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Focus notes: Greece

A technical Study on Greece's Sovereign Solvency
How an elevated debt ratio conceals dramatic improvement in the debt rollover profile

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Summary of Views

Considerable theoretical and empirical difficulties exist in assessing whether a country's fiscal position is sustainable. Such difficulties are further exacerbated by the fact that there is no such a thing as a universally accepted threshold value for the public debt ratio that separates a sustainable from an unsustainable fiscal position. Indeed, past incidences of major sovereign debt crises have shown that sovereign borrowers may default on a public debt ratio no much higher than 60% (e.g. Argentina in December 2001), while others may well carry an elevated debt burden for a long period of time without facing insurmountable financing problems (Japan's gross public debt ratio is currently higher than 230%-of-GDP).

In support of the latter view, the recent literature has demonstrated that the quantitative limits on euro area member states' deficit and debt ratios stipulated in the Stability and Growth Pact may be far too restrictive and they can be shown to be neither *necessary* nor *sufficient* to achieve a sustainable fiscal position.[1] Furthermore, some authors have argued that, in assessing whether a country's fiscal position is sustainable, one should not merely focus on the evolution of the gross public debt to GDP ratio, but instead, on the ratio of government net worth to GDP.[2] That is to take into account the government's asset-liability position and thus, to explicitly recognize that the government can utilize state assets to help repay its debt obligations. Abstracting from any methodological problems involved in the derivation of accurate estimates of the asset-side of the government's balance sheet, the latter definition appears to make much sense for countries like Greece that possess a sizable portfolio of state assets.[3]

In the case of Greece, the *baseline* debt sustainability analysis (DSA) incorporated in the present economic adjustment programme forecasts a decline of the public debt ratio to 124%-of-GDP by 2020, from 175.7%-of-GDP expected this year.[4] Furthermore, as noted in the official statement released by the 26/27 November 2012 Eurogroup, there is an explicit commitment by euro area member states to consider further measures and assistance if needed, so as to facilitate fulfillment of the aforementioned target and to also ensure that the debt ratio falls "substantially lower" than 110% by the end of 2022.

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[1] *See e.g.* Polito and Wickens (2005).
[2] Buiter (1985)
[3] Greece's present privatization programme targets cumulative receipts of €24.2bn in 2011-2020 and around €50bn over a longer-term horizon.
[4] See e.g. IMF County Report No. 13/241, July 2013.

In view of the aforementioned considerations, *Part III* of this paper assesses the sustainability of Greece's fiscal position with the assistance of two quantitative metrics; namely, the *Primary Gap* and the *Tax Gap* indicators. For an assumed range of time horizons and target levels for the debt to GDP ratio, the calculated values for these indicators effectively show the size of the fiscal adjustment that needs to be undertaken in order to bring the country's debt ratio towards a sustainable path.[5]

Our results demonstrate that the country will need to generate positive primary fiscal balances for a number of years in order to facilitate a sustained de-escalation of its debt burden. This not only justifies the efforts made thus far by domestic authorities in reducing state expenditure and boosting budgetary revenue on a lasting basis, but it also highlights the need for a *credible* government commitment to sustained fiscal prudence, aiming to eventually restore state access to international credit markets and reduce sovereign borrowing costs. This is especially true as policy inaction *is* costly and a decision to postpone adjustment would involve *(potentially significant)* costs in the form of additional spending cuts and/or higher taxes in future years so as to meet increased servicing costs resulting from a further accumulation of public debt. In fact, our study provides quantitative estimates of the cost of delayed adjustment under a *hypothetical* scenario assuming that the current ambitious fiscal consolidation programme for the period 2013-2016 was actually delayed for several years.

Thankfully, the main bulk of expenditure-side measures for 2013-2016 have already been implemented last year, suggesting declining implementation risks going forward, while the *cyclically-adjusted* general government primary balance is now en route to reaching a surplus of over 6%-of-GDP this year, by far the largest in the EU-27. As we explain in *Part II* of this document, the latter supports the attainability of the present programme's key fiscal target of reaching a headline primary surplus of 4.5%-of-GDP by 2016 and constitutes one of the main reasons why a new significant package of horizontal austerity measures should be avoided.

Finally, *Part I* of this document explains why Greece's current debt to GDP ratio masks the notable progress already made in reducing debt rollover risks. Among others, our analysis argues in favor of a significant improvement in debt dynamics in the years ahead, especially as the so-called *snowball effect* is now expected to start automatically reducing the debt ratio from 2015 onwards and the generation of a general government primary balance this year will open the door for additional debt relief by official lenders (expected by spring 2014). In support of the aforementioned, our analysis also points to a sharp decline in the general government borrowing requirement over a period stretching well beyond the present adjustment programme's implementation horizon, while Greece's nominal interest rate on the overall debt stock is expected to remain among the lowest in the euro area in the years to come.

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[5] For the definition and algebraic calculation of the *Primary Gap* and *Fiscal Gap* indicators see Section 3 and the Technical Annex of this paper.

Part I

How an elevated debt ratio conceals dramatic improvement in debt rollover profile

1   Public debt dynamics, rollover risks and why Greece's current debt ratio may not be the proper metric to assess fiscal sustainability

Greece's fiscal adjustment over the last 3½ years has been exceptional by any international standard and the country is now en route to reaching a general government primary surplus for the first time since 2002. The respective full-year data for 2013 (ESA95 terms) will be released by Eurostat in mid-April 2014 and the verification of a primary surplus will effectively satisfy a key precondition for the provision of additional debt relief for Greece by official lenders. A brief analysis on the implications of the November 2012 Eurogroup decisions for Greece's solvency position as well as the prospect of a new package of debt relief measures is provided in the *Technical Annex* (*Section 1*) at the end of this document. Nonetheless, we reiterate that such a package should *optimally* aim to meet the dual objective of: *a)* providing significant financing for the coverage of the General Government borrowing requirement over the period 2014-2016 and beyond; and *b)* facilitating a future de-escalation of the public debt ratio, so as to meet the targets set at the November 2012 Eurogroup *i.e.*, 124% in 2020 and "substantially lower" than 110% in 2022. Under the present baseline macroeconomic scenario for Greece, fulfillment of objective *b)* would require the provision of relief measures adequate to generate a decline in the debt ratio of 7ppts-of-GDP cumulatively over the period 2013-2022 (Eurobank Global Market Research estimate).[6]

Notwithstanding the aforementioned considerations, Greece's public debt ratio remains the highest in the euro area. According to the troika's latest baseline scenario, it is expected to peak at 175.7% in 2013, before embarking on a declining trajectory, reaching 124% at the end of 2020 and falling substantially below that level thereafter (to 86.5% by 2030).[7] In view of the still exceptionally high debt ratio one may wonder whether Greece would ever manage to reinstate its fiscal sustainability without a more radical restructuring of its public debt, stretching well beyond the potential range of a new relief measures to be incorporated in a new assistance package for Greece.[8] According to a number of recent press reports, such a package could include higher co-financing rates for EU structural funds as well as lower interest rates on (and a further extension of the maturities of) the EU bilateral loans provided under the first programme (GLF). Yet, *it should not* incorporate outright debt forgiveness in the form of haircuts on official loans, at least as suggested by a number of relevant comments made recently by Germany's Finance Minister Wolfgang Schäuble.

