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Why a relaxation of the primary fiscal target may prove to be a self-financing policy shift

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The potential for a sizeable relaxation of the bailout program's primary surplus targets may prove to be a significant long-term benefit for Greece stemming from the "constructive ambiguity" tone of the February 20 Eurogroup statement[1] That is, provided that the Greek side will honor its commitments, so as to allow the timely conclusion of the existing bailout arrangement and, in the same time, facilitate official discussions on a "possible" follow-up agreement as well as a new relief package for Greek debt[2]. In view of the above, this note presents a simulation exercise on Greek public debt under various scenarios regarding the structure of a new debt relief package and the macroeconomic impact of a potential relaxation of the primary fiscal targets. In more detail, the debt relief structure analyzed herein constitutes an extension of that presented in a couple of our earlier studies, so as to include *both* GLF bilateral loans and EFSF loans given to Greece in the context of the first and the second bailout programs. Furthermore, the macroeconomic effects of the fiscal policy easing are quantified based on a number of discrete scenarios as regards impact multipliers, multiplier persistence and the existence or not of "hysteresis" effects. All in all, our analysis demonstrates that the negative effects on public debt and cash flow dynamics implied by a potential relaxation of the multi-year primary surplus targets may be offset, to a significant extent, by higher GDP growth (denominator effect) and its beneficial impact on key fiscal metrics (numerator effect).

[1] See also, Greece Macro Monitor, "*February 20th Eurogroup Agreement on Greece: Conditionality and Implications*", Eurobank Global Markets Research, February 21, 2015

[2] Speaking in the European Parliament earlier this week, Eurogroup President Jeroen Dijssebloem referred to last week's Eurogroup decision on Greece saying that "if economic circumstances so require, fiscal targets can be adjusted within progarmmes" noting though that "this cannot be a unilateral decision of the government involved". The Eurogroup President added that, if Greece fulfils all the criteria specified in the November 2012 Eurogroup statement, euro area finance ministers could consider, if necessary, a new debt relief package at the end of the 4-month bailout extension.

Why GDP growth is the single most important determinant of public debt dynamics

As demonstrated in *Appendix I* at the end of this document, the public debt-to-GDP ratio evolves according to the following (approximate) formula[3]:

Debt_ratio $_{year\ t}$ = Debt_ratio $_{year\ t-1}$ * snowball effect – primary_balance ratio $_{year\ t}$

In other worlds, the public debt ratio in a given year *t* is derived as the product of the prior year's debt ratio *times* the snowball effect *minus* the primary fiscal balance of year *t*. Here, the snowball effect denotes the automatic decrease (increase) in the debt ratio when nominal GDP growth in year *t* rises above (falls below) the average effective interest rate in that year. In mathematical terms, the snowball effect denotes the difference between the average effective interest rate and nominal growth.

As per the latest available data and our updated estimates/forecasts[4]:

- Greece's general government gross public debt stood at c. 177.7%-of-GDP at the end of 2014; moreover,
- the average effective interest rate on the debt stock stood at c. 2.3% in 2014 and it is expected to reach 2.9% this year

Among others, the values above indicate that: *i)* ceteris paribus, the snowball effect will lead to an automatic decrease in this year's debt ratio, if 2015 nominal GDP growth turns out to be higher than 2.9%; *ii)* assuming all else being equal, for every 1ppt increase in 2015 nominal GDP growth (vs. the assumed baseline), this year's debt ratio declines by 1.77ppts; and *iii)* ceteris paribus, for every 1ppt improvement in this year's primary fiscal balance to GDP ratio, the debt ratio declines by 1ppt. Clearly, the aforementioned points demonstrate that GDP growth is indeed the single most important determinant on debt dynamics.

