

Focus

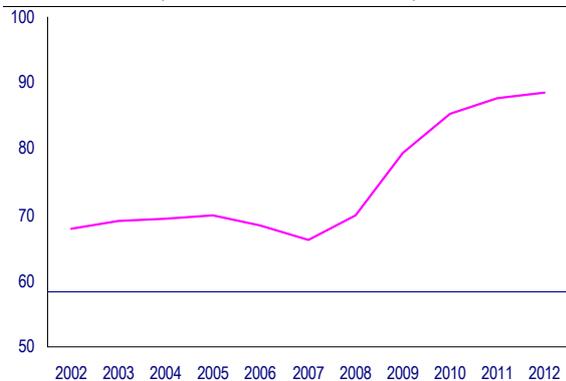
I. Debt dynamics and sustainability in the euro area

The economic and financial crisis has led to a marked increase in government debt in the euro area countries. While the magnitude of the increase is in line with that resulting from other financial crises, its cumulative effect is greater and brings the question of the medium-term sustainability of public finances to the fore. Not only does higher debt require higher primary surpluses to cover the additional interest payments but it can act as a brake on growth. Given the additional difficulties presented by an ageing population, the outlook for the medium term is challenging. This focus section presents an overview of the debt situation both currently and through medium-term projections. It shows that setting public finances on a sustainable path will require significant consolidation measures — over and above those already introduced — in a number of euro area Member States. In some of them, the primary balance required to bring debt back to a sustainable level is particularly high by historical standards. Nevertheless, the responses required are not unprecedented, and responding in a timely manner can both reduce the total effort required and ensure that the European economies benefit as soon as possible from the positive impact that debt reduction has on growth. The section also presents instruments for assessing the risk of fiscal crises that should help policymakers to take early action in the event of additional shocks emerging with adverse effects on sustainability.

I.1. Recent debt developments in the euro area

The global economic crisis has led to rises in debt in all euro area countries due to a combination of higher fiscal deficits and support measures in favour of the banking sector. While the magnitude of the debt increases varies considerably across countries, it is significant enough overall to bring the issue of the medium and long-term sustainability of public finances to the fore. For some countries, the effect of the crisis has been so severe that markets have priced the possibility of sovereign default into bond prices, reflecting the threat of insolvency or illiquidity for the first time since the launch of EMU.

Graph I.1: Government debt, euro area (% of GDP, 2002-2012)

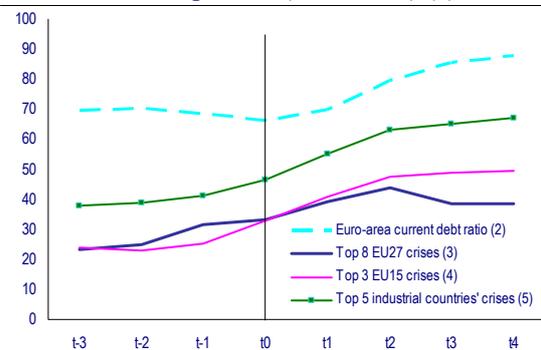


Source: Commission services.

Graph I.1 shows the overall level of debt in the euro area from 2002 to 2012. While debt stood at 66.2% of GDP in 2007, the year before the Great

Recession, the Commission services' most recent forecast expects it to rise to 87.7% of GDP in 2011, with a further increase to 88.5% of GDP in 2012. ⁽¹⁾ An increase of around 20 pp of GDP is in line with experiences of past financial crises.

Graph I.2: Government debt after financial crisis episodes (% of GDP) (1)



(1) Non-weighted country averages unless otherwise specified. (2) Weighted average, $t_0 = 2007$. (3) Financial crisis episodes in EU27 countries (CZ, FI, HU, LV, PL, SK, ES, SE). (4) Financial crisis episodes in EU15 countries (FI, ES, SE). (5) Financial crisis episodes in FI, NO, SE, JP and ES.

Source: Commission services on the basis of IMF and AMECO data.

Graph I.2 shows similar increases in debt during past episodes of financial crises in EU countries and other advanced economies. In particular, a number of European countries experienced significant increases in their debt levels in the aftermath of the oil shocks of the 1970s and 1980s, while similar increases in the level of debt resulted from the banking crises of Sweden and

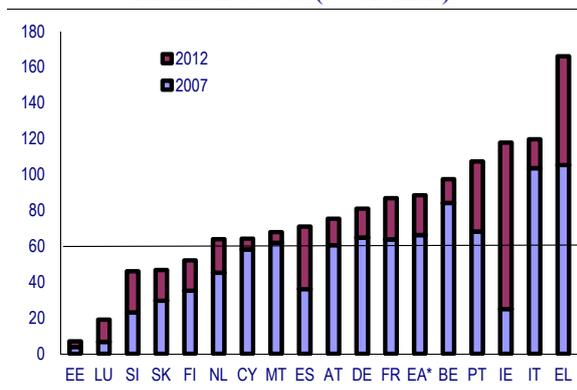
⁽¹⁾ European Commission (2011), 'European economic forecast – Spring 2011', *European Economy* Vol 1. September 2011

Finland in the 1990s. While today’s situation is broadly in line with the experience of past crises, the one significant difference is that the current starting level of debt is higher.

Within the overall total, moreover, there is large variation across countries. Graph I.3 shows the debt level in all euro area countries in both 2007 and 2012, the latter as predicted by the Commission services in the spring 2011 forecasts. It shows that while some countries such as Estonia, Cyprus and Malta are likely to see very modest rises in their debt, Spain and Portugal are expected to experience increases of above 30 pp of GDP and Greece and Ireland of over 60 and 90 pp respectively.

The euro area is not alone in experiencing large increases in debt as a result of the current crisis. Indeed, the debt increases seen so far and forecast for the next year in both the USA and Japan are larger. From a starting level of 62.3% of GDP in 2007, debt in the USA is forecast, by the Commission, to reach 102.4% of GDP by 2012, with the respective figures for Japan being 167.0% in 2007 to 215.9% by 2012. The rise in debt in these leading economies measured in percentage points of GDP is higher than for any euro area country except Greece and shows that this is a problem not restricted to the euro area.

Graph I.3: Debt in 2007 and 2012, euro area Member States (% of GDP)



Source: Commission services.

The increases in debt are a serious concern for policymakers. High debt brings into question the sustainability of an economy, where sustainability relates to the ability of a government to service its debt over the long term. Not only is high debt more costly to service as it requires higher interest payments to be made, but its secondary effects also create difficulties. Once it passes a certain threshold, there is evidence that debt has a negative effect on economic growth, while the

perceived risk associated with high debt levels can lead to increases in the interest rate payable on new debt. ⁽²⁾ Thus interest payments rise not just because of the volume of the debt, but also because the cost of borrowing has risen. Moreover, the higher taxes required to service the debt will act as a brake on growth. It is clear that there is considerable variation within the euro area as to the extent that these issues affect different countries. Not only are the levels of debt quite different, but the other factors affecting sustainability are also far from identical. Growth rates vary and will continue to vary across countries, with some of them being in a better position to meet their obligations due to expected increases in their productivity. Different ageing profiles also mean that some countries are facing significant slowdowns in potential growth as their economies age, as well as significant increases in age-related public spending.