Taking into account the aforementioned points, the following two sections concentrate on the determinants of Greek public debt dynamics and their projected evolution in the years ahead. Overall, our analysis provides support to the following views:

(i)   public debt dynamics are likely to improve considerably in the years ahead, especially as the generation of a General Government primary surplus in 2013 is broadly expected to open the door for additional debt relief by official lenders; and

(ii)   Greece's debt rollover risks have fallen dramatically and, provided that the domestic economy will evolve broadly in line with the present baseline macroeconomic scenario, the country is not expected to face insurmountable financing problems over the coming decade and beyond.

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[6] See Greece Macro Monitor *"Answers to 5+1 crucial questions on the outlook of Greek public debt finances and the prospect of a new aid package from official lenders"*, Eurobank Research, August 29, 2013.
[7] See e.g. IMF Country Report No. 13/241, July 2013.
[8] At the time of writing this report, a number of local and foreign media reported that Greece and its international lenders were working on a proposal to swap a big chunk of the EU bilateral loans provided to the country in the context of the 1st bailout programme (€52.9bn) with a 50-year government bond as a way to engineer a further long-term reduction in the General Government borrowing requirement. Repayment of these bilateral loans is set to begin in 2025 and the swap would extend repayment by several decades. In this report, we abstain from providing a more thorough analysis on the issue. Nonetheless, we note that, apart from any NPV effects, such a swap would not reduce Greece's debt ratio.

1.1   Public debt dynamics expected to improve considerably in the years ahead

As *Table 1* at the end of section demonstrates, the key determinants of future public debt dynamics include:

a)   the starting position *i.e.*, the present debt-to-GDP ratio;

b)   the evolution of GDP growth and the interest rate on the overall debt stock, with the interplay of these two variables determining the so-called snowball effect *i.e.*, the automatic increase (decrease) in the debt-to-GDP ratio when GDP growth is lower (higher) than the interest rate on debt; and

c)   the evolution of future primary balances and stock-flow adjustments such as privatization revenue and the recognition of implicit or contingent liabilities.

In the case of Greece (and more generally), the single most important determinant of future public debt dynamics is GDP growth and its relationship with the interest rate on the overall debt stock. To make the latter point easier to understand, consider that according to the troika's latest projections (July 2013), the snowball effect will account for ca. 13ppts out of the 18.9ppts-of-GDP expected rise in Greece's debt ratio in 2013. To a much lesser extent, the aforementioned increase will be due to official funding provided this year to recapitalize domestic banks as well as the recognition of implicit or contingent liabilities. As per the same projections, the snowball effect will be broadly neutralized in 2015, before start reducing the debt ratio from that year onwards (*Graph 1*). Note that the troika's present baseline macro scenario projects the snowball effect to turn positive (*i.e.*, to start automatically increasing the debt ratio after 2025), with a value of 0.9ppts-of-GDP expected in 2030. However, this forecast is based on a rather conservative outlook for Greek real GDP growth over the period 2021-2030 (between 2.0% and 1.8%), which may be failing to take into account the impact of structural reforms on the long-term growth potential of the economy.[9] More imminently, the pace of real GDP contraction this year is likely to prove slower than currently expected by the official sector, setting the base for a return to positive economic growth from 2014 onwards (*see Section II*).

Graph 1 – Automatic increase (positive numbers) / decrease (negative numbers) in the Greek public debt ratio due to the snowball effect (ppts-of-GDP)

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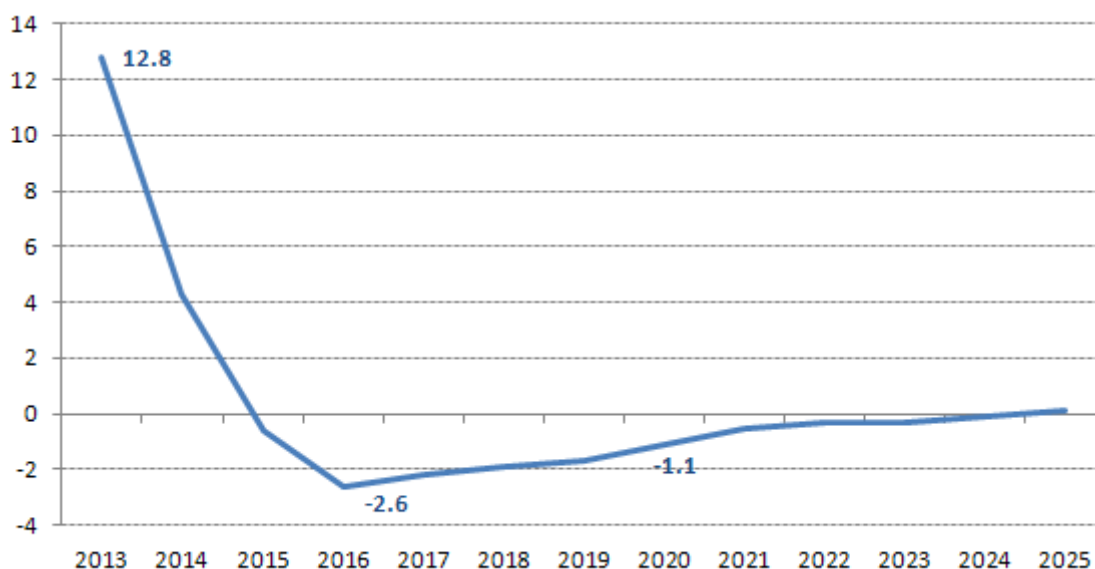
[9] For instance, the IMF expects that a satisfactory implementation rate of Greece's present structural reforms programme could boost the county's long-term GDP growth by as much as 10ppts (IMF Country Report No. 13/155, June 2013).

Additional analysis on the projected evolution of the interest rate on public debt will be provided in the following section, but let us next discuss another key determinant of future debt dynamics, namely the primary fiscal balance. *Part II* of this document explains in greater detail why the key fiscal target of attaining a primary surplus of 4.5%-of-GDP is deemed attainable, provided of course that a policy shift towards undue fiscal relaxation is avoided in the coming years. But, from the moment, let us consider the following: Greece's cyclically-adjusted primary balance has improved by more than 15ppts-of-GDP cumulatively in 2009-2012 and, according to the latest European Commission forecasts, the country remains en route to reaching a cyclically-adjusted primary surplus of over 6%-of-GDP this year, by far the highest in the EU-27.[10] To put it simply, the aforementioned *cyclically-adjusted* measure removes the impact of the economic recession on the government's fiscal accounts and, on that basis, we cannot see why Greece could not manage to generate the targeted primary surpluses once the economy resume's positive and sustained growth.

