The macroeconomic effects of monetary policy shocks under fiscal rules constrained by public debt sustainability☆

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ABSTRACT

This paper studies the macroeconomic effects of monetary policy shocks when fiscal rules are constrained to ensure public debt sustainability. In such an economy, the rise in the interest rate following a monetary policy shock increases the cost of financing debt, thereby making a fiscal adjustment necessary to guarantee debt sustainability. The analysis is based on a DSGE model developed and calibrated to describe the Brazilian economy, where the effects of the interest rate on public debt service tends to be pronounced. The model incorporates a detailed public sector capable of intervening in the economy through several channels. Our simulations show that the magnitude of the reduction in GDP following a monetary policy shock varies considerably depending on the fiscal rule adopted. In particular, there is strong evidence that economic performance worsens when fiscal adjustment relies on public investment cuts.

1. Introduction

It is a well-established fact, both theoretically and empirically, that under most circumstances a monetary policy shock that raises the interest rate will decrease output and inflation.[1] The transmission mechanisms usually considered in the literature work through either (i) higher capital costs, lower discounted present values of assets or a higher opportunity cost of present consumption, which decrease investment and consumption; (ii) domestic currency appreciation, which leads to lower net exports and overall demand; or (iii) bank capital and balance sheet effects, which negatively affect the supply of credit and therefore drive investment and consumer spending down (Boivin et al. (2011)).

In this paper, we investigate an additional channel arising from the interaction between monetary and fiscal policy: as the interest rate rises, government debt increases, thereby leading to the adoption of restrictive fiscal measures that reinforce the contractionary monetary shock. In fact, we may expect public debt to be affected by a monetary policy shock in at least two ways. First, the lower output brought about by the interest rate shock translates into lower tax revenues. For a given level of public expenditure, this implies a higher public sector primary deficit, which needs to be financed through higher debt. Second, even if the fiscal policy rule involves an endogenous response (e.g. higher tax rates or lower expenditures) aimed at keeping a balanced primary budget, the rise in interest rates may lead to higher interest payments on public debt, thus giving rise to a higher public sector nominal deficit and higher debt. In both cases, under an active monetary-passive fiscal policy regime,[2] public debt stabilization eventually requires a fiscal adjustment response through either higher tax rates or lower public expenditures, which must

[1] See, inter alia, Christiano et al. (1999, 2005), Bernanke et al. (2005), Forni and Gambetti (2010) and Barakchian and Crowe (2013). Regarding emerging economies, Mallick and Sousa (2012) show that a monetary policy contraction has a negative effect on output, whereas the aggregate price level either gradually falls (in the case of India, China, and South Africa) or exhibits strong persistence (for Brazil and Russia).

[2] As defined by Leeper (1991), some policy is said to be active if the corresponding authority is free to choose its actions independently of the public sector budget conditions, leaving to the passive authority the task of generating enough revenue to balance the budget.

drive output and inflation further down. Fiscal policy is therefore expected to amplify the initial contractionary effect caused by the monetary policy shock.

Although the literature on the interaction between monetary and fiscal policy rules has gained momentum recently,[3] the channel described earlier has not attracted much attention, being the works of Canzoneri et al. (2006), Valli and Carvalho (2010) and Çebi (2012) among the few to analyze its implications. Given the lack of studies on this subject, we aim to contribute to the literature in four main directions. First, we address this monetary-fiscal policy interaction within a medium-sized small open economy model featuring a detailed public sector, capable of intervening in the economy through several policy instruments: taxation on consumption and income, public investment, social transfers, public employees' payroll and government consumption. This allows us to investigate the effects of monetary policy shocks under a range of fiscal rules that is much wider than in previous studies. We are therefore able to identify which fiscal instrument choices generate larger amplification effects on output and inflation and lead to higher sacrifice ratios, defined as the ratio between cumulative output loss and cumulative price decrease following a monetary shock. Interestingly, some fiscal rules may adversely affect production costs and cause inflation to rise in the medium run, generating new rounds of interest rate increases that may further depress output.

Second, we consider fiscal rules that may differ with respect to both the timing of the policy response to the public debt and to the velocity of the fiscal adjustment back to the steady state. We thus seek to investigate the macroeconomic consequences of, on the one hand, delaying (anticipating) the fiscal adjustment required for debt stabilization; and, on the other hand, responding more (less) aggressively in order to pull the debt back to its equilibrium value more (less) quickly. By varying both the timing of the response to the debt and the velocity of fiscal adjustment, we may analyze how these parameters interact to generate higher or lower sacrifice ratios.

Third, our model explicitly takes into account the presence of public employment, besides other forms of public spending already considered in previous studies. As noted by Stähler and Thomas (2012), the explicit consideration of public employment can significantly affect the analysis of fiscal policy, given that the civil servants' payroll usually accounts for an important share of government consumption as measured by national accounts.

