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THE LONG HAUL: DEBT SUSTAINABILITY ANALYSIS

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Highlights

- This working paper details and updates the debt sustainability analysis of Darvas, Sapir and Wolff (2014) for Greece, Ireland and Portugal. The goal is not the calculation of a baseline scenario which best corresponds to our views, but to set-up a baseline scenario which broadly corresponds to official assumptions and current market views and to assess its sensitivity to deviations from these assumptions.
- The simulated public debt/GDP ratios are slightly lower compared to Darvas, Sapir and Wolff (2014), eg for 2020 our new results are 2-3 percent of GDP lower than in our February projections. This is because of the European Commission's downward revision of the 2013 debt level for Greece and Ireland, higher expected primary surpluses in Ireland, slightly lower interest rates for all three countries, and a 1.5 percent of GDP higher reduction in the debt ratio due to the stock-flow adjustment in 2014-15 for Portugal.
- Our findings suggests that the public debt ratio is set to decline in all three countries under the maintained assumptions, but the debt trajectory remains vulnerable to negative growth, primary balance and interest rate shocks, even though we do not examine extremely negative scenarios.

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1. Introduction

Assessing the sustainability of public debt is a crucial input to policy analysis, and to market assessment of fiscal risk. In Darvas, Sapir and Wolff (2014) we used a debt sustainability analysis (DSA) for Greece, Ireland and Portugal to simulate public debt and its ratio to GDP up to 2030, under various scenarios. The aim of this working paper is to present the full details of the model developed, the data sources used and the assumptions made by Darvas, Sapir and Wolff (2014). We also update the calculations using more recent data for all three countries.

We highlight that the ultimate goal of our debt sustainability analysis is *not* the calculation of a baseline scenario which best corresponds to our views. Instead, our baseline scenario will largely depend on the assumptions and forecasts of the International Monetary Fund and the European Commission, which we find somewhat too optimistic for some indicators. Similarly, for interest rates we use information from current market yields, even if we think that today's markets may be overly optimistic. Therefore, the goal of the debt sustainability analysis is to set-up a baseline scenario that broadly corresponds to official assumptions and current market views, and to assess its sensitivity to deviations from these assumptions.

The sustainability of public debt depends, apart from the initial level of debt, on future

a) GDP growth (real growth and inflation),
b) borrowing costs,
c) non-standard revenues and expenditures (bank bail-outs or privatisation revenues),
d) primary balance, excluding non-standard operations.

There is a simple identity defining the dynamics of public debt in nominal terms:

$$debt_t = debt_{t-1} + i_t \cdot debt_{t-1} - nsre_t - ps_t + sfa_t \quad (1)$$

where $debt_t$ is the stock of gross public debt at the end of the period, i_t is the average interest rate on public debt, $nsre_t$ denotes non-standard revenues and expenditures (defined as net revenues), pb_t is the primary surplus excluding non-standard operations and sfa_t is the so-called stock-flow adjustment, which can encompass net acquisition of financial assets, debt adjustment effects and statistical discrepancies (see Eurostat, 2013). For example, the increase or reduction of the government's cash balances or the impact of the Greek debt restructuring are also recorded here. All variables, but the interest rate, are expressed in current prices, while the interest rate is expressed in percent.

For any debt sustainability analysis, assumptions have to be made concerning the future development of these variables as well as for the GDP, in order to simulate the future trajectory of the debt/GDP ratio. The composition of public debt stocks have to be considered in sufficient detail, because different components of the public debt carry different interest rates and have a different maturity profile. Therefore, the composition has an effect on the average interest rate to be paid on the debt stock (i_t) and on the gross financing needs in future years, which in turn have an impact on the simulated compositions of future debt stocks.

The next section describes the composition of public debt stocks at the end of 2013, our starting point for the DSA, which is followed by the discussion of the assumptions underlying our debt sustainability analysis in Section 3. Section 4 presents our updated DSA simulation results.

2. Composition and maturity profile of gross public debt

The starting point of the DSA is the outstanding volume of gross public debt and its composition. For all countries, we take the end-2013 outstanding stock of debt from the European Commission's Spring 2014 forecast (published in May 2014). Data on the composition of gross public debt come from difference sources as we detail below in Table 1.

Table 1: The stock and composition of gross public debt at the end of 2013

A: Greece

New bonds from the 2012 debt exchange (€bn)	31
Hold-outs (€bn)	4
ECB/NCB holdings (€bn)	38
Short-term securities (€bn)	15
IMF loans (€bn)	29
Bilateral EU loans (€bn)	53
EFSF loans (PSI sweetener and accrued interest) (€bn)	35
EFSF loans (2nd programme) (€bn)	99
Others (€bn)	15
Total (€bn)	**319**
Total (% GDP)	**175**

B: Ireland

Short-term securities (€bn)	2
Long-term securities (€bn)	85
Former Promissory Notes (€bn)	25
ECB holdings (€bn)	10
IMF loans (€bn)	23
EFSF loans (€bn)	18
EFSM loans (€bn)	22
Bilateral loans (€bn)	5
Others (€bn)	14
Total (€bn)	**203**
Total (% GDP)	**124**

C: Portugal

Short-term securities (€bn)	7
Long-term securities (€bn)	103
ECB/NCBs holdings (€bn)	21
IMF loans (€bn)	25
EFSM loans (€bn)	22
EFSF loans (€bn)	25
Others (€bn)	11
Total (€bn)	**214**
Total (% GDP)	**129**

Sources: See in the main text.