1.2 Rollover risks down sharply despite a still elevated debt ratio

Our analysis of Greece's general government borrowing needs and sources of funding in the context of the present adjustment programme broadly concurs with the troika's baseline macro scenario (July 2013), which envisages funding gaps equivalent to €4.4bn in H2 2014 and €6.5bn in 2015-2016. We do not expect the coverage of these gaps to prove an insurmountable hurdle, especially as the generation of a primary surplus this year is broadly expected to open the door for a new package of relief measures by official lenders (expected by spring 2014). Refraining from a more thorough discussion on the potential modalities of a new relief package for Greece (which is beyond the scope of this paper), we analyze below the projected evolution of the government net funding requirement over a period stretching beyond the implementation horizon of the current programme. *Table 2* shows the projected evolution of Greece's general government borrowing needs and sources of funding over the following two sub-periods: 2013-2016 & 2017-2020. For the first sub-period, the headline figures and main components broadly concur with the troika's current baseline scenario (see *e.g.* IMF Country Report No. 13/153, June 2013), while these for 2017-2020 constitute official sector & Eurobank Global Markets Research estimates and forecasts.

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[10] For instance, the IMF expects that a satisfactory implementation rate of Greece's present structural reforms programme could boost the county's long-term GDP growth by as much as 10ppts (IMF Country Report No. 13/155, June 2013).

Table 2– Greece: General government funding needs & sources of funding (EURbn)

In EURbn	2013-2016	2017-2020
I. Gross borrowing need (I.1 + I.2 + I.3)	**84.0**	**28.1**
I.1 Overall general gvnt balance (accrual)	**17.0**	**4.5**
I.2 Amortization (bonds & loans, short-term debt, official creditors)	**64.4**	**40.3**
I.3 Other (I.3.1 + I.3.2 +… + I.3.6)	**2.5**	**-16.7**
I.3.1 Bank recap	*7.2*	*0.0*
I.3.2 Cash upfront for PSI (sweetener & accrued interest)	*0.0*	*0.0*
I.3.3 Arrears clearance	*7.5*	*0.0*
I.3.4 Privatization	*-9.2*	*-12.7*
I.3.5 ECB related income (SMP & ANFA)	*-8.9*	*-4.0*
I.3.6 Other (debt buyback cost, cash buffer, contribution to ESM capital)	*5.8*	*0.0*
II. Gross financing source (II.1+II.2+II.3)	**72.8**	**22.2**
II.1 Market access	**0.0**	**0.0**
II.2 Official financing, including disbursed & committed (II.2.1 + II.2.2 + II.2.3)	**74.1**	**22.2**
II.2.1 EC bilateral loans/EAMS	*36.5*	*0.0*
II.2.2 IMF	*26.4*	*0.0*
II.2.3 EC interest deferral	*11.2*	*22.2*
II.3 Deposit financing & other	**-1.3**	**0.0**
III. Financing gap (I-II)	**10.9**	**5.9**

Source: IMF (July 2013), EC(July 2013), Eurobank Research

As shown in Table 2, the overall general government funding gap over the period 2013-2016 is currently projected at €10.9bn, while that of the 2017-2020 period is expected to amount to only €5.9bn. These forecasts assume that all relevant macro and fiscal variables will evolve broadly in line with the baseline scenario depicted in *Table 2.1* and they crucially incorporate realization of the present programme targets for privatization revenue. On a more comforting note, our forecasts assume a reduction in annual outstanding T-bills issuance after 2016, to €9bn from around €15bn, currently.[11] Additional to the points above, note that the average maturity of Greek sovereign debt is currently 17 years (around double the corresponding euro area average), while around 90% of the overall debt stock is now in official hands (troika, ECB and euro area national central banks).

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[11] It is important to reiterate that the relief measures for Greece announced at the November 2012 Eurogroup have had a sizeable beneficial impact on the government's medium-term funding needs and liquidity conditions, as it is also depicted in Tables A1 & A2 in the Technical Annex of this paper. Among others, the sharp decline in projected borrowing needs over the period 2013-2002 is mainly the result of an agreed 10-year deferral in EFSF interest payments.

Table 2.1 – Greece debt sustainability analysis

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Real GDP (%)	-6.4	-4.2	0.6	2.9	3.7	3.5	3.3	3.0	2.6
GDP deflator (%)	-0.8	-1.1	-0.4	0.4	1.1	1.3	1.4	1.7	1.7
Nominal GDP (%)	-7.1	-5.3	0.3	3.4	4.8	4.8	4.7	4.8	4.3
Nominal GDP (EURbn)	193.7	183.6	184.0	190.2	199.4	209.1	219.0	229.4	239.4
General gvnt balance (% GDP)	-6.3	-4.1	-3.2	-2.1	-0.7	-0.6	-0.8	-0.5	-0.2
Primary balance (% GDP)	-1.3	0.0	1.5	3.0	4.5	4.5	4.3	4.3	4.3
Gross public Debt (% GDP)	156.9	175.8	174.2	168.2	159.5	149.7	140.9	132.0	124.2
Debt (EURbn)	304.0	322.7	320.6	319.9	318.1	313.0	308.6	302.8	297.3

Source: IMF (July 2013), EC (April 2013), Eurobank Research

The key message of all these is a sharp decline in Greece's sovereign rollover risks over a period stretching well beyond the present adjustment programme's implementation horizon. This effectively implies that debt servicing costs over the coming decade will remain broadly manageable, notwithstanding the current elevated public debt ratio. Again, the latter view is conditional on the timely disbursement of remaining programme financing and the attainability of agreed targets as regards privatization revenue and the primary balance.

1.4   A cross-country comparison on public debt levels & servicing costs

As we explained earlier, what is important from a fiscal sustainability standpoint is not only a country's nominal debt level (and the corresponding ratio to GDP), but also the projected debt dynamics and medium-term servicing costs. On that account, Greece does not currently stand in a large disadvantageous position relative to other programme countries, as its interest payments as percent of GDP over the coming decade will not be much higher than these of Italy, Portugal, Ireland and Spain (Table 3.1). Furthermore, Greece's nominal interest rate on the overall debt stock is expected to remain among the lowest in the euro area in the years to come (Table 3.2), pointing to the possibility of a relatively faster reversal of the snowball effect, once positive output dynamics resume.

