Is fiscal dominance for real? Evidence from Brazil's high-frequency data *

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Abstract

As Sargent and Wallace argued long ago, monetary policy tightenings may end up stoking inflationary pressures in countries with high debt. To assess the empircal relevance of the so-called tight-money paradox, I apply Rigobon's identification via heterocedasticity methodology (IH) to brazilian data in the short window surrounding Central Bank's board meetings. I do not find evidence of fiscal dominance: my estimations suggest interest rate tightenings/loosenings have systematically led to lower/higher inflation expectations.

JEL: E58; E31

Key words: fiscal dominance, inflation expectations

1 Introduction

High interest rates coupled with high inflation and low growth in Brazil re-ignited the old debate about fiscal dominance and ineffectiveness of monetary policy. To be sure, different people mean different things when talking about fiscal dominance. For instance, few would

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disagree that a fragile fiscal stance hinders the working of monetary policy. But a more radical version of the argument, dating back at least to Sargent and Wallace (1981), argues that if the Central Bank is weak *vis-à-vis* the Treasury[1], interest rate hikes can generate a *deterioration* in inflation expectations. The mechanism underlying this unpleasant arithmetics is well-known: higher real rates trigger bad debt dynamics which could prompt the CB to monetize part of the debt pile in the future. Rational agents anticipate this and revise their inflation expectations upwards in the short run[2].

In this paper, I use a high-frequency identification strategy (IH) to look for signs of this "tight money paradox" in a highly indebted, high interest rate Inflation Targeter: Brazil.

From Sargent and Wallace's initial paper, sprung other versions of the same phenomenon, usually involving an element of multiple equilibria. In Blanchard (2004), for example: higher interest rates → higher probability of default → depreciation of the currency → higher inflation; whereas low interest rates →low probability of default → appreciation of the currency → low inflation. Importantly, the policy implications of these theoretical exercises can be highly seductive: decrease interest rates and get a lower inflation rate[3].

But is there hard evidence suggesting interest rates are on the wrong side of the "Inflation-Laffer" curve?

Identifying the effects of monetary policy on inflation is not an easy task. Central Banks do not randomly throw dices when setting short-term interest rates; they take the economic environment into consideration. Put it differently, it is difficult to separate out true monetary policy shocks from endogenous Taylor Rule type of reactions. This endogeneity problem explains why it is so hard to get rid of the famous price puzzle in VARs estimations: if

[1] In Game Theory parlor, the Treasury plays first and the CB takes its decision as a given before chosing the optimal inflation tax.

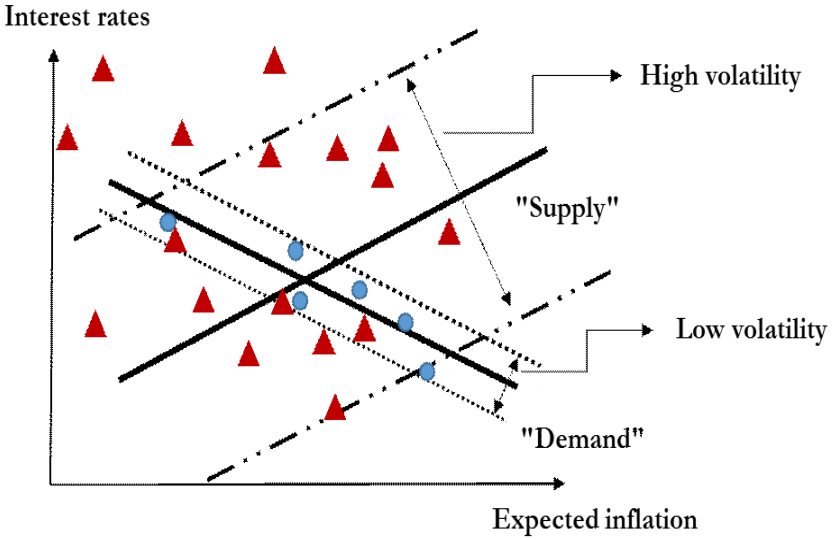
[2] Of course, inflating your way out of a huge debt pile is not the only option available; instead of taxing everyone's nominal wealth, the government could opt to tax bondholders directly, via an explicit default. Sargent and Wallace rule out explicit defaults in their model.

[3] See also Favero and Giavazzi (2004).

the central bank is increasing interest rates because some factor not specified in the VAR model is signaling higher inflation ahead, a VAR impulse response functions might display a strange pattern: tightenings leading to higher prices (and loosenings to lower prices). Fiscal dominance or poor identification?

