Fiscal Policy and Inflation Expectations

CEMLA
Joint Research 2020
30th October 2020

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*The views expressed therein are those of the authors and do not necessarily represent the opinion of the Banco Central del Uruguay.

Motivation

- Inflation expectations play <u>a</u> crucial role in an inflation target monetary regime.

- Monetary authorities aim to anchor inflation expectations to the values that are targeted in order to ensure price stability.

- Inflation expectations may be affected by fiscal, determining an interdependence between fiscal and monetary policies, different from the classical fiscal dominance argument.

- Does fiscal policy affect inflation expectations made by price setters (i.e. firms)?

- If it does, then fiscal policy can have an impact on monetary policy even in the absence of fiscal dominance (i.e. monetary financing of fiscal deficits).

Literature review

- Sargent and Wallace (1981) introduce the distinction between monetary and fiscal dominance.

- Licandro and Vicente (2006) analyze the link between fiscal policy and inflation objectives in Uruguay.

- Bucacos (2020) applies De Resende's (2007) methodology and finds no evidence of fiscal dominance in Uruguay.

- Sims (2003) shows that agents update their expectations based on noisy information.

- Coibion et al. (2018) shows that agents update their expectations after receiving new macroeconomic information.

- Gelos and Rossi (2008) state the influence of fiscal variables over inflation expectations in Uruguay.

Contribution

- We do an empirical study to assess the impact of fiscal policy outcomes on inflation expectations made by price setters in Uruguay.

- We focus on inflation expectations of price setters instead of professional analysts.

- We find robust empirical evidence of an interdependence between fiscal and monetary policies through inflation expectations by price setters in Uruguay.

- Monetary policy faces more challenges to maintain inflation expectations anchored when the budget deficit worsen.

- Nonetheless, monetary policy seems to be effective to compensate the distortions introduced by fiscal policy on inflation expectations.

Research Strategy

- We estimate dynamic panel data models for price setters inflation expectations at the monetary policy horizon, using monetary and fiscal variables.

- We estimate a baseline model that includes the most relevant and popular measurement of fiscal outcome (Budget deficit to GDP) and the monetary policy instrument.

- Then we include in turn monetary authorities comunication to include the impact of this channel over expectations, and several interactions.

- Then we check robusteness of our results using other fiscal variables and controlling for different macroeconomic variables.

The Data

- Inflation expectations survey (IES).

  ➤ 591 firms throughout the entire period covered by the sample: October 2009 to March 2020, monthly frequency, average response ratio of 77% with a minimum of 54%.

  ➤ Representative of private non-financial, non-agricultural firms with 50 employees or more.

  ➤ 3 different horizons: the current year, the next 12 months and the monetary policy horizon (18 months up to June 2013 and 24 months since then).

  ➤ The resulting dataset is an unbalanced, long panel with a total of 126 months and 46,580 observations.

- Fiscal and macroeconomic data

  ➤ Budget deficit to GDP, FX depreciation and volatility, GDP growth, unemployment, etc.

- Monetary contractivity index

  ➤ Assess the tone of monetary policy communications by analyzing strings of 13 words around *inflation* and *monetary policy.*

Communicational Variable

- **<u>Monetary Contractivity Index:</u>**

- Monetary policy statements-COPOM.
- Using web scraping and text analysis techniques we identify two target words inside each statement: *inflation* and *monetary policy.*
- We selected and analyze strings of 13 words that contain one of our target words.
- To characterize the tone of each string we assign a value between -2 and 2 to each one:
    - ➢-2 means very expansive,
    - ➢-1 is expansive,
    - ➢0 is neutral,
    - ➢1 is contractive,
    - ➢2 is very contractive.

- The contractivity index of each monetary policy statement is computed as the simple average of the values assigned to the corresponding strings.

Monetary policy and fiscal deficit in Uruguay

- Uruguay has an inflation targeting regime since 2007.

- Two stages in terms of the monetary policy management instrument.

  - 2007 - June 2013: the interest rate was used as policy instrument.