Table 3.1 – Projected interest payments on general government debt (% GDP)

	2013	2014	2015	2016	2017	2018
Austria	2.0	2.0	2.0	1.9	1.9	1.9
Belgium	3.2	3.4	3.4	3.3	3.2	3.1
France	2.3	2.4	2.4	2.4	2.4	2.5
Germany	2.1	1.9	1.7	1.6	1.5	1.4
Greece	4.1	4.7	5.1	5.1	5.1	5.0
Ireland	4.3	4.4	4.5	4.3	4.3	4.2
Italy	5.3	5.3	5.4	5.6	5.7	5.8
Netherlands	1.2	1.2	1.5	1.6	1.6	1.6
Portugal	4.1	4.0	4.1	4.1	4.2	4.1
Slovak Republic	1.7	1.8	1.9	2.0	2.2	2.1
Slovenia	2.1	2.9	3.2	3.5	3.6	3.8
Spain	3.1	3.3	3.5	3.7	3.9	4.1
Euro area average	2.8	2.8	2.8	2.8	2.9	2.9

Source: IMF, EC, Eurobank Global Markets Research

Table 3.2 – Projected evolution of nominal interest rate on overall debt stock

	2013	2014	2015	2016	2017	2018
Austria	2.7	2.7	2.8	2.8	2.8	2.8
Belgium	3.3	3.5	3.5	3.4	3.4	3.3
France	2.6	2.6	2.6	2.7	2.7	2.8
Germany	2.6	2.4	2.2	2.1	2.2	2.0
Greece	2.5	2.7	3.0	3.2	3.4	3.6
Ireland	3.8	3.8	3.9	3.8	3.9	4.0
Italy	4.1	4.1	4.2	4.4	4.6	4.7
Netherlands	1.7	1.7	2.0	2.2	2.1	2.2
Portugal	3.3	3.3	3.4	3.5	3.6	3.6
Slovak Republic	3.4	3.3	3.5	3.8	4.0	3.9
Slovenia	4.0	4.3	4.7	4.9	5.0	5.2
Spain	3.6	3.7	3.7	3.8	3.8	3.9

Source: IMF, EC, Eurobank Global Markets Research

Table 1
Determinants of public debt dynamics and the importance of economic growth in stabilizing the debt ratio

The formula below provides the basic equation determining debt dynamics (see also the *Technical Annex* at the end of this document)

Δb(t+1) = [r – g] *b(t) + pd (t+1) + Stockflow(t+1) (1)

Where
— **Δb(t+1) = b(t+1) – b(t)**
— **b(t)** is the public debt/GDP ratio in year t
— **r** is the real interest rate on the overall debt stock
— **g** is real GDP growth
— **pd(t+1)** is the primary deficit-to-GDP ratio in year t+1
— **Stockflow(t+1)** stands for privatization revenue & other stock flow adjustments (in ppt-of-GDP terms) in year t+1

From the equation above (and also taking into account the potential endogeneity of the primary balance as a result of the effect of automatic stabilizers), the following example demonstrates why GDP growth is the single most important determinant of the evolution of the debt ratio.

Let us assume that:

— **t** = 2013;
— **b(t)** = 175.8%-of-GDP (*i.e.,* the troika's projection for Greece's debt ratio at the end of 2013);
— the primary deficit, **pd**, is a function of **g** with elasticity of, say, **0.5** (this is not far from what can be implied by the l-t elasticities of public expenditure and tax revenue w.r.t. GDP growth in Greece).

Note that the endogeneity suggested here derives from the interplay of automatic stabilizers as a result of *e.g.* higher tax revenue due to the increase in national income and/or reduced unemployment benefits and other social transfers.
If for some external reason real GDP growth, **g**, in year t+1 (FY-2014) increases by, say, 1%**,** then from equation (1), the debt ratio

declines by 1.758ppt + 0.5ppt = 2.258ppt-of-GDP. In comparison, for every 1% change in the other right-side variables of equation (1), the corresponding declines in the debt ratio are as follows:

For every 1% decline in **r** ⇨ debt ratio declines 1.758ppt-of-GDP
For every 1% decline in **pd** (or 1% rise in the primary surplus) ⇨ debt declines by 1ppt-of-GDP
For every 1% decline in **stockflow** ⇨ debt ratio declines 1ppt-of-GDP

The endogeneity of the primary balance can also work in opposite direction, meaning that in periods of economic recession fiscal austerity measures well in excess of 1ppt-of-GDP need to be taken in order to reduce the primary deficit by 1ppt-of-GDP. All in all, the aforementioned points highlight the primary importance of GDP growth for the evolution of the public debt ratio.

Part II

Why a new package of horizontal austerity measures is neither necessary nor appropriate for Greece

Despite a still elevated public debt ratio, it is our view that Greece has already completed the most difficult part of a giant effort to eliminate severe flow and stock fiscal imbalances accumulated in the years leading to the sovereign debt crisis. Among others:

- between 2009 and 2012, the ESA95 general government deficit was reduced by 9.3ppts-of-GDP and a further adjustment of more than 2.2ppts-of-GDP is expected in 2103 (Eurobank Global Markets Research now forecasts a sub-4%-of-GDP deficit this year);

- over the same period, there has been a 9.2ppts of-GDP reduction in the general government *primary* deficit, with a further adjustment of more than 1.3ppts-of-GDP expected this year (we now forecast a small primary surplus in FY-2013); and

- the *cyclically-adjusted* primary balance has improved by more than 15ppts-of-GDP cumulatively in 2009-2012 and Greece remains en route to reach a cyclically-adjusted primary surplus of over 6%-of-GDP this year, by far the highest in the EU-27.[12]

To put it simply, the aforementioned *cyclically-adjusted* measures remove the impact of the economic recession on the government's fiscal accounts and thus, one can generally surmise that primary surpluses of that magnitude can be attained at the peak of the business cycle *i.e.*, when the domestic economy resume positive and sustained growth rates.[13] In support of the latter point, we note that Greece managed to generate positive and significant primary surpluses (c. 3.6ppts-of-GDP/annum on average) in the 7-year period leading to euro adoption, as part of a major fiscal consolidation effort undertaken back then.

Regarding the additional effort needed to attain the key fiscal target of the present economic programme (*i.e.*, a primary surplus of 4.5%-of-GDP by 2016) we reiterate that, in line with the updated conditionality of the present adjustment programme, domestic authorities and EC/ECB/IMF troika of official lenders agreed late last year on a new package of austerity measures for the period 2013-2016, cumulatively worth around 7.2ppts.[14] The main bulk of the new fiscal package consists of steep cuts in public sector wages, social security transfers and operating expenditure, worth cumulatively 5.2ppts.

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[12] European Commission Economic Forecasts, Spring 2013.
[13] For a more intuitive interpretation of the said terms see the following definition by Wikipedia: *"A government deficit can be thought of as consisting of two elements, structural and cyclical. At the lowest point in the business cycle, there is a high level of unemployment. This means that tax revenues are low and expenditure (e.g., on social security) high. Conversely, at the peak of the cycle, unemployment is low, increasing tax revenue and decreasing social security spending. The additional borrowing required at the low point of the cycle is the cyclical deficit. By definition, the cyclical deficit will be entirely repaid by a cyclical surplus at the peak of the cycle".*
[14] For a more thorough analysis on these issues see e.g. Greece Macro Monitor, "Attainability of 2013 fiscal target, medium-term financing gap and the case for new OSI", Eurobank Research, July 18, 2013.

Despite some lingering risks relating to *e.g.* health care overspending and increased transfers to the social security system, one can credibly claim that implementation risks to the new package of expenditure cuts is rather low, since most of these measures were introduced in early 2013. Yet, implementation risks to the 2013-2016 austerity programme are higher on the revenue-side, especially as there is virtually no room for further increases in tax rates and significant uncertainty continues to surround the near-term success of a number of recently enacted structural reforms to broaden the tax base and fight tax and social security contributions evasion.[15]

In the context of the present (ongoing) troika review of Greece's adjustment programme, concrete strategies are to be identified in order to address a projected fiscal gap for the period 2015-2016. According to the troika staff projections, the latter is worth c. €4bn, though Greece's finance ministry estimates it to be significantly less than that (c. €2.5bn). On the latter issue, high level government officials have recently been quoted by a number local and foreign media as saying that new austerity measures to close the 2015-2016 gap (and/or introduced as conditionality to a new package of debt relief measures expected by spring 204) *should* and *will* be avoided. As per the same sources, the 2015-2016 fiscal gap will primarily be closed by increased government revenue, as a result of the ongoing programme of structural reforms in the public sector, the revenue authority and the taxation system.

