Eurobank Global Markets Research
www.eurobank.gr/research
EurobankGlobalMarkets
Research@eurobank.gr

Eurobank

GREECE MACRO MONITOR

May 12, 2014

Fiscal multiplier, automatic stabilizers and public debt

A simulation exercise for Greece

Dr. Platon Monokroussos
Deputy General Manager
Head of Global Markets Research
pmonokrousos@eurobank.gr

Preface

While a vast volume of theoretical and empirical work exists on the effects of fiscal policy on economic activity, the feedback effect from growth to fiscal aggregates, and in particular to government debt, has received less attention. This issue is becoming increasingly important in this juncture, as debt reduction has become a key policy target in a number of advanced economies. In the case of Greece, an aggressive fiscal consolidation effort has been undertaken since the outbreak of the sovereign debt crisis and the subsequent signing of the first and the second (present) economic adjustment program. This effort has led to a cumulative adjustment of 19.4ppts of GDP in the cyclically adjusted primary fiscal balance, to a surplus of 5.8%-of-GDP in 2013, from a deficit of 13.6%-of-GDP in 2009. Despite this unprecedented improvement, the country's general government debt ratio has actually increased by 45.3ppts since 2009, reaching 175%-of-GDP at the end of 2013. This development naturally raises the question of whether Greece's fiscal adjustment is actually a "self-defeating" proposition, in the sense that the implementation of aggressive fiscal consolidation may prove counterproductive as austerity in a depressed economy could arguably erode the fiscal balance and worsen debt dynamics on a sustained basis. This study presents a simulation exercise for Greece to highlight the effects of the applied fiscal austerity program on the debt ratio and other important fiscal metrics. The paper employs the stock-flow accounting identity, known as the intertemporal budget constraint, to study the evolution of the Greek public debt ratio under different assumptions regarding the size and the degree of persistence of fiscal multiplies, the size (and the implementation profile) of the applied fiscal adjustment, and the response of financial markets to fiscal consolidation (myopic vs. forward-looking markets). Among others, the main results of our simulation exercise can be summarized as follows: a) in view of Greece's present elevated debt ratio, a fiscal adjustment can lead to an initial (contemporaneous) rise in the debt ratio if the fiscal multiplier is higher than around 0.5; b) despite the unprecedented improvement in Greece's underlying fiscal position since 2010, the concomitant increase in the country's public debt ratio can be mainly attributed to the ratio's elevated initial level, a very wide initial structural deficit as well as the ensuing economic recession; c) notwithstanding its negative initial effects on domestic economic activity, the enormous fiscal effort undertaken in the last 4-5 years leaves the country's debt ratio in a more sustainable path relative to a range of alternative scenarios assuming no adjustment or a more gradual implementation profile of fiscal consolidation relative to that implemented thus far.

1. Introduction

The large fiscal adjustment undertaken in many advanced economies in recent years has stimulated renewed interest in the effects of fiscal policy on economic activity. To measure these effects, one needs to make an assumption about the size (and the persistence) of fiscal multipliers.[1] A number of recent empirical studies have demonstrated that fiscal multipliers may be significantly higher in economic downturns than in expansions.[2] Table 1 in the Annex section of this document summarizes the main results of two empirical studies we published recently on the size of fiscal multipliers in Greece in expansionary and contractionary output phases. Table 2 in Annex provides some stylized facts about fiscal multipliers.

In a nutshell, while the earlier literature suggests an average first-year (i.e., impact) fiscal multiplier of around 0.6 for advanced economies, there are strong reasons to believe that in the current environment the multiplier may be closer to 1 and, in certain cases, even higher than that.[3] For instance, in an early empirical study[4], which utilizes a *Smooth Transition Vector Autoregression (STVAR)* model, we estimated strongly significant government spending multipliers in Greece that are as high as 1.32 in recessionary phases along with negative (and broadly insignificant) multipliers in economic expansions. This result is particularly pronounced for government wage expenditure, where the estimated multiplier was found to be as high as 2.35 (and strongly significant) in recessionary regimes and negative (and largely insignificant) in economic expansions.

While a vast volume of theoretical and empirical work exists on the effects of fiscal policy on economic activity (albeit with broadly inconclusive results), the feedback effect from growth to fiscal aggregates, and in particular to government debt, has received less attention. This issue is becoming increasingly important in this juncture as debt reduction has become a key policy target in a number of advanced economies. In the EU, new provisions in the Stability and Growth Pact require member states with a public debt to GDP ratio higher than 60% to act to put it on a downward path so as any excess of the ratio over the said threshold decreases by 1/20th on a 3-year rolling basis.

In the case of Greece, an aggressive fiscal consolidation effort has been undertaken since the outbreak of the sovereign debt crisis and the subsequent signing of the first and the second (present) economic adjustment program. This effort has led to a cumulative adjustment of 19.4ppts of GDP in the *cyclically adjusted* primary fiscal balance, to a surplus of 5.8%-of-GDP in 2013, from a deficit of 13.6%-of-GDP in 2009.[5] Despite this unprecedented improvement (and a number of steps taken in 2012 to restructure privately-held Greek public debt), the country's general government debt ratio has actually increased by 45.3ppts since 2009, reaching 175%-of-GDP at the end of 2013. This development naturally raises the question of whether Greece's fiscal adjustment is actually a "self-defeating" proposition, in the sense that the implementation of aggressive fiscal consolidation may prove counterproductive as austerity in a depressed economy can erode the fiscal balance and worsen debt dynamics on a sustained basis.[6]

The specter of self-defeating consolidations was initially raised in Gros (2011), where a simple framework was utilized to show that austerity could indeed increase the debt ratio in the short-run. However, Gros does not examine the impact of repeated episodes of tightening; neither does he explore the implications of multiplier persistence, two key factors that have been subsequently examined in several empirical studies[7] and are arguably relevant to the Greek case.

[1] Fiscal multipliers are defined as the ratio of a change in output to an exogenous change in the fiscal deficit with respect to their baselines.
[2] See for instance, Auerbach and Gorodnichenko (2011); Baum and Koester (2011); Batini et al. (2012); and Blanchard and Leigh (2013).
[3] A recent literature review by Mineshima et al, (2013), which updates earlier IMF estimates by Spilimbergo and others (2009), finds first-year multipliers of about 0.8 for government spending and about 0.3 for revenue measures. Since about two-thirds of recent fiscal adjustments in advanced economies rely on spending measures, this implies an average overall impact multiplier of ca 0.6 (see Eyraud and Weber, 2013).
[4] Monokroussos and Thomakos (2012), *"Fiscal multipliers in deep economic recessions and the case for a 2-year extension in Greece's austerity programme"*; Eurobank Global Markets Research, Oct. 2012.
[5] IMF Fiscal Monitor, April 2014.
[6] Delong and Summers (2012) argue that under certain conditions even a small amount of "hysteresis" – even a small shadow cast on future potential output by the cyclical downturn – means, by simple arithmetic, that expansionary fiscal policy is likely to be self-financing.
[7] See e.g. European Commission (2012); Eyraud and Weber (2013).

This study presents a simulation exercise for Greece to highlight the effects of the applied fiscal austerity program on the debt ratio and other important fiscal metrics. The paper employs the stock-flow accounting identity, known as the intertemporal budget constraint, to study the evolution of the Greek public debt ratio under different assumptions regarding: **a)** the size and the degree of persistence of fiscal multiplies; **b)** the size and the implementation profile of the applied fiscal adjustment; and **c)** the response of financial markets to fiscal consolidation (myopic vs. forward-looking markets).

