

The European Sovereign Debt Crisis: Appendix

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This appendix provides additional material that is complementary to the analysis in Lane (2012).

The Evolution of Public Debt

The gross level of public debt provides an incomplete picture of the overall sovereign financial balance sheet (Losjch et al 2011 provide a comprehensive review). A government can hold financial assets, so that net public debt can be lower than gross public debt. It also has an implicit asset in the form of the present value of future tax revenues. However, on the other side, it may have contingent liabilities, such as formal or informal guarantees provided to private-sector debt (banks, corporates, households). In addition, it has implicit liabilities such as unfunded public pension commitments. While the distinction between gross government debt and the government's overall financial position will be raised in some contexts in the ensuing discussion, it is beyond the scope of this paper to fully incorporate these factors into the analysis below.

As a benchmark, Figure 1 plots the ratio of sovereign debt to GDP for the aggregate euro area and the United States over 1970 to 2010. The euro area debt ratio surpassed the US debt ratio in 1995 but that both ratios were quite stable during the 2002-2007 pre-crisis period at 70 percent and 60 percent respectively. These debt ratios have climbed during the crisis, with the US debt level rising more quickly than the European debt level. To gain further insight, Figure 2 shows the annual fiscal balances over 1995-2012. Europe both ran smaller aggregate deficits than the United States during the pre-crisis period and also had a smaller aggregate expansion in the scale of deficits during the crisis.

Following Escolano (2010), equation 1 provides a useful decomposition of the change in the debt-output ratio between any two periods $N - t$ and N

$$d_N - d_{N-t} = \sum_{s=N-t}^{N-1} \frac{i_{s+1}}{1 - \gamma_{s+1}} d_s - \sum_{s=N-t}^{N-1} \frac{\gamma_{s+1}}{1 - \gamma_{s+1}} d_s + \sum_{s=N-t+1}^N prim_s + \sum_{s=N-t+1}^N sfa_s \quad (1)$$

where d is the debt-GDP ratio, i is the average nominal interest rate paid on the debt, γ is the growth rate of nominal GDP, $prim$ is the ratio of the primary (non-interest) deficit to GDP and sfa is the stock-flow adjustment term.

The first two terms show the dependence of debt dynamics on the outstanding stock of debt: all else equal, a higher interest rate is associated with more rapid debt accumulation, while a faster rate of nominal GDP growth is associated with an improvement in the debt-GDP ratio by increasing the denominator in this ratio. In a given period, the net impact of these two terms depends on the sign of $(i_{s+1} - \gamma_{s+1})$: if the interest rate is higher than the growth rate, there is upward pressure on the debt ratio; conversely, if the interest rate is below the growth rate, there is downward pressure on the debt ratio.

Importantly, the relevant interest rate is the average yield paid out on the stock of public debt, which depends on the mix of debt maturities and the split between market-based funding and other types of funding (for example, state-sponsored savings accounts). For instance, a country that has mainly issued government bonds at long maturities will face only a minor short-term change in its debt servicing payments if there is a shift in short-term interest rates, whereas the impact would be much greater for a country that has more heavily relied on short-term issuance.

The third term shows the impact of the gap between non-interest expenditure and revenues as a source of debt dynamics. Since interest payments are largely predetermined by the stock of accumulated debt (interacted with the average interest rate on the debt), the primary balance is the key variable that is controllable by the government.

Finally, the “stock-flow” adjustment term reflects valuation effects and transactions that affect the level of gross public debt but do not affect the budget balance. The importance of this term for debt dynamics is highlighted by Abbas et al (2011) and Weber (2012). An important contributor under this heading is the acquisition of financial assets - for instance, a government might issue debt in order to purchase shares in a bank that requires recapitalisation. Since these shares have a financial value, the net financial position of the government is unchanged by such a transaction (even if its risk profile is considerably

altered). In the other direction, a government's gross debt can fall if it receives a financial gain, such as obtaining the proceeds from privatising a state-owned enterprise. (Again, a full assessment of the state's overall balance sheet should take into account the sacrifice of future dividend payments if a firm is privatised.)