We firmly concur with the latter views, among other reasons because:

- a new package of relief measures by official lenders (expected by spring 2014) would not only reduce the overall stock of public debt, but it would also lighten up the government borrowing requirement on a multi-year basis and thus, lessen the need for new austerity measures down the road;[16]

- our recent empirical work on fiscal multipliers demonstrates that the fiscal drag of austerity policies in Greece tends to be much higher in periods of economic contraction;[17]

- besides alienating further the social fabric and creating additional frictions in the domestic political scene, a new significant package of horizontal austerity measures would also risk derailing the still fragile recovery reflected in Greece's Q2 2013 GDP data and a range of forward-looking indicators of domestic economic activity;

- on the latter point, note that on quarter-on-quarter seasonally adjusted basis Greek real GDP grew in Q2 2013 (by c. 0.6%, according to our estimates) for the first time in 3 ½ years and if our forecasts for the following two quarters are vindicated, then the pace of full-year GDP contraction will be lower than expected currently (i.e., -3.5YoY or better vs. -4.0% expected by the troika); and

- GDP is the single most important determinant of debt dynamics (see *Part I - Table 1*).

Elaborating further on the latter argument, we reiterate that the sharp spike in Greece's debt to GDP ratio expected this year will be mainly the result of the *so*-called *snowball effect i.e.,* the automatic increase in the ratio owing to the fact that nominal GDP growth will continue to lag by a large margin the nominal interest rate on the overall debt stock.

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[15] These include, among others, the early-2103 income tax reform, the creation of a semi-autonomous revenue administration and a single property tax, expected to come into effect on 1.1.2014.
[16] Among other strategies, a new package of austerity measures could include additional reduction in official loan rates and further extensions in loan amortization periods.
[17] See Monokroussos & Thomakos (2012), *"Fiscal multipliers in deep economic recessions and the case for a 2-year extension in Greece's austerity programe"* Eurobank Research October 2012 & Monokroussos & Thomakos (2013), *"Fiscal multipliers revisited: Government spending cuts vs. tax hikes and the role of investment expenditure – The Greek experience"*, Eurobank Research April 2013.

Part III

A technical study on Greece's sovereign solvency

1. Literature review

Assessing whether a country's fiscal position is sustainable is an intrinsically difficult task, both from a theoretical and an empirical standpoint. 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.[18]

The above definition appears to be sufficiently straightforward and easy 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 need 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? Moreover, 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, how 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 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.[19]

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. The latter definition takes into account the government's asset-liability position and thus, it explicitly recognizes that the government can utilize state assets to help finance its deficits. From a pure theoretical standpoint, the latter appears to be a more accurate definition of fiscal sustainability. However, in practice 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 *(Section 2 of the Technical Annex at the end of this document provides an algebraic derivation of the government intertemporal budget constraint).*

The above considerations and definitional problems led some authors to distinguish between solvency and fiscal sustainability.[20] 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 debt 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.

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 *stationarity* as a necessary condition for fiscal sustainability. Trehan and Walsh (1988)

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[18] For a comprehensive survey of the various definitions of fiscal sustainability see *e.g.* Balassone and Franco (2000).
[19] *See e.g.* Polito and Wickens (2005).
[20] *See e.g.* Artis and Marcellino (2000).

extend this framework by showing that a necessary and sufficient condition of sustainability can be tested by examining whether a cointegration relation exists between current debt and future primary balances. Bohn (1998) argues that the condition tested in Trehan 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.

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 this 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). 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 (for an algebraic derivation of these indicators as well as a brief discussion on their use see Sections 3 & 4 at the Technical Annex of this document)*.

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 revenue to GDP, which is such that prevents the debt to GDP ratio from exploding over time.[21] The Primary Gap and Tax Gap indicators are then estimated as the difference between the sustainable level of the respective variable of interest from its current level. Following the notation utilized in the *Technical Annex* of this document, the Primary Gap and Tax Gap indicators can be expressed as follows:

$$\Pr imary \_ Gap_t = pb * - pb_t$$

$$Tax \_ Gap_t = T * - T_t$$

where *pd** and *T** depict the *sustainable* primary fiscal balance and tax revenue ratios to GDP, *t* is the time indicator and *pd, T* depict the *current* primary fiscal balance and tax revenue ratios to GDP, respectively.

If the *current* general government primary balance (deficit or surplus) is lower than the *sustainable* primary surplus (i.e., *Primary Gap* > 0), 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 path, with the corresponding Primary Gap measuring the magnitude of the required adjustment. In a similar fashion, if the current tax revenue ratio is lower than the sustainable tax ratio (*Tax Gap* > 0) then fiscal policy will need to be adjusted in order to prevent exessive debt accumulation. This can be done by increasing tax rates and/or reducing expenditure so as to ensure fulfillment of the government's intertemporal budget constraint, with the size of the required adjustment being given by the value of the Tax Gap indicator.

In theory, the calculation of the Primary Gap and Tax Gap indicators requires as inputs long-term forecasts for real GDP growth, inflation and interest rates. For that reason, it is usually more convenient to limit the estimation of these indicators to *finite* horizons. 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_t, and the corresponding time horizon, τ, under consideration.[22] For instance, Blanchard (1990a) proposes three indicators 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 reaches its initial value τ periods in the future *(τ = 1 year, 3 years etc.)*.

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[21] The sustainable level of the variable of interest must be governed 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.

[22] However, such a choice 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 arbitrarily long time horizon.

2. Assessing the sustainability of Greece's fiscal accounts

This section presents an empirical investigation of the sustainability of Greece's fiscal position, taking into account the occurrence of a major policy shift towards multi-year fiscal austerity and structural reforms, in the context of the two consecutive economic adjustment programmes agreed with the EC/ECB/IMF troika of official lenders. Our analysis employs a range of medium- and long-term fiscal sustainability indicators, the calculation of which incorporates the latest troika forecasts for the evolution of Greece's main macroeconomic and fiscal variables. Specifically, based on the algebraic formulas derived in the *Technical Annex* section of this document, 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 *medium-term* horizon, τ, by calculating the respective *Fiscal Gap* and *Tax Gap* indicators implied by a terminal (target) value for the debt-to-GDP ratio, b_τ, which is assumed to be equal to the ratio's current value (b_0). In our study, we assume for simplicity that b_0 equals the realized value of the debt ratio at the end of 2012 ($b_0 = b_{2012}$). For the calculation of our medium-term sustainability indicators we use $\tau=5$ years. In more detail, we first calculate the *sustainable* primary balance and tax revenue ratios, which are required to ensure that the respective five-year-ahead debt ratio reached its current value ($b_{2017} = b_{2012}$). The respective *Fiscal Gap* and *Tax Gap* indicators are then calculated by subtracting from the *sustainable* levels of the corresponding fiscal variables their *current* (in our study, their end-2012) values.

