

## II.1. Debt reduction and fiscal multipliers

The deterioration of public finances in the first years of the crisis has led most Member States to adopt sizeable consolidation packages. However, in view of the persistence of the crisis and the signs of weakening economic activity a vast public debate has arisen on the effectiveness of fiscal consolidation in the current situation, centred on the question of whether "austerity can be self-defeating". In this context, "self-defeating" would mean that "a reduction in government expenditure leads to such a strong fall in activity that fiscal performance indicators actually get worse" (Gros (2011)).<sup>(29)</sup>

Fiscal multipliers are key to assess the response of the public debt ratio to a fiscal consolidation. This section analyses the effects of fiscal consolidations on the public debt ratio in alternative scenarios for the key parameters affecting debt dynamics. The main factors affecting the debt response are the fiscal multipliers and the financial markets' horizon. The work presented here summarizes the more detailed analysis presented in Part III of the European Commission 2012 Public Finance Report.<sup>(30)</sup>

The section begins with a presentation of the analytical framework that formalizes the debt dynamics following a consolidation shock and its relationship with fiscal multipliers. It proceeds with an analysis of the conditions influencing the number of years that, in case of a short-term consolidation-induced debt-increase, are needed for a consolidation to show its effects on the debt ratio. It concludes with a discussion of some policy implications.

### Debt dynamics and effects from consolidations

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

$$b_t = b_{t-1}(1 - g_t) - bal_t = b_{t-1}(1 + r_t - g_t) - bal_t$$

where *bal* represents the budget balance to GDP ratio, *pbal* the primary budget balance, *r* the average effective interest rate on government debt and *g* nominal GDP growth. The evolution of the debt ratio can therefore be understood as being driven by the primary balance and the snowball effect, which is the difference between the average effective interest rate and the growth rate of the economy. Over the medium-term, the snowball effect is of particular importance as it determines the magnitude of primary balances that are necessary in order to ensure that government debt remains sustainable.

### Short-run effects of fiscal consolidations

The effect of a consolidation ("a" in the following) is measured by its induced change on debt. A positive consolidation effect is found if the debt ratio under consolidation is smaller than the debt ratio in the baseline. Arithmetically, the change induced on debt by consolidation is:

$$\frac{db_t}{da} = \frac{db_t}{dpbal_t} \cdot \frac{dpbal_t}{da} + \frac{db_t}{dg_t} \cdot \frac{dg_t}{da}$$

In the short-term, a consolidation affects the debt ratio both via its effect on the primary balance and via its effect on the rate of growth of GDP. In turn, the first of these two effects is the sum of two components reflecting the direct increase in the primary balance due to the consolidation measures adopted, and the indirect impact on growth of the primary balance via the automatic stabilizers (which leads to a partly offsetting decrease of the primary balance).<sup>(31)</sup> The second effect reflects the so-called "denominator effect", i.e. the fact that a lower level of GDP entails a higher debt ratio for a given level of debt.

Overall, the short-term effect of consolidations on the debt level is a function of the existing debt level, the output multiplier of fiscal policy measures (i.e. the overall GDP response to the fiscal shock) and the cyclical budget semi-elasticity,  $\varepsilon$ , which measures the response of the

<sup>(29)</sup> See also Buti, M. and L. Pench, (2012) 'Fiscal austerity and policy credibility', VoxEU.org, 20 April; Cafiso, G. and R. Cellini (2011), 'Fiscal consolidations for debt-to-GDP ratio containment? Maybe... but with much care', VoxEU.org, 20 March; Gros, D. (2011), 'Can austerity be self-defeating?', VoxEU.org, 29 November; Corsetti, G. and G. Müller, (2012), 'Has austerity gone too far?', VoxEU.org, 20 February; Cottarelli, C. (2012), 'Fiscal Adjustment: too much of a good thing?' VoxEU.org, 8 February; Krugman, P. (2012), 'Europe's Economic Suicide', New York Times, April 15.

<sup>(30)</sup> European Economy. 4 July 2012.

