

# **Fiscal adjustment in Greece: In search for sustainable public finances.**

Bas van Aarle<sup>a</sup> and Marcus Kappler<sup>b</sup>

## *Abstract*

*This paper analyses Greek fiscal sustainability from a retrospective and a prospective view. Implications of Greek fiscal (un)sustainability are discussed. In the empirical analysis empirical testing of Greek government solvency during the period 1985-2007 is combined with a scenario analysis of budgetary adjustment in the short and medium run under alternative hypotheses.*

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<sup>a</sup>Hasselt University, Faculty of Applied Economics, Agoralaan 30, Building D, BE-3590 Diepenbeek, Belgium and CESifo Muenich, Germany. Email: [bas.vanaarle@uhasselt.be](mailto:bas.vanaarle@uhasselt.be) . Phone: +32/11 268787, Fax: +32/11 26.8799.

<sup>b</sup>Zentrum für Europäische Wirtschaftsforschung (ZEW), Department of Business Cycle Analysis and Growth, L 7, 1, D-68161 Mannheim, Germany. Email: [kappler@zew.de](mailto:kappler@zew.de) . Phone: +49/621 1235-157, Fax: +49/621 1235-223.

## 1 Introduction

Despite its relatively small size in the total euro area economy, economic and budgetary developments in Greece have played a major role in the euro area since 2009 when first signs of significant fiscal and macroeconomic challenges surfaced<sup>1</sup>. Since the beginning of 2010, global capital markets have sounded the alarm about the situation in Greece: increasing spreads on bond and credit default swap markets signalled diminishing investor confidence. On May 2 2010, Euro finance ministers, IMF and the Greek government agreed on a 110 billion euro rescue package for Greece -80 billion euro comes from the EU and 30 billion euro from the IMF- and supporting economic policies<sup>2</sup>. The Greek President George Papandreou announced that Greece will cut 30 billion in spending over the next three years. Greek bond prices recovered somewhat on this announcement, but this recovery was short-lived.

As a result of the continuing tensions and speculations about difficulties in Greece, Portugal, Ireland and Spain, European Union finance ministers met in a 14 hour session in the weekend of May 8 and 9, 2010, and agreed on a 750 billion euro European-wide rescue package. The IMF was also involved again and the ECB announced to buy European public and private debt. Greek bond prices increased substantially on this announcement.

The continuing fiscal turmoil and social unrest in Greece, combined with continuing speculation in financial markets of a pending Greek default -with or without an exit from the Eurozone-, led to a repeated downgrading of Greek government credit ratings by rating agencies to “junk status”. Risk premia on Greek debt and implied default probabilities in credit default swaps reached new records. As a result, a further rescue program followed in July 2011 focusing on rescheduling of debt obligations and public and private debt-buyback schemes which taken together imply a significant reduction of the Greek debt burden in the shorter and longer run. Taken together, banks would accept a 21% “haircut” on their Greek debt holdings.

Notwithstanding these efforts, speculation about a Greek default continued. An extra Euro area summit on October 26, proposed new measures to support Greece and extend the EFSF to support banks that would be affected by the Greek debt problem, in an attempt to prevent further contagion of the Greek debt problem to other euro area countries. Banks would accept a 50% “haircut” on their Greek debt holdings.

Whether or not the emergency measures constitute a ‘credit event’, de facto Greece has until so far not defaulted on its debt obligations, and its government has repeatedly vowed that budgetary and structural reforms will be implemented that will restore long-run budgetary sustainability and economic growth and thereby also will support confidence in the viability of a Greek participation in the euro area.

While not being a large euro-area country, the interest and importance in the Greek case lies in the potential role of bond market contagion to other euro area countries and related, the design and long-run sustainability of the euro zone. Both issues have received ample consideration/speculation from policymakers and in financial markets.

## 2 Budgetary (un)sustainability in Greece: Empirical testing

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<sup>1</sup> The IMF (2009) e.g. noted in July 2009 on the Greek situation “Fiscal and external imbalances are high and competitiveness has weakened. Fiscal consolidation cannot be postponed. Reforms to bolster competitiveness and growth are essential to avoid slipping into stagnation. Greece needs a coherent fiscal adjustment path, based on durable measures, aimed at returning the debt ratio to a downward trajectory. Revenue enhancements are needed, but the main tasks are to address the wage bill and structurally worsening entitlement programs.”

<sup>2</sup> See EU Commission (2010a) for all details of the Greek adjustment program.

Figure 1 summarizes the main budgetary and macroeconomic trends that are observed during the period from 1990 to 2010. All data are from the EU's AMECO database.<sup>3</sup> While not very favourable already before, fiscal variables significantly deteriorate from 2007 onwards. Also the macroeconomic balance between growth and interest rate deteriorates around the same time. Both factors contribute to a rapid increasing government debt to GDP ratio, reflecting the 'snow-ball' effect. Underlying the fiscal balance deterioration is a combination of increasing government spending and declining revenues, a clear period of fiscal slippage.

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<sup>3</sup> Greek fiscal data and national income data have met repeated criticism on their consistency and adequacy. The European Commission (2010b), summarises the main problems and recommendations for improvement. We take the AMECO data as representing a reasonably adequate approximation of the actual Greek fiscal variables and output.