This focus section will look at why debt has increased to the current levels by considering the debt dynamics at play. It will then consider what this means in terms of the longer-term debt sustainability of the euro area countries by looking at projections for debt and will discuss how these fit into an overall assessment of risk facing these countries, before looking at alternative measures of risk associated with debt.

Why debt has increased

The economic and financial crisis has led to increases in debt due to higher deficits and to the support measures introduced by many Member States in favour of the banking sector. Relative to 2007, deficits have risen in all euro area countries for reasons both within and outside governments’ control. ⁽³⁾ The structure of the tax and spending

⁽²⁾ Reinhard and Rogoff (2010) find that debt over 90% of GDP is associated with lower GDP growth, (Reinhard, C.M. and K.S. Rogoff (2010), ‘Growth in a time of debt’, *American Economic Review*, Vol. 100, No 2, May).

Cecchetti et al. (2010) find that high levels of government debt negatively affects future growth and that there is a threshold effect for debt at a level of 80%-100% of GDP, over which additional debt has an additional significant adverse effect on future growth (Cecchetti S.G, M.S. Mohanty and F. Zampolli (2011), ‘The real effects of debt’, paper prepared for the ‘Achieving maximum long-run growth’ symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, 25-27 August).

For a more in-depth discussion of the effect of debt on growth, see Part III of European Commission (2010), ‘Public finances in EMU 2010,’ European Economy 4|2010 (available online at http://ec.europa.eu/economy_finance/publications/european_economy/2010/pdf/ee-2010-4_en.pdf).

⁽³⁾ Over the longer term, many of the aspects of the tax and spending system that are outside governments’ control over the shorter term can be changed. This statement therefore

Table I.1: Debt dynamics in the euro area since the onset of the crisis (% of GDP)

	Debt			Primary deficit	Stock flow adjustment	Increase in debt due to		
	Previous year's outturn	Current year	Increase			Interest-growth rate differential		
						Total	Interest rate	Growth rate
2008	66.2	69.9	3.6	-1.0	3.2	1.4	3.0	-1.6
2009	69.9	79.3	9.5	3.5	0.9	5.1	2.8	2.3
2010	79.3	85.4	6.0	3.2	2.1	0.8	2.8	-2.0
2011	85.4	87.7	2.4	1.3	0.6	0.4	3.0	-2.5
2012	87.7	88.5	0.8	0.4	0.2	0.2	3.2	-2.9
Total increase 2007-11			21.5	7.0	6.8	7.7	11.6	-3.9

Source: Commission spring 2011 forecasts.

system means that as economic activity slows, lower tax receipts coupled with higher spending (primarily due to increased support for the unemployed and to the maintenance of spending plans set in advance under the expectation of stronger growth) cause deficits to grow automatically. Typically, a slowdown in economic activity will tend to be part of an economic cycle, and the upswing part of the cycle will lead to a return of revenues and a reduction in deficits, as the automatic stabilisers act in the opposite direction. However, some of the non-discretionary increase in deficits seen in the current crisis is due to factors that are not part of the classic economic cycle and that are not necessarily expected to have a counteracting upswing. Receipts linked to asset markets such as the housing and stock markets have fallen, following sharp downward corrections, leading to increased deficits.⁽⁴⁾ Insofar as these receipts were previously used to fund expenditure programmes which remain in place as the revenues disappear, this fall in receipts creates a permanent increase in the deficit that needs to be addressed through consolidation measures.

Aside from these non-discretionary effects, many governments also introduced measures to support demand in their economies, which also increased deficits. These measures were generally intended to be temporary and many have already been withdrawn as part of the current consolidation process. Nevertheless, even where they have been reversed, they still have an effect on the debt. Reversing the measures eliminates their direct effect on the deficit, but the additional borrowing that they generate has been added to the stock of debt – which adds to debt interest payments to be

met until the stock is reduced. If the additional support they provided is strong enough to have a beneficial medium-term effect on economic output, the additional growth may eventually negate the effect of the higher debt. But if the measures were not optimally planned or if there are serious concerns about short-term sustainability or liquidity, these measures could ultimately add to the difficulties of some governments.

Discretionary policy measures were also used to support the financial sector. These measures, which include bank recapitalisations, are off-balance-sheet in the sense that they do not form part of the deficit although they do add to (gross) debt. As such measures often include the transfer of assets to the government, the total net increase in debt once the immediate years of the crisis are over is likely to be lower than the initial increase insofar as the government is able to sell its assets and recoup some of its investment.

I.2. Debt developments and sustainability

Debt dynamics – how debt increases

The increase in debt depends on the size of the primary deficit, the debt level combined with the level of interest rates, and economic growth and stock-flow adjustment.⁽⁵⁾ The following equation gives the year-on-year debt dynamics:

$$\frac{D_t}{Y_t} - \frac{D_{t-1}}{Y_{t-1}} = \frac{PD_t}{Y_t} + \left(\frac{D_{t-1}}{Y_{t-1}} * \frac{i_t - y_t}{1 + y_t} \right) + \frac{SF_t}{Y_t},$$

where t is a time subscript; D , PD , Y and SF are the stock of government debt, the primary deficit, nominal GDP and the stock-flow adjustment respectively, and i and y represent the average nominal cost of debt and nominal GDP growth.

refers to the short term and reflects the fiscal position that results from the interaction of the system in place at the time of the crisis and the changing macroeconomic situation.

⁽⁴⁾ For a more in-depth discussion see Section IV.2 European Commission (2009) 'Public finances in EMU 2009,' European Economy 5|2009 (available online at http://ec.europa.eu/economy_finance/publications/publication_15390_en.pdf) and European Commission (2010) op.cit.

⁽⁵⁾ The stock-flow adjustment consists of government transactions that affect the debt level but not the primary balances, such as the purchasing of shares in financial companies.

The primary deficit equals the deficit net of interest costs. Rises in the overall deficit due to automatic stabilisers, non-cyclical non-discretionary changes such as the effect on revenues of asset markets or structural changes to the economy, or discretionary changes to tax and spending will have a one to one equivalent effect on the primary deficit. The term in parentheses represents the ‘snowball’ effect of public debt. It measures the combined effect of interest expenditure and economic growth on the debt ratio. A higher starting level of debt increases the value of this term directly through the value of the first component, and possibly indirectly through a reduced level of economic growth and a higher interest rate. Whether the snowball effect is positive or negative depends on the interest-growth-rate differential ($i_t - y_t$). When the differential is positive (i.e. the interest rate is higher than the rate of economic growth), the snowball effect is positive leading to an increase in debt. If it is negative – usually in countries that have exceptionally high growth rates – economic growth is high enough to make up for the interest payments, pushing the ratio of debt to GDP down.