Finally, by considering two types of individuals (Ricardian and non-Ricardian agents) and two production sectors (tradables and non-tradables), we are also able to infer possible distributional and sectoral aspects of the interaction between monetary and fiscal policy. In particular, we may rank each fiscal policy rule according to its effects on the consumption of each type of individual and on the output of each sector following a monetary policy shock.

The model is calibrated to represent the Brazilian economy, in which the amplification mechanism we analyze may be particularly relevant for a number of reasons. First, despite the undeniable evolution in macroeconomic fundamentals observed in recent years, Brazilian interest rates remain high when compared to international standards. Second, public debt as a proportion of GDP is also quite high compared to other emerging economies.[4] Third, there is a very close relationship between the monetary policy rate and the cost of financing public debt, which tend to move together (see Appendix 1). As a result, the interaction between monetary and fiscal policies occurring through the effect of interest rates on public debt seems to be particularly relevant for the country. As Brazil is significantly affected by developments in the world economy but not the opposite, the small open economy hypothesis seems quite reasonable.

Regarding the main results of the paper, our simulations suggest that the effects of monetary shocks in an economy similar to the Brazilian one depend significantly on the fiscal policy rule adopted. In particular, rules in which fiscal adjustment relies on public investment reductions to stabilize the public debt tend to generate higher output losses and sacrifice ratios. The conclusion regarding public investment is robust, since it remains valid even when public capital has a modest impact on total factor productivity. Our results also indicate that more aggressive fiscal policy will generally lead to better economic performance following a monetary policy shock, and that most fiscal rules have clear distributional consequences, favoring Ricardian relative to non-Ricardian individuals.

The dangers of cutting public investment to offset an increasing cost of debt induced by a monetary squeeze is very relevant in the Brazilian scenario. Actually, Brazil figures among the countries in which this kind of policy has occasionally been put in place.[5] The result that most fiscal rules hurt non-Ricardian relative to Ricardian individuals is also important in the Brazilian context, given that a significant proportion of the population has limited access to financial services.[6]

Nevertheless, we must emphasize that fiscal adjustments carried out by public investment cuts are not an exclusivity of the Brazilian economy. Indeed, as emphasized by Orair (2016), this type of policy is widely documented in the literature on developed and emerging economies. Calderon et al. (2003), for example, show that almost half of fiscal adjustments put in place by Latin American countries in the 1990s was achieved by cutting investments in infrastructure. We can also cite the highly influential paper of Alesina and Perotti (1997), who identify several episodes of fiscal adjustments in OECD countries, some of them relying on tax increases and cuts in public investment. Therefore, we take as relevant the message that ensuring public debt sustainability by means of investment cuts may be regarded as one of the worst possible choices in response to monetary policy shocks. In fact, this result could be added to the literature regarding the theoretical and empirical importance of public investment[7],[8].

We must also note that our analysis assumes perfect credibility by monetary and fiscal authorities, so that we do not delve into questions related to uncertainty on future policies, as in, inter alia, Feve and Pietrunti (2016) and Lemoine and Linde (2016). We also restrict our analysis

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[3] See e.g. Schmitt-Grohé and Uribe (2005, 2007), Leith and Wren-Lewis (2000, 2008), Leeper et al. (2010a), Davig and Leeper (2011), Malik (2013) and Philippopoulos et al. (2015).

[4] See footnote 5.

[5] Graph 2 in the paper by Orair (2016) shows the behavior of public investment as a proportion of GDP from the end of 1995 until the end of 2015. There was a decline in public investment as a proportion of GDP since 2013, a decrease of 1 percentage point. Throughout the same period, the monetary policy rate rose 7 percentage points (from January 2013 to December 2015), reaching 10,25% per annum. The debt-to-GDP ratio increased more than 10 percentage points over the same period, reaching 80% of GDP in April 2017.

[6] Castro et al. (2015) assume that 40% of the population has limited access to credit markets, being essentially non-Ricardians. Kumar et al. (2005) find that 43 percent of individuals in Brazil have a bank account, implying that approximately half of the population do not.

[7] The strategic role of public investment has been extensively studied in the economic literature since at least Aschauer (1989) and Barro (1991). Although empirical research does not undoubtedly prove that public investment boosts economic growth, theoretical reasons justifying its importance have been extensively discussed. Among them we highlight the higher output and employment multipliers (especially during recessions), the possibility of smoothing total investment by counterbalancing private investment downturns, the ability to break structural bottlenecks and the possibility of increasing the productivity of the economy in the medium and long run - especially if the government invests in infrastructure and human capital.

[8] There is also another reason justifying the importance of public investment, which is quite relevant in the context of emerging economies like Brazil. This reason was highlighted by Mallick (2006), who used a small macroeconomic policy-oriented model of the Indian economy (focusing on the country's experience with the policy changes introduced in 1991) to carry out optimal control exercises. The paper's main results are (i) traditional IMF-supported adjustment programs are successful in improving the balance of payments and controlling the inflation rate, but fail in avoiding a collapse in economic activity, and (ii) output losses could be significantly reduced if the government boosted public investments in infrastructure.