An Oifig Buiséid Pharlaiminteach
Parliamentary Budget Office

PBO DSA Calculator Dashboard Explainer Guide 2023

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Séanadh

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1 Introduction to Debt Sustainability Analysis

1.1 Link to the DSA Caculator Dashboard

- *PBO Debt Sustainability Analysis Calculator Budget 2024*

1.2 Disclaimer

This tool constitutes a calculator and data visualisation dashboard to aid people in seeing visually the hypothetical impact on Ireland's debt statistics of changes to the input variables of primary spending, revenue, GDP growth and interest rates. The PBO accepts no responsibility for the accuracy of the output of the tool and in no way does this tool constitute a forecast by the PBO. The tool is a "beta" version and is designed using a PBO deterministic DSA model. See also our comprehensive *Disclaimer Notice here*.

In particular, the baseline input figures that the calculator uses are merely placeholders. For the Budget 2024 calculator, Budget 2024 is used for figures out to 2026 (except for the market interest rate, which the PBO assumes to be between 3% and 4%) and from 2027, an extrapolation is applied using simplifying assumptions. The debt calculations in this tool are modelled such that all new and "rolled over" debt uses a single input interest rate for a given year. In reality for Ireland, the different debt items in different debt categories, such as individual "Short Term Paper", would be unlikely to be using a single market interest rate.

Likewise the tool assumes that there is a one-to-one relationship between the General Government deficit and the amount borrowed. As such there is no stock flow adjustment factor affecting the debt-to-GDP ratio as the Government changes the size of its outstanding assets.

The core purpose of this online dashboard is to highlight visually the comparative changes between a hypothetical baseline in response to scenario shocks. The purpose is not to provide a forecast, especially as the model inputs, e.g. General Government Primary Spending, past 2027 are simplified so as to merely provide a hypothetical baseline for illustrative purposes, rather than being a forecast.

This calculator builds upon previous work presented in *the PBO analytical model for public debt sustainability analysis* and subsequent DSA-related PBO publications, e.g. *PBO Debt Infographic SPU 2023*. This tool was prepared as part of capacity building by the PBO's Costing and Modelling Unit and will be developed over time.

For Members of the Oireachtas ("Members" hereafter), to conduct any detailed debt sustainability analysis such as shock scenario analysis, or to test the sustainability and fiscal rules compliance of Shadow Budgets, please contact the PBO Costing and Modelling unit at *pbocostings@oireachtas.ie*.

1.3 What is Debt Sustainability Analysis

Debt Sustainability Analysis (DSA) is a study of a country's medium-term to long-term debt situation. DSA assesses how a country's current level of debt and prospective borrowing affect its present and future ability to meet debt service obligations, especially in light of macroeconomic developments and shocks. Debt sustainability is measured using the trajectory of the ratio of a country's total public debt to its gross domestic product (GDP), or the debt-to-GDP ratio in short.

In Ireland's case, issues with GDP are well documented; as such Modified Gross National Income (GNI*) is often used in domestic assessments of DSA.

1.4 Why DSA is important

For policy makers, it is important to have accessible tools that facilitate an assessment of the debt implications of a policy proposal, and to also provide scenario analysis for public debt in respect of shocks to GDP and interest rates.

DSA helps Members to understand how different budgetary choices would affect debt sustainability and compliance with the EU fiscal rules in future years, by using scenario analysis to highlight the interplay between the input values of Primary Spending, Revenue, GDP/GNI* Growth, and Interest Rate.

The model uses granular NTMA debt tranche data to generate projections year by year.

1.5 The EU Fiscal Rules

The EU Fiscal Rules[1] of the Stability and Growth Pact (SGP) constitute the main institutional framework shaping fiscal policy in Ireland (i.e. Government tax and expenditure decisions). The SGP, which was initially established in 1997 and has evolved significantly since then,[2] is made of two Arms: the Corrective and the Preventive Arm. The Corrective Arm, which Ireland was subject to during the crisis period, aims to correct large fiscal imbalances (i.e. high deficit and debt), with the 3% deficit-to-GDP ratio and the 60% debt-to-GDP ratio representing the key fiscal constraints.

The DSA Calculator models compliance with the rules set-out under the Corrective Arm. It tests against the 3% deficit and 60% debt ratio targets only and does not include the further rules laid out in the Preventive Arm.

The Preventive Arm, on the other hand, aims to promote prudent fiscal policy and maintaining stable and sustainable public finances. The Preventive Arm is characterised by two main rules: a Structural Budget Balance rule and a Spending rule limiting annual growth in Government Expenditure (i.e. the Expenditure Benchmark).

The Structural Budget Balance is the General Government budget balance net of the effects of the economic cycle and one-off and other temporary measures. It "gives a measure of the underlying trend in the budget balance"[3]; the "structural balance rule requires that it be above the medium-term budgetary objective (MTO) ... or moving towards the MTO at an adequate pace".[4]

The Expenditure Benchmark at its simplest states that spending increases which go beyond a country's medium-term reference rate of potential GDP must be matched by additional discretionary revenue measures. This encourages a move towards or maintaining of the MTO.[5]

The EU Fiscal Rules are currently suspended in 2023, first due to COVID-19 and then due to the crisis in Ukraine.[6] The EU Fiscal Rules are based on GDP and not on GNI* (Modified Gross National Income). Ireland's GDP is significantly higher than its GNI*; therefore, using GDP would make it easier to meet EU fiscal rules compliance than using GNI*. There are ongoing negotiations to reform the EU Fiscal Rules system, with proposed systems focusing more on debt sustainability analysis to underpin the fiscal rules.[7]

In relation to Fiscal Rules, the Fiscal Council plays an important role in measuring and ensuring compliance with the budgetary rules, as set out in the Fiscal Responsibility Act.[8] Its purpose as an independent statutory body is to provide an independent assessment of official budgetary forecasts and proposed fiscal policy objectives.[9]