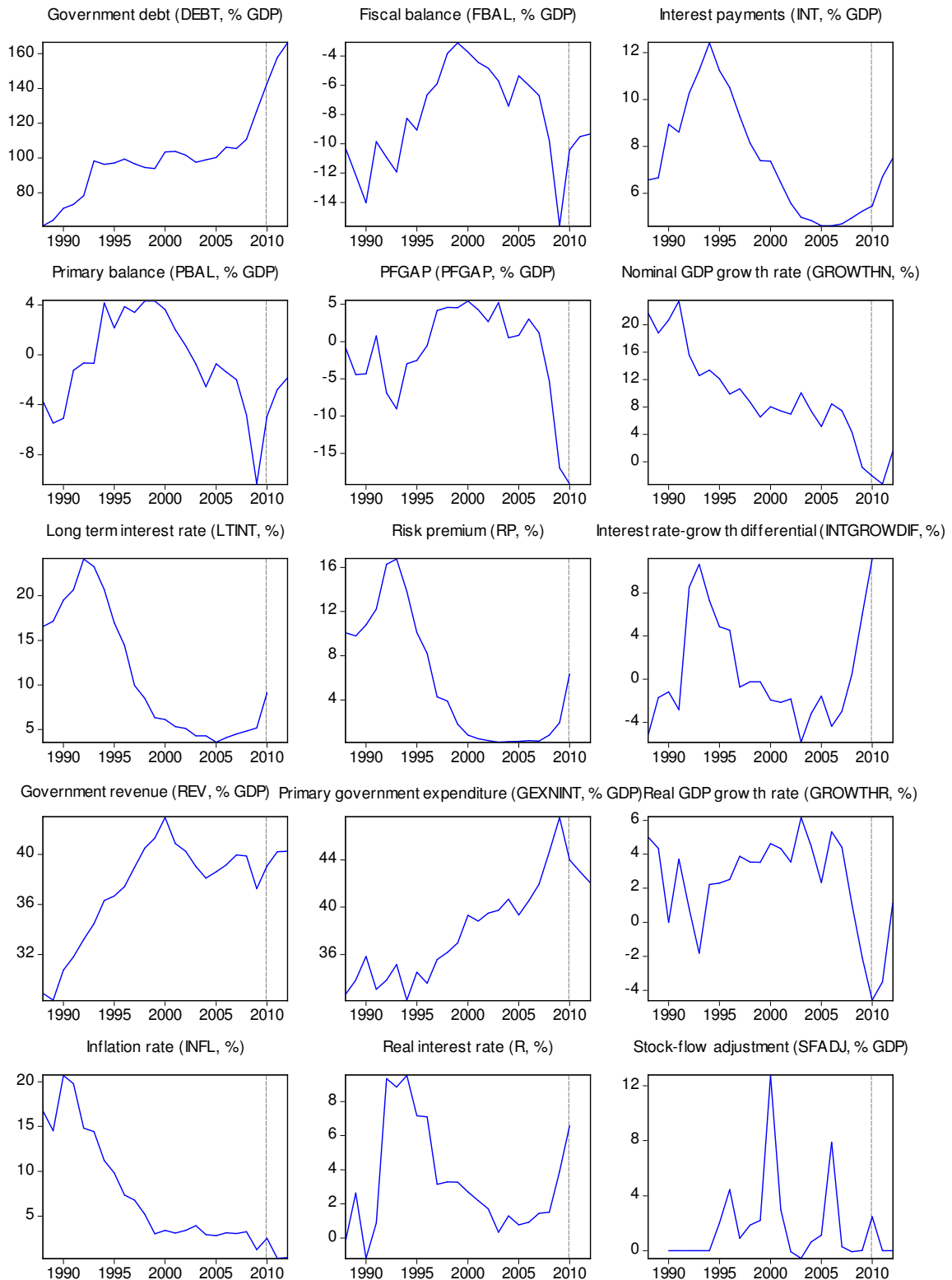


Figure 1 Fiscal and macro-economic variables, Greece, 1990-2010. Source: AMECO

### Sustainability of the Greek budget before the crisis

Unsustainable public finance viz. government insolvency implies the violation of the intertemporal budget constraint and the no-Ponzi game condition. Following Bohn's seminal work (Bohn, 1995), empirical studies on government solvency have focused on estimating

stationarity of fiscal balances and on finding cointegration between debt and the primary fiscal balance. Other studies such as Afonso (2005) apply the test for cointegration between government revenues and government expenditures in order to examine the sustainability hypothesis. A general drawback of this literature is the lack of power of conventional stationarity and cointegration tests in short time series.

To test whether the Greek budget was sustainable before the fiscal crisis in 2009, we first conduct unit root tests on government gross debt, (primary) fiscal balances, government spending and government revenue.

**Table 1: Unit root tests**

	Deterministics	ADF	DF-GLS
Government gross debt	None	2.42 (0.99)	*
	Intercept	-2.06 (0.26)	-0.26
	Intercept and trend	-1.26 (0.88)	-1.22
Fiscal balance	None	-0.59 (0.45)	*
	Intercept	-1.43 (0.55)	-1.39
	Intercept and trend	-0.94 (0.94)	-1.34
Primary balance	None	-1.22 (0.20)	*
	Intercept	-1.18 (0.66)	-1.16
	Intercept and trend	-1.05 (0.91)	-1.12
$\Delta$ Primary balance	None	-1.42 (0.14)	*
	Intercept	-1.23 (0.64)	-1.61
	Intercept and trend	-2.35 (0.39)	-2.16
Government spending	None	1.66 (0.97)	*
	Intercept	0.61 (0.99)	-0.16
	Intercept and trend	-1.57 (0.76)	-1.92
Government revenue	None	1.19 (0.93)	*
	Intercept	-3.17 (0.04)	-1.61
	Intercept and trend	-0.90 (0.94)	-1.01

Sample: 1989-2008, test statistic and p-value in parenthesis

Government debt, total fiscal deficit, primary fiscal deficit, government spending and government revenues are all non-stationary in the sample period from 1989 to 2008. Even the change in the primary fiscal balance is found to be non-stationary during this period. That none of the tests rejects the null of a unit root in the (primary) fiscal balance is a first indication that that intertemporal budget balance was not ensured in Greece even before the fiscal crisis since 2009.

If the expected real interest rate is constant, for intertemporal budget balance to hold, the stock of debt and the primary deficit need to cointegrate (Trehan and Wlsh, 1991). To test for such a cointegrating relation between debt and primary deficit in the Greek case, we applied both the Johanson procedure –results provided in Table 2- and the Engle-Granger single equation cointegration tests for equations with different deterministic components - results provided in Table 3-.

**Table 2: Johanson cointegration test on Greek primary deficit and the stock of debt**

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0

\*Critical values based on MacKinnon-Haug-Michelis (1999)

**Table 3: Engle-Granger cointegration test on Greek primary deficit and the stock of debt**

Cointegrating equation deterministics: C

Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government debt	-1.253965	0.8454	-3.432253	0.8408
Primary balance	-0.841305	0.9283	-3.006412	0.8729

Cointegrating equation deterministics: C TREND

Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government debt	-3.372585	0.2087	-14.96438	0.1881
Primary balance	-2.648573	0.4953	-12.89425	0.3125

Cointegrating equation deterministics: C TREND TREND<sup>2</sup>

Automatic lags specification based on Schwarz criterion (maxlag=3)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government debt	-2.752421	0.6830	-12.24238	0.6119
Primary balance	-4.363916	0.1106	-18.57582	0.1614

\*MacKinnon (1996) p-values.

We do not find a cointegration relationship between the primary budget balance and the stock of debt. Trehan and Walsh (1991) show that the cointegration tests on government solvency do not generalize to the case where the expected real rate of interest is allowed to vary. Time-variation of interest rate expectations is likely given that the Greek economy underwent changes by preparing for the adaption of the Euro and implementing several convergence and stabilization programs that aimed at integrating into the European Monetary Union. A test of budget sustainability that rests on the assumption of a constant expected real interest rate may therefore be not very powerful. However, Trehan and Walsh (1991) argue that stationarity of the inclusive-of-interest deficit – the fiscal budget balance - is sufficient to imply that intertemporal budget balance holds, as long as the expected real rate of interest is positive.