<sup>(31)</sup> If  $m_1$  is the one-year output multiplier and  $\varepsilon$  is the semi-elasticity of budget balance to growth, the precise formula, where  $m_1$  and  $\varepsilon$  are positive parameters, is

$$\frac{dpbal_t}{da} = \frac{\partial pbal_t}{\partial g_t} \cdot \frac{\partial g_t}{\partial a} + \frac{\partial pbal_t}{\partial a} = -\varepsilon \cdot m_1 + 1$$

general government balance-to-GDP ratio to the GDP growth rate: <sup>(32)</sup>

$$\frac{db_t}{da} = (b_{t-1} + \varepsilon) \cdot m_1 - 1$$

This equation leads to the conclusions that i) a high starting level of debt tends to dampen the debt-reducing impact of consolidation all else equal, which operates through the denominator effect. If the initial debt ratio is large enough, consolidations can even bring about increases in the short term. The same holds for the elasticity of the government balance to the cycle; and ii) the larger the short-term multiplier, the smaller the debt-reducing impact of consolidations. This effect is actually independent of the economic growth rate and of the interest rate prior to the fiscal consolidation.

It is therefore possible to compute a critical value for the multiplier beyond which a consolidation leads to a negative rather than positive impact. This critical value is computed as:

$$m_1^c = \frac{1}{b_{t-1} + \varepsilon}$$

It diminishes with the level of debt – the higher the debt the larger the growth impact on the debt to GDP dynamic – and with the response of the government balance-to-GDP ratio to GDP growth – the effect of consolidation measures on deficit are smaller the more the automatic stabilizers react to diminished growth. For a debt ratio equal to 100% of GDP, a typical order of magnitude on the value of the critical multipliers can be computed to be 2/3 if it is assumed that the semi-elasticity of the budget balance to growth is 1/2.

Table II.1.1 shows the estimated critical multipliers for the euro-area Member States, for the 2011 levels of Maastricht debt and the semi-elasticities currently employed to gauge the cyclical component of the budget balance. A review of the empirical literature indicates that in many cases the empirical multipliers are close to or even higher than the critical values presented in the table. In particular, for European countries cumulative multipliers of public expenditure after

four quarters (one year) are usually found to be above unity. Tax-based consolidations are usually found to entail somewhat lower multipliers than expenditure-based consolidations, although there is much variation across the different studies depending on the methodology to identify tax shocks and the country concerned. Multipliers derived from the European Commission's QUEST model amount to around 0.4 to 0.7 for the euro area for a balanced consolidation relying equally on expenditures and revenues in normal economic times, depending on credibility and to 0.7 to around 1.2 in crisis situations.

Table II.1.1: Critical first year multipliers in the euro area at constant interest rates (2011)

	Semi-elasticities	Debt 2011 (% of GDP)	Critical Multiplier
BE	0.54	98.0	0.7
DE	0.51	81.2	0.7
EE	0.30	6.0	2.8
IE	0.40	108.2	0.7
EL	0.43	165.3	0.5
ES	0.43	68.5	0.9
FR	0.49	85.8	0.7
IT	0.50	120.1	0.6
CY	0.42	71.6	0.9
LU	0.49	18.2	1.6
MT	0.36	72.0	0.9
NL	0.55	65.2	0.8
AT	0.47	72.2	0.8
PT	0.45	107.8	0.7
SI	0.47	47.6	1.1
SK	0.29	43.3	1.3
FI	0.50	48.6	0.9

Source: Commission services' calculation

The comparison between the critical multipliers in Table II.1.1 and the estimates found in the literature would suggest that Greece is the only country where short-run debt increases could be observed even in normal times and if consolidation is balanced. However, in the current situation more than one third of the euro area countries are likely to see their debt ratio increasing compared to the baseline in the first year when a consolidation process is implemented. This is due to several factors. First, the public debt has increased further relative to the 2011 level shown in the table. Second, fiscal multipliers are likely to be high at the current juncture for a number of reasons: consolidation is partly spending-based and some households and firms are credit constraints and the transmission of monetary policy is partly broken. In addition, in case of doubts about the credibility of the consolidation strategy fiscal multipliers could even be higher.

<sup>(32)</sup> All the previous computations are done with respect of a baseline, i.e. they show the comparison between the debt ratio at time t after the consolidation and the debt ratio that would have prevailed at time t in the absence of consolidation.

### Medium-run effects of fiscal consolidations

The medium-term evolution of the debt ratio, in the absence of any effect on government yields, is the sum of the same three effects indicated in the previous subsection: i) the cumulative effect of growth on debt, which is larger the larger the initial debt stock and the larger the medium-term multipliers; ii) The cumulative effect of growth on government balance via the operation of the automatic stabilisers on the budget balance, which is greater the larger the size of the multipliers and the size of automatic stabilisers and; iii) the cumulative effect from the adjustment of government balance, which increases with the number of years and with the size of the consolidation implemented. The first two effects increase the debt ratio, while the third lowers it.

