3. 'R-G' DIFFERENTIALS: LATEST DEVELOPMENTS AND IMPLICATIONS FOR PUBLIC DEBT SUSTAINABILITY

Recently, debates sparkled among economists regarding the evidence, persistence, and implications of negative interest-growth rate ('r-g') differentials*. Indeed, the differential between the average interest rate the government pays on its debt and the growth rate of the economy is a key variable for debt sustainability analysis (DSA).*

In this chapter, we take stock of recent evidence, based on the Commission autumn forecast 2021, with a focus on EU and EA countries. *To this purpose, we review recent literature and depict stylised facts about the 'r-g' differential and its contribution to EU and EA countries' change in debt, based on recent data.*

Moreover, using simulations, we illustrate a possible (mild) increase or even reversal of 'r-g' differentials compared to the DSA baseline and its implications for EU countries' debt trajectories. *The results show that more adverse 'r-g' conditions than assumed in the DSA baseline, would lead to higher projected debt ratios by 2032, but would not substantially affect the overall risk assessment in most cases.*

However, even in a negative (favourable) 'r-g' environment, there are strong reasons to retain a focus on debt sustainability. *Even if current favourable financing conditions reflect to some extent structural factors, these conditions could be reversed, especially in high debt countries. Then, factors underlying the debt dynamics are interrelated, and the 'r-g' differential cannot be considered in isolation from other variables. Specifically, favourable 'r-g' differentials have not necessarily been associated with debt reduction, as their favourable effect on the debt dynamic has been offset by a reduced fiscal effort in some countries. Finally, negative 'r-g' differentials are not necessarily associated with reduced fiscal risks, which reflect broader factors.*

3.1. INTRODUCTION

The differential between the average interest rate the government pays on its debt *(r)* and the growth rate of the economy *(g)* is a key variable for debt sustainability analysis. The mechanics through which the *'r-g'* differential affects debt dynamics are summarised in the debt law of motion (see Box II.3.1). Based on this formula, a *negative* differential could appear unambiguously beneficial for debt dynamics. However, the empirical evidence on *'r-g'* differential remains disputed, notably depending on the exact definition and measure of *'r'* and *'g'*, as well as the geographical sample and time period considered. Moreover, an environment of negative differentials may produce complex interactions and implications for debt sustainability.

In recent years, a debate sparkled about the *'r-g'* differential, with some economists calling for revisiting debt sustainability concepts and fiscal policy. Some economists have argued that negative interest-growth rate differentials were the historical norm, and were unlikely to be reversed quickly, notably due to the structural drivers of low interest rates, including population ageing, declining productivity growth and excess saving. In particular, Blanchard (2019) argued that, in such circumstances, "public debt may have no fiscal cost" ([177]), since the economy grows, on average, faster than the interest rate. Therefore, any debt level could be sustained, as public debt would eventually fall gradually relative to GDP (according to a passive debt deleveraging). Such conclusions are instrumental to supportive fiscal policy. Indeed, in a low interest rate environment as currently prevailing, the argument goes, fiscal costs to higher public debt are low, while higher public expenditure, especially investment, would contribute to higher potential growth.

However, other economists challenged this view, putting into evidence the reversibility of the current low interest rate environment and highlighting that debt was not a 'free lunch'. Specific individual levels of *'r'* and *'g'* are likely to matter more for sustainable debt dynamics than the difference between them. Large and positive

([177]) Blanchard, 2019a; Blanchard, 2019b.

GDP growth is especially important: when growth is low or suddenly plunges, this hampers the government's ability to increase the primary balance or to undertake structural reforms to boost long-term growth (e.g. it is politically challenging to fiscally adjust/cut spending when incomes are stagnant) ([178]), ([179]). Moreover, despite favourable financing conditions prevailing, spreads remain in EU countries, reflecting different fundamental characteristics ([180]), and history has shown that financial markets can react quickly and abruptly to changes in economic circumstances ([181]). Then, despite the low or negative *'r-g'* differentials, debt ratios have reached unprecedented levels, as a result of large shocks (global financial crisis, Covid-19 crisis), with limited deleveraging in 'good times'. In fact, several papers highlight that lenient *'r-g'* differentials may have aggravated the deficit bias (see section 3.3.3). Going forward, debt trajectories will be subject to increasing pressures coming from population ageing and climate change, and, neither the growth rate of the economy nor prevailing interest rates are independent from the level of debt. As debt increases, the 'convenience value' of public debt is expected to decrease. Eventually, the rise in the cost of debt will shrink the value of future deficits that the private sector is willing to finance indefinitely and higher debt must be repaid by taxation ([182]).

This debate continues in the aftermath of the Covid-19 crisis, with increased uncertainty on the prospects of several variables relevant for debt sustainability and with debt and its drivers expected to behave in mutually reinforcing ways. In particular, with significant risks of inflation resurgence looming, there are fears of nominal interest rates increasing and of the favourable *'r-g'* differential reversing in the future. Indeed, while long-term real interest rates are still expected to fall in the aftermath of the pandemic ([183]), the effects of monetary policy and inflation in the future are still debated.

The remainder of this chapter is organised as follows. A first section provides an overview of the recent literature on the topic and frames the role of *'r-g'* for debt sustainability relative to other relevant factors. A second section depicts stylised facts about the *'r-g'* differential and its contribution to EU and EA countries' debt dynamics, including on the basis of recent data. The third section illustrates the implications of a (mild) increase or possible reversal of *'r-g'* differentials on debt EU countries' trajectories, based on simulations.

3.2. OVERVIEW OF THE LITERATURE

In the literature, *'r'* and *'g'* are defined in slightly different ways, being commonly characterised in nominal terms ([184]). *'r'* may stand for the market *long-term nominal* interest rate (LTI), which often represents the rate of return on 10-year government bonds in local currency ([185]). In other studies, *'r'* refers to the *implicit interest rate (IIR*), which represents the ratio between government interest payments in the current year *t* and the government debt stock in the previous *year t-1* ([186]). In some cases, the *IIR* takes into account the interest receipts earned on government asset holdings ([187]), ([188]). *'g'*, on the other hand, usually stands for the nominal (or real) annual growth rate of the economy, in local currency ([189]) ([190]). Given the focus on long-term