Greece:

- The **Total** for 2013 (both in € billion and as % of GDP) is taken from the European Commission Spring 2014 forecast (European Commission, 2014b).
- During the debt exchange in March 2012, €199.2 billion bonds were exchange for €62.4 billion **new bonds** (see details in Darvas, 2012). With the December 2012 debt buy-back operation, the outstanding volume of the new Greek bonds declined to 30.9 bn EUR. These bonds will mature between 2023 and 2042.
- Zettemeyer, Trebesch and Gulati (2012) provide a full list of **hold-out bonds**, which were not involved in the debt exchange. In 2013, € 2.0 billion of the hold-out bonds matured, reducing the amount of outstanding hold-outs from € 6.0 billion in 2012 to € 4.0 billion in 2013. The maturity of each hold-out bond is known.
- Central bank holdings comprise of ECB and national central banks (NSB) holdings. The **ECB holdings,** €27.7bn, is taken from the ECBs 2013 annual accounts, which show a country-wise breakdown of the Eurosystem's Security Market Programme holdings (see ECB press release, 20 Feb 2014). There are other central bank holdings too, but we do not have a precise information about their current magnitudes. Before the 2012 debt exchange, the total combined ECB and NCB holdings was €56.5 billion (as indicated in the debt exchange documentation, see Darvas, 2012), which was most likely significantly more than the ECB holdings under the SMP, but we have do not have any further information on this. Therefore, for end-2013 we assume that the total ECB/NCB holdings are €10 billion more than the ECB holdings from the SMP. The maturity profile of ECB/NSB holdings is not known. We use an estimate from an investment bank for the maturity profile: according to this estimate, the outstanding volume will be reduced from the current €38 billion to €11 billion by 2018 and below €3 billion by 2022. The last of such bond, amounting to €100 million is expected to mature in 2036.
- The volume of **Short-term securities**, which amount to €15.0 billion, is taken from Hellenic Republic Public Debt Bulletin of December 2013 and is assumed to be constant over time.
- **IMF loans** and their repayment schedule are taken from Table 16 (Greece: Indicators of Fund Credit, page 58) in the IMF June 2014 Review on Greece, which also shows the repayment schedule up to 2026.

- The European Commission's homepage on financial assistance to Greece gives the data on **bilateral loans** (see http://ec.europa.eu/economy_finance/assistance_eu_ms/greek_loan_facility/index_en.htm).
- The data on **EFSF loans** regarding the **Private Sector Involvement (PSI) sweetener and accrued interest** as well as the **2nd programme** is taken from the EFSF homepage (see http://www.efsf.europa.eu/about/operations/index.htm).
- The category **'others'** was calculated as residual, including among others, currency and deposits, other domestic loans, special purpose and bilateral loans and other external loans. We assume that the current outstanding volume of such liabilities will be gradually reduced to zero by 2019.

Ireland:

- For Ireland, the **total** (both in € billion and as % of GDP) is taken from the European Commission Spring 2014 forecast.
- Eurostat provides data up to the fourth quarter of 2013 for **Short- and Long-term securities.** We assume that the outstanding volume of short term securities will remain constant over time, while for long-term securities we use the maturity profile available from the Irish National Treasury Management Agency.
- The data on the **Former Promissory Notes** are taken from the Irish National Treasury Management Agency.
- The ECB's Security Market Programme breakdown (see ECB 2013 annual accounts, press release from 20 Feb 2014) shows that the **ECB holdings** of Irish government bonds amount to €9.7bn. Data on the National Central Bank holdings of government bond are not available. We do not have information on the maturity profile of ECB holdings and assumed that their outstanding stock will be gradually reduced to zero by 2019.
- **IMF loans** are taken from Table 9 (Indicators of Fund Credit, page 47) in the IMF Review of December 2013, which also shows the repayment schedule up to 2023. The repayment schedule is reported in SDRs: we assumed a constant euro/SDR exchange rate when converting SDR values to euros.
- The maturity profile of Ireland's **EFSF** loans is from the National Treasury Management Agency.
- Concerning the maturity profile of **EFSM loans**, the Treasury provided the following information: "*EFSM loans are also subject to a seven year extension that will bring their weighted average maturity from 12.5 years to 19.5 years. It is not expected that Ireland will have to refinance any of its EFSM loans before 2027. However the revised maturity dates of individual EFSM loans will only be determined as they approach their original maturity dates. It is possible that individual EFSM loans will be extended more than once in order to achieve the objective of increasing the weighted average maturity to 19.5 years. The original EFSM maturities are reflected in the table and graph above.*" We therefore assume no repayment of EFSM loans up to 2025 and a later repayment profile similar to Portugal's repayment profile, since the Portuguese Treasury published an approximate repayment profile of EFSM loans.
- Data on **bilateral loans** from the United Kingdom, Sweden and Denmark can be found in table 4.1 in the European Commission's Economic Adjustment Programme for Ireland (2013 Autumn

Review), while the maturity profile of these loans is available from the Irish National Treasury Management Agency.

- The category **'others'** was calculated as residual.

Portugal:

- The **total** (both in € billion and as % of GDP) again is taken from the European Commission Spring 2014 forecast.
- **Short- and long-term securities** are up to the fourth quarter of 2014 as provided by Eurostat. Similarly to the assumption we made for Greece and Ireland, we assume a constant outstanding amount for short term securities, while for long-term securities we use the maturity profile available from the Portuguese treasury.
- The **ECB/NCB holdings** include data on **NCB-holdings** of Portuguese government debt from the December 2013 balance sheet of the Banco de Portugal (see https://www.bportugal.pt/en-US/Estatisticas/PublicacoesEstatisticas/BolEstatistico/Publications/B2.pdf) and from the ECB's Security Market Programme breakdown (see ECB 2013 annual accounts, press release from 20 Feb 2014) which shows that the **ECB holdings** of Portuguese government bonds amount to € 19 billion. Similarly to Ireland, we do not have information on the maturity profile of these holdings and assume that their outstanding stock will be gradually reduced to zero by 2019.
- The data on **IMF loans** can be found in Table 11 (Indicators of Fund Credit, page 46) of the April 2014 Portuguese IMF Review, which also shows the repayment schedule up to 2019..
- **EFSF loans** are from the EFSF homepage (http://www.efsf.europa.eu/about/operations/index.htm), while data on **EFSM loans** can be found on the EC homepage (see: http://ec.europa.eu/economy_finance/assistance_eu_ms/portugal/index_en.htm).
- The category **'others'** is calculated as residual.

3. Assumptions for the Debt Sustainability Analysis

We made the following assumptions from 2014 onwards.

3.1 Nominal GDP growth

We take the IMF's April 2014 forecast for nominal GDP growth from 2014 to 2019 (IMF, 2014a), given that the European Commission's forecast runs only until 2015. For the 2020s, market-based forecasts for the euro area suggest 3.1 percent per year growth for 2022-26 according to Consensus Economics (2014). For Spain, the figure is 3.7 percent per year, but unfortunately Consensus forecasts are not available for Greece, Ireland and Portugal. Given their structural weaknesses, it is difficult to see how the three countries would be able to achieve much faster growth than the rest of the euro area in the long term, after the current negative output gaps have been corrected. Therefore, and for simplicity, we assume that, taking the IMF's forecast for 2018 as the starting point, annual growth in these countries will gradually converge to 3.7 (ie the Consensus Economics forecasts for Spanish growth, which is still somewhat faster than in the euro area) by 2022 and will remain at this level throughout the 2020s.