The final term in the equation is the stock-flow adjustment. Usually, it is assumed that this will average zero over a long enough time period, although the experience of the first decade or so of EMU has shown that it has tended to be positive, adding to the upward dynamics of debt.

Table I.1 shows the increases in debt over the crisis years, and their components, for the euro area. Using 2007 as the base year (the first line shows the increase from 2007 to 2008), the table provides the outcomes until 2010 and the Commission’s spring 2011 forecasts for 2011 and 2012. Overall, by the end of 2011, debt is expected to rise by 21.5 pp of GDP, with around a third of the increase due to the primary deficits, another third due to stock-flow adjustments and a final third due to the snowball effect. In the later years, the consolidation efforts and return of growth are such as to leave interest payments as the primary upward driver of debt.

Until the actual debt level falls, there is little reason to suppose that interest payments will fall. In practice, however, the relationship between interest payments and the debt level is not simple. Interest payments are a function of existing obligations by governments and of the new borrowing that they undertake. This new borrowing is composed of both the new additions to the stock of debt and the rolling over of

existing debt reaching maturity. The amount of new borrowing and the relative terms of the rolled over debt compared with the terms at which it was being financed make the year-on-year difference in the interest rate effect shown in Table I.1.

The level at which governments are able to undertake new borrowing and roll over debt which has reached maturity will depend on the market’s demand for this debt and the price it is prepared to pay for it. Countries where a large pool of saving exists and the population has typically used government bonds as a preferred form of saving (maybe as hedge against future tax increases) should be able to borrow at lower rates than countries with no such tradition, other things being equal. But a key feature of the price and therefore the interest rate will depend on the perceived riskiness of the debt in terms of the risk of default and this in turn will be linked to the sustainability of the debt level.

The sustainability of debt

The sustainability of public finances relates to continued ability of a government to finance its debt. Although there are a number of definitions of sustainability that could be given, the intertemporal budget constraint can serve as a starting point for defining what a sustainable debt level entails. The intertemporal budget constraint (IBC) is given by:

$$d_0 \leq -\sum_{t=1}^T p d_t \left(\frac{1+y}{1+i} \right)^t$$

A derivation of this equation is given in Box II.1. Intuitively, the IBC is met if the stream of future primary surpluses is large enough to enable a government to meet its financing obligations. Doing so is dependent on the starting level of debt, the primary balances that are possible and any future differential between interest rates and growth rates. Where debt levels are high, not only is the stream of future surpluses that are needed high, but the impact of high debt on the differential between interest rate and growth rate is likely to require even higher primary balances to make up for the lower growth and/or higher interest. The feasibility of running high enough primary balances is essentially political. While there is necessarily a point at which the required primary balances are so high as to either take up all of GDP or require tax to be so high that growth grinds to a halt, political constraints will apply

Box I.1: The intertemporal budget constraint

The equation describing debt dynamics is given as:

$$\frac{D_t}{Y_t} - \frac{D_{t-1}}{Y_{t-1}} = \frac{PD_t}{Y_t} + \left(\frac{D_{t-1}}{Y_{t-1}} * \frac{i_t - y_t}{1 + y_t} \right) + \frac{SF_t}{Y_t}$$

Simplifying the notation by using $d_t = \frac{D_t}{Y_t}$ and $pd_t = \frac{PD_t}{Y_t}$ to give the values of the debt and the primary deficit as shares of GDP, and assuming for simplicity that the stock-flow adjustment SF_t equals zero for all periods, we get:

$$d_t - d_{t-1} = pd_t + \left(d_{t-1} * \frac{i_t - y_t}{1 + y_t} \right) \text{ or equivalently } d_t = pd_t + \left(d_{t-1} * \frac{1 + i_t}{1 + y_t} \right)$$

Under the assumption that $i_t = i$ and $y_t = y$ for all t, and setting $t=0$ as the starting period for assessing sustainability, solving the equation forward until a time period $t=T$, gives:

$$d_T = \sum_{t=1}^T pd_t \left(\frac{1+i}{1+y} \right)^{T-t} + d_0 \left(\frac{1+i}{1+y} \right)^T$$

Which in turn gives:

$$d_0 = d_T \left(\frac{1+y}{1+i} \right)^T - \sum_{t=1}^T pd_t \left(\frac{1+y}{1+i} \right)^t$$

Sustainability can be defined in a number of ways, yielding different definitions of the intertemporal budget constraint. One such definition is that the discounted value of future debt over an infinite horizon equals zero, which is equivalent to saying that the total sum of future primary deficits more than covers the value of the starting (today's) level of debt. This gives the following condition:

$$d_0 \leq - \sum_{t=1}^T pd_t \left(\frac{1+y}{1+i} \right)^t$$

well before this situation is reached.⁽⁶⁾ High primary balances require resources to be diverted away from the economy to debt financing, entailing high levels of taxation and low expenditure on government transfers and services. The prospect of default is likely to become more and more attractive as taxpayers feel the pressure of the situation, so that political sustainability ends up being a significantly tighter constraint than purely economic calculations.

Debt dynamics scenarios for the euro area

In order to gain insights into the future challenges for fiscal policies in the euro area coming out of the crisis, it is informative to look at the projected evolution of the debt ratio in a constant policy setting and also under different assumptions on key variables affecting the debt dynamics. When making such projections, key assumptions need to be made for fiscal consolidation efforts and

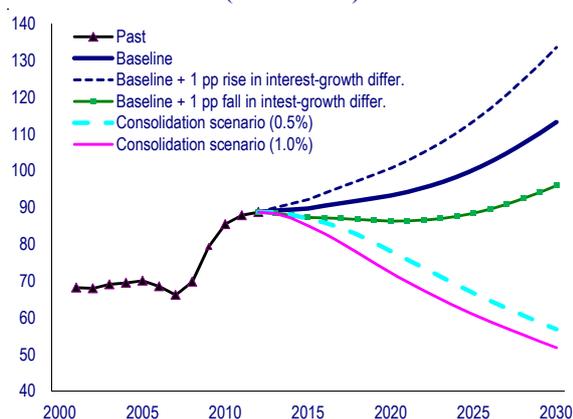
underlying interest and growth rates as well as for future costs related to population ageing.⁽⁷⁾

⁽⁶⁾ These political constraints apply when Blanchard's 'maximum politically feasible primary surplus', as defined in O. Blanchard (1984) 'Current and anticipated deficits, interest rates and economic activity', *European Economic Review*, Vol. 25(1), pp 7-28, is reached.

