on fixed event forecasts,

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[9] This instant of time is characterized by a specific date, namely a day "*d*", *a* month "*m*", or a year "*a*".

[10] Where j = 0 is the current year.

[11] Like Oliveira and Curi (2016) and Montes and Luna (2018), this disagreement measure is used because other measures require knowledge of the entire distribution of expectations. This information is not provided by the CBB. We know that articles on disagreement usually use other measures, such as the interquartile range and the Kulback-Liebler divergence measure. However, these two options cannot be calculated without the entire distribution of the individual forecasts. The standard deviation - SD (ND) - and the coefficient of variation - CV (ND) - are also often used as measures of disagreement. However, although these alternative measures are released, interpolating the SD (ND) and CV (ND) transform into a fixed horizon is not appropriate for the analysis (see, for example, Oliveira and Curi (2016)). Thus, it is not possible to re-estimate the equations with such measures.

[12] An example can help clarify this issue. Suppose that an agent, in April 2010, calculates his expectation about the Selic interest rate at the end of 2010. In this case we can say that the time horizon of the forecast is 9 months, because the monetary policy interest rates for January, February and March are already known. Along the same line of reasoning, when this agent calculates his interest rate expectation in September 2010 over the interest rate at the end of 2010, the time horizon of his forecast shrinks to just 4 months.

[13] Thus, the measure of disagreement observed in April 2010 for the value that the interest rate will assume at the end of 2010 tends to be larger than the measure of disagreement observed in September 2010 for the value that the same variable will assume in the end of 2010. The divergence measure tends to increase again in April 2011, once the current year becomes 2011 and the forecast time horizon becomes 8 months.

most papers in the literature resort to fixed-horizon forecasts where the forecast horizon does not vary over time (e.g., Mankiw et al., 2003; Patton and Timmermann, 2010; Dovern et al., 2012; Montes et al., 2016; Oliveira and Curi, 2016; Seelajaroen et al., 2020). Therefore, the conversion from fixed-event to fixed-horizon forecasts is performed by applying the following formula given by equation (2):

$$E_t X^{12(j+1)} = \frac{12-(m-1)}{12} E_t X^{a+j} + \frac{m-1}{12} E_t X^{a+j+1}, j = 0,1,2,3, \ldots \qquad (6)$$

where, m represents the month when the forecast was carried out (or the month containing the period t), and $E_t X^{12(j+1)}$ represents the average of the agents' expectations about the value that the variable X will assume at the end of the next $12(j+1)$ months. This formula is used to interpolate the minimum and maximum projections to calculate the disagreements in expectation (as well as the average expectations). At the end of the process, we derive a term structure of disagreement in expectations, which is composed of the "vertices" $Disag\_IR_{t^{12}}$, $Disag\_IR_{24}$, $Disag\_INF_{t^{12}}$, $Disag\_INF_{t^{24}}$, $Disag\_EXCH_{t^{12}}$ and $Disag\_EXCH_{t^{24}}$. As the CBB discloses forecasts for the current and the next four years, the formula above can be applied by taking *j* = 0,1,2,3,4. Therefore, we can always interpolate forecasts for the fixed time horizons of 12, 24, 36 and 48 months. In this study, interpolations are made to obtain fixed horizons of 12 and 24 months ahead.

The procedure described above is performed daily, allowing us to study the disagreements for each business day. Time series comprised of daily observations are converted to the monthly frequency by monthly averages. The conversion of fixed event forecasts into fixed horizon and the monthly frequency were applied to compute the disagreements in inflation, interest rate and exchange rate expectations for 12 and 24 months ahead. In the estimations, all series for the disagreements in inflation, interest rate and exchange rate expectations for 12 and 24 months ahead will be expressed in natural logarithm (*ln*).

Since the study uses data from January 2002 to December 2020, Figure 2 shows the behavior of the disagreements in inflation, interest rate and exchange rate expectations for 12 and 24 months ahead expressed in natural logarithm for this period. One can observe that high levels of disagreements in inflation, interest rate and exchange rate expectations for 12 and 24 months occurred at the end of 2002. This is a result of the so-called "Lula effect", in which the presidential elections of 2002 generated great uncertainty with the possibility of victory of the candidate Luiz Inácio Lula da Silva. However, after Lula's victory and with his demonstration of continuing with the policies previously adopted, the disagreements reduced. Between 2004 and 2015, we observe a period of greater convergence of expectations. From 2015, one can observe an increase in all disagreements, period that coincides with the deepening of the Brazilian fiscal crisis and with credibility deterioration.