Table 2: Nominal GDP growth assumptions (% change compared to the previous year), 2014-30

	2014	2015	2016	2017	2018	2019	2020	2021	2022	…	2030
Greece	0.1	3.3	4.8	4.8	4.7	4.5	4.2	4.0	3.7	…	3.7
Ireland	2.3	3.4	3.6	3.9	4.2	4.1	4.0	3.8	3.7	…	3.7
Portugal	2.0	2.5	3.4	3.6	3.7	3.7	3.7	3.7	3.7	…	3.7

Sources: IMF World Economic Outlook April 2014 for 2014-2019 and authors' assumptions from 2020 onward, as described in the main text.

3.2 Primary surplus

We use the IMF's April 2014 World Economic Outlook projection for the primary surplus for 2014-2019, since the European Commission's forecast runs only until 2015. We assume that that privatisation revenues and bank-recapitalisation costs are not incorporated in the IMF's primary surplus projections. For the 2020s, the Commission assumes 4.0 % of GDP persistent primary surplus for Greece. For Portugal and Ireland, the Commissions baseline is respectively 2.6% and 4.6% of GDP in 2020, but we have no information on the Commission's expectations beyond 2020.

Such differences in assumptions make it difficult to compare the debt trajectories for the three countries. For example, Portugal might have a higher than a 2.6 percent of GDP primary surplus should debt sustainability be in danger, and for Ireland and Greece it might prove difficult to sustain a 4.0-4.6 percent primary surplus throughout the 2020s. We therefore chose to assume the same long-run values for all three countries.

There are few examples of advanced countries (except oil-rich Norway) being able to sustain high levels of primary surpluses over long periods of time. As Abbas *et al* (2013) show, the average primary surplus for successful consolidations in advanced economies is 3.1 percent of GDP. We therefore assume that the three countries will gradually converge to this level by 2022, starting from the 2019 IMF forecast primary surplus, and will remain at 3.1 percent until 2030 (Table 3).

Table 3: Primary surplus assumptions (percent of GDP), 2014-30

	2014	2015	2016	2017	2018	2019	2020	2021	2022	…	2030
Greece	1.5	3.0	4.5	4.5	4.2	4.2	3.9	3.5	3.1	…	3.1
Ireland	-0.7	1.6	2.4	3.0	3.4	3.8	3.6	3.3	3.1	…	3.1
Portugal	0.3	1.9	2.4	2.8	3.1	3.3	3.3	3.2	3.1	…	3.1

Sources: IMF World Economic Outlook April 2014 for 2014-2019 and authors' assumptions from 2020 onward, as described in the main text.

3.3 Non-standard revenues and expenditures: privatisation revenues and bank bail-outs

We consider the privatisation schedule reported in the Commission's country reports:

- Greece: the Commission expects €20 billion privatisation revenue between 2014 and 2020 (see European Commission, 2014a, Table 5, page 28);

- Ireland: €110 million of privatisation revenues are expected in 2014 (see European Commission Irish review, December 2013, Section 3.3.3);
- Portugal: €100 million in 2014 (see April 2014 IMF Review Portugal, Table 4, page 40).

We assume that these privatisation revenues are not incorporated in the IMF's primary surplus projections of the World Economic Outlook.

We do not assume any new bank recapitalisation by the public sector in our baseline scenario.

3.4 Stock-flow adjustment of debt

The Commission's projection for stock-flow adjustment is sizable in all three countries in 2014-16 (up to 2017 for Portugal): -6.3 percent of GDP for Greece, -7.1 percent of GDP for Ireland and -6.0 percent of GDP for Portugal (Table 4). For Ireland, most of this adjustment is due to the expected reduction of the government's cash balances from 13 percent of GDP to 6 percent of GDP. No explanation regarding the stock-flow adjustment can be found for Portugal and Greece in the programme documents. We used the Commission projections.

Table 4: Stock-flow adjustment of debt (percent of GDP), 2014-17

	2014	2015	2016	2017
Greece	-0.8	-1.2	-2.2	n.a.
Ireland	-5.6	-0.4	-1.1	n.a.
Portugal	-3.7	-1.3	-0.2	-1.8

Sources: Greece: Table C2 on page 138 of DG ECFIN's fourth review, April 2014; Ireland: Table A3.7 on page 65 of Autumn 2013 review (published in December 2013); Portugal: Table 7 on page 70 of the ECFIN's 11th review, June 2014.

3.5 Borrowing costs

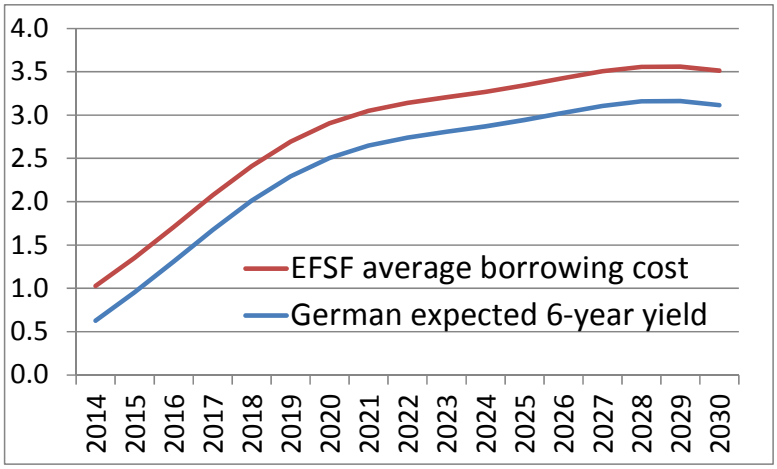
We tracked the interest rates of different components of the debt stock (Table 1) and aimed to project expected interest rates on existing and new borrowings using market expectations (derived from data of 10 June 2014), whenever it was possible.

EFSF (European Financial Stability Facility): All three countries borrowed from the EFSF (see Table 1). The interest rate that the three countries have to pay on EFSF loans are linked to the actual borrowing cost of the EFSF: Greece pays an approximately 1 basis points surcharge, while Ireland and Portugal pay an approximately 11 basis points surcharge. The average maturity of EFSF bonds is close to 6 years, meaning that we could approximate the average future borrowing costs of the EFSF with its 6-year maturity yields. Unfortunately, the full yield curve of the EFSF is not available and therefore we cannot use the expectations hypothesis of the term structure (EHTS) to calculate the expected 6-year EFSF yield for future years[1]. However, for Germany the yield curve is available, making it possible to calculate the expected future 6-year German yields, using the EHTS. Currently, EFSF bonds pay approximately 40 basis points over the German bunds at this maturity and therefore we assume that the average cost of EFSF borrowing will be 40 basis points over the expected German 6-yier yields.