([178]) Abbas *et al.*, 2013.
([179]) Abbas *et al.*, 2020.
([180]) Pamies *et al.*, 2021.
([181]) Lian *et al.*, 2020.
([182]) Reis, 2021.
([183]) Jordà *et al.*, 2020. Turner and Spinelli, 2012, even point to the possibility of a reversal of the saving glut and thus to an increase of *real* interest rates, though this appear less likely at the current stage.
([184]) The real interest rate in the economy may sometimes be quoted (Checherita-Westphal and Domingues Semeano, 2020).
([185]) Turner and Spinelli, 2012; Reis, 2021.
([186]) European Central Bank, 2019; Checherita-Westphal and Domingues Semeano, 2020; European Commission, 2021.
([187]) Turner and Spinelli, 2012.
([188]) In terms of relevance for debt sustainability analysis, the concepts of IIR is more comprehensive, as it reflects several aspects such as the structure of debt (notably in terms of maturity and currency). Though, the simpler concept of market LTI presents advantages, as being available for many countries, in longer, comparable series, all valuable features in cross-country analysis. As LTIs reflect the rate on new issuances of government debt, they may also provide an indicator of future trends in the cost of government financing, which could constitute the preferred angle when analysing a shift about to occur between past/existing and future rates.
([189]) Lian *et al.*, 2020; Mauro and Zhou, 2020; ECB, 2019; Checherita-Westphal and Domingues Semeano, 2020; Reis, 2021.
([190]) Measured as the sum of expected real GDP growth and expected personal consumption expenditure (PCE) inflation rate.

fiscal sustainability, some studies use the nominal *potential* output growth in place of *actual* GDP growth to reduce the volatility associated with the business cycle and measure the trend level of output, which can be sustained without inflationary pressure ([191]).

Many studies note the empirics of a low, declining *'r-g'*, which presents itself as a favourable development for debt sustainability. Several papers document a declining, unusually low *'r-g'* since the 1980s and negative since the Global Financial Crisis (GFC) compared to earlier periods. ([192]) In the EU, countries have experienced negative differentials in about half of the years in the past two decades, though the frequency of negative differential episodes appears to differ across Member States, ranging from zero in Italy to almost 90% in Estonia ([193]). Even over longer periods, the negative differentials experienced today are not unprecedented: in both advanced and emerging economies, they would have been often persisting for long historical stretches ([194]). Such conditions look appealing for debt sustainability. They seem to imply that public debt is more sustainable, with 'no fiscal cost' ([195]) and that countercyclical fiscal policy would be less costly and more effective at the zero lower bound (ZLB) ([196]), ([197]). However, economic (or welfare) costs may still exist, as public debt may crowd out private capital, leading to a worse (costlier) capital allocation that lowers growth. In this set-up, the debt path may still be increasing despite favourable snowball effects, likely to entail second-round effects in terms of growth, investor perceptions, and cost of funding, all associated to fiscal sustainability risks.

The fall in *'r-g'* followed mainly from a decline in the real growth rate, *'r'*, in turn linked to a variety of factors. Looking at each of the components of the differential since the 1970s in advanced economies, some authors conclude that both have followed a protracted downward trend ([198]). Documenting a longer period since 1800 in selected advanced economies (France, Germany, Italy, Japan, Netherlands, Spain, UK, and US), Schmelzing (2020) ([199]) explains the decline in *'r-g'* mainly as a drop in real interest rates. Importantly, many factors behind the decline of this differential are highly endogenous, with empirical findings mostly constituting correlations, rather then causations (see next section).

However, favourable *'r-g'* are not always guaranteed and higher differentials are often associated with weak fiscal positions, and bad economic times. While countries with higher growth and lower public debt ratios tend to experience negative differentials more often ([200]), this is by far not the rule for all countries. First, more *vulnerable fiscal positions – higher or increasing public debt, larger primary deficits* - are generally associated with higher interest-growth rate differentials, even after controlling for the position in the economic cycle ([201]). For *high-debt* countries, this includes a larger probability of extremely high *'r-g'* in the future, meaning that these countries are more likely to experience a reversal from negative to positive *'r-g'* regimes ([202]); this pattern holds for interest rates and growth separately ([203]). Second, cyclical

([191]) Turner and Spinelli, 2012.
([192]) Turner and Spinelli, 2012; Lian *et al.*, 2020; Mauro and Zhou, 2020.
([193]) European Commission, 2021.
([194]) Mauro and Zhou, 2020.
([195]) Blanchard, 2019a.
([196]) Lian *et al.*, 2020.
([197]) The argument about the ZLB is different than that about *'r-g'*. Presence of the ZLB should ensure absence of crowding out.
([198]) Checherita-Westphal and Domingues Semeano, 2020.
([199]) Schmelzing, 2020.
([200]) European Commission, 2021.
([201]) Escolano *et al.*, 2017; ECB, 2019; Checherita-Westphal and Domingues Semeano, 2020; Turner and Spinelli, 2012.
([202]) This probability is assessed by estimating the distribution of *'r-g'* as a function of public debt, using quantile regressions. The gap between the upper and median quantiles of the average *'r-g'* in the next two or five years is positively associated with the level of public debt. For example, as the current debt-to-GDP ratio increases from 40% to 120%, the 90th percentile of the average *'r-g'* over the following five years increases from around 0 to 2 percent. At the same time, the median *'r-g'* only increases by around 0.8 percentage points. The increase in the downside risk is not compensated by higher upside risk; if anything, higher public debt today is also associated with a smaller decline in *'r-g'* in the very good state (lower quantiles).
([203]) This suggests that both *'r'* and *'g'* components contribute to the positive association between public debt and *'r-g'* at risk. Theoretically, public debt may lead to higher downside risk in *'r-g'* because high public debt affects both *'r'* and *'g'* such that they tend to be significantly more negatively correlated in bad times. On the *'i'* side, many countries with higher public debt experience a larger (and persistent) increase in interest rates in response to adverse global volatility shocks (as measured by VIX); however, in countries typically considered 'safe havens' (the US, the UK, Japan, Switzerland, and Germany) interest rates do not

conditions (*bad economic times*) are also key, and the *'r-g'* differential tends to increase quickly and significantly during *recessions*, especially in high-debt countries ([204]). This happens as *negative shocks*, a slowdown, or domestic growth lower than expected tend to be associated with an increase in risk premia (interest rates), especially in high, foreign currency denominated debt countries. Then, within high-debt countries, a *higher share of foreign currency-denominated public debt* is associated with higher average *'r-g'*, as debts denominated in currencies that appreciate following adverse shocks increase the real value of outstanding liabilities and borrowing costs in bad times ([205]).