The main results of our study are summarized below:

- Other things being equal, the chances of a "self-defeating" consolidation increase with the initial debt level, the size of the fiscal multiplier and its persistence.
- In view of Greece's present elevated debt ratio, a fiscal adjustment can lead to an initial (contemporaneous) rise in the debt ratio if the fiscal multiplier is higher than around 0.5
- The chance of a self-defeating consolidation also increases if financial markets act myopically, by placing a disproportionate weight on the initial rise in the debt ratio following a fiscal policy tightening.
- To a large extent, Greece has been sealed from the latter effect, as more than 80% of its public debt is currently held by the official sector at concessional interest rates that are expected to decrease further following a new debt relief package (to be provided before the end of 2014).
- Despite the unprecedented improvement in Greece's underlying fiscal position since 2010, the concomitant increase in the country's public debt ratio can be mainly attributed to the ratio's elevated initial level, a very wide initial structural deficit as well as the deep economic recession. The aforementioned factors have led to an increase in the debt ratio, that is likely to prove temporary, in our view.
- Notwithstanding its negative initial effects on domestic economic activity, the enormous fiscal effort undertaken in the last 4-5 years leaves the country's debt ratio in a more sustainable path relative to a range of alternative scenarios assuming no adjustment or a more gradual implementation profile of fiscal consolidation.

The rest of the paper is structured as follows, **Chapter 2** provides some unpleasant arithmetic of fiscal consolidations**; Chapter 3** presents the main results of our simulation exercise and analyzes their policy implications; and **Chapter 4** concludes.

2. Some unpleasant arithmetic of fiscal consolidation

2.1 Why fiscal consolidation can lead to an initial rise in the debt ratio

In the absence of any stock-flow adjustments, the government debt-to-GDP ratio evolves according to the following (approximate) formula:

$$b_t = b_{t-1}(1+r_t - g_t) - pbal_t \quad (1)$$

where ***t*** is the time subscript (years); b_t is the public debt ratio in year *t*; ***pbal*** is the primary budget balance to GDP ratio; ***g*** represents nominal GDP growth; and ***r*** is the average nominal effective interest rate on debt. In the present study, the latter variable is proxied by the ratio of total interest expenditure in year *t* over the public debt stock of year *t-1*.

By definition, the general government balance is the sum of a cyclical component and a structural component:

$$\mathbf{bal_t = cab_t + cb_t} \quad (2)$$

where ***cab*** is the cyclically adjusted general government balance and ***cb*** is the cyclical component of the balance. The cyclical component varies proportionally to the percentage difference of GDP to the respective baseline, with a coefficient equal to the semi-elasticity of budget balance, ***ε***.

In line with Bussard et al. (2012) and other recent studies[8], the size of the annual structural fiscal effort is represented by the annual change in the cyclically adjusted primary balance. Therefore, a permanent fiscal consolidation (or expansion) in year *t* constitutes a change in $\boldsymbol{cab_t}$ that remains constant (with respect to the baseline) throughout all years onwards.

The fiscal multiplier, $\boldsymbol{m_t}$, of year *t* is defined as the ratio of nominal GDP over a decrease (increase) in the cyclically adjusted primary balance:

$$\mathbf{m_t = d(Y_t) / d(CAPB_t)} \quad (3)$$

where, ***d*** is the first-differencing operator, ***Y*** represents GDP in levels and ***CAPB*** is the cyclically adjusted primary budget balance in levels.

From equations (1)-(3) and after some arithmetic manipulations,[9] it can be shown that a fiscal consolidation in year *t* leads to a contemporaneous increase in the debt ratio (i.e., $\mathbf{d(b_t)/d(cabp_t) \geq 0}$) if the following condition is met:

$$\mathbf{m_t \geq 1 / [b_{t-1}(1+g_t) + \varepsilon]} \quad (4)$$

which, for a small *g* can be approximated by the following formula:

$$\mathbf{m_t \geq 1 / (b_{t-1} + \varepsilon)} \quad (4.1)$$

For the case of Greece, taking as a reference ratio the country's Maastricht debt ratio of 2011 (170.3% of GDP) and a budgetary semi-elasticity of 0.43 (see European Commission, 2012), the *critical* value of the fiscal multiplier that prevents a (contemporaneous) rise in the in the debt ratio following a fiscal adjustment in year t is around 0.47. In other words, a fiscal adjustment undertaken in year *t* (here, t=2011) would lead to an initial rise in the debt ratio if the size of the fiscal multiplier in that year is equal or greater than 0.47.

Conclusion 1

In view of Greece's present elevated debt ratio, a fiscal adjustment can lead to an initial (contemporaneous) rise in the debt ratio if the fiscal multiplier is higher than ca 0.5

[8] See e.g. European Commission (2012, 2013)
[9] See e.g. Bussard et al. (2012)

2.2 Multiplier persistence

As we have explained in the previous section, fiscal consolidations may have negative short-run repercussions not only for economic activity but also for aggregate fiscal metrics, especially in the presence of a high initial debt ratio and fiscal multipliers significantly higher than these documented in early studies. To get a clearer understanding of the effects of fiscal austerity on the debt ratio, let us consider the following (approximate) relation, which under certain simplifying assumptions describes the contemporaneous (i.e., first year) change in the debt ratio following a 1 percent of GDP consolidation relative to a given baseline[10]:

$$\Delta(\text{debt\_ratio}) * 100 \approx -1 + \text{multiplier} * \text{debt\_ratio} + \text{multiplier} * \text{revenue\_ratio} \quad (5)$$

For a country featuring a debt ratio of, say, 100%, a revenue ratio of 40% and a fiscal multiplier of 0.6, a discretionary fiscal tightening of 1ppt-of-GDP lowers the debt ratio (relative to the no-policy-change baseline) by only 0.16% of GDP in the first year. That is, assuming all others factors remaining unchanged. In the case of Greece, given the country's current debt ratio (ca. 175%-of-GDP at the end of 2013) and the present general government revenue ratio (ca. 44%-of-GDP), a fiscal multiplier of, say, 1 means that a fiscal tightening of 1ppt-of-GDP would actually increase the debt ratio by 0.45 ppts-of-GDP (relative to the baseline of no consolidation) in the year that the fiscal consolidation is implemented.

In equation (5) above, the first term (*-1*) in the right-hand side represents the (positive) direct effect of fiscal consolidation that improves one-to-one the primary fiscal budget and thus, it has a reducing effect on the debt ratio. However, this positive impact is partially offset (and, in certain instances, more than outweighed) by the effects of declining output on government revenues through the interplay of automatic stabilizers; this (*numerator*) effect is represented by the last term on the right-hand side of the above equation i.e., *multiplier*revenue_ratio*. In addition to that, the decline in economic activity following fiscal tightening reduces the denominator of debt-to-GDP, exerting an increasing effect on the said ratio; the latter effect is represented by the second term in the right-hand side of equation (5) and it is known as the *denominator* effect.

