Fiscal Challenges to Monetary Dominance in the Euro Area: A Theoretical Perspective

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1 Introduction

Based on the fiscal fundamentals, it might come as a surprise that government debt problems arose in the euro area rather than in other parts of the world. Figure 1 shows the ratio of the primary balance to GDP (on the horizontal axis) and the ratio of net government debt to GDP (on the vertical axis) for the euro area, the US, Japan and the UK in 2009.[1] The fiscal fundamentals were bad everywhere, but they were worse in the US, Japan and the UK than in the euro area on average. Figure 2 shows that the fiscal fundamentals of the US, the UK or Japan were comparable to those of Greece, Portugal, Ireland or Spain, the euro area economies that were the most affected by the crisis.

Several differences between the euro area and the rest of the world can explain this puzzle. The euro area deprives its members from certain margins of flexibility, such as exporting their way out of low growth by depreciating their currencies. Euro area countries do not enjoy the benefits of issuing a

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[1]The data come from the World Economic Outlook (October 2011). The data for the euro area are the GDP-weighted average of the 11 largest euro area economies.

reserve currency to the same extent as the US, and most of them cannot rely on a high domestic saving rate to the same extent as Japan. Finally—and this is the difference that I will focus on in this note— the relationship between monetary policy and fiscal policy is not the same in the euro area as elsewhere.

The euro area was explicitly designed to minimize the risk of monetization of government debts, that is, to enforce the maximum degree of "monetary dominance" (Sargent and Wallace, 1981). The risk of monetization is perhaps not zero, because it is not certain what the European Central Bank (ECB) would do in a large-scale government debt rollover crisis that would threaten the existence of the euro. But it is certainly more likely that the monetary authorities would let the fiscal authorities default in the euro area than elsewhere.[2]

If this is what makes the euro area special, then in order to study the European debt crisis one would need a theoretical framework in which monetary dominance can be challenged, and the monetary authorities have a choice between monetizing government debt or letting the government default. I present a simple model with those features below.

The model has somewhat unconventional implications, but it sheds an interesting light on the current debates on European policies. This debate often takes the form of an opposition between two seemingly irreconcilable views that—at the risk of oversimplifying—one might call the "Northern view" and the "Southern view". The Northern view is that the interest rate spreads associated with the threat of default may be a normal and even desirable feature of the equilibrium, to the extent that they give euro area governments incentives to keep their fiscal house in order. This view is defended by the ECB and the German government.

The Southern view is that the spreads are harmful, and that their presence in the euro area (and not elsewhere) comes from the ECB's failure to play its role of "lender of last resort" (De Grauwe (2011)). According to that view, the spreads reflect a vicious circle in government debt dynamics and market expectations—with high spreads leading to exploding debts, which in turn justifies the expectation of a default. By standing ready to buy government

[2]Martin Feldstein puts it in this way in his recent piece "The French Don't Get It": "When interest and principal on British government debt come due, the British government can always create additional pounds to meet those obligations. By contrast, the French government and the French central bank cannot create euros." Project Syndicate at http://www.project-syndicate.org/commentary/feldstein43/English

debt at the right price, the ECB could ensure that the economy stays in the good equilibrium with low interest rates. And like in the Diamond-Dybvig model, the commitment to lend would imply that lending-in-last-resort is not necessary in equilibrium.

One theme of this paper is that those two views are a bit too simple. On the one hand, the proponents of the Southern view make their lives too easy by simply assuming that government solvency would be ensured by low spreads. It is true that, other things equal, lowering spreads to zero would reduce the probability of default, but this does not mean that the probability of default would be reduced to zero. And a positive residual probability of default implies that the monetary authorities might be called to "lend in last resort" to an insolvent government in equilibrium. Debt monetization, thus, is not a purely notional out-of-equilibrium risk, it is a real risk that has to be weighted against the benefits from low spreads.

One the other hand, it is not obvious either that high spreads necessarily provide the appropriate incentives for fiscal adjustment. They could as well discourage fiscal adjustment by making the dynamics of debt unsustainable and reducing the probability that fiscal efforts eventually pay off. By reducing the likelihood of a successful fiscal adjustment, high spreads might actually make inflation more (not less) likely, as I will show in this note. In the long run, furthermore, it might be necessary to accept a small risk of debt monetization (occurring, say, once every century on average) in order to establish a relationship between fiscal policy and monetary policy that is sustainable—i.e., one that does not generate a government debt crisis every ten years.

