Do monetary policy credibility and disagreements in inflation and interest rate expectations affect business confidence? Evidence from an inflation targeting developing country

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Abstract

Purpose – Business confidence is crucial to firm decisions, but it is deeply related to professional forecasters' expectations. Since Brazil is an important inflation targeting country, this paper investigates whether monetary policy credibility and disagreements in inflation and interest rate expectations relate to business confidence in Brazil. The study considers the aggregate business confidence index and the business confidence indexes for 11 industrial sectors in Brazil.

Design/methodology/approach – The authors run ordinary least squares and generalized method of moments regressions to assess the direct effects of disagreements in expectation and monetary policy credibility on business confidence. The authors also make use of Wald test of parameter equality to observe whether there are "offsetting effects" of monetary credibility in mitigating the effects of both disagreements in expectations on business confidence. Besides, the authors run quantile regressions to analyze the effect of the main explanatory variables of interest on business confidence in contexts where business confidence is low (pessimistic) or high (optimistic).

Findings – Disagreements in inflation expectations reduce business confidence, monetary policy credibility improves business confidence and credibility mitigates the adverse effects of disagreements in expectations on business confidence. The sectors most sensitive to monetary policy credibility are Rubber, Motor Vehicles, Metallurgy, Metal Products and Cellulose. The findings also suggest the effect of disagreement in inflation expectations on business confidence decreases as confidence increases, and the effect of monetary policy credibility on business confidence increases as entrepreneurs are more optimistic.

Originality/value – While there is evidence that monetary policy credibility is beneficial to the economy, there are no studies on the effects of disagreements in inflation and interest rate expectations on business confidence (at the aggregate and sectoral levels). Besides, there are no studies that have investigated whether monetary policy credibility can mitigate the effects of disagreements in inflation and interest rate expectations on business confidence (at the aggregate and sectoral levels). Therefore, there are gaps to be filled in the literature addressing business confidence, monetary policy credibility and disagreements in expectations. These issues are particularly important to inflation targeting developing countries.

Keywords Business confidence, Disagreement, Expectation, Inflation, Interest rate, Credibility

Paper type Research paper

JEL Classification — E32, E66, M21

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1. Introduction

Inflation-targeting (IT) central banks care about monetary policy credibility due to the stabilizing outcomes it provides in the economy, facilitating the expectations formation process and creating confidence in private agents in relation to a country's macroeconomic performance (Montes and Curi, 2016; de Mendonça and Tiberto, 2017; de Mendonça and Almeida, 2019; Montes and Ferreira, 2019; de Mendonça and Finn, 2022). If, on the on hand, monetary policy credibility is a desirable aspect to IT central banks since it helps in the task of guiding private agents' expectations, strengthening the confidence of these agents in relation to a country's economy; on the other hand, disagreements in expectations about both inflation and the monetary policy interest rate are undesirable aspects for IT central banks once they reflect uncertainties regarding the conduct of monetary policy and central banks' goals (Oliveira and Curi, 2016; Montes and Ferreira, 2018).

Monetary policy credibility is a forward-looking concept directly related with inflation expectations, which reflects the belief by the public in the probability of a successful execution of a monetary policy to control inflation (de Mendonça, 2018). The importance of credibility to central banks is related to the ability in reducing the sacrifice ratio and social costs during a disinflation process because disinflation can be reached through a decrease in inflation expectations without the adoption of a tough monetary policy. In a context of high monetary policy credibility, inflation can be reduced with lower costs to the extent that the public believes that the central bank can reach the announced inflation target (de Mendonça, 2018). Thus, credibility is important for the creation of a stable macroeconomic environment and for the development of more optimistic expectations and confidence in relation to the economy.

With respect to disagreements in expectations, Mankiw *et al.* (2003) argue that "not everyone has the same expectations" and, thus, it is quite reasonable to assume that there is divergence among agents' forecasts. Hence, studies on disagreements in expectations focus on the fact that expectations formed for different economic variables differ among agents (Mankiw *et al.*, 2003; Oliveira and Curi, 2016; Montes and Curi, 2017). Although several studies seek to understand the determinants of disagreements, the literature investigating the consequences of disagreements in expectations on the economy is scarce.

Disagreements in inflation and interest rate expectations represent concepts contrary to some goals of the IT regime, which are to reduce uncertainties about both future inflation and interest rates and to guide inflation expectations to the inflation target. Guiding the market participants' expectations about future inflation and interest rates is a key task of IT central banks aiming at creating a stable macroeconomic environment able to positively impact business confidence.

Since private investment and production decisions are influenced by business confidence [1], studies seek to identify and analyze the determinants of business confidence (e.g. Konstantinou and Tagkalakis, 2011; Montes and Bastos, 2013; Khumalo, 2014; Martinez-Serna and Navarro, 2015; Montes and Nogueira, 2022). The literature indicates that business confidence is affected by macroeconomic variables (such as output, inflation and interest rates), and it suggests that economic policies that seek to maintain a stable macroeconomic environment improve business confidence (Montes and Bastos, 2014; Ilut and Saijo, 2021). Once monetary policy credibility improvements can strength macroeconomic stability and create optimistic expectations about the performance of the economy, we can expect a direct relationship between monetary policy credibility and business confidence (as found by de Mendonça and Almeida (2019), de Mendonça and Finn (2022), Montes and Nogueira (2022)). In turn, since disagreements in inflation and interest rate expectations reveal uncertainties about the conduct of monetary policy and the IT regime to guide inflation expectations to the target, suggesting macroeconomic instabilities, one can expect inverse relationships between disagreements in inflation and interest rate expectations with business confidence.

While there is evidence that monetary policy credibility is beneficial to the economy (and to business confidence), there are no studies on the effects of disagreements in inflation and interest rate expectations on business confidence (at the aggregate and sectoral levels). Besides, there are no studies that have investigated whether monetary policy credibility can mitigate the effects of disagreements in inflation and interest rate expectations on business confidence (at the aggregate and sectoral levels). Therefore, there are gaps to be filled in the literature addressing business confidence, monetary policy credibility and disagreements in expectations.

Thus, considering an important IT developing country (Brazil), this paper aims at contributing to the literature by investigating: (1) the effect of monetary policy credibility on business confidence; (2) the effects of disagreements in inflation and interest rate expectations on business confidence; (3) whether monetary policy credibility can mitigate the effects of disagreements in inflation and interest rate expectations on business confidence and; (4) whether these effects change when we use business confidence indexes at both the aggregate and sectoral levels.

Regarding the literature on business confidence, and the relationships investigated after the adoption of the IT regime in Brazil, the existing studies analyzed: the effect of macroeconomic variables and economic policies on expectations and confidence of entrepreneurs (Montes and Bastos, 2013), the influence of the Central Bank's communication on business confidence (Montes and Cidad, 2016), the direct effect of monetary policy credibility on business confidence (de Mendonça and Almeida, 2019), the "offsetting effect" that monetary policy credibility has in mitigating the harmful effects of the increase in electricity price on business confidence (de Mendonça and Finn, 2022), the effects of political uncertainty and economic policy uncertainty on business confidence (Montes and Nogueira, 2022). Hence, with respect to relationships analyzed, and the existing literature, our paper is completely different to the extent that it analyzes the effects of disagreements in inflation and interest rate expectations on business confidence, and it verifies whether monetary policy credibility can mitigate the effects of these disagreements on business confidence. To our knowledge, no study has analyzed these relationships for the Brazilian case and for other countries. Therefore, our study is the first to empirically address these relationships.

Most studies mentioned above use aggregate business confidence indexes in their empirical analysis. However, the study by de Mendonça and Finn (2022) uses business confidence indexes at the aggregate and sectoral levels (i.e. for 11 industrial sectors with higher electricity consumption) to observe the "offsetting effect" that credibility can have in mitigating the harmful effects of the increase in electricity price on business confidence. Our study is the second to use business confidence indexes at the aggregate and sectoral levels (considering the same 11 industrial sectors analyzed by de Mendonça and Finn (2022)). But our analyzes differ from those provided by de Mendonça and Finn (2022) once we check the direct effects of disagreements in inflation and interest rate expectations on business confidence, as well as the "offsetting effect" that monetary credibility can have in mitigating the effects of these disagreements on business confidence.

The study uses monthly data from the Brazilian economy from January 2010 to January 2020. Brazil is an interesting case to understand the effects of disagreements in expectations and credibility on the economy because, besides being the largest emerging market in Latin America, it has adopted an IT regime since 1999 and offers a large database of expectations about monetary policy-related variables. The dataset corresponds to the period when the effects from the 2007–2008 global financial crisis have largely dissipated and predate the Covid-19 economic crisis. We use as a measure for business confidence the index released by the National Confederation of Industry (CNI). This indicator offers two main advantages: (1) it allows us to observe whether the entrepreneur is pessimistic (index below 50) or optimistic

(index above 50); and (2) it is released for several industrial sectors in Brazil, which allows for a more specific (sectoral) analysis. Regarding credibility, we use the indicator developed by de Mendonça (2007). The indicator is of direct interpretation and shows how much inflation expectations diverge from the inflation target. The series of disagreements in interest rate and inflation expectations are calculated based on the literature (e.g. Montes *et al.*, 2016; Montes and Ferreira, 2018), from a survey of expectations provided by the Central Bank of Brazil [2].

With respect to the econometric strategy, the analysis is based on time-series methodology. We run ordinary least squares (OLS) and generalized method of moments (GMM) regressions to assess the direct effects of disagreements in expectation and monetary policy credibility on business confidence. A novelty in the econometric aspect is the use of Wald test of parameter equality to observe whether there are "offsetting effects" of monetary credibility in mitigating the effects of both disagreements in expectations on business confidence. Besides, different from existing studies, thus representing another novelty, is the use of quantile regressions to analyze the effect of the main explanatory variables of interest on business confidence in contexts where business confidence is low (pessimistic) or high (optimistic). Quantile regressions were performed for the aggregate business confidence index and for the business confidence indexes of the 11 sectors.

