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Assessing fiscal policy with the use of sustainability indicators: The case of Greece

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- In this study we assess the sustainability of Greece's fiscal position with the assistance of a number of quantitative indicators, estimated over various time horizons and target levels for the public debt-to-GDP ratio.

- The calculated values for our primary gap and tax gap indicators for Greece suggest that the country will need to generate positive and significant primary surpluses over a number of years, or even decades, in order to facilitate a sustained de-escalation of its debt burden.

- Such an adjustment would not only need a huge effort to reduce state expenditure and boost budgetary revenue on a lasting basis; it would also require a credible government commitment to aggressive and sustained fiscal consolidation, aiming to eventually restore state access to international credit markets and reduce borrowing costs.

- A swift restoration of positive and sustainable economic growth and a more ambitious program for the privatization of state assets would also be instrumental for stabilizing debt dynamics and improving investor confidence towards the country.

- In those lines, the rigorous implementation of the present EC/ECB/IMF-monitored adjustment programme of fiscal consolidation and structural reforms aiming to boost competitiveness and medium-term potential growth is of primary importance for stabilizing Greece's fiscal position.

- That is especially true as policy inaction is not costly and a decision to postpone adjustment would involve (potentially significant) costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt.

- From a more intertemporal perspective, the range of long-term forecasts for GDP growth and interest rates utilized in our study suggest that the fiscal position would need to generate positive and significant primary surpluses in the area of 2% of GDP to 4% of GDP in order to facilitate fulfillment of the government budget constraint over an infinite horizon and improve perceptions over long-run sovereign solvency.

1. Introduction

Assessing whether a fiscal position is *sustainable* has proven both difficult and controversial. At first glance, a given fiscal policy can be characterized as sustainable if it can be pursued for a sufficiently long period of time without necessitating major interventions in the government's taxation or spending patterns. Alternatively, given current legislation and existing government fiscal plans, the expected evolution of revenue and expenditure ratios does not lead to excessive debt accumulation[1].

The above definition appears to be sufficiently straightforward and ease to understand. However, a closer look at the underlying assumptions needed to assess and measure fiscal sustainability in practice reveals a number of issues that have to be addressed in order to make the above definition operational. Specifically, what is the appropriate time horizon over which fiscal sustainability should be measured? In addition, what can be characterized as exessive debt accumulation and what kind of policy intervention is required to bring the fiscal position towards a more sustainable path? Finally, in what ways can a certain policy shift affect the model of the macro economy and how that influences our future assessment of fiscal sustainability?

In the euro area, the present Stability and Growth Pact aims to address the issue of fiscal sustainability by setting quantitative limits on member states' deficit and debt ratios. Yet, the recent literature has shown that these limits may be far too restrictive. More importantly, they can be shown to be neither *necessary* nor *sufficient* to achieve a sustainable fiscal position[2].

Blanchard (1990a) defines sustainable fiscal policy as a policy that ensures that the debt-to-GDP ratio converges towards its initial level. Buiter (1985) uses a broadly similar definition, but instead of focusing on the evolution of the gross debt to GDP ratio he looks at the ratio of government net worth to GDP. In other words, Buiter's definition is explicitly taking in to account the government's asset-liability position. As such, it explicitly recognizes that the government can utilize state assets to help finance its deficits; that is, until when such assets are depleted. From a pure theoretical standpoint, the latter appears to be a more accurate definition of fiscal sustainability. In practice, however, there are significant methodological problems involved in derivation of accurate estimates of the liability and, especially, the asset-side of the government's balance sheet.

A major issue related to Blanchard's definition of sustainability is its apparent arbitrariness, in at least one important dimension. Specifically, there appears to be no theoretical reason why the debt ratio would ever need to return to its initial level or, more generally, to any particular level, either higher or lower than the initial one. The recent literature has addressed the latter issue by defining fiscal sustainability in much broader terms. Under this broader definition, a given fiscal policy is sustainable if the current debt level is equal to the present value of the government's future primary balances. This definition is derived from the *government intertemporal budget constraint*, which constitutes a key equation for determining the sustainability of fiscal policy.

The above considerations and definitional problems led some authors to distinguish between solvency and fiscal sustainability[3]. In the existing literature, a government is often deemed as solvent when it satisfies the intertemporal budget constraint. In other worlds, solvency relates to a sovereign borrower's ability to finance its debts through future primary surpluses over an *infinite* time horizon. On the other hand, the term sustainability is often used to indicate a government's ability to attain a specific target value for the debt-to-GDP ratio over a finite horizon.

Although in the existing literature there appears to be no unanimity on what really distinguishes fiscal sustainability from solvency, drawing a more clear distinction between the two terms is of particular importance in the current trajectory. That is especially true in view of a recent (November 29, 2010) Eurogroup statement providing a general outline of a proposed permanent crisis resolution mechanism – the so-called European Stability Mechanism (ESM) – that will replace the existing EFSF/EFSM facility, when it expires in June 2013. According to that statement, private sector bondholders would share some of the rescue costs in the event of a sovereign default, but only on "a case-by-case basis", in line with current IMF policies. Specifically, in the case that a sovereign borrower is deemed solvent on the basis of a debt sustainability analysis conducted by the EC, ECB and the IMF, private sector creditors will be encouraged "to maintain exposure" in the sovereign. However, in the unexpected event that a country appears to be insolvent, the Member State would need to negotiate a comprehensive restructuring plan with its private creditors, in line with IMF practices with a view to restoring debt sustainability. According to the Eurogroup statement, if debt sustainability can be reached through these measures, the ESM may provide liquidity assistance.

Based on the government intertemporal budget constraint, two major strategies have been developed in the literature to empirically assess fiscal sustainability. The **first strategy** is to conduct econometric tests of fiscal solvency, following the seminal work of Hamilton and Flavin (1986). This paper tests for debt stationary as a necessary condition for fiscal sustainability. Thehan and Walsh (1988) extend this framework by showing that a necessary and sufficient condition of sustainability can be tested by examining whether a cointegration relation exist between

[1] *For a comprehensive survey of the various definitions of fiscal sustainability see e.g. Balassone and Franco (2000).*
[2] *See, for instance, Polito and Wickens (2005).*
[3] *See, for instance, Artis and Marcellino (2000).*

current debt and future primary balances. Bohn (1998) argues that the condition tested in Thehan and Walsh is necessary and sufficient only in the case that the cost of debt financing is constant. Specifically, the introduction of uncertainty on the cost of debt financing suggests that a sufficient condition for fiscal sustainability is the existence of a positive response of the primary surplus to the debt level in the government's fiscal policy reaction function. (*For some additional analysis on the construction and use of these as well as a number of other well-known econometric tests of fiscal sustainability please read Section 2 of our Technical Appendix at the end of this document).*

A major drawback in the use of econometric tests of fiscal solvency relates to the fact that these are backward-looking, in the sense that they are slow to respond to current fiscal conditions and expected policy changes, which themselves can cause structural breaks in the underlying data generating processes. To help address that drawback a **second strategy** for assessing fiscal solvency has been developed in the literature, which involves the use of a range of fiscal indicators, along the lines suggested by, among others, Buiter (1985, 1987) and Blanchard (1990).

In this study we assess the sustainability of Greece's fiscal position with the assistance of a number of quantitative indicators, the calculation of which incorporates the latest European Commission /European Central Bank /International Monetary Fund forecasts for the evolution of the country's key macroeconomic variables. The calculated values for our *primary gap* and *tax gap* indicators for Greece over a range of time horizons and target levels for the debt to GDP ratio suggest that the country will need to generate positive and significant primary surpluses over a number of years in order to facilitate a sustained de-escalation of its debt burden. Indicatively, if the domestic environment were to evolve in line with the assumed underlying macroeconomic forecasts *(and Greece managed to restore market assess after the expiration of the present EU/IMF lending programme),* a annual primary surplus of ca 4.9% of GDP would be required to reduce the debt to GDP ratio towards 80% by 2030. A 60% target for the debt ratio over the same horizon would require an even greater adjustment, in the form of annual primary surpluses of around 5.7% of GDP.

Such an adjustment would not only need a huge effort to reduce state expenditure and boost budgetary revenue on a lasting basis; it would also require a credible government commitment to aggressive and sustained fiscal consolidation, aiming to eventually restore state access to international credit markets and reduce borrowing costs. A swift restoration of positive and sustainable economic growth and a more ambitious program for the privatization of state assets would also be instrumental for stabilizing debt dynamics and improving investor confidence towards the country.

In those lines, the rigorous implementation of the present EC/ECB/IMF-monitored adjustment programme of fiscal consolidation and structural reforms aiming to boost competitiveness and medium-term potential growth is of primary importance for stabilizing Greece's fiscal position. That is especially true as policy inaction *is not* costly and a decision to postpone adjustment would involve *(potentially significant)* costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt. In the example specified above, if the adjustment effort were to start with a 10 years delay (*i.e., in 2021),* the required primary surpluses to ensure that the debt ratio takes the value of 80% of GDP or 60% of GDP in 2030 would be 1.5ppt of GDP and 2.5ppt of GDP higher relative a the baseline scenario, under which the adjustment effort starts in 2011.

From a more intertemporal perspective, the range of long-term forecasts for GDP growth and interest rates utilized in our study suggest that the fiscal position would need to generate positive and significant primary surpluses in the area of 2% of GDP to 4% of GDP in order to facilitate fulfillment of the government budget constraint over an infinite horizon and improve perceptions over long-run sovereign solvency.

The rest of the present paper is structured as follows: Section 2 provides a formal derivation of the government intertemporal budget constraint, which is the key accounting identity utilized in the construction of a number of econometric tests and quantitative indicators for assessing fiscal sustainability. Section 3 provides a formal derivation of and additional analysis on two of the most frequently used sustainability indicators appearing in the literature; namely, the primary gap and the tax gap. Section 4 discusses the use of these two indicators in practice. Section 5 provides an assessment of the sustainability of Greece's fiscal accounts. Section 6 concludes.