Relationship to the literature. The distinction between monetary dominance and fiscal dominance was originally made by Sargent and Wallace (1981). There is monetary dominance when the monetary authorities are entirely focused on controlling inflation, whereas the fiscal authorities adjust fiscal policy to stay solvent conditional on an exogenous flow of seigniorage. Fiscal dominance, conversely, occurs when monetary policy is subject to the constraint of providing enough seigniorage to the government to ensure solvency. This distinction appears under different guises in the literature that looks at monetary and fiscal policy rules in recursive models. In Leeper's (1991) terminology, monetary dominance corresponds to the case where monetary policy is "active" and fiscal policy is "passive". In the analysis of Woodford (2003), monetary dominance results when the monetary rule follows the "Taylor principle" and the fiscal rule is "locally Ricardian".

The approach in this paper is related to other contributions that explore the grey area between pure fiscal dominance and pure monetary dominance. For example, Davig and Leeper (2007) study an environment in which the monetary policy rule switches between an active stance and a passive stance. Davig, Leeper and Walker (2010) use a rational expectations framework to assess the implications of rising debt in an environment with a "fiscal limit", i.e., a point where the government no longer has the ability to finance higher debt levels by increasing taxes, so that either a fiscal adjustment or inflation must occur to stabilize debt. Those papers, however, do not consider *default* as an alternative to fiscal adjustment or inflation.

Other papers introduce the possibility of government default in dynamic optimizing models of monetary and fiscal policy. Uribe (2006) makes the point that if fiscal and monetary policy are both "active", then the only way that the government can satisfy its intertemporal budget constraint is by sometimes defaulting. He shows that the equilibrium behavior of default and rates and risk premiums may be quite sensitive to the specification of the monetary rule. Bi (2011) presents an intertemporal optimizing model in which default is an alternative to fiscal consolidation. However, Uribe's model does not have fiscal adjustments and Bi's model does not have monetary policy. This paper, by contrast, embeds the three options of default, inflation and fiscal adjustment in the context of a single framework.[3]

The paper is structured as follows. Section 2 present the assumptions of the model. I then study lending-in-last resort (section 3) and the trade-off between inflation and default (section 4).

2 A simple model

The model has two periods, $t = 1, 2$. Period 2 represents the long run: it is a reduced form for an infinite-time steady state.[4] Fiscal policy and monetary policy are implemented by the government and the central bank respectively. The central bank targets an inflation rate, which for convenience is normalized to zero. The government must roll over its debt between period $t = 1$

[3]This paper is in part based on Jeanne (2012). The difference is that the model in Jeanne (2012) is in continuous time and features learning about the government's type, thus yielding richer and more realistic dynamics.

[4]The details of the infinite-time model underlying the analysis presented here are available upon request to the author.

and period $t = 2$. It is not certain in period 1 that the fiscal primary balance will be high enough in the long run (period 2) to make the government solvent conditional on zero inflation. If the primary balance is not high enough, there is a solvency crisis, following which either the government defaults, or the central bank comes to its rescue by increasing seigniorage.

The model can be summarized in three equations. The first equation describes the evolution of government nominal debt between period 1 and period 2,

$$(1 + i)d_1 = d_2, \tag{1}$$

where i is the nominal interest rate between the two periods. The government has a zero primary balance in period 1 so that its debt at the beginning of period 2, d_2, is simply equal to its debt at the beginning of period 1, d_1, times the nominal interest factor. The initial level of debt, d_1, is exogenous.

The second equation is the budget constraint of the government in period 2,

$$rd_2 = b + s(\pi), \tag{2}$$

where r is the riskless real interest rate, b is the long-run real primary balance excluding seigniorage, and $s(\pi)$ is real seigniorage revenue, which is increasing with the rate of inflation, π. This is the budget constraint for the steady-state with constant real debt that prevails from period 2 onwards. For the level of real government debt to remain constant, the interest payment on the debt must be equal to the primary balance including seigniorage.[5] Equation (2) applies if the government does not default in period 2. If the government defaults, the left-hand-side is multiplied by $1 - h$, where h is the "haircut" that creditors must bear in a debt restructuring.

The level of the long-run primary balance b is not known in $t = 1$ and is observed in period 2. It is expected in period 1 that the government will do a fiscal adjustment, i.e., will increase the primary balance to the level that is required to avoid a default conditional on zero inflation—given by $b = rd_2$. However, for political or economic reasons the government may be unable to set the primary balance at that level. The ex ante probability (i.e., viewed from period 1) that the government will fail to implement the fiscal adjustment is an increasing function of b, which will be denoted by $P(b)$.