For the calculation of our *long-term* sustainability indicators, we repeat a similar exercise for $\tau=10$ years, examining the case for a terminal (target) level of the debt-to-GDP ratio of 110%-of-GDP; namely $b_{2022}=110\%$.[23] We also consider the case for $\tau=20$ years, with the corresponding *Fiscal Gap* and *Tax Gap* indicators calculated for as many as three distinct terminal (target) values for the debt ratio, namely 100%, 80% and 60%-of-GDP.[24] Again, each of these sustainability indicators is calculated as the difference between the *sustainable* level of the variable of interest and its *current* (in our study, its end-2012) level.

Along with the above derivations, we also calculate the cost of delaying fiscal adjustment by 3 or 5 years in the case of our long-term sustainability indicators. As we noted earlier, a decision to delay adjustment isn't costless, potentially involving significant costs in the form of additional spending cuts and/or higher taxation 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 difficulty 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)*. Given that non-financial assets usually account for the greatest part of government assets, inaccurate estimates of their total value may bias the calculated sustainability indicators quite considerably.

For the reasons heighted above, 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 as 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.

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[23] The choice of the said time horizon ($\tau=10$ years) and the target debt ratio ($b_{2022}=110\%$) has been made with a view to compare our results with the baseline debt sustainability analysis presented in the most recent troika staff reports on Greece's stabilization programme. According to the latter, Greece's debt-to-GDP ratio should reach 124% in 2020 and fall "substantially" below 110% by the end of 2022.

[24] The choice of the terminal value of 60% for the debt ratio is to comply with the respective debt sustainability criterion of the Maastricht Treaty, while these of 100% and 80% of GDP are to bring the Greek debt ratio to levels close to the present euro area average.

3. Data

The primary source of our data is the latest European Commission and IMF reports on Greece's economic adjustment programme, which contain baseline macroeconomic forecasts and sensitivity analysis on public debt dynamics up to 2030.[25] Our study also assumes full implementation of the debt-relief measures for Greece announced at the 26/27 November 2012 Eurogroup. These measures were made conditional on the "positive outcome" of a debt buy-back operation (that was successfully carried out on December 2012)[26], and included *inter alia*: (i) a 100bps reduction of the interest rate charged to Greece on the loans provided in the context of the 1st EU/IMF bailout (Greek Loan Facility); (ii) a 10bps reduction of the guarantee fee costs paid by Greece on the EFSF loans; (iii) an extension of the maturities of the bilateral and EFSF loans by 15 years and a deferral of interest payments for Greece on EFSF loans by 10 years; and (iv) a commitment by Member States to pass on to Greece's segmentation account, an amount equivalent to the income on the SMP portfolio accruing to their national central bank as from budget year 2013.[27] In addition to these relief measures, the official statement of the November 2012 Eurogroup read that euro area Member States would be ready to consider further (contingency) measures and assistance, if needed, including *inter alia* lower co-financing in structural funds and/or further interest rate reduction of the Greek Loan Facility, in order to ensure that Greece can reach a debt-to-GDP ratio of 124% in 2020 and "substantially lower" than 110% in 2022. As per the same statement, these new measures will be considered when Greece reaches an annual primary surplus, as envisaged in the revised MoU, and should be subject to the full implementation of programme conditionality. According to our estimates, attainment of the aforementioned terminal targets for the public debt ratio would require the provision of contingency relief measures for Greece worth cumulatively 7ppts-of-GDP over the period 2013-2022. Judging from recent official comments on the issue and provided that Greece will manage to generate an ESA95 annual primary surplus in FY-2013 (a high probability scenario, in our view), we expect euro area partners to proceed with identification of such measures, sometime in the spring of 2014.

4. Results

To investigate the sustainability of Greece's fiscal position over the different time horizons and corresponding target values for the public debt ratio considered in our study ($\tau = 5$ years, 10 years and 20 years & $b_{2017} = b_{2012}$, $b_{2022}=110\%$ and $b_{2032}=100\%$, 80% or 60%), we focus on the *Primary Gap* indicator.[28] The calculation of this indicator requires long-term projections for real GDP growth and the GDP deflator as well as the general government primary balance and the real interest rate on the overall debt stock. *Table 1.1* below shows the forecasts series utilized in our study, which are broadly in line with these used in the troika's baseline debt sustainability framework for Greece.[29] Note that the table below projects a slightly lower rate of GDP contraction in 2013 relative to that envisaged in the July 2013 troika baseline   (-4.0% vs.4.2%). This is in line with recent press reports suggesting that, in the context of the present troika review of Greece's adjustment programme, there has been a similar revision to the 2013 GDP forecast assumed in the baseline macro scenario.[30]

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[25] See *"The Second Economic Adjustment Programme for Greece Third Review – July 2013"* European Commission Occasional Papers 159/July 2013 and IMF Country Report No. 13/241, July 2013.

[26] The debt buyback was carried out on December 13, 2012, with a total notional amount of €31.9bn of old GGBs being validly tendered in the exchange

[27] Member States under a full financial assistance programme would not be required to participate in schemes i) and iv) for the period in which they receive themselves financial assistance.

[28] A similar analysis applies to the *Tax Gap* indicator and thus, the respective estimates are not presented in this report.

[29] See e.g. IMF Country Report No. 13/241, Table AI.1., page 66 (July 2013).

[30] For the current year as a whole, we even see a good probability for an even slower pace of GDP contraction (-3.7% or lower) along with a small primary surplus, but, to remain on the conservative side, we abstain from incorporating these views in Table 1.

Table 1.1 – Greece: short-, medium- & long-term macroeconomic forecasts

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
γ_t real GDP growth YoY %	-4.0	0.6	2.9	3.7	3.5	3.3	3.0	2.6	2.0	1.9
r_t real interest rate on public debt (%)	3.6	3.1	2.6	2.2	2.1	2.0	1.8	1.8	1.6	1.6
π_t GDP deflator (%)	-1.1	-0.4	0.4	1.1	1.3	1.4	1.7	1.7	1.9	2.0
pb_t primary balance (% GDP)	0.0	1.5	3.0	4.5	4.5	4.3	4.3	4.2	4.0	4.0

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
γ_t real GDP growth YoY %	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8
r_t real interest rate on public debt (%)	1.7	1.9	2.1	2.2	2.4	2.6	2.7	2.8	2.8	2.8
π_t GDP deflator (%)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
pb_t primary balance (% GDP)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Source: IMF (July 2013), Eurobank Research

Table 1.2 – Greece: evolution of gross public debt ratio (troika baseline scenario)

	2012	2013	2014	2015	2016		2020	2021	2022	2023	2024	2025		2030
b_t public sector debt (% GDP)	156.9	175.7	174.0	168.1	159.4		124.0	118.2	113.6	109.4	105.7	102.3		86.5

Source: IMF (July 2013)

Table 2 below shows the *sustainable* primary surpluses and the corresponding Primary Gap indicator values for the different time horizons and debt ratio targets examined in our study. As the table below demonstrates, an annual primary surplus of 4.7%-of-GDP in 2013-2022 would be needed to bring Greece's debt ratio to 110% at the end of that period. Similarly, attainability of the debt ratio targets of 100%, 80% and 60% by 2032 would require the generation of respective annual primary surpluses of 3.1%, 3.9% and 4.8%-of-GDP over the intervening 20-year period. Finally, the Primary Gap indicator values presented in *Table 2* are calculated by

subtracting the primary deficit ratio realized in 2012 (-1.3%of-GDP) from each of the corresponding $pd*$ values.

