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ABSTRACT

Saving the Euro: self-fulfilling crisis and the 'Draghi Put'*

European markets for sovereign bonds have been prone to panic as investors fly to safety whenever they think others will. Calvo (1988) had warned of the possibility of multiple equilibria in bond markets; and argued for official action to limit interest rate rises so as rule out a self-fulfilling default equilibrium. Until recently, however, it appeared that the ECB was not able to act as necessary. But in August 2012, the ECB announced a policy of Outright Monetary Transactions which promised intervention to put a ceiling on rates for sovereigns willing to accept further fiscal stringency; and we use Calvo's framework to illustrate how this policy of a 'put' for sovereigns can work.

In addition to unilateral action by the ECB, some have proposed the consolidation of sovereign debt into Eurobonds backed by a supranational agency. Specifically, we propose the creation of a Special Purpose Vehicle (SPV) which issues Eurobonds and holds both plain vanilla sovereign debt and newly created state-contingent bonds. This offers, we believe, a desirable complement to the 'Draghi put'.

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"The ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough." Mario Draghi (July, 2012)

Introduction

Writing in 2011, Paul De Grauwe noted the contrast between the alacrity of the ECB in providing liquidity in the banking crisis of 2008-09 and its reluctance to do so in the subsequent sovereign debt crisis:

> Things were very different when the sovereign debt crisis erupted in 2010. This time the ECB was gripped by hesitation. A stop-and-go policy ensued in which it provided liquidity in the government bond markets at some moments and withdrew it at others. When the crisis hit Spain and Italy in July 2011, the ECB was compelled again to provide liquidity in the government bond markets. (De Grauwe, 2011a)

In fact, he argues, both banks and bond markets need the services of the Central Bank as lender of last resort to avoid liquidity crises. This is a perspective shared with Reinhart and Rogoff (2009) who, in their survey of *This Time is Different: Eight Centuries of Financial Folly*, observe that:

> Governments can be subject to the same dynamics of fickle expectations that can destabilize banks. This is particularly so when a government borrows from external lenders over whom it has relatively little influence. Most government investments directly or indirectly involve the long-run growth potential of the country and its tax base, but these are highly illiquid assets. … High debt levels lead, in many mathematical economics models, to "multiple equilibria" in which the debt level might be sustained – or might not be. (p. xlii).

But what about liquidity provision in a monetary union? In this case, Paul De Grauwe (2011b) points out governments face a peculiar constraint not shared with those who issue debt in their own currency:

> National governments in a monetary union issue debt in a "foreign" currency, i.e. one over which they have no control. As a result, they cannot guarantee to the bondholders that they will always have the necessary liquidity to pay out the bond at maturity. This contrasts with "stand alone" countries that issue sovereign bonds in their own currencies [which] allows these countries to guarantee that the cash will always be available to pay out the bondholders. (p.2)

> The government bond markets in a monetary union have the same structure as the banking system. When solvency problems arise in one country (Greece) bondholders, fearing the worst, sell bonds in other bond markets. This triggers a liquidity crisis is these other markets…But this selling activity leads to an

increase in government bond rates and turns the liquidity crisis into a solvency crisis. (p.3)

Consequently he concludes that:

The single most important argument for mandating the ECB to be a lender of last resort in the government bond markets is to prevent countries from being pushed into a bad equilibrium. (p.3)

Bearing in mind Walter Bagehot's counsel that in a liquidity crisis the lender of the last resort should promise unlimited liquidity support at a penalty rate, he argued further that "the ECB should commit itself to provide unlimited liquidity as soon as the government bond rate of country A exceeds the risk free rate by more than, say, 200 basis points (it could also be another number)". De Grauwe (2011a, p.10)

In fact, about a year later, the ECB moved decisively to preserve the single currency and to restore confidence in euro bond markets. Following ECB president Draghi's bold promise in July 2012 - reprinted above - the Governing Council announced a policy of what was called outright monetary transactions (OMT). Billed as necessary for safeguarding the monetary policy transmission and ensuring a common monetary policy, this involved the ECB pledging unlimited purchases of sovereign debt in secondary markets for applicant countries, subject to fiscal conditionality as judged appropriate.

[Subsequently, both Aizenman et al. (2012) and De Grauwe and Ji (2012) reported econometric results showing that interest rates had become far more volatile in the Eurozone countries than in comparable 'stand-alone' countries elsewhere - evidence that appears to be consistent with multiple equilibria in sovereign bond markets in the Eurozone.]

Although no country has yet asked for assistance under the provisions of OMT, the announcement of the programme appears to have succeeded in stabilising the situation. So far the announcement itself has succeeded in substantially reducing sovereign spreads for Italy and Spain without either country applying for the facility. Whether the ECB pledge to save the Euro is constitutionally acceptable in Germany is now a matter for legal debate, but the policy has been stoutly defended by Mr Draghi who argued "frankly when you look at the data, it's really very hard not to state that OMT has been probably the most successful monetary policy measure undertaken in recent times…Ten-year sovereign bond yields declined spectacularly in several

countries but went up in Germany" (Steen, 2013).