[5]The price level is periods 1 and 2 is normalized to 1, so that d_2 is the real level of debt at the beginning of period 2. To be exact, r should be defined, in this equation, as the real interest rate divided by one plus the real interest rate.

That is, a fiscal adjustment is less likely if it is larger. The probability $P(b)$ is a measure of the fiscal risk.

It will be convenient to assume that there are two thresholds $\underline{b}$ and $\bar{b}$ such that the fiscal adjustment is implemented with probability one if b is lower than $\underline{b}$ and with probability zero if b is larger than $\bar{b}$. Thus, if $rd_2 \leq \underline{b}$, the fiscal adjustment is implemented with certainty, and if $rd_2 > \underline{b}$, there is a positive probability that the government fails to implement the adjustment. If the adjustment is not implemented, the primary balance is set to a level that is at most $\underline{b}$.

If the government does not implement the fiscal adjustment, there is a solvency crisis in period 2. Then, one of the following two things happens:

- inflation, no default: the central bank rescues the government from a default by increasing seigniorage to $s(\pi) = rd_2 - \underline{b}$;
- default, no inflation: the central bank sticks to its zero inflation target and let the government default.

In the second case, the government sets the primary balance to the level that ensures solvency after default, $b = r(1-h)d_2$. The haircut is assumed to be large enough that this is always possible.

To sum up, if there is a solvency crisis in period 2, the government cannot roll over its debt. The central bank is faced with a choice between increasing inflation and letting the government default subject to the constraint that the primary balance b cannot exceed $\underline{b}$.

The public does not know, ex ante, how the central bank will respond to a solvency crisis. I assume that conditional on a solvency crisis, the central bank sticks to its inflation target (and let the government default) with an exogenous probability denoted by μ. The public knows μ and forms rational expectations based on this knowledge. Parameter μ, thus, is a measure of the central bank's reputation for enforcing monetary dominance ex post, in a crisis.

Note that the kind of monetary dominance that is measured by μ is not exactly the same as monetary dominance as defined by Sargent and Wallace. In Sargent and Wallace (1981), monetary dominance is the assumption that the government sets the fiscal balance to a level that ensures solvency, taking the seigniorage as given. This is captured in my model by $1 - P(b)$, the probability that the government does the fiscal adjustment. But μ is

something different: it is the probability that the central bank will let the government default if the fiscal adjustment is not implemented. It is a measure of what one might call "ex post" (or "hard") monetary dominance—the fact that monetary dominance is implemented when it is fiscally challenged.[6] It is useful to distinguish the two notions since, if $P(b)$ were equal to zero, the model would feature monetary dominance in the sense of Sargent and Wallace (1981) but this would say nothing about μ. For example, one can imagine situations where $P(b)$ and μ are both low, i.e., monetary dominance is strong ex ante but weak ex post.

Finally, the model is closed by an interest parity condition. I assume risk neutrality, implying that the expected return on the government debt between period 1 and period 2 must be equal to r,

$$(1+i)\left[1-P(b)\mu h\right]=1+r. \tag{3}$$

The nominal interest factor, $(1+i)$, is multiplied by one minus the probability of a default times the haircut. Note that the nominal interest rate entails a default risk premium but no inflation risk premium because inflation is equal to zero between time 1 and time 2 (if the government rolls over its debt).[7]

Using that the primary balance ensuring no default is $b=rd_2=r(1+i)d_1$, equation (3) can be rewritten

$$1+i=\frac{1+r}{1-\mu hP(r(1+i)d_1)}. \tag{4}$$

This equation links the nominal interest rate to the exogenous variables of the model. All the results will be derived, in one way or another, from this equation.

[6]The term "hard" is meant to evoke the distinction between "hard" and "soft" power that is made in the study of international relations. Soft monetary dominance means that the fiscal authorities do everything possible ex ante to reduce the risk of an open conflict between monetary dominance and fiscal dominance. Hard monetary dominance means that the monetary authorities enforce monetary dominance ex post when the conflict has not been avoided.

[7]I assume that if there is debt monetization, the rate of inflation increases from period 2 onwards, but the period-2 price level remains the same. Thus, government debt is not inflated away. This assumption can be relaxed but it is important for my argument that the premium for the risk of inflation be lower than the premium for the risk of default.