Instead of resorting to VARs, the strategy in this paper is to use the high frequency identification methodology laid out in Rigobon (2003) to better identify monetary policy shocks. Briefly, identification is achieved through institutionally built-in data heterocedasticity[4]. As figure 1 below illustrates, if shocks to interest rates and inflation differ in size in different dates, identification becomes possible because the "supply curve" (in this case the CB's reaction function: $i = f(expected\_inflation^{+})$) moves around more than the "demand curve" ($expected\_inflation = f(i^{-})$) at particular dates, tracing the latter out[5].

Figure 1: Graphical intuition behind Rigobon's identification procedure



2 Data and Methodology

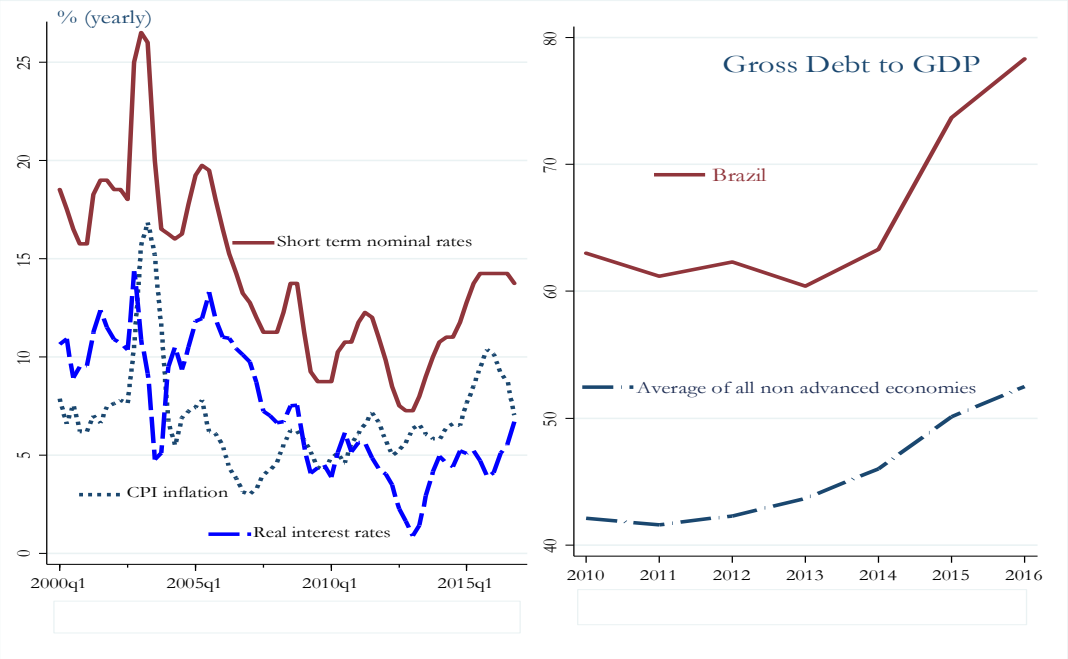
Claims about fical dominance in Brazil are understandable: as Figure 2 below shows, the country has witnessed high debt and abnormally high real interest rates since the turn of the

[4]Here whether or not the Central Bank meets to decide on the prime rate in a particular week.
[5]This follows Rigobon and Sacks (2004) very closely.

century – amidst relatively high inflation rates. So not only the ingredients for fiscal dominance have been present, but also a naked-eye look at inflation and interest rate behaviors certainly raises suspicion.

The chart also suggests the pre-2005 period was highly chaotic, with inflation and nominal rates jumping 10 percentage points and then plunging back between 2003 and 2004[6].

Figure 2: reasons behind the fiscal dominance thesis



Brazil adopted a fully-fledged inflation targeting regime after being forced out of its peg, back in 1999[7]. Amongst other features, IT in Brazil entails FOMC-style board meetings in which 7 directors choose by majority voting the short-term interest rate (Selic rate). These "Copom" (FOMC counterpart acronym in portuguese) meetings start on Tuesdays, and a final decision is announced to the public after markets close on Wednesday. Given this time structure, the high-frequency identification strategy used here uses Tuesdays and Thursdays'

[6] At the end of 2002 the country elected the Worker's Party candidate for president. Given the party's strong anti-markets rethoric prior to the election, investors fled securities and sought refuge in hard currency. The nominal depreciation reached 100%, stoking inflationary pressures. After the market realized the new administration's much more pragramatic economic approach, risk premia, exchange rate and inflation came tumbling down. And so did the nominal rate of interest.