In Table 1, we employ equation (1) to provide a more detailed analysis of debt dynamics for these countries over 1992-2011. We divide this period into four phases: the run up to EMU (1992-1998); the early years of EMU (1998-2002); the pre-crisis period (2002-2007); and the crisis (2007-2011). After the signing of the Maastricht Treaty in 1992, a number of European countries undertook significant fiscal adjustments in order to qualify for EMU membership. In particular, Greece, Ireland and Italy ran sizeable primary surpluses even if the burden of servicing the existing debt meant that debt ratios did not decline for Greece and Italy.¹

The early years of EMU were associated with a major reduction in debt servicing costs for Greece, Italy and Portugal, while rapid growth in Ireland and Spain contributed to sizeable reductions in debt-output ratios. For the latter pair, strong growth during 2002-2007 saw further reductions in debt ratios, even if the primary surplus declined markedly for Ireland (as it did for Italy). However, there was a sizeable reversal in the primary balance for Greece, which ran primary deficits during this period, despite its high outstanding debt burden. The primary deficit also climbed in Portugal during this period, contributing to a large increase in its public debt ratio from 53.9 percent in 2002 to 68.3 percent in 2007.

All countries experienced sizeable increases in debt ratios during the 2007-2011 crisis period. To further highlight the components of this adverse shift, Table 2 reports the change in debt dynamics between the pre-crisis 2002-2007 period and the crisis period 2007-2011. The scale of the recession is an important factor, with the nominal growth term declining in magnitude for all countries and even turning positive for Greece and Ireland. With the exception of Germany, there was substantial deterioration in primary balances, even if Italy still maintained a small primary surplus. In fact, the cost of debt interest payments was lower during the crisis period for most countries, in line with the decline in short- and medium-term interest rates for most of this period. The stock-flow adjustment term was not a significant contributor to the adverse shift in debt dynamics, with the exceptions of

¹The stock-flow adjustment was also an adverse factor for Greece. Greece's entry into EMU was delayed until 2001. Ireland's extraordinary output growth during this period contributed to a large decline in the debt-output ratio.

Ireland and Germany.²

The 2007-2011 period really consists of two distinct stages. During 2007-2009, the global crisis and global recession saw a deterioration in fiscal positions in many countries. This was mainly due to a sharp decline in tax revenues, with stimulus programs only playing a minor role. Sustained concerns about debt sustainability only took hold in 2010 and 2011, with the launch of austerity programs and EU/IMF rescue packages for Greece, Ireland and Portugal.

Accordingly, as is shown in Table 3, it is helpful to also examine the year-by-year debt dynamics within the 2007-2011 crisis period. Table 3 shows that the primary deficit peaked in 2009 for all countries (with the exception of Germany), with an average cumulative reduction of 5.5 percent of GDP in the primary deficit between 2009 and 2011 for Ireland, Portugal and Spain and an extraordinary reduction of nearly 10 percent of GDP for Greece.³ However, weak or negative nominal growth and the impact of the increase in the level of outstanding debt on interest payments meant that debt ratios continued to climb during 2010 and 2011.

Tables 1 - 3 are backward-looking and describe the actual evolution of public debt until 2011. While the accumulation of high debt and deficit levels are important contributors, the European crisis is as much to do with projections about future debt dynamics. In particular, these countries face considerable fiscal adjustment challenges over the next twenty years in order to bring debt levels back down to “normal” levels. As an illustration, International Monetary Fund (2011) calculated the required improvement in cyclically-adjusted primary balances between 2010 and 2020 if the debt-GDP ratio is to converge to 60 percent of GDP by 2030.⁴ The results are shown in Table 4: the scale of the required adjustment is

²The fiscal cost of public recapitalisation of the Irish banking system in part shows up in the stock-flow adjustment term, since some of the capital injections could be interpreted as acquiring a valuable financial asset in terms of share ownership of viable banks. However, the capital injections into the disaster banks were more accurately classified as capital transfers and showed up in the extraordinary-large primary deficit in 2010. The large stock-flow adjustment term for Germany relates to its decision to set up a “bad bank” to relieve some banks of impaired assets, with these asset purchases funded through the issuance of extra government debt. See also Eurostat (2011) on the proper accounting treatment of “fiscal defeasance structures.”