3.3. STYLISED FACTS ABOUT *'R-G'* DIFFERENTIALS AND DEBT DYNAMICS IN THE EU

3.3.1. Developments in the interest-growth rate differential in the EU

Interest-growth rate overall developments

Over the past two decades, the *'r-g'* differential for the EU as a whole followed an overall downward trend (see Graph II.3.1). It averaged around 0.9 pps. between 2001 and 2020 and recorded three notable spikes ([206]). It was negative during periods of robust output growth, while it reached record highs at the peak of the Great Financial Crisis, the European sovereign debt crisis and the COVID-19 pandemic. Between 2001 and 2020, nominal growth exceeded the cost of debt in eight out of twenty years. The differential was positive and on a declining path between 2000 and 2005 and turned negative in 2006 and 2007. The GFC in 2008-2009 and the outbreak of the European sovereign debt crisis (2009-2012) pushed the interest-rate-growth differential again in positive territory during those years. The differential spiked to a high of 8½ pps. in 2009, driven by the sharp contraction in GDP (see Graph II.3.1). During the subsequent five years (2010-2014), sluggish growth kept the EU average interest-rate-growth differential in positive territory, although with significant heterogeneity across Member States (see below). As the EU economy recovered and market confidence improved, EU GDP growth once again exceeded the implicit interest rate in 2015. In the subsequent years, the interest rate-growth differential remained negative, reaching even -2.0 pps. in 2017, thereby helping to reduce the EU aggregate stock of government debt from 85% of GDP in 2015 to 77½% in 2019. In 2020, the economic crisis triggered by the COVID-19 pandemic once again led to a surge in *'r-g'* to almost 6½ pps. in 2020, due to the sharp contraction in GDP, while the average cost of debt continued to decline (though some temporary tensions on financial markets appeared at the outbreak of the crisis, in March 2020, for some countries) ([207]).

A steady drop in the implicit interest rate drove the underlying downward trend in the interest rate-growth differential for the EU as a whole (see Graph II.3.1)**.** Year-to-year fluctuations in *'r-g'* have been shaped by developments in nominal GDP growth. However, beyond these cyclical fluctuations, GDP growth also followed an underlying downward trend, which has partly offset the favourable impact on debt dynamics from the steady fall in the implicit interest rate from around 5⅓% to 2.0% over the same period. ([208]) The downward trend in the EU interest - growth rate differential is even steeper when, instead of the implicit interest rate, market interest rates are used. The long-term market interest rate ([209]) for the EU as a whole, which describes the cost of the newly issued debt, fell from almost 5.0% in 2021 to 0% in 2021.

The downward trend in nominal output and the interest rate was mirrored by the decline in

react to increases in uncertainty/global volatility, even when their debts are high (Lian *et al.*, 2020).

([204]) ECB, 2019; Checherita-Westphal and Domingues Semeano, 2020.

([205]) Lian *et al.*, 2020.

([206]) The average *'r-g'* differential for the EU as a whole is measured as the GDP-weighted average of the *'r-g'* differential of the 27 EU Member States. The interest rate on government debt for each Member State, *'r'*, refers to the implicit interest rate on debt and is measured by dividing the cost of interest payments in year *t* by the outstanding stock of government debt at the end of year *t-1*.

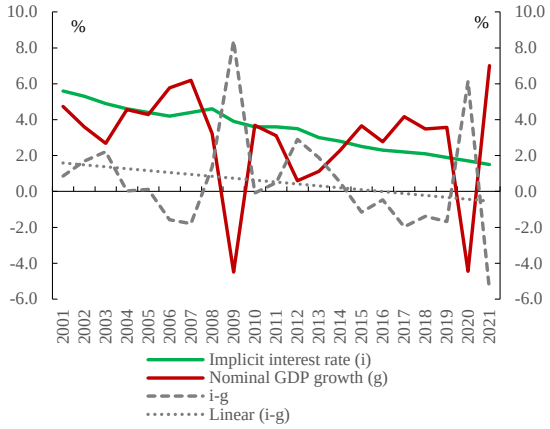
([207]) Data for 2021 in the graphs of this section refer to those projected in the European Commission Autumn 2021 Economic Forecast.

([208]) The euro area nominal long-term interest the rate, as measured by the euro area 10-year government benchmark bond yield provided by the ECB, fell from around 5% in 2001 to 0.2% in 2020.

([209]) This refers to the market yield on government bonds with a 10-year maturity.

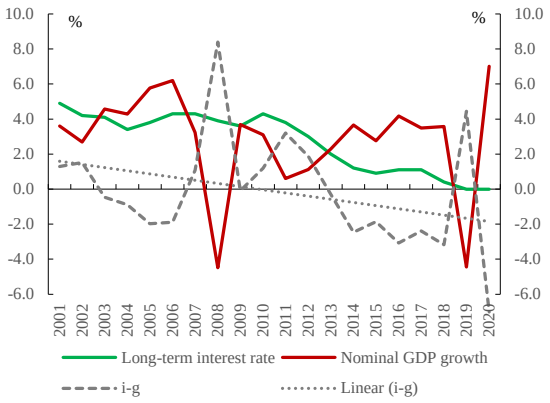
their real values. In order to identify the underlying drivers of changes in *'r-g'*, it is useful to take into account the effect of inflation and examine changes in the real values of GDP growth and of the interest rate. In real terms, the euro area aggregate long-term interest rate ([210]) fell by almost 6 pps. over the past twenty years, from almost 3.3% in 2001 to -0.7% in 2021. On the output side, according to Commission's estimates, potential (real) GDP growth is also estimated to have declined by around 1 pp. between 2002 and 2019 ([211]), which is significant but substantially less than the drop in the real interest rate.

Graph II.3.1: **EU interest rate-growth differential based on nominal implicit interest rate and nominal GDP growth, 2001-2021**



Source: European Commission, Ameco database.

Graph II.3.2: **EU interest rate-growth differential based on nominal market long-term interest rate and nominal GDP growth, 2001-2021**



Source: European Commission, Ameco database.

Drivers of the trend decrease of market interest rates (and potential growth)

The fall in the nominal long-term market interest rate reflects the downward shifts of both the expected short-term (policy) rates and the term premia ([212]). The impact of the global financial crisis and in particular of the euro area sovereign debt crisis on the euro area economy and muted inflation expectations contributed to the downward shift in the average expected nominal short-term interest rates. The mix of reduced uncertainty about inflation and about the path of future short-term interest rates reflecting inflation expectations and the ECB's forward guidance also exerted a downward pressure on the risk premia. The ECB's expanded asset purchase programme since 2014 contributed to lower interest rate risk at longer maturities and thus further compressed term premia ([213]).