3 Lending in last resort

Both sides of equation (4) are increasing with i, which may lead to multiple equilibria. The intuition behind this multiplicity is the same as in Calvo (1988): high interest rates can be self-fulfilling because they increase the burden of repayment and so the probability of default.

The equilibrium multiplicity is illustrated in Figure 3. To construct this figure I assume that the probability of not implementing the fiscal adjustment is increasing linearly from zero to one in the interval $(\underline{b}, \bar{b})$, that is

$$F(b) = \frac{b - \underline{b}}{\bar{b} - \underline{b}}. \tag{5}$$

The parameters are set to the following values: the riskless real interest rate is equal to 5 percent ($r = 0.05$), the debt-to-GDP ratio is 100 percent ($d_1 = 1$), the haircut is equal to to 50 percent ($h = 0.5$), the central bank never monetizes ($\mu = 1$) and $(\underline{b}, \bar{b}) = (0.06, 0.09)$.

With those parameter values there are two equilibria, as shown by the figure. In the good equilibrium (point A), the default probability is zero and the government can roll over its debt at the riskless interest rate of 5 percent. As a result it needs a fiscal balance of $d_1(1 + r)r$= 5.25 percent of GDP in period 2, which is achieved with certainty since it is lower than $\underline{b}$= 6 percent.

In the bad equilibrium (point B), the default probability is 70 percent. The government has to pay an interest rate of 62 percent to roll over its debt. The larger debt requires a larger primary balance of 8.1 percent of GDP in period 2, which is implemented with a probability of 30 percent.

Note that the bad equilibrium can be removed by decreasing μ, if this lowers the right-hand side of equation (4) sufficiently that it no longer crosses the left-hand side in point B. This is obvious if one sets μ to zero: then the right-hand side becomes the horizontal line $i = r$, so that only the good equilibrium remains. By promising to monetize the debt if the government is insolvent, the central bank ensures that the government can roll over its debt at a low interest rate, so that the government is solvent in period 2. This is a free lunch since the central bank does not need to monetize in equilibrium.

More generally, the case for pure lending-in-last resort arises if $P(rd_1) = 0$, that is, if it is known with certainty that the government will do the fiscal adjustment conditional on a zero default risk premium. This may be a reasonable assumption under some circumstances but there is no reason to assume that it is always satisfied. If the government has to roll over a

large amount of debt d_1, then the probability that the government will fail to adjust may be positive even with a zero premium. In this case, it remains true that lowering μ may remove the bad equilibrium (if there is one), but this is no longer a free lunch. There is a nonzero probability that debt will have to be monetized and the rate of inflation will have to increase in equilibrium.[8]

4 Trade-off between inflation and default

The more realistic case is where $P(rd_1)$ is positive. To explore this case, I keep the same model specification and numerical values as in the previous section, except that I lower $\underline{b}$ and $\bar{b}$ by one percent, to respectively 5 and 8 percent. As a result, the probability of insolvency conditional on a zero risk premium is no longer zero: it is $P(rd_1)$= 8.3 percent.

I then compute how the equilibrium probability of each possible outcome (fiscal adjustment, default, inflation) varies with μ. If there are multiple equilibria I pick the good one. The results are reported in Figure 4.

Several results are worth highlighting. First, the fiscal adjustment is possible only if the hard monetary dominance index, μ, is lower than a threshold of about 80 percent, that is if conditional on a solvency crisis the central bank monetizes government debt with a probability of at least 20 percent. If μ is larger than 80 percent, there is no interest interest rate at which the government can roll over its debt in period 1, so that the debt rollover crisis (and the hard choice between inflation and default) comes up in period 1 rather than period 2. If $\mu = 1$, the central bank never opts for monetization so that the government defaults with probability 100 percent in period 1.

Second, the probability of inflation may be *increasing* with hard monetary dominance, μ. When μ crosses the 80 percent threshold from below, the probability of inflation jumps up from about 10 percent to about 20 percent. This is because a situation where the government can roll over its debt and a fiscal adjustment is still possible is replaced by an immediate rollover crisis in which the central banks has to choose between inflation and default—and chooses the former with a twenty percent probability. From the point of view of inflation, intermediate levels of μ may bring about the worst of both worlds: μ is too high to leave time for a successful fiscal adjustment, but

[8] Another problem with the lending-in-last-resort view is that the underlying theory of equilibrium multiplicity has loose ends. The government, as a large agent, should be able to pick the good equilibrium, as emphasized by Chamon (2007).

not high enough to guarantee that a solvency crisis will not be followed by inflation.