2. The government intertemporal budget constraint

Neglecting stock-flow adjustments, the following simple relationship describes the government's *nominal* budget constraint:

$$P_t \times g_t + (1+R_t)\times B_{t-1} = B_t + \Delta M_t + P_t \times T_t$$
(1)

where the subscript t denotes time, P_t is the general price level in period t, g_t is *real* government expenditure including real transfers to households, R_t is the average interest rate on government bonds issued at the end of period t-1, B_t is nominal value of government bonds issued at the end of period t-1, T_t is total real taxes and M_t is the stock of nominal, non-interest bearing money in circulation supplied by the central bank at the start of the period t. Note that the left-hand side of equation (1) is total nominal government outlays in period t, while the right-hand side represents total nominal receipts (from taxes and seigniorage revenues) plus new government borrowing in period t.

Applying some simple algebraic manipulations to (1) we get the following equation:

$$\frac{b_t}{y_t} = (1+\lambda_t)\times \frac{b_{t-1}}{y_{t-1}} + \frac{pb_t}{y_t} \qquad (2)$$

where b_t is the *real* stock of government debt in period t *(i.e., B_t/P_t, for P_t denoting the general price level in period t)*, pb_t is the *real* primary balance *(i.e., the overall government balance minus interest costs divided by the general price level)* in period t, y_t is the *real* GDP *(in constant prices)* in period t and $1+\lambda_t = \frac{(1+R_t)}{[(1+\pi_t)\times(1+\gamma_t)]}$, with π_t denoting the inflation rate and γ_t the real GDP growth rate in period t. The latter equation implies the following approximation:

$\lambda_t = R_t - \pi_\tau - \gamma_\tau$ *i.e.,* the real interest rate adjusted for economic growth.

Equation (2) is key for determining fiscal policy sustainability. It effectively implies that the current fiscal stance is sustainable if the debt-to-GDP ratio remains finite and financial markets are willing to hold the ensuing debt level. Furthermore, the debt to GDP ratio does not explode if the ratio of the primary balance to GDP does not become unboundedly large over time.

(A detailed derivation of equation (2) is provided in Section 1 of the Technical Appendix at the end of this document).

3. Indicators of fiscal sustainability

Equation (2) defining the government intertemporal budget constraint is the main building block for the construction of a range of fiscal sustainability indicators. Such indicators need to provide clear and comprehensive signals as to whether current policies appear to be leading to excessive debt accumulation. They must also indicate the size of the adjustment that needs to be undertaken in order to bring the fiscal position to a sustainable path.

The most frequently used sustainability indicators appearing in the literature are the *primary gap* and the *tax gap*. In order to construct these two indicators, we first estimate the *sustainable* level of the key variable of interest *e.g.* the *sustainable* primary balance to GDP or the *sustainable* tax to GDP ratio. The sustainable level of the fiscal variable of interest is such that it prevents the debt to GDP ratio from exploding over time. Furthermore, its calculation is governed by the key *condition of sustainability i.e.,* the so-called *non-Ponzi game* or *transversality condition*, which effectively states that the *present discounted value* of the debt ratio from a very distant time in the future is equal to zero. In mathematical terms, the non-Ponzi game condition is expressed as follows:

$$lim\left[b_\tau \times (1+\lambda)^{-\tau}\right] = 0 \text{ for } \tau \to \infty$$

where, as discussed earlier, $\lambda = R - \pi - \gamma$, with the equation holding in approximate terms and λ assumed constant.

Assuming next that the above condition of sustainability holds, it can be shown that the sustainable primary balance, pb*, can be expressed as follows:

$$pb^* = -b_0 \times \left(\frac{\lambda}{1+\gamma}\right); \text{ or ignoring } 1+\gamma: \; pb^* = -b_0 \times \lambda$$

for b_o denoting the initial debt to GDP ratio (t = 0)

As such, for pb_t signifying the primary balance to GDP ratio in period t, the following identity gives the key equation for the primary gap:

Equation for the primary gap indicator:

$$Pr\,imary\_Gap_t = pb^* - pb_t = -b_0 \times \lambda - pb_t$$

In calculating the primary gap, one needs to know the current value of the primary balance-to-GDP ratio and to also use long-term forecasts for the average values of the effective interest rate, inflation and the rate of growth of real GDP in order to calculate the sustainable primary balance, pd*.

Now, if the primary gap is found to be negative ($pb^* - pb_t < 0$), in other words, if the *current* primary deficit ratio is higher than the *sustainable* primary deficit ratio, then the debt-to-GDP ratio will rise without any limits and the current fiscal policy will be unsustainable. The latter suggests that the sustainable primary balance (pb*) can be also seen as an appropriate policy target, guiding the government towards a sustainable fiscal position, with the corresponding primary gap measuring the magnitude of the required adjustment.

In a similar way, the tax gap indicator is calculated as the difference between the sustainable tax to GDP ratio and the current tax ratio.

Equation for the tax gap indicator:

$$Tax\_Gap_t = T^* - T_t$$

where T* denotes the *sustainable* tax ratio that satisfies the condition of sustainability (i.e., the non-Ponzi game condition) and T_t is the current tax ratio.

(Formal algebraic derivations of pb and T* are provided in Section 3 or our Technical Appendix at the end of the document).*

Now, if the tax gap indicator in period t is positive (*i.e., the current tax ratio is lower than the sustainable tax ratio),* then fiscal policy will need to be adjusted in order to prevent exessive debt accumulation. This can be done by increasing taxes and/or reducing expenditure so as the ensure fulfillment of government's intertemporal budget constraint, with the size of the required adjustment being given by the value of the tax gap indicator.

It needs to be emphasized that both the primary gap and the tax gap have been calculated over an infinite time horizon. This effectively requires long-term forecasts for real GDP growth, inflation and interest rates. For the calculation of the tax gap, it also requires long-term projections *(i.e., over an infinite time horizon)* for the evolution of government revenues and expenditures. As such, it is usually more convenient in practice to limit the estimation of the gap indicators to finite horizons.

Calculation of the primary gap and tax gap indicators over a *finite* horizon is based again on equation (2), which depicts the government intertemporal budget constraint. Starting from that equation and applying some algebraic manipulations we get the corresponding values for the *sustainable* primary balance, pd*, or the sustainable tax ratio, T*, required to ensure that the debt ratio reaches the value of b_τ in period τ. Again, the corresponding primary gap and tax gap indicators are calculated as follows:

$$Primary\_Gap_t = pb^* - pb_t$$

$$Tax\_Gap_t = T^* - T_t$$

(Formal derivations of pd and T* for a finite horizon are provided in Section 3 or our Technical Appendix at the end of the document).*

It is important to note that the calculation of finite-horizon gap indicators of fiscal sustainability requires a choice for the values of the targeted debt ratio (b_τ) and the time horizon τ. Theses choices can only be arbitrary, while the calculated values for the sustainable primary balance and tax ratios *do not* necessarily satisfy the intertemporal budget constraint over an infinite horizon. Blanchard (1990a) proposes three indictors of fiscal sustainability that correspond to three different time horizons, namely 1 year, 3-5 years and 30-50 years. These indicators correspond to primary and tax gaps that need to be bridged in order to ensure that the debt ratio reached its initial value τ periods in the future *(τ = 1 year, 3 years etc.).*

In practice, policy makers often prefer to postpone adjustment, even if sustainability indicators point to an unsustainable fiscal position that threatens to result in a rapidly accumulating public debt burden. In certain cases, the temptation to postpone adjustment is reinforced by the potential economic and political costs such an adjustment entails, especially in the initial period following a policy shift towards fiscal austerity. However, it should be noted that the decision to postpone adjustment *does* involve (potentially significant) costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt.

4. The use of fiscal sustainability indicators in practice

Blanchard (1990b) was one of the first authors to systematically investigate fiscal sustainability for a number of OECD countries based on the use of a range of quantitative indictors including, among others, the short-, medium- and long-term tax gaps.

Starting in 2001, the OECD has been also publishing a comprehensive analysis on the long-term sustainability of public finances for member countries based on national models using broadly homogenous sets of assumptions about macroeconomic and demographic developments. The study covers a wide range of age- and demographic-related costs, including pension expenditure, health care costs, child-related programs and education. Long-term sustainability in the OECD 2001 study is evaluated on the basis of the primary balance needed to ensure observance of a predetermined debt ratio target by the end of the forecasting period. Two terminal debt targets were employed in the aforementioned study; specifically: a) the debt ratio target converges to its initial level by 2050 and b) the debt ratio goes to zero by 2050.

In recent years, the European Commission (EC) has been regularly reporting comprehensive analysis and evaluation of the long-term sustainability of its member states[4]. The EC assesses fiscal sustainability with the assistance of a number of quantitative indicators that utilize information from long-term budgetary projections calculated on the basis of commonly agreed methodology and underlying assumptions.

Specifically, the formulas calculating these quantitative indicators include as inputs such variables as: **a)** the current level of gross government debt, **b)** the structural primary balance *(i.e., the cyclically-adjusted primary balance net of one-off transactions)* and **c)** any additional costs related to population ageing. The EC calculates and reports the values of two indicators of fiscal sustainability, with each one of them estimated over both a finite version and an infinite version of the government budget constraint.

The so-called **S1 indicator** measures the required adjustment in the structural primary balance aiming to ensure that the debt-to-GDP ratio reaches 60% of GDP in 2060. The indicator incorporates projected ageing-relating expenditure over the corresponding period.

The **S2 indicator** shows the adjustment to the structural primary balance required to fulfill the infinite-horizon intertemporal

budget constraint, including paying for any additional expenditure arising from an ageing population.

In line with the EC definitions, the S1 and S2 indicators are calculated as follows:

S1 = IBP + DR + LTC

S2 = IBP + LTC

Where **IBP** represents the required adjustment in the *structural* primary balance, given the initial budgetary position (IBP). Specifically, the IBP component in the formulas above calculated as the difference (gap) between the initial *(i.e., current)* structural primary balance and the structural primary balance that is required to stabilize the debt ratio at its initial level by 2060 (S1 indicators) or over an infinite time horizon (S2 indicator). Note that the structural primary balance corresponds to the government overall fiscal balance *(surplus or deficit)* adjusted for the effect of the business cycle and any temporary *(one-off)* expenditure or revenue measures. In its regular spring and autumn Forecasts, the EC regularly publishes estimates/forecasts for member state structural balances.