The reduction in the expected policy rate partly reflects a steady drop in the so-called natural rate of interest ([214]). The natural, or neutral, rate of interest (r^*) is the real short-term interest rate that is consistent with an output gap of zero (i.e. full employment) and, therefore, stable inflation. The dynamics of savings and investments stand at

([210]) The long-term interest rate refers to the euro area 10-year government benchmark bond yield as estimated by the ECB. The long-term real rate is calculated using the 12-month average of euro area core inflation.

([211]) Over the two-decade period under review, the drop in HICP core inflation (used to estimate the real interest rate) has been similar to the drop in inflation measured by the GDP deflator (which is used to convert nominal to real GDP).

([212]) McCoy, 2019.

([213]) The net asset purchases between March 2015 and end-2018 are estimated to have suppressed 10-year sovereign yields in the euro area by around 100bps. For details, see Eser *et al.*, 2019.

([214]) Brand *et al.*, 2018; Holzmann and Valderrama, 2020; Bean *et al.*, 2015.

the heart of the long-term downward trend in r^*, with the ageing and productivity trends identified as major contributors driving structural changes in savings and investments. The contribution of growing inequality to reducing the natural interest rate has also come under increasing scrutiny, namely through the redistribution of income away from low to high-saving households affecting saving and investment preferences. ([215]) Factors such as post-GFC deleveraging and the global savings glut originating from Asian emerging markets appear to have added a more transitory downward pressure on real interest rates. ([216]) Finally, but importantly, the scarcity of safe assets coupled with their increased demand is likely to have played an increasing role in the post-GFC and European sovereign debt crisis periods, globally and in the euro area ([217]).

Accommodative monetary policy or the quantitative easing measures undertaken since the GFC have been associated with lower interest rates ([218]). Indeed, over the past couple of decades, the adoption of monetary policy regimes credibly targeting low inflation, including the introduction of the euro (European Monetary Union set-up) led to very low (monetary) policy rates and short-term interest rates and even pushed nominal long-term interest rates down.

However, some of the factors that have led to a reduction in r^*, especially ageing and productivity, also affect potential GDP growth. As a result, the favourable impact on the interest rate-growth differential from the reduction in the natural rate of interest is in part offset by lower GDP growth in the longer term. As mentioned above, the Commission's estimates indeed point to a reduction in potential GDP growth over the past two decades. Arena, M. et al. (2020) ([219]) estimate that r^* decreased by 2 percentage points (on average) when comparing the post-GFC with the pre-GFC period, while trend growth fell by around 1 percent. Therefore, their estimates suggest that the trend decline in the *'r-g'* differential was actually half as large as the decrease in r^*.

Country specificities

There has been significant heterogeneity in the development of the interest-growth rate differential across the Member States. As shown in Graph II.3.3, Estonia, Bulgaria, Slovakia and Ireland had a sizeable negative interest-growth rate differential on average over the past two decades. By contrast, in several high debt Member States, including Greece, Italy and Portugal, the implicit interest rate exceeded nominal GDP growth on average. Graph II.3.3 shows that Member States with higher government debt had an unfavourable interest-growth rate differential (i.e. more positive or less negative) compared with those with lower debt. As Graph II.3.4 shows, this was consistently the case during the four main economic periods identified in this section, namely the expansionary period between 2001 and 2007, the GFC and the European sovereign debt crisis (2008-2012), the economic recovery/growth phase between 2013 and 2019, and the COVID-19 crisis (2020-2021). The low debt Member States, defined as those with a debt ratio less than 60% of GDP in 2019 ([220]), had a negative interest-growth rate differential during three of these four economic periods, with their implicit interest rate exceeding nominal GDP growth only during the period of the GFC and the European sovereign debt crisis. On the other hand, the group of Member States with government debt between 60% and 90% of GDP in 2019 ([221]) collectively had a favourable (i.e. negative) *'r-g'* only between 2001 and 2007, while it was practically close to zero during the 2013-2019

([215]) Rachel and Smith, 2015.

([216]) Other studies conjecture that the global savings glut as well as population ageing seem to have depressed not only (natural) interest rates, but also potential GDP growth (ECB, 2019; Checherita-Westphal and Domingues Semeano, 2020). In their work, ageing variables presents some complexities: higher dependency ratio is associated with lower '$r-g$', while slower population growth tends to increase the differential.

([217]) Downgrades by credit rating agencies following the GFC have led to fewer European countries being highly rated (AA and AAA). This effect is also visible at the global level (Caballero *et al.*, 2017). Moreover, during the period preceding the COVID-19 crisis, sovereign net debt issuance by highly rated EU countries had significantly slowed down or even declined. Moreover, the ECB's asset purchase program has withdrawn from the market a significant share of the outstanding amount of highly rated sovereign debt since 2015.

([218]) Lian *et al.*, 2020; Checherita-Westphal and Domingues Semeano, 2020; Turner and Spinelli, 2012.

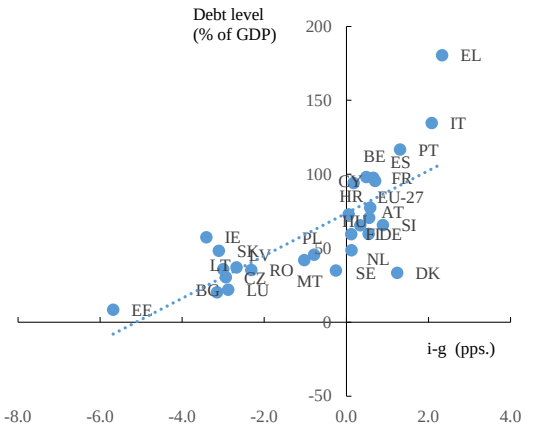
([219]) Arena *et al.* 2020.

([220]) The EU Member States included in this group are Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Finland, and Sweden.

([221]) This group of Member States consists of Croatia, Austria, Slovenia, and Hungary.

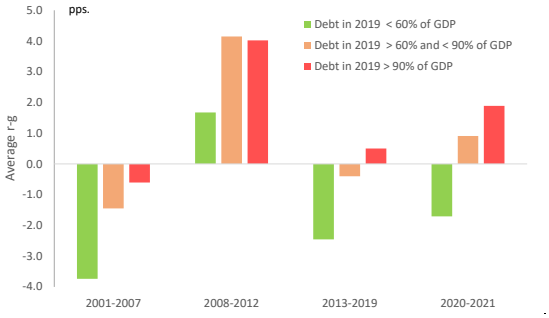
period. The Member States with government debt above 90% of GDP in 2019 ([222]) had a (marginally) negative '*r-g*' only during the strong growth period between 2001 and 2007.