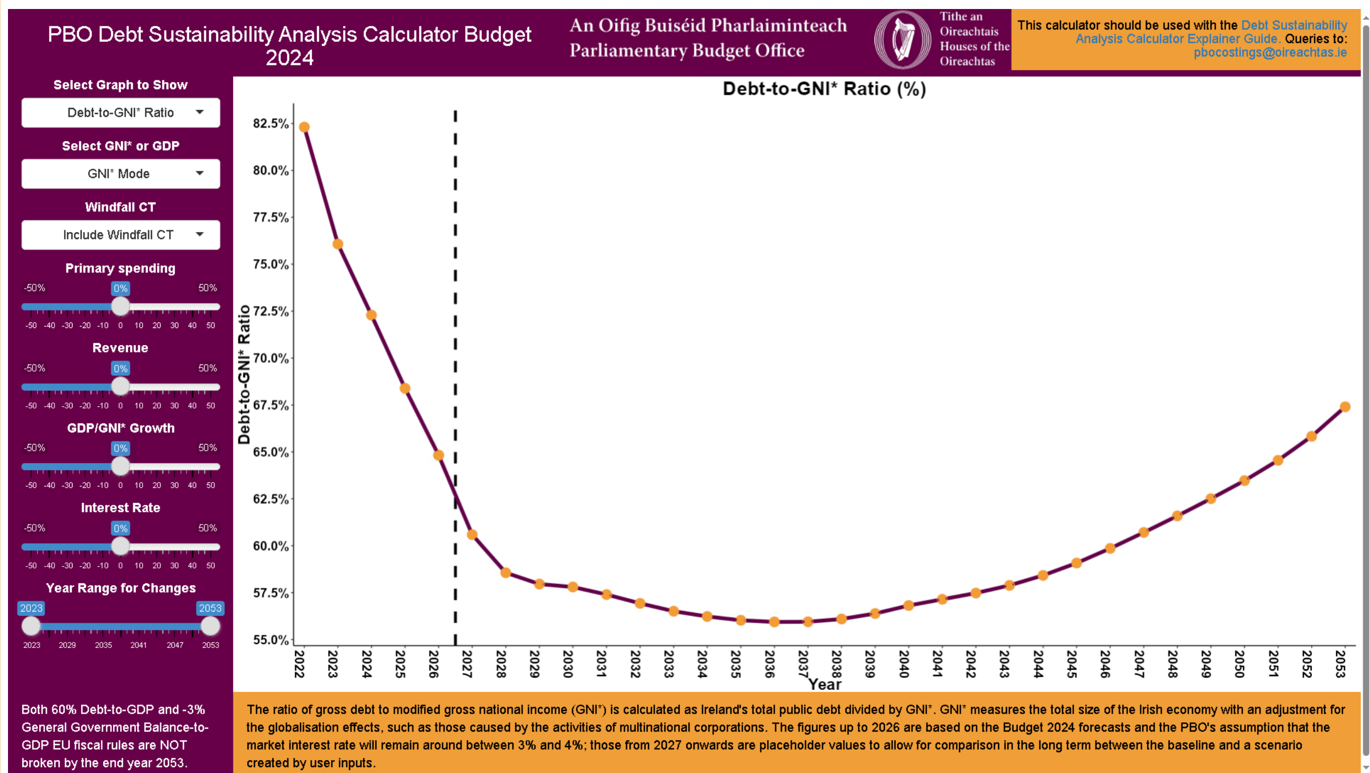
1 This section draws from PBO Briefing Paper 6 of 2018: *Potential Output, the Output Gap and Associated Key Issues for Fiscal Policy-making in Ireland*
2 The EU fiscal rules were further expanded by the so called "6 pack" changes in 2011 and "2 pack" changes in 2013.
3 *European Court of Auditors, EU requirements for national budgetary frameworks: Need to further strengthen them and to better monitor their application, (2019), p.9.*
4 *Fiscal Council, Fiscal Assessment Report, (May 2021), p.98.*
5 *Fiscal Council, Fiscal Assessment Report, (November 2013), Box I.*
6 *European Commission, European Semester Spring Package: Sustaining a green and sustainable recovery in the face of increased uncertainty, (May 2022).*
7 European Commission, *Commission proposes new economic governance rules fit for the future*, (April 2023)
8 *ISB, Fiscal Responsibility Act 2012 - Number 39 of 2012.*
9 *Fiscal Council, About the Council.*

2 The Debt Sustainability Analysis Calculator Dashboard Walkthrough

2.1 What the DSA Dashboard Does

The PBO DSA Calculator Dashboard shows what effect changes in Primary Spending, Revenue, GNI*/GDP Growth and Interest Rates would have on Ireland's fiscal sustainability, debt trajectory and EU Fiscal Rules compliance. This facilitates an assessment of the macro-fiscal changes, and shocks such as the removal of "windfall" corporation tax (CT), on the sustainability of Ireland's borrowing.

Figure 1: The Debt Sustainability Analysis Dashboard



The core purpose of the dashboard is to highlight visually the importance of fiscal sustainability and to support Members in exploring the fiscal implications of different budgetary policies. The DSA calculator is useful for Members to cost the debt implications of alternative budgets, and to see if they comply with core EU fiscal rules.

A policy or Budget is not fiscally sustainable if revenue and spending are unbalanced (e.g., if it uses potentially temporary revenue spikes to fund permanent spending increases, such as the concern surrounding the use of "windfall" corporation tax).

The graphed outputs are:

- Debt-to-GNI*/GDP Ratio
- Interest Spending
- General Government Balance-to-GNI*/GDP ratio
- Primary Balance
- General Government Debt
- Debt-to-GNI*/GDP Dynamics

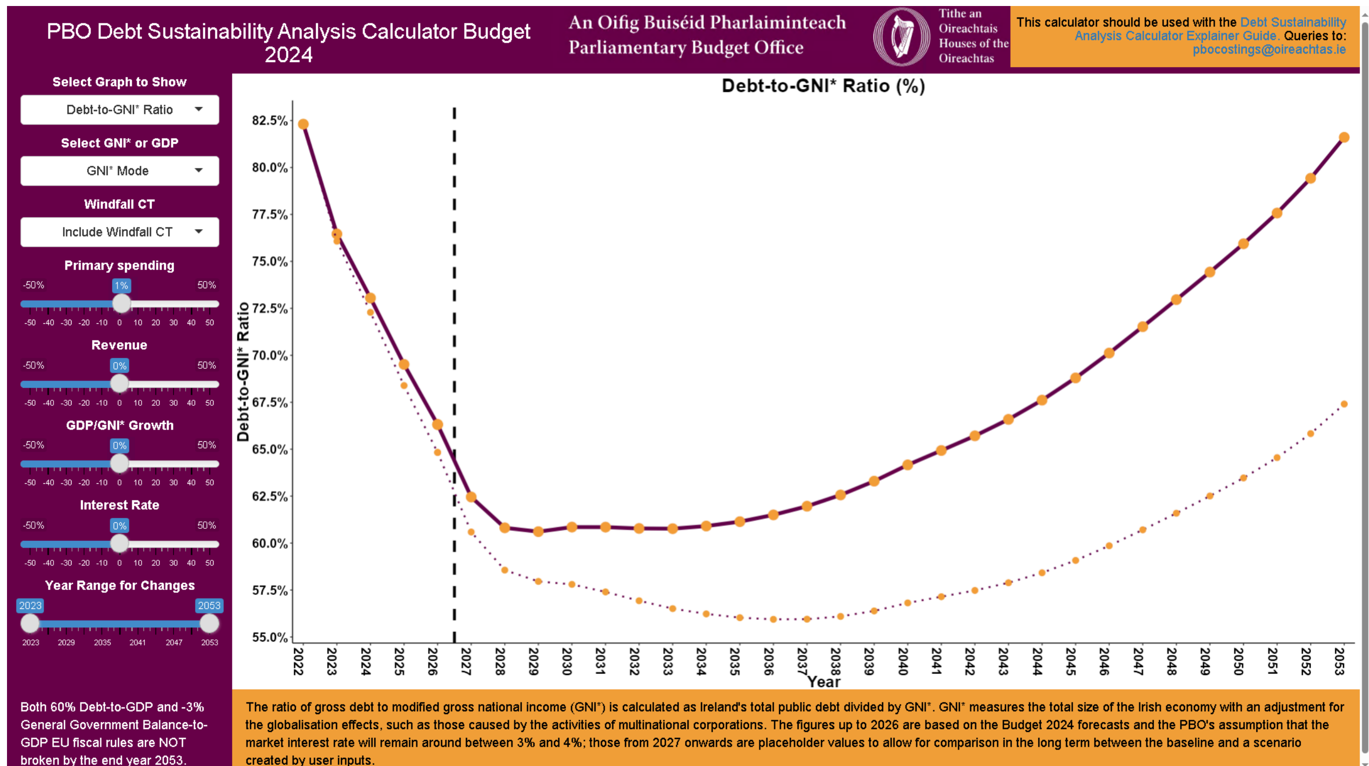
Each aspect of the calculator has a tool-tip popup to explain how to use it. In summary, you select the graph shown and change inputs by using the sliders and dropdowns on the left hand side of the screen. At the bottom of the dashboard, it displays the fiscal rules compliance and a brief description of the graph shown.

All detailed DSA queries by Members, such as for shock stress testing of Shadow Budgets, should be directed to the PBO at: *pbocostings@oireachtas.ie*.