⁽⁷⁾ The projections are based on the Commission's spring 2011 forecasts (up to 2012), and the Europe 2020 macroeconomic scenarios up to 2020. Beyond 2020, the scenarios assume a return of growth to the long-term trend as agreed by the Commission and Ageing Working Group of the Economic Policy Committee and published in the 2009 Ageing Report (AR). The specific assumptions made are: (i) the increase in age-related expenditure was made consistent with the new macroeconomic scenario, by using implicit elasticities derived from the 2009 AR sensitivity tests. Age-related expenditure in the EU increases, on average, by 0.4 pp of GDP in the EU as a whole up to 2020 (0.6 pp in the euro area) and by 1.9 pp (2.2 pp in the euro area) up to 2030; (ii) the tax-to-GDP ratios are projected to converge linearly, by 2018, to their pre-2007 level for countries with 2012 tax burdens below their 2007 level. For countries with 2012 tax-to-GDP ratios above the pre-crisis level, it is assumed that the tax ratio remains constant. The cyclical component of tax revenues is added to the projected values on the basis of OECD elasticities; (iii) the implicit interest rate on government debt converges linearly to 3% in real terms (the value assumed for the purposes of the long-term sustainability of public finance assessment) in 2015 (or 2017), when the output gap is closed and remains constant thereafter, for all countries; (iv) the inflation rate (GDP deflator) converges linearly to 2% in 2015 (or 2017), when the output gap is closed and remains constant thereafter, for all countries; (v) zero stock-flow adjustment after 2012, i.e.

Graph I.4 depicts the projected evolution for the government gross debt ratio, for the euro area. The solid thick line shows the outcome for a baseline scenario under the assumption of no fiscal consolidation measures beyond those contained in the Commission's spring 2011 forecasts (i.e. structural primary balance/GDP ratio kept constant at the 2012 estimated level⁽⁸⁾) and incorporating the expected future age-related spending.⁽⁹⁾ Primary balances fall short of what is needed to stabilise the ratio of public debt to GDP, which rises steadily over the projection period. By 2015, the debt is projected to be at around 90% of GDP in the euro area (more than 20 pp of GDP higher than before the crisis). It would continue increasing to about 93% of GDP by 2020 and further to 113% of GDP by 2030, albeit with large differences across countries.

Graph I.4: **Medium-term debt projections under alternative assumptions – euro area (% of GDP)**



Source: Commission services.

Table I.2 presents a breakdown of the medium-term debt-to-GDP projections for the euro area that allows the contributions of the main drivers in the baseline scenario to be considered: 1) the primary balance; 2) age-related expenditure; 3) the snowball effect. The fiscal consolidation over the years to 2012 results in a reduction in the structural primary balance, which helps to limit the increase in the debt ratio in the period to 2020. However, ageing costs weigh on the primary balance over time and, on current policies, would

no further purchases of financial assets or recapitalisations of financial institutions, nor disposal of such assets.

⁽⁸⁾ For Greece, Ireland and Portugal, the structural primary balances in their economic adjustment programmes (2014 for Greece and 2015 for Ireland and Portugal) are kept constant in the baseline scenario.

⁽⁹⁾ For details on future age-related spending, see European Commission and Economic Policy Committee (2009), '2009 Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008-2060)', European Economy, No 2.

send the primary balance into the red again in the mid 2020s. Moreover, with rising debt, the snowball effect would prove significant over time; interest expenditure would rise continuously and increasingly outweigh the growth effect.

Sustained fiscal consolidation would curb the euro area's debt dynamics

Graph I.4 also shows the results of additional scenarios built up to examine the long-run implications of a gradual fiscal adjustment and also of alternative assumptions on the differential between interest rate and growth rate. A first fiscal consolidation scenario is based on the assumption of all euro-area countries implementing fiscal consolidation efforts from 2012, measured in terms of an improvement of the structural balance by 0.5% of GDP per year until the medium-term objective (MTO) reported by the country is reached.⁽¹⁰⁾⁽¹¹⁾ The graph illustrates that, for the euro area, this consolidation pace – the benchmark consolidation effort in the Stability and Growth Pact – would be enough to halt the growth in debt by 2013, after which the ratio of debt to GDP would decrease, but only slowly, from 89% in 2013 to 78% in 2020. It would fall below 60% only in 2029.

A stronger consolidation effort of 1% of GDP per year until the MTO of each euro area Member State is reached would also halt the increase in the government debt ratio from 2013. Nevertheless, in 2020, the debt ratio would still be larger than before the crisis (by about 6 pp of GDP), and it would fall below the 60% threshold only in 2026.

Stress tests based on different assumptions on the interest/growth rate differential

In addition to the aforementioned scenarios, stress tests reveal the sensitivity of debt developments to different assumptions on the interest rate and economic growth by modelling an increase and decrease of 1 pp in the differential between these two variables. The interest/growth rate differential is a critical input parameter in determining the future evolution of public debt. Countries with high levels of debt face the possibility of an ever

⁽¹⁰⁾ For Greece, Ireland and Portugal all extrapolations are done taking into account their economic adjustment programmes (till 2014 and 2015 respectively) i.e. using the debt levels and primary balances at the end of the programmes.

⁽¹¹⁾ The MTO effectively corresponds to a close to balance or surplus budgetary position. See section I.3 of European Commission (2011) 'Public finances in EMU 2011,' *European Economy*, No. 3|2011 available online at: http://ec.europa.eu/economy_finance/publications/european_economy/2011/pdf/ee-2011-3_en.pdf.

Table I.2: General government gross debt for the euro area – baseline projections (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030
Gross debt ratio	79.3	85.4	87.9	88.7	89.1	89.4	89.7	90.5	91.2	91.8	92.5	93.2	100.2	113.2
changes in the debt ratio (1+2+3)	9.4	6.1	2.4	0.9	0.4	0.3	0.3	0.8	0.7	0.7	0.7	0.7	1.9	3.0
of which (1) Overall primary balance (+ = deficit)	3.5	3.2	1.3	0.4	-0.1	-0.5	-0.7	-0.6	-0.6	-0.5	-0.3	-0.2	0.7	1.7
Structural primary balance (kept constant at 2012 lvl)	1.4	1.2	0.0	-0.6	-0.7	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Cyclical component	2.1	2.0	1.3	1.0	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ageing cost (incl. revenues pensions tax)					0.2	0.3	0.5	0.7	0.9	1.0	1.2	1.3	2.0	3.0
Property incomes					-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0
Revenues					-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5
(2) Snowball effect (interest rate/growth differential)	5.2	0.8	0.5	0.3	0.4	0.7	0.9	1.4	1.3	1.2	1.0	0.9	1.3	1.6
Interest expenditure	2.9	2.8	3.0	3.2	3.6	4.0	4.4	4.4	4.5	4.5	4.5	4.5	4.8	5.4
Growth effect (real)	3.0	-1.4	-1.4	-1.5	-1.6	-1.7	-1.7	-1.3	-1.4	-1.5	-1.7	-1.8	-1.6	-1.7
Inflation effect	-0.7	-0.6	-1.2	-1.4	-1.5	-1.6	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.9	-2.2
(3) Stock flow adjustment	0.7	2.1	0.7	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PM : Structural balance (+ = deficit)					2.7	2.9	3.4	3.6	3.6	3.6	3.6	3.7	5.4	7.0
Key macroeconomic assumptions														
GDP growth (real)	-4.1	1.8	1.6	1.8	1.9	1.9	2.0	1.4	1.6	1.7	1.9	2.0	1.6	1.6
Interest rate (real)	2.9	2.7	2.1	2.0	2.3	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Inflation (GDP deflator)	1.0	0.8	1.4	1.7	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Source: Commission services.

increasing debt burden in the event of either higher interest rates or lower GDP growth rates or both. Empirical evidence also confirms that when debt becomes very large, it may be difficult to generate the primary balance that is necessary to ensure sustainability. ⁽¹²⁾ In turn, a deteriorating domestic outlook for fiscal deficits and debt is likely to be associated with higher interest rates. As the increase in interest rates only affects new debt issuance and refinancing needs, countries with short average debt maturity rates are more exposed to interest rate shocks than those that have longer debt maturity rates.