In what follows, recent empirical evidence of volatile bond spreads in Eurozone countries is briefly discussed before turning to Calvo's (1988) model of sovereign debt with 'good' and 'bad' equilibria. This framework is used to indicate how OMT may be designed to eliminate the bad equilibrium.

Notwithstanding the efforts of the ECB to calm the crisis by open market operations, programmes of fiscal consolidation being implemented throughout many Eurozone countries are having devastating effects of economic growth. In some cases it seems clear that structural change is required to establish credible systems of tax collection. For countries that are essentially solvent but temporarily in recession, however, the primary surpluses called for to cover interest payments have the perverse effect of reducing national income and pushing them towards insolvency.

As Barr et al. (2012) emphasise, capital markets are incomplete: state-contingent debt would, in principal, be a more efficient way of handling such shocks as corporate sector financing suggests. Chapter 11 procedures for corporate bankruptcy may, for example, be worth considering here, procedures where solvent companies can seek relief from creditors by getting an "automatic stay" with debtor-in-possession finance – to be followed by debt restructuring typically a debt equity swap. Anne Krueger (2001) sought to replicate such corporate procedures for sovereigns in her proposal for an SDRM – Sovereign Debt Restructuring Mechanism; but in April 2002 her proposal was side-lined in favour of the US Treasury's initiative[2] which was to promote the insertion of collective action clauses (CACs) into sovereign debt instruments.

In the European context, we argue that there may be a case for supporting new market initiatives with structural reform. After discussing how, in principle, a bond swap could help to ease the pressure on debtor countries, we outline a proposal for a supra-national SPV, which issues Eurobonds and holds growth bonds. In the longer-run, if and when growth bonds have become acceptable and markets have stabilised, the SPV could sell its assets and pay off its creditors.

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[2] As described in Miller (2002): but some observers have suggested that talk of SDRM was used simply as scare tactic to persuade bond holders to accept CACs.

1. Brief look at empirical evidence

Aizenman and Hutchinson (2012) analyse the pricing of risk in the sovereign debt component of the, largely over-the-counter, credit default swap (CDS) market[3]. Regression analysis is used to relate sovereign spreads to fundamentals for 50 countries, over the period 2005-2011 for 3, 5 and 10 year CDS focusing in particular on the five countries in the South-West Eurozone Periphery (Greece, Ireland, Italy, Portugal, and Spain). The fundamentals include two measures of "fiscal space" – the ratio of debt to the tax base and of deficits to the tax base. What do they find?

> Dynamic panel estimates of the model suggest that fiscal space and other macroeconomic factors are statistically significant and economically important determinants of market-based sovereign risk. However, risk-pricing of the South-West Eurozone Periphery countries is not predicted accurately by the model either in-sample or out-of-sample: unpredicted high spreads are evident during global crisis period, especially in 2010 when the sovereign debt crisis swept over the periphery area.
> Aizenman and Hutchinson (2012, Abstract)

They also report that spreads in Europe widened much more than those of similar countries outside the Eurozone:

> We "match" the periphery group with five middle income countries outside Europe that were closest in terms of fiscal space during the European fiscal crisis. We find that Eurozone periphery default risk is priced much higher than the "matched" countries in 2010, even allowing for differences in fundamentals. One interpretation is that the market has mispriced risk in the Eurozone periphery. An alternative interpretation, consistent with the selective default of Greece in early 2012, is that the market is pricing not on current fundamentals but future fundamentals, expecting the periphery fiscal space to deteriorate markedly and posing a high risk of debt restructuring.
> Aizenman and Hutchinson (2012, Abstract).

Note, however, that both interpretations are not inconsistent with the notion of multiple equilibria: the first indicates that things need not necessarily have been so, the second that expectations can be self-fulfilling.

In a related exercise, De Grauwe and Ji (2012) test the hypothesis that government bond markets in the Eurozone are more fragile and more crisis prone than in stand-alone countries. In their empirical study they found found evidence that a large part of

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[3] CDS instruments relating to sovereign debt were valued at $2.5 trillion in 2010, which exceeded the value of US government-issued international debt ($2.2 tr) and of US GDP ($1.5 tr).