The role of fiscal multipliers and the risk of self-defeating fiscal consolidations

The findings above are derived by conducting a *ceteris paribus* analysis, which assumes that all other factors/drivers remain unchanged relative to a given baseline. For instance, the analysis of the previous section conceals the fact that a certain fiscal adjustment, which targets an improvement in the primary balance, may negatively affect nominal GDP growth in the short-term (or even in the long-term due to the so-called "hysteresis" effects) as well government tax revenue and social security costs[5]. This could lead to a situation where an improvement in the primary balance *does not* necessarily translate into an equiproportional improvement in the debt ratio. Even worse, a situation where an improvement in the primary balance actually exerts a temporary (or even lasting) worsening effect on debt dynamics, especially if aggressive fiscal austerity is implemented in deep recessionary environments as was the case in Greece over the last 5-6 years. The conditions for a potential realization of the latter scenario (*i.e.*, the risk of a *self-defeating* fiscal consolidation) for the case of Greece were analyzed in one of our recent research notes.[6] In more detail, taking as a reference the 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[7] that prevents a (contemporaneous) rise 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. For Greece, the existing literature and our recent empirical findings[8] suggest that, in deep economic contractions, the size of the fiscal multiplier may well exceed the aforementioned threshold and, in certain instances, be even higher than 1. (*Appendices II & II* at the end of this document provide a mathematical derivation of fiscal multipliers as well as brief literature review of their determinants and their macroeconomic effects).

[3] Among others, the said formula assumes the absence of stock-flow adjustments.
[4] See e.g., Greece's 2015 Budget and IMF Country Report No. 14/151 (June 2014).
[5] For instance, in a deep recessionary period, the government may face higher costs for unemployment benefits. Furthermore, a sharp decline in economic activity may see the incomes of a higher number of tax payers falling below the tax-exempt threshold than in normal economic times.
[6] *"The Challenge of Restoring Debt Sustainability in a Deep Economic Recession: The case of Greece",* Platon Monokroussos, GreeSE Paper No.87, Hellenic Observatory Papers on Greece and Southeast Europe, October 2014
http://www.lse.ac.uk/europeanInstitute/research/hellenicObservatory/CMS%20pdf/Publications/GreeSE/GreeSE-No87.pdf
[7] The fiscal multiplier is defined as the ratio of a change in output to an exogenous change in the fiscal deficit with respect to their baselines.
[8] Monokroussos, Platon and 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 and 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.

A simulation exercise for Greek public debt

Restructuring EU loans provided in the context of the 1st and the 2nd bailout programs

Earlier this month, Greece's Finance Minister Yanis Varoufakis was quoted in a *Financial Times* article as saying that the Greek government now aims to reach an agreement with official lenders on a "menu of debt swaps" that would involve two types of new bonds. The first, indexed to nominal economic growth, would replace European rescue loans. The second, consisting of "perpetual bonds", would replace ECB-owned Greek bonds. The Minister stated that his proposal constitutes a form of "smart debt engineering" aiming to replace the term "haircut", seen as politically unacceptable in a number of creditor EU countries. In view of the aforementioned, we present below the potential structure (and the implications) of a theoretic debt swap transaction involving the European rescue loans given to Greece in the context of the 1st and the 2nd bailout programs. The assumed transaction has many similarities with the first of the two structures suggested by Greece's Finance Minister in his recent FT interview.

Restructuring EU bailout loans

The debt relief structure analyzed in this section constitutes an extension of that presented in a couple of our earlier studies[9], so as to include *both* GLF bilateral loans and EFSF loans given to Greece in the context of the first and the second bailout programs, respectively. In more detail, this hypothetical structure assumes that a new debt relief package (OSI) for Greece is agreed with official creditors sometime in H1 2015 and involves the following transactions:

Transaction 1 - GLF loans

(i) Swap of GLF loans (€52.9bn) into a 50-year fixed coupon amortizing bond with 10-year grace period on interest payments.

(i) In our study we examine two concrete (fixed) coupon rate scenarios: 0.50% and 0.25% against a variable interest rate of 3month euribor+50bps currently applied on GLF loans.

Transaction 2 - EFSF loans

The structure under examination assumes:

(ii) 20-year maturity extension of all EFSF loans given to Greece in the context of the second bailout program[10].

(ii) 10-year grace period on interest and principal payments.

(iii) Fixing of respective interest rates applied on EFSF loans to 0.50% and 0.25% (two scenarios) against a range of variable interest rates (linked to 6month euribor or to EFSF funding cost applied currently)[11].