³The record-breaking Irish deficit of 31.2 percent of GDP in 2010 consisted of a ‘regular’ deficit of 11.4 percent of GDP and capital transfers of 19.8 percent of GDP into the banking system.

⁴These calculations are based on ‘normal’ values for interest rates and growth rates. The primary balance is assumed to be maintained at its 2020 value until 2030. As noted by the IMF, the required fiscal

large for each for the euro periphery countries; indeed, it is also considerable for France.

References

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adjustment is even greater if the trend increase in ageing-related public spending is taken into account. (The IMF calculations also indicate that the United States and Japan face major fiscal adjustments over this period.)

Table 1: Debt Dynamics: 1992 to 2011

1992-1998	d_{1992}	$prim$	$i * d$	$\gamma * d$	sfa	d_{1998}
Greece	79.0	-17.4	63.4	-57.4	27.6	95.4
Ireland	91.4	-26.4	29.6	-50.6	8.8	53.1
Portugal	50.0	0.5	30.5	-23.2	-7.5	50.4
Spain	63.3	-1.6	14.1	-12.0	0.2	64.2
Italy	105.2	-25.3	64.6	-35.0	5.7	114.9
Germany	42.0	3.1	20.1	-8.5	3.7	60.5
France	39.7	7.0	20.3	-9.2	1.6	59.5
1998-2002	d_{1998}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2002}
Greece	95.4	-10.8	27.1	-27.0	18.0	102.6
Ireland	53.1	-15.1	7.2	-21.0	7.8	31.9
Portugal	50.4	1.4	11.5	-11.7	2.4	53.9
Spain	64.2	-9.5	12.5	-17.6	3.1	52.5
Italy	114.9	-15.6	24.9	-19.2	0.4	105.1
Germany	60.5	-5.0	12.4	-5.0	-2.1	60.7
France	59.5	-3.6	11.8	-8.9	0.1	59.0
2002-2007	d_{2002}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2007}
Greece	102.6	7.7	24.1	-35.5	9.3	107.4
Ireland	31.9	-11.9	5.5	-10.2	9.6	24.9
Portugal	53.9	6.3	13.3	-11.1	6.0	68.3
Spain	52.5	-14.5	9.5	-16.3	5.1	36.2
Italy	105.1	-7.4	24.2	-18.2	-0.5	103.1
Germany	60.7	-1.7	14.4	-8.6	0.4	65.2
France	59.0	2.2	13.6	-12.6	2.1	64.2
2007-2011	d_{2007}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2011}
Greece	107.4	22.6	22.8	4.7	5.6	162.8
Ireland	24.9	53.0	10.1	8.6	11.5	108.1
Portugal	68.3	16.2	13.3	-1.1	5.0	101.5
Spain	36.2	24.2	7.5	-1.1	2.9	69.6
Italy	103.1	-2.4	18.8	-2.4	3.1	120.5
Germany	65.2	-1.5	10.4	-4.4	12.1	81.8
France	64.2	13.4	10.5	-4.0	1.4	85.4

Note: d is the ratio of public debt to GDP, $prim$ is the primary deficit (as a ratio to GDP), $i * d$ is the level of interest payments, $\gamma * d$ is the growth term and sfa is the stock-flow adjustment. Author's calculations based on AMECO data.