the surge in the spreads of the peripheral Eurozone countries during 2010-11 was disconnected from underlying increases in the debt to GDP ratios, and was the result of time dependent negative market sentiments that became very strong since the end of 2010, as illustrated in Figure 1.1 taken from their paper.
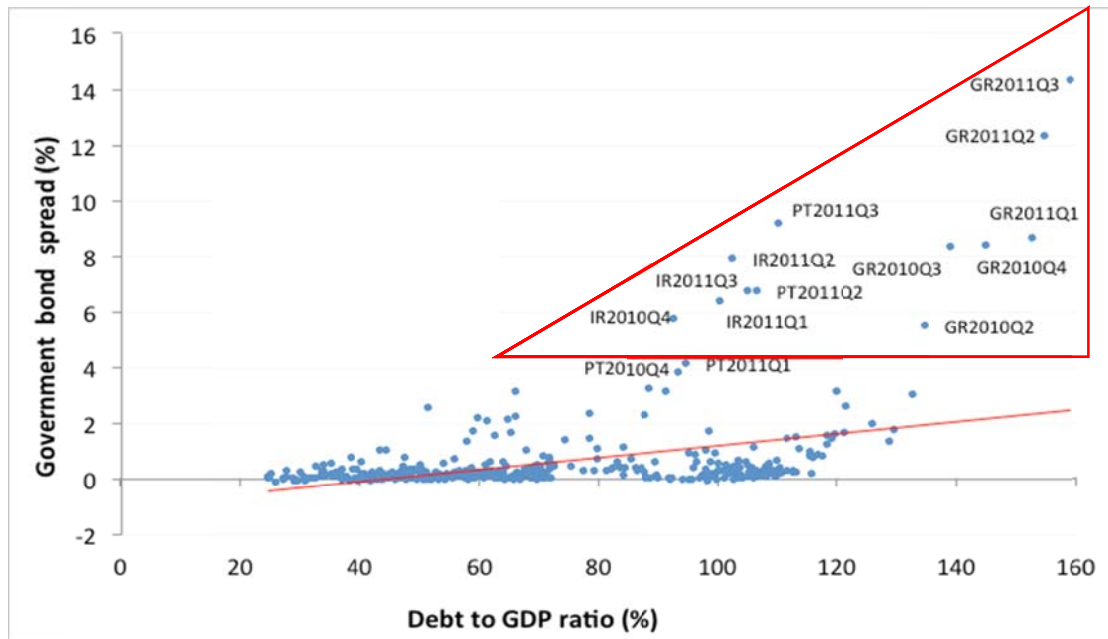

Figure 1.1: Spreads and debt to GDP ratio in Eurozone (2001Q1-2011Q3)
(Source: De Grauwe and Ji, 2012)

This was, they suggest, "the result of negative self-fulfilling market sentiments that became very strong since the end of 2010 [which] can drive member countries of the Eurozone into bad equilibria".

In contrast to this evidence that "after years of neglecting high government debt, investors became increasingly worried about this in the Eurozone, and reacted by raising the spreads, no such worries developed in stand-alone countries despite the fact that debt to GDP ratios were equally high and increasing in these countries". This is indicated in Figure 1.2 from their paper.
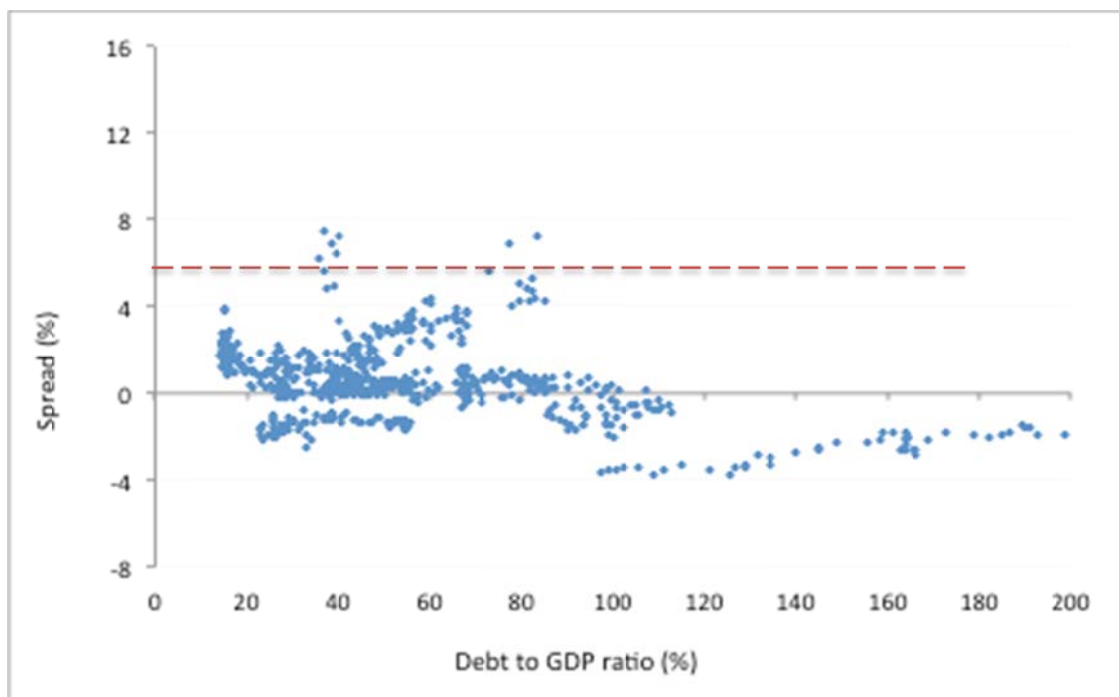
Figure 1.2: Spreads and debt to GDP ratio in stand-alone countries (2000Q1-2011Q3)
(Source: De Grauwe and Ji, 2012)

In conclusion they go further than Aizenman and Hutchinson (2012) and assert that "the story of the Eurozone is also a story of self-fulfilling debt crises, which in turn lead to multiple equilibria" (p.22).