Graph II.3.3: **Interest-growth rate differential and public debt, average 2001-2021 (based on IIR)**



Source: European Commission's Ameco database, Eurostat.

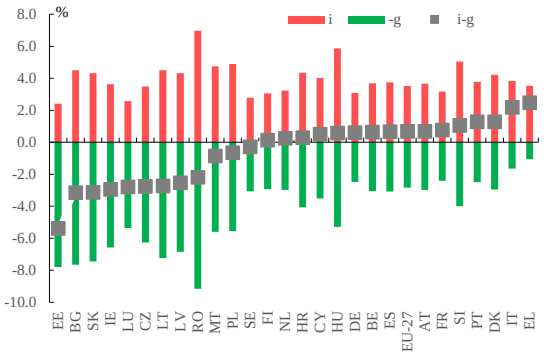
Graph II.3.4: **Interest – growth rate differential across economic periods and debt levels (based on IIR)**



Source: European Commission's Ameco database, Eurostat.

The heterogeneity in *'r-g'* reflects differences in both output growth and in interest rates. Strong output growth contributed to a negative average '*r-g*' in several Member States (see Graph II.3.5, especially in those that acceded the EU in 2004 and 2007 and benefited from a real convergence process. The effect from high growth in these Member States was in part offset by a higher implicit interest rate, due to higher inflation expectations and higher risk premia that are likely to reflect higher inflation risks, less liquid capital markets and currency volatility risks. The implicit interest rate was particularly high in Romania, Hungary, Slovenia and Poland. Among the euro area Member States, low growth in Greece and Italy contributed to a positive differential. At the same time, the implicit interest rate on government debt for Italy, Portugal, Spain and Belgium exceeded the rates for Germany and France by around ¾ pps, including due to a higher credit risk premia ([223]).

Graph II.3.5: **Breakdown of 'r-g' differential across Member States, 2001 – 2021 (based on IIR)**



(1) Positive growth is expressed with a minus sign, reflecting its contribution to the *'r-g'* differential.
Source: European Commission's Ameco database.

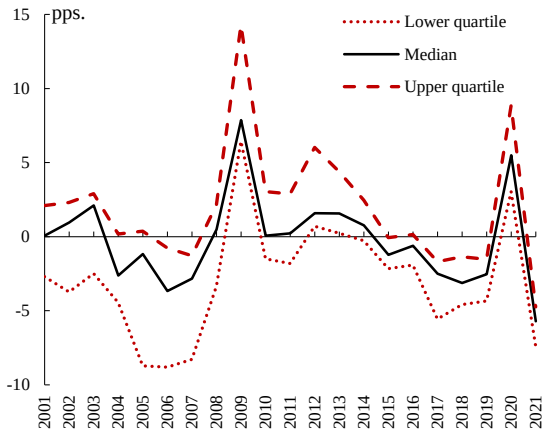
The dispersion of the interest-rate-growth differential across the Member States has been significantly lower during the recent COVID-19 crisis compared with the GFC and the European sovereign debt crisis. The economic crisis between 2008 and 2012 saw an exceptionally sharp increase in the '*r-g*' differential for the quarter of Member States with the highest debt, compared with the median value of the differential and with the quartile of Member States with the lowest debt (see Graph II.3.6), mainly on account of greater concerns about credit risks. By contrast, the COVID-19 crisis was characterised by a reduced dispersion of the '*r-g*' differential and the quarter of Member States with the highest debt had a differential that was close to the median, indicating that the current crisis was accompanied by reduced debt sustainability fears for this group of countries compared to the GFC and the European sovereign debt crisis. This reduced dispersion likely reflects the coordinated fiscal-monetary response in the COVID crisis, which

([222]) This group of Member States consists of Greece, Italy, Portugal, Belgium, France, Spain and Cyprus.

([223]) Corradin *et al.*, 2021.

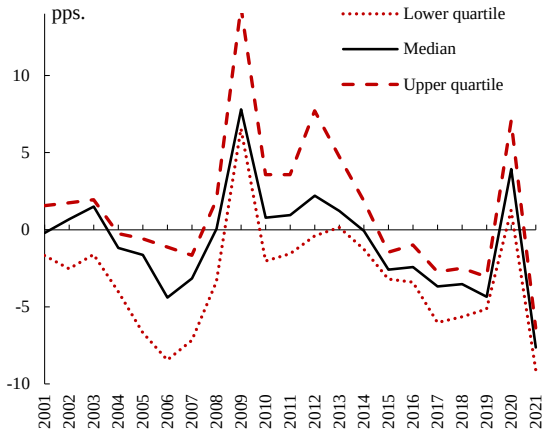
helped to reduce fragmentation in sovereign debt markets in the euro area and the EU.

Graph II.3.6: **Dispersion of the interest-growth rate differential, distribution of EU countries (based on IIR)**



Source: European Commission's Ameco database.

Graph II.3.7: **Dispersion of the interest-growth rate differential, distribution of EU countries (based on market long-term interest rates)**



Source: European Commission's Ameco database.

Looking forward, the COVID-19 crisis, the war in Ukraine and exceptional uncertainty on the economic outlook make it extraordinarily difficult to predict the future development of the interest-growth rate differential. This uncertainty is related to factors such as the need for a substantial increase in investment to meet the green and digital transition and to improve resilience, possible productivity gains from a faster digital transition, the risk of economic scarring effects, the implications of the green transition on sectoral composition of growth, the prospect of higher precautionary savings, possible higher demand for safe bonds, including due to growing demand from emerging market economies ([224]) and their use in collateralised operations, and permanently higher risk premia on less safe assets, and others. Persistently high inflation could also trigger a tightening of monetary policy, possibly resulting in higher nominal interest rates and weaker economic growth.

3.3.2. The main drivers of debt dynamics over time

Several conclusions emerge from an overview of the data for the past couple of decades. To better understand the debt dynamics and the role of *'r-g'* over time, we look at the data available for EU countries in the AMECO database (for most countries since 1995 and until 2021). Several conclusions emerge.