2.2 A Scenario of a 1% Spending Increase by Graph

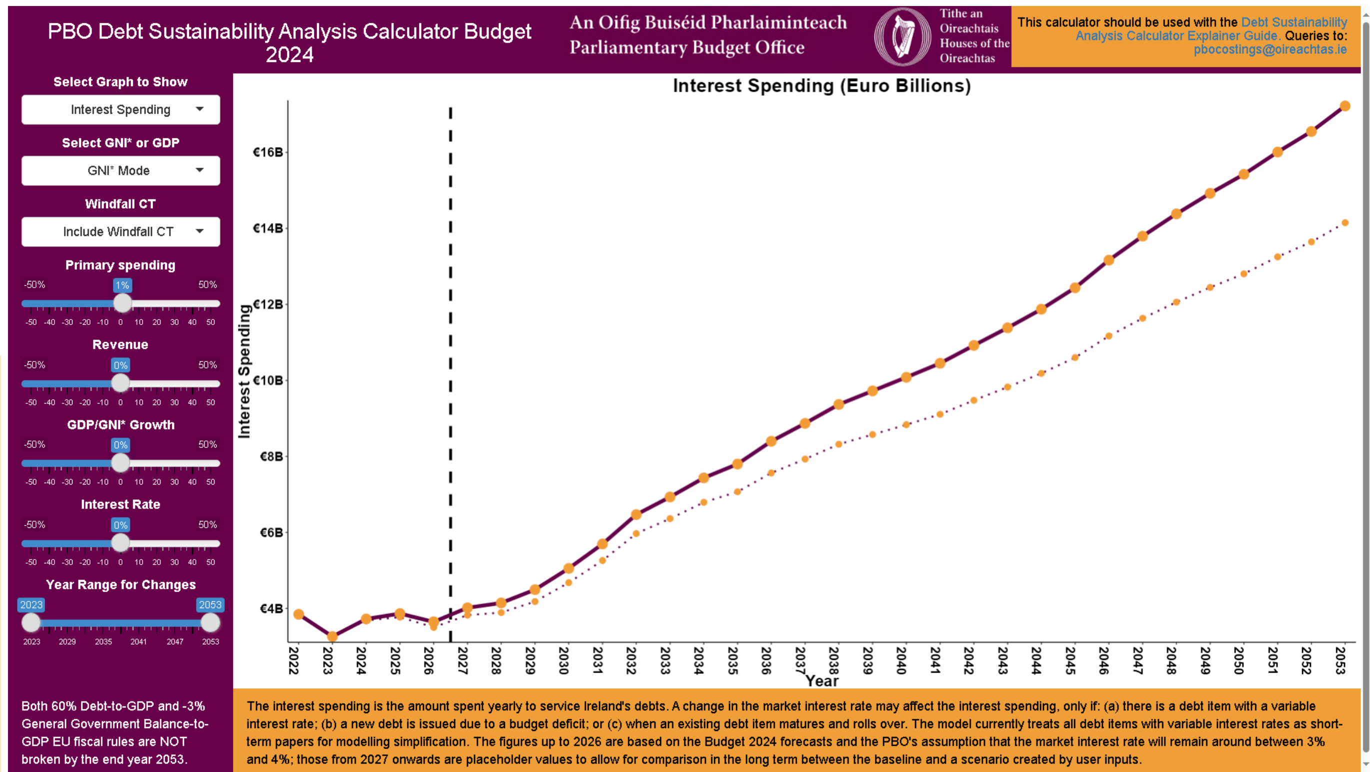
To highlight the use of the dashboard, we will show how a 1% increase to Primary Spending would affect debt sustainability according to each of the graphs. From 2023 to 2026 the baseline, indicated by the dotted line, is based on the projections published by the Department of Finance (except for the market interest rate as mentioned before), demarcated by the dashed vertical divider line in 2026. Figures from 2027 to 2053 are a hypothetical placeholder extrapolation, which largely assumes constant nominal economic growth over the entire time horizon.

Figure 2: DSA Dashboard - Debt-to-GNI*



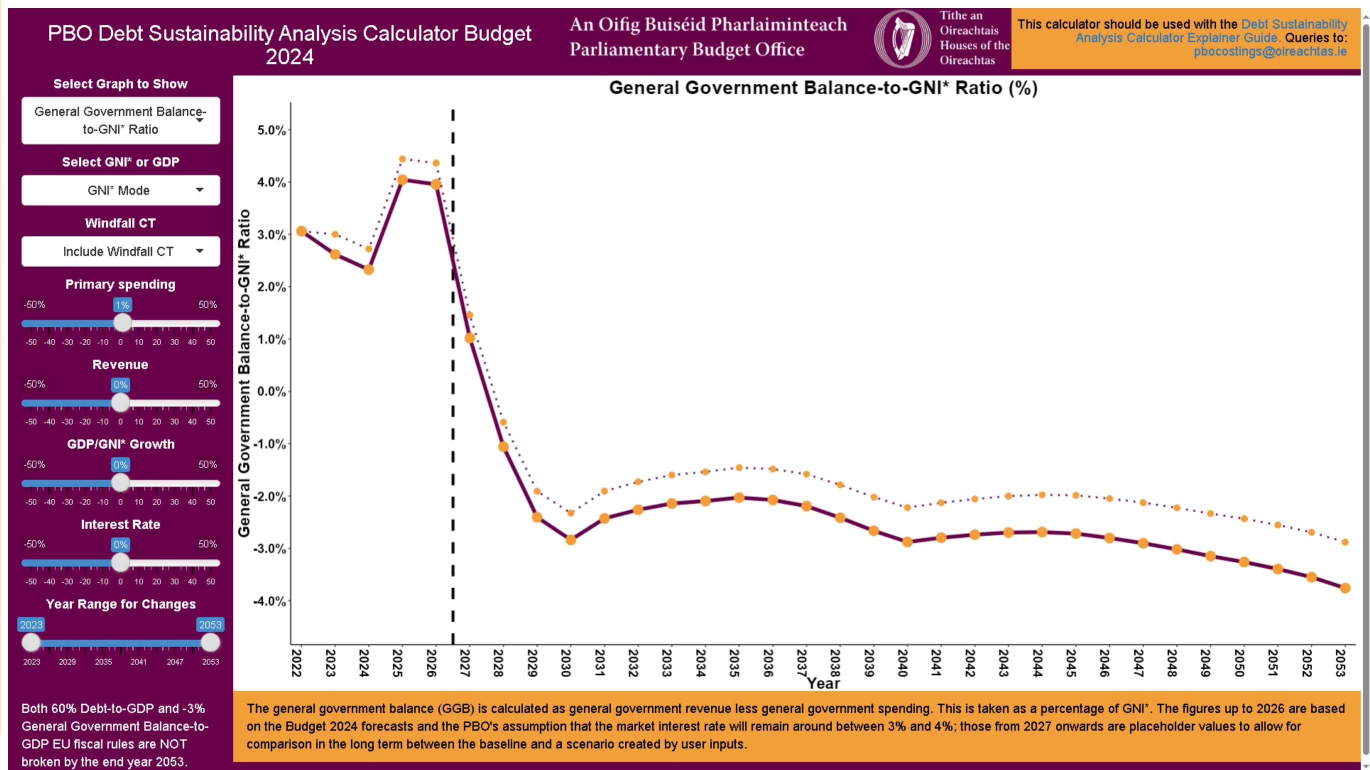
A 1% spending increase results in a higher trajectory for the Debt-to-GNI* ratio, and a more upward shaped curve.