The **DR** component of the S1 indicator represents the required adjustment to reach a debt ratio target of 60% of GDP in 2060. For countries with starting government gross debt in excess of 60% of GDP the DR component will be positive, reflecting the additional effort that needs to be undertaken in order to ensure that the debt ratio reaches the Treaty's reference value of 60% by 2060. On the other hand, for a current debt ratio below 60%, the DR indicator takes a negative value.

The **LTC** component of the above formulas shows the additional fiscal adjustment needed to finance higher public expenditure due to population ageing up to 2060 (S1 indicator) or over an infinite time horizon (S2 indicator). The size of the LTC component may vary significantly between the S1 and S2 indicators, depending on when the larger part of population ageing is expected to occur.

As a general assessment, it needs to be noted that deriving reliable estimates for IBP, DR and LTC components is a rather demanding exercise, potentially entailing large impressions. Among other considerations, that is especially as the 2008 global financial crisis and the ongoing sovereign debt crisis in the euro area have probably caused structural breaks in the data generating processes of key macroeconomic variables utilized as inputs in the above estimations. Furthermore, significant bank support schemes, introduced by EU governments since late 2008, have resulted to a large accumulation of contingent liabilities, implying the risk of a faster pace of increase in the debt ratio than implicit by the primary deficit.

The paragraph below provides a brief summary of the result of the EC 2009 sustainability report:

The S1 indicator shows sustainability gaps of 5.4% of GDP and 4.8% of GDP for the EU-27 countries and the euro area, respectively. The corresponding sustainability gaps for the S2 indicator are 6.5% of GDP (EU-27) and 5.8% of GDP (euro area). The report also provides a decomposition of the S1 and S2 indicators into their constituent components. This decomposition offers important information about medium-term fiscal drivers and as such, it can be quite useful in designing the appropriate policy response aiming to reinstate fiscal sustainability. For instance, the LTC component contributes 3.5ppt and 2.4ppt to the S1 gap for the euro area. This effectively says that the projected increase in ageing-related costs is expected to have a pronounced impact on the sustainability of the fiscal position, even without accounting for the required adjustment as result of the initial

[4] *Sustainability Report 2009, European Economy 9/2009.*

budgetary position. The latter, in turn, highlights the need for policy measures aiming to contain public pensions, health care-related costs and other ageing-related spending.

5. Assessing the sustainability of Greece's fiscal accounts

In this section we proceed with an empirical investigation of the sustainability of Greece's fiscal position. Our study takes into account a major policy shift towards multi-year fiscal austerity and structural reforms initiated in May 2010, following the country's agreement with the IMF and its euro area partners on a €110bn three-year lending programme. The present facility expires in May 2013 and consists of quarterly disbursements of loans under a €30bn Stand-By Arrangement with the Fund and an €80bn package of by-lateral loans provided by other EU16 Member States.

Disbursement of funds under the present assistance programme is subject to rigid quantitative targets and structural benchmarks specified in a Memodandum of Understanding (MoU) signed between Greece and its official lenders in May 2010. A revision of the MoU was conducted in September 2010, following the first programme review by the EC/ECB/IMF (from now on being referred to as *the troika*). A second revision to the MoU is expected by the end of 2010, following the completion of the second programme review in November 2010.

Under the existing loan agreement, Greece would need to repay each loan in eight equal installments over a period of 2 years, following an initial grace period of 3-3¼ years. However, Greece's Finance Ministry said in late November 2010 that a loan repayment extension was likely to be granted to the country upon approval of EU16 parliaments. That would come in return for a higher effective fixed interest rate cost of 5.8 percent, compared to 5.5 percent per annum applied at the time. According to the proposed extension, each loan tranche would need to be repaid over a 7-year period, following an initial grace period of 4 years.

In this section we assess the sustainability of Greece's fiscal position with the assistance of a number of short-, medium- and long-term fiscal sustainability indicators, the calculation of which incorporates the latest EC/ECB/IMF forecasts for the evolution of Greece's key macroeconomic variables. Specifically, based on the formulas derived in the prior two sections, we calculate *primary gap* and *tax gap* indicators for Greece, using various time horizons, τ, and target values for the debt-to-GDP ratio, b_τ.

We assess fiscal sustainability over a short-term horizon of 1 year (τ=1), by calculating the respective *fiscal gap* and *tax gap* indicators implied by a terminal value for the debt-to-GDP ratio, which is equal to the ratio's estimated current value ($b_{2011} = b_{2010}$). For the calculation of our medium-term sustainability indicators we use τ=3 years, 5 years and 10 years. For τ=3 years and 5 years, we calculate the *sustainable* primary balances, which are required to ensure that the respective three-year-ahead and five-year-ahead debt to GDP ratios reach the current value of the debt ratio ($b_{2013}=b_{2010}$ and $b_{2015} = b_{2010}$, respectively). We repeat a similar exercise for τ=10 years, examining the case for a 100% terminal level of the debt to GDP ratio; namely b_{2020}=100%. In line with the methodology presented in the prior sections, the respective fiscal gap and tax gap indicators are calculated by subtracting the *sustainable* levels of the corresponding fiscal variables from their *current* values. Note that the choice of a time horizon of τ=10 years is made here with a view to compare our results with the base-line forecasts and sensitivity analysis on Greek debt dynamics provided by the EC/ECB/IMF staff reports under the existing stabilization programme.

For the calculation of our long-term sustainability indicators we consider the case for τ=20years, with the corresponding primary gap indicators calculated for two terminal target values for the debt ratio, namely 80% of GDP and 60% of GDP. Again, each of these sustainability indicators is calculated as the difference between the *sustainable* level of the variable of interest and its current level. Furthermore, the terminal value of 60% for the debt ratio is to comply with the respective debt sustainability criterion of the Maastricht Treaty, while the 80% of GDP value is to bring the debt ratio close to the levels prevailing before the 2008 global financial crisis. Finally, we calculate our sustainability indicators over an infinite horizon by utilizing long-term forecasts for real GDP growth and interest rates.

Along with the derivation of our quantitative indications, we also estimate the cost of delaying fiscal adjustment by: a) 5 years in the case of our medium-term sustainability indicators and b) 10 years in the case of our long-term sustainability indicators. As we noted earlier, a decision to delay adjustment isn't costless; it does involve *potentially-significant* costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt.

A final issue that needs to be discussed before we formally present our empirical results is whether *gross* or *net* public debt should be considered when assessing fiscal sustainability. From a pure theoretical perspective, a formal study of fiscal sustainability should look at net debt, as the sale of state assets can be used to meet servicing costs on existing debt and to finance future deficits. However, the problem with this methodology relates to the difficultly in valuing state assets in practice. Generally speaking, the asset-side of the government balance sheet consists of marketable financial assets *(e.g. deposits and shares in state-controlled companies)* as well as non-financial assets that may be either illiquid or non-negotiable *(e.g. buildings, roads)*. Now, since non-financial assets account for the greater part of government assets, inaccurate estimates of their total value may bias the calculated sustainability indicators quite considerably. For that reasons, we follow the practice adopted in a number of recent empirical studies of fiscal sustainability *(including those provided by the European Commission)* that look at consolidated general government gross debt. The latter definition only takes into account government assets so long as a state entity holds assets in the form of other state entities' debts and ignores all other financial and no-financial assets. In line with the above considerations, in the present study we look at general government consolidated gross debt.

Data

The primary source of our data is the IMF's latest review of Greece's Stand-By Arrangement (IMF Country report No. 10/286; September 2010), which contains macroeconomic forecasts and sensitivity analysis on Greece's debt dynamics up to 2020. We also utilize data from the Greek 2011 budget plan and the European Commission's 2nd review of the Economic Adjustment Programme for Greece, which includes the most recent projections for the evolution of a range of macroeconomic and fiscal variables in the period 2010-2014 and also purports to take into accounts **a)** the future expected impact of the latest *(November 2010)* Eurostat revisions to Greece's past deficit and debt figures *(see Appendix 2 at the end of this document)* and **b)** a package of austerity measures included in the 2011 budget, which comes in addition to those already incorporated in the EC/ECB/IMF-agreed Memorandum of Understanding *(see Appendix 3 at the end of this document)*. For the derivation of our long-term fiscal sustainability indicators we unitize data and long-term projections from the European Commission's latest sustainability report, which contains forecasts on such key macro variables as GDP growth and inflation as well as ageing-related expenditure in Greece up to 2060[5].

Short-term fiscal sustainability indicators for Greece

Table 1 below shows the latest official forecasts for the evolution of a number of key macroeconomic and fiscal variables in the period 2010-2014. The source of the data is the 2011 budget plan *(unveiled in November 2010)* and the European Commission's 2nd review of Greece's economic adjustment programme *(December 2010)*. Given the above forecasts and abstracting from stock-flow adjustments, we derive the **one-year tax gap** for the year 2011 by utilizing the respective formula for the calculation of the sustainable tax ratio, T*, that is required to stabilize the debt ratio at its initial value ($b_{2011} = b_{2010}$). As we have discussed earlier, the corresponding tax gap indicator can be calculated as follows:

$$Tax\_Gap_{2011} = T^* - T_{2011}$$

Based on the official projections for real GDP growth, real effective interest rates and government expenditure in 2011 (Table 1) we calculate T* to be equal to ca 52.5% of GDP and the corresponding one-period tax gap to be to ca 9.9ppt of GDP *(=52.5% - 42.6%)*. This effectively means that the government would need to increase revenues *(or reduce spending)* by *a further* 9.9ppt of GDP in 2011 so as to keep that year's debt ratio stable at around 141.2% of GDP. Note that the one-year tax gap should, by definition, be equal to the projected rise in the debt ratio. Table 1 shows that the projected rise in the debt ratio in 2011 is somewhat higher than 9.9ppt of GDP, but this is due to the inclusion of certain stock-flow adjustments. The primary gap indicator can be derived in the same way, by first calculating the sustainable primary balance to GDP ratio in 2011 (~9.3% of GDP).