[1] See Darvas *et al* (2011) for details on how to use the EHTS for calculating expected future yields.

Figure 1 indicates that the 6-year German yield is expected to increase from current 0.6 percent per year to about 3.2 percent by 2030.

Figure 1: Expected 6-year German yield and our assumption for the average borrowing cost of the EFSF (percent per year), 2014-30



Sources: German yield is calculated with the expectation hypothesis of the term structure of interest rates using data of 11 June 2014, while the EFSF borrowing cost is our assumption as described in the main text.

EFSM (European Financial Stability Mechanism) loans: Ireland and Portugal have received loans from the EFSM. Initially, the two countries had to pay a margin of 292.5 basis points (Ireland) and of 215 basis points (Portugal) over the funding costs of the EFSM, which was reduced to zero in October 2011. The weighted average funding cost of the EFSM was 3.02 percent and therefore we assume this fixed rate for both countries.

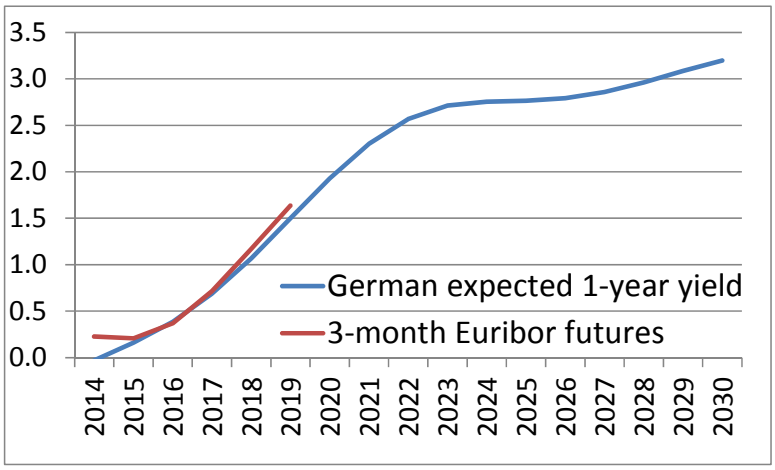
IMF loans: All three countries borrowed from the IMF. We use the most recent editions of programme reviews for interest payments, ie Table 16 on page 58 of IMF (2014c) for Greece, Table 9 on page 48 of IMF (2013) for Ireland and Table 11 on page 46 of IMF (2014b) for Portugal.

Bilateral loans: Greece benefitted from bilateral loans from euro area partners, while Ireland borrowed from the United Kingdom, Sweden and Denmark (Table 1).

For Greece, the interest rate on bilateral loans is linked to the 3-month EURIBOR. The initial spread over EURIBOR was 300 basis points for the first 3 years and 400 basis points afterwards, plus an upfront service change of 50 basis points. In 2011, there was a retroactive spread cut to 150 basis points. Eventually, on 27 November 2012 the spread was cut by another 100 basis points, lowering the spread to 50 basis points.

3-month EURIBOR futures are available up to March 2020 for the 4 main maturities of futures contracts: March, June, September and December. For 2014-2019 we calculate the annual average of the futures quotes for the four main maturities in each year and use these averages in our DSA. Figure 2 indicates that the 3-month EURIBOR futures are very close to the expected Germany one-year yield and therefore for 2020-2030 we approximated the expected value of 3-month EURIBOR with the German one-year yield, by adding to it the expected spread in 2019, which is 14 basis points.

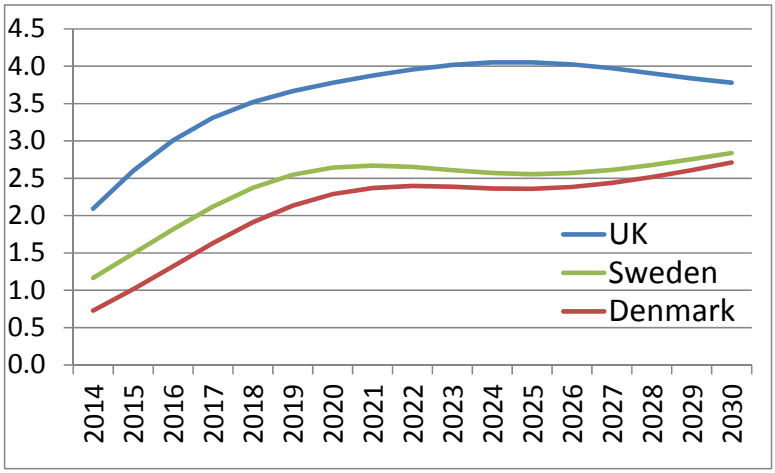
Figure 2: Expected 1-year German yield (2014-2030) and the 3-month EURIBOR futures prices (2014-19), percent per year



Sources: German yield is calculated with the expectation hypothesis of the term structure of interest rates using data of 11 June 2014. The source for EURIBOR futures data is http://www.barchart.com/commodityfutures/3-Month_EuriBor_Futures/IM?mode=D&view=.

For Ireland, the interest payment on bilateral loans from the United Kingdom is composed of a service charge of 0.18 percentage points and the UK cost of funding, defined as the average yield of gilt issuance. We approximate the average yield with the UK 6-year yield and again use the expectation hypothesis of the term structure to approximate future yields. Given lack of other information, we assume the same interest rate determination for the Danish and Swedish bilateral loans. Figure 3 shows the expected 6-years yields in the UK, Sweden and Denmark.

Figure 3: Expected 6-year UK, Swedish and Danish yields (percent per year), 2014-30



Source: Expected yields are calculated with the expectation hypothesis of the term structure of interest rates using data of 11 June 2014.

Short term bills: All three countries have short term treasury bills. For Greece, we assume an interest rate of 5% for all years. For Ireland, we assume a spread of 25 basis points over the 3-month EURIBOR, while for Portugal we assume 50 basis points spread (see the previous point for the calculation of 3-month EURIBOR projections).