Third, if $\mu = 0$ the probability of inflation is not zero (there is no free lunch) but, at about 8 percent, it is not very high either. The probability of a fiscal adjustment is more than ten times larger than the probability of inflation. That is, a commitment to provide a monetary backstop to a government debt rollover crisis is not implemented very often in equilibrium. To illustrate, if the need for the fiscal adjustment described in the model arose every ten years in average, full monetary backstop ($\mu = 0$) implies that debt is monetized less than once every hundred years on average. Hard monetary dominance ($\mu = 1$), by contrast, implies that the government defaults every ten years on average. It is not clear, on the face of it, that the latter is preferable to the former.[9]

5 Conclusion

I have looked at the impact of "hard monetary dominance", i.e., a commitment by the monetary authorities to let the fiscal authorities default rather than raise inflation, on the probabilities of three possible equilibrium outcomes—fiscal adjustment, default and inflation—in the context of a simple model. Although the model is very stylized, the relationship between monetary dominance and the outcomes is perhaps more subtle than would be suggested by the existing literature on the benefits of monetary dominance. Hard monetary dominance may come at the cost of making fiscal adjustment more difficult and default more likely. It can even make inflation more likely. Providing a monetary backstop for government debt crises may be a necessary condition for an orderly and sustainable policy mix in which governments are not defaulting too often, although it may come at the cost of a nonzero (but not necessarily very high) probability of debt monetization.

The analysis presented in this short paper certainly misses important aspects of the problem. For example, I did not look at the impact that the risk of default might have on the incentives to invest more effort in fiscal

[9] Another way to put it is that the levels of government debt that are sustainable under hard monetary dominance are much lower than if there is full monetary backstop. The problem of the euro area, if one takes this perspective, is that it inherited levels of government debt that were inconsistent with the hard monetary dominance that was embedded in the new monetary regime.

adjustment. One might surmise that governments have stronger incentives to improve their fiscal prospects (summarized by function $F(\cdot)$ in the model) if a failure to adjust is punished by a costly default. However, the analysis in Jeanne (2012) shows that the incentive effects of high default risk are ambiguous. High spreads, by making default more likely independently of the government's fiscal efforts, may undermine the incentives to fiscal effort. It will be important in future research to go beyond the realm of theoretical possibilities and develop a range of realistic dynamic models that can yield more quantitative insights on the impact of hard monetary dominance in the real world.

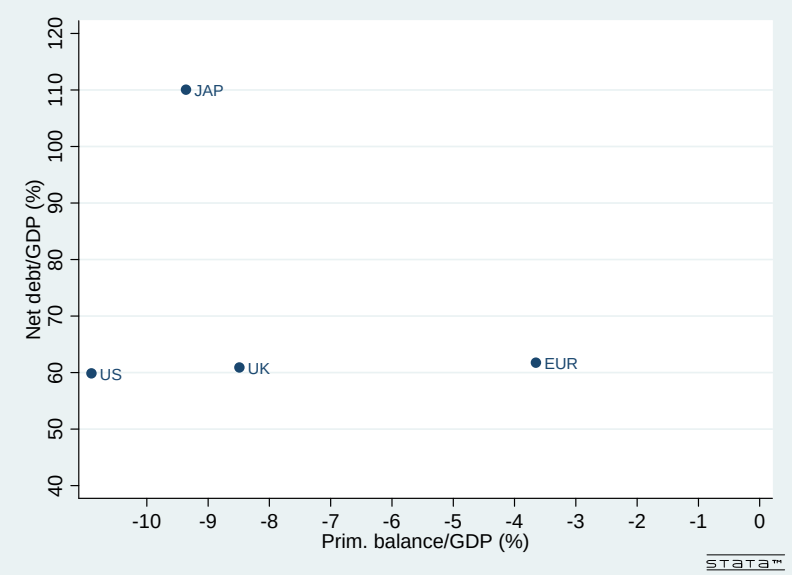

Figure 1: Ratio of fiscal primary balance and net government debt to GDP in the US, Japan, the UK and the euro area (2009). Source: World Economic Outlook.