Figure 3: DSA Dashboard - Interest Spending



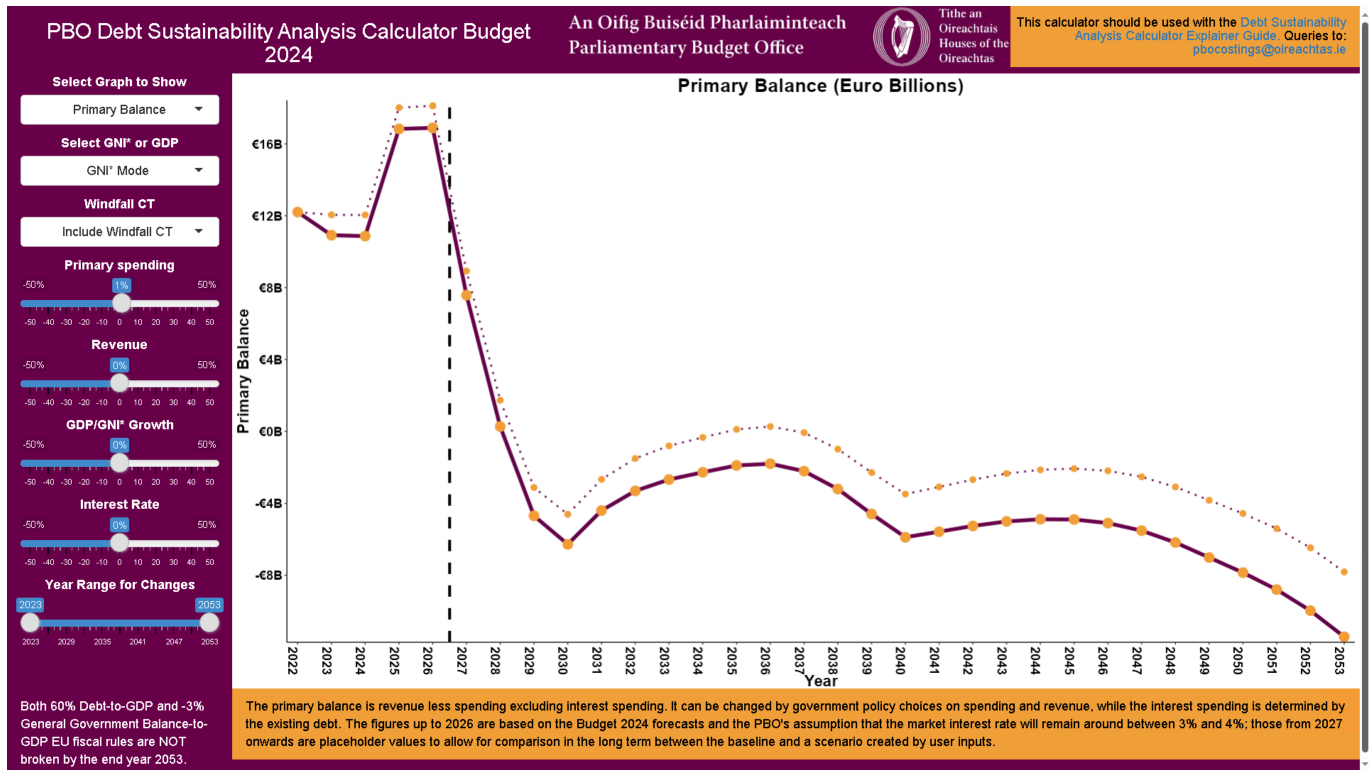
A 1% spending increase also results in a higher trajectory for the Interest Spending, as a greater amount of debt will need to be issued to cover the spending increase.

Figure 4: DSA Dashboard - General Government Balance-to-GNI* Ratio



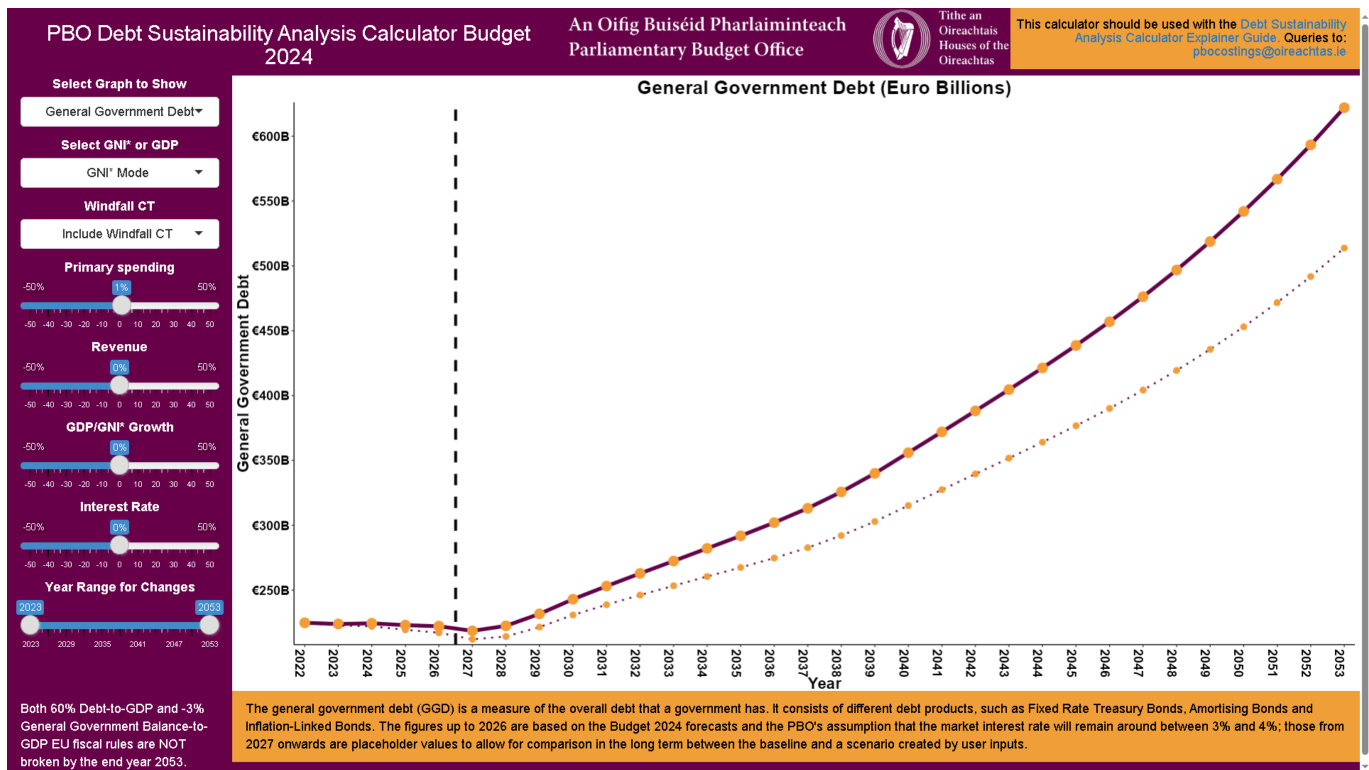
A 1% spending increase generates a lower trajectory for General Government Balance-to-GNI* Ratio, as it results in running larger deficits.

Figure 5: DSA Dashboard - Primary Balance



A 1% spending increase also creates a lower trajectory for the Primary Balance, which excludes the interest spending, running more primary deficits than in the baseline.

Figure 6: DSA Dashboard - General Government Debt



Finally, a 1% spending increase results in a higher trajectory for the General Government Debt. The baseline assumes that a trend towards a primary balance is roughly achieved. This means that what is borrowed ever year is for the interest payment for the year. Hence debt and interest payments will continue to accumulate over time.