Note that the analysis above describes the contemporaneous (*i.e.*, same year) dynamics of the debt ratio following a 1ppt of GDP fiscal consolidation, under the assumption of a constant average effective interest rate on the overall debt stock. But, what happens if the effects of fiscal consolidation on output persist beyond the year that fiscal consolidation is implemented? What if one assumes that financial markets react in a certain way to a discretionary fiscal policy change *e.g. myopically*, by concentrating only on the initial rise in the debt ratio (and thus, demanding a higher risk premium in holding the country's debt) or, alternatively, in a more normal i.e., *forward looking* manner, by demanding a lower risk premium on sovereign debt and thus, compressing the sovereign bond yield spreads? Finally, what happens in the case of repeated consolidations, a situation more akin to the Greek case, given the huge fiscal consolidation implemented over the last 5 years?

Delong and Summers (2012) suggest that in a depressed economy even a small amount of "hysteresis" - i.e., a small impact on potential output due to the economic downturn – means, by simple arithmetic, that expansionary fiscal policy is likely to be self-financing. Although the authors clarify that their argument "does not justify unsustainable fiscal policies, nor does it justify delaying the passage of legislation to make unsustainable fiscal policies sustainable" it is clear to us that the notion of hysteresis takes particular importance for fiscal consolidations undertaken during deep economic downturns, where multipliers are likely to be both high and persistent *i.e.*, their recessionary effects stretch well beyond the year that fiscal adjustment is applied.

Conclusion 2

Other things being equal, the chances of a self-defeating consolidation increase with the initial debt level, the size of the multiplier and its persistence.

[10] See Eyraud and Weber (2013).

2.3 Market reaction to fiscal consolidation

From the intertemporal budget constraint in equation (1) that describes debt dynamics, it is apparent that the debt ratio increases with the nominal effective interest rate on debt. Thus, assuming that the initial (year *t-1*) debt ratio is 100% of GDP, the average nominal effective interest rate on debt is 4.50%, nominal GDP growth in year *t* is 0.0% and the primary fiscal balance is 0.0% of GDP, then in the absence of stock-flow adjustments, the rise in the debt ratio in year *t* will be 4.5ppts of GDP. This simple arithmetic example demonstrates the importance of market reaction to a fiscal consolidation policy, especially in cases where fiscal adjustment leads to an initial rise in the debt ratio. To address this issue, the recent literature distinguishes between *myopic* markets and more normal i.e., *forward looking* markets, depending on the sovereign bond yield sensitivity to the thrust of the fiscal consolidation effort and the subsequent change in the debt ratio.

In order to take account of these influences, Boussard et al. (2012) parameterize the change in the average effective interest rate on debt as follows:

$$d(r_t)/d(capb_t) = \mu + \gamma^*[d(b_{t+h})/ d(capb_t)] \quad (6)$$

where $d(r_t)/d(capb_t)$ depicts the change in the average effective interest rate on debt per one unit change in the cyclically-adjusted primary fiscal balance-to-GDP ratio, μ is the yield sensitivity to fiscal consolidation and γ is the yield sensitivity to the debt ratio in year $t+h$ (for $h \geq 1$). Here, parameter h, the horizon of financial markets, plays a key role. In particular, $h=1$ and $\gamma>0$ indicate that markets exhibit a high degree of myopia by concentrating on the initial rise in the debt ratio following consolidation and thus, demanding a higher risk premium for holding the country's sovereign debt. On the other hand, for cases where $\mu<0$, $\gamma>0$ and h is much higher than 1, markets behave in a more normal (i.e., forward-looking) manner, by concentrating on the longer-term fiscal consolidation impact on the debt ratio and thus, demanding a lower risk premium.

Conclusion 3

Ceteris paribus, the chances of self-defeating consolidation increase if financial markets act myopically, by placing a disproportionate weight on the initial rise in the debt ratio following a fiscal policy tightening. It is important to note here that, to a large extent, Greece has been sealed from this effect, as more than 80% of its public debt is currently held by the official sector at concessional interest rates that are expected to decrease further following a new debt relief package (expected before the end of 2014).

3. The case of Greece – A simulation exercise

This section presents a simulation exercise, which aims to a) measure the effects on public debt of the fiscal austerity measures that have been implemented in Greece since 2010; and b) to evaluate the chances of "self-defeating" consolidation.

The results of the simulation exercise (and a brief description of underling scenarios) are depicted in Tables A & B at the end of this section. Furthermore, Table 3 (Annex) shows the evolution of Greek public debt over the period 2011-2030, under a macroeconomic scenario which broadly evolves in line with the revised troika debt sustainability analysis for Greece[11] and also assumes that a new debt relief package (OSI) is provided before the end of 2014.

[11] European Commission (April 2014) and IMF (July 2013).

In our exercise, the latter is assumed to incorporate: i) a 20-year extension in the average maturity of EU bilateral loans disbursed to Greece in the context of the 1st adjustment program (GLF); ii) a further reduction of the interest rate charged on these loans (to 0.6% fixed, from 3m euribor + 50bps, currently); and iii) a 10 year deferral of GLF interest payments.[12] The reason for incorporating the above relief structure in Table 3 is to ensure that the revised official targets for the debt ratio in 2020 and 2022 (around 125% of GDP and 112% of GDP, respectively) are met, under the assumed baseline macro scenario.

Both Tables A & B below assume that 2010 is the first year that fiscal consolidation is implemented and thus, all relevant variables take their realized values for the year 2009.[13] Specifically:

Year t_0=2009 assumptions

- General government primary fiscal deficit equals 10.5% of GDP;
- Cyclically adjusted primary fiscal deficit equals 13.6% of (potential) GDP;
- Nominal effective interest rate on debt equals 4.5%;
- Nominal GDP growth equals -0.9%;
- Debt to GDP ratio equals 129.8% (b_0= 129.8%).

Our exercise also examines two initial values for the first-year (impact) multiplier; namely **-1.5** "high multiplier" and **-0.5** "low multiplier", while *persistence* is incorporated in our simulation framework by assuming that the multiplier follows the convex, autoregressive decaying path analyzed in Table 4 of the Annex. In our simulation, "high persistence" corresponds to the following parameter values: **α=0.8 & β=0**; and "low persistence" to the following values: **α=0.5 & β=-0.2**.

Finally, the simulation scenarios presented in Tables A & B assume a budgetary semi-elasticity with respect to GDP equal to **0.43**.

In more detail,

Table A simulates the path of Greek public debt ratio over the period 2010-2020 assuming that: nominal GDP growth evolves in line with potential GDP growth (realized and projected); the average nominal interest rate on debt is fixed at its 2009 realized value (4.50%) throughout the entire projection horizon (2010-2020); other debt creating flows (besides the snowball effect and the primary balance) are assumed to be fixed at 0.0% of GDP from 2010 onwards; and there are varying degrees of fiscal adjustment, identified by the assumed path of the annual change in the cyclically-adjusted primary fiscal balance. These paths are briefly described below (see also explanatory note of Table A):

Scenario 0 - *"Counterfactual_ high-multiplier / high persistence"* assumes no fiscal consolidation from 2010 onwards (*i.e.*, annual change in the cyclically-adjusted primary balance = 0.0% of GDP).

Scenario 1- *"Full_ frontloaded adjustment_ high-multiplier / high persistence"* assumes that Greece timely implements the full adjustment (realized and projected) envisaged in its present bailout program (*i.e.*, annual change in the cyclically-adjusted primary balance evolves in line with the program's present baseline scenario).