Eurosystem holdings: We do not have information on the interest rates paid by bonds held by the ECB and national central banks and therefore assume the average pre-crisis borrowing rate, which was about 5 percent in Greece and 4.5 percent in Ireland and Portugal.

Other liabilities: As Table 1 indicates, after taking into account various items of public debt, a category we called 'others' remains. Similarly to Eurosystem holdings, we assume the average pre-crisis borrowing rate, which was about 5 percent in Greece and 4.5 percent in Ireland and Portugal.

New Greek bonds from the 2012 debt exchange: The 20 new bonds which were issued during the Greek debt exchange of 2012 have a coupon of 2 percent per year in 2013-2015, 3 percent per year in 2016-2020, 3.65 percent per year in 2021, and 4.3 percent per year in 2022 and later. They are accompanied by warrants which pay an interest premium (capped at 1 percent per year) if GDP targets are met (for details, see the Annex in Darvas, 2012). In our simulations, we checked the fulfilment of these GDP conditions and added the pay-outs of the warrants to interest costs[2].

Greek hold-outs: For the pre-2010 bonds, which were not involved in the Greek debt exchange, we assume a 5 percent interest rate, which was the average pre-crisis borrowing cost of Greece.

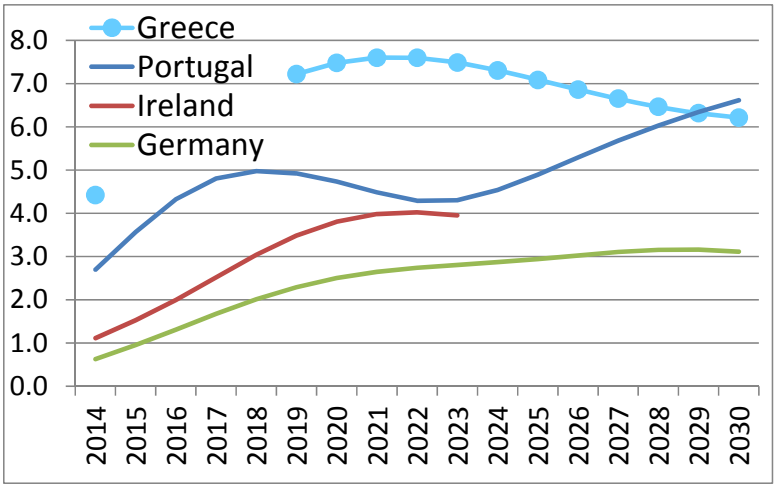
Irish government bonds replacing the earlier 'Promissory Notes': the interest rate on these bonds is the six-month EURIBOR plus an average interest margin of 2.63 percent (in our calculations, we use the bond-specific spreads, which is available from the Irish Treasury). We do not have a separate projection for the 6-month EURIBOR, but instead assume that it will be 11 basis points higher than the 3-month EURIBOR, which is the historical difference between the two rates during January 1999 – May 2014. See Figure 2 and the discussion on the expected 3-month EURIBOR rates.

Long-maturity (pre-programme) bonds of Ireland and Portugal: For Ireland, we assume a 4.5 percent rate, which is about the average of pre-crisis borrowing costs. For Portugal, we have information on the interest rate of each bond, which allows calculating the exact interest to be paid in each year. In 2014, the average interest on outstanding pre-programme bonds is 4.59 percent.

New borrowing: By tracking the maturity and repayment schedule of all vintages of all kinds of debt liabilities and having a projection for the overall budget deficit, the annual gross financing need can be derived, which should be met with new borrowing from the market (or optionally from a new financial assistance programme). The crucial question however is at what spread over the German bunds the three could borrow from the market in future years. . In Darvas, Sapir and Wolff (2014) we assumed the following spreads over the Bund: 100 basis points in Ireland (2014 onwards), 150 basis points for Portugal (to be reached by 2018 from the level of 350 basis points in 2014) and 200 basis points for Greece (to be reached by 2022 from the level of 600 basis points in 2014). Since Ireland and Portugal have exited the financial assistance programme, we can instead use the interest rates derived from their respective term structure, as indicated in Figure 4.

[2] The warrants pay if nominal and real GDP conditions are simultaneously met. In our DSA calculations we simulated nominal GDP and therefore can check directly the fulfilment of nominal GDP conditions. In order to check the fulfilment of the real GDP growth conditions, we assumed that 60 percent of nominal growth is real growth, eg when nominal growth is 4.0 percent, we assume that real growth is 2.4 percent.

Figure 4: Expected 6-year Greek, Portuguese, Irish and German yields (percent per year), 2014-30



Source: Expected yields are calculated with the expectation hypothesis of the term structure of interest rates using data of 11 June 2014.

In detail, for Ireland the current spread of 49 basis points over the 6-year maturity is smaller than what was assumed by Darvas, Sapir and Wolff (2014), but this spread is expected to increase to 130 basis points by 2020 and then fall marginally to 115 basis points by 2023. Lack of longer term yields prohibits the calculation of the expected yields further into the future. We therefore use the expected Irish yields up to 2023 and assume a 115 basis points spread over the German bund from 2023 onward.

For Portugal, the expected spread (as derived by the EHTS) is smaller in 2014-16, but higher in 2017-2022, than what was assumed by Darvas, Sapir and Wolff (2014). The spread is expected to decline to 150 basis points by 2023, which is the long-run value assumed by Darvas, Sapir and Wolff (2014). After 2023, the spread is expected to increase again. Since Portugal has only very recently left the financial assistance programme, bond trading volumes may be small and therefore the information content of the current yield curve, and especially its longer segments, may be questionable. We therefore use the EHTS-derived expected yields only up to 2023 and assume a constant spread of 150 basis points over the bund for later years.

For Greece, current yields are available for 5, 10, 15 and 30 years. For all other years between 5 and 30, we interpolated the yield curve and applied the EHTS for calculating the expected future 6-year yields. The current estimated 6-year yield, 4.4 percent, is 380 basis points over the German bund. The 6-year yield is expected to increase over 7 percent in 2019 (493 basis points over the bund), after which the spread is gradually expected to decline to 310 basis points by 2030. Therefore, the current 6-year yield is somewhat below the earlier assumption of Darvas, Sapir and Wolff (2014), but above it in later years.