The use of different specifications and methods allowed robust and interesting results. The results show that there is a negative and significant impact of disagreement in inflation expectations on business confidence. On the other hand, the estimates reveal that monetary policy credibility improvements increase business confidence. Moreover, the parameter equality test allowed us to observe that monetary policy credibility can compensate for the loss of confidence caused by disagreements in expectations. The results remain when the relations are analyzed at the sectoral level. In turn, based on quantile regressions, it was possible to observe that the state of confidence (more pessimistic or more optimistic) is important for the magnitude of the effects and significance of the coefficients related to the variables of interest. Thus, in contexts where business confidence is very low, the effects of disagreements in inflation expectations tend to be more damaging to business confidence and vice-versa. On the other hand, the effect of monetary policy credibility is greater as entrepreneurs are optimistic.

2. Data and methodology

The analysis covers the period from January 2010 to January 2020. The period was chosen to avoid the effects of shocks caused by the international financial crisis and the coronavirus pandemic in 2020.

Entrepreneurs' expectations about the future of the economy and their business, reflected in business confidence indicators, have shown an important predictive ability of macroeconomic performance (Taylor and McNabb, 2007; Konstantinou and Tagkalakis, 2011). Due to the need to group diverse information to measure business confidence, in general, the construction of indicators for this purpose considers surveys carried out with entrepreneurs. Business confidence indicators can explain investment decisions, economic activity and the business cycle and inventory for different industries (Salhin *et al.*, 2016; Khan and Upadhayaya, 2020).

In the Brazilian case, the three best-known business confidence indicators are: the Industrial Business Confidence Index, provided by the National Confederation of Industry (CNI); the Business Confidence Index, provided by the Organization for Economic Cooperation and Development (OECD); and the Business Confidence Index, calculated by the Getúlio Vargas Foundation (FGV). As the industrial business confidence index provided by the CNI (*BCI*) is easy to interpret (values of the index below 50 indicates a pessimistic

environment and above 50 suggests an optimistic environment), and once it has the advantage over the others of making this information available both at the aggregate level and for various industrial sectors, our analysis makes use of this indicator. Figure 1 shows the industrial business confidence index provided by the CNI at the aggregate level.

The series of disagreements in expectations are calculated from a survey of expectations provided by the Central Bank of Brazil (CBB), through the "Focus Bulletin". The disagreements in inflation and interest rate expectations are calculated for the fixed horizon of 12 months and follow the literature (e.g. Oliveira and Curi, 2016; Montes *et al.*, 2016; Montes and Ferreira, 2018). At the end of the process, we obtain the disagreements in inflation and interest rate expectations for the fixed horizon of 12 months (i.e. $Disag\_INF_{t^{12}}$ and $Disag\_IR_{t^{12}}$, respectively) [3].

Figure 2 presents the evolution of $Disag\_INF_{t^{12}}$ and $Disag\_IR_{t^{12}}$. Between February 2014 and June 2016, there is an increase in uncertainty regarding the future of both inflation and interest rate in the context of the political crisis in the government of Dilma Rousseff [4].

In relation to monetary policy credibility (*CRED*), we use the index proposed by de Mendonça (2007). The index captures the variations in central bank credibility in a way compatible with the inflation targeting framework (Seelajaroen *et al.*, 2020). The index uses

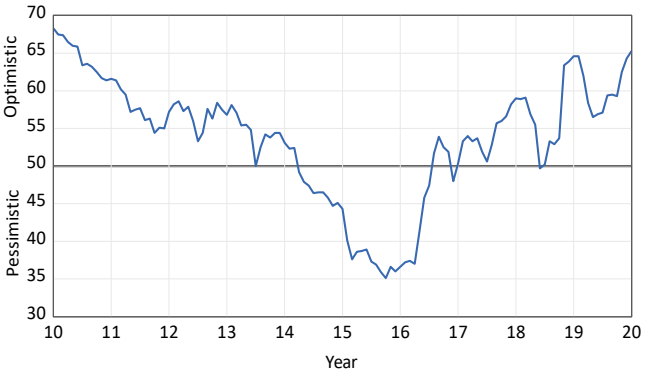

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Figure 1.
Business confidence index (BCI) – aggregate level (Jan 2010–Jan 2020)

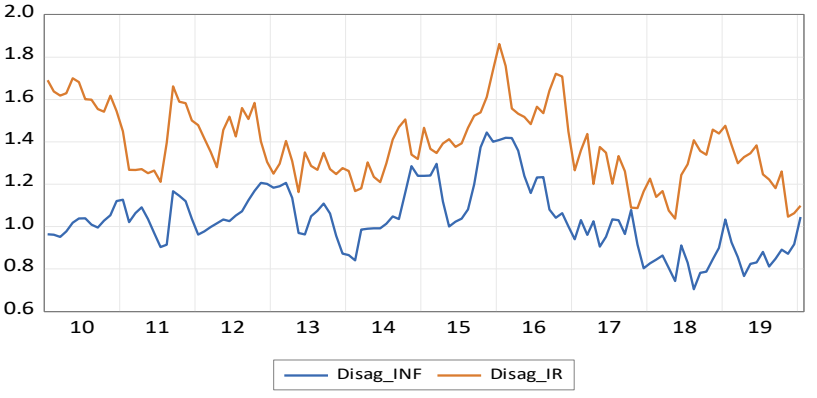

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Figure 2.
Disagreements in inflation and interest rate expectations (Jan 2010–Jan 2020)

the inflation target and the tolerance intervals defined by the Brazilian monetary authority. Figure 3 presents the monetary policy credibility index.

To observe the effects of both monetary policy credibility and the disagreements in expectations on business confidence (*BCI*), equation (1) is estimated. Besides *CRED* and the disagreements in inflation and interest rate expectations, the set of control variables X is formed by exchange rate (*EXCH*), interest rate (*IR*), electricity price (*EP*) and output gap (*GAP*) [5]. The choice of control variables follows studies addressing the determinants of business confidence (Campa and Goldberg, 2005; Atukeren *et al.*, 2013; de Mendonça and Finn, 2022). These variables have the potential to affect business confidence, and the explanations for their relationships with the *BCI* can be found in de Mendonça and Finn (2022).

$$BCI_t = \alpha_0 + \alpha_1 CRED_{t-1} + \alpha_2 Disag\_IR_{12t-1} + \alpha_3 Disag\_INF_{12t-1} + \alpha_4 X_{t-1} + \varepsilon_t \quad (1)$$

where, ε_t is the error term, $\varepsilon_t \sim N(0, \sigma^2)$. Since business confidence is captured through a perception indicator, information from the recent past can affect their behavior. Thus, all explanatory variables were lagged one month (X_{t-1}).

All variables used in the models are in natural logarithm form. This makes it possible to interpret the relationships more directly, in which the coefficients represent the elasticities, and we can observe the responses of the variables in percentage terms. Unlike *BCI* and disagreements, in which only the natural log was applied, credibility assumes values equal to 0. To circumvent this problem, we use the natural logarithm of the credibility variable plus one, i.e. $ln\_CRED = \ln(CRED + 1)$.

In order to check unit root and stationarity of the series, we perform ADF, PP and KPSS tests (Table A2, Appendix). Based on the tests, we observe that both interest rate and exchange rate are I(1), and the other variables are I(0). Thus, in the regressions, the interest rate and exchange rate variables are used in the first difference (Δir and $\Delta exch$).

Estimates are obtained from OLS, GMM and quantile regression. OLS and GMM estimates use the Newey–West matrix (HAC) to deal with autocorrelation and heteroskedasticity problems identified. If, on the one hand, OLS estimates are susceptible to endogeneity problems, on the other hand, GMM provides consistent estimates (Wooldridge, 2001; Hall, 2005) and allows one to verify whether the results obtained by OLS are preserved. Therefore, GMM is used to deal with endogeneity problems. In general,

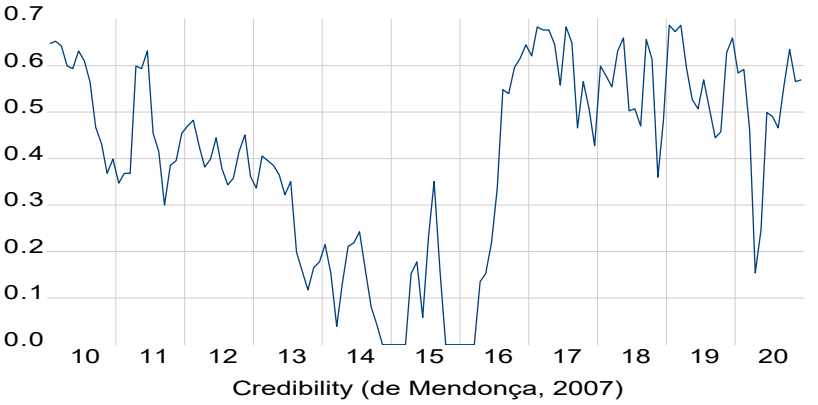

Figure 3.
Monetary policy credibility index

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endogeneity occurs due to simultaneity, omission of variables and measurement errors. Our analysis might be subject to the omission of variables and measurement errors.

In order to deal with such problems, we follow Johnston (1984) to select the instruments on GMM estimation, i.e. the instruments were dated to the period t−2 or earlier to assure the exogeneity (in the case of the dependent variables, they were dated to the period t−1 or earlier) [6]. 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 (DWH) test. As can be seen in all tables, both J and DWH tests validate all GMM estimates.