Table 1
Greece's medium-term fiscal framework - Realizations and forecasts

	2009	2010	2011	2012	2013	2014
g_t (general gvtn primary expenditure % GDP)	47.9	43.1	43.4	41.8	40.8	39.5
T_t (general gvnt revenue % of GDP)	37.8	39.9	42.6	41.6	41.0	39.8
pb_t (primary deficit % of GDP)	-10.1	-3.2	-0.8	0.9	3.2	5.5
b_t (general gvnt consolidated debt to GDP)	126.8	141.2	152.6	156.9	157.2	154.9
y_t (real GDP growth % YoY)	-2.4	-4.2	-3.0	1.1	2.1	2.1
r_t (real interest rate %)	3.8	1.8	3.3	4.8	4.6	4.5
π_t (inflation % YoY- GDP deflator)	1.2	3.0	1.5	0.4	0.8	1.0

Source: 2011 budget; EC Dec. 2010; Author's calculations for b_t and r_t in 2012-2014

[5] *Sustainability Report 2009, European Economy 9/2009*

Medium-term fiscal sustainability indicators for Greece

To investigate **fiscal sustainability over a 10-year horizon**, we focus on the primary gap indicator. The calculation of the latter does not require long-term projections of budgetary spending; it only necessitates the utilization of ten-year-ahead forecasts for real GDP growth and real interest rates. Table 2 below shows the forecasts series utilized in our study. The forecasts for the period 2011-2014 are the same with those presented in table 1. For the period 2015-2020, we utilize the latest real GDP growth and inflation forecasts envisaged in the baseline scenario of the EC/ECB/IMF stabilization programme for Greece (IMF Country report No. 10/286; September 2010). The series for real interest rates, primary balance-to-GDP and debt-to-GDP ratios constitute the Author's projections[6].

Table 2
Greece's medium-term macro forecasts & evolution of debt under sustainable primary balance

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
γt (real GDP growth % YoY)	-3.0	1.1	2.1	2.1	2.7	2.7	2.7	3.1	3.2	3.3
rt (real interest rate %)	3.3	4.8	4.6	4.5	4.4	4.1	4.2	4.0	4.0	3.7
πt (GDP deflator)	1.5	0.4	0.8	1.0	1.1	1.4	1.2	1.4	1.5	1.6
pdt (primary balance to GDP projections)	-0.8	0.9	3.2	5.5	5.9	5.8	5.9	5.9	6.0	6.0
bt (debt-to-GDP projections)	152.6	156.9	157.2	154.9	151.0	146.7	142.3	137.0	131.6	125.6
pb* (sustainable primary balance)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
b_t* (implied debt ratio)	143.3	141.5	137.9	134.1	129.2	123.8	118.5	112.4	106.0	100.0
Primary gap (b_T =100%)	7.4	5.6	3.4	1.0	0.6	0.7	0.6	0.6	0.5	0.5

Source: 2011 budget, EC December 2010, MoU Sept 2010 & Author's calculations

(*) Note that our projections for the evolution of the debt ratio b_t incoprorate stock-flow adjustments of 1.8ppt of GDP in 2011, 0.1ppt of GDP in 2012-2015 and 0 ppt of GDP thereafter. On the other hand, our calculation for b_t* excludes stock-flow adjustments; incorporating such adjustments would see the debt ratio falling to ca 102.5% of GDP in 2020

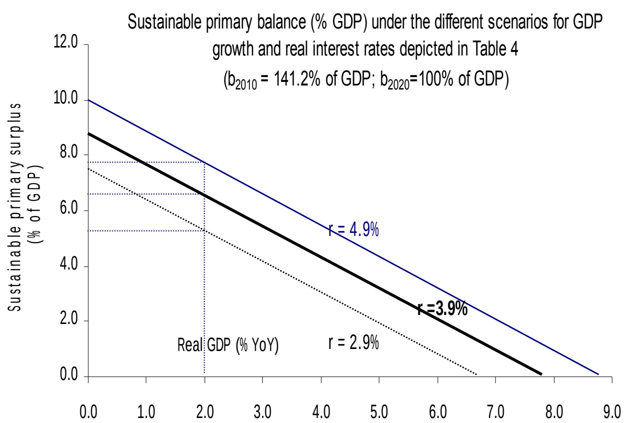
Note that some of these projections may deviate from those envisioned in the Sept 2010 IMF Country report as they account for a number of recent methodological changes in the calculation of Greece's general government fiscal accounts. Table 2 shows that the *sustainable* primary surplus is around 6.5-of-GDP[7]. The latter is necessary to ensure that the debt ratio falls to 100% by the end of the reference period (i.e., by 2020), provided that all macroeconomic variables evolve as portrayed in the table above. Again, the primary gap in year t *(for t = 2011, 2012….2020)* is calculated as the difference between the *sustainable* primary balance (6.5% of GDP) and the projected primary balance for that year. The last line of Table 2 shows the calculated values for our primary gap indicators over the entire projection period 2011-2020. An interesting question is how sensitive the above results are to our underlying forecasts for real GDP growth and the real interest rate. Table 3 below presents a sensitivity analysis for **a)** 1ppt higher (lower) average real GDP growth relative to the scenario portrayed in Table 2 and **b)** 1ppt higher (lower) average real interest rate relative to the scenario presented in Table 2.

Table 3 - Sensitivity analysis

	Baseline (Table 3)	1ppt higher GDP growth	1ppt lower GDP growth	1ppt lower real interest rate	1ppt higher real interest rate
	2011-20 avrg	2011-20 avrg	2011-20 avrg	2011-20 avrg	2011-20 avrg
γ	2,0	3,0	1,0	2,0	2,0
r	3,9	3,9	3,9	2,9	4,9
pb*	**6,5**	**5,4**	**7,7**	**5,4**	**7,7**

Source: Author's calculations

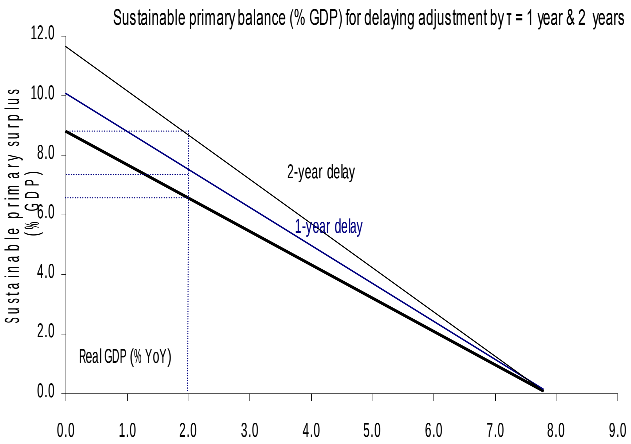
The table above indicates that higher real GDP growth (γ) by 1ppt per annum relative to the baseline scenario would reduce the annual primary surplus required to ensure that the debt ratio falls to 100% of GDP by ca 1.1ppts of GDP (=6.5ppts-5.4ppts). With 1ppt lower growth, the government would need to implement a greater effort *(i.e., but generating an annual primary surplus of 7.7% of GDP)* in order to reduce the debt ratio to 100% of GDP at the end of the forecasting horizon. Table 3 also shows the sustainable primary surpluses for real interest rates (r) that are higher (lower) by 1ppt per annum relative those calculated under the scenario of Table 2.



[6] The annual (nominal) effective interest rate on outstanding debt in year t can be approximately calculated as the ratio of the overall interest expense of year t to the overall debt stock of year t-1. The corresponding real rate series are calculated as the effective annual interest rates on the outstanding debt stock minus the forecasted inflation rates (here GDP deflation rates)

[7] Note here that we utilize time-varying real GDP growth and real interest rate projections for the calculation of the sustainable primary balance over corresponding forecasting horizon. This calculation can be conducted by applying a simple iteration algorithm to solve equation (3a) in the Technical Appendix for pd_t=pd.*

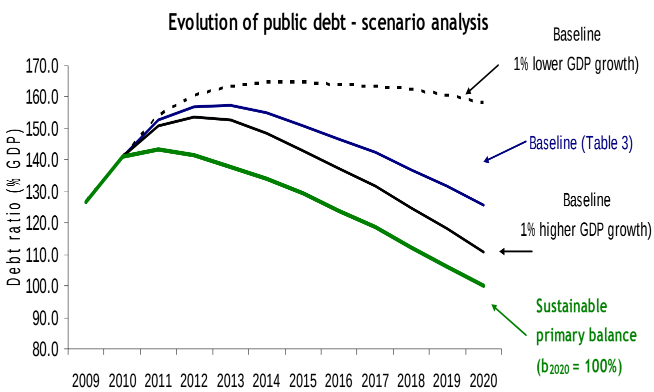
Another important issue worth highlighting here relates to the cost of delaying fiscal adjustment. As we have noted earlier in this document, policy inaction *is not* costless. In fact, the decision to postpone adjustment *does* involve *(potentially significant)* costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt. To help highlight the latter points let us assume again that the macro economy evolves according to our baseline scenario described in Table 2 and that the government postpones by 3 years *(to 2014 from 2011 under the baseline scenario)* the implementation of a new fiscal adjustment program aiming to reduce the debt ratio to 100% of GDP by 2020. Under the new program, annual primary surpluses equal to ca 9.7ppt of GDP would need to be generated in the period 2014-2020 so as to ensure that the debt ratio reaches the value of 100% of GDP in 2020. This effectively implies that if the fiscal effort to reduce the debt ratio to 100% by 2020 were to be postponed by 3 years, that would involve an incremental adjustment cost of around 3.2ppt of GDP per year (= 9.7ppt of GDP – 6.5ppt of GDP) in the form of a higher primary surplus required to attain the new targeted reduction in the debt ratio. The graph below offers a graphical depiction of the respective sustainable primary surpluses needed to ensure that b_{2020}=100% of GDP, assuming τ = 1 year and 2 years delay in the needed adjustment (pb* =7.8 of GDP for 1 year delay & pb* = 8.8% of GDP for 2 years delay).



It needs to be stressed here that the above sensitivity results are derived by applying a *partial* equilibrium analysis to the evolution of public debt. To understand the latter point, consider the case of a real effective rate on debt that is lower by 1ppt/annum relative to the baseline scenario presented in Table 2. Assume furthermore that this is solely the result of higher inflation expected to persist over the corresponding period. Higher inflation could, however, exacerbate the competitiveness problem facing the Greek economy, resulting in lower medium term economic growth due to a higher external deficit.