[7] For more on Brazil's Inflation Target regime, see Bogdanski et al (1999).

daily financial (and survey) data.

Nominal interest (i) data is the one-year swap interest rate, which is arguably more sensitive to surprise variations in the prime rate than longer market rates. Expected inflation, $e(p)$, is calculated comparing the returns on nominal bonds with those from inflation-indexed bonds. This market inflation expectations data is available on a daily basis from september 2009 onwards. My main estimation thus uses data from September/24/2009 through February/23/2017 (the last Copom meeting in the dataset). In total, the number of **non-**Copom observations is $TNC = 328$, whereas the number of Copom meetings in the sample is $TC = 60$.

I also experiment with inflation expectations coming from Central Bank's surveys with the market, known as *Focus Survey*, which extends more back in time. But survey data is problematic: it is very slow moving, maybe because professional forecasters in financial firms have private incentives to be averse to changes – better to be wrong with the crowd than risk being wrong by yourself.

The key parameter to be estimed is the elasticicity capturing the impact of interest rate variations $\Delta i_{t:Tue\_Thu}$ on expected inflation $\Delta e(p)_{t:Tue\_Thu}$. That is, θ in the following equation ("demand curve"):

$$\Delta e(p)_{t:Tue\_Thu} = \theta.\Delta i_{t:Tue\_Thu} + \rho \Delta X_{t:Tue\_Thu} + \epsilon_{t:Tue\_Thu} \tag{1}$$

A positive θ is what we should expect if fiscal dominance is at play.

However, since Central Banks do not choose randomly, one has to take into account the possibility that $\Delta i_{t:Tue\_Thu}$ and $\epsilon_{t:Tue\_Thu}$.are not orthogonal. Put it differently, Central Banks' reaction function ("supply curve") cannot be conveniently swept under the rug:

$$\Delta i_{t:Tue\_Thu} = \beta.\Delta e(p)_{t:Tue\_Thu} + \varphi \Delta X_{t:Tue\_Thu} + \zeta_{t:Tue\_Thu} \tag{2}$$

Where:

- $\Delta e(p)_{t:Tue\_Thu}$ is the variation in inflation expectations.
- $\Delta i_{t:Tue\_Thu}$ is variation in interest rates.
- $\Delta X_{t:Tue\_Thu}$ is a vector of variables influencing both inflation expectations and interest rates.
- $\epsilon_{t:Tue\_Thu}$ and $\zeta_{t:Tue\_Thu}$ are shocks.

Rearranging both equations:

$$\Delta e(p)_{t:Tue\_Thu} = \frac{1}{1-\theta\rho}\left(\left(\theta\varphi+\rho\right)X_{t:Tue\_Thu} + \theta\zeta_{t:Tue\_Thu} + \epsilon_{t:Tue\_Thu}\right) \tag{3}$$

$$\Delta i_{t:Tue\_Thu} = \frac{1}{1-\beta\rho}\left(\left(\varphi+\rho\beta\right)X_{t:Tue\_Thu} + \zeta_{t:Tue\_Thu} + \beta\epsilon_{t:Tue\_Thu}\right) \tag{4}$$

Equation (1) is sometimes estimated via OLS. This is the so-called "event-study" approach, which implicitly assumes the only shocks taking place during the Tue_Thu time window are monetary policy shocks[8]. But in the presence of other shocks, estimating θ using OLS will yield biased results. Rigobon's (2003) contribution was to show that due to institutionally-built data heterocedaskticity, θ can still be consistently estimated through GMM or IV (necessary assumptions below).

The clever trick is to split the sample into monetary policy meetings' episodes, C, and its complement, NC. Exploring this heterogeneity, further define $Z = [\frac{\Delta i_C^{'}}{\sqrt{TC}}; -\frac{\Delta i_{NC}^{'}}{\sqrt{TNC}}]'$

[8] See for instance Cook and Hahn (1989) who regress daily changes in market interest rates on changes in the federal funds rate. See also Bomfim (2003) on monetary policy and stock market reactions.