2.2.1 Modelling Debt Dynamics

The debt dynamics capture the change in the debt-to-GDP (or GNI*) ratio year-on-year. This change is largely driven by:

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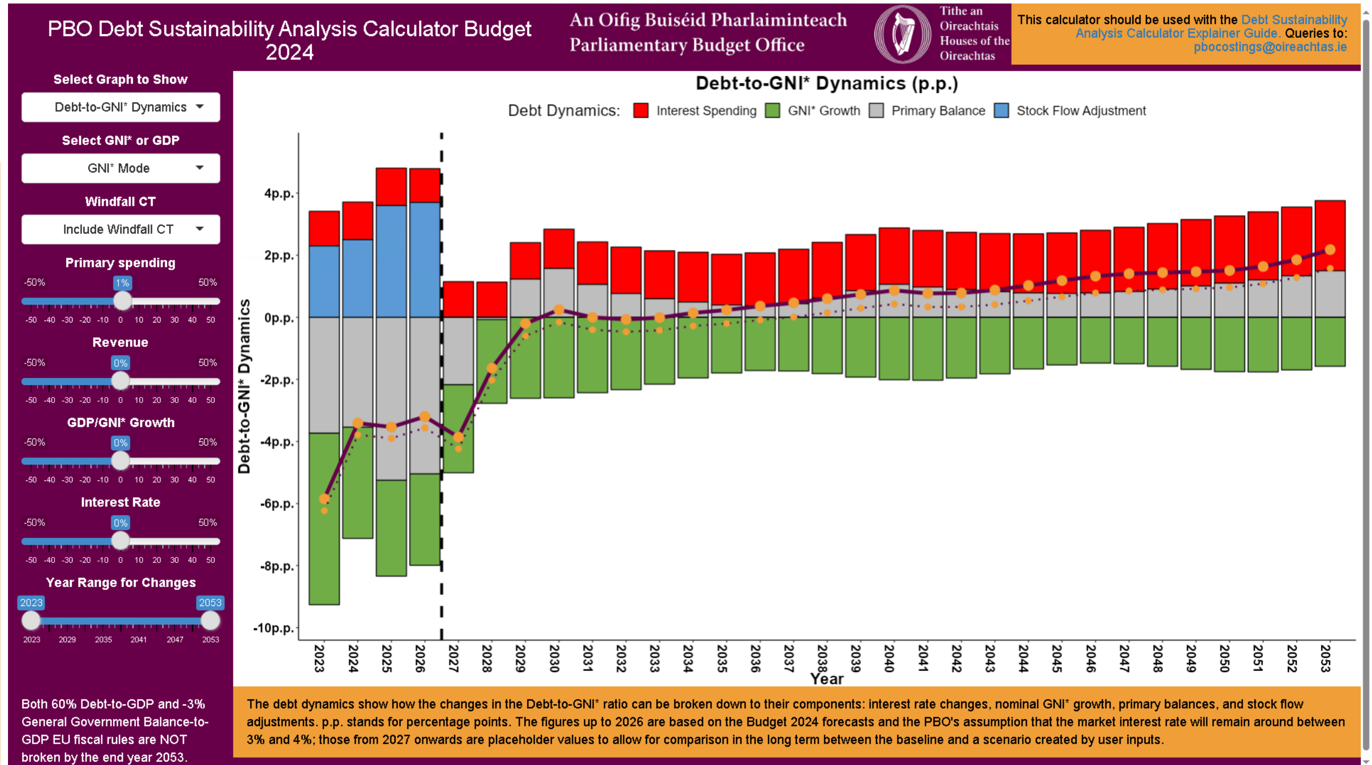
- Nominal GDP (or GNI*) growth (inflation + real growth);
- Interest rates on outstanding debt;
- Primary balance (general government balance without interest spending).

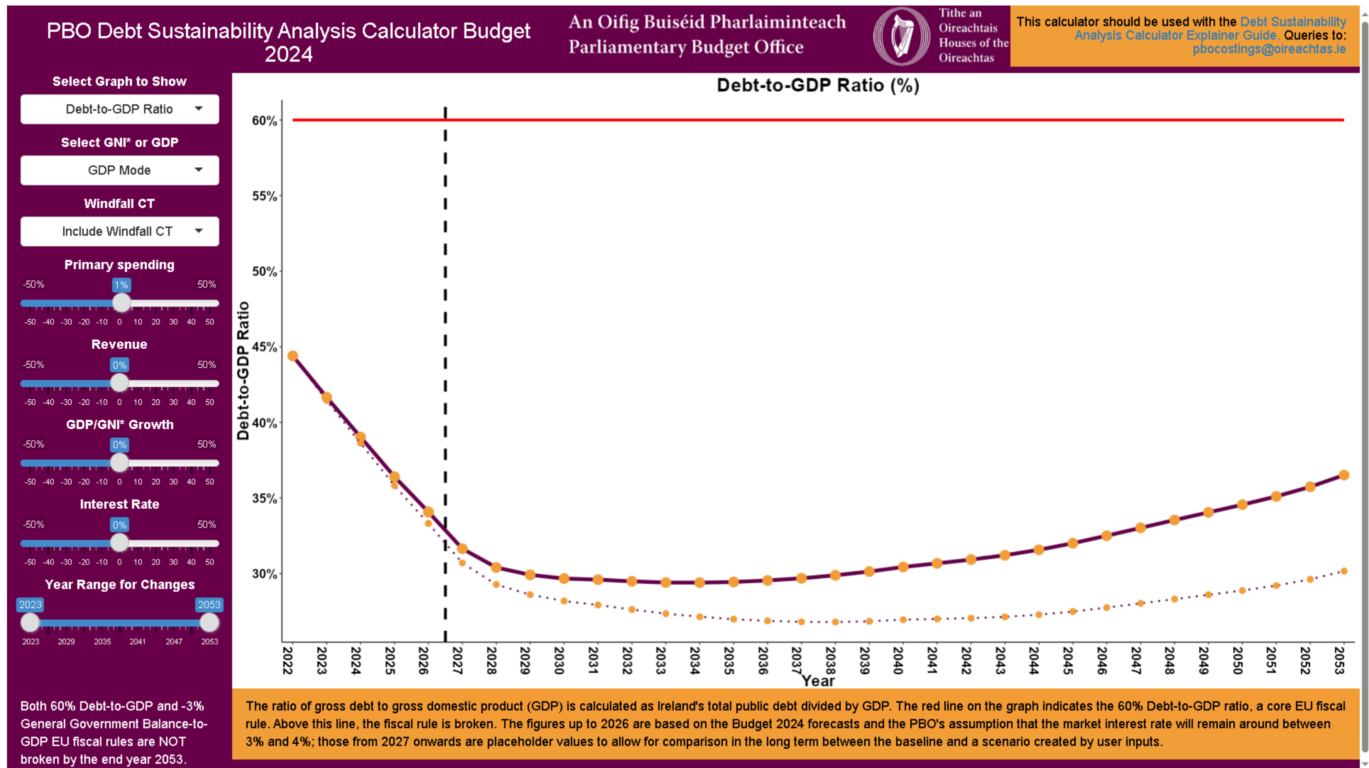
Figure 7: DSA Dashboard - Debt-to-GNI* Dynamics



The debt dynamics break down what causes the change in the Debt-to-GNI*/GDP ratio for a given year into its constituent parts of the GNI*/GDP growth effect, primary balance effect, interest spending effect, and stock flow adjustment effect. A 1% spending increase results in the primary balance effect of the debt dynamics increasing.