Similarly to Darvas, Sapir and Wolff (2014), we continue to advise a new financial assistance programme for Greece, since the debt trajectory is still subject to major risks. Also, current and expected yields are too high and have the potential of seriously endangering debt sustainability. However, we simulate a hypothetical debt trajectory of a clean exit. One could argue that similarly to Ireland and Portugal, a clean exit, if it gained credibility, would lead a reduction in yields compared to

current yields. Therefore, we assume future yields lower than what is reflected in the current term structure of interest rates for the hypothetical clean exit scenario. Specifically, we assume that relative to Portugal, the current 170 basis points spread will be reduced to 50 basis points by 2023 and thereby 200 basis points over the German bunds, similarly to the long-run assumptions of Darvas, Sapir and Wolff (2014).

4. Debt simulations

In addition to a baseline scenario, we simulate the sensitivity of the public debt-to-GDP ratio trajectory to four adverse scenarios, one-by-one and in combination:

1) GDP growth is 1 percentage point slower than in the baseline scenario in each year from 2014-30;
2) the primary surplus is 1 percentage point of GDP lower than in the baseline scenario in each year from 2014-30;
3) interest rates for the floating-rate liabilities are 100 basis points greater than in the baseline scenario in each year from 2014-30;
4) at the end of 2014, governments have to provide an additional 5 percent of GDP for bank recapitalisation (which would amount to between €8-€9 billion in the three countries);
5) these four adverse scenarios in combination.

Before presenting the results, we make two remarks concerning Greece.

First, the possibility of extending the maturity of the Greek bilateral loan facility to 50 years and reducing its spread over the three-month EURIBOR to zero has been raised. In our scenarios, we take into account this maturity extension and spread reduction, and we also take into account a further extension of EFSF loans to Greece so that Greece does not have to repay any principal to European lenders until 2030. The reasons is that such help to Greece by euro-area partners would most likely come first and would be relatively easy, as it would not lead to creditor losses, nor would require the commitment of new funding. To indicate this change in the current financing conditions, we talk about a 'revised baseline' instead of 'baseline' as we do in the cases of Ireland and Portugal.

Second, the 27 November 2012 agreement included the deferral of interest payments of most EFSF loans by 10 years, in order to reduce the funding needs during this period. But the deferred interest has to be paid back and therefore it does not constitute a debt reduction. Therefore, we do not consider the interest deferral in our simulations.

We start by checking the difference between the baselines of our current projection and the February 2014 projections of Darvas, Sapir and Wolff (2014). The final line of Table 5 indicates that for all three countries, the projected debt/GDP ratios are now slightly lower (by about 2-3 percent of GDP) compared to our February projections. For Greece and Ireland, this is partly due to lower debt level in end-2013 (in our February projection, we used the Commission's autumn 2013 forecast for the 2013 debt level, while now we use the Spring 2014 forecast). In contrast, there was an upward revision of the debt level in Portugal. GDP growth forecasts (which come from the IMF) remained practically

unchanged for Greece and Portugal, while for Ireland there was a small decline. For Ireland, the IMF now expects a significantly larger primary budget surplus (2.4 percent versus 1.9 percent), while for Greece and Portugal there is no change in this indicator. Expected interest rates came down slightly for all three countries. For Portugal, the Commission now expects a 1.5 percent of GDP higher reduction in the debt ratio due to the stock-flow adjustment in 2014-15 and for Greece a 2.0 percent of GDP smaller adjustment in 2014-16 than in the earlier programme reviews.

Table 5: Comparison of our current projections with the assumptions and results of Darvas, Sapir and Wolff (2014)

		Greece		Ireland		Portugal	
	Date of Bruegel calculations	***Feb***	***June***	***Feb***	***June***	***Feb***	***June***
Changes in assumptions	Debt in 2013 (% GDP)	176.2	175.1	124.4	123.7	127.8	128.9
	Average growth (%, 2014-20)	3.83	3.80	3.93	3.64	3.19	3.22
	Average primary surplus (% GDP, 2014-20)	3.7	3.7	1.9	2.4	2.5	2.4
	Average interest rate (%, 2014-20)	2.76	2.50	3.66	3.53	3.84	3.74
	Total stock-flow adjustment in 2014-16 (% GDP)*	-6.3	-4.3	-7.1	-7.1	-4.5	-6.0
	Total privatisation in 2014-20 (€ billion)	21.0	20.0	0.11	0.11	0.5	0.1
Changes in results	Debt in 2020 (% GDP)	124.2	122.8	101.7	99.0	113.6	110.4

Source: Authors' calculations using the methods described in Section 3. Note: * for Portugal, the stock-flow adjustment covers 2014-17.

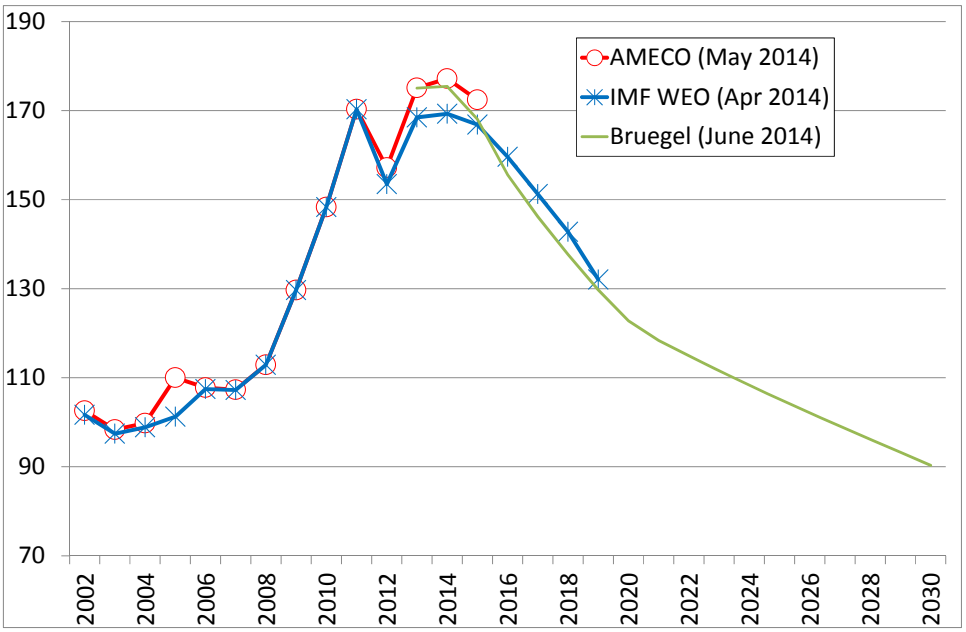
Figure 5, 6 and 7 plot our simulated debt/GDP ratios. The first panel of each of these charts compares our baseline with the most recent IMF and ECFIN projections, while the second panels present our sensitivity analysis.