The stock and cash-low implications of the above transactions are presented in Tables A1 and A2.

Table A1 – Impact of EU bailout loan restructuring on Greece's general government debt ratio

	2014	2020	2022	2032
Baseline (no policy change)	177.7%	125.5%	115.1%	81.4%
GLF& EFSF loans restructuring (fixed coupon assumption 0.50%)	177.7%	126.0%	114.8%	76.2%
GLF& EFSF loans restructuring (fixed coupon assumption 0.25%)	177.7%	124.6%	113.1%	72.8%

Source: IMF (June 2014); Greek Budget 2015; Eurobank Economics Research

[9] See e.g. Greece Macro Monitor, *"Hard and soft OSI scenarios for the restructuring of Greek public debt; Stock and cash flow"*, Eurobank Economic Research, January 26, 2015.
http://www.eurobank.gr/Uploads/Reports/GREECE_MACRO_FOCUS_Jan26_2015.pdf

[10] €141.9bn released thus far. Our analysis assumes that the next and final EFSF disbursement (c. €1.8bn) takes place before the new debt relief package is agreed upon.

[11] A detail analysis of the structure and the cost of EFSF loans can be found in *"Hard and soft OSI scenarios for the restructuring of Greek public debt: Stock and cash flow implications"*, Greece Macro Monitor, Eurobank Research, January 20, 2015.

Table A2 – Cumulative impact of EU bailout loan restructuring on Greece's general government net borrowing requirement in EURbn (negative sign indicates cash-flow relief)

	year 2015	period 2015-2016	period 2015-2020	period 2015-2032
GLF& EFSF loans restructuring (fixed coupon assumption 0.50%)	-0.32	-0.61	-2.56	-57.38
GLF& EFSF loans restructuring (fixed coupon assumption 0.25%)	-0.32	-0.61	-2.56	-62.03

Source: IMF (June 2014); Greek Budget 2015; Eurobank Economics Research

Note on Tables A1 & a2
Baseline (no policy change) scenario assumes underlying drivers to evolve in line with the IMF's DSA (June 2014), which has been properly updated, taking into account Greece's 2015 Budget.
All scenarios assume that the €10.9bn HFSF buffer returns to the ESM and thus, reduces the 2015 debt ratio by an equiproportional amount.
GLF & EFSF loans restructuring scenarios as in *Transactions 1 & 2* analyzed in the text.
The euribor rates utilized in our calculations are derived from the euribor futures curve (as of February 24, 2015).
The forecast of the EFSF future funding cost curve is based on a polynomial of 5th degree fit on the current EFSF cost curve.

Restructuring of EU loans and relaxation of the bailout program's fiscal targets

Here, we extend our analysis to look at the implications of the hypothetical debt restructuring package presented in the previous section, taking also into account a potential relaxation of the bailout program's fiscal targets, as signaled by the February 20th Eurogroup. Before proceeding with our analysis, we highlight below how a certain relaxation of the primary fiscal target may impact debt dynamics.

Let's assume that a relaxation of the primary surplus target by 1%-of-GDP is implemented in year *t*. Ceteris paribus, this policy change exerts a one-to-one direct impact on public debt *i.e.,* it increases the debt ratio by 1%-of-GDP that year. However, this adverse outcome can be partially offset (and, in certain instances, more than outweighed) by two additional effects: ***i)*** the boost in nominal GDP due to the relaxation of the fiscal target (denominator effect); and ***ii)*** the potential boost in tax revenue and/or the decrease in social expenditure, as a result of higher GDP growth *i.e.,* via the interplay of automatic stabilizers (numerator effect). Arguably, the last two effects could be particularly pronounced in Greece's case, given the sharp contraction in domestic economic activity since 2009 and the still immense negative output gap, which is not expected to be absorbed before 2019-2020, at the earliest.