Table 2: Shift in Debt Dynamics from 1992/1997 to 1997/2011

	$\Delta PBAL$	$\Delta i * D$	$-\Delta g * D$	ΔSFA
Greece	14.9	-1.3	40.2	-3.7
Ireland	64.9	4.6	18.8	1.8
Portugal	9.9	-0.1	10.0	-0.9
Spain	38.7	-2.0	15.2	-2.2
Italy	5.0	-5.3	15.8	3.6
Germany	0.3	-4.0	4.2	11.8
France	11.2	-3.1	8.6	-0.7

Note: Δd is the change in ratio of public debt to GDP between 2002-2007 and 2007-2011, $\Delta prim$ is the change in the primary deficit (as a ratio to GDP), $\Delta i * d$ is the change in the level of interest payments, $\Delta \gamma * d$ is the change in the growth term and Δsfa is the change in the stock-flow adjustment. Author's calculations based on AMECO data.

Table 3: Debt Dynamics in Detail: 2008 to 2011.

2008	d_{2007}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2008}
Greece	107.4	4.8	5.1	-4.7	0.4	113.0
Ireland	24.9	6.0	1.4	1.4	10.7	44.3
Portugal	68.3	0.6	3.1	-1.1	0.7	71.6
Spain	36.2	2.9	1.6	-1.2	0.5	40.1
Italy	103.1	-2.5	5.1	-1.4	1.4	105.8
Germany	65.2	-2.7	2.8	-1.2	2.6	66.7
France	64.2	0.4	2.9	-1.5	2.2	68.2
2009	d_{2008}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2009}
Greece	113.0	10.6	5.1	0.6	-0.1	129.3
Ireland	44.3	12.1	2.0	5.4	1.3	65.2
Portugal	71.6	7.3	2.9	1.4	-0.2	83.0
Spain	40.1	9.4	1.8	1.5	1.0	53.8
Italy	105.8	0.8	4.5	3.4	0.9	115.5
Germany	66.7	0.5	2.7	2.8	1.8	74.4
France	68.2	5.1	2.4	1.6	1.7	79.0
2010	d_{2009}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2010}
Greece	129.3	5.0	5.8	2.5	2.5	144.9
Ireland	65.2	28.2	3.1	1.9	-3.6	94.9
Portugal	83.0	6.8	3.0	-2.0	2.6	93.3
Spain	53.8	7.4	1.9	-0.2	-1.9	61.0
Italy	115.5	0.1	4.4	-2.2	0.5	118.4
Germany	74.4	1.8	2.5	-3.1	7.6	83.2
France	79.0	4.6	2.4	-1.8	-2.0	82.3
2011	d_{2010}	$prim$	$i * d$	$\gamma * d$	sfa	d_{2011}
Greece	144.9	2.2	6.7	6.3	2.7	162.8
Ireland	94.9	6.7	3.6	-0.1	3.0	108.1
Portugal	93.3	1.6	4.2	0.5	1.9	101.5
Spain	61.0	4.5	2.2	-1.3	3.2	69.6
Italy	118.4	-0.9	4.8	-2.3	0.3	120.5
Germany	83.2	-1.1	2.4	-2.9	0.1	81.8
France	82.3	3.2	2.6	-2.3	-0.5	85.4

Note: d is the ratio of public debt to GDP, $prim$ is the primary deficit (as a ratio to GDP), $i * d$ is the level of interest payments, $\gamma * d$ is the growth term and sfa is the stock-flow adjustment. Author's calculations based on AMECO data.

Table 4: Required Shift in Primary Fiscal Balance, 2010 to 2020. Note: Based on calculations reported in IMF *Fiscal Monitor* (September 2011).

Greece	15.5
Ireland	12
Portugal	9.6
Spain	8.3
Italy	3.1
France	6.3
Germany	2.3

Note: Required shift in cyclically-adjusted primary fiscal balance (expressed as a ratio to GDP) between 2010 and 2010, if debt is to converge to 60 percent of GDP by 2030. Source: IMF *Fiscal Monitor* (September 2011).