The stress tests on the interest/growth rate differential clearly show that a higher interest rate and/or a lower GDP growth rate will have a strong adverse impact on debt going forward (see Graph I.4), pointing to a markedly more demanding consolidation effort than under a baseline scenario if markets impose on them a risk premium that translates into a lasting increase in the average cost of debt. By contrast, a lower differential would broadly lead to stabilisation of the debt ratio at the current elevated level until the early 2020s, which would however start increasing thereafter due to the effect of ageing on public finances and on growth.

Though these scenarios are based on a number of simplifying assumptions, they suggest that fast debt reduction requires determined and sustained consolidation efforts. Nonetheless, even in the scenario in which a structural fiscal adjustment of 1 pp per year is assumed until the MTOs are reached, it would take 15 years for the debt ratio in the euro area to fall below the 60% of GDP threshold. The simulations also reveal that if

measures are put in place to reduce the interest rate and/or increase the GDP growth rate, the effect on the debt ratio could be significant. Still, this would only stabilise the debt ratio over the coming decade, and from the 2020s onwards it would start to rise again. If, by contrast, growth prospects and/or financing conditions were worse than in the baseline scenario, curbing the debt dynamics would be even more challenging.

It is clear that reversing the effect of the crisis and dealing with the effects of an ageing population will require a strong and sustained policy response. Nevertheless, the benefits of rising to the challenge in timely manner are clear. Not only do strong policy measures change the perception of the sustainability risk faced by Member States, but the sooner that countries can benefit from the reduced interest payments and higher growth that lower debt entails, the better the outlook.

While this analysis highlights the magnitude of the challenge ahead, expanding it to take other factors into account can help better understand the related policy implications. The remainder of this text presents additional methodologies that complement the assessment presented so far and provide a broader picture of the current debt situation. These include the analysis of fiscal reaction functions (in the remainder of this section) and of the risk of fiscal crises (next section).

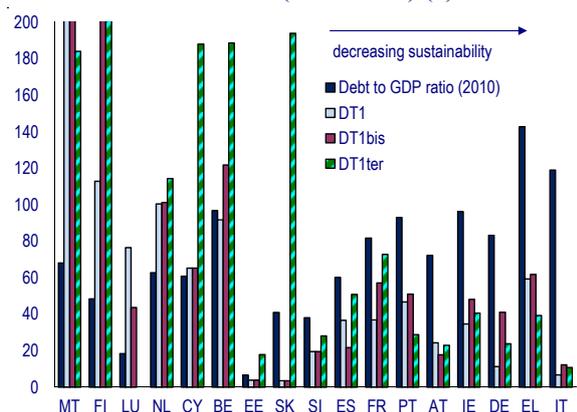
Using fiscal reaction functions as part of sustainability analysis

In order to assess whether it is feasible to put in place the policy responses required to address the sustainability challenge facing the euro area economies, fiscal reaction functions (FRF) can be

⁽¹²⁾ See IMF (2010), 'Fiscal Space', *IMF Staff Position Note*, September 1.

estimated and their results interpreted within the context of current debt ratios. These consider how governments have tended to adjust their primary balances in response to debt increases, and interpret this past behaviour as a realistic guide to fiscal behaviour in the future.⁽¹³⁾ Econometric techniques are used to evaluate the empirical response of the primary balance to the outstanding level of public debt, after controlling for a number of economic and institutional determinants. The resulting estimates of the primary balance drawn from the FRF model capture the structural surplus-generating capacity of countries and are then combined with the government's intertemporal budget constraint (IBC) to calculate sustainable debt thresholds for euro area Member States. The sustainable debt threshold is a measure of the steady state differential between the interest rate and the rate of growth of GDP. A country is then defined as being fiscally sustainable as long as its actual debt does not exceed the sustainable debt threshold.

Graph I.5: Debt sustainability thresholds vs current debt (% of GDP) (1)



(1) The debt sustainability thresholds are derived from primary balance estimates from a Fiscal Reaction Function estimated over the 1975–2010 period and from the average interest-growth rate differentials over the 1990–2010 (DT1), 1975–2010 (DT1bis) and 2008–2014 (DT1ter) periods, respectively.

Source: Commission services based on AMECO and World Bank Database of Political Institutions.

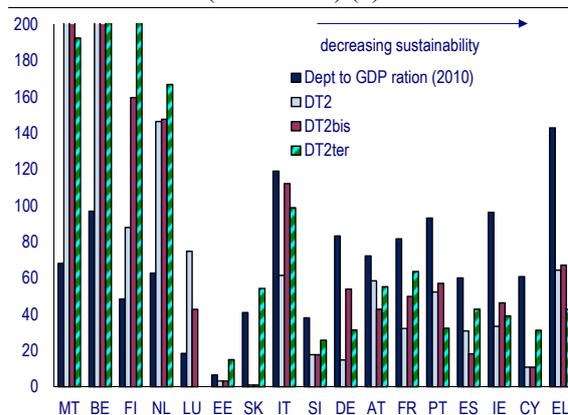
Part IV of European Commission (2011) presents the results of the econometric analysis in more detail.⁽¹⁴⁾ The resulting debt thresholds for euro area Member States derived from the analysis covering the 1975–2010 and 1990–2009 periods are shown in Graphs I.5 and I.6, respectively, against actual debt ratios in 2010. In each chart three thresholds are displayed, corresponding to

⁽¹³⁾ A model-based estimate of primary balance, where the model is the FRF, is preferable to the simple average of past primary balances as it captures structural determinants of the latter.

⁽¹⁴⁾ See European Commission (2011) Part IV.4, *op cit* for more details.

the average interest rate-growth rate differentials over three different periods, i.e. 1990–2010, 1975–2010 and 2008–2014, in order to assess the robustness of the sustainability ranking to the historical vs. forecast growth-adjusted interest rate. The interpretation is straightforward: a country's fiscal position is not sustainable if the actual debt ratio exceeds the threshold. Countries are ranked in decreasing order of sustainability (i.e. from left to right: sustainable in all scenarios, only in some, never).