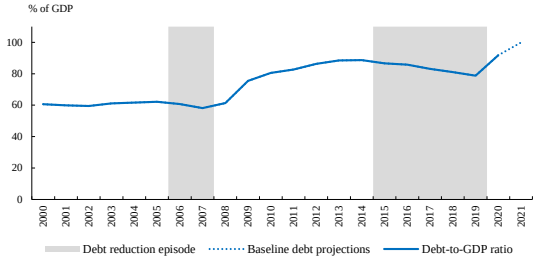
First, in aggregate terms, debt appears 'sticky', with large debt increases having been more customary than large declines and with rises and falls exhibiting different anatomies. Over the available sample, positive and negative changes in debt have indeed occurred with contrasting frequencies and magnitudes ([225]). Largest *debt-increasing episodes* have typically been associated to crises, namely the Global Financial Crisis and the COVID-19 crisis. During the latter, (blue shaded in graph II.3.9 and table II.3.1), government debt increased on average by some 5-6 pps. of GDP per year in the EU/EA, compared to the remaining periods, with some annual peaks larger than 10 pps. of GDP (see Table II.3.1). *Debt declining episodes* have been both less frequent and smaller in magnitude, with debt decreasing on average by a maximum of 1 pp. of GDP per year in the EU/EA (see Graphs II.3.8, II.3.9 and Table II.3.1).

Debt increases and drops also seem to differ in terms of composition, with a varying relative size of debt drivers. During the largest *debt-increasing episodes*, positive (unfavourable) *'r-g'* differentials have featured sizable, matching sign contributions to debt dynamics, comparable and

([224]) Caballero *et al.*, 2017.
([225]) A debt increasing / decreasing episode is defined as a positive / negative y-o-y change.

sometimes larger than those of primary deficits (see Graph II.3.9 and Table II.3.1). During *debt-declining episodes*, all coinciding with good times, the primary surplus has been the clear driver of debt dynamics (see Graph II.3.9 and Table II.3.1.). This partially reflects real growth effects and the use of different policy levers (see Box 2.3 in the Debt Sustainability Monitor 2017).

Graph II.3.8: **Historical developments in the debt ratio, EA**

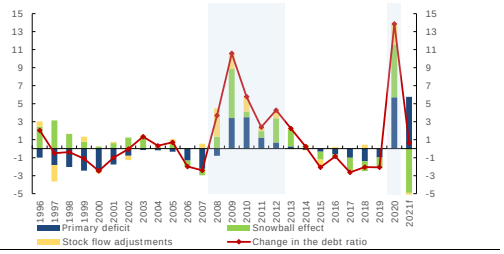


(1) Grey-shaded areas mark periods of debt decline.
Source: Commission services

A more detailed analysis confirms the importance of the snowball effect in the debt dynamic. *Average outcomes* confirm the relevance of the snowball effect (see Table II.3.1.). *Results by year* at aggregate EU level, over the 21 years between 2001-2021, show 9 *debt reduction episodes* (all in good times), 8 of which supported by a favourable/negative *'r-g'* differential, while at EA-19 level, over the period 1996-2021, 7 of the 12 *debt reduction episodes* (all in good times) were backed by a favourable/negative *'r-g'* differential. Conversely, in both EU and the EA, the vast majority of *debt-increasing episodes* in the sample up to 2021 included (i.e. 12 episodes for the EU, 13 for the EA, most of which during crisis periods), coincided with positive *'r-g'* differentials (unfavourable snowball effects).

However, observed debt dynamics do not only depend on *'r-g'*, and debt can sometimes move in the opposite direction compared to the snowball effect. During certain years, debt dropped despite a positive *'r-g'* differential (adverse snowball effects); conversely, debt was found to increase notwithstanding favourable *'r-g'* conditions. At aggregate EU level, debt fell marginally despite an unfavourable (positive) snowball effect in 2002. Similarly, at EA level, before 2003 there were 6 debt-reduction episodes which relied mainly on primary surpluses (and SFA) to prevail over adverse (positive) *'r-g'* differentials. In 2021, both EU and EA aggregate debt ratios are expected to still increase marginally, despite favourable snowball effects (see Graph II.3.9).

Graph II.3.9: **Debt ratio dynamics, breakdown by component, % of GDP, EA**



(1) Blue-shaded areas mark crisis periods. A negative contribution from the deficit constitutes a surplus and reduces debt.
Source: Commission services

A key explanation to this outcome is fiscal policy, which has contributed to EU/EA average debt dynamics more substantially than snowball effects have, over most of the sample. During crises, the deterioration of primary balance is an important driver of debt dynamics, reflecting both the impact of automatic stabilisers (the cyclical component) and of unique events (one-off and temporary items), as well as that of active/discretionary measures adopted by governments to support the economy (as seen in structural primary balance (SPB)). During non-crisis periods, the improvement in the primary balance is the main driver of debt dynamics, with indication of some active consolidation having taken place in 2013-19 (as seen in SPB – see Table II.3.1). However, these aggregate results hide important cross-country differences, with high debt countries known to have consolidated little or not at all before the Covid-19 crisis.

Stock-flow adjustments (SFA) matter too for debt dynamics, especially in crisis times. During crises, (positive) stock-flow adjustments are an important driver of the debt dynamic. Indeed, while in normal times SFA are on average close to zero, crises are associated with more significant SFA (see Table II.3.1.). During the GFC and the European sovereign debt crisis, larger SFA were driven by government support to the financial sector, while during the Covid-19 crisis, SFA rose due to tax deferrals and other liquidity support provided to the corporate sector. In more specific

terms, notable SFA occur during crises for different reasons related to their components ([226]).

Not least, in the sample analysed, it is noteworthy that the average *'r-g'* differential has rapidly reversed sign in both of the last two crises even in an environment of low interest rates, essentially as economic activity fell. Both the 2008-12 crisis (GFC, European sovereign debt) and the Covid-19 crisis brought about a reversal of the snowball effect (*'r-g'*) sign compared to the years preceding these crises (see Graph II.3.6). The *'r-g'* differential increased sharply in both crises, essentially as economic activity plummeted. During the GFC and the European sovereign debt crisis, this increase was aggravated by a notable surge in interest rate (spreads) in vulnerable countries ([227]). This reversal materialised even in the environment of low interest rates prevailing before, during, and after the Covid-19 crisis. Indeed, even though at EU aggregate level *'r-g'* had turned negative, inducing snowball effects favourable to debt dynamics since 2015, the outbreak of the Covid-19 crisis briskly interrupted these conditions in 2020 (see Graph II.3.6). Evidence that snowball effects may both revert sign and increase their magnitude in a crisis is therefore a reminder that favourable, negative *'r-g'* differentials cannot be relied upon at all times (see also the next section).

Aggregate EU/EA data hide important cross-country differences. During crisis times, the large average debt increases experienced by (already) high debt countries, associated to strong contributions from unfavourable snowball effects, illustrate their vulnerability to reversals of financing conditions (see Table II.3.1).