Figure 2 Disagreements in inflation, interest rate and exchange rate expectations (12 and 24 months ahead)

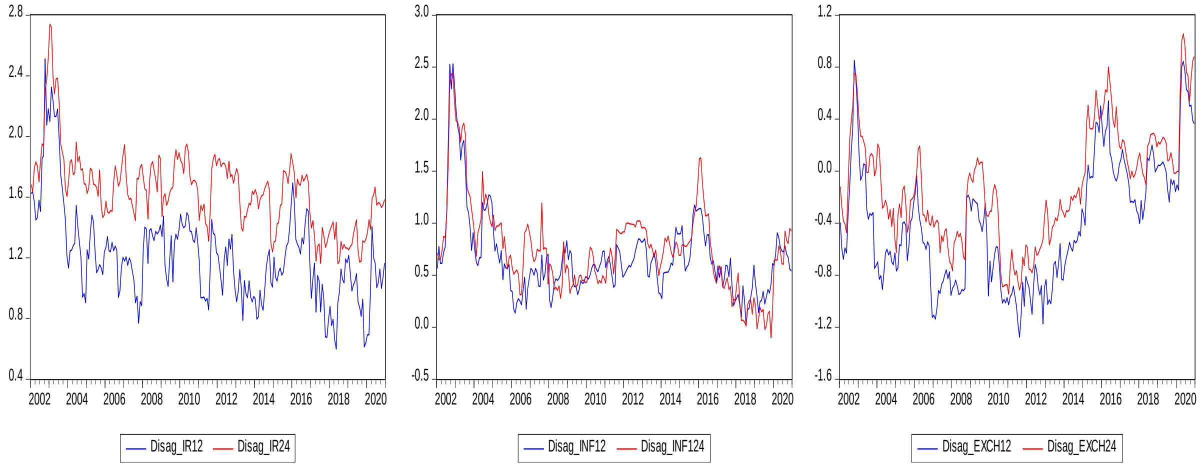

Table I presents the correlations between disagreements in expectations and monetary policy opacity. It is possible to observe that, except for the correlation between Disag_ECH_12 and OPAC_12, all other correlations are positive.

Table I Correlations

	12 months ahead		
Variables	Disag_IR_12	Disag_INF_12	Disag_EXCH_12
OPAC_12	0.450	0.253	-0.014
	24 months ahead		
Variables	Disag_IR_24	Disag_INF_24	Disag_EXCH_24
OPAC_24	0.291	0.376	0.377

The time series considered in the estimates have a monthly frequency and are available from the CBB's Time Series System. The control variables were determined based on the literature (e.g., Oliveira and Curi, 2016; Montes et al., 2016; Montes and Curi, 2017; Montes and Acar, 2018; Montes and Ferreira, 2019), and are formed by the following variables. Economic activity *(*GAP*)*is represented by the output gap. The output gap uses the real GDP to capture economic activity. Real GDP is calculated using the 12-months accumulated GDP (series 4382 obtained from the CBB), and the general price index (obtained from the IPEADATA website). The output gap series was obtained applying the Hamilton (2018) method. The volatilities of the variables related to the disagreements (i.e., IR_VOL, INF_VOL and EXCH_VOL) enter their respective control groups, thus, as in Oliveira and Curi (2016), volatilities were calculated as follows: Y_VOL_t = $(Y_t - Y_{t-1})^2$, where *Y* represents the inflation rate, the Selic interest rate, or the exchange rate. The monetary policy interest rate (SELIC) is the "Selic accumulated in the month in annual terms (%)" (Series 4189 obtained from the CBB); the inflation rate (IPCA) is the "National Consumer Price Index (IPCA), in 12 months, (%)" (Series 13522 obtained from the CBB); the exchange rate (EXCH) is the "Exchange rate - Free - US dollar (sale) - end of period - cmu/US$" (series 3696 obtained from the CBB). The credibility index (CRED) proposed by de Mendonça (2007) is used based on the literature (i.e., Oliveira an Curi (2016) analyzed the effects of monetary policy credibility on disagreements in expectations in Brazil).[14] Also, the models are also controlled for two important events that occurred: the global financial crisis (SUBPRIME) and the impact caused by the Covid-19 (COVID-19) outbreak in Brazil. Hence, to capture the effect of the global financial crisis, a dummy variable for the period was used. This variable (SUBPRIME) assumes a value equal to 1, from March 2008 to June 2009, and zero otherwise. In turn, to capture the impact caused by the Covid-19 outbreak, we use the monthly average of confirmed cases in Brazil as a way to measure this effect. The variables used in the study are expressed in natural logarithms, except SUBPRIME. Table A.I in the Appendix presents the descriptive statistics.