In equation (1), the coefficients α_2 and α_3 measure the effects of disagreements in expectations on the BCI. In turn, α_1 measures the effect of monetary policy credibility on the BCI. We expect inverse relationships between disagreements in expectations and business confidence, i.e. we expect $\alpha_2 < 0$ and $\alpha_3 < 0$. On the other hand, we expect monetary policy credibility brings benefits to business confidence and, therefore, $\alpha_1 > 0$. Hence, it is possible that the positive effect of credibility on the BCI is sufficient to neutralize the negative impact related to disagreements in inflation and interest rate expectations. To test this possible offsetting effect, we perform a test of equality of parameters (Wald test), so that the null hypothesis is H_0: $\alpha_1 + \alpha_2 + \alpha_3 = 0$. The non-rejection of H_0 implies that the increase in business confidence arising from credibility improvement is equal in magnitude to the loss of confidence arising from increases in disagreements in inflation and interest rate expectations.

Quantile regression is used to observe: (1) the effect that monetary credibility has on business confidence at different business confidence levels, and (2) the effects that disagreements in inflation and interest rate expectations have at different levels of business confidence. Introduced by Koenker and Basset (1978), quantile regression splits the distribution so that a certain proportion of observations are located below the quantile. The quantile regression method estimates the relationship between the dependent variable and the explanatory variables at any chosen point in the conditional distribution of the dependent variable. Thus, we obtain several sets of coefficient estimates with each set describing the relationship between the dependent variable and the explanatory variables at a particular quantile of the dependent variable. As the confidence index below 50 indicates a pessimistic environment, and above 50 it suggests an optimistic context, it will be possible to know in which situations our variables of interest have a more significant effect.

3. Empirical evidence

Since the study suggests that disagreements in expectations reduce business confidence, negative relationships between disagreements and *BCI* are expected. In turn, a positive relationship is expected between monetary policy credibility and *BCI*. Figure 4 shows scatter plot graphs with correlations. It is possible to observe that the disagreements in expectations have negative correlations with business confidence, and monetary policy credibility has a positive correlation with business confidence.

Table 1 presents OLS and GMM estimates. Regarding the main variables of the study, the results suggest that increases in disagreements in inflation expectations cause a reduction in business confidence. All coefficients for *Disag_INF* are negative and statistically significant. With respect to the economic effect, one can observe that a 1% increase in *Disag_INF* causes, on average, a reduction of approximately 0.24% on business confidence. In turn, although the coefficients for the disagreement in interest rate expectations are negative and significant in the individual regressions (i.e. only considering *Disag*_IR), the coefficients for *Disag*_IR are not significant in the complete model (which also consider *Disag*_INF).

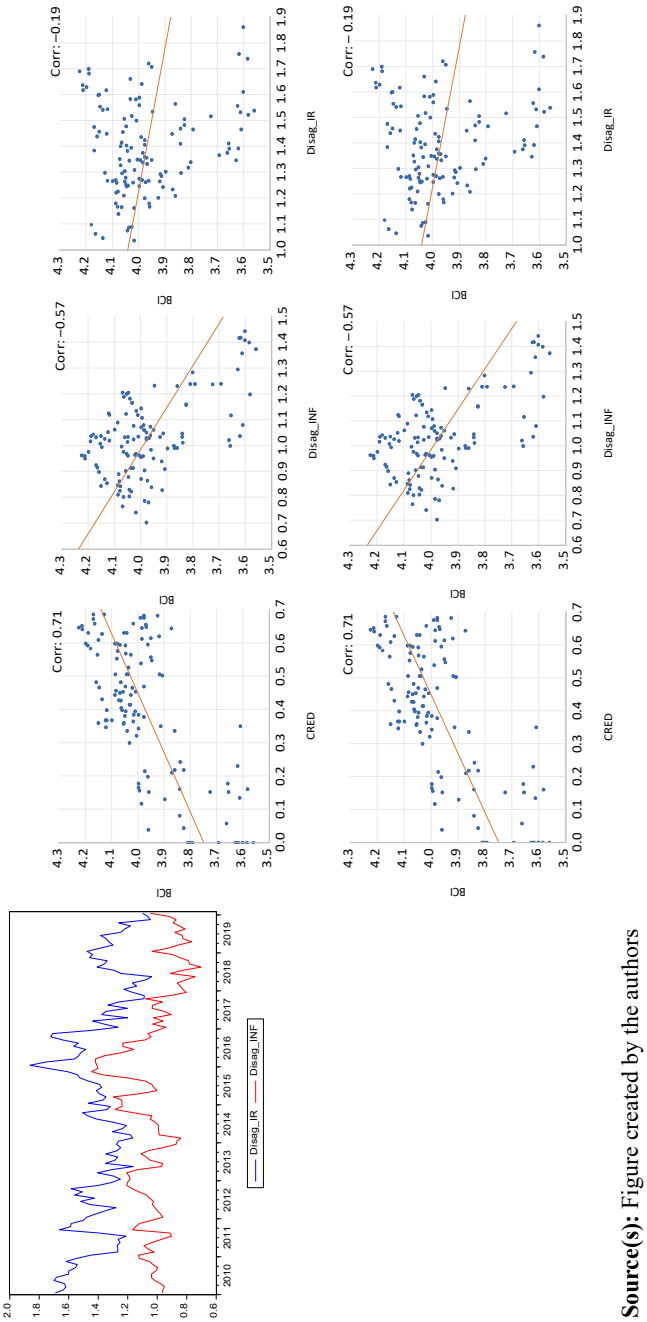

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Figure 4.
Relationship between business confidence, credibility and disagreements

Dependent: BCI	OLS			GMM		
Regressors			Eq 4			Eq 4
C	4.690***	4.416***	4.690***	5.038***	4.758***	5.095***
	(0.295)	(0.351)	(0.297)	(0.242)	(0.274)	(0.252)
Cred(−1)	0.279***	0.360***	0.279***	0.324***	0.433***	0.350***
	(0.063)	(0.069)	(0.065)	(0.079)	(0.084)	(0.087)
Disag_Inf(−1)	−0.235***		−0.236***	−0.269***		−0.237**
	(0.063)		(0.079)	(0.073)		(0.094)
Disag_IR(−1)		−0.092**	0.001		−0.159***	−0.053
		(0.044)	(0.056)		(0.057)	(0.074)
ΔExch(−1)	−0.832***	−0.043	−0.832***	−1.735***	−1.850***	−1.845***
	(0.222)	(0.022)	(0.223)	(0.455)	(0.450)	(0.461)
Δ IR(−1)	−0.765**	−0.624*	−0.766**	−1.543***	−1.193***	−1.340***
	(0.363)	(0.381)	(0.352)	(0.362)	(0.443)	(0.380)
EP(−1)	−0.105**	−0.083	−0.105**	−0.161***	−0.130***	−0.166***
	(0.053)	(0.064)	(0.053)	(0.036)	(0.046)	(0.039)
Gap(−1)	2.867***	3.119***	2.867***	2.510***	2.812***	2.360***
	(0.593)	(0.643)	(0.596)	(0.587)	(0.708)	(0.613)
Adj. R2	0.795	0.775	0.798	0.737	0.698	0.732
F-stat	66.498	68.828	59.223			
p-value (F-stat)	0.000	0.000	0.000			
J-statistic				13.011	11.227	13.034
p-value (J-statistic)				0.162	0.260	0.222
D-W-H test				2.936	5.084	3.386
p-value (D-W-H)				0.817	0.533	0.847
No. Instr./No. Obs				16/118	16/118	18/118
H_0: $\alpha\_1 + \alpha\_2 + \alpha\_3 = 0$			0.164			0.219
Wald - *p*-value(F)			0.685			0.641

Note(s): Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Standard errors in parentheses

Source(s): Table created by the authors

Table 1. OLS and GMM estimates for the effects of credibility and disagreements on business confidence (BCI)

In relation to monetary policy credibility, all coefficients are positive and significant, suggesting the monetary authority's ability to guide inflation expectations to the inflation target positively affects business confidence. Analyzing the economic effect, considering the average of all estimated coefficients, we observe that a 1% increase in *CRED* causes, on average, an increase of approximately 0.33% on business confidence. In turn, regarding the "offsetting effect" of monetary policy credibility, the results of the Wald test ($\alpha_1 + \alpha_2 + \alpha_3 = 0$) allow us not to reject the null hypothesis. Therefore, the increase in business confidence arising from monetary policy credibility may offset the reduction on business confidence due to disagreements in inflation and interest rate expectations.

Analyzing the results for the control variables, the negative coefficients for both the exchange rate and the interest rate show that exchange rate devaluations and interest rate increases can induce a drop in business confidence. The results are in line with economic theory, as exchange rate devaluations can be associated with an increase in production costs, since the pass-through effect from exchange rate to prices in emerging and less industrialized economies is higher (Campa and Goldberg, 2005). On the other hand, an increase in the interest rate in emerging economies can increase the cost of capital, causing declines in investment and consumption through income and substitution effects and ultimately reducing output and profitability (Mallick and Sousa, 2012).

The coefficients for electricity prices are negative in all specifications and most present statistical significance, reinforcing the findings of de Mendonça and Finn (2022). This result

suggests the rise in electricity prices has negative effects on business confidence, as production costs and company competitiveness are affected (Sarwar *et al.*, 2018). With respect to economic activity, we find a positive relationship between the output gap and business confidence.

