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Limits to government debt sustainability in OECD countries

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ABSTRACT

The recent euro area sovereign debt crisis has shown the importance of market reactions for the sustainability of debt in advanced economies. This paper calculates endogenous government debt limits given the markets assessment of the probability to default. The estimated primary balance reaction function to growing debt has the “fiscal fatigue” property (a loosening fiscal effort makes the primary balance insufficient to support rising debt) at high debt levels. The combination of this feature of the primary balance reaction function with the market interest rate reaction to growing debt determines the government debt limit beyond which debt cannot be rolled over. An application to OECD countries over the period 1985 – 2013 with a model-based risk-premium shows that current debt limits are high for most of the OECD thanks to particularly low risk-free interest rates. It also shows for some countries that current debt levels are not sustainable without a change in government behaviour. Most importantly, the framework illustrates the state contingent nature of debt limits and therefore the vulnerability of governments to a change in macroeconomic conditions and to market reactions. Last, computations with an estimated interest rate reaction to public debt illustrate that debt limits are lower in the euro area than in other countries because of a sharper market interest rate reaction to rising debt.

1. Introduction

The recent euro area sovereign debt crisis has shown the importance of debt sustainability concerns in advanced economies. However, it is particularly difficult to assess debt sustainability, as illustrated sometimes with sharp short-term variations in default probabilities inferred from market prices. Indeed, market participants have to take into account a broad set of factors, such as macroeconomic prospects, the debt structures and the political risks among other factors. In addition, public defaults have been rather scarce in recent history in advanced economies. While recent history provides more information about public debt defaults in emerging economies, there are several deep differences between emerging and advanced economies. These differences suggest that the experience of emerging economies is unlikely to provide grounds to estimate debt limits in advanced economies (Fall et al., 2015).

The aim of this paper is to calculate state-contingent debt limits and therefore provide insights in assessing debt sustainability in OECD countries. Given the lack of historical default events, modelling the interaction between government behaviour and market reactions

allows to capture default likelihood that may not be identified with a purely empirical approach. Another advantage of the reliance on a model is that it illustrates some of the mechanisms at work.

There is a vast literature on the linkages between debt and fiscal policy since Barro's (1979) seminal paper. Bohn (1995, 2007) has pioneered the empirical work on fiscal solvency by providing direct and powerful method to conduct non-structural empirical tests for fiscal solvency. These tests require only data on the primary balance, outstanding debt and a few control variables as GDP growth. He points to the relevance of estimated fiscal reaction function to analyse the dynamics of fiscal adjustment that maintain solvency. Another angle is to observe past default episodes, building on Reinhart and Rogoff (2011) data on default episodes. Beyond the fiscal sustainability analysis, this can also capture the fiscal risk that governments may decide to default even if it is solvent (D'Erasmo et al., 2015). This risk and the “fiscal fatigue” feature considered in here share a common pattern: in both cases governments give up with consolidation efforts associated with debt repayments. Another alternative approach to fiscal reaction functions is used by Bi (2012) and Bi and Leeper (2013) who build on the Laffer curve. Botev et al. (2016) provide a discussion on these different approaches.

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Following this literature on fiscal reaction function estimates as in Ghosh et al. (2013), this paper is developed for and applied to OECD countries. Only a few papers provide models to estimate debt limits. The model used here is driven by the key variables that affect the public debt dynamic: the real interest rate, the real growth rate and the primary balance, as illustrated for instance in Bohn (2007). In addition, the recent euro area sovereign debt crisis has shown the importance of market reactions that are embedded in the model. Uncertainties surrounding Greek debt developments have been associated with a rapid increase of interest rates for some euro area countries and in particular for Ireland, Italy, Portugal and Spain. Formerly sustainable debt levels suddenly appeared risky, precipitating the launch of consolidation policies and ECB reactions.

The debt limit is defined as the debt level at which a sovereign borrower loses market access and hence cannot service its debt. This paper relies on a model to assess levels at which governments are more likely to default on their debt. The theoretical model is thus built on observable patterns to infer debt limits. It takes into account government endogenous reactions, through the primary balance, and market reactions to rising debt. It aims at calculating debt limits and at investigating the role of country-specific determinants.

The application in this paper shows this approach is robust to the use of quite a different method to estimate the fiscal reaction function. Ghosh et al. (2013) presume that the primary balance follows a cubic polynomial function of the lagged debt. These results are sensitive to the presence of a few countries with very high debt levels. Unlike Ghosh et al. (2013), in this paper, the primary balance reaction function is estimated with debt thresholds. Two hypotheses are successively estimated: in the first one (central scenario) there are two debt thresholds over which government's fiscal reaction to growing debt changes, that is the fiscal reaction is non-linear. In the second one, the government fiscal reaction function is estimated with only one threshold. While the framework is robust to the change in the number of thresholds included in the estimation, the two thresholds hypothesis is more able to display government primary balance efforts to counter growing debt up to a point where there is a relax in these efforts.