In order to avoid spurious regressions, the stationarity of the series is tested using the following unit root and stationarity tests: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). Based on the tests, we observe that the variables are stationary (see Table A.II in the Appendix).

In turn, the empirical strategy to verify the impact of *OPAC* on the disagreements in inflation, interest rate and exchange rate expectations, we follow the literature (e.g., Mankiw et al., 2003) and consider the following econometric model:

$$DISAG\_X_t = \gamma_0 + \gamma_1 VOL\_X_t + \gamma_2 OPAC_t + \gamma_3 Z_t + e_t \tag{7}$$

where, *DISAG_X* denotes the disagreement in expectations about the interest rate, the inflation rate, or the exchange rate; *Z* is a set of control variables; and e_t is the error term.

[14] Both credibility and transparency of monetary policy are important aspects for the expectations formation process and, consequently, for the conduct of monetary policy. However, if, on the one hand, the monetary policy opacity results from an information asymmetry problem, and thus it is related to the low ability of agents' forecast regarding the future value of the monetary policy interest rate; on the other hand, credibility is related to the expectation that inflation will converge to the inflation target, as well as to the fact that the central bank has consistently guaranteed inflation compatible with the target. In this sense, the credibility is associated with the public's perception of the central bank's commitment to the goals of low and stable inflation, while the transparency analyzed in the study is related to the public's expectation about the future value of the main monetary policy instrument, that is, whether the public is able to accurately deduce the future actions of the central bank.

We estimate the models using two different methods: ordinary least squares (OLS) and the generalized method of moments (GMM), both with Newey-West covariance matrix (Newey and West, 1987) to deal with autocorrelation and heteroscedasticity problems. While OLS estimates are susceptible to endogeneity problems, GMM provides consistent estimates (Wooldridge, 2001; Hall, 2005 and 2015) and allows one to verify whether the results obtained by OLS are preserved. Therefore, GMM is used to deal with endogeneity problems.

According to Wooldridge (2002), the endogeneity problem occurs (in general) due to the omission of variables, simultaneity and measurement errors. Our analysis might be subject, for instance, to the omission of variables and simultaneity. When a variable is omitted from the model, it ends up being incorporated into the error. If this omitted variable is correlated with other regressors (which is not uncommon), then there will be a correlation between the explanatory variable and the error term. Since not all determinants of disagreements in expectations are known and measured, the omitted variable problem can affect the model. In relation to the simultaneity problem, its cause is because the explanatory variable is determined simultaneously with the dependent variable (which, in our model, is the case of *OPAC*). In the analyzed models, there exists the possibility of the occurrence of both problems. The reason is that there is an impossibility to know and measure all the variables that affect disagreements, and the measure related to *OPAC* could be influenced by disagreements, which, in turn, validates the hypothesis of simultaneity.[15]

According to Cragg (1983), overidentification has an important role in the selection of instrumental variables to improve the efficiency of the estimators. Therefore, a standard J-test was performed aiming at testing this property for the validity of the overidentifying restrictions, i.e., the J-statistic indicates whether the orthogonality condition is satisfied. Finally, to analyze the endogeneity of the equation regressors, we report the results of the Durbin–Wu–Hausman test.

4. Estimates

Table II shows the estimates for the disagreements in interest rate expectations (*Disag_IR_12* and *Disag_IR_24*). All coefficients for monetary policy opacity (*OPAC_12* and *OPAC_24*) are positive and statistically significant. Hence, the estimates show that the higher the monetary policy opacity, the larger the disagreement in interest rate expectations, but the relation is stronger for a shorter time horizon. In relation to the control variables, the volatility of the interest rate increases the disagreement in interest rate expectations. Monetary policy credibility, on the other hand, reduces the disagreements in interest rate expectations. All coefficients for *CRED* are negative and significant. From a theoretical standpoint, this outcome makes sense, because as agents gain confidence in the conduct of monetary policy, uncertainty in relation to monetary policy is supposed to decrease. Estimates for the output gap show that the larger the gap, the higher the disagreement in interest rate expectations. Finally, the effects of the Subprime crisis and the crisis caused by the COVID-19 outbreak have a common impact of increasing the disagreements in interest rate expectations.