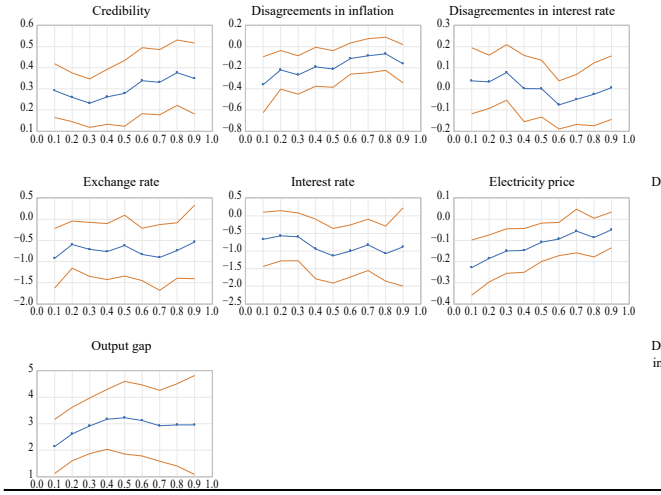
To check robustness and identify the existence of asymmetries, the results of the quantile regressions are presented in Figure 5. Figure 5 shows the graphs for the estimated coefficients of each variable as well as the estimates for the variables of interest (*CRED*, *Disag_INF* and *Disag_IR*). Analyzing monetary policy credibility, we observe that the coefficients are positive and significant, and the effect is increasing as business confidence increases and reveals greater optimism. We identify that a 1% increase in credibility increases business confidence by 0.29% when business confidence is very pessimistic (quantile 0.1) and by 0.39% when business confidence is optimistic (quantile 0.9). Thus, the effect of monetary policy credibility on business confidence is greater when confidence is high.

In relation to disagreement in inflation expectations, the coefficients are negative and, in most cases, significant. The estimates reveal that a 1% increase in *Disag_INF* decreases business confidence by −0.36% when entrepreneurs are very pessimistic (quantile 0.1) and by −0.16% when they are optimistic (quantile 0.9). In turn, the effect is not significant in the 0.6, 0.7 and 0.8 quantiles. Thus, the effect of disagreement in inflation expectations on business confidence is greater when entrepreneurs are already pessimistic.

The results for the disagreement in interest rate expectations corroborate the estimates obtained through OLS and GMM. All coefficients do not show statistical significance. Thus, we do not observe a relevant effect of *Disag_IR* on *BCI* when the *BCI* is at high or low levels.

4. Industrial sectors results

Aiming at evaluating whether the effects of disagreements and credibility on business confidence are different when different industrial sectors are considered, we re-estimate Equation (1) through OLS, GMM and quantile regression, taking into account the business



	Quantile	Coef.	*p*-value
Credibility	0.1	0.292	0.000
	0.2	0.260	0.000
	0.3	0.232	0.000
	0.4	0.262	0.000
	0.5	0.278	0.001
	0.6	0.339	0.000
	0.7	0.331	0.000
	0.8	0.377	0.000
	0.9	0.349	0.000
Disagreements in inflation	0.1	−0.361	0.009
	0.2	−0.220	0.021
	0.3	−0.268	0.005
	0.4	−0.191	0.045
	0.5	−0.212	0.019
	0.6	−0.112	0.142
	0.7	−0.086	0.299
	0.8	−0.068	0.400
	0.9	−0.162	0.082
Disagreements in interest rate	0.1	0.038	0.636
	0.2	0.033	0.606
	0.3	0.078	0.251
	0.4	0.001	0.986
	0.5	0.001	0.992
	0.6	−0.076	0.192
	0.7	−0.050	0.408
	0.8	−0.026	0.732
	0.9	0.006	0.942

Figure 5.
Quantile regression (BCI)

Source(s): Figure created by the authors

confidence indicators of 11 industrial sectors. Hence, it will be possible to observe which sectors have a business confidence more sensitive to uncertainties about inflation and interest rate and, through the Wald test, whether monetary policy credibility is able to offset the negative effects in each sector. The sectors considered are Food, Rubber, Cellulose, Personal Hygiene, Production of Nonmetallic Minerals, Metallurgy, Plastic, Metal Products, Chemicals, Textiles and Motor Vehicles.

The results from both OLS and GMM regressions are shown in Tables 2 and 3, respectively. The estimates reveal positive and significant coefficients for monetary policy credibility in all sectors under consideration. Analyzing the economic impact, the sectors most sensitive to credibility are Rubber, Motor Vehicles, Metallurgy, Metal Products and Cellulose. Taking the average coefficients obtained for CRED through OLS and GMM, for these sectors respectively, we observe that a 1% increase in monetary policy credibility increases business confidence in each of these sectors by 0.43%, 0.42%, 0.37%, 0.36 and 0.34%. In turn, the sector least affected by credibility is "Non-metal Mineral Products".

Regarding the effects of disagreement in inflation expectations, the findings indicate that, except the "Motor Vehicles" sector, all other sectors are inversely affected, i.e. increases in this disagreement reduce business confidence. The two sectors most affected are "Non-metal Mineral Products" and "Plastic", where a 1% increase in *Disag_INF* reduces business confidence in each of these sectors, on average, by 0.37 and 0.35%, respectively. In turn, the sector with the business confidence least affected by *Disag_INF* is the "Textile" sector.

When we turn our attention to the estimated coefficients of the disagreement in interest rate expectations, the results show a practically null effect. Except for the coefficient obtained by GMM for *Disag_IR* in the "Metallurgy" sector, which was negative and significant, all other coefficients do not show statistical significance.

Regarding the possible "offsetting effect" of monetary policy credibility in relation to the loss of business confidence due to an increase in disagreements in expectations, the results of the Wald test (H_0: $\alpha_1 + \alpha_2 + \alpha_3 = 0$) indicate that this perspective is valid for all industrial sectors.

The results of the quantile regression for each of the 11 sectors are presented in Figures 6–16. Analyzing the results for monetary policy credibility, we observe that the coefficients are positive and significant in all sectors. The findings for the "Metallurgy" and "Textile" sectors indicate that the higher the confidence, the higher is the positive effect of credibility on business confidence. This result is also found in the "Cellulose" sector, however, with a lower intensity in the variation from the first to the last quantile. On the other hand, the estimates for the "Rubber" and "Metal Products" sectors indicate that the higher the confidence, the lower is the positive effect of credibility on business confidence. Moreover, the sector of "Production of Nonmetallic Minerals" is the only one that presents the CRED coefficient in the last quantile without statistical significance.

According to quantile regression estimates, the coefficients of disagreement in inflation expectations on business confidence, in most sectors, are negative, but the effects are decreasing to the extent that confidence increases. In some sectors (such as, "Rubber", "Cellulose", "Personal Hygiene", "Metal Products" and "Textiles"), statistical significance is observed only at the lowest quantiles, where confidence is low. On the other hand, in the "Metal Products" sector, coefficients are negative and significant from the fifth to the ninth quantile (where confidence is high), but the negative effect is increasing as confidence increases. In turn, reinforcing the findings previously reported, most coefficients for *Disag_INF* in the "Motor Vehicles" sector do not present statistical significance, except the coefficient estimated for the first quantile (where confidence is very low) which is negative and significant.

Regarding the estimates for the disagreement in interest rate expectations (*Disag_IR*), the "Motor Vehicles" sector is the only with significant coefficients. All coefficients for *Disag_IR*

Table 2.
OLS estimates for the effect of credibility and disagreements on 11 industrial sectors business confidence

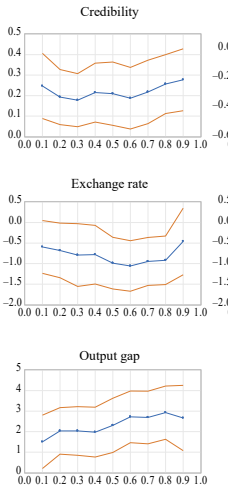
OLS dependent : BCI_i Regressors	Food	Rubber	Cellulose	Pers. Hygiene	Non-metal mineral products	Metallurgy	Plastic	Metal products	Chemicals	Textile	Motor vehicles
C	4.831***	4.168***	4.457***	4.736***	5.684***	4.342***	4.342***	4.661***	4.575***	4.262***	4.061***
	(0.269)	(0.404)	(0.332)	(0.346)	(0.373)	(0.347)	(0.292)	(0.382)	(0.328)	(0.294)	(0.325)
Cred(−1)	0.221***	0.425***	0.316***	0.253***	0.165*	0.319***	0.256***	0.355***	0.273***	0.310***	0.391***
	(0.067)	(0.100)	(0.084)	(0.070)	(0.091)	(0.082)	(0.076)	(0.092)	(0.064)	(0.065)	(0.078)
Disag_Inf(−1)	−0.234***	−0.265**	−0.245***	−0.257***	−0.381***	−0.282***	−0.306***	−0.267**	−0.234***	−0.175**	−0.159
	(0.072)	(0.118)	(0.086)	(0.099)	(0.110)	(0.103)	(0.079)	(0.113)	(0.078)	(0.089)	(0.107)
Disag_IR(−1)	0.005	0.031	0.019	0.055	0.000	−0.087	−0.015	−0.040	0.017	0.005	−0.090
	(0.058)	(0.077)	(0.068)	(0.068)	(0.076)	(0.068)	(0.066)	(0.082)	(0.050)	(0.059)	(0.075)
Δ Exch(−1)	−0.788***	−0.860***	−1.014***	−0.804***	−0.629**	−1.140***	−1.031***	−0.924***	−1.040***	−1.142***	−1.034***
	(0.226)	(0.308)	(0.252)	(0.278)	(0.271)	(0.259)	(0.239)	(0.297)	(0.243)	(0.218)	(0.241)
Δ IR(−1)	−0.657*	−0.571	−0.836**	−1.078**	−0.691	−0.843**	−0.860**	−0.891*	−0.507	−0.866**	−0.645*
	(0.340)	(0.430)	(0.415)	(0.437)	(0.438)	(0.419)	(0.383)	(0.495)	(0.336)	(0.350)	(0.346)
EP(−1)	−0.120**	−0.037	−0.073	−0.113*	−0.248***	−0.025	−0.029	−0.098	−0.085	−0.051	−0.005
	(0.049)	(0.072)	(0.060)	(0.061)	(0.066)	(0.061)	(0.053)	(0.071)	(0.056)	(0.055)	(0.058)
Gap(−1)	2.109***	3.487***	3.182***	2.720***	3.308***	3.967***	3.180***	3.721***	2.522***	2.835***	3.766***
	(0.615)	(0.712)	(0.645)	(0.787)	(0.718)	(0.710)	(0.589)	(0.832)	(0.636)	(0.568)	(0.593)
Adj. *R*2	0.734	0.755	0.756	0.713	0.771	0.804	0.769	0.766	0.768	0.771	0.798
F-stat	47.444	52.872	53.211	42.972	57.619	70.297	57.012	56.096	56.096	57.895	67.651
p-value (F-stat)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
H_0: $\alpha\_1 + \alpha\_2 + \alpha\_3 = 0$	0.007	1.414	0.440	0.166	1.926	0.166	0.298	0.100	0.231	1.350	1.225
Wald - *p*-value(F)	0.935	0.234	0.507	0.684	0.165	0.684	0.585	0.752	0.631	0.245	0.268