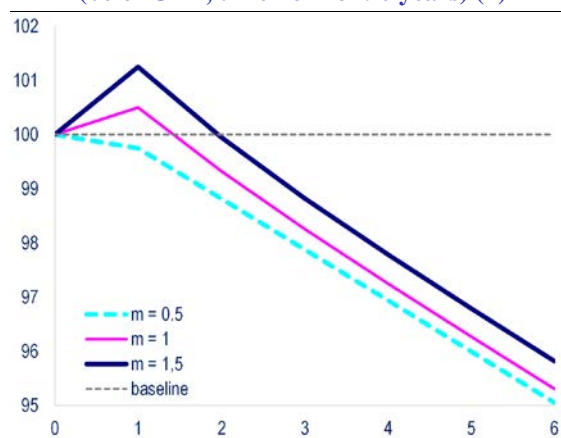
One way to look at the medium-term effects of a consolidation is to consider the number of years  $n^*$  (hereafter "the critical year") necessary for the consolidation to lead to a decrease in debt with respect to a baseline scenario that keeps the primary balance-to-GDP ratio constant (i.e. non-consolidation scenario). The critical period  $n^*$  is different from the number of years required for the debt to go below its level before starting to consolidate unless the baseline corresponds to a scenario with a constant debt ratio. However, when the baseline scenario is characterized by an increasing debt-to-GDP ratio, the number of years needed to bring the ratio below the pre-consolidation level exceeds  $n^*$ . In this connection, it is worthwhile noticing that the size of the consolidation does not affect  $n^*$ , whereas it is key to determine the number of years needed to reduce the debt ratio below the existing level before the adoption of the consolidation measures.

The higher the multipliers in the first year and the larger the change in GDP induced by the consolidation, the larger the value of  $n^*$  and the longer it will take for a consolidation to be effective in reducing the public debt ratio. The response of output to the fiscal consolidation, i.e. the fiscal multiplier, can be very persistent or can decay rapidly in the first years.<sup>(33)</sup> Graph II.1.1 shows the debt-to-GDP ratio dynamics for the

<sup>(33)</sup> Medium term multipliers are obtained by applying a decay function with powers of 0.5 for the low persistence case and of 0.8 for the high persistence case. In the low persistence case around 47% of the initial effect on output vanishes at the 2<sup>nd</sup> year and around 90% thereof at the 6<sup>th</sup> year. In the high persistence case only around 18% of the initial effect on output disappears the following year after the shock and at the 6<sup>th</sup> year around 3.7% of the initial effect still remains.

low-persistence multipliers path under different assumptions about the impact multiplier. The baseline scenario is one of a constant debt ratio of 100% of GDP and a cyclical budgetary semi-elasticity of  $\epsilon=0.55$ . When the first-year multiplier lies below 0.7 –corresponding to the value of the critical multiplier–, the consolidation lowers the debt ratio from the first year. It should be noted that a first year multiplier of 1.5 is on the high side of existing estimates as it is the estimate of a temporary consolidation based on government spending.

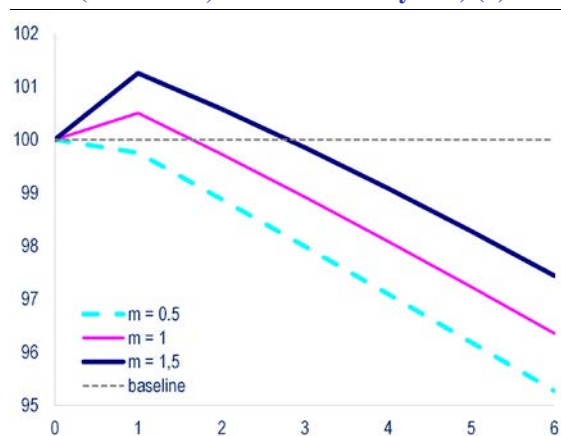
**Graph II.1.1: Debt dynamics with no effect on interest rates, low persistence (% of GDP, time horizon: 6 years) (1)**



(1) baseline steady state,  $b_0 = 100\%$

Source: Commission services.