Table III shows the estimates for the disagreements in inflation expectations (*Disag_INF_12* and *Disag_INF_24*). Monetary policy opacity (*OPAC_12* and *OPAC_24*) is positively related to disagreements in inflation expectations and, thus, to uncertainty with respect to inflation. OLS and GMM estimates exhibit positive and significant coefficients at the 1% level for *OPAC_12* and *OPAC_24*. The coefficients have a higher value when a longer time horizon is considered, suggesting opacity has a greater effect on disagreement in inflation expectations for a larger forecast horizon, implying greater inflation uncertainty. Regarding control variables, inflation volatility presents positive and significant coefficients, suggesting when volatility increases, inflation uncertainty (*Disag_INF)* also increases. This result is consistent with the findings presented by the literature. Another important result regards monetary policy credibility. All coefficients are negative and significant at the 1% level of significance.

[15] To deal with such problems, we follow the methodology of Johnston (1984) to select the instruments on GMM estimation, i.e., the instruments were dated to the period t-1 or earlier to assure the exogeneity. Table A.III in the Appendix shows the instruments used in GMM estimates reported in Tables II, III and IV.

Thus, estimates show that the more credible monetary policy is, the lesser the disagreement in inflation expectations. Furthermore, SUBPRIME and COVID-19 variables show positive coefficients, suggesting a positive relation with inflation uncertainty. Regarding the output gap, only the coefficient obtained by GMM for the 24-month horizon is positive and significant.

Table IV shows estimates the disagreements in exchange rate expectations (*Disag_EXCH_12* and *Disag_EXCH_24*). Monetary policy opacity (*OPAC_12* and *OPAC_24*) has positive relations with *Disag_EXCH_12* and *Disag_EXCH_24*. All *OPAC* coefficients are positive and significant. Hence, as monetary policy opacity increases, disagreements in exchange rate expectations increase. Also, when a longer time horizon is evaluated, the coefficients have a higher value, demonstrating that opacity has a stronger influence on disagreement in exchange rate predictions for a longer forecast horizon, reflecting greater exchange rate uncertainty. The estimates also show positive relations between exchange rate volatility and disagreements in exchange rate expectations. In turn, the coefficients for the output gap are negative, suggesting that output gap increases can reduce disagreements in exchange rate expectations. Although the coefficients for the subprime crisis were not significant, the COVID-19 variable had positive and significant coefficients, suggesting the pandemic's effects on rising exchange rate uncertainty. Finally, the credibility coefficient was not significant for the 12-month disagreement in exchange rate expectations, but it was positive and significant for the 24-month disagreement in exchange rate expectations.

Analyzing the economic impacts of monetary policy opacity on the disagreements in interest rate expectations, we observe that a 1% increase in opacity (*OPAC_12*) increases *Disag_IR_12*, on average, by 0.063% and, a 1% increase in opacity (*OPAC_24*) increases *Disag_IR_24*, on average, by 0.043%. Regarding disagreements in inflation expectations, the results indicate that a 1% increase in opacity (*OPAC_12*) increases *Disag_INF_12*, on average, by 0.039%, and a 1% increase in opacity (*OPAC_24*) increases *Disag_INF_24*, on average, by 0.094%. Finally, with respect to disagreements in exchange rate expectations, we observe that a 1% increase in both *OPAC_12* and *OPAC_24* increases *Disag_EXCH_12* and *Disag_EXCH_24* by 0.024% and 0.067%, respectively. In relation to 12 months ahead variables, the most affected disagreement in expectation is the one related to interest rate, followed by the one related to inflation, and, finally, by the disagreement in exchange rate expectations. On the other hand, in relation to 24 months ahead variables, we observe that the disagreement in inflation expectations is the most affected by opacity, followed by the disagreement in exchange rate expectations, and, finally, by the disagreement in interest rate expectations.

Table II OLS and GMM estimations for OPAC and disagreement in interest rate expectations