Moreover, this framework highlights the non-linear and unstable nature of debt sustainability. The market interest rates reaction to rising debt exhibits a non-linear debt spiral. Second, the debt limit model exhibits a strictly positive solution in some, but not all cases. The absence of solution is a stylised illustration that fiscal behaviour is not sustainable under the observed macroeconomic conditions. This illustrates that a structural change, such as a sudden drop in potential growth, can alter debt sustainability (of conversely, that an increase in potential growth can restore debt sustainability). Third, multiple equilibria are possible. This shows that, even when debt is well below its limit, good times cannot be taken as granted: when market confidence is lost, interest rates can increase sharply in a self-fulfilling crisis.

The analysis is applied to 31 OECD countries over the period 1985–2013, encompassing the post-crisis period. We find support for the existence of a non-linear reduced-form relationship between the primary balance and (lagged) public debt that exhibits the fiscal fatigue characteristic. The estimations indicate that at 120% of GDP governments react strongly to rising debt and at around 170% of GDP, primary balance efforts are relaxed. Combining the empirical estimates of the primary balance reaction function with actual interest rate data or with model's endogenous interest rates, the debt limit for each country is calculated. The results confirm that Greece, Iceland, Ireland, Portugal, Slovakia, Slovenia, Spain and Japan are in a difficult situation with a high debt level not allowing for the determination of a debt limit. When one threshold is considered in the fiscal reaction function, in addition to these countries, Italy and the United States appear to be sensitive and their debt limit becomes undetermined.

The robustness is further investigated in an alternative approach in which the effect of public debt on interest rate is estimated, rather than

modelled. By nature, the effect of public debt on interest rate is difficult to capture, and results can change substantially. In particular, with this approach, the debt limit for the Czech Republic, France and United Kingdom becomes undetermined.

Results illustrate that the debt limit is state dependent: it evolves with the behaviour of the government, monetary policy (captured here with the risk-free interest rate), market reactions and growth prospects. A change in underlying key parameters such as the potential growth rate, the risk-free interest rate, and a constant in the fiscal reaction function capturing the past behaviour of the government induce a change in the debt limit. Hence, the debt limit does not predict the timing of a default, but rather indicates sustainability given actual economic conditions.

This paper is structured as follows. First, the government primary balance reaction function to increasing debt is estimated. It shows a non-linear reaction of governments to increasing debt. Second, a model is solved to calculate the debt limit. This model incorporates the estimated primary balance behaviour in the standard debt accumulation dynamics, with the interest rate determined by the probability of default. Third, the interest rate reaction to debt is estimated. This estimation provides an alternative calculation of debt limits. The last section concludes.

2. Estimating the fiscal reaction function

2.1. Estimation method

The estimation of fiscal reaction functions follows the framework of Ghosh et al. (2013), which suggests that at a high level of debt, there is fiscal fatigue that sets in, implying that governments do not increase their primary balance to limit debt accumulation. Since Bohn's (1998) seminal work, there have been several papers that have presented fiscal reaction functions, among which are Galí and Perotti (2003), de Mello (2008), Celasun et al. (2006), Mendoza and Ostry (2008), Burger et al. (2011), Burger and Marinkov (2012) and Medeiros (2012). They estimate a relationship between the primary balance and various potential determinants.

Ghosh et al. (2013) are the first to explore the debt sustainability implications of a non-linear response of the primary balance to rising debt. However, Bohn (1998; 2008) has already found a non-linear fiscal reaction function. Using a quadratic specification for the United States, he finds that the primary surplus is more responsive to increases in debt at higher debt levels. (over 1916–95 and 1792–2003). By contrast, Mendoza and Ostry (2008), who look at international evidence, find that the response of the primary balance to debt weakens at higher debt levels.

Ghosh et al. (2013) presume that the primary balance follows a cubic polynomial function of the lagged debt ratio and find statistically significant estimates. Medeiros (2012) results also suggest the existence of fiscal fatigue, which occurs at a debt ratio of 80–90% for a set of EU countries. However, these results are highly sensitive to the presence of a few countries with very high debt levels.

To investigate the robustness of the estimation of the “fiscal fatigue” hypothesis, the primary balance reaction function is estimated with debt thresholds, in a specification relating the primary balance to the output gap, fiscal one-offs, the sovereign debt ratio, and country fixed effects:

$$\begin{aligned} PB_{it} = & \beta_1 GAP_{it} + \beta_2 OT_{it} + \beta_3 (D_{it-1} 1_{D_{it-1} < d_1} + d_1 1_{d_1 \leq D_{it-1}}) \\ & + \beta_4 ((D_{it-1} - d_1) 1_{d_1 \leq D_{it-1} < d_2} + (d_2 - d_1) 1_{d_2 \leq D_{it-1}}) + \beta_5 (D_{it-1} - d_2) 1_{d_2 \leq D_{it-1}} \\ & + \beta_6 OO_{it} + u_i + v_{it} \end{aligned} \quad (1)$$

where PB_{it} denotes the primary balance of country i at year t as a per cent of GDP, GAP_{it} denotes the output gap, OT_{it} denotes the openness ratio multiplied by the term of trade, OO_{it} denotes fiscal one-offs, D_{it}

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