In a similar way with the analysis provided above we calculate the 3-year primary gap that signifies the additional fiscal effort that needs to be applied in order to ensure that the debt ratio three years from now reaches its present value (b_{2013} = b_{2010}). We estimate the corresponding value for the *sustainable* primary balance (surplus) to be around 5.9ppt-of-GDP. In other words, under the assumption that the macroeconomic environment in 2011-2013 will evolve as portrayed in Table 2 the government will need to generate a primary surplus of ca 5.9% of GDP in order to reduce the debt ratio to 141.2% of GDP at the end of the projection horizon *(i.e, in 2013)*. The calculations above imply that the one-period sustainability gap is significantly higher than the corresponding 3-year gap. This can be explained by the fact that the one-period tax gap completely ignores expected developments beyond 2011 *(e.g. an expected resumption of positive GDP growth)*. Applying similar calculations to those presented above, we estimate that the sustainable primary surplus needed to reduce the 5-years-ahead debt ratio towards its current value (141.2% of GDP) is equal to 4.6% of GDP.

As a final note on this section, we provide a graphical representation of the evolution of Greece's public debt ratio. The baseline scenario depicted in the graph below corresponds to the debt ratio projections, b_t, of table 2. Two alternative scenarios are also presented for GDP growth in 2011-2020 that is higher (lower) by 1ppt/annum relative to the baseline. Finally, we portray the evolution of public debt under a scenario where the government manages to generate an annual primary surplus of 6.5%-of-GDP over the entire projection period. In the latter case, the debt ratio falls towards 100% of GDP by 2020.



Source: 2011 Budget, EU/IMF, Author's calculations

Long-term fiscal sustainability indicators for Greece

To investigate fiscal sustainability over a time horizon of 20-years, we again focus on the primary gap indicator. The calculation of that indicator does not require long-term projections of budgetary spending. It only necessitates the utilization of long-term forecasts for real GDP growth and real interest rates. In our study we calculate the sustainable primary surpluses that are required to ensure that the debt-to-GDP ratio fall to 80% and 60%, respectively at the end of the forecasting horizon τ (τ = 2030).

Our long-term projections of economic growth in Greece are derived as follows:

For the period 2011-2020 we assume average annual real GDP growth of 2%, in line with the baseline scenario presented in Table 2. For the periods 2020-2030 we utilize the forecasts for Greek real GDP growth portrayed in the European Commission's Sustainability Report 2009 (see table below)[8].

	2007	2010	2015	2020	2025	2030	2040	2050	2060	Change 2007-2060
Real potential GDP growth	3.5	2.0	2.7	2.9	1.8	1.3	1.0	1.2	1.4	-2.1

Source: European Commission (Sustainability Report 2009)

Our long-term forecasts for the real effective interest rate are somewhat more arbitrary. As a baseline scenario in our study we assume that the real effective interest rate on public debt falls by the end of the projection horizon (i.e., by 2030) towards its 2011 level.

Table 4 below shows our calculations for the sustainable primary balance required to ensure that the debt to GDP ratio reaches the values of 80% of GDP and 60% of GDP, respectively by the end of the projection horizon (2030). The table also shows how these calculations change with annual GDP rates that are 1pt higher (lower) relative to the assumed baseline scenario. The cost of delaying adjustment by 10 years is also calculated for each scenario under examination.

Table 4

	Sustainable primary surplus pb* (% of GDP)	Cost of delaying adjustment by 10years (ppt-of-GDP)
Baseline (b_{2030} = 80%)	4.9%	1.5
Baseline +1% GDP (b_{2030} = 80%)	3.9%	1.4
Baseline -1% GDP (b_{2030} = 80%)	6.0%	1.5
Baseline (b_{2030} = 60%)	5.7%	2.5
Baseline +1% GDP (b_{2030} = 60%)	4.7%	2.6
Baseline -1% GDP (b_{2030} = 60%)	6.7%	2.6

Source: Author's calculations

The first line of Table 4 says that a sustainable primary surplus of around 4.9% of GDP is required to ensure that the debt ratio falls to 80% of GDP at the end of the projection horizon (2030). The respective cost of delaying adjustment is calculated at 1.5ppts of GDP. In other words, if the adjustment effort is started with a 10 years delay (*i.e., in 2021 instead of 2011 as in our baseline scenario),* the required primary surplus to ensure that the debt ratio takes the value of 80% of GDP in 2030 is 6.4%-of-GDP *(= 4.9ppt of GDP + 1.5ppt of GDP)* or 1.ppt of GDP higher relative to the baseline scenario, under which the adjustment effort starts in 2011.

To investigate next sustainability over an *infinite* horizon, we need to know the current primary balance and debt ratios and also make assumptions about the long-run forecasted values of real GDP growth and the real interest rate. In line with the above discussion, we utilize as an indicative baseline scenario – *which, we consider to be relatively mild* - envisioning average long-term real GDP growth rate (γ) of 2% along with a 3.5% average real interest rate on debt (r). Table 5 below shows the sustainable primary surplus and the corresponding primary gap that are necessary to satisfy the government intertemporal budget constraint over an infinite time horizon. The results of a sensitivity analysis for real GDP growth and real interest rates that are 1ppt higher (lower) relative to the baseline assumptions are also provided in the table below.

Table 5
Sustainable primary surpluses and primary gaps over an infinite time horizon

γ / r	2.0/3.5	2.0/2.5	2.0/4.5	3.0/3.5	3.0/2.5	3.0/4.5	1.0/3.5	1.0/2.5	1.0/4.5
Sustainable primary surplus to GDP ratio (pb*)	2.1%	0.7%	3.5%	0.7%	-0.7%	2.1%	3.5%	2.1%	4.9%
Primary gap in 2010 (pb* - pb_{2010}) *in ppt-of-GDP*	5.3%	3.9%	6.7%	3.9%	2.5%	5.3%	6.7%	5.3%	8.1%

Source: Author's calculations

[8] *A number of studies by international organizations assume that future labor productivity growth eventually converges to the average historical productivity growth of a technological leader (e.g. the US). These studies usually assume long-term equilibrium labor productivity growth of 1.5%-1.75%. In the case of Greece, the latter assumption along with a broadly constant population structure would yield a long-term real GDP growth forecast of 1.5%-1.75%. The latter is not significantly different from the EC projections presented in latest Sustainability Report (see table).*

6. Assessment of our results and concluding remarks

In this paper we assess the sustainability of Greece's fiscal policy with the assistance of a number of quantitative indicators, calculated over various time horizons and for different target values for the consolidated general government debt to GDP ratio. Our results are based on a *partial* equilibrium framework and thus, they should only be considered as indicative of the policy effort that needs to be made in order to facilitate a move towards a more sustainable fiscal position.

It needs to be emphasized that our estimates of the *primary gap* and *tax gap* indicators for Greece incorporate the most recent EC/ECB/IMF forecasts for the evolution of the country's main macroeconomic and fiscal variables in the period 2011-2020. They also take into account: **a)** the future expected impact of the latest *(November 2010)* Eurostat revisions to Greece's past deficit and debt figures and **b)** a package of austerity measures included in the 2011 budget, which comes in addition to those already included in the revised (September 2010) Memorandum of Understanding agreed with the troika .

Our results *do not* account for future privatization receipts and, more generally, potential government revenue via a better utilization of state assets. Moreover, they do not provide for a possible extension of the repayment period of the EU/IMF loans under the existing lending programme for Greece *(see analysis above)*. Such an extension would help reduce debt servicing costs and facilitate the state's borrowing program over the next several years.

The implications of the calculated sustainability gaps over the range of finite horizons under review are, more or less, self-explanatory. The country will need to generate positive and significant primary surpluses over a number of years in order to facilitate a sustained de-escalation of its public debt ratio. For instance, if the domestic macroeconomic environment were to evolve in line with the underlying macro forecasts assumed in Table 4 *(and Greece managed to restore market assess after the expiration of the present EU/IMF lending programme)*, a annual primary surplus of ca 4.9% of GDP would be required to reduce the debt to GDP ratio towards 80% by 2030. A 60% target for the debt ratio over the same horizon would require an even greater adjustment, in the form of annual primary surpluses of around 5.7% of GDP.

Such an adjustment would not only need a huge effort to reduce state expenditure and boost budgetary revenue on a lasting basis; it would also require a credible government commitment to aggressive and sustained fiscal consolidation, aiming to eventually restore state access to international credit markets and reduce borrowing costs. A swift restoration of positive and sustainable economic growth and a more ambitious program for the privatization of state assets would also be instrumental for stabilizing debt dynamics and improving investor confidence towards the country.

In those lines, the rigorous implementation of the present EC/ECB/IMF-monitored adjustment programme of fiscal consolidation and structural reforms aiming to boost competitiveness and medium-term potential growth is of primary importance for stabilizing Greece's fiscal position. That is especially true as policy inaction *is not* costly and a decision to postpone adjustment would involve *(potentially significant)* costs in the form of additional spending cuts and/or higher taxes that need to be implemented in the future so as to meet increased servicing costs resulting for a further accumulation of public debt. In the example specified above, if the adjustment effort were to start with a 10 years delay (*i.e., in 2021)*, the required primary surpluses to ensure that the debt ratio takes the value of 80% of GDP or 60% of GDP in 2030 would be 1.5ppt of GDP and 2.5ppt of GDP higher relative a the baseline scenario, under which the adjustment effort starts in 2011.

From a more intertemporal perspective, the range of long-term forecasts for GDP growth and interest rates utilized in our study suggest that the fiscal position would need to generate positive and significant primary surpluses in the area of 2% of GDP to 4% of GDP in order to facilitate fulfillment of the government budget constraint over an infinite horizon and improve perceptions over long-run sovereign solvency.

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Technical Appendix

Section 1

Derivation of the key equation (2) specifying the government inter temporal budget constraint

Neglecting stock-flow adjustments, the following simple relationship describes the government's *nominal* budget constraint:

$$P_t \times g_t + (1+R_t) \times B_{t-1} = B_t + \Delta M_t + P_t \times T_t \qquad (1.1)$$

where the subscript t denotes time, P_t is the general price level in period t, g_t is *real* government expenditure including real transfers to households, R_t is the average interest rate on government bonds issued at the end of period t-1, B_t is nominal value of government bonds issued at the end of period t-1, T_t is total real taxes and M_t is the stock of nominal, non-interest bearing money in circulation supplied by the central bank at the start of the period t. Note that the left-hand side of equation (1) is total nominal government outlays in period t, while the right-hand side represents total nominal revenues plus new government borrowing in period t.