Dependent Variable: Disag_IR				
Variables	OLS - 12	OLS - 24	GMM - 12	GMM - 24
C	1.568***	1.877***	1.661***	2.020***
	(0.11)	(0.08)	(0.09)	(0.08)
IR_VOL	0.268***	0.233**	0.257***	0.249***
	(0.09)	(0.10)	(0.06)	(0.06)
OPAC_12	0.054***		0.073***	
	(0.01)		(0.01)	
OPAC_24		0.036***		0.050***
		(0.01)		(0.01)
CRED	-0.565***	-0.531***	-0.698***	-0.755***
	(0.16)	(0.14)	(0.14)	(0.13)
GAP	0.447	1.745***	0.510	2.559***
	(0.74)	(0.57)	(0.56)	(0.45)
SUBPRIME	0.166*	0.165***	0.683**	0.115
	(0.08)	(0.05)	(0.33)	(0.27)
COVID-19	0.016	0.004	0.026***	0.004
	(0.00)	(0.00)	(0.01)	(0.01)
Adj. R^2	0.39	0.33	0.18	0.30
ARCH(1) test	77.49	165.80		
Prob. ARCH(1) test	0.00	0.00		
LM(1) test	260.72	373.12		
Prob. LM(1) test	0.00	0.00		
F-statistic	24.82	19.16		
Prob. F-statistic	0.00	0.00		
Observations	277	227	221	219
RANK			30	31
J-statistic			28.71	19.36
p-value(J-stat)			0.19	0.73
DWH test			2.15	7.95
DWH p-value			0.90	0.33

Note: Marginal significance levels: *** Denotes p-value<0.01; ** Denotes p-value <0.05; * Denotes p-value <0.1. Robust (Newey-West) standard errors are in parentheses.

Table III OLS and GMM estimations for OPAC and disagreement in inflation expectations

Dependent Variable: Disag_INF				
Variables	OLS - 12	OLS - 24	GMM - 12	GMM - 24
C	1.402***	1.498***	1.551***	1.970***
	(0.19)	(0.16)	(0.16)	(0.10)
INF_VOL	0.035***	0.024*	0.079***	0.074***
	(0.01)	(0.01)	(0.02)	(0.01)
OPAC_12	0.045***		0.033**	
	(0.01)		(0.01)	
OPAC_24		0.074***		0.115***
		(0.02)		(0.01)
CRED	-1.118***	-1.207***	-1.361***	-1.882***
	(0.25)	(0.25)	(0.22)	(0.18)
GAP	-0.439	0.922	1.177	4.487***
	(0.81)	(0.90)	(0.86)	(0.57)
SUBPRIME	0.077	0.009	0.481*	0.514
	(0.10)	(0.08)	(0.26)	(0.35)
COVID-19	0.023**	0.012	0.020**	0.024***
	(0.01)	(0.01)	(0.01)	(0.01)
Adj. R^2	0.47	0.47	0.38	0.35
ARCH(1) test	370.04	203.98		
Prob. ARCH(1) test	0.00	0.00		
LM(1) test	391.15	422.34		
Prob. LM(1) test	0.00	0.00		
F-statistic	34.09	34.82		
Prob. F-statistic	0.00	0.00		
Observations	227	227	221	220
RANK			32	31
J-statistic			24.02	28.96
p-value(J-stat)			0.51	0.22
DWH test			1.04	2.03
DWH p-value			0.98	0.92

Note: Marginal significance levels: *** Denotes p-value<0.01; ** Denotes p-value <0.05; * Denotes p-value <0.1. Robust (Newey-West) standard errors are in parentheses.

Table IV OLS and GMM estimations for OPAC and disagreement in exchange rate expectations

Dependent Variable: Disag_EXCH				
Variables	OLS - 12	OLS - 24	GMM - 12	GMM - 24
C	0.103	0.383***	0.416**	0.864***
	(0.14)	(0.10)	(0.18)	(0.13)
EXCH_VOL	0.061***	0.043***	0.158***	0.133***
	(0.01)	(0.00)	(0.02)	(0.02)
OPAC_12	0.029*		0.020*	
	(0.01)		(0.01)	
OPAC_24		0.067***		0.067***
		(0.01)		(0.02)
CRED	0.151	0.014	0.829***	0.285*
	(0.18)	(0.14)	(0.14)	(0.15)
GAP	-6.422***	-5.049***	-7.544***	-5.178***
	(0.82)	(0.73)	(0.89)	(1.06)
SUBPRIME	-0.093	0.041	-0.284	0.236
	(0.06)	(0.10)	(0.23)	(0.39)
COVID-19	0.107***	0.100***	0.046***	0.048***
	(0.01)	(0.01)	(0.01)	(0.01)
Adj. R^2	0.56	0.60		
ARCH(1) test	76.21	76.92		
Prob. ARCH(1) test	0.00	0.00		
LM(1) test	188.98	269.08		
Prob. LM(1) test	0.00	0.00		
F-statistic	49.06	56.92		
Prob. F-statistic	0.00	0.00		
Observations	227	227	218	221
RANK			31	31
J-statistic			25.55	23.55
p-value(J-stat)			0.37	0.48
DWH test			2.96	6.41
DWH p-value			0.88	0.37

Note: Marginal significance levels: *** Denotes p-value<0.01; ** Denotes p-value <0.05; * Denotes p-value <0.1. Robust (Newey-West) standard errors are in parentheses.