2. Sovereign debt servicing in the Calvo model: multiple equilibria

To illustrate De Grauwe's argument, we use Calvo's (1988) model of self-fulfilling crisis, where the driving force is the market rate of interest on sovereign debt, indicated by the gross rate of interest R_b. If this rises above R, the gross, risk-adjusted rate available on capital (the alternative to holding government bonds), it acts both as a measure of market expectations and a possible trigger of government action.

It is assumed the excess of R_b over R reflects market expectations of θ, the degree of partial default to which bond-holders are exposed. Using the arbitrage condition that $R_b (1 - \Theta^e) = R$, expected default is defined as:

$$\Theta^e = (R_b - R)/R_b \qquad (1)$$

That the rise in the cost of debt service may trigger actual default at rate Θ follows from the government's budget constraint, namely:

$$x = g + (1 - \Theta)bR_b + \alpha\Theta bR_b \tag{2}$$

where g is government expenditure; $(1 - \Theta)bR_b$ is the cost of servicing (and redeeming) the fraction of bonds outstanding that will be honoured; $\alpha\Theta bR_b$ is the cost of defaulting on the remainder of the debt; and x is what Calvo calls taxation (which also includes redemption costs).

Assuming the amount of debt, b, and expenditure, g are predetermined; and that the government chooses to fix the rate of tax at x* for Θ lying between zero and one[4], the actual rate of partial default chosen will be

$$\Theta = \frac{bR_b + g - x^*}{(1 - \alpha)bR_b} = \frac{1}{1 - \alpha}\left(1 + \frac{g - x^*}{bR_b}\right) \tag{3}$$

for

$$0 \leq \Theta \leq 1 \,.$$
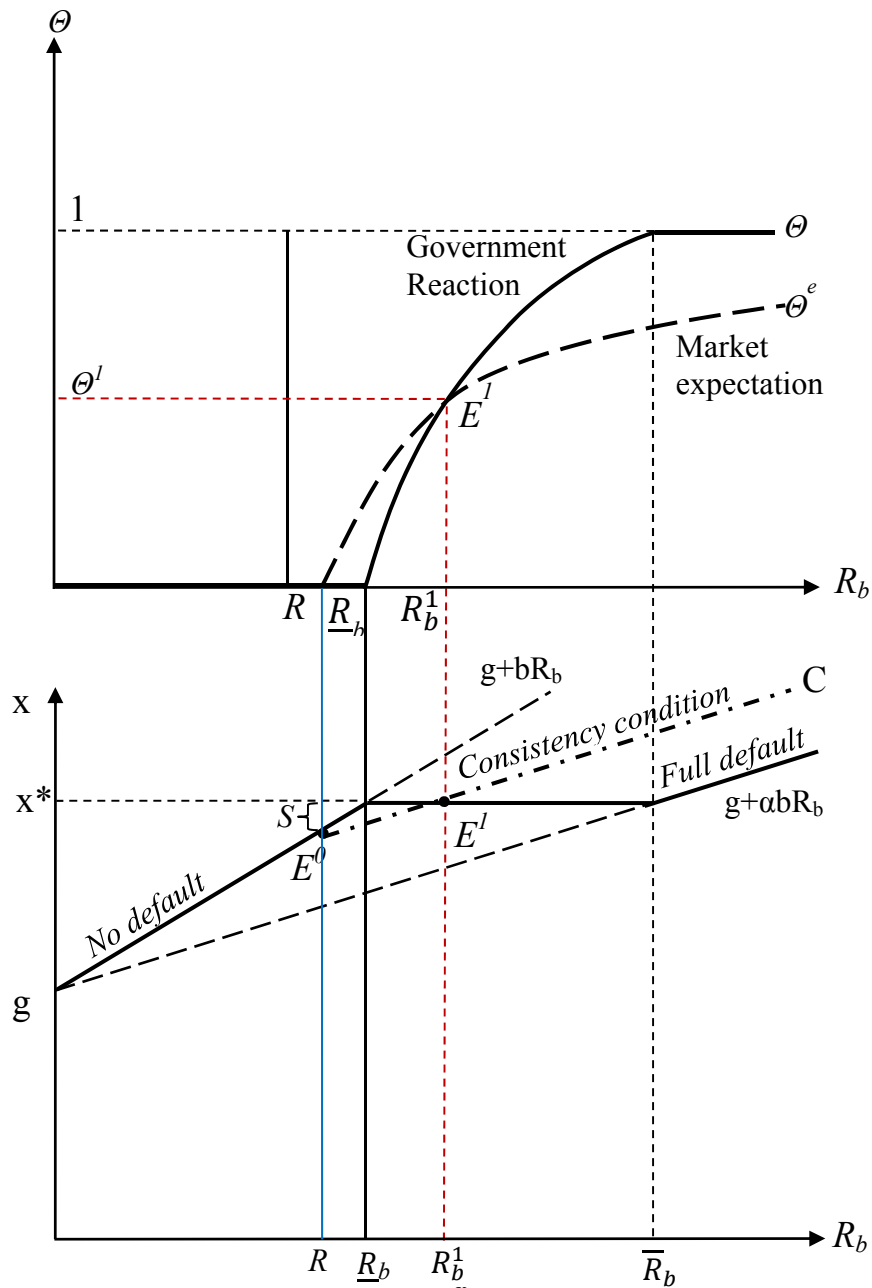
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[4] As in Calvo (1988).

