

Robust monetary policy, structural breaks, and nonlinearities in the reaction function of the Central Bank of Brazil

Gabriela Bezerra de Medeiros^a, Marcelo Savino Portugal^b,
Edilean Kleber da Silva Bejarano Aragón^{c,*}

^a Department of Economics, Federal University of Paraíba, Brazil

^b Graduate Program in Economics, Federal University of Rio Grande do Sul, Brazil

^c Graduate Program in Economics, Federal University of Paraíba, Brazil

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Abstract

In this work, we seek to investigate the existence of nonlinearities in the reaction function of the Central Bank of Brazil arising from this policymaker's uncertainties about the effects of the output gap on inflation. Theoretically, we follow Tillmann (2011) to obtain a nonlinear optimal monetary policy rule that is robust to uncertainty about the output-inflation trade-off of the Phillips Curve. In addition, we perform structural break tests to assess possible changes in the conduct of the Brazilian monetary policy during the inflation-targeting regime. The results indicate that: (i) the uncertainties about the slope in the Phillips curve implied nonlinearities in the Central Bank of Brazil's reaction function; (ii) we cannot reject the hypothesis of a structural break in the monetary rule parameters occurring in the third quarter of 2003; (iii) there was an increase in the response of the Selic rate to output gap and a weaker response to the current inflation gap in Meirelles–Tombini's administration; and (iv) the Central Bank of Brazil has also reacted to the exchange rate in Meirelles–Tombini's administration.

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Resumo

Neste trabalho, nós procuramos investigar a existência de não linearidades na função de reação do Banco Central do Brasil decorrentes de incertezas desse *policymaker* acerca dos efeitos do hiato do produto sobre a inflação. Teoricamente, nós seguimos Tillmann (2011) para obter uma regra de política monetária ótima não linear que é robusta às incertezas acerca do *trade-off* produto-inflação na curva de Phillips. Além disso, nós realizamos testes de quebra estrutural para avaliar possíveis mudanças na condução da política monetária brasileira durante o regime de metas de inflação. Os resultados indicaram que: i) as incertezas acerca da inclinação na curva Phillips implicaram em não linearidades na função de reação do Banco Central do Brasil; ii) não se pode rejeitar a hipótese de uma quebra estrutural nos parâmetros da regra monetária ocorrendo no terceiro trimestre de 2003; iii) houve um aumento na

* Corresponding author. Tel.: +55 08332167482.

E-mail address: edilean@hotmail.com (E.K.d.S.B. Aragón).

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resposta da taxa Selic ao hiato do produto e uma redução da reação ao hiato da inflação corrente no regime Meirelles-Tombini; e iv) o Banco Central do Brasil também tem reagido à taxa de câmbio durante o regime Meirelles-Tombini.

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Palavras-chave: Política monetária robusta; Regra de taxa de juros não linear; Quebras estruturais; Endogeneidade; Brasil

1. Introduction

In the 1990s, the inflation-targeting regime was adopted by several countries as an alternative for the conduct of monetary policy and for the maintenance of price stability. In Brazil, this regime was implemented by the Central Bank of Brazil (CBB) in July 1999. This happened six months after the exchange rate band system was replaced with a floating system. Given exchange rate overshooting and the rise in inflation and in inflation expectations, the Brazilian government intended to implement a policy regime that could maintain price stability and establish a new nominal anchor for inflation.

Numerous papers, seeking to assess the CBB's monetary policy decisions during the inflation-targeting regime, have estimated the Taylor (1993) rule or the forward-looking reaction function introduced by Clarida et al. (2000). In line with Taylor's (1993) monetary rule, the central bank adjusts the nominal interest rate to the deviations of current inflation from the inflation target and to the current output gap. On the other hand, Clarida et al.'s (2000) policy rule assumes the monetary authority adjusts the interest rate according to the inflation and output gap expectations for the future. Some authors like Minella et al. (2003) and Minella and Souza-Sobrinho (2013) estimated a forward-looking reaction function and concluded that the CBB had a strong reaction to inflation expectations. Sanches-Fung (2011) estimated reaction functions for the CBB in a data-rich environment. His evidence demonstrates that the CBB adjusted the Selic interest rate by following the Taylor principle, but that it did not respond systematically to exchange rate movements.

The papers referenced above take for granted that interest rate rules are linear functions of variables that indicate economic status. However, empirical evidence has pointed out important nonlinearities in the monetary policy rule. Nobay and Peel (2000), Schaling (2004) and Dolado et al. (2005) argue that a nonlinear optimal monetary rule takes shape whenever the central bank has a quadratic loss function and the Phillips curve is nonlinear. Bec et al. (2002), Nobay and Peel (2003), Dolado et al. (2004), Surico (2007), and Cukierman and Muscatelli (2008) mention that nonlinearities in the optimal monetary rule may be present should the monetary authority have asymmetric preferences for inflation and/or for the output gap. Kato and Nishiyama (2005) and Adam and Billi (2006) show that if the nominal interest rate has a lower bound equal to zero, the central bank may have a stronger reaction to a decrease in inflation so as to reduce the probability of deflation.

Brazilian studies on monetary policy rule nonlinearities look into specific characteristics of the CBB's asymmetric reaction. For instance, Aragon and Portugal (2010), Sá and Portugal (2011), and Aragon and Medeiros (2013) describe an asymmetric preference of the Brazilian monetary authority for an above-target inflation during the inflation-targeting regime. Moura and Carvalho (2010) gather empirical evidence in favor of nonlinearities in the reaction function that is consistent with the CBB's asymmetric preference for inflation. Lopes and Aragon (2014) evince that the nonlinearity in the interest rate rule results from time-varying asymmetric preferences, and not from possible nonlinearities in the Phillips curve. Schifino et al. (2013) reveal the nonnegativity constraint on the Selic interest rate may hinder the calibration of the CBB's preferences, being conducive to nonlinearities in the optimal monetary rule. Aragon and Medeiros (2015) estimate a reaction function whose parameters vary over time and conclude that the reaction of the Selic rate to inflation varies remarkably throughout the period, showing a downtrend during the inflation-targeting regime.

In contrast to the studies referenced above, this paper's prime goal is to investigate nonlinearities in the CBB's reaction function as a result of this policymaker's concern about specification errors in the macroeconomic model. In particular, we follow Tillmann (2011) to obtain a nonlinear optimal monetary policy rule that is robust to uncertainties over the effects of output gap on inflation. The estimation of this monetary rule allows checking for the presence of nonlinearities in the CBB's monetary policy conduct produced by specification errors in the model. In addition, we seek to run structural break tests to assess possible changes in the CBB's reaction function coefficients during the

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