A well-known methodological issue in the empirical estimation of fiscal multipliers relates to the identification of purely exogenous fiscal shocks (*Appendix II*). For the purpose of our analysis, we assume that fiscal shock in year *t* is represented by the annual change in the primary balance (from year *t-1* to year *t*)[12] and we then proceed to estimate its impact on GDP growth and debt dynamics. Furthermore, we circumvent some of the methodological problems highlighted above by assuming three alternative values for the *impact* multiplier (*i.e.,* the contemporaneous impact of a fiscal shock on GDP) in conjunction with a number of discrete scenarios as regards multiplier *persistence* and *hysteresis* effects *i.e.,* the impact of fiscal austerity/relaxation on long-term economic growth (see *Appendices IV and V* at the end of this document).

In more detail, the three values for the impact multiplier assumed herein are: -1.5 "high multiplier"; -1 "intermediate multiplier"; and -0.5 "low multiplier". The interpretation of these values is as follows: for *e.g.* the "high multiplier" value, we assume that a relaxation of the fiscal target by 1 euro in year *t* leads *to* an increase *in* nominal *GDP* by 1.5 euro in that year. Furthermore, in order to incorporate multiplier persistence and hysteresis effects, we follow Boussard et al. (2012) and European Commission (2012, 2013) and assume that fiscal multipliers follow a certain convex, autoregressive decay path. Finally, the simulations presented below are based on the following two scenarios as regards the relaxation of the fiscal target: ***i)*** the primary surplus target is relaxed to 1.5%-of-

[12] The annual change in the *structural* primary balance would be a more proper metric for the fiscal shocks assumed in our study, but we avoid using that metric due to the lack of relevant data over the full forecasting horizon of our analysis.

GDP in 2015 and in the period thereafter from 3%-of-GDP this year and between 4% and 4.5% in the following years as envisaged in the present bailout program; and *ii)* the primary surplus target is relaxed to 2.0%-of-GDP in 2015 and in the period thereafter.

The results of our simulation exercise for the evolution of Greek public debt under various scenarios regarding ***a)*** the restructuring of EU bailout loans and ***b)*** the relaxation of the primary surplus target are presented in *Table B*.

Table B - Impact of EU bailout loan restructuring and relaxation of the primary surplus target on the debt ratio

Scenario 1 - No relaxation of primary surplus targets					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	168.6%	125.5%	115.1%	81.4%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	168.8%	126.0%	114.8%	76.2%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	168.5%	124.6%	113.1%	72.8%
Scenario 2.1 - Primary surplus target 1.5%-of-GDP; high impact multiplier (-1.5), high multiplier persistence & "hysteresis" effects					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	166.2%	137.7%	132.8%	126.9%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	166.4%	138.2%	132.6%	121.7%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	166.1%	136.8%	130.8%	118.2%
Scenario 2.2- Primary surplus target 1.5%-of-GDP; intermediate impact multiplier (-1), high multiplier persistence & "hysteresis"					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	167.5%	138.5%	133.4%	127.2%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	167.6%	139.0%	133.2%	122.0%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	167.4%	137.6%	131.4%	118.5%
Scenario 2.3- Primary surplus target 1.5%-of-GDP; low impact multiplier (-0.5), low multiplier persistence & no "hysteresis"					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	168.8%	140.4%	134.9%	128.0%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	168.9%	140.9%	134.7%	122.8%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	168.7%	139.5%	132.9%	119.4%
Scenario 3.1 - Primary surplus target 2.0%-of-GDP; high impact multiplier (-1.5), high multiplier persistence & "hysteresis" effects					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	167.0%	135.3%	129.2%	117.8%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	167.1%	135.7%	129.0%	112.6%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	166.9%	134.3%	127.2%	109.2%

Note on Table B

See explanatory note in the next page

Table B continued) - Impact of EU bailout loan restructuring and relaxation of the primary surplus target on the debt ratio

Scenario 3.2- Primary surplus target 2.0%-of-GDP; intermediate impact multiplier (-1), high multiplier persistence & "hysteresis"					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	167.8%	136.0%	129.7%	118.1%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	168.0%	136.4%	129.5%	112.9%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	167.7%	135.0%	127.7%	109.4%