Figure 2.1: Self-fulfilling partial default

As Corsetti and Dedola (2013) point out, the relationship between market expectations and the government's choice of partial default (and the 'time consistent' equilibria that emerge when they coincide) can be seen by plotting both as a function of the market rate R_b, see upper panel of Figure 2.1 For market rates that lie just above the safe rate, (specifically $R < R_b \leq \underline{R}_b$) the government can honour its debt in full, i.e. set $\Theta = 0$; so market fears will not be realised. For market rates between $\underline{R}_b$ and R_b^1, however, the government will opt for increasing levels of partial default, with a time consistent equilibrium at E^1 where market expectations are matched by the

rate chosen by the sovereign. For higher rates of interest, market expectations will lie below government reaction as can be seen from the diagram.

For finite rates of interest, therefore, it is evident that there are *two equilibria where expectations are satisfied:* the no-default case where $\Theta = \Theta^e = 0$ and the interest rate is the safe rate R; and the time consistent rate of partial default where $\Theta = \Theta^e = \Theta^1$ and the interest rate is R_b^1.

2.1 The Calvo diagram

How the "time-consistent" rate of partial default is determined is indicated graphically in the lower panel of Figure 2.1 drawn from Calvo's article, which plots the level of public expenditure including gross interest payments as a function of R_b . The upper schedule labelled $g + bR_b$ indicates the rising costs of financing exhaustive spending and honouring all debts as market rates rise. The lower schedule indicates how these expenditures may be reduced by full default. Note that in this case government spending will include exhaustive expenditure, g, plus a charge associated with default, αbR_b. For concreteness, we will interpret this as the fees paid to lawyers for arranging default.

Consider the case of a sovereign who is solvent in that the chosen level of taxes x* is greater than the exhaustive expenditure and debt charges at the safe rate of interest, so there is a surplus $S = x^* - g + bR$ at the equilibrium E^0. The second equilibrium at E^1 may be found graphically by the intersection of the time consistency condition C drawn from E^0 running parallel to $g + \alpha bR_b$ and the chosen level of taxes x*.

It is interesting to observe that in this self-fulfilling 'bad' equilibrium, legal costs absorb all the surplus available in the 'good' equilibrium- so creditors gain nothing from the rise in market rates!

To see this, note that the government budget constraint, (2) can be rewritten as:

$$x - g - bR = (1 - \Theta)bR_b - bR + L = b(R_b - R) - \Theta bR_b + L \qquad (4)$$

where $L = \alpha\Theta bR_b$ represents the lawyer's fees for writing down Θ of the debt outstanding at prevailing market rates. Using the fact that in equilibrium $\Theta R_b = R_b - R$, this may be rewritten as:

$$S = x - g - bR = b(R_b - R) - b(R_b - R) + L = L \tag{5}$$

which shows that the lawyers collect the initial surplus. It follows of course that no extra payments are made to bond holders despite the rise in interest rates, i.e. $(1 - \Theta)bR_b = bR$.

2.2 Region of stability

It is evident from the Calvo diagram that a higher level of debt, which increases both the costs of honouring and of defaulting, will lead to a **lower** level of partial default in equilibrium. This comparative static property - that a sovereign with greater debt may wind up with lower rates of default - Calvo characterises as somewhat paradoxical. Does it not suggest the bad equilibrium is unstable?

To illustrate, assume that default expectations were to adjust to the market rate of interest rate such that:

$$d\Theta^e/dt = \xi(\Theta - \Theta^e) \tag{6}$$

where Θ^e is the default rate expected by the market.

In this case, as can be seen from the upper panel in Figure 2.1, for low values of R_b, Θ^e will be falling. If this is how expectations adjust, equilibrium at point E^0 is stable while that at E^1 is unstable, so the region between E^0 and E^1 is a 'region of stability'. From this perspective things look less paradoxical: an increase in the debt to GDP ratio makes E^0 less likely as an equilibrium as it shrinks the region of stability.