Graph I.6: Debt sustainability thresholds vs current debt, alternative estimates (% of GDP) (1)



(1) The thresholds are calculated as in the previous graph except for the primary balance estimates that come from a Fiscal Reaction Function estimated over the 1990–2009 period. As in the previous graph, average interest-growth rate differentials are calculated over the 1990–2010 (DT2), 1975–2010 (DT2bis) and 2008–2014 (DT2ter) periods, respectively.

Source: Commission services based on AMECO and World Bank Database of Political Institutions

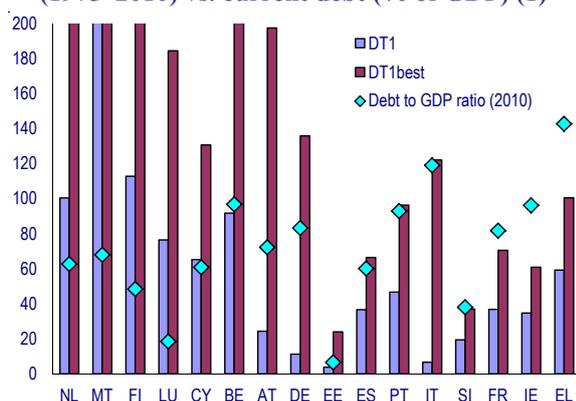
To a large extent, the two different models presented in the graphs give (reassuringly) similar results. Countries where the current debt ratio exceeds debt thresholds based on both FRF models, regardless of the reference period for interest growth differentials, are AT, DE, ES, FR, EL, IE, IT, PT and SI, albeit with a varying magnitude of the sustainability gap by country. At the opposite end of the ranking are FI, LU, MT and NL, which never exceed the threshold, and BE which exceeds it only in one out of six cases.

In order to provide a simple test of the extent to which surplus-generating capacity needs to be improved in order to turn a fiscally unsustainable country into a sustainable one, debt thresholds have been recalculated based on the average of the three largest estimated primary balances from the FRF. This tests whether the current debt ratio would become sustainable if the future surplus-generating capacity of the country were to equal the best primary balance performance achieved in

I. Debt dynamics and sustainability in the euro area

the past according to the FRF model.⁽¹⁵⁾ Graphs I.7 and I.8 show the debt thresholds based on the best estimated primary balance ('DT1best' and 'DT2best') together with the general thresholds ('DT1' and 'DT2'), both derived from the first and second FRF model, respectively, against the actual debt ratio.⁽¹⁶⁾

Graph I.7: Debt sustainability thresholds for the best 3 years of estimated primary balance (1975–2010) vs. current debt (% of GDP) (1)



(1) DT1 = Debt Threshold 1 as in Graph II.5; DT1best = Debt Threshold derived from the (average of the) three largest estimated primary balances from the FRF estimated over the 1975-2010 period and from the average interest rate-GDP growth rate differential over the 1990-2010 period. Figures for thresholds in a few countries exceed the maximum value of the axis (200 %).

Source: Commission services, AMECO and World Bank Database of Political Institutions

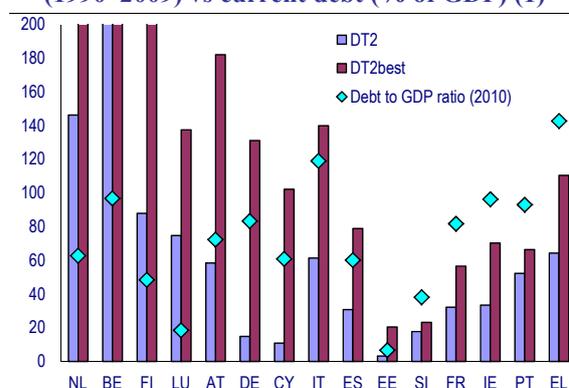
This approach obviously increases the estimated level of sustainable debt. According to 'DTbest', the sustainability assessment moves from negative to positive for AT, DE, ES, IT, PT and SI according to the first FRF model, and for AT, CY, DE, ES and IT according to the second FRF model. For most countries, the response required by the sustainability challenge is therefore challenging, but not unprecedented. However, a few Member States remain fiscally unsustainable even under this more 'optimistic' scenario, i.e. FR, EL and IE according to both models, and PT and SI according to the second FRF model.

⁽¹⁵⁾ A current debt ratio becomes sustainable if it is lower than the recalculated debt threshold.

⁽¹⁶⁾ As explained in section IV.4 of European Commission (2011), whenever the overall average of estimated primary balances was negative, it has been restricted to positive primary balance values in order to increase the number of countries included in threshold calculation. This implies that for those countries with only one or two positive values for the estimated primary balance, the main debt threshold already implies a significant over-estimation of surplus-generating capacity and would *decrease* if based on the best three-year primary balance values. These countries were then excluded from calculation of DTbest, i.e. SK in Graph II.7 and MT and SK in Graph II.8.

Of course, achieving in the future the best outcomes seen so far for several years may raise serious political difficulties, as the primary balances on which this exercise was based are unlikely to be maintained indefinitely. Moreover, although past fiscal behaviour can serve as a guide to the future, providing information about the feasible magnitude of future primary balance, it can only serve as an imperfect guide, particularly given the unique circumstances in which the European economies find themselves. Nevertheless, there are countries, such as Belgium, that have maintained sizeable primary surpluses for long periods of time, indicating that it is possible if the political willingness is there.

Graph I.8: Debt sustainability thresholds for the best three years of estimated primary balance (1990–2009) vs current debt (% of GDP) (1)



(1) DT2 = Debt Threshold 2 as in Graph II.6; DT2best = Debt Threshold derived from the (average of the) three largest estimated primary balances from the FRF estimated over the 1990-2009 period and from the average interest rate-GDP growth rate differential over the 1990-2010 period. Figures for thresholds in a few countries exceed the maximum value of the axis (200 %).

Source: Commission services, AMECO and World Bank Database of Political Institutions

I.3. Assessing the risk of fiscal crises

Expanding on the existing methodologies to gauge fiscal risks

The analysis and discussion so far has focused on looking at debt projections and gaining an idea of future sustainability based on debt dynamics and the intertemporal budget constraint set out in the first part of this section. But aside from assumptions and projections about the primary balances and their components, interest and growth rates, it is evident that levels of debt and concepts of sustainability depend on a broad range of other factors. The Great Recession has illustrated how problems emanating from the financial sector can have devastating effects on public finances and on governments' perceived

ability to control them. In turn, the growth rate of the economy is related to a host of other variables, with competitiveness problems often being symptoms of deep-seated productivity challenges.

The framework for assessing fiscal sustainability can be usefully complemented by fiscal crisis risk models that aim at timely detection of risks of debt distress. These models help to gauge fiscal crisis risks by allowing for the determination of critical thresholds for a set of variables and for composite indicators combining them. By identifying increased risk of debt distress, policymakers can respond in a timely manner.