**Graph II.1.2: Debt dynamics with no effect on interest rates, high persistence (% of GDP, time horizon: 6 years) (1)**

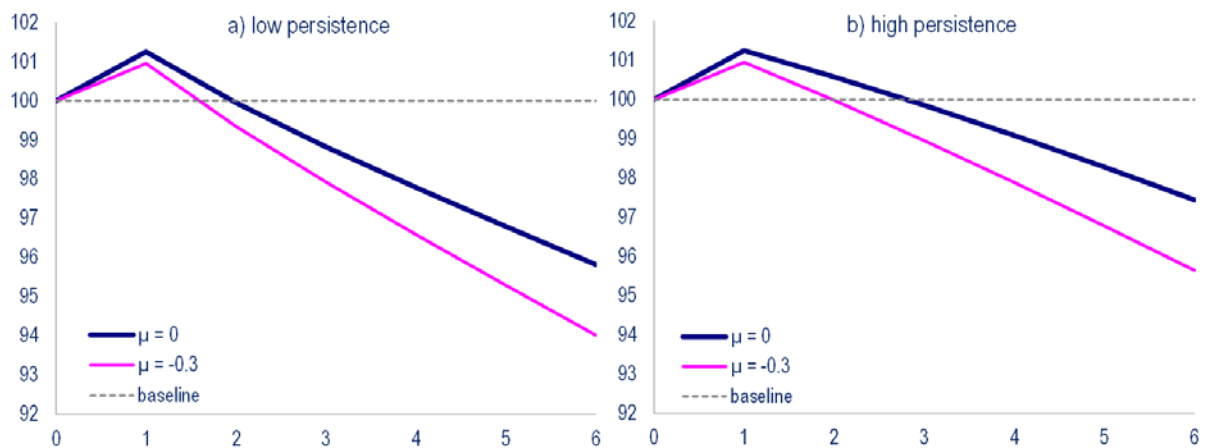


(1) baseline steady state,  $b_0 = 100\%$

Source: Commission services.

Graph II.1.2 shows the corresponding case for a high persistence of the multiplier. The higher persistence generates longer-lasting negative effects from fiscal consolidation. If the first-year

Graph II.1.3: Confidence effects on debt dynamics, first-year  $m=1.5$   
(in % of GDP, time horizon: 6 years)



Source: Commission services.

multiplier is 1.5 the consolidation-based debt increase lasts for one more year so that three years are needed before debt goes below baseline.

### Introducing changes of government yields

The analysis has so far been based on the assumption of constant interest rate. This is obviously a very strong assumption as consolidation affects solvability and thereby interest rates which in turn affect fiscal balances and the dynamics of consolidation. Over the medium-term, changes to the average effective interest rate are as important a factor for the debt to GDP dynamics as the growth rate of GDP. The impact of consolidation on average effective interest rates is more visible in the medium-term than in the short-term, with limited first-year impact on the debt level.

The sign of this effect however is not clear cut as it depends crucially on the way market expectations are generated. In the simulations presented hereafter it is assumed that the change on average effective interest rates is driven by the risk premium so that the change of the average effective interest rate  $r_i$  due to a consolidation  $a$  is expressed as:

$$\frac{dr_i}{da} = \mu + \gamma \frac{db_{i+h}}{da} \Big|_{dr=0}$$

where  $\mu$  can be interpreted as the effect on the interest rate (via the risk premium) linked to the credibility of the consolidation measures adopted

(<sup>34</sup>), while  $\gamma$  represents the yield sensitivity to the debt level and  $h$  refers to the horizon considered by the financial markets.

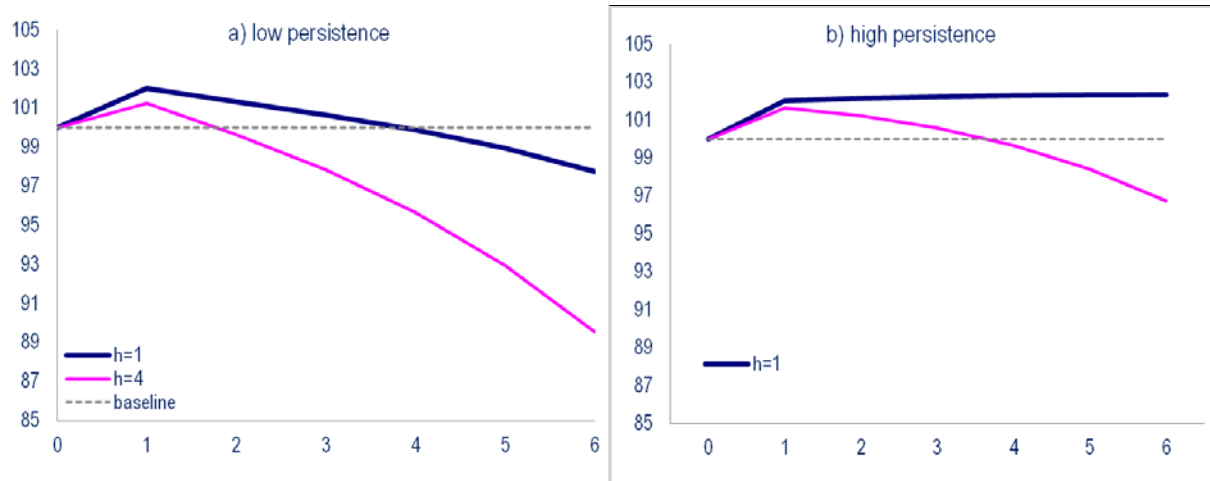
The normal case would be that consolidation improves market confidence and reduces yields, leading to a lower average effective interest rate  $r$ . In this case, the effect of consolidation on debt is reinforced and debt-to-GDP ratios are likely to decrease at a higher speed (or increase less) than with constant yields. This is the case illustrated by Graph II.1.3 under the condition that the first-year multiplier is 1.5 and no reaction of interest rates to public debt increases ( $\gamma=0$ ) takes place. It can be seen that the critical number of years before the debt is reduced to below its starting level declines somewhat with respect to the simulation where these confidence affects are not accounted for.