Table 2 – Sustainable primary balances & Primary Gap indicator values for assumed adjustment horizons & debt ratio targets

	To stabilize debt ratio over 5 years ($b_{2017} = b_{2012} = 156.9\%$-of-GDP)	To bring debt ratio to 110% by 2022 ($b_{2022} = 110\%$-of-GDP)	To bring debt ratio to 100% by 2032 ($b_{2032} = 100\%$-of-GDP)	To bring debt ratio to 80% by 2032 ($b_{2032} = 80\%$-of-GDP)	To bring debt ratio to 60% by 2032 ($b_{2032} = 60\%$-of-GDP)
pd* *sustainable* primary surplus (% GDP)	2.1	4.7	3.1	3.9	4.8
Primary Gap (% of GDP)	3.4	6.0	4.4	5.2	3.5

Source: IMF (July 2013) & Eurobank Research estimates

As we noted earlier, the Primary Gap indicator effectively measures the fiscal adjustment that needs to be undertaken so as to ensure fulfillment of the assumed debt ratio targets. However, in the case of Greece, this measure overstates the adjustment effort required to bring public finances towards a sustain path, given that its calculation abstracts from stock-flow adjustments such as privatization revenue, recognition of implicit or contingent liabilities and/or other debt-creating flows. According to the troika's present baseline macro scenario for Greece, projected privatization revenue constitute a big chunk of future debt-reducing flows. On a ceteris paribus basis, the timely implementation of Greece's privatization programme would reduce by 1ppts-of-GDP or more the annual primary surpluses needed for reaching the aforementioned debt ratio targets.[31]

To draw a more close parallel to Greece's present adjustment programme, let us now concentrate on the fiscal effort needed to bring the country's debt ratio towards, say, 110%-of-GDP by 2022. As shown in the 2nd column of *Table 2*, the calculated Primary Gap indicator demonstrates that, abstracting from stock-flow adjustments (*e.g.* privatization revenue) the primary fiscal balance would need to improve by 6ppts-of-GDP relative to its end-2012 level, so as to ensure annual primary surpluses of 4.7%-of-GDP over the period 2013-2022. Considering now that Greece's general government primary balance is broadly expected to generate a small primary surplus this year, the Primary Gap indicator value at the end of 2013 should fall below 5%-of-GDP. Taking finally into consideration that the present adjustment programme assumes significant privatization revenue in the years ahead as well and the identifications of measures to close a projected fiscal gap of ca 2ppts-of-GDP in 2014-2015, it suffices that the attainment of the 110%-of-GDP debt ratio target in 2022 would not necessary require additional austerity measures (i.e. over and above these incorporated in the current programme). That is, assuming that (i) all underlying macro and fiscal variables will evolve in line with the troika's baseline scenario and (ii) official lenders will provide additional relief measures to Greece (expected sometime in spring 2014) so as to facilitate attainability of the debt ratio targets agreed at the November 2012 Eurogroup (see also Section 3.1).

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. The hypothetical scenario provided below can help us highlight the aforementioned point. Let us assume that the government had decided to postpone for 3 years the implementation of the new fiscal adjustment programme for the period 2013-2016, which was actually agreed with official lenders late last year as a prior action to the resumption of official funding to Greece.

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[31] Greece's present privatization programme targets cumulative receipts of €24.2bn in 2011-2020 and around €50bn over a longer-term horizon.

Under this scenario, a new major fiscal adjustment effort would begin in 2017 (instead of 2013) and, assuming realization of the macro scenario presented in Table 1.1, it would require an annual primary surplus of 5.4%-of-GDP in 2017-2022 (instead of 4.7%-of-GDP under the no delay scenario) in order to reduce the public debt ratio to 110%-of-GDP by 2022 (see *Table 3.1*). Of course, that is a ceteris paribus analysis and as such, it does not take into account other potential costs emanating from such a decision *e.g.* further deterioration of investor outlook towards Greece and ensuing implications.

Table 3.1 - Sustainable primary balances & Primary Gap indicator values under 3-year delayed adjustment scenario

	To bring debt ratio to 110% by 2022 (b_{2022} = 110%-of-GDP)	To bring debt ratio to 100% by 2032 (b_{2032} = 100%-of-GDP)	To bring debt ratio to 80% by 2032 (b_{2032} = 80%-of-GDP)	To bring debt ratio to 60% by 2032 (b_{2032} = 60%-of-GDP)
pd* *sustainable* primary balance (% GDP)	5.4	3.4	4.6	5.8
Primary Gap (% of GDP)	6.7	4.7	5.9	7.1

Source: IMF (July 2013) & Eurobank Research estimates

In a similar vein, *Table 3.2* demonstrates the cost of delaying the aforementioned adjustment by 5 years.

Table 3.2 - Sustainable primary balances & Primary Gap indicator values under 5-year delayed adjustment scenario

	To bring debt ratio to 110% by 2022 (b_{2022} = 110%-of-GDP)	To bring debt ratio to 100% by 2032 (b_{2032} = 100%-of-GDP)	To bring debt ratio to 80% by 2032 (b_{2032} = 80%-of-GDP)	To bring debt ratio to 60% by 2032 (b_{2032} = 60%-of-GDP)
pd* *sustainable* primary balance (% GDP)	8.3	4.0	5.4	6.8
Primary Gap (% of GDP)	9.6	4.0	5.4	6.8

Source: IMF (July 2013) & Eurobank Research estimates

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Technical Appendix

Section 1 - What the November 2012 Eurogroup statement said about the prospect of a new (third) aid package

Upon a full staff-level agreement between the Greek side and the troika on updated programme conditionality, the Eurogroup November 26/27, 2012 announced a number of relief measures for Greece aiming to improve debt dynamics and to reduce medium-term rollover risks. These measures were made conditional on the "positive outcome" of a debt buy-back operation (that was successfully carried out on December 2012)[32], and included *inter alia*: (i) a 100bps reduction of the interest rate charged to Greece on the loans provided in the context of the 1st EU/IMF bailout programme *i.e.,* the so-called Greek Loan Facility (GLF); (ii) a 10bps reduction of the guarantee fee costs paid by Greece on the EFSF loans; (iii) an extension of the maturities of the bilateral and EFSF loans by 15 years and a deferral of interest payments for Greece on EFSF loans by 10 years; and (iv) a commitment by Member States to pass on to Greece's segmentation account, an amount equivalent to the income on the SMP portfolio accruing to their national central bank as from budget year 2013.[33]