[12] A more detailed analysis on this debt relief structure is provided in Greece Macro Monitor, "*The economic and market significance of the new 5-year government bond issue- Resumed market access and a new debt relief package will greatly lessen the need for additional official sector financing*", Eurobank Global Markets Research, April 15, 2014.
http://www.eurobank.gr/Uploads/Reports/GREECE_MACRO_FOCUS_April15_2014_5Y_Bond_issue.pdf
[13] European Commission (April 2014) and IMF Fiscal Monitor (April 2014).

.Scenario 2 - *"Partial adjustment_ high multiplier / high persistence"* assumes annual changes in the cyclically adjusted primary balance in 2010-2016 that are half the size of these assumed in the baseline (*i.e.*, Scenario 1); from 2017 onwards, respective annual changes are assumed to be equal to these envisaged in Scenario 1.

Scenario 3 - *"Gradual adjustment 1_ high multiplier / high persistence"* assumes annual changes in the cyclically adjusted primary balance in 2010-2016 that are equal to the arithmetic average of the cumulative size of fiscal effort assumed in Scenario 1; from 2017 onwards, respective annual changes are assumed to be the same with these envisaged in Scenario 1.

Scenario 4 - *"Gradual adjustment 2_ high multiplier / high persistence"* assumes that the cumulative change in the cyclically adjusted primary balance in 2010-2016 that materializes in Scenario 1 is now taking place (equiproportionally) over a longer implementation horizon (i.e., over the period 2010-2023);

Scenario 5 - *"Full_ frontloaded adjustment_ high-multiplier / low persistence"* is the same as Scenario 1, assuming instead a high impact multiplier value and low persistence.

Scenario 6 - *"Full_ frontloaded adjustment_ low multiplier / low persistence"* is the same as Scenario 1, assuming instead a low impact multiplier value and low persistence.

The key take away from the graphical depiction of the aforementioned scenarios in Table A is that despite an initial (temporary) rise in the debt ratio under *full_frontloaded adjustment* (above the levels envisaged in all other scenarios), the former is clearly superior from a fiscal sustainability perspective, as all other scenarios lead to either explosive debt dynamics or a stabilization of the debt ratio at much higher levels relative to the baseline. A similar conclusion is drawn from the inspection of Table B, with the main difference now being that the latter table incorporates different assumptions as regards GDP growth (realized and projected). In more detail,

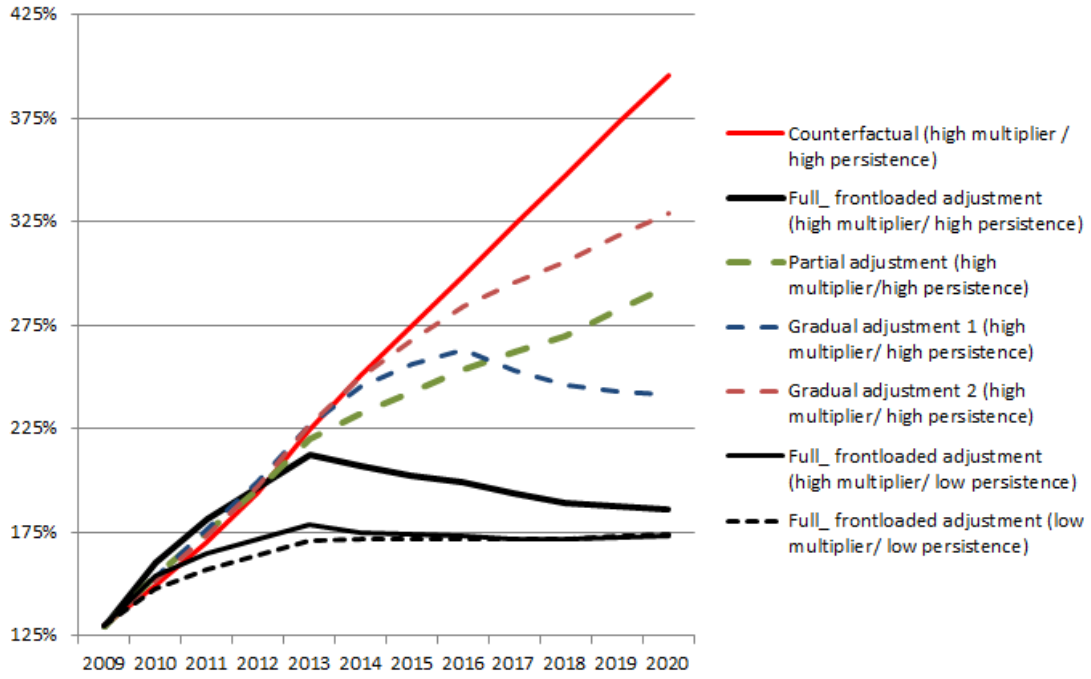
Table B incorporates the same assumptions as Table A as regards: a) the initial values of all relevant variables in year 2009; b) impact multipliers and persistence parameters; and c) fiscal adjustment paths. However, the main difference with the scenarios presented in the previous table is that Table B incorporates the realized GDP values (2010-2013) and the GDP projections envisaged in Greece's present economic adjustment program. This effectively renders our baseline "full adjustment" scenario in Table B tantamount to the present baseline DSA scenario of the Greek adjustment program.[14] Note also that all alternative scenarios (*i.e.*, other than the "full adjustment" baseline) assume similar paths for the nominal effective interest rate and stock-flow adjustments with these envisaged under the baseline. The only exception to this is the *"No adjustment_nominal IR on debt fixed at 2009 level"* scenario, which instead assumes that the average interest rate on debt is fixed at its 2009 value (4.50%) throughout the entire projection horizon. These assumptions effectively benefit (to a significant degree) all alternative *no-full-adjustment* scenarios, as they allow them to take advantage of the effects of *e.g.* the PSI+ and the debt buyback operation conducted in 2012. They also allow them to benefit from the concessional rates on official loans provided to Greece after the country fulfilled major prior actions and milestones in the context of its adjustment programs. Another alternative scenario (not shown in Table B) incorporating realized and projected market rates and bond yield spreads leads to an even steeper explosive path for the debt ratio than these depicted by the *no consolidation scenarios* in Table B. The main take away of all these is summarized below:

[14] European Commission (April 2014).

Conclusion 4

Despite the unprecedented improvement in Greece's underlying fiscal position since 2010, the concomitant increase in the country's public debt ratio can be mainly attributed to its elevated initial level, a very wide initial structural deficit as well as the deep economic contraction that led to an initial increase in the ratio, which is likely to prove temporary. Notwithstanding its negative initial effects on domestic economic activity, the enormous fiscal effort undertaken in the last 4-5 years leaves the country's debt ratio in a more sustainable path relative to a range of alternative scenarios assuming no adjustment or a more gradual implementation profile of fiscal consolidation.

Table A – Greece: Debt-to-GDP ratio evolution, under *full, partial* and *no* fiscal adjustment scenarios; baseline nominal GDP growth = potential GDP growth (realized & projected) from 2010 onwards



Source: EC (April 2014); IMF (April 2014); Eurobank Global Markets Research

Notes

Year t_0 = 2009 assumptions

- General government primary fiscal deficit equals 10.5% of GDP;
- Cyclically adjusted primary fiscal deficit equals 13.6% of (potential) GDP;
- Nominal effective interest rate on debt equals 4.5%;
- Nominal GDP growth equals -0.9%;
- Debt ratio equals 129.8% (b_0 = 129.8%).