### Myopic behaviour and debt ratio

However, under certain conditions markets might react to consolidations by increasing yields, especially when starting levels of debt are very high, the consolidation strategy lacks credibility, the expectations about future GDP growth are subdued or when the time horizon considered by financial markets is very short. In such a case, the increase in interest rates would entail a rise in the debt ratio, which would involve an increase in the number of years needed to resume to the starting

(<sup>34</sup>) A constant coefficient associated to the credibility of the adjustment is arguably a strong assumption, although helpful to illustrate its implications for debt dynamics. Another inconvenient of this linear specification is that it does not take into account thresholds effects, which can be potentially relevant in crisis periods.

Graph II.1.4: Debt evolution as a function of market horizon, first year  $m=1.5$   
(in % of GDP, time horizon: 6 years)



Source: Commission services.

level. Such an effect would be rather unusual, however. In particular, where  $h=1$  indicates that markets look at the debt in the year of the consolidation, thereby indicating a high degree of myopia of financial markets. In this case, if a consolidation increases the debt ratio due to the denominator effect, a high sensitivity of interest rates to the debt ratio could make consolidations self-defeating and act as a driver for a divergent debt ratio.

The presence of myopia in financial markets can play a role in increasing the number of years after which the debt ratio remains above baseline. However, as simulations in Graph II.1.4 shows, only in very extreme cases characterized by high and persistent multipliers and elevated debt ratios, financial markets myopia would lead to a debt increase in the medium run. In these simulations a positive reaction of interest rates to debt increases ( $\gamma=0.3$ ) has been assumed.

### Conclusions

The reaction of debt ratios to fiscal consolidations is largely driven by the size of the GDP multiplier. In this regard, it is likely that one-year multipliers are larger in the current crisis period than in normal times. Accordingly, the currently high debt levels and the presumably sizeable fiscal multipliers due to the crisis, jointly with normal values for cyclical elasticities, are likely to lead to debt rises in response to consolidations in the short run in several Member States.

However, for high but plausible values of the multipliers, such counter-intuitive effects are short-lived. Over the medium-term,

consolidations are generally successful in reducing the debt-to-GDP-ratio as long as they are based on measures with permanent effects on the budget. However, debt increases following fiscal consolidations can be more protracted if multipliers are high and very persistent or if interest rates rise abnormally in response to a fiscal tightening accompanied by a short-term rise in debt. A credible consolidation strategy would significantly reduce such risks. A fully self-defeating dynamics would only be generated under very unlikely configurations for which, in addition to very large multipliers and brisk increases in sovereign interest rates in response to the consolidation, a high degree of financial market myopia is required.

The analysis presented in this section implies that, for a number of euro-area Member States, it will take some time before consolidation brings debt ratios back to current levels. In the current setting, involving high fiscal multipliers, it is likely that some consolidation packages will lead to temporary short-term debt increases that will lengthen the horizon over which public debt will start to decrease. To speed up the process of debt reduction in the sense of bringing debt below its pre-consolidation level, sizeable consolidations are warranted. Moreover, given the currently high debt levels in many of these countries, consolidating is of primary importance, as delaying the adjustment implies rising debt ratios, which increases significantly the likelihood of fully self-defeating dynamics in the future.