In the case of Portugal, our baseline scenarios is undistinguishable from the IMF and ECFIN projections (up to the year till these projections are available), but for Greece and Ireland our baseline are somewhat more optimistic. In the case of Greece, the difference may at least partly come from our revised baseline assumption, ie that we already considered further extension of loans to Greece and a reduction in the spread on bilateral loans.

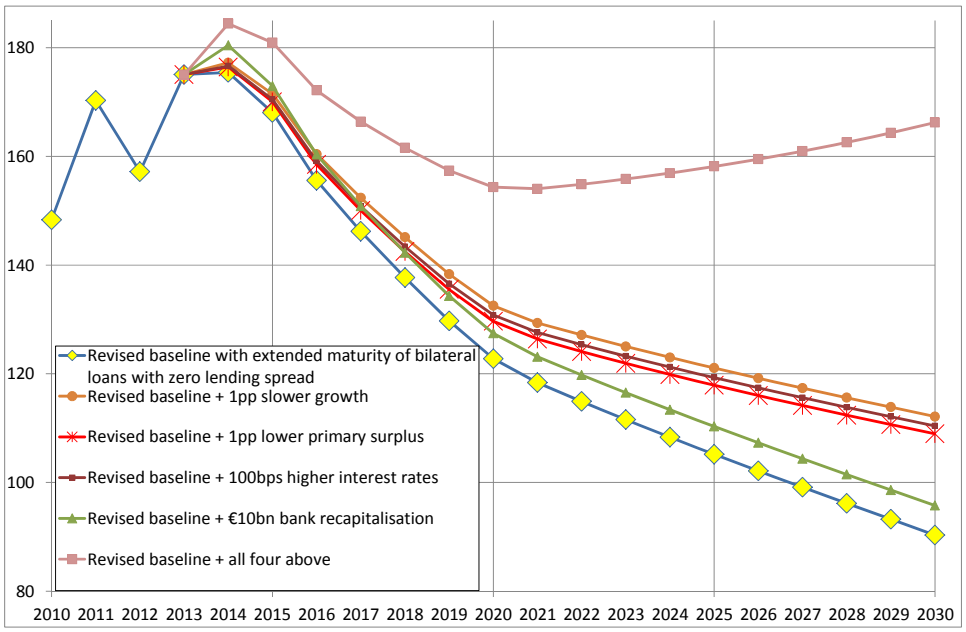
For the sensitivity analysis, our findings are qualitatively the same as in Darvas, Sapir and Wolff (2014).

Figure 5: Greek public debt ratio scenarios (% GDP)

A: Bruegel revised baseline versus AMECO and IMF projections



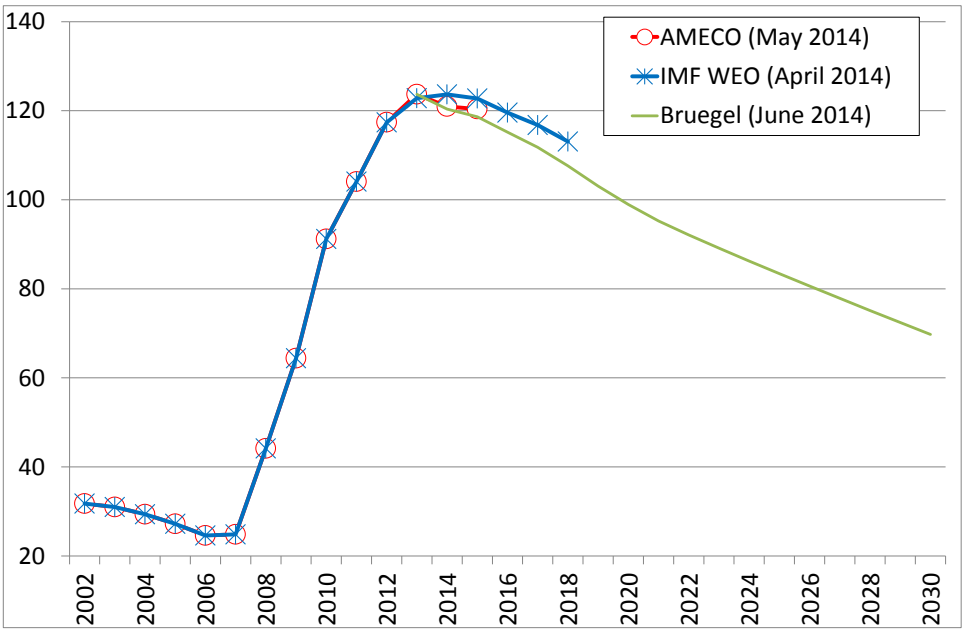
B: Bruegel sensitivity analysis



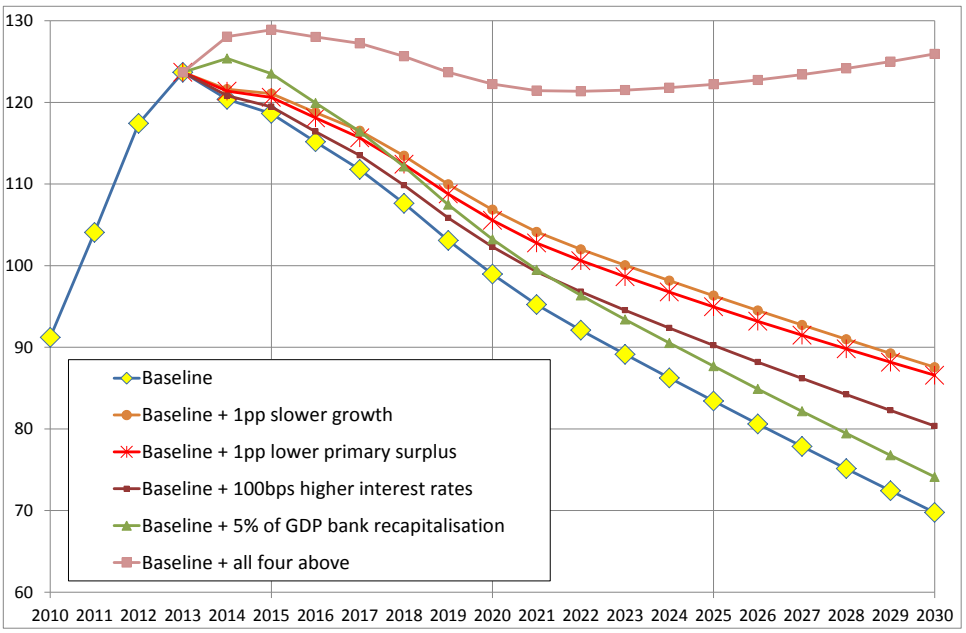
Source: Bruegel. Note: Revised baseline with extended maturity of bilateral loans with zero lending spread.