and $I = [\frac{\Delta i_C}{\sqrt{TC}}; \frac{\Delta i_{NC}}{\sqrt{TNC}}]$, where Z is Rigobon's instrument under the following identifying assumptions:

$$\sigma^2_C(\Delta X) = \sigma^2_{NC}(\Delta X)$$

$$\sigma^2_C(\epsilon) = \sigma^2_{NC}(\epsilon)$$

$$\sigma^2_C(\zeta) >> \sigma^2_{NC}(\zeta)$$

The idea is that structural shocks to the "demand curve" should be similar in the two sub-samples, but those hitting the "supply curve" – that is, interest rates shocks – more relevant around Central Bank's board meetings. If that holds, then:

$$1/T(p\lim(Z'I)) = \frac{1}{(1-\beta\rho)^2}[(\varphi+\rho\beta)^2\left(\sigma^2_C(\Delta X) - \sigma^2_{NC}(\Delta X)\right) + \quad (5)$$

$$+\beta\left(\sigma^2_C(\epsilon) - \sigma^2_{NC}(\epsilon)\right) + \left(\sigma^2_C(\zeta) - \sigma^2_{NC}(\zeta)\right)] \quad (6)$$

$$1/T(p\lim(Z'I)) = \frac{\left(\sigma^2_C(\zeta) - \sigma^2_{NC}(\zeta)\right)}{(1-\beta\rho)^2} > 0 \quad (7)$$

and

$$1/T(p\lim(Z'\epsilon)) = \frac{\beta^2\left(\sigma^2_C(\epsilon) - \sigma^2_{NC}(\epsilon)\right)}{(1-\beta\rho)^2} = 0 \quad (8)$$

In the sample, $\sigma^2_C(\Delta i) = 3.24.10^{-4}$ and $\sigma^2_{NC}(\Delta i) = 1.24.10^{-4}$, so $\sigma^2_C(\Delta i) \approxeq 2.5\sigma^2_{NC}(\Delta i)$. Also crucial for the empirical strategy implemented here: $\sigma^2_C(\Delta e(p)) = 6.1\ .10^{-7}$and $\sigma^2_C(\Delta e(p)) = 5.9\ .\ 10^{-7}$ implying $\sigma^2_C(\Delta e(p)) \approxeq 1.01\sigma^2_{NC}(\Delta e(p))$. So $\sigma^2_C(\zeta) > \sigma^2_{NC}(\zeta)$ and $\sigma^2_C(\epsilon) = \sigma^2_{NC}(\epsilon)$ look reasonable assumptions to make.

3 Results

A positive and significant θ in equation (1) would be a sign of fiscal dominance in its strongest form: higher interest rates pushing inflation upwards. And as table 1 below shows, that is

exactly what the OLS estimation yields: a positive and very significant parameter. Most likely, however, the cause is not fiscal dominance since models (2)-(4) employing the IH strategy described in the previous section yield negative estimators.

Table 1: main results

Variables	(1) OLS, 2009/2017 bonds inflation_e	(2) IH, 2009/2017 bonds inflation_e	(3) IH, 2009/2017 survey inflation_e	(4) IH, 2005/2017 survey inflation_e
Variation in interest rates	0.188***	-0.862**	-0.177*	-7.329
	(0.0459)	(0.407)	(0.0902)	(78.71)
Constant	0.00563	0.00724	0.00156	-0.0106
	(0.00554)	(0.00850)	(0.00188)	(0.115)
Observations	388	388	388	634
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 2 below presents the results from the same model, but excluding 2015. This was by all means an abnormal year: administered prices inflation went virtually through the roof, possibly swamping the importance of any monetary policy move on inflation expectations[9]. The broad picture is the same, but now the estimations using survey data have much smaller standard-deviations

Figure 3: administered prices inflation

[9]Many important administered prices were put into a freeze during the previous three years. When president Dilma entered her second term in january 2015, one of first measures taken by her new finance minister was to readjust these prices in a single fell swoop.

Table 2: excluding 2015

Variables	(1) OLS, 2009/2017 bonds inflation_e	(2) IH, 2009/2017 bonds inflation_e	(3) IH, 2009/2017 survey inflation_e	(4) IH, 2005/2017 survey inflation_e
Variation in interest rates	0.113**	-0.643**	-0.187***	-2.272
	(0.0464)	(0.264)	(0.0670)	(6.433)
Constant	0.00146	6.86e-05	-0.000820	-0.00981
	(0.00528)	(0.00708)	(0.00180)	(0.0260)
Observations	336	336	336	582
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

4 Final remarks

High debt and real interest rates constitute fertile soil for Sargent and Wallace's tight money paradox, and Brazil – additionally presenting high inflation rates in recent years – is a natural candidate for fiscal dominance stories.

However, using a high frequency identification strategy, I show the positive correlation between variations in interest rates and variations in expected inflation to be an artifact of endogeneity. Properly isolating the direction of causality yields the opposite: higher interest rates bring inflation expectations down. Now, if the tight money paradox does not seem to be present in a country so prone to fiscal dominance as Brazil, what are the odds it could be operational elsewhere?

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