Multiplier assumptions

- Impact multiplier values: "high" = -1.5; "low" = -0.5;
- Multiplier persistence parameter values": "high persistence" ($\alpha = 0.8$; β=-0.2); "low persistence" ($\alpha = 0.5$; β=0);

Automatic stabilizer assumption

– Primary balance semi-elasticity with respect to GDP equals 0.43.[15]

Scenario 0 - ***"Counterfactual_ high-multiplier / high persistence"***

– Nominal GDP growth = Potential GDP growth (realized & projected)

2010-2015: in line with IMF WEO (April 2014); FY-2020: in line with IMF's 4th review of Greek program (July 2013); 2015-2020: gradual convergence towards 2020 value;

– Annual change in cyclically adjusted primary balance (*i.e.*, our proxy for the size of fiscal effort) equals 0.0% from 2010 onwards (no fiscal adjustment scenario);
– Average nominal interest rate on debt fixed at FY-2009 realized value (4.50%) from 2010 onwards;
– Other debt creating flows (besides the snowball effect and the change in the primary balance) are assumed to be fixed at 0.0% of GDP from 2010 onwards.

Scenario 1 - ***"Full_ frontloaded adjustment_ high-multiplier / high persistence"***

– Nominal GDP growth (before incorporating fiscal multiplier impact) = Potential GDP growth;
– Annual change in cyclically adjusted primary balance (*i.e.*, our proxy for the size of fiscal effort) assumed to evolve in line with IMF's (WEO April 2014) realizations and projections (full fiscal adjustment scenario);
– Average nominal interest rate on debt fixed at FY-2009 realized value (4.50%);
– Other debt creating flows are assumed to be fixed at 0.0% of GDP from 2010 onwards.

Scenario 2 - ***"Partial adjustment_ high multiplier / high persistence"***

– Annual changes in cyclically adjusted primary balance (i.e., our proxy for the size of fiscal effort) in 2010-2016 are assumed to be half of these assumed in *Scenario 1*; from 2017 onwards, respective annual changes are assumed to be equal to these envisaged in Scenario 1;
– All other assumptions same as in *Scenario 1*.

Scenario 3 - ***"Gradual adjustment 1_ high multiplier / high persistence"***

– Annual change in cyclically adjusted primary balance (i.e., our proxy for the size of fiscal effort) in 2010-2016 is assumed to be equal to the arithmetic average of the cumulative size of fiscal effort assumed in Scenario 1; from 2017 onwards, respective annual changes are assumed to be the same with these envisaged under Scenario 1;
– All other assumptions same as in *Scenario 1*.

[15] See European Commission, "Effects of fiscal consolidation envisaged in the 2013 Stability and Convergence Programmes on public debt dynamics in EU Member States". Economic Papers 504/Sept 2013.

Scenario 4 - *"Gradual adjustment 2_ high multiplier / high persistence"*

- Cumulative change in cyclically adjusted primary balance in 2010-2016 under Scenario 1 is here assumed to take place (equiproportionally) over a longer implementation horizon (i.e., over the period 2010-2023);
- All other assumptions same as in *Scenario 1*.

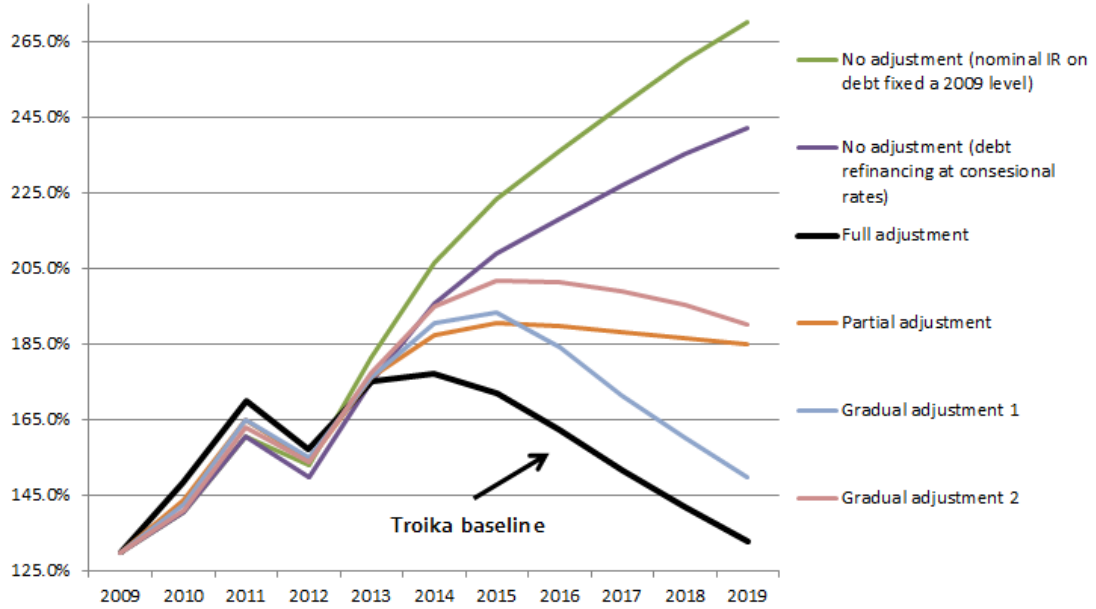
Scenario 5 - *"Full_ frontloaded adjustment_ high-multiplier / low persistence"*

- Same as Scenario 1, with "low" multiplier persistence parameter values.

Scenario 6 - *"Full_ frontloaded adjustment_ low multiplier / low persistence"*

- Same as Scenario 1, with "low" impact multiplier value and "low" multiplier persistence parameters.

Table B – Greece: Debt-to-GDP ratio evolution, under *full*, *partial* and *no* fiscal adjustment scenarios; baseline nominal GDP growth from 2010 onwards in line with revised Greek adjustment program baseline



Source: EC (April 2014); IMF (April 2014); Eurobank Global Markets Research

Notes

Year t_0=2009 assumptions

- General government primary fiscal deficit equals 10.5% of GDP;
- Cyclically adjusted primary fiscal deficit equals 13.6% of (potential) GDP;
- Nominal effective interest rate on debt equals 4.5%;
- Nominal GDP growth equals -0.9%;
- Debt ratio equals 129.8% (b_0= 129.8%).

Multiplier assumptions

- Impact multiplier values: "high" = -1.5 in 2010-2015; "low" = -0.5, from 2016 onwards;
- Multiplier persistence parameter values": "high persistence" (α = 0.8; β=-0.2) in 2010-2015; "low persistence" (α = 0.5; β=0) from 2016 onwards.

Automatic stabilizer assumption

– Primary balance semi-elasticity with respect to GDP equals 0.43.[16]

Scenario o - *"Full adjustment"*

– Underlying assumptions same as in Greece's present economic adjustment program (baseline scenario).[17]

Scenario 1 - "No adjustment_ nominal IR on debt assumed fixed at 2009 level"

– No fiscal consolidation in 2010-2020 (i.e., annual change in cyclically adjusted primary balance assumed equal to 0.0%);
– Nominal GDP growth in 2010-2020 calculated by extracting from baseline scenario (*Scenario 0*) the effects of fiscal consolidation assumed in Scenario 0;
– Average nominal interest rate on debt fixed at FY-2009 realized value (4.50%) from 2010 onwards;
– All other assumptions same as in *Scenario 0*.