In addition to these relief measures, the official statement of the November 2012 Eurogroup read that euro area Member States would be ready to consider further measures and assistance if needed, so as to ensure that Greece can reach a debt-to-GDP ratio of 124% in 2020 and "substantially lower" than 110% in 2022. As per the same statement, such a new assistance package would include *inter alia* lower co-financing in structural funds and/or further interest rate reduction of the Greek Loan Facility. Moreover, they should be subject to (i) full implementation of programme conditionality as laid out in the revised MoU and (ii) generation of an annual primary surplus in the general government accounts. Provided that Greece will manage to generate a small general government primary surplus this year (our baseline scenario) and taking into account a number of recent official comments, we now expect a new package of debt relief measures to be approved by spring 2014.[34]

A new aid package for Greece should *optimally* aim to meet the dual objective of *a)* providing adequate financing of the General Government borrowing need over the period 2014-2016 *i.e.,* facilitating the coverage of any financing gaps projected for the aforementioned period; and *b)* facilitating a future de-escalation of the public debt ratio so as to meet the targets set at the November 2012 Eurogroup *i.e.,* 124% in 2020 and "substantially lower" than 110% in 2022. Under the present baseline macroeconomic scenario for Greece, fulfillment of objective *b)* would require the provision of relief measures adequate to generate a decline in the debt ratio of 7ppts-of-GDP cumulatively over the period 2013-2022 (Eurobank Research estimate).[35]

Tables A1 & A2 below show the estimated impact of the November 2012 relief measures on Greece's gross public debt-to-GDP ratio and the General Government borrowing needs and sources of funding over the period 2012-2022. The tables assume: (i) full implementation of the relief measures announced at the November 2012 Eurogroup; and (ii) additional contingency (not yet identified) measures, needed to facilitate the required reduction in the debt ratio towards the aforementioned terminal targets.

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[32] The debt buyback was carried out on December 13, 2012, with a total notional amount of €31.9bn of old GGBs being validly tendered in the exchange.

[33] Member States under a full financial assistance programme would not be required to participate in schemes i) and iv) for the period in which they receive themselves financial assistance.

[34] Speaking before the European Parliament's Financial Affairs Committee in early September 2013 Eurogroup President Jeroen Dijsselbloem said that discussion on the financing gap of the current program will begin in October and is expected to be completed by November, while any decisions on improving the sustainability of the Greek debt are forwarded to April, when it will have been confirmed whether the Greek budget for 2013 has closed with a primary surplus.

[35] See Greece Macro Monitor *"Answers to 5+1 crucial questions on the outlook of Greek public debt finances and the prospect of a new aid package from official lenders",* Eurobank Research, August 29, 2013.

Table A1 - Contributors to the projected decline in the Greek public debt ratio in FY-2020, as envisaged in the 26/27 November 2012 Eurogroup statement (in ppts)

	Δ Gross public debt-to-GDP in FY-2020 (ppts)
Debt buyback (due to upfront reduction in the public debt stock)	-8.8
Debt buyback (due to reduced coupon payments)	-2.8
100bps cut in GLF interest rate	-1.7
10bps reduction in EFSF guarantee fee	-0.5
Return of SMP profits	-3.8
EFSF interest payment deferral & loan maturities extension	0.0
Increased T-bills issuance	0.9
Deferral (and reduction in the size of) cash buffer	0.0
Contingency measures (implementation assumed after 2016)	-3.2
Total	**-20.0**

Source: EC, IMF, Eurobank Research

Table A2 – *Estimated impact of new relief measures on the general government borrowing requirement in the period 2012-2016 and beyond (EURbn) - Negative (positive) sign signifies reduction (increase) in the cumulative borrowing need*

	Δ Net cumulative borrowing need in 2012-2016 (EURbn)	Δ Net cumulative borrowing need in 2012-2022 (EURbn)
Increase in funding need due to debt buyback 1/	11.3	11.3
Reduced coupon payments on outstanding *privately-held* government bonds (post-buyback)	-2.9	-9.2
100bps cut in GLF interest rate	-2.1	-5.1
10bps reduction in EFSF guarantee fee	-0.6	-1.4
Return of SMP profits (coupons & capital gains)	-7.2	-10.5
EFSF interest payment deferral	-13.4	-43.8
Extension of GLF maturities	0.0	0.0
Extension of EFSF maturities	0.0	0.0
Increased T-bills issuance 2/	-9.0	-9.0
Higher interest payment due to increased T-bills issuance 2/	2.0	2.0
Cash buffer deferral (and reduction in size) 3/	-2.0	-2.0
Total	**-23.9**	**-67.8**

Source: EC, IMF, Eurobank Research

Section 2- Derivation of the government intertemporal budget constraint

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

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

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, which represents the *real* government budget constraint:

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

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 $1+\lambda_t = \dfrac{1+R_t}{(1+\pi_t) \times (1+\gamma_t)}$, 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:

$\lambda_t = R_t - \pi_t - \gamma_t$ *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.[36]

Section 3 - Indicators of fiscal sustainability

Equation (2) in the prior *Technical Annex* section 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:

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

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_0 denoting the initial debt to GDP ratio (t = 0)

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[36] For a more formal treatment on the concept and derivation of the intertemporal government budget constraint see e.g. *"Assessing fiscal policy with the use of sustainability indicators: The case of Greece"*, Eurobank Research, December 2010.

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:

$$Primary\_Gap_t = pb* - pb_t = -b_0 \times \lambda - pb_t$$

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**. If the *current* general government primary deficit or surplus is lower than the *sustainable* primary surplus i.e., *primary gap* > 0), 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 path, 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. If the current tax revenue ratio is lower than the sustainable tax ratio (*tax gap* > 0) then fiscal policy will need to be adjusted in order to prevent exessive debt accumulation. This can be done by increasing tax rates and/or reducing expenditure so as the ensure fulfillment of the government's intertemporal budget constraint, with the size of the required adjustment being given by the value of the tax gap indicator.

In theory, the calculation of the Primary Gap and Tax Gap indicators requires as inputs long-term forecasts for real GDP growth, inflation and interest rates. For that reason, it is usually more convenient to limit the estimation of these indicators to *finite* horizons. 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*$_\tau$, and the corresponding time horizon, *τ*, under consideration. [37]

The calculation of the primary gap and tax gap indicators over a finite horizon is again based 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*$_t$ in period τ. Again, the corresponding primary gap and tax gap indicators are calculated as follows: [38]

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

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

[37] However, such a choice 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 arbitrarily long time horizon.
[38] A more formal treatment of the concept and algebraic derivations of the *pb** and *T* variables* is provided in *"Assessing fiscal policy with the use of sustainability indicators: The case of Greece"*, Eurobank Research, December 2010.

Section 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.[39] 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 government 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 is 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 publishes member states' 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.

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[39]See *e.g. Sustainability Report 2009, European Economy 9/2009.*

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 ensuing 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.

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