Another prerequisite for a sustained budget is that revenues and expenditures move in parallel in the long-run. Only deviations of revenues from expenditures that are not mean-reverting violate restrictions on a sustainable budget balance. Consequently, if the budget process is balanced in the long-run, we expect revenues and expenditures being cointegrated.

Table 1 provided unit root tests of total expenditures (excluding interest payments) and total revenue. Both variables are non-stationary so that we indeed need to check whether a stationary linear combination between expenditures and revenues exist. Table 4 reports results of Johanson's cointegration test and Table 5 outcomes of the Engle-Granger cointegration test. The null of no cointegration is rejected by Johanson's trace and maximum eigenvalue statistic in almost all cases. The Engel-Granger procedure also rejects cointegration except in the very special case when a quadratic deterministic trend is included

in the cointegration equation. Since the presence of a quadratic trend in the cointegration equation lacks any economic rationale and surely would not point to a healthy budget process in the long-run, we overall conclude that governmental revenues and expenditures in Greece did not co-move prior to the crisis in 2009. This finding implies non-sustainability of the Greek budget and confirms again the earlier finding using budget balance and debt stock data.

**Table 4: Johanson cointegration test of revenues and expenditures**

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	0	1	0	0	0
Max-Eig	0	0	0	0	0

\*Critical values based on MacKinnon-Haug-Michelis (1999)

**Table 5: Engle-Granger cointegration test of government revenues and spending**

Cointegrating equation deterministics: C

Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government spending	-0.565618	0.9590	-1.932556	0.9360
Government revenues	-1.482438	0.7711	-3.421505	0.8416

Cointegrating equation deterministics: C TREND

Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government spending	-3.261304	0.2433	-15.54340	0.1606
Government revenues	-1.716555	0.8879	-4.982806	0.9264

Cointegrating equation deterministics: C TREND TREND^2

Automatic lags specification based on Schwarz criterion (maxlag=3)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Government spending	-4.088150	0.1640	-18.48348	0.1657
Government revenues	-3.039170	0.5571	-57.47535	0.0001

\*MacKinnon (1996) p-values.

Taken together, the unit-root tests and cointegration analysis point strongly to unsustainability of Greek public finances during the period between 1989 and 2008. Clearly, the ensuing economic and fiscal crisis that Greece experienced has added additional pressure on the urge to regain fiscal sustainability. An important question is therefore how Greece may regain fiscal stability.

### **3 A forward-looking approach to fiscal sustainability in Greece: Simulating alternative scenarios for 2011-2030.**

Fiscal sustainability can not only be defined in terms of observed behaviour of fiscal deficits, debt, expenditures and revenues in the past, but also in terms of a forward-looking approach by considering alternative scenarios for the near future and beyond and assess their implications in term of budgetary sustainability. In this section, we analyse a number of

budgetary scenarios that could be relevant from the perspective of sustainability of Greek consolidated public finances.

We set out a baseline scenario for the period from 2011 to 2030 and analyse the consequences for budgetary sustainability of five alternative scenarios. In the first case, we consider the effects of a 1% GDP change in (net) government spending. Containing government spending viz. raising tax revenues has been advocated as crucial in regaining fiscal sustainability in Greece. In the second case, the effects of a 1% change in economic growth is considered: a crucial factor since economic growth determines the tax bases from which government spending, deficits and debt can be financed. Uncertainty over economic growth in the short and long-run is typically high, therefore the importance of assessing the impact of alternative growth hypotheses on public finances.

In the third case, the effects of a 1% change in the interest rate are analysed. While the interest rate is a destabilising factor in debt to GDP dynamics, economic growth is a stabilising factor. The interest rate risk premium is obviously also one of the crucial driving forces in the dynamics of the Greek debt to GDP ratio, viz. debt sustainability. A higher interest rate not only implies a higher interest burden on outstanding debt, but we also consider the possibility that a higher debt stock itself in addition induces an increasing risk premium on government debt, inducing higher interest rates and reinforcing therefore the instability from high, increasing debt.

In the fourth case, we consider the effects from a 25% of GDP stock-flow adjustment. Such an adjustment could be connected to the debt restructuring package that was agreed upon for Greece in July 2011 and that would lead to a substantial alleviation of the Greek debt burden. In the fifth case we consider “best” and “worst” case scenarios that bring together the previous four cases. In the sixth case we consider the effects of a stronger vs a lower risk-premium mechanism; the case of a lower risk premium mechanism is linked to the recent discussion of the possible introduction of ‘Eurobonds’ to stem the European debt crisis.

Underlying our analysis is a small simulation model that can be summarised by the following equations:

Table 1 A small model of Greek public finances

$\left(\frac{B}{Y}\right)_t = (1 - gr_t^n) \left(\frac{B}{Y}\right)_{t-1} - \left(\frac{D}{Y}\right)_t + \left(\frac{SF}{Y}\right)_t$	(1)
$\left(\frac{D}{Y}\right)_t = \left(\frac{T}{Y}\right)_t - \left(\frac{G}{Y}\right)_t$	(2)
$\left(\frac{G}{Y}\right)_t = \left(\frac{G^P}{Y}\right)_t + int_t$	(3)
$\left(\frac{D^P}{Y}\right)_t = \left(\frac{T}{Y}\right)_t - \left(\frac{G^P}{Y}\right)_t$	(4)
$int_t = i_t \left(\frac{B}{Y}\right)_t$	(5)
$i_t = r_t + \pi_t + rp_t$	(6)
$rp_t = \alpha \left(\frac{B}{Y}\right)_t$	(7)
$gr_t^n = gr_t^r + \pi_t$	(8)
$pfgap_t = (i_t - gr_t^n) \left(\frac{B}{Y}\right)_{t-1} - \left(\frac{D^P}{Y}\right)_t$	(9)



Equation (1) determines the dynamics of the debt-to-GDP ratio ( $B/Y$ ) as a result of debt in the previous period, the deficit to GDP ratio ( $D/Y$ ), the GDP growth rate ( $gr$ ) and the stock-flow adjustment ( $SF/D$ ). The deficit, (2), equals revenues to GDP minus expenditures to GDP. Total expenditures in (3) consist of primary expenditures, and interest expenditures,  $int$ . (4) defines the primary fiscal balance by taking out the interest payments –defined in (5)- from the total deficit. The nominal interest rate in (6) is defined as the sum of the real interest rate,  $r$ , (expected) inflation,  $\pi$ , and a risk premium,  $rp$ . We assume in (7) that the risk premium depends on the level of debt, with the sensitivity measured by the curvature parameter  $\alpha$ . Note that (7), (6), (5) and (1) imply a non linearity (i.e. quadratic) in the debt dynamics. Nominal growth in (8) equals real growth plus inflation<sup>4</sup>. Finally, eq.(9) gives the primary fiscal gap, the difference between the primary fiscal balance that would stabilize debt at the level at the start of the current period and the actual primary fiscal balance. Our model deals with the general government fiscal variables and is therefore not further worked out into federal, regional, local government and social security accounts.