Scenario 2 - *"No adjustment_ debt refinancing at concessional rates"*

– No fiscal consolidation in 2010-2020 (i.e., annual change in cyclically adjusted primary balance assumed equal to 0.0%);
– Nominal GDP growth in 2010-2020 calculated by extracting from baseline scenario (*Scenario 0*) the effects of fiscal consolidation assumed in *Scenario 0*;
– Evolution of annual average nominal interest rate on debt assumed equal to that envisaged in *Scenario 0* (baseline);
– All other assumptions same as in *Scenario 0*.

Scenario 3 - *"Partial adjustment"*

– Annual changes in cyclically adjusted primary balance (i.e., our proxy for the size of fiscal effort) in 2010-2016 are assumed to be half of these assumed in *Scenario 0*; from 2017 onwards, respective annual changes are assumed to be equal to these envisaged in Scenario 0;
– Nominal GDP growth in 2010-2020 calculated by extracting from *"No adjustment"* scenario (*Scenario 1*) the effects of fiscal consolidation assumed in *Scenario 3*;
– All other assumptions same as in *Scenario 0*.

Scenario 4 - *"Gradual adjustment 1"*

– Annual change in cyclically adjusted primary balance (i.e., our proxy for the size of fiscal effort) in 2010-2016 is assumed to be equal to the arithmetic average of the cumulative size of fiscal effort assumed in Scenario 0; from 2017 onwards, respective annual changes are assumed to be the same with these envisaged under Scenario 0;
– Nominal GDP growth in 2010-2020 calculated by extracting from *"No adjustment"* scenario (*Scenario 1*) the effects of fiscal consolidation assumed in *Scenario 4*;
– All other assumptions same as in *Scenario o*.

[16] See European Commission, "Effects of fiscal consolidation envisaged in the 2013 Stability and Convergence Programmes on public debt dynamics in EU Member States"; Economic Papers 504/Sept 2013.
[17] European Commission (April 2014); IMF (July 2013), Eurobank Global Markets Research.

Scenario 5 - *"Gradual adjustment 2"*

- Cumulative change in cyclically adjusted primary balance in 2010-2016 under Scenario 0 is here assumed to take place (equiproportionally) over a longer implementation horizon (i.e., over the period 2010-2023);
- Nominal GDP growth in 2010-2020 calculated by extracting from *"No adjustment"* scenario (*Scenario 1*) the effects of fiscal consolidation assumed in *Scenario 5*;
- All other assumptions same as in *Scenario o*.

References

Aktas, Arda; Tiftik & Mehmet Emre, 2009, "Measuring Fiscal Sustainability for Practical Use in Short-Term Policy Making", Topics in Middle Eastern and North African economies: Proceedings of the Middle East Economic Association.- Chicago, Ill : Loyola University, ZDB-ID 21134662.- Vol. 11.2009, p. 1-18.

Alesina, Alberto,2010, "Fiscal adjustments: lessons from recent history", Ecofin meeting in Madrid April 15 2010.

Amo-Yartey, Charles; Narita, Machiko; Nicholls, Garth Peron, Okwuokei, Joel Chiedu; Peter, Alexandra & Turner-Jones, Therese, 2012, "The Challenges of Fiscal Consolidation and Debt Reduction in the Caribbean", IMF Working Paper 12/276.

Andersen, Torbe M., 2012, "Fiscal sustainability and fiscal policy targets", Aarhus University, Business Department of Economics and Business, Economic Working Papers 2012-2015.

Angello, Luca; Castro, Vitor & Sousa, Ricardo, 2013, "What determines the duration of a fiscal consolidation program?", Faculdade de Economia da Universidade de Coimbra.

Auerbach, Alan J.& Gorodnichenko, Yuriy , 2010, "Measuring the output responses to fiscal policy", NBER Working Paper Series, Working Paper 16311

Bagaria, Nitika; Holland, Dawn & van Reenen, John, 2012, "Fiscal Consolidation During a Depression", Project LINK Meeting on the World Economy, National Institute of Social and Economic Research.

Baldacci, Emanuele; Gupta, Sanjeev & Mulas-Granados, Carlos, 2013, "Debt Reduction, Fiscal Adjustment, and Growth in Credit-Constrained Economies ", IMF Working Paper No. 13/238.

Barrell, Ray; Holland, Dawn & Hurst, Ian, 2012, "Fiscal Consolidation: Part 2. Fiscal Multipliers and Fiscal Consolidations", OECD Economics Department Working Papers No. 933.

Batini, N.; G. Callegari, & G. Melina, 2012, "Successful Austerity in the United States, Europe and Japan," IMF Working Paper 12/190 (Washington: International Monetary Fund).

Baum, Anja; Koester, Gerrit B., 2011, "The impact of fiscal policy on economic activity over the business cycle : evidence from a threshold VAR analysis", Discussion paper / Deutsche Bundesbank / Series 1, Economic studies ; 03/2011.

Berti,, Katia; de Castro, Francisco & Salto, Matteo, 2013, "Effects of fiscal consolidation envisaged in the 2013 Stability and Convergence Programmes on public debt dynamics in EU Member States," European Commission Economic Papers No 504.

Bi, Ran; Qu, Haonan, & Roaf, James, 2013, "Assessing the Impact and Phasing of Multi-year Fiscal Adjustment: A General Framework", IMF Working Paper 13/182.

Blanchard, Olivier & Leigh, Daniel, 2013, "Growth Forecast Errors and Fiscal Multipliers", IMF Working Paper 13/1.

Boussard, Jocelyn; de Castro, Francisco & Salto, Matteo, 2012, "Fiscal Multipliers and Public Debt Dynamics in Consolidations," European Commission Economic Papers No 406.

Cafiso, Gianluca & Cellini, Roberto, 2012, "Evidence on Fiscal Consolidations and the Evolution of Public Debt in Europe", CESifo Working Paper: Policy, Macroeconomics and Growth, No. 4027.

Chalk, Nigel & Hemming, Richard, 2000, "Assessing Fiscal Sustainability in Theory and Practice," IMF Working Paper No. 00/81.

Cherif, Reda & Hasanov, Fuad, 2012, "Public Debt Dynamics: The Effects of Austerity, Inflation, and Growth Shocks", IMF Working Paper No. 12/230.

Delong, J. Bradford & Summers, Lawrence H., 2012, "Fiscal Policy in a Depressed Economy ", Brookings Papers on Economic Activity, Spring 2012, The Brookings Institution.

Eyraud, Luc & Weber, Anke, 2013, "The Challenge of Debt Reduction during Fiscal Consolidation," IMF Working Paper No. 13/67.

Favero, Carlo & Giavazzi, Francesco, 2008, "Debt and the Effects of Fiscal Policy".

Gros, Daniel, 2012, "Can Austerity Be Self-defeating?", CEPS, Intereconomics : review of European economic policy.- Berlin : Springer, ISSN 1613-964X, ZDB-ID 2066476X. - Vol. 47.2012, 3, p. 175-184.

Hernández de Cos & Jimeno, Juan F., 2013, "Fiscal policy and external imbalances in a debt crisis: The Spanish case", Banco di Espana, Documentos Ocasionales N. 1303.

IMF Fiscal Monitor 2014.

Kanda, Daniel, 2011, "Modeling Optimal Fiscal Consolidation Paths in a Selection of European Countries ", IMF Working Paper No. 11/164.