Although the specifications presented use controls to both crises (*SUBPRIME* and *COVID-19*), a little caveat is that these variables capture the effects of the crises specifically for the Brazilian case. Since external shocks can explain the disagreements in expectations, thus, to check robustness, we estimate the regressions by substituting both *SUBPRIME* and *COVID-19* variables for the VIX index (since VIX is basically unrelated to the Brazilian economy).[16] Table A.II in the appendix (unit root tests) indicates that stationarity conditions apply to the VIX. The results of the regressions are presented in Table A.IV in the Appendix.[17] In general, the estimates reinforce the findings already reported for the analyzed relations of interest, i.e., the analyzed disagreements in expectations are positively related to monetary policy opacity. Regarding the VIX, the estimates reveal, as expected, positive and significant coefficients when the dependent variables are *Disag_IR* and *Disag_INF*. However, for *Disag_EXCH*, the coefficients for the VIX are not significant.

5. Concluding Remarks

Disagreements in expectations about inflation, interest rate and exchange rate reflect uncertainties about the goals of the central bank and the conduct of their policies. Such uncertainties, and the consequent disagreement in expectations, in part, result from the information asymmetry about monetary policy, and therefore, the lack of transparency in relation to monetary policy. The importance of monetary policy transparency has been pointed out by several academics, policymakers, and central bankers as fundamental to reduce information asymmetries and guide expectations about both monetary policies and inflation.

To the extent that disagreements in expectations can generate negative effects on the economy, this study investigated the relations between monetary policy opacity and disagreements in expectations about interest rate, inflation, and exchange rate.

As a novelty, the paper developed a new monetary policy opacity index in order to overcome the low frequency limitation and the unavailability for different time horizons related to existing monetary policy transparency indicators. Using forecasting errors for the monetary policy interest rate, we calculated a monetary policy opacity index based on the idea of signal-to-noise ratio, and we used this index considering two different time horizons (12 and 24 months ahead) to investigate the relations between monetary policy opacity and disagreements in expectations.

In general, estimates suggest monetary policy opacity is positively related to disagreements in expectations about variables under the CBB's control, i.e., the findings point to the same direction: monetary policy opacity raises the disagreements in expectations. We also observed that the disagreement in interest rate expectations 12 months ahead is the most affected by monetary policy opacity, while the disagreement in inflation expectations 24 months ahead is the most affected by monetary policy opacity. Furthermore, the results for the control variables are consistent with what is expected from a theoretical standpoint, as well as with the findings of other studies in the literature on disagreement in expectations.

Hence, this study highlights the importance of transparency in the conduct of monetary policy to reduce uncertainties in the economy and to better guide expectations.

The results allow us to presume that monetary policy transparency represents an important tool for policymakers (in general) and central bankers (in particular) committed to sound macroeconomic policies and aiming at guiding expectations. One of the main aspects of transparency is the effect on expectations. When central banks are not committed to their goals and policies, they tend to become opaque, increasing information asymmetries and creating uncertainties in the economy. Therefore, the increase in monetary policy transparency represents a fundamental aspect to reduce uncertainties and improve the expectations formation process. In this sense, the monetary authority may have gains in reducing uncertainties in the economy as monetary policy becomes more transparent.

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[16] Like the other variables, the VIX is estimated using the series in natural logarithm (ln).

[17] Table A.V in the Appendix shows the instruments used in GMM estimates reported in Table A.IV.

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Appendix

Table A.I Descriptive statistics

	DISAG_IR_12	DISAG_IR_24	DISAG_INF_12	DISAG_INF_24	DISAG_EXCH_12	DISAG_EXCH_24	IR_VOL	INF_VOL	EXCH_VOL	OPAC_12	OPAC_24	CRED	GAP	COVID	SUBPRIME
Mean	1.21	1.65	0.67	0.76	-0.41	-0.11	0.15	-3.18	-5.95	-3.50	-2.57	0.41	0.02	0.26	0.07
Median	1.18	1.66	0.60	0.73	-0.46	-0.13	0.05	-2.94	-5.64	-3.12	-2.19	0.46	0.02	0.00	0.00
Maximum	2.51	2.74	2.53	2.44	0.85	1.06	1.97	2.17	-1.22	0.00	0.00	0.69	0.11	6.97	1.00
Minimum	0.60	1.16	0.02	-0.10	-1.28	-0.95	0.00	-9.21	-15.20	-11.51	-12.36	0.00	-0.13	0.00	0.00
Std. Dev.	0.31	0.26	0.41	0.44	0.47	0.43	0.29	2.26	2.36	2.22	2.05	0.22	0.04	1.27	0.25
Observations	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227