The equivalent *real* government budget constraint can be derived by dividing both sides of equation (1.1) by the general prices level P_t as follows:

$$g_t + (1+R_t) \times \left(\frac{B_{t-1}}{P_{t-1}}\right) \times \left(\frac{P_{t-1}}{P_t}\right) = \qquad (1.2)$$
$$= \frac{B_t}{P_t} + T_t + \frac{M_t}{P_t} - \left(\frac{P_{t-1}}{P_t}\right) \times \left(\frac{M_{t-1}}{P_{t-1}}\right)$$

The equation above can also be written as:

$$g_t + (1+r_t) \times b_{t-1} =$$
$$b_t + T_t + m_t - m_{t-1} \times \left(\frac{1}{(1+\pi_\tau)}\right) \qquad (1.3)$$

where b_t is the *real* stock of government debt in period t, m_t is the real stock of non-interest bearing money in circulation, π_t is the inflation rate and r_t is the real interest rate defined as $1+r_t = \frac{(1+R_t)}{(1+\pi_t)}$, which implies that r_t approximately equals R_t-π_t.

Another way to state the equation for the government budget constraint is to express all variables involved as ratios to GDP.

Specifically, by dividing both sides of (1.1) by nominal GDP, P_t*y_t, where y_t denotes real GDP (in constant prices) we obtain:

$$\frac{g_t}{y_t} + \left[\frac{(1+R_t)}{(1+\pi_\tau) \times (1+\gamma_\tau)}\right] \times \frac{b_{t-1}}{y_{t-1}} =$$
$$\frac{b_t}{y_t} + \frac{T_t}{y_t} + \frac{m_t}{y_t} - \frac{m_{t-1}}{y_{t-1}} \times \left(\frac{1}{(1+\pi_t) \times (1+\gamma_t)}\right)$$

where γ_t denotes real GDP growth in period t.

We next process with deriving the expressions for a) the overall nominal government balance D_t (deficit or surplus) and b) the nominal primary balance (deficit or surplus) PB_t as follows:

$$D_t = P_t \times g_t + R_t \times B_{t-1} - P_t \times T_t - \Delta M_t \qquad (1.4)$$

Dividing both sides of equation (1.4) by P_t*y_t, and after some simple algebraic manipulations, we obtain:

$$\frac{d_t}{y_t} = \frac{b_t}{y_t} - \frac{b_{t-1}}{y_{t-1}} \times \left(\frac{1}{(1+\pi_t) \times (1+\gamma_t)}\right) \qquad (1.5)$$

where d_t denotes the real government budget balance and the rest of variables being defined as indicated earlier.

Now, the equation for the nominal primary balance *(i.e., total government balance minus interest payments)* is:

$$PB_t = D_t - R_t \times B_{t-1} \qquad (1.6)$$

After divided again both sides of equations (1.6) by nominal GDP and applying some additional algebraic manipulations, we get the following key equation

$$\frac{b_t}{y_t} = (1+\lambda_t) \times \frac{b_{t-1}}{y_{t-1}} + \frac{pb_t}{y_t} \qquad (2)$$

where pb_t denotes the real primary balance and $1+\lambda_t = \frac{(1+R_t)}{[(1+\pi_t) \times (1+\gamma_t)]}$, which implies the following (approximate) equation

$\lambda_t = R_t - \pi_t - \gamma_t$ *i.e.,* the real interest rate adjusted for economic growth.

Section 2

Econometric tests of fiscal sustainability

Equation (2) is key for determining fiscal policy sustainability. It effectively implies that the current fiscal stance is sustainable if the debt-to-GDP ratio remains finite and financial markets are willing to hold the ensuing debt level.

A number of econometric tests are available in the literature for testing empirically the sustainability of fiscal policy. All these tests take equation (2) as their starting point. Before moving next to discuss some of these tests it is useful to highlight a number of cases with respect to the nature of the variable λ_t *(real interest rate adjusted for economic growth)* appearing in equation (2).

In the simple cases examined below we assume that λ_t is constant (non time-varying). Under this assumption, equation (2) becomes:

$$\frac{b_t}{y_t} = (1+\lambda)\times\frac{b_{t-1}}{y_{t-1}} + \frac{pb_t}{y_t} \quad (2.1)$$

If we next assume that λ is less than zero (λ < 0), then the above difference equation is stable and thus, it can be solved *backwards* by successive substitution. This can give the following expression for the expected debt-to-GDP ratio n period ahead, conditional on the information available at time t:

$$E_t\left(\frac{b_{t+n}}{y_{t+n}}\right) =$$

$$\left[(1+\lambda)^n\right]\times\frac{b_t}{y_t} + \sum_{s=0}^{n-1}\left[(1+\lambda)^{n-s}\right]\times E_t\left(\frac{pb_{t+s}}{y_{t+s}}\right)$$

(2.2)

Now, if assume that the so-called transversality (non-Ponzi game) condition holds *i.e.,* for n assumed to be unboundedly large the term $\left[(1+\lambda)^n\right]\times\frac{b_t}{y_t}$ converges to zero, then the limit of $E_t\left(\frac{b_{t+n}}{y_{t+n}}\right)$ for n converging to infinity is equal to the limit of the 2nd part of the right-hand side of equation (2.2). In other words, from n →∞, the following equation holds

$$\lim E_t\left(\frac{b_{t+n}}{y_{t+n}}\right) = \lim\left\{\sum_{s=0}^{n-1}\left[(1+\lambda)^{n-s}\right]E_t\left(\frac{pb_{t+s}}{y_{t+s}}\right)\right\} \quad (2.3)$$

Equation (2.3) effectively implies that the evolution of the public debt-to-GDP ratio depends on the evolution of the ratio of primary balance to GDP.

In line with Polito and Wickens (2005) let us now assume that pb_t/y_t is stochastic but expected to grow at a constant rate ρ as follows:

$$E_t\left(\frac{pb_{t+s}}{y_{t+s}}\right) = (1+\rho)^s\times\frac{pb_t}{y_t}$$

It can then be shown that:

If ρ=0, then $\lim E_t\left(\frac{b_{t+s}}{y_{t+s}}\right) = -\left(\frac{1}{\lambda}\right)\times\left(\frac{pb_t}{y_t}\right)$, for n →∞.

In that case, the ratio of the (real) primary balance to GDP, $\frac{pb_t}{y_t}$, is a non-stationary I(1) process and it is cointegrated with the debt ratio, $\frac{b_t}{y_t}$ (also I(1)), with cointegrating vector (1, $\frac{1}{\lambda}$).

If, on the other hand, ρ < 0, then $\frac{pb_t}{y_t}$ is stationary *(i.e., I(0) process)* with the limit of $E_t\left(\frac{b_{t+s}}{y_{t+s}}\right)$ going to 0 for n →∞.

Finally, for ρ > 0, then the limit of $E_t\left(\frac{b_{t+s}}{y_{t+s}}\right)$ explodes, for n →∞.

From the above results it surmises that the debt to GDP ratio does not explode if the ratio of the primary balance to GDP does not become unboundedly large over time.

Now if we assume that λ *i.e., the non-time-varying real average interest rate adjusted for economic growth* is less than zero (λ < 0), then equation (2.1) is an unstable difference and needs to be solved *forwards*. Specifically, after applying n successive iterations to the above equation, we get:

$$\left(\frac{b_t}{y_t}\right) = \left[(1+\lambda)^{-n}\right]\times E_t\left(\frac{b_{t+n}}{y_{t+n}}\right) - \sum_{s=1}^{n}\left[(1+\lambda)^{-s}\right]\times E_t\left(\frac{pb_{t+1}}{y_{t+n}}\right)$$

which, assuming again fulfillment of the transversality condition, yields the following expression :

$$\left(\frac{b_t}{y_t}\right) = \sum_{s=1}^{n}\left[(1+\lambda)^{-s}\right]\times E_t\left(\frac{-pb_{t+1}}{y_{t+n}}\right) \quad (2.4)$$

These results can be compared to a number of econometric tests of fiscal sustainability proposed in the literature. Among them, the seminal paper of Hamilton and Flavin (1986) examines empirically the following version of equation (2.4)

$$\left(\frac{b_t}{y_t}\right) = A_0 \times (1+\lambda)^{-t} - \sum_{s=1}^{n}(1+\lambda)^{-s} \times E_t\left(\frac{pb_{t+1}}{y_{t+n}}\right)$$

where $A_0=0$ is tantamount to the null hypothesis that the non-Ponzi game condition holds.

On their part Trehan and Walsh (1988) and Hakkio and Rush (1991) propose cointegration tests for fiscal sustainability, with the former examining the cointegation between real public debt and the real primary balance and the latter performing the same exercise with the said variables expressed as ratios to GDP. If both variables are I(1) and are cointegrated with cointegration vector (λ,1), then the fiscal stance is deemed sustainable. Alternatively, if government expenditure and revenue are both unit root processes I(1), then the cointegrating vector with debt should be (λ,1, -1).

Section 3

Algebraic derivations of the primary gap and the tax gap indicators

Equation (2) defining the government intertemporal budget constraint is the main building block for the construction of a range of fiscal sustainability indicators. Such indicators need to provide clear and comprehensive signals as to whether current policies appear to be leading to excessive debt accumulation. They must also indicate the size of the adjustment that needs to be undertaken in order to bring the fiscal position to a sustainable path.

The most frequently used sustainability indicators appearing in the literature are the *primary gap* and the *tax gap*. In order to construct these two indicators, we first estimate the *sustainable* level of the key variable of interest *e.g. the sustainable primary balance to GDP or the sustainable tax to GDP ratio.* The sustainable level of the fiscal variable of interest is such that it prevents the debt to GDP ratio from exploding over time. Furthermore, its calculation is governed by the key condition of sustainability *i.e.,* the so-called *non-Ponzi game* or *transversality* condition *(see definition of the transversality condition below)*.