  - July 2013 - nowadays:

    o The inflation target range was widened, from [4-6] to [3-7].

    o Growth of monetary aggregates became the policy instrument.

    o The monetary policy horizon was extended, from 18 months to 24 months.

- Inflation was rarely within the target range, however, there seems to be no substantive de-anchoring of expectations, as these are at high levels but relatively stable over time.

- Budget deficit to GDP increased from 2,5% to 5.1% during the period analyzed.
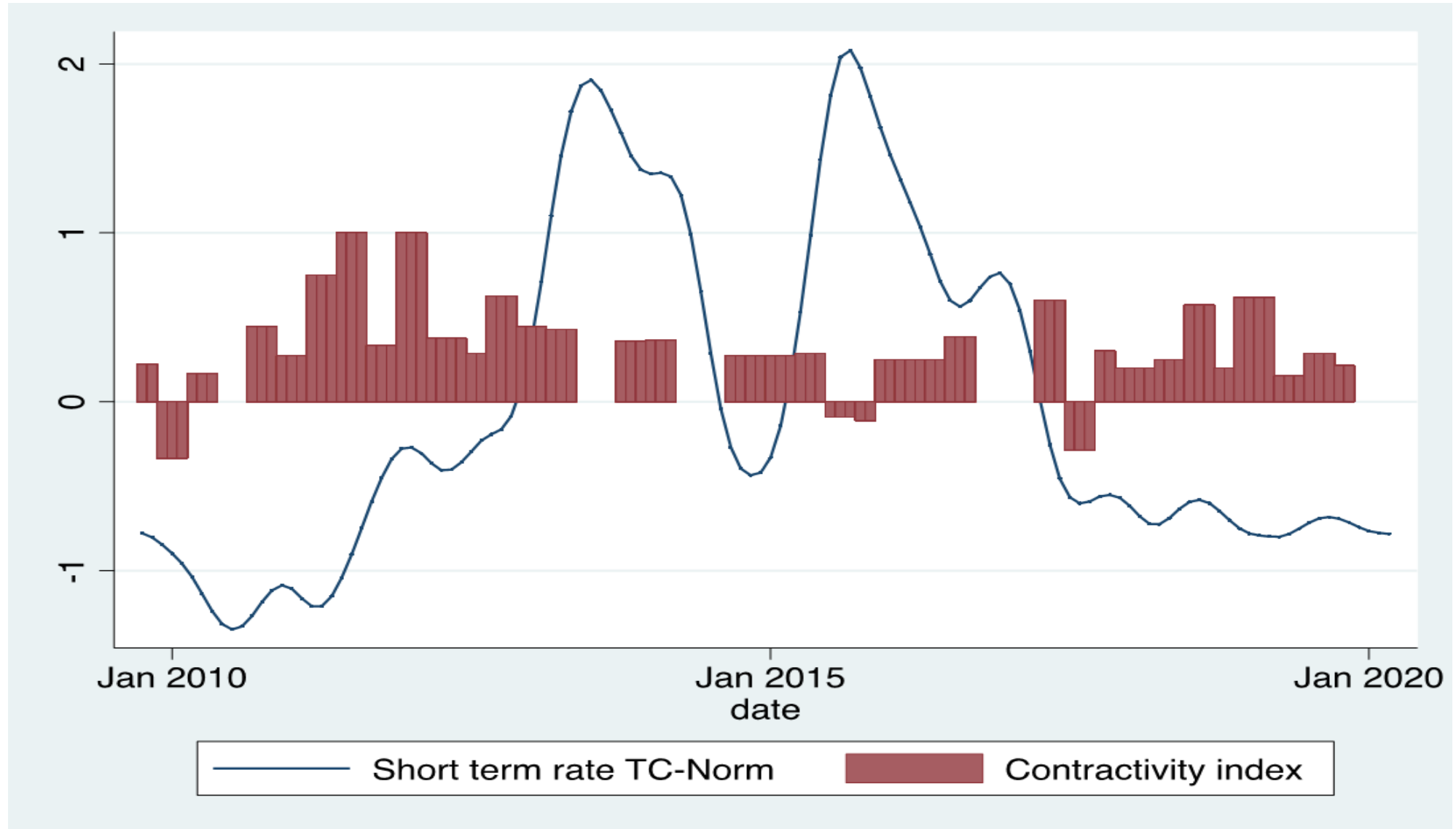
Inflation and monetary policy
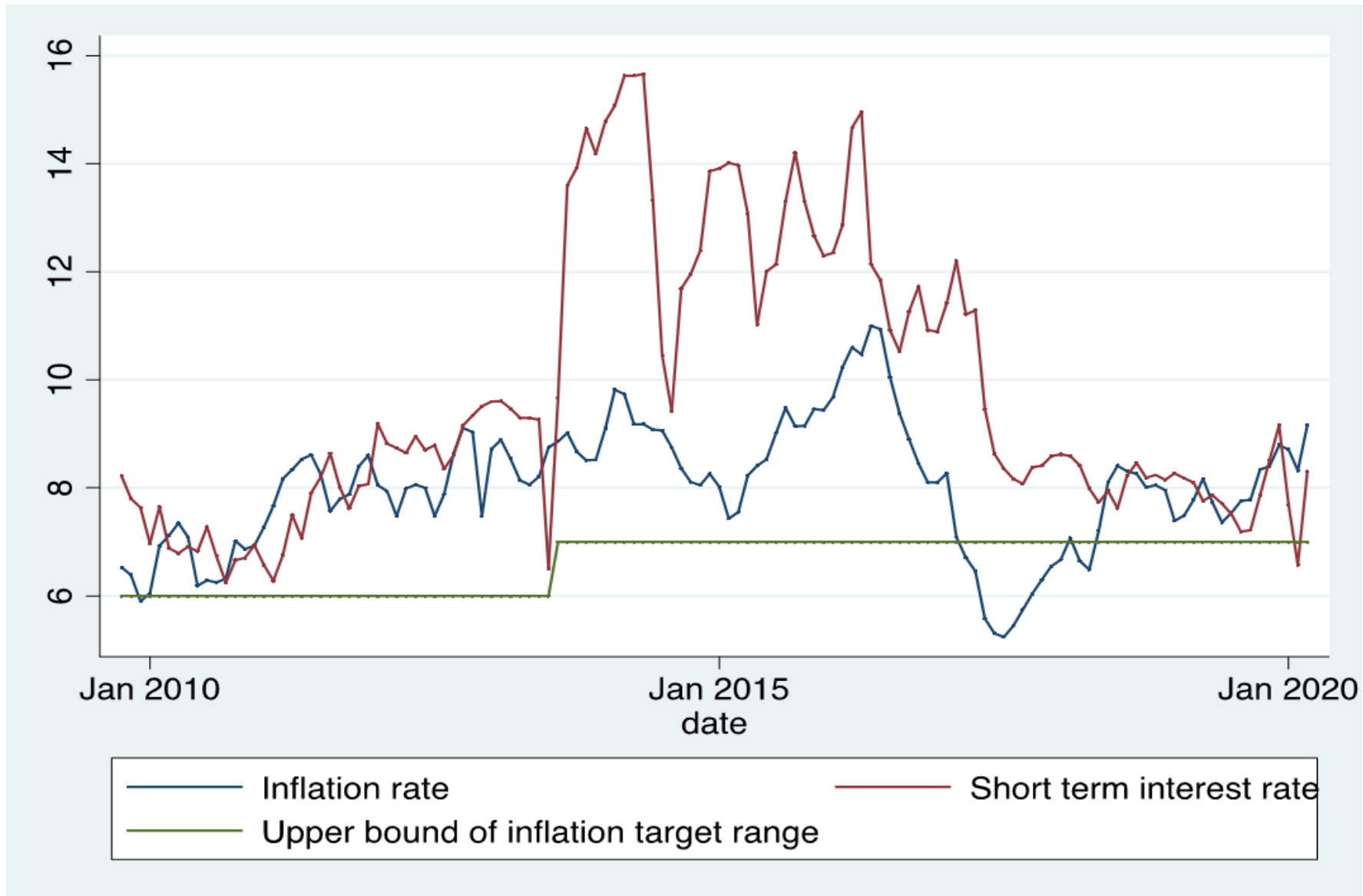
Inflation and inflation expectations
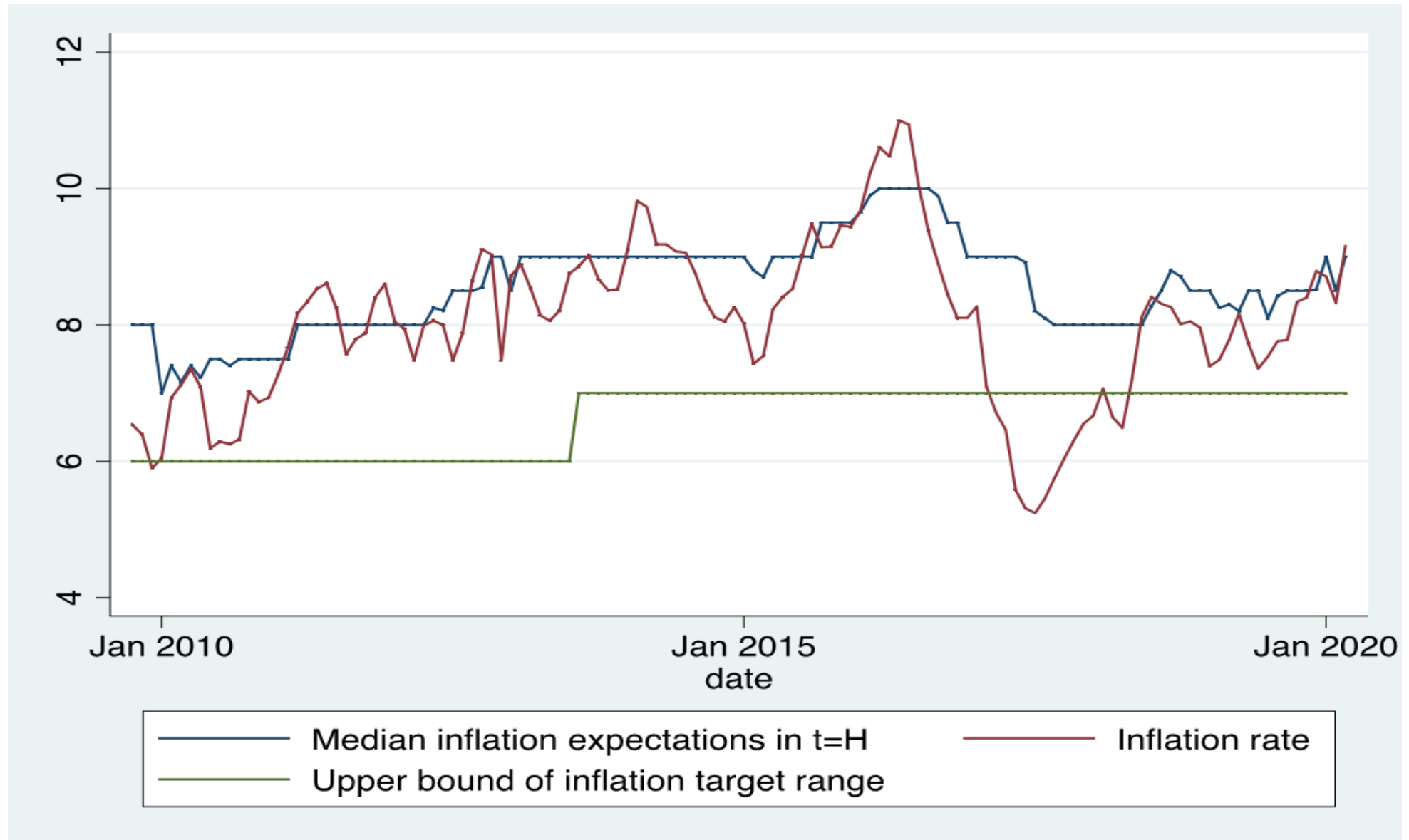
Monetary contractivity index