Scenario 3.3- Primary surplus target 2.0%-of-GDP; low impact multiplier (-0.5), low multiplier persistence & no "hysteresis"					
	2014	2015	2020	2022	2032
Base (no debt relief)	177.7%	168.7%	137.5%	131.1%	118.8%
Restructuring of EU bailout loans (fixed coupon 0.50%)	177.7%	168.9%	138.0%	130.8%	113.6%
Restructuring of EU bailout loans (fixed coupon 0.25%)	177.7%	168.6%	136.6%	129.1%	110.2%

Source: IMF (June 2014); Greek Budget 2015; Eurobank Economics Research

Note on Table B

Our EU bailout loan restructuring scenario assumes that the following two transactions take place sometime in H1 2015

Transaction 1 – GLF loans

(i) Swap of GLF loans (€52.9bn) into a 50-year fixed coupon amortizing bond with 10-year grace period on interest payments.

(ii) In our study we examine two concrete (fixed) coupon rate scenarios: 0.50% and 0.25% against a variable interest rate of 3month euribor+50bps currently applied on GLF loans.

Transaction 2 - EFSF loans

(i) 20-year maturity extension of all EFSF loans given to Greece in the context of the second bailout program.

(ii) 10-year grace period on interest and principal payments.

(iii) Fixing of respective interest rates applied on EFSF loans to 0.50% and 0.25% (two scenarios) against a range of variable interest rates (linked to 6month euribor or EFSF funding cost applied currently)

Base (no policy change) scenario assumes underlying drivers to evolve in line with the IMF's DSA (June 2014), which has been properly updated, taking into account Greece's 2015 Budget.

All scenarios assume that the €10.9bn HFSF buffer returns to the ESM and thus, reduces the 2015 debt ratio by an equiproportional amount.

The euribor rates utilized in our calculations are derived from the euribor futures curve (as of February 24, 2015).

The forecast of the EFSF future funding cost curve is based on a polynomial of 5th degree fit on the current EFSF cost curve.

Concluding remarks

This note presents a simulation exercise on Greek public debt under various scenarios regarding the structure of a new debt relief package and the macroeconomic impact of a potential relaxation of the primary fiscal targets. The debt relief structure analyzed herein constitutes an extension of that presented in a couple of our earlier studies, so as to include *both* GLF bilateral loans and EFSF loans given to Greece in the context of the first and the second bailout programs. Furthermore, the macroeconomic effects of the fiscal policy easing are quantified based on a number of discrete scenarios as regards impact multipliers, multiplier persistence and the existence or not of "hysteresis" effects.

Under the bailout program's macroeconomic scenario[13], Greece's public debt ratio is projected to reach levels around 125% in 2020 and to decline further thereafter. On the other hand, an OSI debt restructuring package involving further maturity extensions, lower interest rates and interest/principal payment deferrals on GLF and EFSF loans disbursed in the context of the 1st and the 2nd bailout programs would result to some lightening up of the nominal value of the debt stock, though its main benefit would come in the form of a significant reduction in the government borrowing requirement post 2020. Moreover, the combination of additional debt relief

[13] IMF Country Report No. 14/151 (June 2014).and Greek 2015 Budget.

and a lasting reduction of the primary fiscal targets envisaged in the present program could still manage to stabilize fiscal dynamics and bring Greece's public debt ratio towards respective EU averages at the end of the forecasting horizon.

All in all, our analysis demonstrates that the negative impact on public debt and cash flow dynamics implied by a potential relaxation of the multi-year primary surplus targets may be offset, to a significant extent, by higher GDP growth (denominator effect) and its beneficial effect on fiscal metrics (numerator effect).

Appendix I - Derivation of a simplified formula depicting debt dynamics

In the absence of stock-flow adjustments, the government debt-to-GDP ratio evolves according to the following (approximate) formula[14]:

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

where ***t*** is the time subscript (years); b_t is the public debt to GDP 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[15].