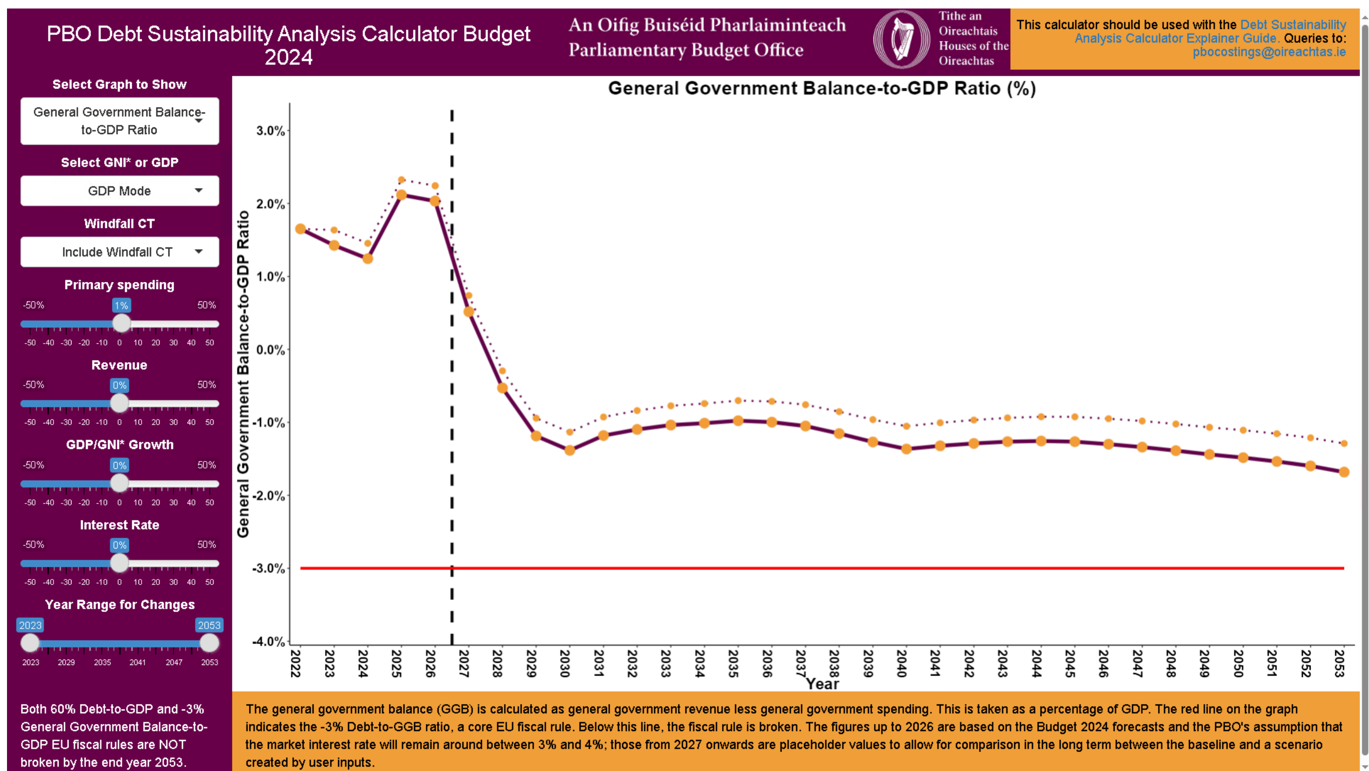
2.2.2 GDP-based Ratios and Fiscal Rule Compliance

Figure 8: DSA Dashboard - Debt-to-GDP Fiscal Rules



As shown, a 1% spending increase results in a higher trajectory for the Debt-to-GDP ratio, and a more upward shaped curve. This would still be within the core EU fiscal rules of 60% Debt-to-GDP ratio. Note that for Ireland, GNI* is approximately half the size of GDP.

Figure 9: DSA Dashboard - General Government Balance-to-GDP ratio Fiscal Rules



A 1% spending increase also results in a lower trajectory for General Government Balance-to-GDP ratio, meaning running larger deficits. This would still be within the core EU fiscal rules of -3% General Government Balance-to-GDP ratio.

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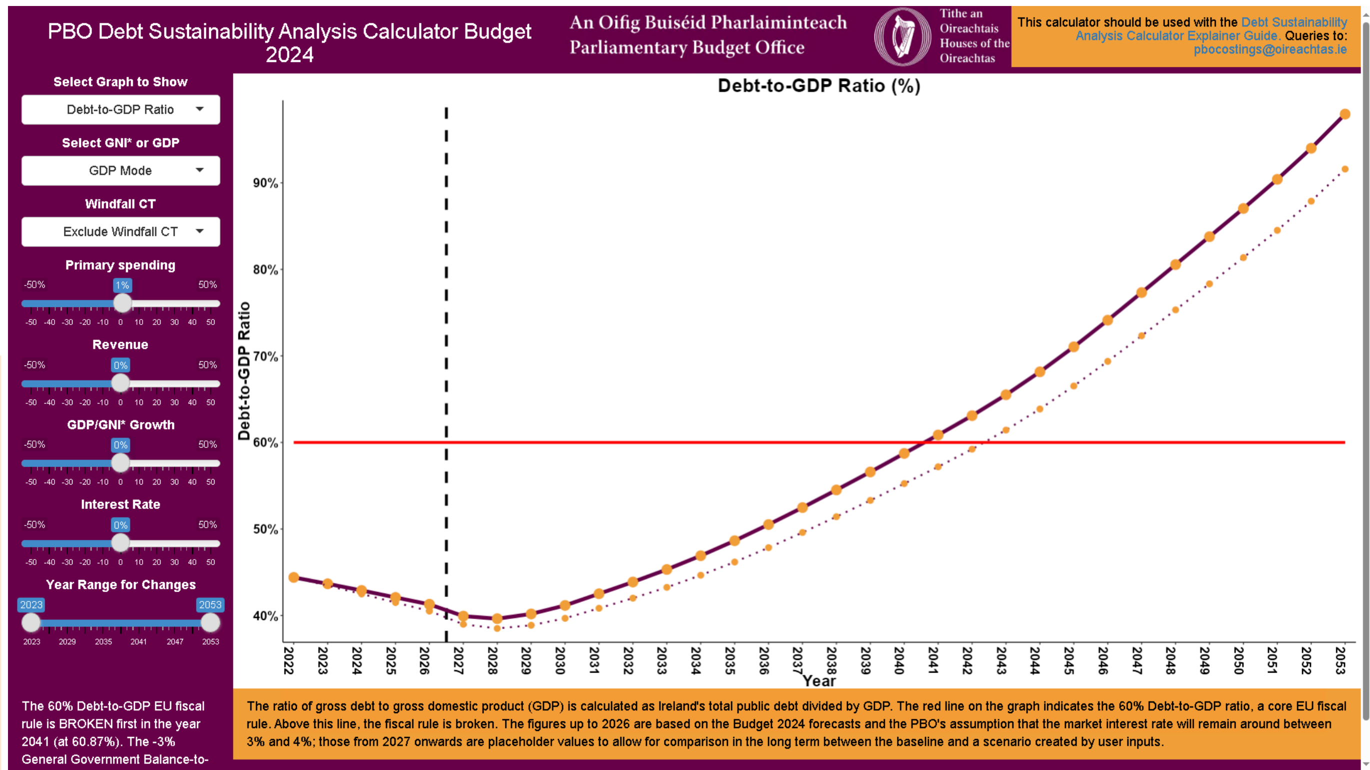
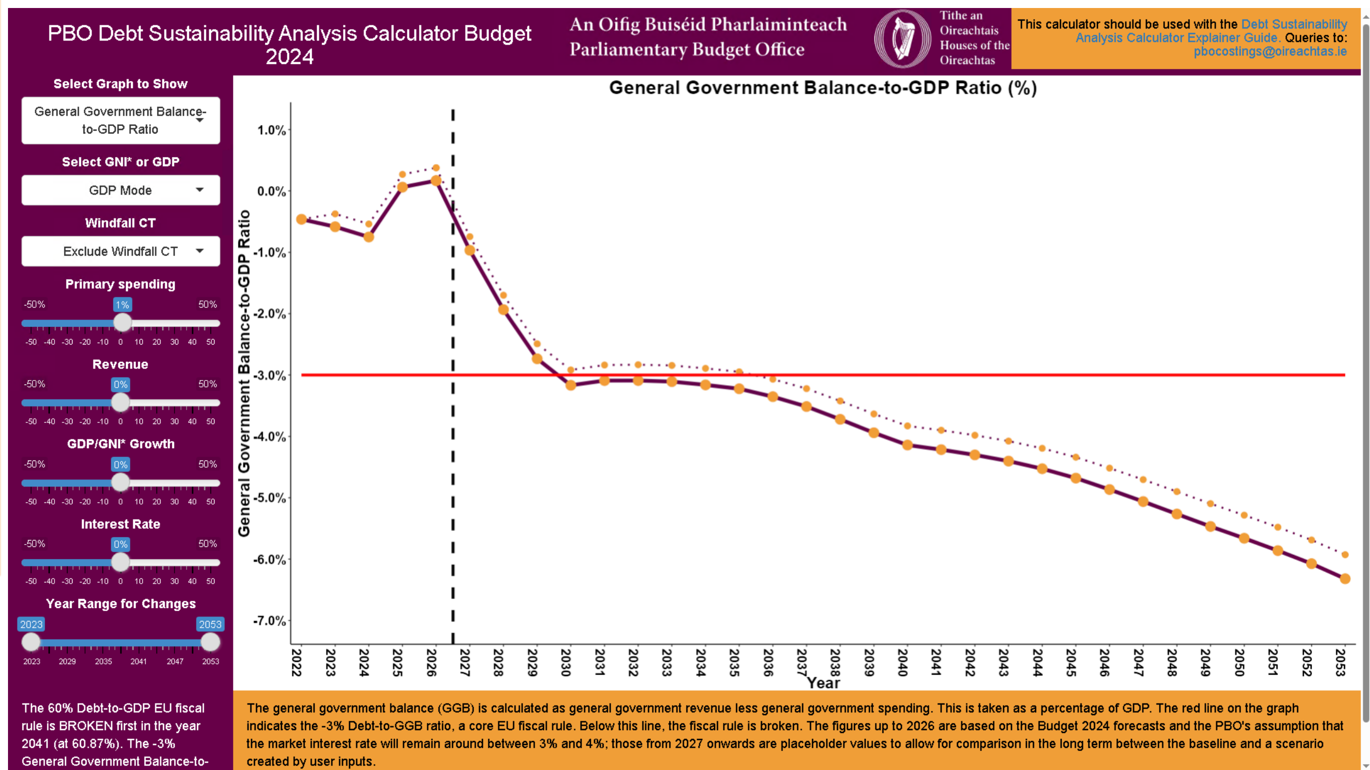
Figure 10: DSA Dashboard - Balance-to-GDP ratio Excluding Windfall Corporation Tax