First, we outline a baseline scenario for the period 2011-2030. To simulate our simple model of the Greek public finances during that period and compare alternative scenarios, we need to choose a baseline scenario for the exogenous variables in the model. While this baseline scenario should not be considered necessarily as the most realistic scenario, we give it a number of features that could be a useful benchmark. We assume a real growth rate of 1.25%, an inflation rate of 2% and a real interest rate of 1%. Primary government expenditures and government revenues are both set to 41% of GDP- close to their 2009-2010 values- implying a primary balance in equilibrium, this implies in other words a neutral stance on this aspect.<sup>5</sup> The stock-flow adjustment is set to 0% of GDP.

Simulating the model with these baseline assumptions results in the adjustments shown in Figure 1 with a blue line. In this baseline scenario, government debt gradually rises from the starting value of close to 140% of GDP to 180% by 2030. This growth is driven by a rising interest burden that contributes to deteriorating fiscal conditions –increasing debt, deficits, and risk premium. A primary fiscal balance gap of around 2.5% of GDP suggests that throughout the period a sustained primary fiscal balance (improvement) of 2.5% -compared to the baseline- is needed to stabilise debt at its current level, other things equal, 2.5% more therefore than our (optimistic) baseline assumption of a 0% primary fiscal balance. The persistent and rising risk premium of around 2% reflects of course the high initial debt level and unfavourable debt dynamics. The risk premium curvature coefficient  $\alpha$  is put to 0.01, based on a simple regression of the Greek interest rate differential w.r.t. Germany on the level of Greek debt.

In the first case, Scenario 1 (2) analyses the effects of a 1% decrease (increase) in primary government spending on the fiscal variables. Figure 1 compares the outcomes of scenario 1 (2) and the baseline scenario.

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<sup>4</sup> Note that our simple model ignores the effects of changes of government spending and government revenues on economic growth and inflation. There is considerable uncertainty about the size and even the sign of fiscal multipliers (think of the literature on the s.c. non-Keynesian effects of fiscal adjustments) in the short and long-run, see Spilimbergo (2008).

<sup>5</sup> An example of more pessimistic baseline on the primary fiscal balance (-2% for the period 2010-2014) is taken by the IMF (2009). IMF (2010) considers an alternative, more optimistic scenario with the primary fiscal balance gradually improving from -2.5% of GDP in 2010 to +5% of GDP in 2015. In the even more optimistic scenarios of the European Commission (2010c), a positive primary fiscal balance of 5.5% of GDP is assumed from 2011 onwards, resulting in a gradual debt reduction from 137% to 125% to GDP in 2025.

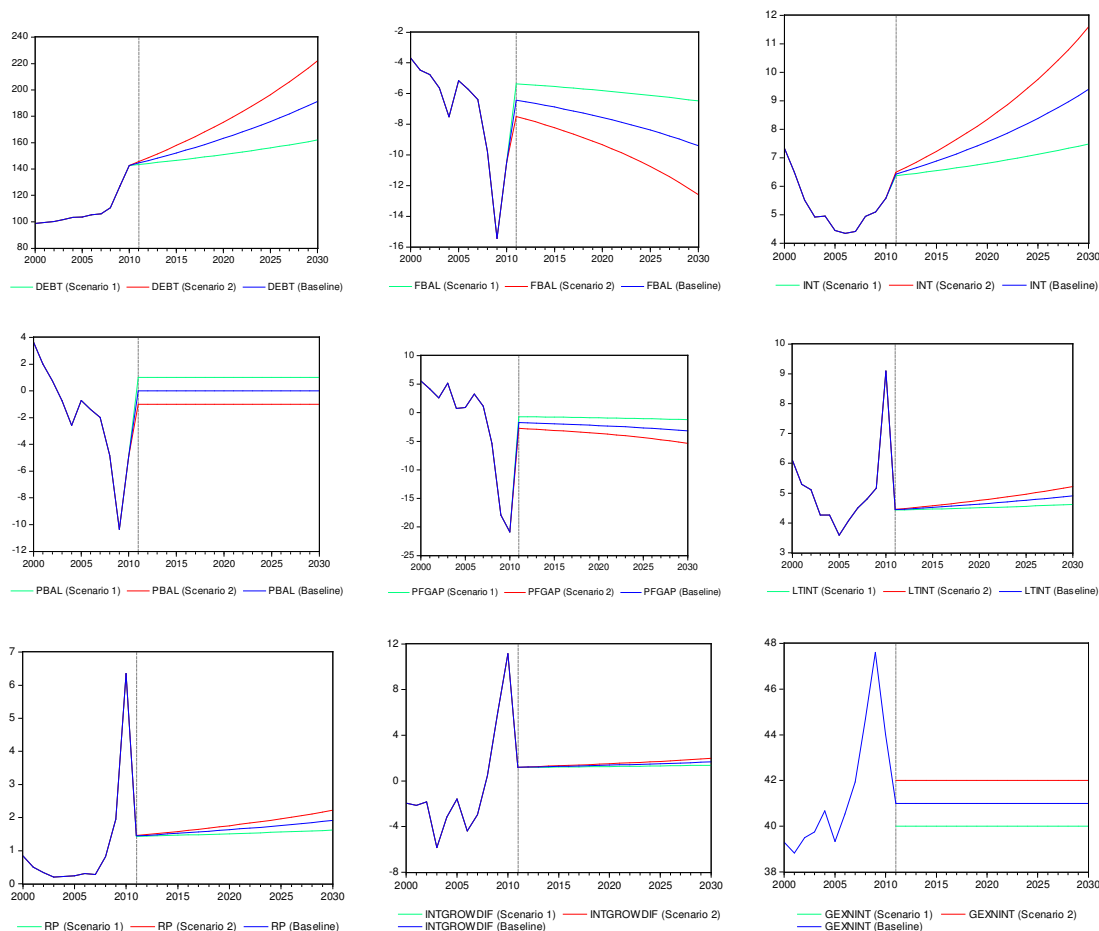


Figure 2 Simulation of 1% lower (Scenario 1, green line) or higher (Scenario 2, red line) primary government spending, 2011-2030.<sup>6</sup>

This scenario illustrates the relatively high sensitivity –especially in a longer-run perspective– of the Greek budgetary situation to small, permanent changes in the primary balance. Compared to the baseline, all fiscal variables improve (deteriorate) from a reduction (increase) in primary government spending, especially in the long-run.