Specifically, starting from the key equation (2) and solving it backwards to an initial period t=0 we get the following expression for the debt-to-GDP ratio at time τ:

$$b_\tau = b_0 \times (1+\lambda)^\tau + \sum_{t=0}^{\tau-1}(1+\lambda)^{\tau-t} \times pb_t$$

(3)

(For simplicity, in the above equation we assume that both the debt and primary balance variables are expressed as ratios to GDP and also that the real interest rate adjusted for economic growth is constant i.e., λ = R – π – γ).

Equation (3) effectively implies that the debt-to-GDP ratio at time τ can be written as the sum of the present value of initial debt and the present value of all past primary balances.

Dividing next both sides of equation (3) by the term $(1+\lambda)^\tau$, we get the following expression:

$$b_\tau \times (1+\lambda)^{-\tau} = b_0 + \sum_{t=0}^{\tau-1}(1+\lambda)^{-t} \times pb_t$$

(3a)

If we can now assume that the present discounted value of the debt ratio from a very distant time in the future is equal to zero; in other worlds, if the following no-Ponzi game condition holds:

$$lim\left[b_\tau \times (1+\lambda)\right]^{-\tau} = 0 \text{ for } \tau \to \infty$$

(3b)

(where, as discussed earlier, λ = R-π-γ, with the equation holding in approximate terms)

Then equation (3) becomes:

$$lim\left[\sum_{t=0}^{\tau-1}(1+\lambda)^{-t} \times pb_t\right] = -b_0 \text{ for } \tau \to \infty$$

(3c)

Now, in order to calculate a constant *(i.e., non time-varying)* primary balance-to-GDP ratio that satisfies the condition of sustainability (3b), we assume that pb_t in equation (3c) is constant (pb) and solve for the infinite geometric series of discounted primary balances as follows:

$$pb^* = -b_0 \times \frac{(r-\gamma)}{(1+\gamma)}$$

for γ representing real GDP growth and r denoting the real interest rate *(which is approximately equal to R-π)*

Then, since λ is approximately equal to r-γ and ignoring 1+γ, the above equation becomes:

$$pb^* = -b_0 \times \lambda \qquad (3d)$$

As such, the following identity gives the key equation for the primary gap in period t:

Equation for the primary gap indicator in period t:

$$Primary\_Gap_t = pb^* - pb_t = -b_0 \times \lambda - pb_t \quad \textbf{(4)}$$

In calculating the primary gap, one needs to know the current value of the primary balance-to-GDP ratio and to also use long-term forecasts for the average values of the effective interest rate, inflation and the rate of growth of real GDP in order to calculate the sustainable primary balance, pd*.

Now, if the primary gap is found to be negative ($pb^* - pb_t < 0$), in other words, if the *current* primary deficit ratio is higher than the *sustainable* primary deficit ratio, then the debt-to-GDP ratio will rise without any limits and the current fiscal policy will be unsustainable. The latter suggests that the sustainable primary balance (pb*) can be also seen as an appropriate policy target, guiding the government towards a sustainable fiscal position, with the corresponding primary gap measuring the magnitude of the required adjustment.

In a similar way, the tax gap indicator is calculated as the difference between the sustainable tax to GDP ratio and the current tax ratio. To calculate the sustainable tax ratio, we start from the following two equations, which specify the nominal government balance (5a) and the nominal primary balance *(i.e., the total government balance minus interest payments)* in period t:

$$D_t = P_t \times g_t + R_t \times B_{t-1} - P_t \times T_t - \Delta M_t \quad (5a)$$

$$PB_t = D_t - R_t \times B_{t-1}$$

(5b)

Substituting D_t *(nominal government balance)* in equation (5b) with the right-hand side of equation (5a) and also: a) ignoring seigniorage revenue and b) dividing both sides of the equation by nominal GDP, P_t*y_t, we get the following identity:

$$pb_t = g_t - T_t$$

(5c)

which effectively says that the government's net primary balance equals the difference between real non-interest expenditure and real tax revenue (all variables above being expressed as ratios to GDP).

We next substitute (5c) into (3c) and solve for a constant *(i.e., time invariant)* tax ratio, T, to get the following expression for the *sustainable* tax ratio T*:

$$T^* = \left[\frac{(r-\gamma)}{(1+\gamma)}\right] \times \left\{\sum_{t=1}^{\infty}\left[g_t \times (1+\lambda)^{-t}\right] + b_0\right\}$$

(6)

By subtracting then the sustainable tax ratio from the current tax ratio we get the formula defining the tax gap indicator:

Equation for the tax gap indicator in period t:

$$Tax\_Gap_t = T^* - T_t \quad (7)$$

Now, if the tax gap indicator in period t is positive (*i.e., the current tax ratio is lower than the sustainable tax ratio),* then fiscal policy will need to be adjusted in order to prevent exessive debt accumulation. This can be done by increasing taxes and/or reducing expenditure so as the ensure fulfillment of government's intertemporal budget constraint, with the size of the required adjustment being given by the value of the tax gap indicator.

It needs to be emphasized that both the primary gap and the tax gap are calculated over an infinite time horizon. This effectively requires long-term forecasts for real GDP growth, inflation and interest rates. For the calculation of the tax gap, it also requires long-term projections *(i.e., over an infinite time horizon)* for the evolution of government revenues and expenditures. As such, it is usually more convenient in practice to limit the estimation of the gap indicators to finite horizons.

Calculation of the primary gap and tax gap indicators over a *finite* horizon is based again on equation (3), which depicts the government intertemporal budget constraint. Starting from that equation and solving for the primary deficit-to-GDP ratio (pd) we get the formula for the *sustainable* primary balance:

$$pd^* = \left[\frac{(r-\gamma)}{(1+\gamma)}\right] \times \left[b_\tau \times (1+\lambda)^{-\tau} - b_0\right] \times \left[1-(1+\lambda)^{-\tau}\right]^{-1} \quad (8)$$

where, again, all fiscal variables in equation (8) are expressed as ratios to nominal GDP.

Note that the formula depicting the sustainable primary deficit (equation 8) shows the primary deficit ratio (pd*) required to ensure that the debt ratio reaches the value of b_τ in period τ. However, the terminal value for the debt ratio (b_τ) is unavoidably arbitrary and, as such, the non-Ponzi game condition (3b) is *not* satisfied. Nonetheless, in line with equation (4), the primary gap indicator over a finite time horizon is again expressed as pd*-pd.

A special case of equation (8) is the primary deficit needed to stabilize the debt ratio at its initial value ($b_\tau = b_0$). In that case the formula for the primary deficit can be easily shown to be:

$$pd^* = -b_0 \times \frac{(r-\gamma)}{(1+\gamma)}$$

where, ignoring 1+γ and considering that λ is approximately equal to r-γ we get

$$pd^* = -b_0 \times \lambda \qquad (8a)$$

This expression looks similar to equation (3d) that shows the sustainable primary deficit that satisfies the government's intertemporal budget constraint. However, the difference here rests in the assumptions for the effective interest rate (R), GDP growth (γ) and inflation (π) one needs to make in order to calculate the sustainable primary balance. For instance, the calculation of the primary balance needed to stabilize the debt ratio at a predetermined level of b_τ in, say, two years from now requires 1-year and 2-years ahead forecasts for the effective interest rate, real GDP growth and inflation. The problem with the use of such forecasts is that they may deviate substantially from the corresponding long-run forecasts that need to be used in the calculation of the sustainable primary and tax ratios that ensure fulfillment of the intertemporal budget constraint over an infinite horizon.

In the above derivations of the primary and tax gaps a negative value indicates that the intertemporal budget constraint is satisfied. It suffices to repeat, however, that these indicators do not provide any definite answer to the question of how the necessary adjustment in the primary balance will need to take place so as to bring the debt ratio towards a specific value by the end of the reference period. As we noted above, such an adjustment could be implemented via, among other measures, increased government receipts (e.g. higher direct or indirect taxes), a reduction in discretionary spending, or through policies to reduce ageing-related costs. Of course, the exact combination of measures aiming at attaining that adjustment may itself have an impact on the macroeconomic environment. For instance, a large increase in the tax burden to fill the sustainability gap may itself reduce economic growth, at least during the initial period of the implemented policy shift, with negative consequences for sustainability.

The calculation of the sustainable tax ratio for a finite horizon is derived in a similar manner as the corresponding calculation of the sustainable primary deficit. Specifically, substituting the definition of the primary balance (equation (5c)) into equation (3a) and solving for the tax rate (T*) required to ensure that the debt ratio reaches the value of b_τ in τ periods in the future gives the algebraic formula for the sustainable tax ratio over a finite (τ-period) horizon.

Specifically, the formula for the sustainable tax ratio needed to ensure that at time τ the debt ratio is equal τo its initial value b_0 is as follows:

$$T^* = \left[\frac{(r-\gamma)}{(1+\gamma)}\right] \times$$
$$\times \left\{ b_0 + \left[1-(1+\lambda)^{-\tau}\right]^{-1} \times \left[\sum_{t=1}^{\tau} g_t (1+\lambda)^{-t}\right] \right\}$$

(9)

As we have noted already, the calculation of finite-horizon gap indicators of fiscal sustainability requires a choice for the values of the targeted debt ratio (b_τ) and the time horizon τ. Theses choices can only be arbitrary, while the calculated values for the sustainable primary balance and tax ratios do not satisfy the intertemporal budget constraint. Blanchard (1990a) proposes three indictors of fiscal sustainability that correspond to three different time horizons, namely 1 year, 3-5 years and 30-50 years. These indicators correspond to primary and tax gaps that need to be bridged in order to ensure that the debt ratio reached its initial value τ periods in the future *(τ = 1 year; 3 years etc.)*.

Appendix 2

Eurostat revisions to Greece's 2006-09 fiscal data: *Analysis & implications*

In mid-November 2010, Eurostat released a second notification on provisional EU27 deficit and debt figures for the period 2006-2009. The report showed a rise in the euro area government deficit to 6.3%-of-GDP in 2009, from 2.0%-of-GDP in 2008, with the corresponding debt to GDP ratio reaching 79.2% in 2009 compared to 69.8%-of-GDP in the prior year. At a EU27-wide level, the fiscal deficit rose to 6.8%-of-GDP in 2009, from 2.3%-of-GDP in 2008, while the corresponding government debt-to-GDP ratios stood at 74% and 61.8% at the end of 2009 and 2008, respectively.