Appendix II – Fiscal multiplier: definition and derivation

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

$$bal_t = cab_t + cb_t \quad (2)$$

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.[16]

In line with Boussard et al. (2012) and others[17], 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 cab_t that remains constant (with respect to the baseline) throughout all years onwards. The fiscal multiplier, m_t, of year *t* is defined as the ratio of nominal GDP over an exogenous decrease (increase) in the cyclically adjusted primary balance[18]:

$$m_t \equiv \frac{dY_t}{dCAPB_t} \quad (3)$$

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

[14] The formula is derived from the identity $B_t = B_{t-1}(1+r_{t-1}) - PBal_t$, where B_t depicts gross public debt in nominal terms. Dividing both sides of the equation by nominal GDP, Y_t, we get $\frac{B_t}{Y_t} = \frac{B_{t-1}}{Y_{t-1}}(1+r_{t-1})\frac{Y_{t-1}}{Y_t} - \frac{PBal_t}{Y_t}$. The latter can be rewritten as $b_t = \frac{b_{t-1}(1+r_{t-1})}{1+g_t} - pbal_t$ and approximating $\frac{(1+r_{t-1})}{1+g_t}$ with $(1 + r_{t-1} - g_t)$ we derive the formula in the text.

[15] The average effective interest rate on debt is proxied by the ratio of total interest expenditure in year *t* over the public debt stock of year *t-1*.

[16] The EU fiscal framework uses a standard "two-step methodology", which consists in computing the cyclical component of the budget first and then subtracting it from the actual budget balance. In algebraic terms $cab_t = bal_t - cb_t$, where *bal* stands for the nominal budget balance to GDP ratio and *cb* for its cyclical component (European Commission, 2013). The determination of the cyclical component of balances in the EU methodology requires two inputs: i) a measure of the cyclical position of the economy (the output gap, og_t) and ii) a measure of the link between the economic cycle and the budget (cyclical-adjustment budgetary parameter). The product of the two measures gives the cyclical component of the [budget], $cb_t = \varepsilon * og_t$, which is then subtracted from the headline budget-to-GDP ratio to obtain the *cab*.

[17] See e.g. European Commission (2012, 2013)

[18] As we have noted already, the fiscal multiplier is defined as the ratio of a change in output to an *exogenous* change in the fiscal deficit with respect to their corresponding baselines. In the formula presented in the text we divide by the change in the cyclically adjusted primary balance *CAPB* in order to disentangle the effects of automatic stabilizers i.e., the feedback effect from the change in output on the fiscal balance. Moreover, we implicitly assume that the change in *CAPB* is orthogonal to the state of the macroeconomy, an assumption crucial for the identification of exogenous fiscal shocks. Such an assumption is central to the identification approach followed in the standard fiscal SVAR framework introduced by Blanchard and Perotti (2002) and extended by Perotti (2004), albeit at quarterly time frequencies.

Appendix III - Brief literature review on fiscal multipliers

III.1 ***Determinants of fiscal multipliers***

Prior theoretical and empirical work on the response of main macroeconomic aggregates to exogenous fiscal shocks has shown that the size and, in certain instances, the sign of the fiscal multiplier can be country-, estimation method-, and economic conditions-specific. In general, it appears that quite diverse views continue to exist among professional economists and policy makers as regards the quantitative and qualitative effects of fiscal policy (see e.g. Perotti, 2004).

From a purely theoretical perspective, neoclassical models would predict that a positive shock to government spending would lead to a crowding out of private consumption, while Keynesian and some neo-Keynesian models would predict the opposite effect. To complicate things further, uncertainty regarding the size (or even the sign) of the fiscal multiplier in developing and emerging markets is even higher, not only because of the scarcity of timely and reliable national and government account statistics, but also because of a long history of fiscal profligacy and sovereign debt crises that have blurred the efficacy of any fiscal expansion.

Based on an extensive literature review on the topic, Spilimbergo et al. (2011) provide some stylized facts on the potential size and determinants of fiscal multipliers. As per the said study, the size of the multiplier is large if: "leakages" are limited i.e., only a small part of the fiscal stimulus is channeled to savings or imports; monetary conditions are accommodative i.e., a fiscal stimulus does not lead to an increase in the interest rate; and the country's fiscal position is sustainable following a fiscal expansion.