Koutsogeorgopoulou, Vassiliki & Turner, David, 2007, "The Costs of Delaying fiscal Consolidation-A Case Study for Greece", OECD Economics Department Working Papers No. 582.

Locarno, Alberto; Notarpietro, Alessandro & Pisani, Massimiliano, 2013, "Fiscal Multipliers, Monetary Policy and Sovereign Risk:A Structural Model-Based Assessment", Bank of Italy Temi di Discussione (Working Paper) No. 943.

Mineshima, A., M. Poplawski-Ribeiro & A. Weber, 2013, "Fiscal Multipliers," in Post-Crisis Fiscal Policy, C. Cottarelli, P. Gerson, and A. Senhadji (eds.) (forthcoming; Washington, International Monetary Fund).

Monokroussos, Platon & Thomakos, Dimitris, 2012, "Fiscal Multipliers in deep economic recessions and the case for a 2-year extension in Greece's austerity programme", Economy & Markets, Global Markets Research, Eurobank Ergasias S.A.

Monokroussos, Platon & Thomakos, Dimitris, 2013, "Greek fiscal multipliers revisited – Government spending cuts vs. tax hikes and the role of public investment expenditure", Economy & Markets, Global Markets Research, Eurobank Ergasias S.A.

Rawdanowicz, Lukasz, 2012, "Choosing the Pace of Fiscal Consolidation", OECD Economics Department Working Papers No. 992.

Rother, Philipp; Schuknecht, Ludger & Stark, Jürgen, 2010, "The benefits of fiscal consolidation in uncharted waters", European Central Bank, Occasional paper series, No 121/November 2010.

Spilimbergo, A., S. Symansky, & M. Schindler, 2009, "Fiscal Multipliers," IMF Staff Position Note, SPN/09/11, May (Washington: International Monetary Fund).

Weymes, Laura, 2012, "Fiscal Consolidation - Does it deliver?", Central Bank of Ireland, Vol. 2012, No.

ANNEX

Table 1 - Main results of Eurobank Global Markets Research studies on fiscal multipliers in Greece

Monokroussos & Thomakos (2012), *"Fiscal Multipliers in deep economic recessions and the case for a 2-year extension in Greece's austerity programme"*, Greece Macro Monitor, Eurobank Research, October 2012.

http://www.eurobank.gr/Uploads/Reports/ECONOMY%20AND%20MARKETSfiscal%20multipliers.pdf

The study utilizes the **classic SVAR approach** developed in Blanchard and Perotti (2002) and extended further in Perotti (2004) for estimating output responses to discretionary fiscal shocks. It also presents a variant of the **Smooth Transition Vector Autoregression (STVAR) model** presented in Auerbach and Gorodnichenko (2011) to investigate the *time-* and *regime-dependent* properties of Greece's fiscal multiplies. The main results of the said study are summarized below:

Our Structural Vector Autoregression (SVAR) models estimate government spending multipliers that are not far away from these estimated for Greece in a number of earlier empirical studies (i.e., multipliers in the vicinity of 0.5).

- However, our (regime-switching) Smooth Transition Vector Autoregression (STVAR) models estimate strongly significant government spending multipliers that are as high as 1.32 in recessionary phases along with negative (and broadly insignificant) multipliers for periods of economic expansion.
- The latter finding is particularly pronounced for government wage expenditure, where the estimated multiplier is found to be as high as 2.35 (and strongly significant) in recessionary regimes and negative (and largely insignificant) in economic expansions.

Monokroussos & Thomakos (2013), *"Greek fiscal multipliers revisited: government spending cuts vs. tax hikes and the role of public investment expenditure"*, Greece Macro Monitor, Eurobank Global Market Research, March 2013.

http://www.eurobank.gr/Uploads/Reports/GREECE_MACRO_FOCUS_March_20_2013_2.pdf

The study employs a **Multivariate Threshold Autoregressive Model (TVAR)** that has a number of unique features that make it particularly suitable for: a) estimating regime-dependent fiscal multipliers in Greece; and b) taking a closer look at certain important government expenditure categories e.g. public investment outlays that could potentially play a key role in facilitating a return to positive economic growth. The main results of this study are summarized below:

- The response of real output to discretionary shocks in government current spending on goods and services and/or government tax revenue depends on the regime in which the shock occurs as well as on the size and direction (expansionary vs. contractionary) of the initial shock.
- In general, expansionary or contractionary shocks taking place in lower output regimes (economic downturns) appear to have much larger effects on output - both on impact and on a cumulative basis - than shocks of similar sign and size occurring in upper regimes (economic expansions).
- In lower regimes in particular, the contractionary effects on output from a negative fiscal shock (spending cut or tax hike) rise with the absolute size of the shock. In the same vein, the expansionary effects on output from a positive fiscal shock (spending hike or tax cut) increase with the absolute size of the shock. Similar effects apply for fiscal shock taking place in an upper output regime, though to a much lesser extent.

Table 2 - Fiscal multipliers: stylized facts

Recent theoretical and empirical work highlights some stylized facts on the potential size and determinants of fiscal multipliers. As pointed out in a relevant literature review by Spilimbergo et al., 2011, the size of the multiplier is large if: a) "leakages" are limited *i.e.*, only a small part of the fiscal stimulus is channeled to savings or imports; b) monetary conditions are accommodative (*i.e.*, a fiscal stimulus does not lead to an increase in the interest rate); and **c)** the country's fiscal position is deemed as sustainable following a fiscal expansion. More specifically,

a) "Leakages" are limited if:

- The propensity to import is relatively small, meaning that, ceteris paribus, large closed economies usually have larger multipliers than open economies with no barriers to trade.
- The fiscal measures mainly target *liquidity constrained* consumers. That is, an exogenous fiscal shock (*e.g.* increase in government spending) does not lead to a rise in precautionary savings in anticipation of higher taxation in the future. On the contrary, liquidity constrained households spend a significant portion of the windfall (*e.g.* wage increase or increased government purchases of goods and services that boost household income) to increase current consumption.
- The size of the automatic stabilizers (i.e., the output elasticity of government revenue and spending) is relatively small, meaning that the automatic offsets to an exogenous fiscal shock are limited.
- Domestic economic conditions are recessionary and the economy is far from its full employment equilibrium. Under such conditions, an increase in government spending does not necessarily lead to an increase in interest rates that could, in turn, crowd out private investment.
- The fiscal stimulus has a larger spending component relative to tax cuts (and vice versa), as the initial shock could have a more immediate impact on aggregate demand, while households may save part of a tax cut.
- An important point to make here is that the above condition may not apply to countries featuring unsustainable fiscal positions. In the latter case, an unwarranted fiscal expansion could further exacerbate investor worries about fiscal sustainability, leading to a further increase in sovereign bond yield spreads and domestic interest rates, causing a crowding out of private investment and reducing the multiplier.

b) Monetary conditions are accommodative if:

- A fiscal shock (*e.g.* increased discretionary government spending) does not put upward pressure on the nominal interest rate. On the latter point, a number of recent empirical studies have documented that the fiscal multiplier can rise by a factor of 2 or 3 if the nominal interest rate is at (or very close to) the lower nominal bound of zero percent (a situation akin to the Keynesian liquidity trap).
- The exchange rate is fixed.

c) Ceteris paribus, the fiscal multiplier is lower the more unsustainable a country's fiscal position is considered to be.