As shown, combining the removal of the "windfall corporation tax" with a 1% spending increase generates an even higher trajectory for the Debt-to-GDP ratio. Note that the baseline displayed is now excluding the "windfall" CT, and the scenario line combines this with the 1% spending increase.

This combined shock would break the fiscal rule of 60% Debt-to-GDP ratio first in 2041, while the -3% General Government Balance-to-GDP ratio would be first broken in 2030. Note that excluding windfall CT brings this scenario in 2053 from 36.5% Debt-to-GDP, up to 97.9% Debt-to-GDP. This highlights the significant impact that a fall in "windfall" CT would have.

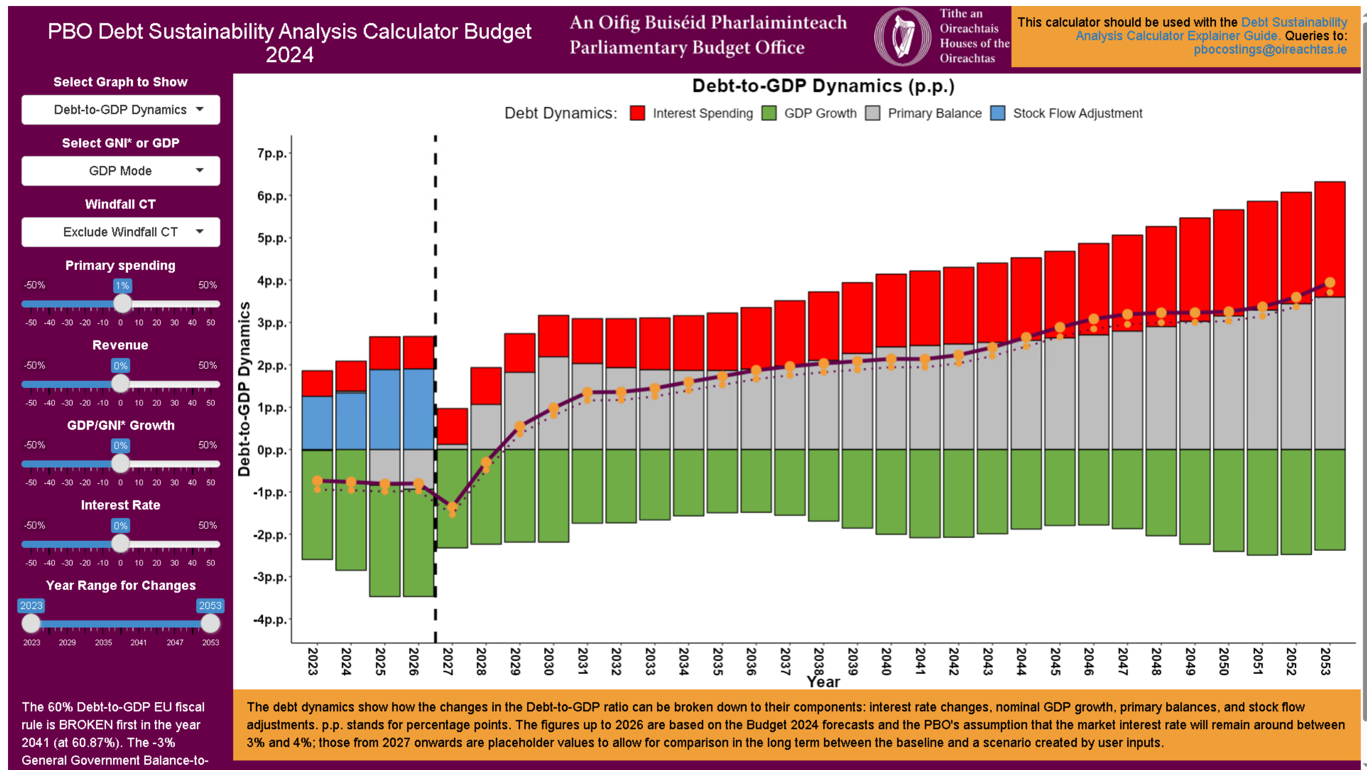
Figure 11: DSA Dashboard - General Government Balance-to-GDP Excluding Windfall Corporation Tax



As shown, combining the removal of the ”windfall corporation tax” with a 1% spending increase results in an even lower trajectory for the General Government Balance-to-GDP ratio. Note that the baseline displayed is now excluding the ”windfall” CT, which the scenario line combines this with the 1% spending increase.

This combined shock would break the EU fiscal rule as discussed before. Note that excluding windfall CT brings this scenario in 2053 from -1.7% General Government Balance-to-GDP ratio, up to -6.3% General Government Balance-to-GDP ratio, highlighting the significant impact that a fall in ”windfall” CT would have.

Figure 12: DSA Dashboard - Debt-to-GDP Dynamics Excluding Windfall Corporation Tax