Table II.3.1: **Debt ratio dynamics, breakdown by component, different period averages, % of GDP, EA, EU and groups of countries with debt below and above 60%, respectively**

EA		Non-crisis 1996-07	Crisis 2008-12	Non-crisis 2013-19	Crisis 2020	Non-crisis 2021
	Change in the debt ratio *(1+2+3),* of which:	**-0.5**	**5.3**	**-1.0**	**13.9**	**0.6**
(1)	Primary deficit, of which:	-1.4	1.6	-0.6	5.7	5.7
	• Structural primary deficit	*n.a.*	0.5	-1.2	2.1	4.3
	• Cyclical component	-0.5	0.8	0.5	3.5	1.5
	• One-off and temp items	*n.a.*	0.2	0.1	0.1	0.0
(2)	Snowball effect	0.9	2.2	-0.4	5.9	-4.9
(3)	Stock flow adjustments	0.0	1.6	0.0	2.3	-0.2
EU		**Non-crisis 2001-07**	**Crisis 2008-12**	**Non-crisis 2013-19**	**Crisis 2020**	**Non-crisis 2021**
	Change in the debt ratio *(1+2+3),* of which:	**-0.6**	**4.8**	**-1.0**	**12.9**	**0.3**
(1)	Primary deficit, of which:	-1.0	1.6	-0.6	5.5	5.3
	• Structural primary deficit	-0.3	0.6	-1.1	2.1	4.0
	• Cyclical component	-0.6	0.8	0.4	3.2	1.4
	• One-off and temp items	*n.a.*	0.2	0.1	0.1	-0.1
(2)	Snowball effect	0.2	1.9	-0.4	5.1	-4.7
(3)	Stock flow adjustments	0.2	1.4	0.0	2.4	-0.2
EU, debt in 2019 < 60%		**Non-crisis 2001-07**	**Crisis 2008-12**	**Non-crisis 2013-19**	**Crisis 2020**	**Non-crisis 2021**
	Change in the debt ratio *(1+2+3),* of which:	**-0.2**	**3.8**	**-2.5**	**8.5**	**1.4**
(1)	Primary deficit, of which:	-0.8	0.6	-1.4	3.8	4.5
	• Structural primary deficit	-0.7	-0.2	-1.4	1.7	3.6
	• Cyclical component	-0.1	0.5	0.0	2.1	1.0
	• One-off and temp items	*n.a.*	0.4	0.0	0.0	-0.1
(2)	Snowball effect	0.6	0.9	-1.2	1.6	-3.0
(3)	Stock flow adjustments	0.0	2.2	0.1	3.1	-0.1
EU, debt in 2019 > 60%		**Non-crisis 2001-07**	**Crisis 2008-12**	**Non-crisis 2013-19**	**Crisis 2020**	**Non-crisis 2021**
	Change in the debt ratio *(1+2+3), of* which:	**-0.6**	**6.1**	**0.7**	**19.4**	**-0.8**
(1)	Primary deficit, of which:	-1.1	2.3	0.2	7.2	6.1
	• Structural primary deficit	0.0	1.2	-0.8	2.6	4.4
	• Cyclical component	-1.1	1.1	0.9	4.4	1.8
	• One-off and temp items	*n.a.*	0.0	0.1	0.2	-0.1
(2)	Snowball effect	0.2	3.0	0.5	10.2	-6.4
(3)	Stock flow adjustments	0.3	0.7	0.0	2.0	-0.5

(1) Contributions from the cyclical component and one-off and temporary items are defined as a deficit. A positive contribution from a deficit increases debt. A negative contribution from a deficit constitutes a surplus and reduces debt. *The groups of low and high debt countries ae defined as countries with a debt ratio < 60% and > 60% of GDP in 2019, respectively.*
Source: Commission services.

3.3.3. Final reflections about the importance of a negative (favourable) *'r-g'* differential for debt sustainability relative to other factors

Even in a negative (favourable) *'r-g'* environment, there are further reasons to retain a focus on debt sustainability. First, even if current favourable financing conditions reflect structural factors (see section 3.2.2)**, these conditions could be reversed, especially in high debt countries that already pay higher spreads than others**. Indeed, studies find that sovereign bond spreads respond to fundamental variables, especially government debt, in non-linear fashion, and the sensitivity of spreads to fundamentals,

([226]) First, crises often induce changes in the government's financial assets such as cash deposits use or build-up, potential fire sales to support debt adjustments, privatisations, financial sector recapitalisations or materialisation contingent liabilities from public guarantees, if recorded below the line. Second, *cash-accrual differences* are also larger in a crisis, when governments commonly grant substantial tax deferrals, 'frontload' some social payments, delay settlements on certain goods and services or go for a fast or delayed settlement of tax refunds. Third, large *valuation effects* may also occur in a crisis for countries having issued, for instance, part of their debt in currencies that attract a flight to safety (which quickly appreciate after a global shock) or due to possible *volume effects* associated to sector reclassifications, for instance from the banking sector to the state or general government sector. See Box I.1.2 for more details on the three SFA components.

([227]) Though this is not evident when looking at the implicit interest rate, given the maturity structure of debt.

including government debt also increases with international investors' risk aversion ([228]). Low or negative differentials are not associated with lower frequency of sovereign defaults. Sovereign default histories demonstrate that, after prolonged periods of low differentials, marginal borrowing costs (LTI) (as opposed to average effective interest rates (EIR)) often rise suddenly and sharply just prior to default, shutting countries out of financial markets at short notice ([229]). This evidence shows that favourable *'r-g'* circumstances should not be overstated, as they often escape the direct control of governments ([230]).

Then, all underlying factors driving the debt dynamics are interrelated and the *'r-g'* differential cannot be considered in isolation from other variables. In particular, several papers highlight that negative *'r-g'* differentials may have aggravated the deficit bias ([231]). Indeed, *while negative differentials support debt reduction, this effect is partly offset by a reduced fiscal effort, especially in highly indebted Member States; [hence] a reduction in interest rate-growth differentials does not lead to a one-to-one change in the pace of debt reduction. As [debt] reaches high levels, discretionary fiscal policy tends to react to the negative differential environment by delivering a smaller effort* ([232]). Therefore, low financing costs may pose risks to debt sustainability when they operate as a pull factor towards higher government debt, as the issuance of new debt appears affordable. This perverse effect may cause a protracted (and potentially more sizeable) debt overhang as governments fail to deleverage in good times. The recent literature also provides new insights into the interrelations between the growth rate of the economy, prevailing interest rates, and the level of debt. As debt increases, the convenience value of public debt will decrease. Eventually, the rise in the cost of debt will shrink the value of future deficits that the private sector is willing to finance indefinitely and higher debt must be repaid by taxation ([233]). In this sense, *'r<g'* can finance small deficits, but it does not resolve already exponentially-growing debt *or* large deficits, which still need to be repaid by subsequent surpluses ([234]), also considering that persistent primary surpluses are, nowadays, rare ([235]).