For Greece, the announced revisions were broadly in line with market expectations, following a number of recent press reports on their likely direction and expected size. Specifically, the 2009 general government budget deficit was re-estimated at 15.4%-of-GDP, compared to a deficit of 13.8%-of-GDP presented in the 2011 draft budget (released in mid-October). Moreover, the 2009 government debt to GDP ratio was revised to 126.8%, from a 115.4% figure recorded in the draft budget (see table below).

Revisions in Greek government deficit and government debt ratios

	2006	2007	2008	2009
Revision in government budget deficit (% of GDP)	-2.2	-1.3	-1.8	-1.8
	to -5.7 from -3.6	to -6.4 from -5.1	to -9.4 from -7.7	to -15.4 from -13.6
due to revision of deficit	-2.2	-1.3	-1.7	-1.6
due to revision of GDP	0.0	0.0	-0.1	-0.1

	2006	2007	2008	2009
Revision in government debt (% of GDP)	8.3	9.3	11.1	11.7
	to 106.1 from 97.8	to 105.0 from 95.7	to 110.3 from 99.2	to 126.8 from 115.1
due to revision of debt	8.7	9.6	10.2	10.5
due to revision of GDP	-0.4	-0.3	0.9	1.2

Source: Eurostat

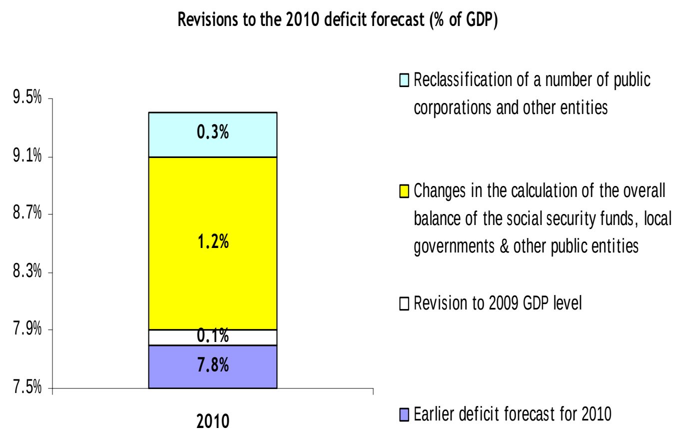
Shortly after the release of Eurosta's revisions to Greece's 2006-2009 fiscal data, the Greek Finance Ministry announced new forecasts for the general government deficit and debt figures for 2010. Specifically, the government said that is forecasted the overall budget deficit in 2010 to amount to ca €22bn (9.4%-of-GDP), which compared with an earlier deficit target of €18.5bn (7.8%-of-GDP) envisioned in the revised memorandum of understanding (MoU) agreed with the EC/ECB/IMF "troika". Furthermore, taking into account the latest upward revision to the 2009 deficit figure, the overall fiscal adjustment *(i.e., deficit reduction)* in 2010 was expected to amount to 6ppts-of-GDP vs. 5.5ppts-of-GDP expected earlier.

In more detail, the government said that the ca €3.5bn (~1.5ppts-of-GDP) upward revision to its 2010 general government deficit forecast was due to:

a) Methodological changes in the calculation of the overall balance of the social security funds, local governments & other public entities that were expected to increase the 2010 deficit by around 1.2ppts-of-GDP relative to the earlier estimates.

b) The reclassification of 10 public corporations (DEKOs) and 3 other organizations in the calculation of the general government deficit (ESA 95 definition). According to the new government projections, this was expected to boost the 2010 deficit ratio by a further 0.3ppts-of-GDP.

c) Downward revision to 2009 GDP level, expected to increase the 2010 deficit ratio by a further 0.1ppts-of-GDP. *(see graph below).*



Source: FinMin

In line with the aforementioned changes to the deficit forecast for 2010 and the latest revisions to Greece's past fiscal data by Eurostat, the government said that it expected the debt-to-GDP ratio to rise to 144.2%-of-GDP by the end of 2010. This compares with an earlier debt ratio forecast of 132.7%-of-GDP *(see 2011 draft budget)*. In more detail, the significant revision to the government forecast for 2010 debt ratio was expected to result from:

i) The incorporation of past off-market swaps in the calculation of the overall public debt stock (expected to add ca 2ppts-of-GDP to the 2010 debt ratio).

ii) The inclusion of outstanding debts of a number of public corporations and other entities (expected to add a further 7ppts-of-GDP to the 2010 ratio).

iii) Recent downward revisions in the GDP level and other adjustments (expected to increase the 2010 ratio by a further 2.5ppts-of-GDP).

All in all, the announced Eurostat revisions to Greece's 2006-2009 deficit figures and the government's new deficit and debt forecast for 2010 were, to a large extent, the result of methodological changes in the calculation of the general government accounts. The silver lining in the above developments was the lifting of Eurostat's reservations on the country's past fiscal data as expressed in the April 2010 notification.

Appendix 3

Greece's 2011 budget - Main targets

In mid-November 2010, the Greek government unveiled its final budget plan for 2011. The new budget targets a reduction in the general government deficit *(ESA 1995 definition)* to 7.4%-of-GDP in 2011, from an *(upwardly-revised)* deficit forecast of 9.4%-of-GDP in 2010.

In nominal terms, the overall fiscal deficit is expected to decline to ca €16.8bn in 2011, from €21.9bn in 2010. The latter effectively means that the government will aim to bring next year's deficit back in line with the terms of the existing EC/ECB/IMF bailout deal. To assist attain the 2011 deficit targets, the new budget incorporates a number of additional austerity measures *i.e., beyond these already included in the revised Memorndum of Understanding (MoU) with the troika*. The government estimates these additional measures to be worth 2.7pp-of-GDP, bringing the total expected thrust of the 2011 austerity package to 6.4pp-of-GDP *(=2.7pp-of-GDP + 1.2pp-of-GDP carry over from measures taken earlier this year + 2.5pp-of-GDP measures for 2011, incorporated in the MoU).*

Table A below shows the main targets and expected realization of the new budget in nominal and ppt-of-GDP terms. Column (a) corresponds to 2009 realizations; column (b) contains this year's targets as they appear in the *revised* MoU; column (c) shows the estimated fiscal realizations for 2010 as they appear in the 2011 budget plan; and column (d) presents the fiscal targets for next year. A few points related to table A deserve some additional analysis.

The new budget is framed on an adverse domestic macro environment, envisioning a continuation of the economic recession in 2011. Specifically, real GDP growth is expected to contact by 3.0% following a 4.2% decline in 2010, while the unemployment rate is forecasted to climb further, reaching 14.6% of the labor force, from levels around 12% in 2010. On the other hand, domestic inflation is expected to remain at elevated levels, with the annual CPI rate averaging 4.6% in 2010 and 2.2% in 2011.

Finally, the general government debt stock is expected to reach 152.6%-of-GDP in 2011, from 142.5%-of-GDP in 2010 and 126.8%-of-GDP in 2009. Note also that the general government primary position is expected to be broadly balanced in 2011 (-0.4%-of-GDP), comparing to sizeable primary deficits in the prior two years (2009: -10.1% 2010 & -3.7%-of-GDP in 2010).

Table A: 2011 Budget - 2010 estimates and 2011 targets

In € mio	2009 (a)	2010 EU/IMF program (b)	2010e (c)	2011 (d)	% Change (b)/(a)	(c)/(a)	(d)/(c)
1. Ordinary Budget							
a. Current revenue	52,308	58,744	54,853	57,520	12.3%	4.9%	4.9%
a1. Tax returns	4,952	5,100	5,100	3,800	3.0%	3.0%	-25.5%
a2. Extraordinary revenue	1,190	1,532	1,681	1,840	28.7%	41.3%	9.5%
a3. Net ordinary budget revenue (a-a1+a2)	48,546	55,176	51,434	55,560	13.7%	5.9%	8.0%
b. Ordinary budget expenditure (b1+b2+b3+b4)	74,626	69,725	68,893	71,839	-6.6%	-7.7%	4.3%
b1. Interest payments	12,325	13,017	13,260	15,920	5.6%	7.6%	20.1%
b2. Primary expenditure	57,992	54,611	52,798	52,633	-5.8%	-9.0%	-0.3%
b3. Payments for thesettlement of outstanding hospital debts	1,498	245	345	450			
b4. Other expenditure (includes called state guaranties on public corporations' debts)	2,811	1,852	2,490	2,836			
2. Ordinary budget balance (1a3-b)	**-26,080**	**-14,549**	**-17,459**	**-16,279**	-44.2%	-33.1%	-6.8%
3. Public Investment budget (PIB)							
a. Revenue	2,040	3,258	2,892	3,922	59.7%	41.8%	35.6%
b. Expenditure	9,588	9,200	8,500	8,500	-4.0%	-11.3%	0.0%
4. PIB balance (3a-3b)	**-7,548**	**-5,942**	**-5,608**	**-4,578**	-21.3%	-25.7%	-18.4%
5.central government balance (2+4)	**-33,628**	**-20,491**	**-23,067**	**-20,857**	**-39.1%**	**-31.4%**	**-9.6%**
6. Broader public sector (6a+6b+6c)	**-2,521**	**1,769**	**1,167**	**4,024**			
6a. Budget balances of local governments, social security funds & other public entities	-2,365	2,669	-851	1,491			
6b. Transfers to various public entities	-531	-550		-420			
6c. National accounts adjustments	375	-350	2,018	2,953			
7. General government budget balance (5+6)	**-36,150**	**-18,722**	**-21,900**	**-16,833**	**-48.2%**	**-39.4%**	**-23.1%**
7i. General government budget balance (% GDP)	*-15.4%*	*-8.1%*	*-9.4%*	*-7.4%*			
General gvnt primary balance	-23,825	-5,705	-8,640	-913			
General gvnt primary balance (% GDP)	-10.1%	-2.5%	-3.7%	-0.4%			

Source: FinMin, Eurobank Research

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