Figure 6: Irish public debt ratio scenarios (% GDP)

A: Bruegel baseline versus AMECO and IMF projections



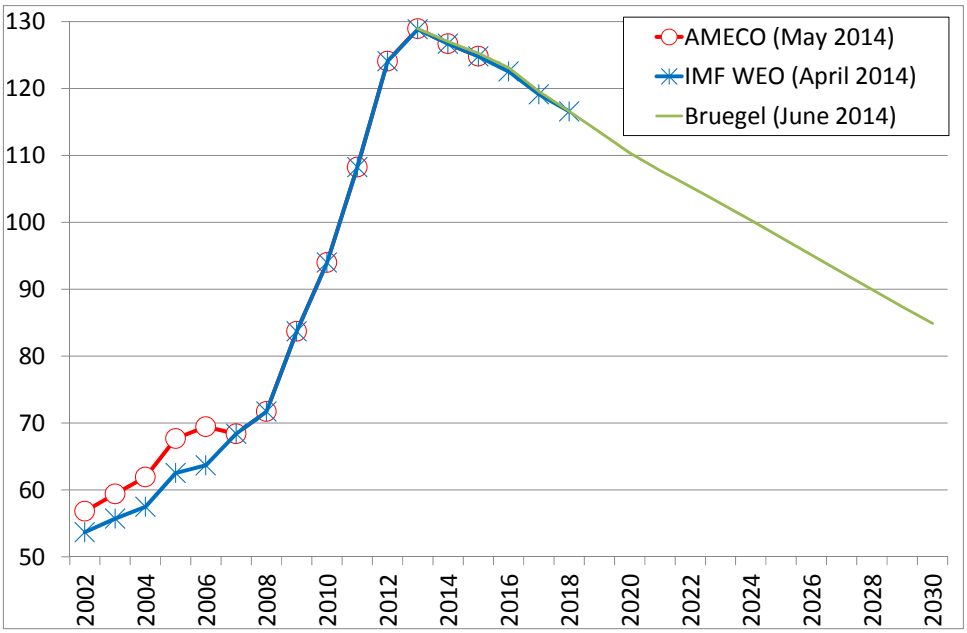
B: Bruegel sensitivity analysis



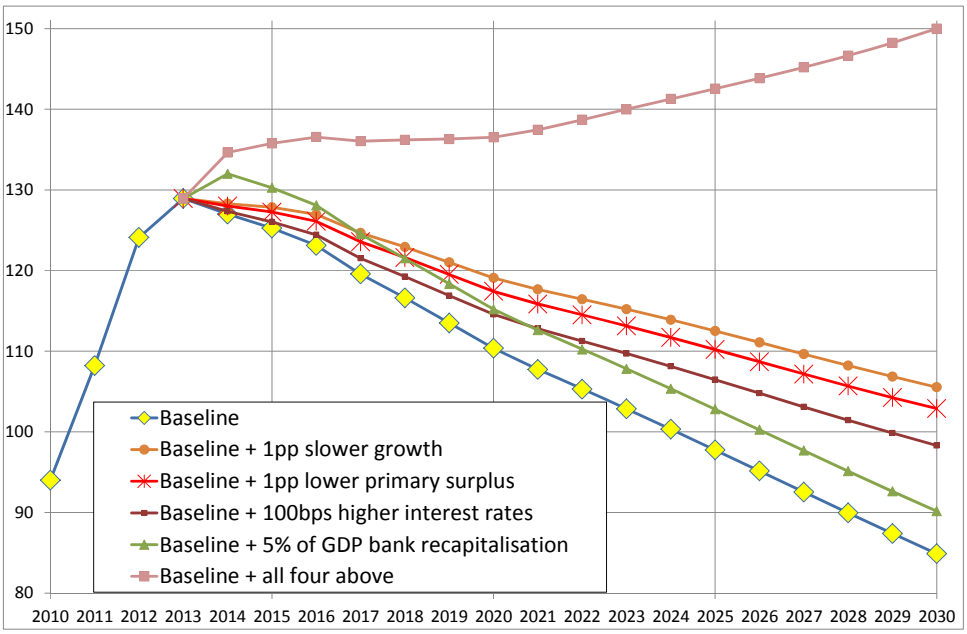
Source: Bruegel.

Figure 7: Portuguese public debt ratio scenarios (% GDP)

A: Bruegel baseline versus AMECO and IMF projections



B: Bruegel sensitivity analysis



Source: Bruegel.

5. Summary

This paper detailed and updated the debt sustainability analysis (DSA) of Darvas, Sapir and Wolff (2014) for Greece, Ireland and Portugal. The goal was *not* the calculation of a baseline scenario which best corresponds to our views, but to set-up a baseline scenario which broadly corresponds to official assumptions and current market views and to assess its sensitivity to deviations from these assumptions.

The results have marginally changed compared to Darvas, Sapir and Wolff (2014), whereby the simulated public debt/GDP ratios are slightly lower, eg for 2020 our new results are 2-3 percent of GDP lower than in our February projections. The reasons for this are downward revision of the 2013 debt level for Greece and Ireland (which is the starting point of our calculations), higher expected primary surpluses in Ireland, slightly lower interest rates for all three countries, and a 1.5 percent of GDP higher reduction in the debt ratio due to the stock-flow adjustment in 2014-15 for Portugal.

Notwithstanding the slightly lower baseline results of this working paper, our findings continue to support the conclusions of Darvas, Sapir and Wolff (2014). The public debt ratio is set to decline in all three countries under market-based interest rate projections, the IMF growth and primary balance projections up to 2018, and longer-term assumptions based on historical experience with the primary balance and on Consensus Economics growth forecasts. However, the debt trajectory is vulnerable to negative growth, primary balance and interest rate shocks – yet we do not examine extremely negative scenarios – especially in Greece and Portugal though also in Ireland.

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