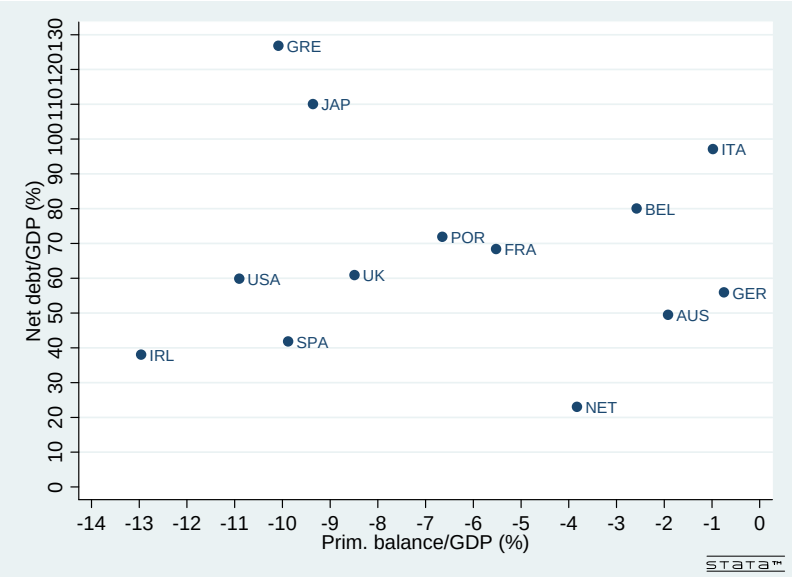

Figure 2: Ratio of fiscal balance and net government debt to GDP in the US, Japan, the UK and euro area economies (2009). Source: WEO.

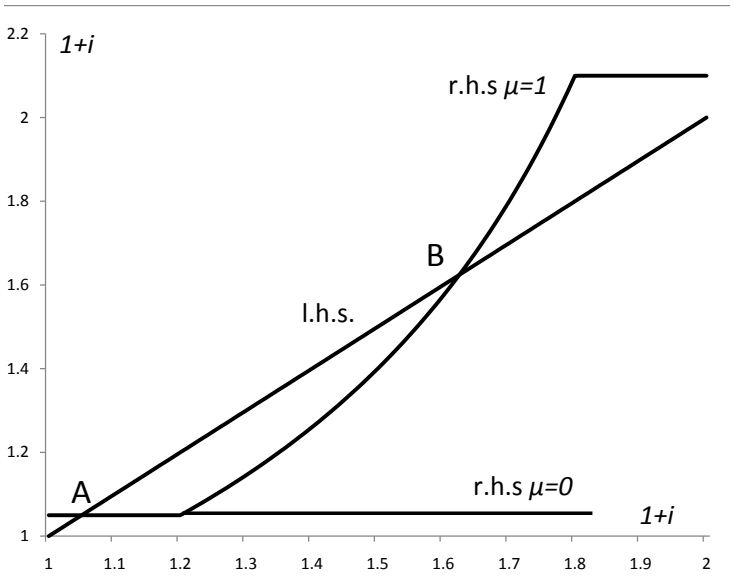

Figure 3: Left-hand-side and right-hand-side of equation (4). Source: author's computations.

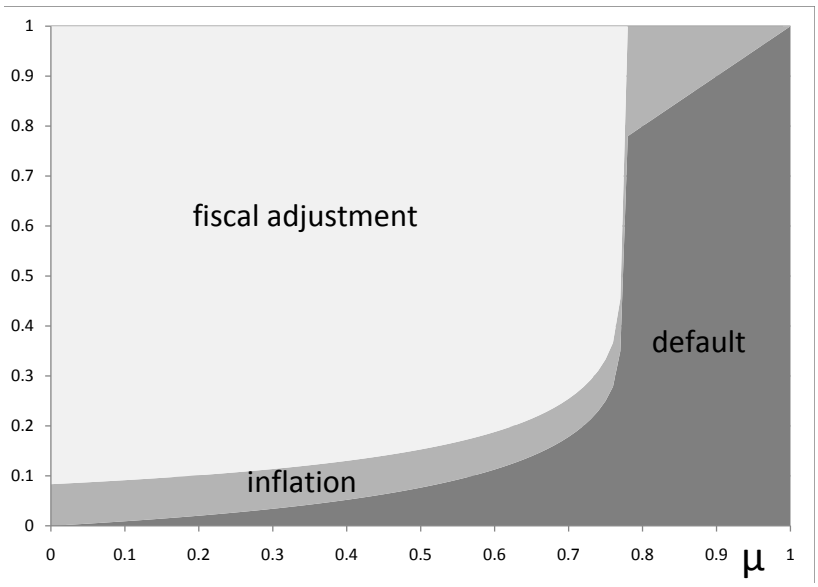

Figure 4: Variation of probability of fiscal adjustment, inflation and default with μ. Source: author's computations.

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