Budget deficit and primary deficit to GDP
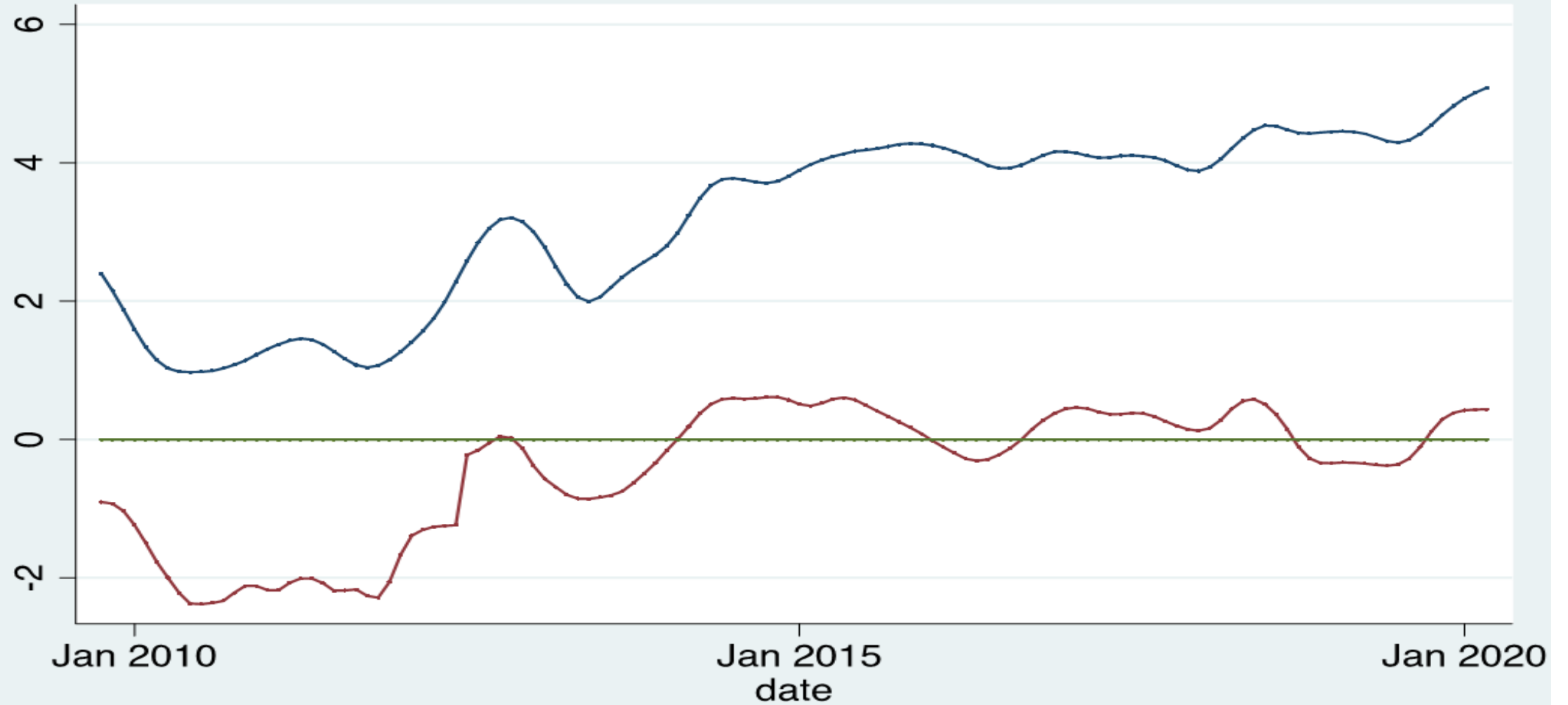
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Expected inflation rate in $t = H$	46,580	8.95	2.06	5.00	25.00
Inflation rate	46,580	8.00	1.16	5.24	11.00
Short term interest rate	46,580	9.76	2.60	6.25	15.66
Budget deficit to GDP	46,580	2.98	1.30	0.44	5.11
Monetary contractivity index	46,580	0.28	0.29	-0.33	1.00
Awareness about monetary policy	46,580	0.20	0.40	0.00	1.00
FX depreciation	46,580	0.48	2.43	-5.11	13.93
FX volatility	46,580	0.10	0.19	0.00	1.78
GDP growth	36,062	2.79	2.09	-1.49	7.96
Unemployment rate	46,580	7.25	1.00	5.60	10.80