3. Avoiding the bad equilibrium: the Draghi Put

As regards public policy, Calvo noted,

> The central message that comes across this paper is that expectations may play a crucial role in the determination of equilibrium when the government debt is auctioned off to the public, and there is no attempt to manage expectations or to peg interest rates on the government debt…In more general terms, however, our discussion pointed out to the advisability of governments taking a more active stance on nominal interest rates. (p.659)

In a later paper, Cohen and Portes (2004) argued for intervention by the IMF as a lender of first resort as a way of avoiding default equilibrium.
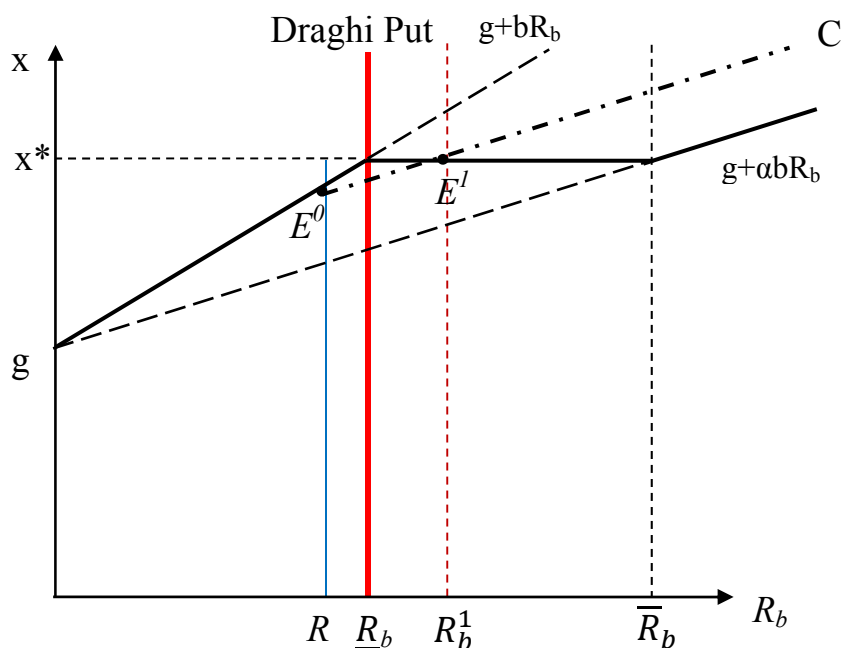
Figure 3.1. Avoiding the default equilibrium with the Draghi Put

In the current European context, however, it is the President of the ECB that has taken the initiative in stabilising European bond markets by authorising bond purchases in the secondary market subject to explicit fiscal conditionality[5].

The policy announced by Mario Draghi is described as one of Outright Monetary Transactions, OMT, as it is supposed to improve the monetary policy transmission mechanism via increased harmonisation of interest rates across Europe. It could better be described as the issue of a put on sovereign bonds – a 'Draghi put'- with moral hazard aspects, in principle, covered by the fiscal conditionality.

If successful, such a put - where the ECB establishes a floor price for the debt of sovereigns who are solvent but face a crisis of liquidity - could rule out the default equilibrium. As a floor on the price implies an interest ceiling, an intervention that

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[5] Brendan Simms (2013, p. 55) says 'It was probably a wink from Berlin that encouraged the new head of the ECB Mario Draghi to declare in late July2012 that he "would do whatever it takes to defend the euro".' Effectively, he suggests, it was removing a veto.

keeps market interest rates at manageable levels (strictly $R_b < R_b^1$). This should in principle avoid triggering partial default and help to stabilise market expectations. This is illustrated with Figure 3.1, with a put that limits interest rates to lie below $\underline{R}_b$.

To date, no sovereign has requested intervention by the ECB under OMT. But the announcement of this facility had a marked effect on prices of sovereign debt, with a substantial reduction in yields for Spain and Italy, for example, see Figure 3.2.
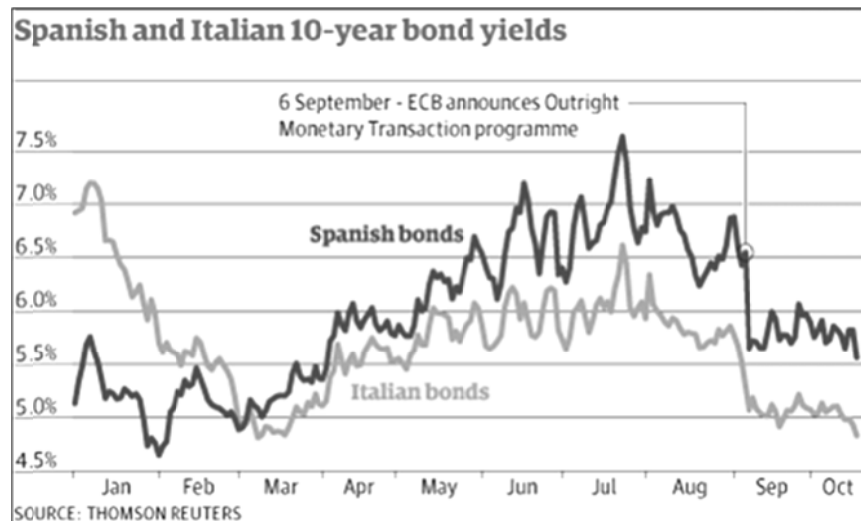

Figure 3.2. Effects of OMT

4. An SPV for stability and growth

How can sovereigns reduce their indebtedness? Rogoff (1999) points out that the current international monetary system is excessively biased towards debt finance[6] and recommends a switch towards more equity finance:

> 'Junk' country debt plays too large a role, given the lack of an effective international bankruptcy system. In an ideal world, equity lending and direct investment would play a much bigger role. Rogoff (1999, pp.39-40)

What specifically might this imply for sovereign debt? Consider, as Anne Krueger did, whether institutions and instruments might be designed to help countries to restructure their debts -- as corporations are by the law courts, under the provisions of Chapter 11 of the US bankruptcy code for example. To restore solvency, of course, debt write-downs may be needed, as for both Argentina in 2005 and Greece in 2012.