Our simple framework ignores the effects that changes in government spending (and government revenue) may have on economic growth and inflation. Most empirical studies would point to small but positive fiscal multipliers. The literature on non-Keynesian effects of fiscal adjustments would, however, point to the possibility of positive growth effects from fiscal consolidations, especially under conditions of high government debt and high tax rates, a situation that would apply to the case of Greece. Taken together, this could suggest that the short-run and long-run growth effects of such a fiscal consolidation are –while perhaps not zero– rather limited in this case.

The second case, displayed in Figure 4, considers Scenario 3 (4) of an improvement (deterioration) of the real growth rate of 1% compared to the baseline. A small but sustained

<sup>6</sup> In the Figures 2-7, the following abbreviations are used DEBT: debt to GDP ratio, FBAL: fiscal balance to GDP ratio, INT: interest payments to GDP ratio, PBAL: primary fiscal balance to GDP ratio, PFGAP: primary fiscal balance gap to GDP ratio, GROWTHN: nominal growth rate GDP, LTINT: long-term interest rate on government bonds, RP: risk premium on government bonds, INTGROWDIF: interest rate-growth rate differential, REV: government revenues to GDP ratio, GEXNINT: primary government spending to GDP ratio, GROWTHR: real GDP growth rate, INFL: inflation rate, R: real interest rate, SFADJ: stock-flow adjustment to GDP.

improvement of economic growth has strong effects on public finances. Debt dynamics get on declining path and all fiscal variables improve. The relatively positive fiscal dynamics of the period from 2000 to 2007 are basically returning in the medium and long-run, fiscal variables stabilize and do not deteriorate compared to the initial situation.

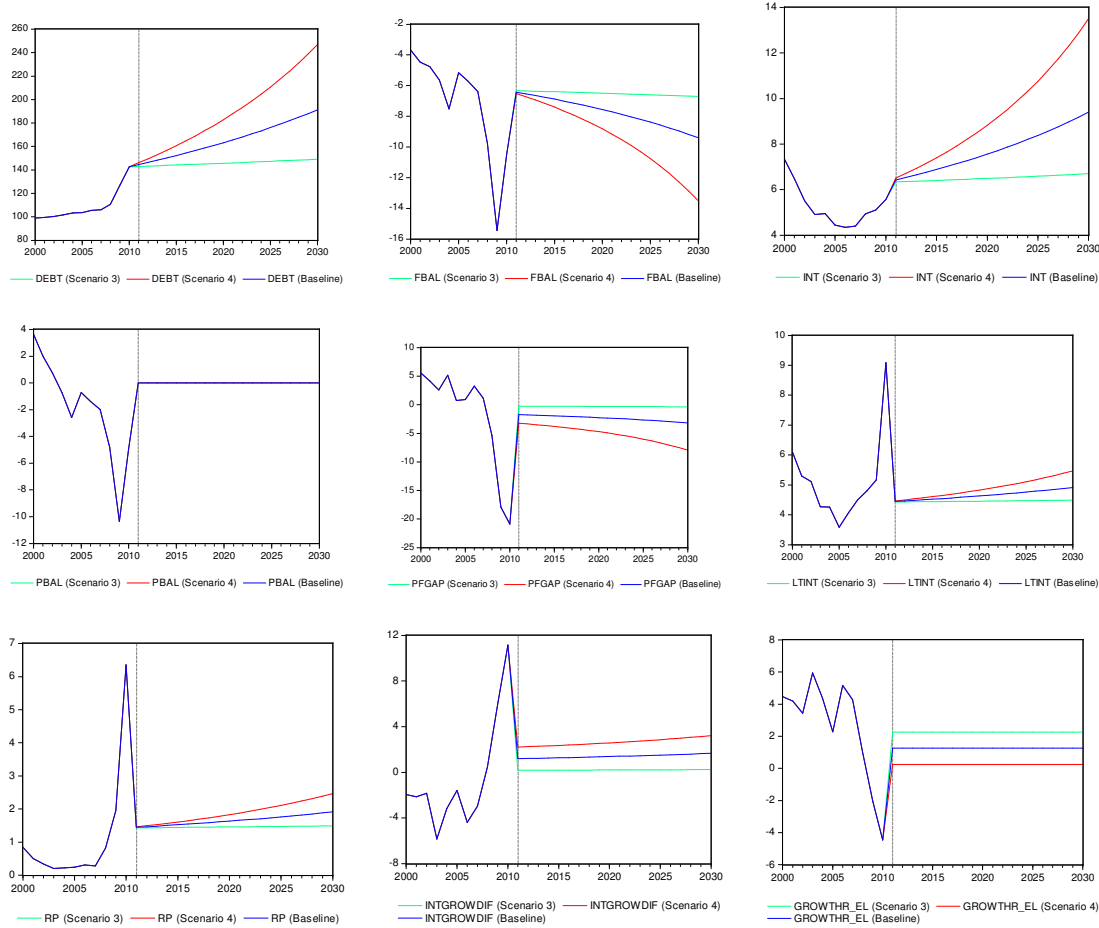
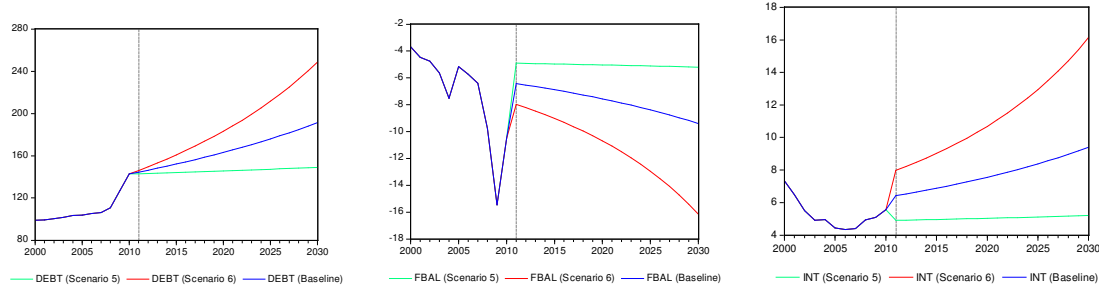


Figure 3 Simulation of 1% higher (Scenario 3, green line) and 1% lower (Scenario 4, red line) economic growth, 2011-2030.

In the third case (Figure 4), Scenario 5 (6) considers the effects of a 1% lower (higher) real interest rate on Greek debt, compared to the baseline.