Note(s): Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Standard errors in parentheses
Source(s): Table created by the authors

Table 3. GMM estimates for the effect of credibility and disagreements on 11 industrial sectors business confidence

GMM Dependent Regressors	Food	Rubber	Cellulose	Pers. Hygiene	Non-metal mineral products	Metallurgy	Plastic	Metal products	Chemicals	Textile	Motor vehicles
C	5.266***	4.361***	5.068***	5.100***	5.915***	4.773***	4.942***	5.098***	5.091***	4.710***	4.274***
	(0.278)	(0.364)	(0.359)	(0.318)	(0.298)	(0.331)	(0.300)	(0.360)	(0.313)	(0.330)	(0.292)
Cred(−1)	0.270***	0.447***	0.365***	0.269***	0.226**	0.423***	0.295**	0.372***	0.329***	0.341***	0.457***
	(0.092)	(0.116)	(0.126)	(0.101)	(0.099)	(0.119)	(0.114)	(0.099)	(0.093)	(0.098)	(0.120)
Disag_Inf(−1)	−0.236**	−0.281**	−0.322***	−0.240**	−0.360**	−0.206*	−0.396***	−0.311**	−0.262***	−0.215**	−0.161
	(0.097)	(0.140)	(0.108)	(0.107)	(0.139)	(0.122)	(0.110)	(0.131)	(0.098)	(0.102)	(0.123)
Disag_IR(−1)	−0.028	0.000	−0.035	−0.018	−0.002	−0.234***	−0.052	−0.070	−0.054	−0.059	−0.138
	(0.074)	(0.113)	(0.091)	(0.086)	(0.102)	(0.085)	(0.089)	(0.105)	(0.068)	(0.073)	(0.086)
Δ Exch(−1)	−1.832***	−1.748***	−2.686***	−1.863***	−0.766	−2.386***	−2.613***	−2.006***	−2.248***	−2.780***	−2.067***
	(0.486)	(0.556)	(0.706)	(0.510)	(0.552)	(0.489)	(0.645)	(0.615)	(0.559)	(0.651)	(0.531)
Δ IR(−1)	−1.192***	−0.834*	−1.334**	−2.073***	−1.569***	−1.452***	−1.423***	−1.576***	−0.940**	−1.253***	−1.117**
	(0.349)	(0.498)	(0.532)	(0.529)	(0.441)	(0.451)	(0.495)	(0.526)	(0.378)	(0.447)	(0.500)
EP(−1)	−0.190***	−0.060	−0.153***	−0.161***	−0.295***	−0.084	−0.110**	−0.158***	−0.155***	−0.107**	−0.033
	(0.044)	(0.060)	(0.054)	(0.047)	(0.048)	(0.053)	(0.049)	(0.057)	(0.047)	(0.053)	(0.048)
Gap(−1)	1.743**	3.524***	2.453***	2.748***	3.275***	3.276***	2.427***	3.485***	1.804**	2.400***	3.493***
	(0.686)	(0.810)	(0.880)	(0.783)	(0.625)	(0.741)	(0.747)	(0.817)	(0.753)	(0.714)	(0.803)
Adj. $R2$	0.659	0.735	0.659	0.628	0.735	0.736	0.677	0.725	0.686	0.667	0.757
J-statistic	12.962	13.796	12.635	12.726	11.622	11.425	13.120	13.414	13.440	14.077	15.003
p-value (J-statistic)	0.226	0.183	0.245	0.239	0.311	0.325	0.217	0.201	0.200	0.169	0.132
H_0: $\alpha\_1 + \alpha\_2 + \alpha\_3 = 0$	0.002	0.978	0.003	0.007	0.697	0.009	0.910	0.003	0.008	0.206	0.942
Wald - p-value(F)	0.962	0.323	0.959	0.934	0.404	0.923	0.340	0.955	0.927	0.650	0.332

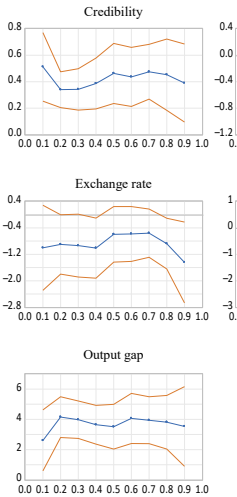
Note(s): Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Standard errors in parentheses
Source(s): Table created by the authors



	Quantile	Coef.	*p*-value
Credibility	0.1	0.247	0.003
	0.2	0.193	0.006
	0.3	0.178	0.008
	0.4	0.215	0.004
	0.5	0.209	0.009
	0.6	0.187	0.016
	0.7	0.218	0.007
	0.8	0.256	0.001
	0.9	0.277	0.001
Disagreements in inflation	0.1	−0.240	0.116
	0.2	−0.275	0.050
	0.3	−0.282	0.006
	0.4	−0.297	0.001
	0.5	−0.185	0.017
	0.6	−0.123	0.110
	0.7	−0.140	0.051
	0.8	−0.137	0.095
	0.9	−0.184	0.032
Disagreements in interest rate	0.1	−0.103	0.326
	0.2	0.017	0.851
	0.3	0.047	0.515
	0.4	0.104	0.138
	0.5	0.000	0.999
	0.6	−0.008	0.890
	0.7	−0.023	0.700
	0.8	−0.006	0.931
	0.9	0.035	0.646

Source(s): Figure created by the authors

Figure 6.
Quantile regression (Food)

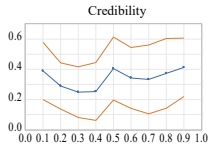


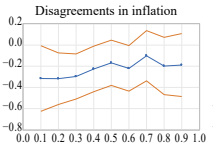
	Quantile	Coef.	*p*-value
Credibility	0.1	0.512	0.000
	0.2	0.339	0.000
	0.3	0.341	0.000
	0.4	0.386	0.000
	0.5	0.462	0.000
	0.6	0.436	0.000
	0.7	0.475	0.000
	0.8	0.452	0.001
	0.9	0.390	0.011
Disagreements in inflation	0.1	−0.437	0.191
	0.2	−0.279	0.009
	0.3	−0.271	0.022
	0.4	−0.251	0.063
	0.5	−0.202	0.137
	0.6	−0.154	0.216
	0.7	−0.145	0.223
	0.8	−0.046	0.693
	0.9	−0.212	0.343
Disagreements in interest rate	0.1	0.178	0.101
	0.2	0.098	0.211
	0.3	0.032	0.722
	0.4	0.007	0.943
	0.5	−0.032	0.741
	0.6	−0.048	0.574
	0.7	−0.034	0.683
	0.8	−0.053	0.611
	0.9	0.005	0.962

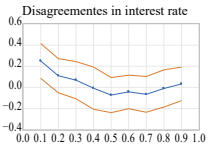
Source(s): Figure created by the authors

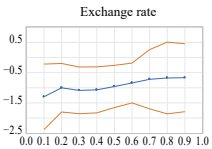
Figure 7.
Quantile regression (Rubber)

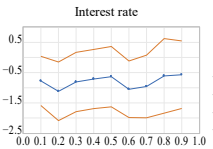
for the other sectors do not present statistical significance. The findings for the "Motor Vehicles" sector indicate that from the fifth to the eighth quantile, the coefficients are negative and statistically significant, in the other quantiles the coefficients are not statistically significant. From the fifth quantile, the results suggest the higher the confidence, the higher is the negative effect of disagreement in interest rate expectations on business confidence, but, when confidence is very high (ninth quantile), the effect of *Disag_IR* on business confidence is not significant.