Table 5: 2007 Data — Original and Revised Estimates

		Original	Latest
Greece	Output Gap	1.3	3.4
	Structural Balance	-3.4	-7.9
Ireland	Output Gap	-0.7	3.7
	Structural Balance	1.2	-1.4
Portugal	Output Gap	-1.7	0.6
	Structural Balance	-2.2	-3.4
Spain	Output Gap	-0.5	2.1
	Structural Balance	2.0	1.0
Italy	Output Gap	-0.8	2.8
	Structural Balance	-1.9	-3.0

Note: European Commission estimates of output gap and cyclically-adjusted budget balance for 2007. Original denotes values from 2007 Autumn Report; Latest denotes values from 2011 Autumn Report.

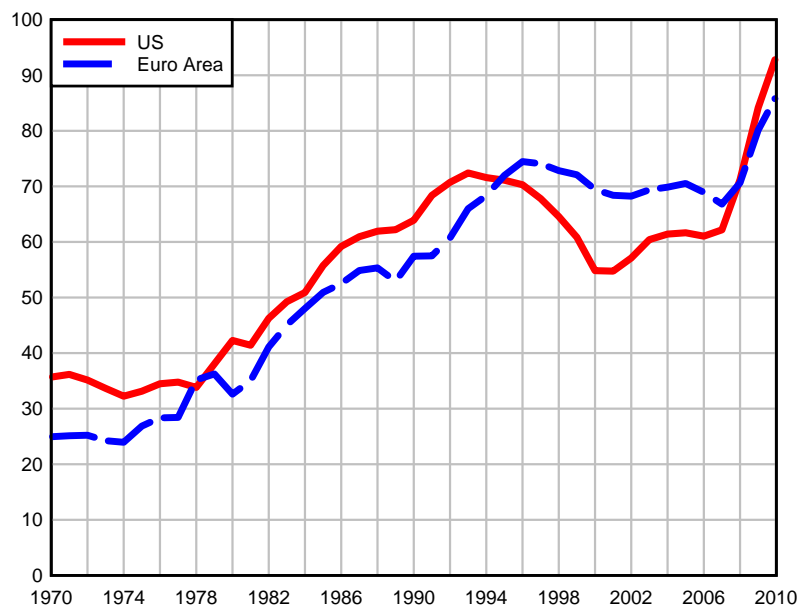


Figure 1: Public Debt Ratios: Euro Area and United States, 1970 to 2010. Source: Author's calculations, based on IMF Public Debt Database.

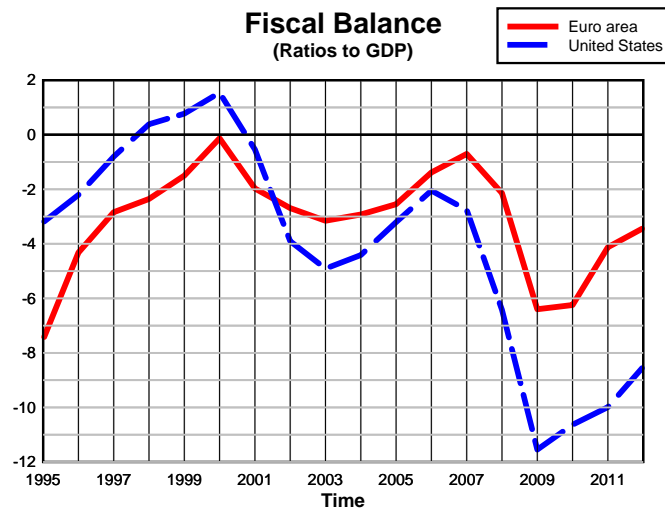


Figure 2: Fiscal Balances (Ratios to GDP). Source: Author's calculations based on AMECO data.