Table A.II Unit root tests

Series	ADF				PP				KPSS			
	Eq.	Lag	Test	10%	Eq.	Band	Test	10%	Eq.	Band	LM-stat	1%
DISAG_EXCH_12	None	0	-1.8162	-1.6158	None	4	-1.8985	-1.6158	I	11	0.687	0.739
DISAG_EXCH_24	None	1	-2.6046	-1.6158	None	8	-1.8218	-1.6158	I	11	0.623	0.739
DISAG_IPCA_12	I	0	-2.8074	-2.5735	I	5	-3.2188	-2.5735	I	11	0.451	0.739
DISAG_IPCA_24	I	0	-2.5857	-2.5735	I	1	-2.7496	-2.5735	I	11	0.600	0.739
DISAG_SELIC_12	I	0	-3.6905	-2.5735	I	3	-3.6025	-2.5735	I+T	11	0.113	0.216
DISAG_SELIC_24	I	0	-3.1757	-2.5735	I	3	-3.2507	-2.5735	I+T	10	0.066	0.216
LN_CRED	I	2	-2.7968	-2.5736	I	4	-3.2871	-2.5735	I	11	0.177	0.739
LN_GAP	None	8	-2.7023	-1.6157	None	2	-3.9405	-1.6158	I+T	10	0.145	0.216
LN_OPAC_12	None	0	-2.6853	-1.6158	None	8	-2.0951	-1.6158	I+T	9	0.117	0.216
LN_OPAC_24	None	0	-2.6528	-1.6158	None	3	-2.4457	-1.6158	I	10	0.611	0.739
LN_VOL_EXCH	I	0	-10.063	-2.5736	None	1	-2.7272	-1.6158	I	8	0.522	0.739
LN_VOL_IPCA	None	4	-1.8475	-1.6157	None	7	-5.5273	-1.6158	I	8	0.304	0.739
LN_VOL_SELIC	None	7	-2.3503	-1.6157	None	7	-4.9038	-1.6158	I	8	0.652	0.739
LN_VIX	I	0	-4.496	-2.5735	I	3	-4.244	-2.5735	I	11	0.171	0.739

Table A.III List of instruments (Tables II, III and IV)

Table II	GMM-12	disag_selic_12(-1 to -5) ir_vol(-1 to -2) opac_12(-1 to -5) cred(-1 to -4) gap(-1 to -7) covid(-1 to -6)
	GMM-24	disag_selic_24(-1 to -2) ir_vol(-1 to -8) opac_24(-1) cred(-1 to -6) gap(-1 to -6) covid(-1 to -8)
Table III	GMM-12	disag_inf_12(-1 to -6) inf_vol(-1 to -4) opac_12(-1 to -4) cred(-1 to -7) gap(-1 to -6) covid(-1 to -4)
	GMM-24	disag_inf_24(-1) inf_vol(-1 to -7) opac_24(-1 to -7) cred(-1 to -4) gap(-1 to -4) covid(-1 to -7)
Table IV	GMM-12	disag_exch_12(-1 to -4) exch_vol(-1 to -3) opac_12(-1 to -5) cred(-1 to -10) gap(-1 to -6) covid(-1 to -3)
	GMM-24	disag_exch_24(-1 to -3) exch_vol(-1 to -5) opac_24(-1 to -4) cred(-1 to -7) gap(-1 to -5) covid(-1 to -6)

Table A.IV Estimations for OPAC and disagreements in expectations (IR, INF and EXCH)