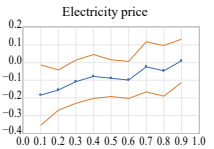


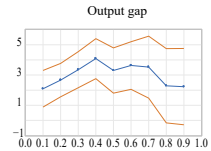








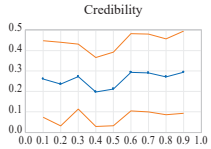


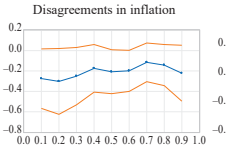


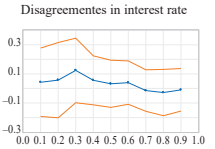
	Quantile	Coef.	*p*-value
Credibility	0.1	0.389	0.000
	0.2	0.290	0.000
	0.3	0.249	0.004
	0.4	0.253	0.011
	0.5	0.405	0.000
	0.6	0.343	0.001
	0.7	0.333	0.005
	0.8	0.373	0.002
	0.9	0.413	0.000
Disagreements in inflation	0.1	−0.316	0.049
	0.2	−0.317	0.012
	0.3	−0.297	0.007
	0.4	−0.226	0.043
	0.5	−0.168	0.128
	0.6	−0.220	0.048
	0.7	−0.101	0.406
	0.8	−0.198	0.156
	0.9	−0.189	0.216
Disagreements in interest rate	0.1	0.251	0.004
	0.2	0.111	0.181
	0.3	0.069	0.447
	0.4	−0.007	0.945
	0.5	−0.072	0.396
	0.6	−0.042	0.603
	0.7	−0.065	0.452
	0.8	−0.010	0.912
	0.9	0.033	0.681

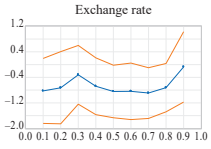
Source(s): Figure created by the authors

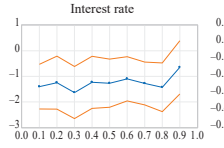
Figure 8.
Quantile regression (Cellulose)

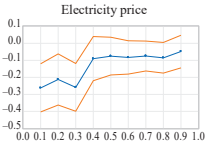


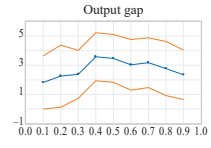










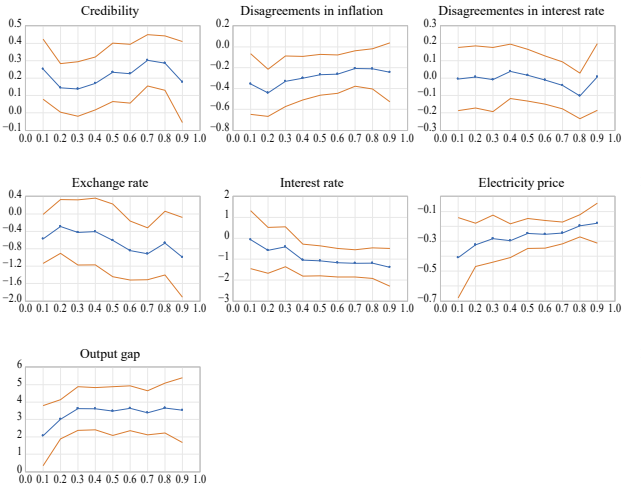


	Quantile	Coef.	*p*-value
Credibility	0.1	0.261	0.007
	0.2	0.236	0.026
	0.3	0.272	0.001
	0.4	0.197	0.024
	0.5	0.212	0.023
	0.6	0.293	0.003
	0.7	0.290	0.004
	0.8	0.271	0.005
	0.9	0.294	0.005
Disagreements in inflation	0.1	−0.275	0.067
	0.2	−0.302	0.070
	0.3	−0.251	0.084
	0.4	−0.175	0.146
	0.5	−0.207	0.062
	0.6	−0.199	0.056
	0.7	−0.116	0.235
	0.8	−0.143	0.168
	0.9	−0.222	0.115
Disagreements in interest rate	0.1	0.043	0.723
	0.2	0.057	0.667
	0.3	0.124	0.276
	0.4	0.056	0.516
	0.5	0.032	0.698
	0.6	0.040	0.600
	0.7	−0.014	0.842
	0.8	−0.028	0.731
	0.9	−0.009	0.902

Source(s): Figure created by the authors

Figure 9.
Quantile regression (Personal hygiene)

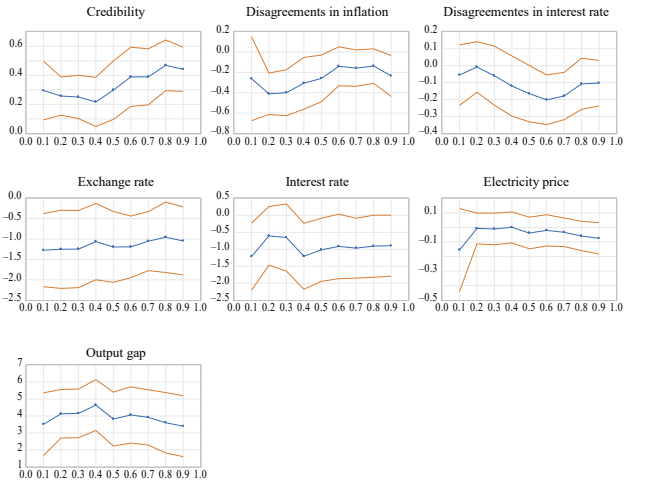
Aiming at bringing new evidence to the literature and complement the work of de Mendonça and Finn (2022), we draw attention to the results related to electricity price (*EP*) obtained through GMM, and even more interesting, through quantile regression. In the work of de Mendonça and Finn (2022), electricity price negatively affects business confidence of all 11 sectors with statistical significance, and the sectors in which business confidence is more



	Quantile	Coef.	*p*-value
Credibility	0.1	0.252	0.005
	0.2	0.144	0.047
	0.3	0.137	0.090
	0.4	0.169	0.032
	0.5	0.233	0.008
	0.6	0.225	0.011
	0.7	0.303	0.000
	0.8	0.286	0.001
	0.9	0.177	0.139
Disagreements in inflation	0.1	−0.356	0.018
	0.2	−0.441	0.000
	0.3	−0.331	0.009
	0.4	−0.301	0.006
	0.5	−0.268	0.009
	0.6	−0.262	0.006
	0.7	−0.208	0.018
	0.8	−0.211	0.034
	0.9	−0.244	0.094
Disagreements in interest rate	0.1	−0.005	0.954
	0.2	0.006	0.944
	0.3	−0.008	0.929
	0.4	0.039	0.629
	0.5	0.017	0.829
	0.6	−0.011	0.873
	0.7	−0.042	0.543
	0.8	−0.102	0.129
	0.9	0.007	0.944

Figure 10.
Quantile regression
(Non-metallic products)

Source(s): Figure created by the authors

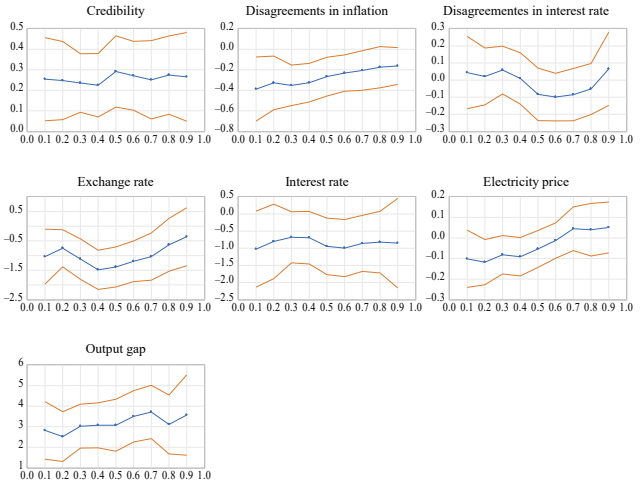


	Quantile	Coef.	*p*-value
Credibility	0.1	0.295	0.005
	0.2	0.257	0.000
	0.3	0.251	0.001
	0.4	0.217	0.014
	0.5	0.298	0.005
	0.6	0.390	0.000
	0.7	0.389	0.000
	0.8	0.469	0.000
	0.9	0.441	0.000
Disagreements in inflation	0.1	−0.262	0.216
	0.2	−0.410	0.000
	0.3	−0.399	0.001
	0.4	−0.307	0.020
	0.5	−0.259	0.029
	0.6	−0.140	0.155
	0.7	−0.158	0.088
	0.8	−0.138	0.115
	0.9	−0.235	0.024
Disagreements in interest rate	0.1	−0.056	0.540
	0.2	−0.008	0.917
	0.3	−0.059	0.505
	0.4	−0.121	0.187
	0.5	−0.165	0.054
	0.6	−0.201	0.008
	0.7	−0.179	0.013
	0.8	−0.108	0.164
	0.9	−0.103	0.134

Figure 11.
Quantile regression
(Metallurgy)

Source(s): Figure created by the authors

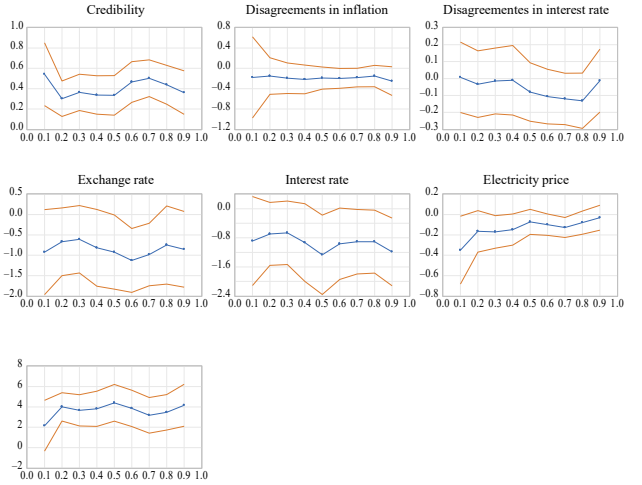
affected by electricity price are: Metal Products, Production of Nonmetallic Minerals, Rubber, Motor Vehicles and Cellulose. In turn, analyzing our estimates by GMM, we observe that not all sectors have business confidence negatively affected by electricity price, such as Rubber and Metallurgy (which do not present statistical significance). When we turn our attention to the results obtained from the quantile regressions, we observe that electricity price does not affect business confidence, regardless of the existing level of confidence, in the following



	Quantile	Coef.	*p*-value
Credibility	0.1	0.254	0.015
	0.2	0.248	0.012
	0.3	0.236	0.002
	0.4	0.225	0.005
	0.5	0.292	0.001
	0.6	0.271	0.002
	0.7	0.251	0.011
	0.8	0.274	0.006
	0.9	0.266	0.018
Disagreements in inflation	0.1	−0.387	0.017
	0.2	−0.327	0.016
	0.3	−0.351	0.001
	0.4	−0.326	0.001
	0.5	−0.266	0.007
	0.6	−0.232	0.012
	0.7	−0.207	0.038
	0.8	−0.175	0.092
	0.9	−0.162	0.079
Disagreements in interest rate	0.1	0.044	0.686
	0.2	0.021	0.802
	0.3	0.059	0.412
	0.4	0.009	0.902
	0.5	−0.084	0.288
	0.6	−0.100	0.164
	0.7	−0.085	0.276
	0.8	−0.052	0.493
	0.9	0.065	0.551