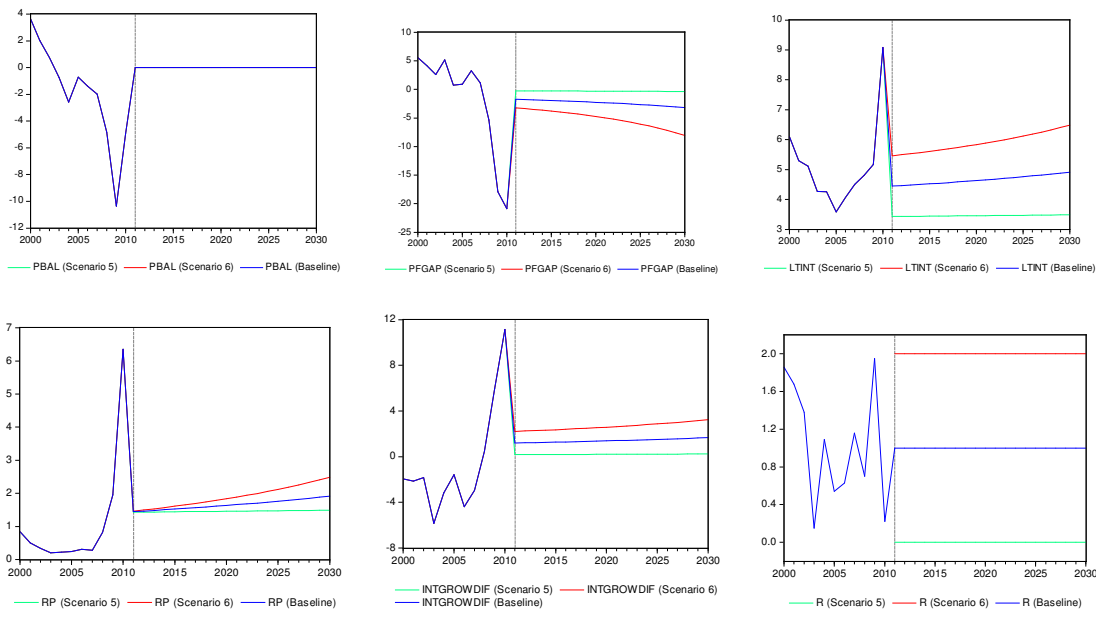
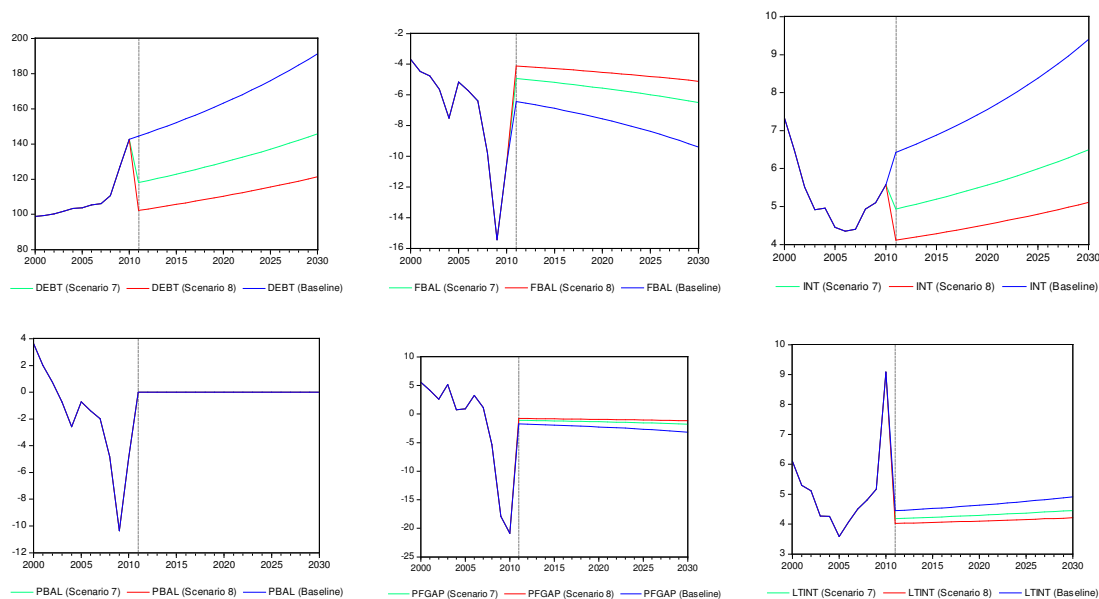


Figure 4 Simulation a 1% lower (Scenario 5, green lines) and 1% higher (Scenario 6, red lines) real interest rate, 2011-2030.

The results are similar to the 1% economic growth changes in Figure 3, the main differences lies of course in the interest burden and total deficit adjustment. Note that the outcomes of the scenarios of Figure 4 would also occur from a permanent 1% reduction (increase) of the risk premium.

Case 4 in Figure 5 studies the effects of a stock-flow adjustment of -25% of GDP (scenario 7 green lines) that could be considered as a rough approximation of the effects of the substantial Greek debt-rescheduling incorporated in the second rescue-package of July 2011. We also include a second, larger debt “haircut” scenario of -40% of GDP (scenario 8 red lines) that could be considered as a rough approximation of the second Greek debt “haircut” agreed in the rescue package of October 27 and which would strip roughly 100 bln euro from the Greek debt.