Empirical approach

$$E_{it}\left(\pi_H\right) = \alpha_i + \beta_1 E_{it-1}\left(\pi_H\right) + \beta_2 \pi_{t-1} + \beta_3 i_t^{st} + \beta_4 E_{it}(F_t) + \varepsilon_{it}$$

- $E_{it}\left(\pi_H\right)$ is the inflation expectation for the monetary policy horizon $(t = H)$ of agent i in period t.

- π_{t-1} is the observed annual inflation rate in $t - 1$.

- i_t^{st} is the short term interest rate, proxy of monetary policy.

- $E_{it}(F_t)$ is the expected budget deficit of agent i in period t, (unobserved, instrumented by F_{t-2}).

Estimation method

- Estimation method is two-step GMM with robust standard errors.

  - ➤ Inflation expectations in monthly frequency are highly persistent.

  - ➤ Endogenous variables (short term interest rate, budged deficit to GDP, monetary contractivity index) are instrumented by their lags, the 12 months average of firms' expected costs and inflation.

- Controls:

  - ➤ Annual and monthly fixed effects.

  - ➤ Monetary policy range and instrument changes.

  - ➤ Number of answers to the IES.

Main results

	M1	M2	M3	M4	M5	M6
(1) Expected inflation rate $(t-1)$	0.118***	0.143***	0.143***	0.122***	0.122***	0.121***
	(0.031)	(0.029)	(0.029)	(0.030)	(0.030)	(0.030)
(2) Inflation rate $(t-1)$	0.314***	0.232***	0.225***	0.242***	0.244***	0.238***
	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
(3) Short term interest rate (t)	-0.263***	-0.233***	-0.226***	-0.198***	-0.200***	-0.202***
	(0.021)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)
(4) Budget deficit to GDP (TC) (t)		0.387***	0.390***	0.354***	0.350***	0.349***
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
(3)x(4)			0.053**			
			(0.024)			
(5) Monetary contractivity index				-0.147***	-0.152***	-0.135***
				(0.010)	(0.011)	(0.011)
(4)x(5)					0.013	
					(0.011)	
(3)x(4)x(5)						-0.027**
						(0.013)
Obs	41,078	37,930	37,930	37,930	37,930	37,930
N-Groups	570	560	560	560	560	560
AR(1)-p	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)-p	0.501	0.966	0.955	0.900	0.921	0.887
Hansen-p	0.741	0.871	0.888	0.876	0.882	0.881

Robustness check: primary deficit to GDP

	M1	M2	M3	M4	M5	M6
(1) Expected inflation rate $(t-1)$	0.118***	0.160***	0.159***	0.136***	0.135***	0.135***
	(0.031)	(0.029)	(0.029)	(0.030)	(0.030)	(0.030)
(2) Inflation rate $(t-1)$	0.314***	0.284***	0.287***	0.291***	0.292***	0.290***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
(3) Short term interest rate (t)	-0.263***	-0.245***	-0.227***	-0.209***	-0.212***	-0.215***
	(0.021)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)
(4) Budget primary deficit to GDP (TC) (t)		0.070**	0.083**	0.071**	0.062*	0.070**
		(0.034)	(0.034)	(0.035)	(0.036)	(0.035)
(3)x(4)			0.001***			
			(0.000)			
(5) Monetary contractivity index				-0.158***	-0.173***	-0.137***
				(0.010)	(0.011)	(0.012)
(4)x(5)					0.038***	
					(0.012)	
(3)x(4)x(5)						-0.000***
						(0.000)
Obs	41,078	37,930	37,930	37,930	37,930	37,930
N-Groups	570	560	560	560	560	560
AR(1)-p	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)-p	0.501	0.929	0.974	0.998	0.945	0.987
Hansen-p	0.741	0.865	0.854	0.869	0.864	0.814