Source(s): Figure created by the authors

Figure 12.
Quantile regression (Plastic)

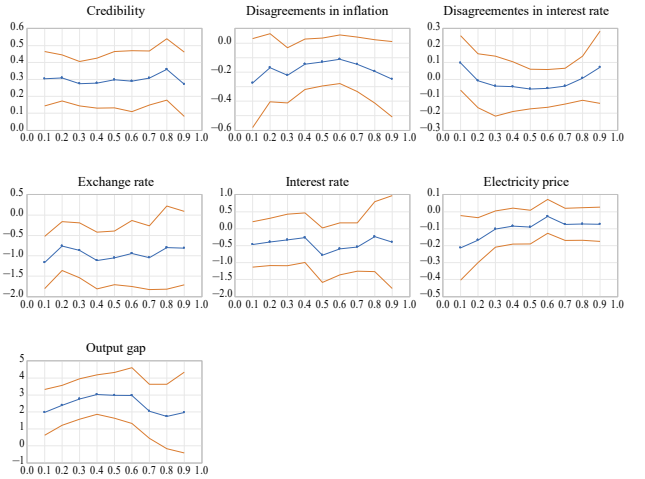


	Quantile	Coef.	*p*-value
Credibility	0.1	0.542	0.001
	0.2	0.301	0.001
	0.3	0.364	0.000
	0.4	0.338	0.001
	0.5	0.334	0.001
	0.6	0.465	0.000
	0.7	0.502	0.000
	0.8	0.438	0.000
	0.9	0.361	0.001
Disagreements in inflation	0.1	−0.178	0.663
	0.2	−0.151	0.411
	0.3	−0.194	0.210
	0.4	−0.218	0.135
	0.5	−0.191	0.089
	0.6	−0.197	0.051
	0.7	−0.182	0.054
	0.8	−0.152	0.159
	0.9	−0.251	0.086
Disagreements in interest rate	0.1	0.007	0.947
	0.2	−0.033	0.741
	0.3	−0.015	0.883
	0.4	−0.010	0.921
	0.5	−0.080	0.367
	0.6	−0.107	0.198
	0.7	−0.120	0.122
	0.8	−0.131	0.118
	0.9	−0.013	0.895

Source(s): Figure created by the authors

Figure 13.
Quantile regression (Metal products)

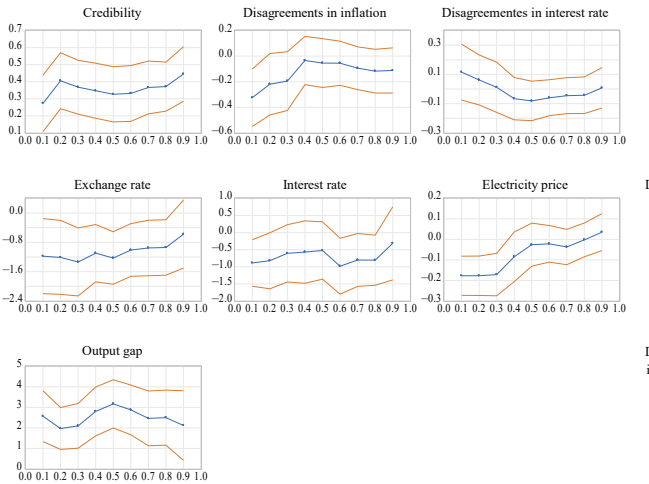
sectors: Rubber, Metallurgy, Plastic, and Motor Vehicles. In addition, we observe that the effect of electricity price on business confidence is negative but decreasing as business confidence is higher (and in some sectors the effect is only significant at low levels of confidence), in the following sectors: Food, Cellulose, Personal Hygiene, Production of Nonmetallic Minerals, Metal Products, Chemicals and Textiles. In our estimates, the business confidence of the Production of Nonmetallic Minerals sector is negatively affected by



	Quantile	Coef.	*p*-value
Credibility	0.1	0.304	0.000
	0.2	0.308	0.000
	0.3	0.274	0.000
	0.4	0.278	0.000
	0.5	0.298	0.001
	0.6	0.290	0.002
	0.7	0.308	0.000
	0.8	0.359	0.000
	0.9	0.271	0.006
Disagreements in inflation	0.1	−0.275	0.082
	0.2	−0.169	0.161
	0.3	−0.222	0.024
	0.4	−0.145	0.105
	0.5	−0.130	0.127
	0.6	−0.111	0.198
	0.7	−0.146	0.131
	0.8	−0.195	0.084
	0.9	−0.249	0.064
Disagreements in interest rate	0.1	0.098	0.239
	0.2	−0.008	0.921
	0.3	−0.040	0.661
	0.4	−0.043	0.570
	0.5	−0.057	0.341
	0.6	−0.053	0.355
	0.7	−0.040	0.466
	0.8	0.007	0.913
	0.9	0.072	0.512

Source(s): Figure created by the authors

Figure 14.
Quantile regression (Chemicals)



	Quantile	Coef.	*p*-value
Credibility	0.1	0.273	0.002
	0.2	0.406	0.000
	0.3	0.368	0.000
	0.4	0.347	0.000
	0.5	0.326	0.000
	0.6	0.331	0.000
	0.7	0.366	0.000
	0.8	0.371	0.000
	0.9	0.445	0.000
Disagreements in inflation	0.1	−0.325	0.005
	0.2	−0.219	0.076
	0.3	−0.195	0.099
	0.4	−0.034	0.724
	0.5	−0.054	0.578
	0.6	−0.056	0.527
	0.7	−0.094	0.270
	0.8	−0.117	0.179
	0.9	−0.112	0.216
Disagreements in interest rate	0.1	0.116	0.238
	0.2	0.062	0.476
	0.3	0.012	0.896
	0.4	−0.066	0.374
	0.5	−0.082	0.239
	0.6	−0.060	0.341
	0.7	−0.045	0.471
	0.8	−0.042	0.509
	0.9	0.008	0.908

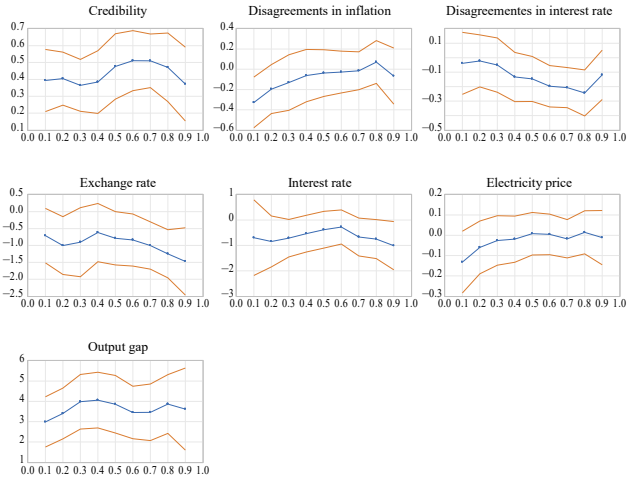
Source(s): Figure created by the authors

Figure 15.
Quantile regression (Textile)

electricity price, with statistical significance observed in all quantiles; but this effect decreases as confidence raises.

5. Concluding remarks

Business confidence plays an important role to investment and production decisions, and it serves as a leading indicator of economic activity for policymakers and financial market



	Quantile	Coef.	*p*-value
Credibility	0.1	0.393	0.000
	0.2	0.404	0.000
	0.3	0.365	0.000
	0.4	0.384	0.000
	0.5	0.477	0.000
	0.6	0.511	0.000
	0.7	0.510	0.000
	0.8	0.471	0.000
	0.9	0.372	0.001
Disagreements in inflation	0.1	−0.327	0.012
	0.2	−0.196	0.115
	0.3	−0.131	0.352
	0.4	−0.063	0.636
	0.5	−0.038	0.750
	0.6	−0.027	0.801
	0.7	−0.015	0.876
	0.8	0.072	0.508
	0.9	−0.067	0.635
Disagreements in interest rate	0.1	−0.039	0.723
	0.2	−0.022	0.810
	0.3	−0.051	0.597
	0.4	−0.133	0.127
	0.5	−0.147	0.067
	0.6	−0.197	0.008
	0.7	−0.207	0.004
	0.8	−0.243	0.003
	0.9	−0.119	0.175

Source(s): Figure created by the authors

Figure 16.
Quantile regression (Motor vehicles)

investors. Thus, firms, policymakers and investors often use confidence surveys to assess the direction of the economy. In Brazil, since the adoption of the inflation targeting regime in 1999, the CBB has sought to build its reputation and enhance credibility to provide a less uncertain environment for the expectations formation regarding inflation and monetary policy. Credibility is a forward-looking variable that reflects the central bank's ability to guide inflation expectations, but disagreements in inflation and interest rate expectations reflect uncertainties about these variables in the future, and once confidence and expectations are highly related, the following question arises: do monetary policy credibility and disagreements in inflation and interest rate expectations affect business confidence? This paper, in seeking to answer this question, contributes to the literature studies that address the determinants of business confidence and the consequences of expectations in the economy.

Therefore, in addition to the economic variables often used as determinants of business confidence, this study brought new evidence on the relationship between monetary policy credibility and business confidence at the aggregate and sectoral level, and it was the first to analyze whether disagreements in inflation and interest rate expectations can impact business confidence in Brazil, as well as business confidence of 11 different industrial sectors in Brazil. The paper was also the first to analyze, through tests of parameter equality, whether credibility can offset the loss of business confidence due to an increase in disagreements in expectations.