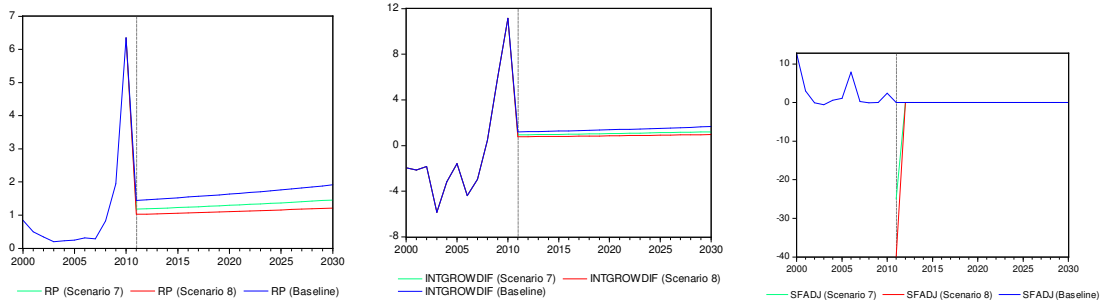
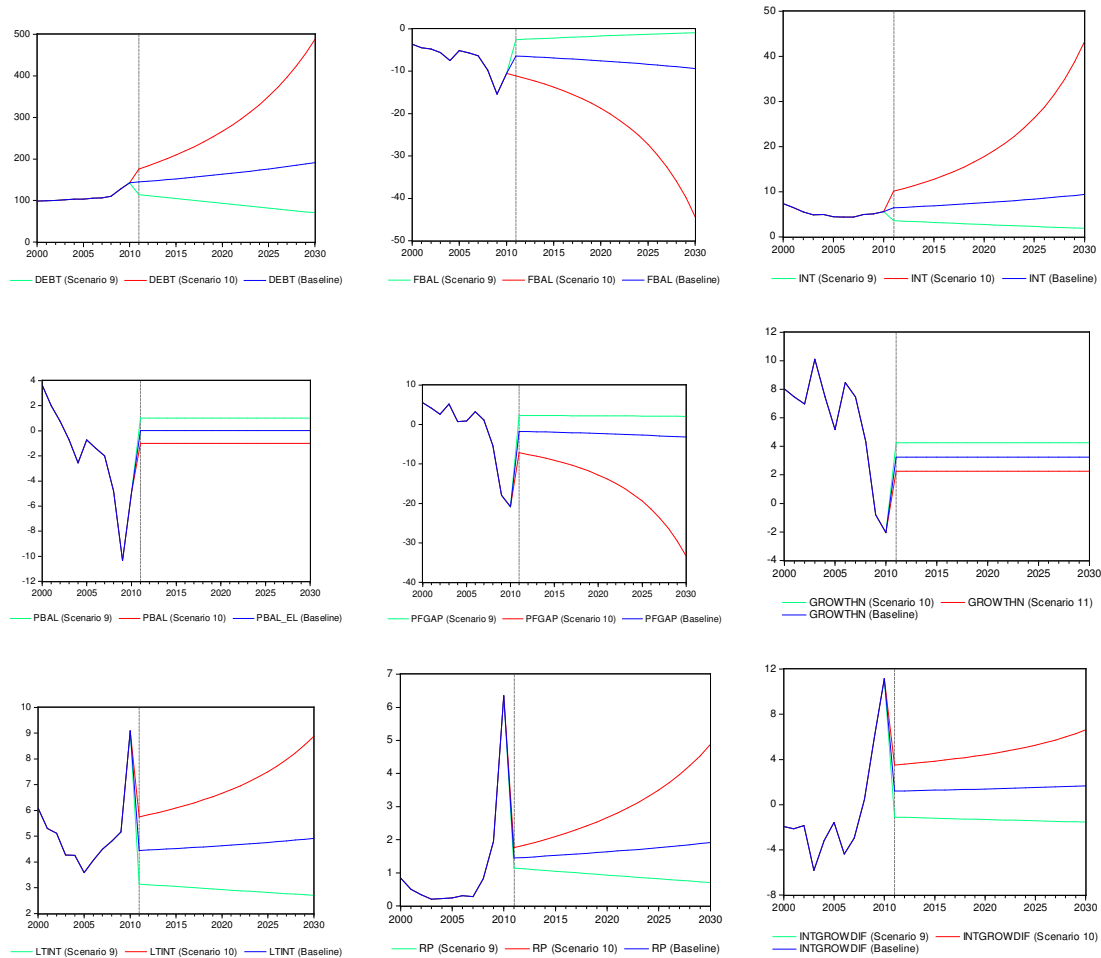


Figure 5 Simulation of a -25% GDP (Scenario 7) en -40% GDP (Scenario 8) stock-flow adjustment, 2011-2030.

In case of such a one-time debt-reducing effort from rescheduling/debt-buybacks and other measures in the order of 25% or even 40% of GDP, Greek public finances regain a more stable adjustment path over time, even if the long run again a small upward trend in debt remains, as the structural problem of low growth and insufficient fiscal stringency is not tackled by a one-time debt-relief. Nevertheless, considerably more budgetary “breath space” is provided from these debt-relief scenarios.

Case 5 provided in Figure 6 considers a “best case” (Scenario 9) and a “worst case” (Scenario 10). These combine the previous four cases. In the “best case” (“worst case”) this implies in other words a combination of lower (higher) primary government spending, higher (lower) economic growth, lower (higher) interest rates and debt reduction (increase) from a stock-flow adjustment.



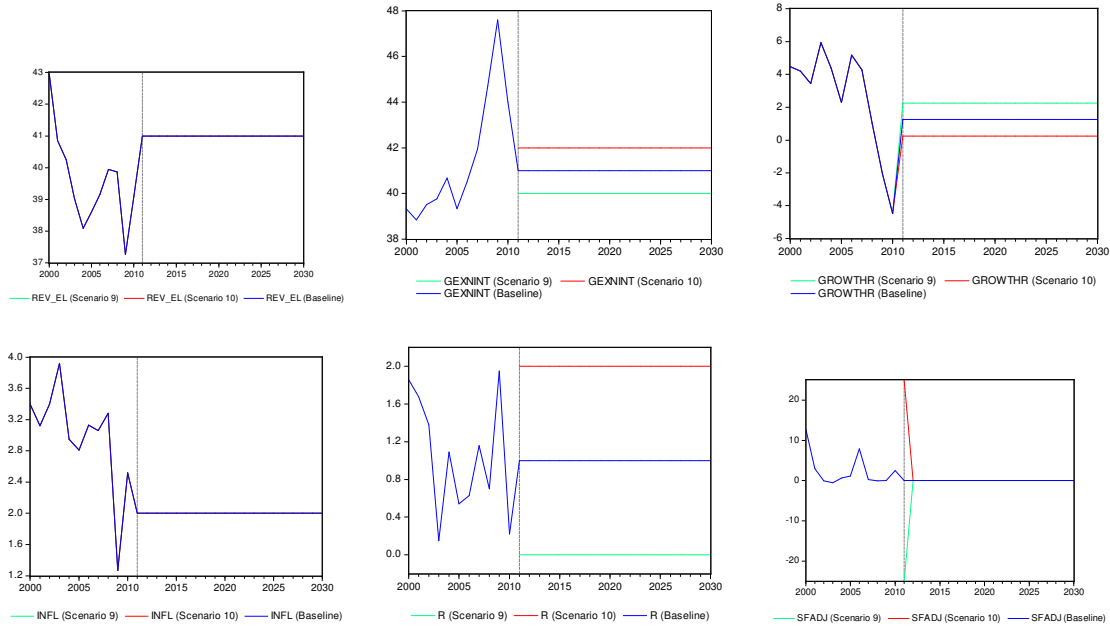
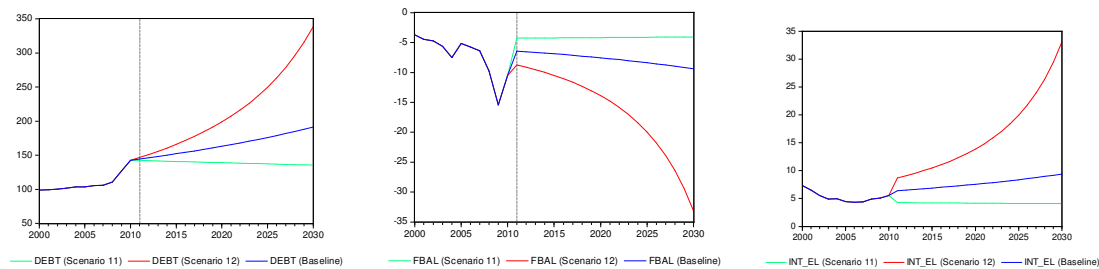
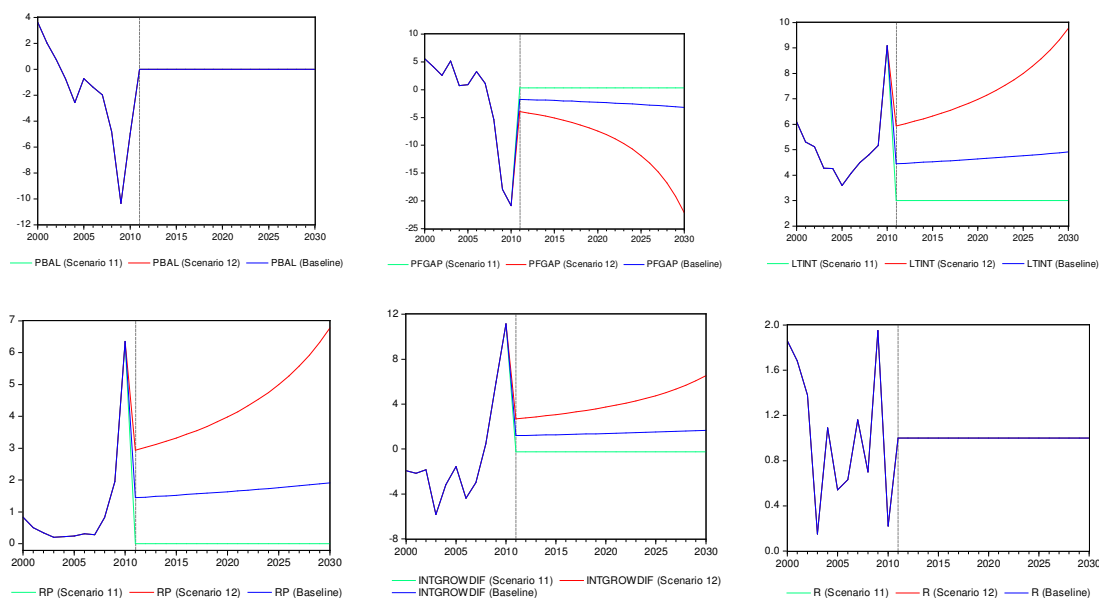