Dependent Variable:	Disag_IR_12	Disag_IR_24	Disag_IR_12	Disag_IR_24	Disag_INF_12	Disag_INF_24	Disag_INF_12	Disag_INF_24	Disag_EXCH_12	Disag_EXCH_24	Disag_EXCH_12	Disag_EXCH_24
Variables	OLS	OLS	GMM	GMM	OLS	OLS	GMM	GMM	OLS	OLS	GMM	GMM
C	0.613***	1.248***	0.439***	1.889**	0.424**	0.958***	0.532***	1.235***	-0.078	0.408	0.430*	1.133***
	(0.17)	(0.14)	(0.17)	(0.07)	(0.19)	(0.20)	(0.17)	(0.19)	(0.29)	(0.27)	(0.24)	(0.27)
IR_VOL	0.196**	0.210**	0.164**	0.206***								
	(0.07)	(0.08)	(0.06)	(0.06)								
INF_VOL					0.036***	0.025*	0.060***	0.055***				
					(0.01)	(0.01)	(0.02)	(0.02)				
EXCH_VOL									0.072***	0.055***	0.157***	0.141***
									(0.01)	(0.01)	(0.02)	(0.02)
OPAC_12	0.063***		0.095***		0.050***		0.063***		0.021		0.017*	
	(0.01)		(0.02)		(0.01)		(0.02)		(0.01)		(0.01)	
OPAC_24		0.033***		0.038***		0.075***		0.104***		0.066***		0.060***
		(0.01)		(0.01)		(0.01)		(0.02)		(0.01)		(0.02)
CRED	-0.480***	-0.473***	-0.470***	-0.715***	-1.047***	-1.177***	-1.246***	-1.692***	0.235	0.122	0.745***	0.337**
	(0.12)	(0.12)	(0.12)	(0.10)	(0.20)	(0.22)	(0.14)	(0.16)	(0.18)	(0.13)	(0.11)	(0.14)
GAP	0.215	1.685***	0.178	2.64***	-0.615	0.885	-0.210	3.593***	-6.979	-5.702***	-8.163***	-6.351***
	(0.66)	(0.53)	(0.63)	(0.56)	(0.78)	(0.89)	(0.73)	(0.81)	(0.81)	(0.75)		(0.89)
VIX	0.339***	0.212***	0.439***	0.005**	0.340***	0.186**	0.370***	0.217***	0.076	0.016	0.002	-0.080
	(0.05)	(0.05)	(0.06)	(0.002)	(0.09)	(0.08)	(0.06)	(0.06)	(0.10)	(0.09)	(0.08)	(0.08)
Adj. R^2	0.52	0.40	0.46	0.36	0.56	0.50	0.58	0.52	0.49	0.52	0.29	0.30
ARCH(1) test	39.82	117.95			276.01	174.31			68.24	110.50		
Prob. ARCH(1) test	0.00	0.00			0.00	0.00			0.00	0.00		
LM(1) test	142.17	276.00			282.17	378.60			183.35	235.49		
Prob. LM(1) test	0.00	0.00			0.00	0.00			0.00	0.00		
F-statistic	50.47	30.59			58.12	46.01			44.12	50.11		
Prob. F-statistic	0.00	0.00			0.00	0.00			0.00	0.00		
Observations	227	227	222	220	227	227	222	221	227	227	218	222
RANK			26	30			27	28			34	30
J-statistic			29.92	22.48			24.61	29.21			29.17	27.14
p-value(J-stat)			0.07	0.55			0.26	0.14			0.40	0.30
DWH test			4.82	4.70			1.26	1.10			3.52	4.20
DWH p-value			0.44	0.58			0.94	0.95			0.62	0.52

Note: Marginal significance levels: *** Denotes p-value<0.01; ** Denotes p-value <0.05; * Denotes p-value <0.1. Robust (Newey-West) standard errors are in parentheses.

Table A.V List of instruments (Table A.IV)

Table A.IV	IR	GMM-12	*DISAG_IR_12(-1 to -6) IR_VOL(-1 to -4) OPAC_12(-1 to -5) CRED(-1 to -6) GAP(-1) VIX(-1 to -3)*
		GMM-24	*DISAG_IR_24(-1 to -6) IR_VOL(-1 to -7) OPAC_24(-1 to -3) CRED(-1 to -7) GAP(-1 to -6) VIX(-1 to -1)*
	INF	GMM-12	*DISAG_INF_12(-1 to -6) INF_VOL(-1 to -4) OPAC_12(-1 to -4) CRED(-1 to -3) GAP(-1 to -6) VIX(-1 to -3)*
		GMM-24	*DISAG_INF_24(-1 to -2) INF_VOL(-1 to -6) OPAC_24(-1 to -6) CRED(-1 to -4) GAP(-1 to -4) VIX(-1 to -5)*
	EXCH	GMM-12	*DISAG_EXCH_12(-1 to -4) INF_EXCH(-1 to -4) OPAC_12(-1 to -5) CRED(-1 to -10) GAP(-1 to -6) VIX(-1 to -4)*
		GMM-24	*DISAG_EXCH_24(-1 to -4) INF_EXCH(-1 to -5) OPAC_24(-1 to -5) CRED(-1 to -5) GAP(-1 to -5) VIX(-1 to -5)*