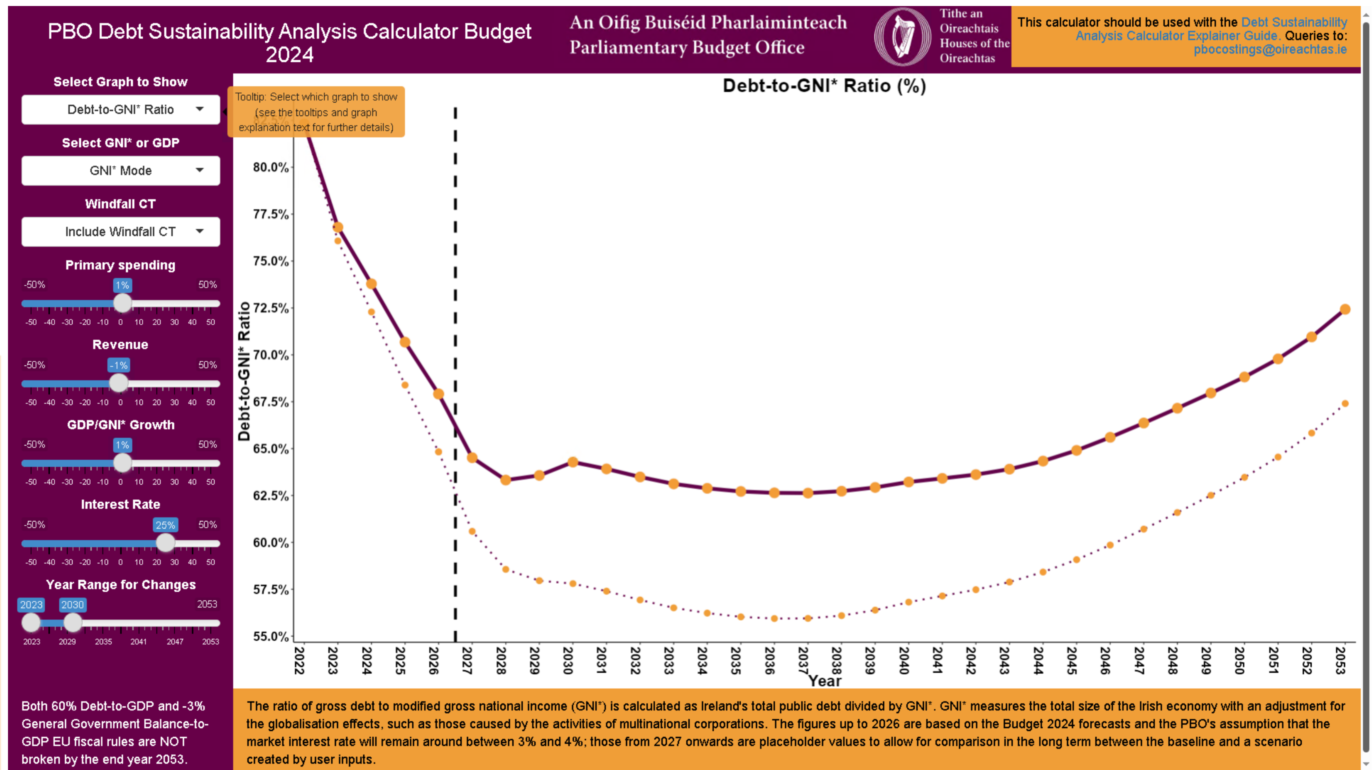


Likewise for this combined shock you can see that while the GDP growth effect acts to counterbalance the interest spending effect, the percentage point change in the Debt-to-GDP ratio is caused by the significantly increased primary balance effect due to the now missing ”windfall” CT.

2.3 Further Uses of the Calculator

For the example above, we tested only two changes in terms of spending increases and the existence of the ”windfall” corporation tax. As shown below, you can change all of the inputs at the same time, and for particular time horizons.

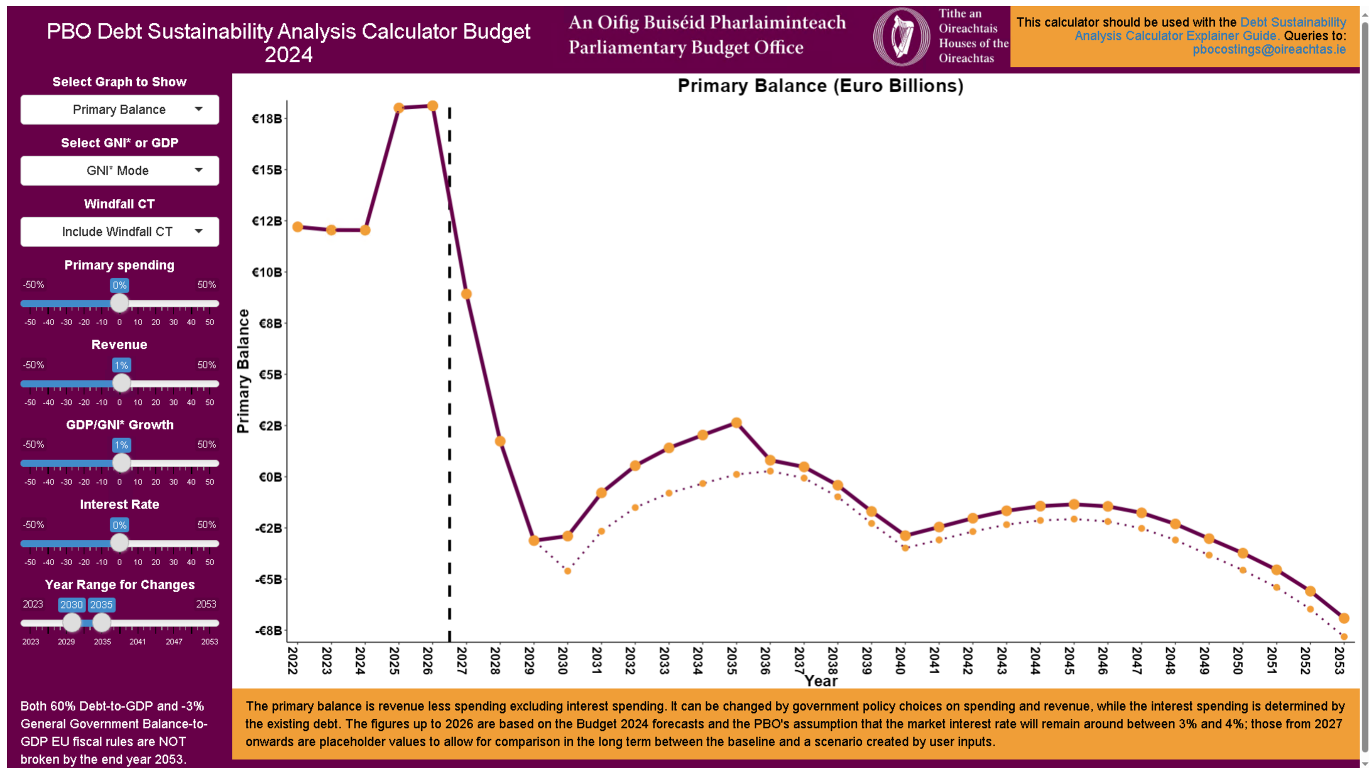
Figure 13: DSA Dashboard - Scenario Shock Within a Particular Time Frame



For this scenario, we will simultaneously do: a 1% spending increase, a 1% revenue decrease, a 1% increase in GNI* growth from the baseline growth rate (e.g. 2% for 2027 becomes 2.02%) and a 25% increase in the baseline interest rate (e.g. the interest rate for a particular year, such as 3.5%, now becomes 4.375%). We are now performing these changes from the period 2023 to 2030, where past 2030 the inputs return to the baseline trends.

As graphed, it is possible to see that while the shock ends in 2030, the effects in terms of the amount of debt accumulated is permanent (i.e. how much money is owed at 2030). Here, you can see how the changes persist as a proportion of GNI*.

Figure 14: DSA Dashboard - Fiscal Feedback Example



The programmed model for this dashboard has the macroeconomics and fiscal input variables be exogenous (i.e. spending and revenue are independent inputs into the model). The exogenous Revenue input is made partially endogenous in the model with GNI*/GDP through a fiscal feedback effect with a dynamically calculated elastically for every year. This means that Revenue is both affected by discretionary changes, but also by the changes in the underlying macro-economy/tax base.

This means that if you use the slider to increase the GNI*/GDP growth rate, it will also increase Revenue, as the underlining tax base is also assumed to have grown.

As graphed, if you increase revenue by 1% and also GNI*/GDP growth by 1% between 2030 and 2035, the revenue shock effect will be temporary, while the shock to GNI* will result in permanent increase in the Nominal GNI* in 2030, and hence in the size of the underlying tax base. In other words, this revenue increase from the GNI* growth is permanent, even past 2030 when the shock ends.

2.3.1 Technical Details of the Assumptions of the Underlying Model

The technical details of the programmed models and theoretical assumptions can be provided by the PBO to a Member of the Oireachtas on request.

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