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[6] He proposed a "plan" to address this bias along lines suggested earlier in Bulow and Rogoff (1990).

But to ease debt servicing problems for sovereigns that are solvent, however, present-value–preserving swaps are an appealing option.

With the approval the European Commission and the IMF, for example, the Government of Cyprus has in 2013 carried out a debt exchange which lengthened the maturity of € 1 billion with no change in principal or in the coupons – a lock-in to enhance the sovereign's liquidity rather than a write down to improve solvency. Market reaction has been mixed: but, as Buchheit and Gulati (2013) wryly observes, "a principal extension of this kind is the most clement of the three instruments in the restructurer's tool box, the other two are surgeon's saws labelled, respectively 'principal' and 'interest'.

A more ambitious strategy than such 'inter-temporal' debt exchange is to swap debt into 'state-contingent' form, along the lines of the debt-equity swaps characteristic of Chapter 11.

Chapter 11 procedures suggest that financing problems for debtor countries can be eased by bond swaps. But there the problem of funding instability occurs as creditors switch between countries in a flight for safety. The ECB is doing what it can with OMT but creditor panic in bond markets with a flight to quality which has taken bond yield in Germany to virtually zero suggests the need for further action as an alternative to fiscal consolidation.

Fiscal consolidation may indeed be likened to a "catwalk contest" where the models try to outdo each other in a self-destructive slimming race. Illustrative payoffs in the austerity game - where each player can choose between stabilising output by running a deficit , or stabilising debt via austerity - are shown in Table 4.1.

	Output Stabilisation	Fiscal Austerity
Output Stabilisation	1,1	-1,2
Fiscal Austerity	2,-1	0,0

Table 4.1. The Debtors' Dilemma: An Engine of Austerity?

The dominant strategy for each payer is fiscal austerity: so budgets are designed not to stabilize the economy on a growth path, but to woo capital markets. Finance Ministers

around Europe may be trapped in a costly signalling game. As is common with Prisoners' Dilemmas, institutional mechanisms may be needed to avoid the inefficient Nash equilibrium.

What about debt consolidation, rather than fiscal consolidation? A number of plans have been proposed, as described in Brunnermeier et al. (2011). Some of the variants under discussion are shown in Table 4.2, drawn from Leinemann (2012).

Name	Concept
Euro-bonds	Issue of common bonds to replace all debt
"Blue bonds"	Issue of common bonds up to 60% of GDP
"Elite" bonds	Common bonds only for AAA rated countries
Debt retirement fund	New entity that pools all debts above 60% of GDP, issues its own common bonds. Countries have a credible commitment to amortise the debt in a certain time frame

Table 4.2. Different types of stability bonds

What we propose is a European SPV to play the role of market-maker (in taking up state-contingent debt issued in swaps) and to act as market-stabiliser (by offering 'supra-national' Eurobonds to investors)[7]. This is shown graphically as follows in Figures 4.1 and 4.2.
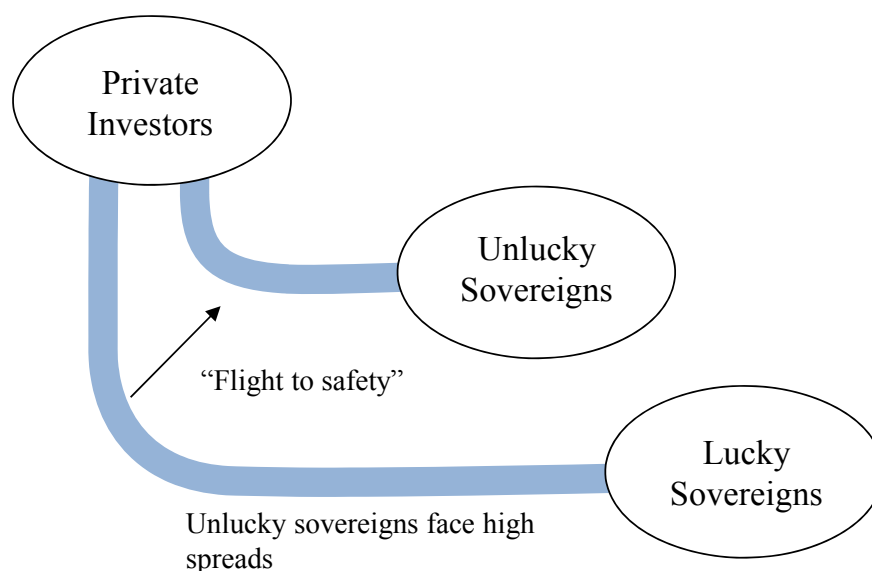

Figure 4.1: BEFORE: Investors holds sovereign bonds - but are prone to switch See PDF for correction.