Figure 6 Simulation of a “best case” (Scenario 9, green lines) vs “worst case” scenario (Scenario 10, red lines), 2011-2030.

The “best case” scenario essentially restores Greek fiscal sustainability, even at a slow pace. The fiscal balance improves gradually as the interest burden recedes. Government debt starts to decline. In the “worst case” scenario a rapid further decline in fiscal sustainability occurs. Note in particular also the asymmetry between both cases due to the non-linearity in the risk-premium: in the “worst case” scenario, fiscal variables deteriorate faster than they improve in the “best-case” scenario.

As noted at various places, the risk-premium formation and dynamics play a significant role in the adjustment of fiscal variables. It is therefore interesting to examine this role further. In our last case, we compare in Figure 7 the baseline scenario –based on the nonlinear (quadratic) risk premium mechanism when combining equations (1), (5), (6) and (7), with  $\alpha = 0.01$ - with two alternatives. In Scenario, 11  $\alpha$  equals 0 implying no risk premium on Greek government bonds; in Scenario 12,  $\alpha$  equals 0.02 implying a stronger non-linearity in the risk-premium, and consequently in the entire adjustment of fiscal variables.





Figuur 7 Simulation of  $\alpha = 0$  (Scenario 11) en  $\alpha 0.02$  (Scenario 12), 2011-2030.

This scenario where risk-premia on Greek debt would disappear could result from the introduction of the s.c. Eurobonds, a possibility that has been widely discussed. The scenario where the link between risk-premia and government debt is tightened ( $\alpha = 0.02$ ) could be interpreted as a headwind scenario with stronger speculation on a Greek default in international financial markets<sup>7</sup>, speculative downgradings of Greek debt by rating agencies and a general lack of confidence on the Greek efforts to restructure public finance and the economy. This scenario with its stronger non-linearity in public finances from the risk-premia effect, results in a situation where a Greek default is practically inevitable in the medium term when this non-linearity start to “bite” more strongly than in the baseline.

## Conclusions

Recently, Greece found itself in the centre of the European debt crisis feeding speculations of a pending Greek sovereign default and an exit from the euro area. Policymakers of the European Union and the IMF responded by designing a Greek rescue programme to avert such a ‘worst-case scenario’ on the near and medium term. Greek policymakers committed themselves to an extensive programme of fiscal and structural reforms. Given high vulnerabilities in growth, public finances, and the financial sector, Greek policies need in particular to restore confidence and bolster sustainability.

This paper provided a more detailed look at the stability of public finance in Greece. Econometric tests on solvency showed that the Greek public finances were not on a sustainable path during the period between 1989 and 2008. In a forward-looking scenario-analyse it was in a next step investigated how Greek public finances may evolve during the short and medium run. Simulations for the period between 2011 and 2030, using a simple model of the Greek public finances, provided a number of interesting insights and policy

<sup>7</sup> Such speculations can be fed e.g. by massive buying of Credit Default Swaps (CDS) on Greek debt. Instruments that have been described as “financial weapons of mass destruction”. While not necessarily fully adequate in case of sovereign debt, spreads on CDS are often used to derive an implied default probability and recovery rate, see Berndt e.a (2005) on such valuations using CDS. Arghyroua and Kontonikas (2011) analyse determinants of risk premia and CDS spreads in the Eurozone in the running-up and during the European debt crisis.

implications. A first result is the importance of the interest vs. growth factor for the dynamics of the fiscal variables in the longer run: a small reduction in interest rate or a small improvement of growth delivers important gains in limiting/preventing the “debt snowball” we still observe quite significantly in the baseline scenario. Given that interest rates and economic growth are only very indirectly under control of policymakers, fiscal prudence requires being very cautious regarding projections on interest rates and growth, and considering the possibility that both interest rates could get higher than projected and growth rates lower than projected.

Regaining long-run sustainability in other words will require a long period of fiscal consolidation, resulting in substantial expenditure reduction with accompanying economic, political and social costs. In a “best case” scenario, the fiscal consolidation is significantly supported by growth and interest improvements and a significant debt-rescheduling package. At the same time, a “worst case” scenario where all these parameters turn adverse, imply a rapid derailment of Greek public finance and most likely a rapid default in practical terms. A final simulation pointed to the importance of the risk-premia dynamics in sustainability of public finances. A ‘Eurobonds’ scenario where this risk-premia disappears (or is largely reduced) would provide strong support to sustainability as it mitigates the non-trivial adverse impact of speculation in international bond markets about a Greek default.

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