Based on OLS and GMM estimates, the results indicate that business confidence, at the aggregate level, increases to the extent that monetary policy credibility increases and disagreement in inflation expectations reduce. In addition, tests of parameter equality revealed that monetary policy credibility can offset the reduction on business confidence due to disagreements in inflation and interest rate expectations. In turn, the findings obtained through quantile regression indicate that the effect of monetary policy credibility on business confidence is greater as confidence increases, and the effect of disagreement in inflation expectations on business confidence is greater as confidence is at low levels.

OLS and GMM estimates at the sectoral level indicate positive and significant effects of monetary policy credibility on business confidence of all sectors analyzed. The sectors most sensitive to credibility are Rubber, Motor Vehicles, Metallurgy, Metal Products and Cellulose, and the sector least affected by credibility is "Non-metal Mineral Products". With respect to the effects of disagreement in inflation expectations, we observed that increases in this disagreement reduce the business confidence of 10 sectors; the only sector that business confidence is not affected by this disagreement is the "Motor Vehicles" sector. If, on the one hand, both "Non-metal Mineral Products" and "Plastic" are the sectors that business confidence is more affected by disagreement in inflation expectations, on the other hand, the sector with the business confidence least affected by disagreement in inflation expectations is the "Textile" sector. Regarding the "offsetting effect" of monetary policy credibility in relation to the loss of business confidence due to an increase in disagreements in expectations, the findings, based on tests of parameter equality, indicate that the "offsetting effect" is valid for all industrial sectors.

Quantile regressions for the 11 sectors analyzed revealed that monetary policy credibility positively affects business confidence in all sectors. But the effects are distinct from one sector to another. For instance, while in both "Metallurgy" and "Textile" sectors we observed that the higher the confidence, the higher is the positive effect of credibility on business confidence, and in the "Cellulose" sector, the same is true but with a lower intensity; on the other hand, the findings for both "Rubber" and "Metal Products" sectors indicate that the higher the confidence, the lower is the positive effect of credibility on business confidence.

In turn, quantile regressions for the 11 sectors analyzed indicate that the effect of disagreement in inflation expectations on business confidence, in most sectors, is negative, and the effects are decreasing to the extent that confidence increases.

In general, we observed that the positive effects of increased credibility can offset the negative effects of disagreements in expectation on confidence. In this sense, the adoption of credible monetary policies and the development of mechanisms that allow for greater predictability of monetary variables (such as inflation and interest rate) should be a priority for the government since both can affect economic activity and investments through expectations and confidence. In other words, if disagreements in expectations about monetary variables and monetary policy credibility affect business confidence and since there is an extensive empirical literature study indicating that business confidence matters for various economic decisions, then the policy implications are direct.

Notes

1. For an analysis of the effects of business confidence on the economy, see Taylor and McNabb (2007), Holmes and Silverstone (2010) and Khan and Upadhayaya (2020).
2. The Central Bank of Brazil presents, through the "Boletin Focus", results of market expectation surveys – a survey of forecasts from about 120 banks, asset managers and other institutions for the Brazilian economy.
3. The methodology for calculating disagreements can be provided upon request or included in an Appendix. Anyway, the explanation can be found, for instance, in Oliveira and Curi (2016), Montes *et al.* (2016) and Montes and Ferreira (2018).
4. The political crisis that took place in Brazil between 2014 and 2016 was caused by the corruption scandals and investigations of crimes of fiscal irresponsibility committed by the government of Dilma Rousseff and had its end with the Impeachment in August 31, 2016.
5. The definitions and sources of all series, as well as their descriptive statistics, are in Table A1 of Appendix.
6. The list of instruments is shown in Table A3 (Appendix).

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Appendix

Variables	Variable description	Data source	Mean	Median	Maximum	Minimum	Std. Dev
BCI	Business Confidence Index	CNI	3.969	4.015	4.224	3.541	0.172
CRED	Monetary policy credibility	TSMS/CBB - devised by authors (equation 3)	0.403	0.445	0.686	0	0.208
Disag_IR	Interest rate disagreements	TSMS/CBB - devised by authors (equation 1)	1.389	1.371	1.862	1.037	0.17
Disag_Inf	Inflation rate disagreements	TSMS/CBB - devised by authors (equation 1)	1.04	1.033	1.445	0.704	0.152
ΔEXCH	Real effective exchange rate index (IPCA) - Jun/ 1994 =101	TSMS/CBB (code 11752)	0.004	0.005	0.105	−0.09	0.032
GAP	Output gap	TSMS/CBB (code 24364) - Hamilton filter (2018)	0.002	0.007	0.146	−0.138	0.034
ΔIR	Interest rate - Selic accumulated in the month in annual terms	TSMS/CBB (code 4189)	−0.012	0	0.075	−0.193	0.043
EP	Average industrial electricity consumption tariff in Reais per MWh	Eletrobrás	5.799	5.931	6.254	5.345	0.301
Sectors							
Cellulose		CNI	3.955	3.99	4.26	3.49	0.19
Chemical		CNI	3.987	4.029	4.243	3.52	0.163
Food		CNI	4.007	4.045	4.197	3.656	0.142
Motor vehicles		CNI	3.919	3.961	4.197	3.336	0.207
Metal prods		CNI	3.935	3.99	4.218	3.44	0.212
Metallurgy		CNI	3.935	3.986	4.281	3.424	0.212
Non-met. mineral prods		CNI	3.951	4.011	4.241	3.466	0.194
Pers. hygiene		CNI	4.012	4.055	4.258	3.555	0.166
Plastic		CNI	3.96	3.986	4.228	3.526	0.185
Rubber		CNI	3.921	3.957	4.268	3.318	0.218
Textile		CNI	3.937	3.978	4.208	3.401	0.179

Note(s): CNI - National Confederation of Industry. TSMS - Time Series Management System//Central Bank of Brazil. Eletrobrás - Centrais Elétricas Brasileiras S.A
Source(s): Table created by the authors

Table A1. Description of the variables, sources of data and descriptive statistics

Variables	ADF Eq	Lag	Test stat	10%	PP Eq	Band	Test stat	10%	KPSS Eq	Band	Test stat	1%
BCI	I	1	−3.074	−2.579	I	9	−2.276	−2.579	I	9	0.284	0.739
CRED	I	0	−2.589	−2.579	I	2	−2.535	−2.579	I	9	0.317	0.739
Disag_IR	I	0	−3.814	−2.579	I	3	−3.816	−2.579	I/T	8	0.074	0.216
Disag_INF	I	0	−2.812	−2.579	I	1	−3.016	−2.579	I/T	9	0.121	0.216
EXCH	I/T	1	−2.794	−3.147	I/T	3	−2.376	−3.147	I/T	9	0.083	0.216
ΔEXCH	N	0	−8.573	−1.615	N	8	−8.522	−1.615	N	2	0.089	0.739
GAP	I/T	7	−5.298	−2.579	I/T	0	−6.588	−3.147	I/T	2	0.068	0.119
IR	N	6	−1.241	−1.615	N	8	−1.085	−1.615	I/T	9	0.276	0.216
ΔIR	N	5	−1.602	−1.615	N	5	−3.492	−1.615	I/T	8	0.107	0.216
EP	I	0	−9.555	−2.579	N	3	1.745	−1.615	I	3	0.081	0.739
Sectors												
Cellulose	I	1	−3.03	−2.579	I	7	−2.601	−2.579	I	9	0.248	0.739
Chemical	I	1	−3.104	−2.579	I	9	−2.561	−2.579	I	9	0.274	0.739
Food	I	1	−2.669	−2.579	I	3	−2.612	−2.579	I	3	0.613	0.739
M. vehicles	I	3	−2.66	−2.579	I	4	−2.681	−2.579	I	4	0.391	0.739
Metal prods	I	1	−2.485	−2.579	I	6	−2.121	−2.579	I	9	0.273	0.347
Metallurgy	I	2	−2.622	−2.579	I	8	−2.146	−2.579	I	9	0.242	0.739
Non-met. mineral prods	I	1	−2.686	−2.579	I	13	−2.25	−2.579	I	9	0.399	0.739
Pers. hygiene	I	0	−2.826	−2.579	I	2	−2.744	−2.579	I	9	0.273	0.739
Plastic	I	1	−3.017	−2.579	I	11	−2.442	−2.579	I	9	0.241	0.739
Rubber	I	0	−2.571	−2.579	I	3	−2.618	−2.579	I	9	0.279	0.739
Textile	I	1	−3.411	−2.579	I	9	−2.703	−2.579	I	8	0.254	0.739

Table A2.
Unit root and stationary tests (ADF, PP and KPSS)

Note(s): ADF - the final choice of lag was made based on Schwarz information criterion. PP and KPSS tests - Band is the bandwidth truncation chosen for the Bartlett kernel. "I" denotes intercept, "I/T" denotes intercept and trend and "N" denotes none

Source(s): Table created by the authors

	Instruments
no *Disag_IR*	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Exch(−2) Exch(-3) IR(−2) IR(-3) EP(−2 to −3) Gap(−2 to −3)
no *Disag_INF*	BCI(−1 to −3) Cred(−2 to −3) Disag_IR(−2 to −3) Exch(−2) Exch(-3) IR(−2) IR(-3) EP(−2 to −3) Gap(−2 to −3)
Eq4	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Cellulose	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Chemical	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Food	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
M. vehicles	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Metal prods	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Metallurgy	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Non-met. mineral prods	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Prs. hygiene	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Plastic	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Rubber	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)
Textile	BCI(−1 to −3) Cred(−2 to −3) Disag_INF(−2 to −3) Disag_IR(−2 to −3) Exch(−2 to −3) IR(−2 to −3) EP(−2 to −3) Gap(−2 to −3)

Source(s): Table created by the authors

Table A3.
List of instruments in GMM estimations

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