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[7] A brief, avowedly non-technical, description is provided in 'How the Euro was saved', Miller (2011).
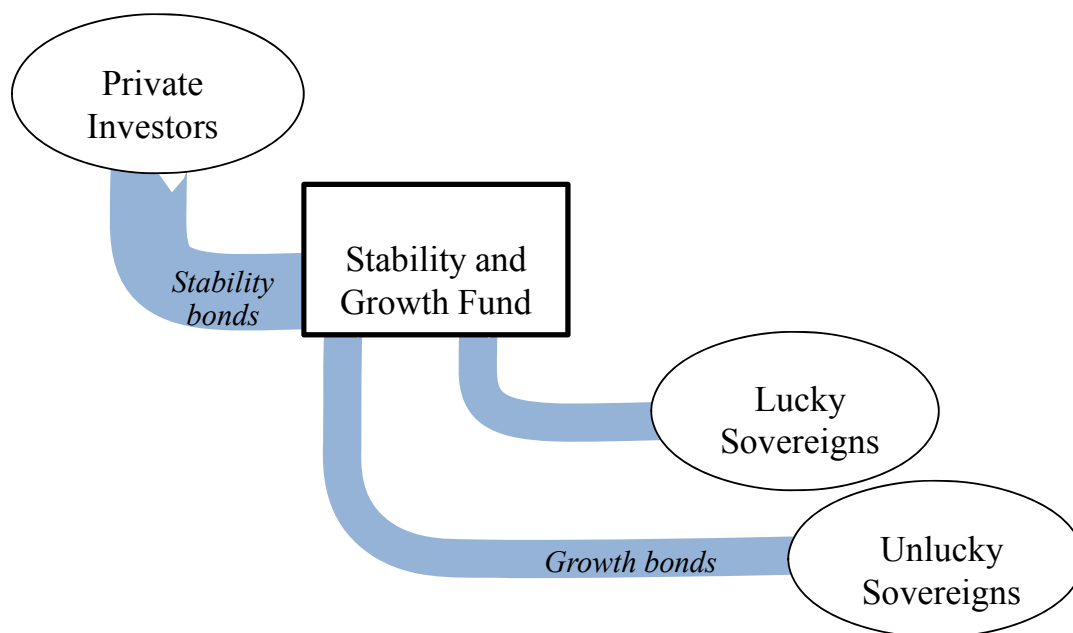
Figure 4.2: AFTER: Stability and growth fund pools sovereign debt - and diversifies types of bond

In more detail, consider the balance sheet of the proposed SPV.

Assets	Liabilities

Sovereign bonds:
    (a) Plain vanilla
    (b) Growth and GDP-linked
	Euro stability bonds
	
	Equity base

Table 4.3. Balance sheet of SPV

On the assets side, holding of regular government debt are complemented by growth and GDP-linked bonds. The market may not give full value for them especially if they are issued in the midst of a crisis. This was the case for Argentina; as reported by Griffith-Jones and Hertova (2012) growth warrants now standing at about $15 were sold for only $2 in 2005: and it appears that the market is attaching little value to Greek warrants. This suggests that such securities might be taken out of the market by an agency with a longer horizon - until such time as the country has begun to grow. This would give a breathing space for the debtor country and help it to avoid selling its debt at a deep discount. That is the logic behind the role of a European SPV for the purpose. Its liabilities will be the Eurobonds; and its equity will be guaranteed by Treasuries of Europe.

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The issue of debtor moral hazard is flagged up by Reinhart and Rogoff (2009, xli-xlii) as follows: "Suppose a world government agency provided expansive deposit insurance to protect every worthy borrower from panics…The problem is that if one provides insurance to everyone everywhere, with no conditions, some players are going to misbehave." But what is envisaged is not blanket insurance for all European debt: it is tailored restructuring subject to strict conditionality. As GDP is observable and verifiable, the first best contractual solution would be to use GDP in designing contingent instruments. Even if debt service capacity is not monotonically related to GDP, "Eurozone conditionality" can surely be used to link debt service capacity to GDP so as to reduce moral hazard.

5. Conclusion

European countries are currently engaged in a peculiarly masochistic process that is generating widespread austerity. As indicated in Section 4 above , countries are effectively incentivised to reduce their GDP growth rates. The game may be changed, however, by simultaneously restructuring some debts to include growth bonds and by consolidating debt with Euro-bonds. The creation of an SPV that holds one and issues the other seems the obvious institutional innovation.

One might object that the IMF had similar ideas back in 2000 but they led nowhere. There are reasons for believing that the chances for institutional innovation are greater in the European context. Given the perceived consequences of failure, there is a common desire to find a solution; there are mechanisms in place to impose fiscal conditionality; and there are existing supranational institutions such as the ESM and the EFSF to act as precedents.

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