Models of this kind are taken into consideration by the IMF to supplement the framework used for assessing external and fiscal sustainability in the context of Fund-supported programmes and Article IV surveillance. Recently, fiscal crisis risk models have also become a building block of the joint IMF-FSB Early Warning Exercise,⁽¹⁷⁾ created in 2008 at the request of the G20, in response to the need to improve policymakers' ability to spot risks and vulnerabilities quickly in order to be able to coordinate early policy responses.

Results from a fiscal crisis risk model based on the 'signals approach'⁽¹⁸⁾ are presented here. The model provides thresholds based on past behaviour, beyond which fiscal crisis signals are detected for: 1) each individual variable included in the analysis, 2) a composite indicator incorporating all variables, 3) thematic composite indicators referring to different subsets of variables (e.g. fiscal, financial, competitiveness).

The signals approach allows consideration (and aggregation into an overall index) of a large set of variables, thus permitting quite a comprehensive analysis of underlying vulnerabilities. For the analysis presented here, both fiscal and macro-financial variables are selected and their correlation with past fiscal crises is first analysed. An optimal threshold (for each variable included in the analysis) is found, which maximises the ability of the variable to predict a fiscal crisis

based on the value taken by the variable one year ahead of the crisis. A variable will be sending a 'crisis signal' when it takes a value above or below such optimal threshold, depending on the variable in question.⁽¹⁹⁾⁽²⁰⁾ Once these triggering thresholds are calculated, the variables can be aggregated into composite indicators of fiscal crisis vulnerability.

Giving concrete guidance in a sustainability assessment framework based on the overall fiscal crisis vulnerability index requires careful consideration of which variables drive the outcome of the exercise on a country by country basis. This makes the signals approach an instrument that is best used at the beginning of the assessment procedure.

In the context of a regular fiscal crisis early warning exercise, the overall indicator of fiscal crisis vulnerability can be computed for a selected sample of countries in each year and compared against the critical threshold identified. Indicator values beyond the threshold for a country in a given year provide warnings of fiscal crisis risks for the following year. The values of thematic indicators (grouping different subsets of variables – fiscal, financial and competitiveness variables) and of the individual variables themselves relative to their respective thresholds can also be used to complete the picture of the sources of vulnerabilities and to highlight areas where early policy intervention might be required. Finally, alongside the analysis of values taken against critical thresholds at a certain point in time, the monitoring at country level should also pay attention to the evolution of the fiscal crisis vulnerability indicator over time, with increases in the value of the indicator highlighting increased vulnerability. This is of course also relevant in cases where countries remain below the critical threshold of fiscal crisis risk.

⁽¹⁷⁾ See IMF (2011), 'The IMF-FSB early warning exercise. Design and methodological toolkit', September 2010, (available online at: <http://www.imf.org/external/np/pp/eng/2010/090110.pdf>).

⁽¹⁸⁾ Seminal papers on this approach are: Kaminsky, G., S. Lizondo, and C.M. Reinhart (1998), 'Leading indicators of currency crises', *IMF Staff Papers*, Vol. 45, No. 1. and Kaminsky, G.L. and C.M. Reinhart (1999), 'The twin crises: The Causes of banking and balance-of-payments problems', *American Economic Review*, Vol. 89(3), pp. 473-500.

⁽¹⁹⁾ For the change in public debt over GDP, for instance, a value above the optimal threshold would signal a fiscal crisis, while for the general government balance over GDP a value below the optimal threshold is taken as a crisis signal.

⁽²⁰⁾ In brief, the methodology for determining the optimal thresholds works as follows. Using historical data, signals sent by the variable for the different countries and years are compared to the crisis definition. A signal is correct when for the country in question the variable indicates a crisis (non-crisis) year and indeed the year following that in which the signal is recorded turns out to be a crisis (non-crisis) year. On the contrary, a signal is wrong when the variable has signalled no crisis ahead of a crisis year (type II error) and when it has signalled a crisis ahead of a non-crisis year (type I error). The optimal threshold is chosen in such a way as to minimise the share of not signalled crises plus the share of non-crises signalled as crises (see Part IV, Chapter 3 in European Commission (2011) for more details).

Preliminary results

The calculation of the optimal thresholds is based on a panel of 33 countries (all EU countries except CY, LU and MT, and nine other advanced economies).⁽²¹⁾ Data come from AMECO, the IMF’s World Economic Outlook (WEO) and the Bank for International Settlements. Time series covering the period 1970-2010 are used whenever possible but for a number of variables data are only available starting from 1995. The identification of fiscal crisis events over the time interval 1970–2010 is borrowed from Baldacci et al. ⁽²²⁾ A fiscal crisis episode is identified if any of four different criteria is satisfied: high inflation rates, large sovereign bond yield spreads, public debt default or restructuring/rescheduling based on Standard & Poor’s definition, large-scale IMF-supported programme in place.

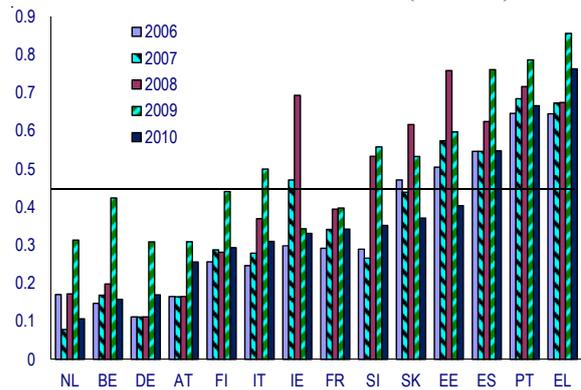
The fiscal variables entering the calculations include the general government’s gross debt (and its first difference), the short-term debt, the total, primary and cyclically-adjusted balances, the change in government expenditure and in government final consumption expenditure, and the change in projected age-related public expenditure. Among the macro-financial variables, the following are considered: net financial assets of the total economy, net savings of households and non-financial corporations, private sector debt, net acquisition of financial assets for the private sector, leverage of financial corporations, short-term debt of non-financial corporations, and competitiveness variables like the change in the real effective exchange rate, the change in nominal unit labour costs and the current account.

European Commission (2011) Part IV presents the results of the analysis and the derived thresholds for both the individual variables and the composite indicators. It shows that the overall composite indicator derived would have correctly identified 73% of past crisis events and 83% of past non-crisis events (i.e. correctly signalled that no crisis was imminent), highlighting quite a good overall performance for this type of

methodology.⁽²³⁾ The fact that the indicator displays a relatively good performance at not missing crises is a particularly encouraging feature.

In general, joint consideration of all the variables combined into a composite indicator tends to provide better results in terms of early warnings of fiscal crises than separate observation of the individual variables, although individual variables are necessary to understand the specific sources of vulnerability. The overall index of fiscal crisis vulnerability could therefore be a very useful building block of an early warning system. Regular monitoring of the index should consider both its level (above or below the critical threshold of 0.45) and changes in the index over time reflecting improvement/deterioration in terms of fiscal crisis vulnerability for the country concerned.

Graph I.9: The fiscal crisis vulnerability index, selected euro area countries (2006-10)



Source: Commission services.