Elaborating further on the aforementioned conditions, the authors clarify that leakages are limited if: (i) the propensity to import is relatively small, meaning that large closed economies usually feature larger multipliers than small open economies with no barriers to trade; (ii) the 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 by consumers in anticipation of higher taxation in the future. That is because liquidity constrained households spend a significant portion of the windfall (e.g. wage increase or increased government purchases of goods and services) to increase current spending; (iii) domestic economic conditions are recessionary and the economy is far from its full employment equilibrium; if such conditions prevail, an increase in government spending does not necessarily lead to an increase in interest rates that could, in turn, crowd out private investment; and (iv) the fiscal stimulus has a large spending component, as the initial shock would then 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 a country featuring an unsustainable fiscal position. In that case, an unwarranted fiscal expansion may 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.

Separately, 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).

Other factors potentially influencing the size of the fiscal multiplier include the degree of financial market deepening and liberalization as well as the broader macroeconomic conditions in the domestic economy. A relatively low degree of financial intermediation usually implies that liquidity-constrained households and businesses cannot easily borrow to intertemporally smooth consumption and investment and thus, a positive fiscal impulse can lead to higher current consumption (and less precautionary saving) than otherwise the case. Furthermore, heightened macroeconomic uncertainty may induce consumers to increase precautionary savings, decrease their marginal propensity to consume and thus, reduce the size of the multiplier (see e.g. Spilimbergo et al., 2011). That is demonstrated by official U.S. data showing that the 2008 tax rebate has been largely saved. At the other end of the spectrum, one could convincingly argue that the crisis may have actually increased the size of the fiscal multiplier, as the ensuing credit crunch has raised the proportion of liquidity-constrained households and, furthermore, monetary authorities in major industrialized countries have reduced their nominal policy rate towards the zero percent bound.

In view of the ambiguous effects of the recent global economic and financial crisis on the size of the fiscal multipliers, Spilimbergo et al. (2011) caution against re-estimating the size of the multiplier in the present trajectory, on the basis that the crisis may have caused structural breaks in relevant date series.

III.2 Empirical studies

Various methodological approaches have been developed to study the effect of fiscal policy changes on economic activity. As of today, the most promising stand of research which aims to isolate the macroeconomic effects of *purely exogenous* fiscal policy impulses rely on the structural vector-autoregression (SVAR) model, initially proposed by Blanchard and Perotti (2002) and extended by Perotti (2004).

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.[19] Overall, many empirical studies document a positive response of output to an exogenous government spending increase and a negative response of output to an exogenous rise in government revenue (higher taxation), with the former exceeding the latter in absolute terms.

It should be noted here that an important limitation of the methodological approaches highlighted above is that, by construction, they rule-out *state-dependent* multipliers. Yet, recent empirical work has emphasized that government spending multipliers may be larger in recessions than in expansions.[20] Using an estimation approach similar in many respects to the *Smooth Transition Autoregressive (STAR) models* developed in Granger and Teravista (1993), Auerbach and Gorodnichenko (2010) estimate spending multipliers that are approximately zero in expansions and as high as 2.0 in recessions. Other recent studies broadly confirm the existence of sizeable cyclical variations of fiscal multipliers. Among others, Bachmann and Sims (2011), report that the spending multiplier is approximately zero in expansions and approximately 3 in recessions. Separately, Shoag (2010) examines state-level variation in government spending and finds that the multiplier is approximately 3.0-3.5 when labor markets have a slack (recession) and approximately 1.5 when there is no slack (expansion). These findings seem to be in agreement with earlier Keynesian arguments in favor of using discretionary fiscal policy in recessionary periods to stimulate aggregate demand. Intuitively, when the economy has a slack, expansionary government spending shocks are less likely to crowd out private consumption or investment.

For Greece, empirical estimation of fiscal multipliers has long been constrained by the lack of available macroeconomic and fiscal data. In a recent paper, Monokroussos and Thomakos (2012) utilize actual (not interpolated) quarterly general government data reported by Eurostat (relevant series dated back to Q1 1999) to estimate the size of fiscal multipliers in expansionary and contractionary output phases. The study employs the classic SVAR approach to estimate 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 study are as follows: (i) SVAR model estimates indicate 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; (ii) the STVAR model estimates 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; and (iii) 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.