Robustness check: gross debt to GDP

	M1	M2	M3	M4	M5	M6
(1) Expected inflation rate $(t-1)$	0.118***	0.048	0.049	0.048	0.047	0.045
	(0.031)	(0.036)	(0.037)	(0.037)	(0.037)	(0.037)
(2) Inflation rate $(t-1)$	0.314***	0.123***	0.124***	0.131***	0.132***	0.112***
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
(3) Short term interest rate (t)	-0.263***	-0.078***	-0.459	-0.078***	-0.080***	-0.086***
	(0.021)	(0.022)	(0.513)	(0.022)	(0.022)	(0.022)
(4) Gross debt to GDP (TC) (t)		0.100***	0.100***	0.096***	0.095***	0.098***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
(3)x(4)			0.006			
			(0.008)			
(5) Monetary contractivity index				-0.033***	-0.042***	-0.048***
				(0.011)	(0.011)	(0.011)
(4)x(5)					0.022*	
					(0.012)	
(3)x(4)x(5)						-0.001***
						(0.000)
Obs	41,078	37,930	37,930	37,930	37,930	37,930
N-Groups	570	560	560	560	560	560
AR(1)-p	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)-p	0.501	0.210	0.213	0.212	0.210	0.179
Hansen-p	0.741	0.831	0.862	0.853	0.862	0.850

Robustness check: other macro variables

	R11	R12	R13	R14	R15	R16
(1) Expected inflation rate $(t-1)$	0.146***	0.143***	0.141***	0.143***	0.143***	0.144***
	(0.029)	(0.029)	(0.030)	(0.030)	(0.030)	(0.029)
(2) Inflation rate $(t-1)$	0.227***	0.234***	0.241***	0.230***	0.235***	0.240***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)
(3) Short term interest rate (t)	-0.233***	-0.234***	-0.240***	-0.235***	-0.234***	-0.243***
	(0.023)	(0.022)	(0.023)	(0.023)	(0.023)	(0.023)
(4) Budget deficit to GDP (TC) (t)	0.382***	0.395***	0.398***	0.389***	0.397***	0.401***
	(0.036)	(0.035)	(0.036)	(0.036)	(0.036)	(0.036)
(5) Awareness about monetary policy (t)	0.624					0.573
	(0.451)					(0.454)
(6) FX depreciation (t)		0.004				0.003
		(0.003)				(0.004)
(7) FX volatility (t)			0.176***			0.155***
			(0.035)			(0.041)
(8) GDP growth (t)				0.054*		0.053
				(0.031)		(0.033)
(9) Unemployment growth (t)					0.031	0.036
					(0.027)	(0.028)
Obs	37,229	37,930	37,930	37,930	37,930	37,229
N-Groups	556	560	560	560	560	556
AR(1)-p	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)-p	0.636	0.972	0.992	0.964	0.959	0.638
Hansen-p	0.894	0.891	0.869	0.868	0.854	0.880

Final remarks

- Fiscal policy has a significant impact on inflation expectations in Uruguay, determining interdependence between monetary and fiscal policies.

  - ➢ Monetary policy faces more challenges to anchor expectations when the budget deficit worsen.

  - ➢ The interest rate channel of monetary policy working in isolation is not enough to compensate the negative impact of fiscal policy.

  - ➢ When the communication channel of monetary policy is added, then monetary policy has a significant impact over inflation expectations, compensating the fiscal negative results.

- Further work is needed in order to explain the determinants behind these results:

  - Expectations of monetary finance of Government's budget?

  - Agents perceive fiscal dominance, even though there isn't any?

  - Other objectives, such as FX stability?