The evolution of the index is presented jointly for a number of euro area countries in Graphs I.9 to I.11. In Graph I.9, values taken by the overall index from 2006 to 2010 are considered relative to the estimated 0.45 threshold. Over this time interval the index would have consistently signalled six euro area countries (NL, BE, DE, AT, FI and FR) as remaining broadly on the safe side for the following year. On the contrary, ES, PT and EL exceeded the threshold for fiscal crisis vulnerability over all five years, and more strongly so in 2009 with a peak value of 0.86 for EL. Other euro area countries that have exceeded the threshold for fiscal crisis vulnerability over the

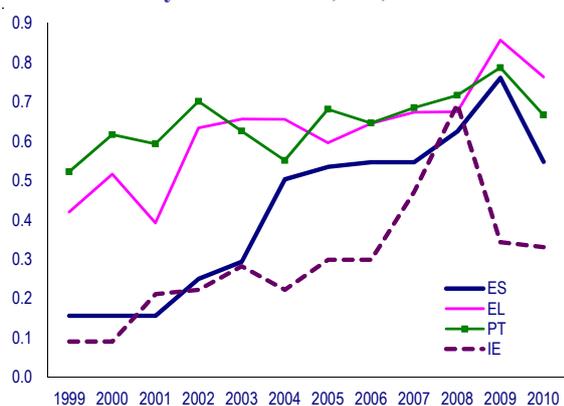
⁽²¹⁾ CY, LU and MT are excluded from the sample as the necessary information on recorded fiscal crisis events over the past four decades is currently missing. The other nine advanced economies included in the analysis are: Australia, Canada, Iceland, Israel, Japan, New Zealand, Norway, Switzerland, US.

⁽²²⁾ Baldacci, E., Petrova, I., Belhocine, N., Dobrescu, G., and S. Mazraani, (2011) ‘Assessing Fiscal Stress’, *IMF Working Paper* 11/100.

⁽²³⁾ The empirical literature shows that early warning system methodologies are typically subject to non-negligible predictive errors. See Baldacci et al. (2011) *op. cit.* and Hemming et al. (2003), ‘Fiscal vulnerability and financial crises in emerging market economies,’ *IMF Occasional Paper*, No. 218.

last three years are EE, IE, SI and SK in 2008 and EE, IT, SI and SK in 2009.⁽²⁴⁾ Graph I.9, also shows that the crisis vulnerability index is lower in 2010 than in 2009 for all countries, signalling a reduced risk. As economic and fiscal fundamental continue to strengthen, it is expected that the index will continue to fall in 2011.

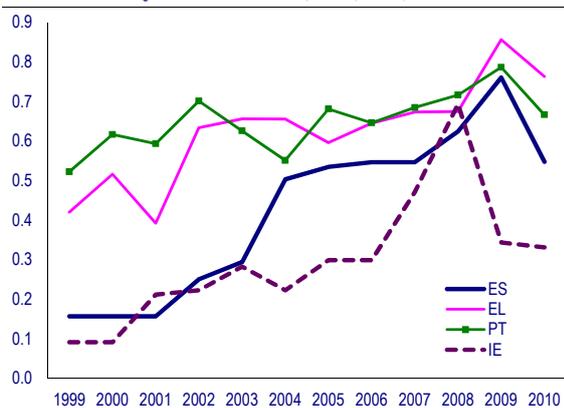
Graph I.10: Evolution of the fiscal crisis vulnerability index for DE, FR, IT 1999-2010



Source: Commission services.

Graphs I.10 and I.11 provide information on the evolution of the fiscal crisis vulnerability index between 1999 and 2010 for selected countries. Spikes in the index are particularly evident for IE, ES, EL and PT in 2008 and 2009.

Graph I.11: Evolution of the fiscal crisis vulnerability index for ES, EL, PT, IE 1999-2010



Source: Commission services.

The analysis of the overall index should be complemented by analysis of the thematic composite indicators. These two indicators provide information on the respective contributions of different groups of variables to

⁽²⁴⁾ The low values for IE are explained by the fact that IE does not provide series for the financial variables which are consolidated by national account subsector (non-consolidated data could be used in a regular assessment).

fiscal crisis vulnerability. The analysis should then be further deepened at individual variable level to have the full picture of where vulnerabilities stem from.

By looking retrospectively at the results obtained for countries that were particularly strongly hit by the crisis, it is possible to gauge the usefulness of the more detailed indicators. As an example, on an ex post basis, it is now clear that Greece was building up imbalances in the run-up to the crisis that have since proved very costly.⁽²⁵⁾ Our results for Greece show that many fiscal variables were consistently signalling crisis risks from 2002 onwards. For the years since 2006 almost all fiscal variables with relatively high signalling power (the primary balance, cyclically adjusted balance, gross and net debt, and change in projected age-related public expenditure) identified a risk of crisis, while the change in gross debt over GDP started flashing red in 2009. Fiscal crisis signals have also been sent by macro-financial variables with some of the highest signalling powers, including net financial assets of the total economy, net savings of households and private sector debt since 2007, and the leverage of financial corporations since 2008.⁽²⁶⁾ On the competitiveness side, the current account over GDP and the growth rate of nominal unit labour costs have been flashing red since 2006. Thus, not only did the overall indicator correctly point to weaknesses in Greece, but also the analysis of the sub-indices and of the single variables showed that both the government (the fiscal side) and the private sector (the macro-financial side) had put in place a dangerous excess of consumption accompanied by a process of debt accumulation.

I.4. Conclusions

The deterioration in the public finances of the euro area since the onset of the economic and financial crisis comes on top of already high starting levels of debt and at a time when the European economies are facing the prospect of the sustainability challenge of an ageing population. In the absence of additional consolidation measures, taking the Commission's spring 2011 forecasts and projecting the debt ratio forward while incorporating additional age-related

⁽²⁵⁾ It should be noted that any such a conclusion is based on an ex-post analysis relying on currently available data and not on data that were available in real time. Furthermore, the risk assessment instruments presented here have been developed in response to the crisis and were not available before the crisis.

⁽²⁶⁾ Some of these variables are also part of the Scoreboard on which the recently adopted Excessive Imbalance Procedure will be based.

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spending shows debt passing the 100% of GDP mark over the next 15 years and continuing to increase thereafter.

It is clear that in order to reverse the increases in growth and ensure the sustainability of public finances, significant permanent consolidation measures – over and above those already introduced – will be necessary in a number of euro area countries. The analysis based on the fiscal reaction functions shows that in some cases the required primary balance to bring debt back to a sustainable level is particularly high, albeit not unprecedented, by historical standards.

Moreover, although the aftermath of the current crisis is central to budgetary policy, it is important not just to focus on the present, but to put into place measures to reduce the likelihood and/or severity of future crises. The ability to predict the risk of future crises is a valuable one, to allow policy measures to be taken in due time, where a risk of a crisis is identified. In this context, the indicators of fiscal crisis risk presented in this section are an important part of the toolbox required to analyse debt sustainability.