In a more recent study, Monokroussos and Thomakos (2013) employ a Multivariate Threshold Autoregressive Model (TVAR) that has a number of unique features that make it particularly suitable for estimating regime-dependent fiscal multipliers for various important government expenditure and revenue categories. Their main results are as follows: (i) 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; (ii) 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); (iii) 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

[19] However, as noted in the IMF's World Economic Outlook of October 2012 (Box 1.1, page 41), "The main finding, based on data for 28 economies, is that the multipliers used in generating growth forecasts have been systematically too low since the start of the Great Recession, by 0.4 to 1.2, depending on the forecast source and the specifics of the estimation approach. Informal evidence suggests that the multipliers implicitly used to generate these forecasts are about 0.5. So, actual multipliers may be higher, in the range of 0.9 to 1.7".

[20] For a discussion on these and other related issues see e.g. Auerbach and Gorodnichenko (2010).

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.

Appendix IV – Multiplier persistence

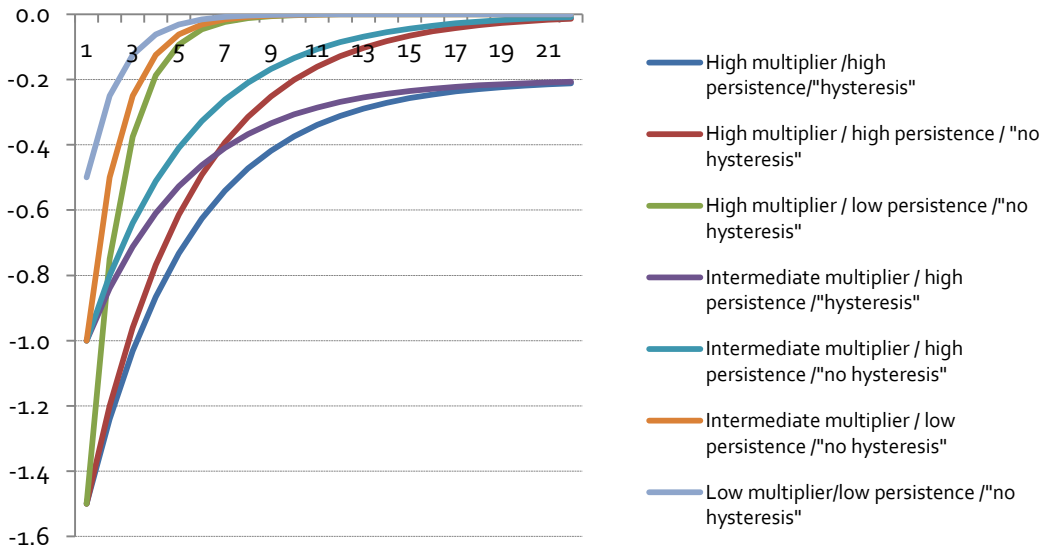
In order to incorporate multiplier persistence in our simulation exercise we follow Boussard et al. (2012) and European Commission (2012, 2013) and assume that fiscal multipliers follow the following convex, autoregressive decay path[21]:

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

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 β *is* 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 figure below depicts the decaying path of the fiscal multiplier assumed in the simulation exercise presented in this study. Here, the initial value of the (impact) multiplier is assumed to take one of the following three values: **-1.5** "high multiplier"; **-1.0** "intermediate multiplier" and **-0.5** "low multiplier". Moreover, "high persistence" corresponds to the following parameter value: α=0.8 and "low persistence" corresponds to α=0.5. Finally, for the presence of "hysteresis" effects we assume β=-0.2, while the case of β=0 corresponds to "no hysteresis" effects.

Figure: Response of GDP to one-off cyclical adjustment



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

Note: Response of GDP in years t=1,…,21 per one unit cut in cyclically adjusted primary balance in year t=1. Assuming that the same logic applies, then a unit increase in the cyclically adjusted primary balance in year t=1, would lead to a GDP response that could be portrayed by inverting the above figure.

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

Appendix V - *Hysteresis*

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 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. In the following section we present the results of a simulation exercise for Greece, which takes into account the potential effects of some on the aforementioned factors on the evolution of the country's public debt ratio.

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