Table 3 – Evolution of gross public debt ratio & underlying assumptions

Scenario assumes implementation of new debt relief package involving: a) 20-year maturity extension of GLF loans; b) reducing of interest rate on GLF loans from 3m + 50bps currently to 0.6% fixed; 10-year grace on GLF interest payments

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross public debt (% GDP)	**170.2**	**157.2**	**175.0**	**177.1**	**172.1**	**162.2**	**151.7**	**142.1**	**132.7**	**124.3**
Nominal public debt (EUR bn)	354.8	303.9	318.7	322.1	323.3	319.5	313.2	307.3	300.6	293.7
Memorandoum items										
Real GDP Growth	-7.2	-7.0	-3.9	0.6	2.9	3.7	3.5	3.2	3.0	2.6
GDP deflator inflation	1.2	-0.3	-2.1	-0.7	0.4	1.1	1.3	1.5	1.7	1.7
Primary fiscal balance (% GDP)	-2.4	-1.3	0.8	1.6	3.0	4.5	4.5	4.3	4.3	4.2
Nominal interest rate on debt (%)	4.6	2.7	2.4	2.5	3.0	3.2	3.4	3.4	3.5	3.5
Nominal GDP (EURbn)	208.5	193.3	182.1	181.9	187.9	196.9	206.4	216.2	226.5	236.3
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Gross public debt (% GDP)	**117.9**	**112.6**	**107.9**	**103.7**	**100.1**	**96.2**	**92.6**	**89.2**	**85.8**	**82.4**
Nominal public debt (EUR bn)	289.7	287.6	286.3	286.1	286.8	286.6	286.8	287.0	287.2	286.7
Memorandoum items										
Real GDP Growth	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
GDP deflator inflation	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Primary fiscal balance (% GDP)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Nominal interest rate on debt (%)	3.6	3.6	3.6	3.8	4.0	4.1	4.3	4.6	4.7	4.7
Nominal GDP (EURbn)	245.7	255.3	265.4	275.8	286.7	298.0	309.7	321.9	334.6	347.8

Source: EC (April 2014); IMF (July 2013); Eurobank Global Markets Research

Table 4 – multiplier persistence

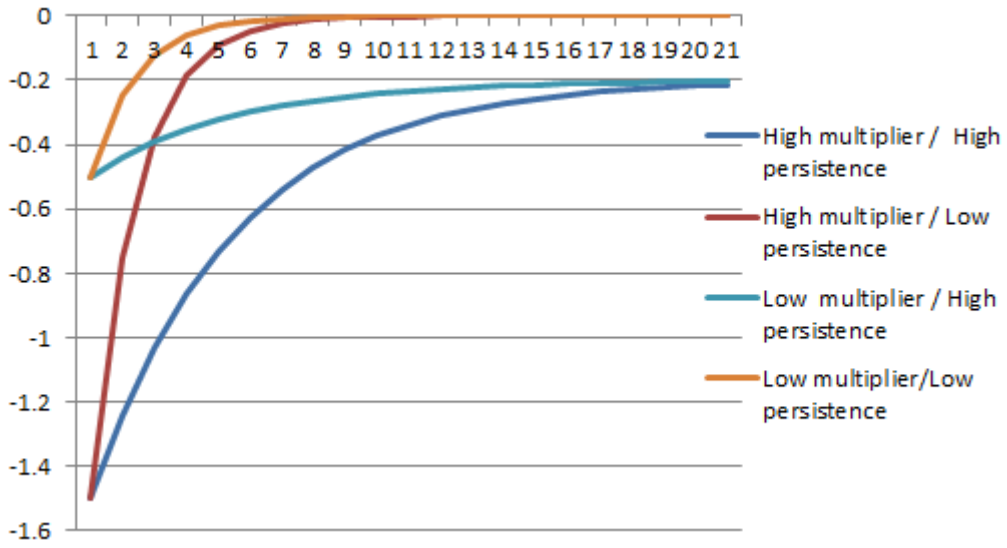
In order to incorporate multiplier persistence in our simulation exercise we follow Bussard et al. (2012) and European Commission (2012, 2013) and assume that fiscal multipliers follow the following convex, autoregressive decay path[18]:

$$m_{t,i} = (m_1 - \beta)\alpha^{i-t} + \beta$$

where, m_1 is the impact (i.e., first year) multiplier, $m_{t,i}$ is the fiscal multiplier applying in year i following a permanent fiscal shock in year t, $0 < \alpha < 1$; and no assumption made on the sign of β *i.e.*, the long-run impulse response of GDP to fiscal consolidation. A negative value of β indicates that "hysteresis" effects are present (see *e.g.* de Long and Summers, 2012). A positive one represents a situation in which a consolidation today boosts long term growth by e.g. reducing the interest rate and by lessening the crowding out on private investment.

The graph below depicts the decaying path of the fiscal multiplier assumed in the simulation exercise presented in this study. Herein, the initial value of the (impact) multiplier is assumed to take one of the following two values: **-1.5** "high multiplier" and **-0.5** "low multiplier". Moreover, "high persistence" corresponds to the following parameter values: α=0.8 & β=-0.2; and "low persistence" to the following values: α=0.5 & β=-0.

Graph - Response of GDP in years t=1,…,21 per one unit cut in cyclically adjusted primary balance in year t=1



Source: EC (September 2013); Eurobank Global Markets Research

[18] This decay function reproduces relatively well the shape of the impulse-response function by typical DSGE models for most of the permanents fiscal shocks.

Eurobank Global Markets Research

Global Markets Research Team

Dr. Platon Monokroussos: *Head of Global Markets Research*
pmonokrousos@eurobank.gr,
+30 210 37 18 903

Paraskevi Petropoulou: *G10 Markets Analyst*
ppetropoulou@eurobank.gr,
+30 210 37 18 991

Galatia Phoka: *Emerging Markets Analyst*
gphoka@eurobank.gr,
+30 210 37 18 922

Global Markets Sales

Nikos Laios: *Head of Treasury Sales*
nlaios@eurobank.gr, + 30 210 37 18 910

Alexandra Papathanasiou: *Head of Institutional Sales*
apapathanasiou@eurobank.gr, +30 210 37 18 996

John Seimenis: *Head of Corporate Sales*
yseimenis@eurobank.gr, +30 210 37 18 909

Achilleas Stogioglou: *Head of Private Banking Sales*
astogioglou@eurobank.gr, +30 210 37 18 904

George Petrogiannis: *Head of Shipping Sales*
gpetrogiannis@eurobank.gr, +30 210 37 18 915

Vassilis Gioulbaxiotis: *Head International Sales*
vgioulbaxiotis@eurobank.gr, +30 210 3718995

Eurobank Ergasias S.A, 8 Othonos Str, 105 57 Athens, tel: +30 210 33 37 000, fax: +30 210 33 37 190, email: EurobankGlobalMarketsResearch@eurobank.gr

Eurobank Global Markets Research

More research editions available at htpp://www.eurobank.gr/research

Greece Macro Monitor: Periodic overview of key macro & market developments in Greece
Daily overview of global markets & the SEE region:
Daily overview of key developments in global markets & the SEE region
South East Europe Bi-Monthly:
Monthly overview of economic & market developments in the SEE region
Global Markets & SEE themes: Special focus reports on Global Markets & the SEE region

Subscribe electronically at htpp://www.eurobank.gr/research
Follow us on twitter: https://twitter.com/Eurobank Group