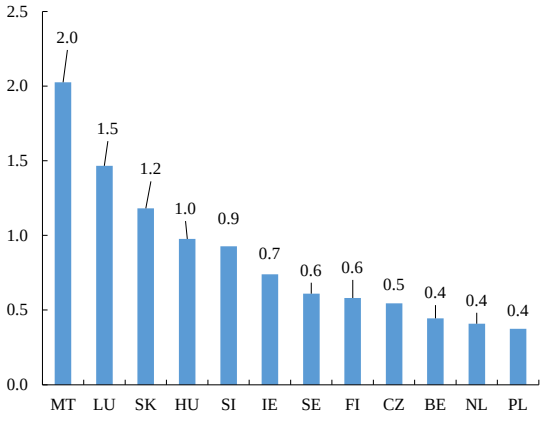
Furthermore, negative *'r-g'* differentials are not necessarily associated with reduced fiscal risks, which encompass broader, future developments in different factors. Despite the low or negative *'r-g'* differentials observed outside of crisis times, debt ratios have reached unprecedented levels, as a result of large shocks (global financial crisis, COVID-19 crisis), increasing in turn the vulnerability of the debt trajectory to future shocks and reversals. In full foresight, a comprehensive analysis should also consider risks to fiscal sustainability from *direct or contingent liabilities* expected in the future. With *population ageing*, *climate change*, *financial stability* risks looming in the banking, insurance and private pension sectors ([236]), and with governments having issued important guarantees to different sectors during the COVID-19 crisis, direct, as well as implicit and explicit contingent liabilities have increased. Thereby, governments may expect higher liabilities to materialize from these areas in the future, also implying new risks to debt sustainability. At the same time, when interest rates are low, governments' future commitments in net present value are larger and likely to widen some countries' sustainability gaps (see Graph II.3.10) ([237]).

For all these reasons, the argument that public debt has no fiscal costs in a negative *'r–g'* environment is only partial and a vigilant focus on debt sustainability is still needed. A holistic approach to government debt sustainability appears desirable, especially after the latest debt surges crises have inflicted over the past decade(s).

([228]) Pamies *et al.*, 2021; Mausch *et al.*, 2017.
([229]) Mauro and Zhou, 2020.
([230]) Lian *et al.*, 2020.
([231]) European Commission, 2021; Schuknecht, 2020.
([232]) European Commission, 2021.
([233]) Reis, 2021.
([234]) Cochrane, 2021.
([235]) Panizza and Eichengrren, 2014 point to Norway after 1999, Belgium after 1995, and Singapore after 1990.
([236]) Risks to financial stability in these sectors may derive from the very phenomenon of climate change and extreme weather events (insurance sector) as well as from the environment of low interest rates, which increases capitalisation needs (in the private pension defined benefit sector) and lowers the rate of return (in the private pension defined contribution sector), as well as it has increased risk taking (in the financial sector as a whole).
([237]) Whether lower interest rates increase or reduce a country's sustainability gap depends on the relative size of two counteracting effects of low rates – reduced future interest payments on debt, on the one hand, and larger future ageing costs in present value, whereby interest rates serve as discount factors, on the other.

Such a view would also need to integrate considerations on the quality of public finances and the strength of institutions.

Graph II.3.10: **Impact of lower interest rates (-1 pp.) on the contribution of costs of ageing to the S2 indicator, selected countries, pps. of GDP**



(1) Interest rates and growth rates serve as discounting factor when calculating the contribution of all future costs of ageing (CoA) to S2, a form of net present value of CoA. The graph shows the difference between such CoA contributions to S2 when interest rates are 1 pp lower compared to baseline assumptions.
Source: Commission services.

3.4. IMPLICATIONS OF A CORRECTION OF *'R-G'* DIFFERENTIALS FOR DEBT SUSTAINABILITY RISKS

The baseline debt projections included in this report are anchored to favourable *'r-g'* differentials' assumptions, and warrant stress testing. The baseline interest rate assumptions reflect financial market expectations, which are currently very favourable. Moreover, baseline GDP projections include the expected positive impact of *NextGenerationEU*, and in particular of the investments planned under the Recovery and Resilience Facility. However, given that less favourable macro-financial conditions could materialise, with, in particular, non-trivial risks of reversal of financial conditions (as argued in this chapter), baseline debt trajectories are stress tested against less favourable *'r-g'* differential assumptions.

An adverse *'r-g'* scenario is designed to capture risks of a (moderate) *'r-g'* increase or even reversal. We design an adverse *'r-g'* scenario, whereby the *'r-g'* is assumed to be permanently higher in the future, by 1 pp. compared to the baseline. This higher differential is obtained by applying simultaneous shocks to short and long-term market interest rates and to economic growth assumed under the baseline, similarly to a combined adverse shock to these variables. These combined shocks apply over the period 2022-2032 of the projections.

Table II.3.2: **Interest – growth rate differentials, baseline and adverse scenario (based on the implicit interest rate)**

	avg 2001-21	Baseline 2032	Adverse 'r-g' scenario 2032
BE	0.5	-1.7	-0.8
BG	-2.7	-1.6	-0.8
CZ	-1.0	-1.2	-0.3
DK	1.3	-2.2	-1.5
DE	0.6	-2.5	-1.6
EE	-4.8	-3.9	-3.1
IE	-2.6	-2.9	-2.1
EL	2.6	-1.8	-1.2
ES	0.9	-1.3	-0.5
FR	0.7	-2.0	-1.1
HR	0.4	-1.6	-0.7
IT	2.1	-0.7	0.2
CY	0.3	-2.6	-1.8
LV	-2.5	-2.8	-1.9
LT	-2.0	-2.8	-1.9
LU	-2.7	-3.1	-2.3
HU	-0.9	-1.5	-0.6
MT	-1.1	-3.2	-2.3
NL	0.2	-2.1	-1.2
AT	0.6	-2.2	-1.3
PL	-1.0	-2.6	-1.7
PT	1.4	-1.0	-0.2
RO	-5.6	-0.5	0.5
SI	0.3	-3.1	-2.2
SK	-1.0	-2.7	-1.9
FI	0.2	-2.8	-2.1
SE	-0.9	-2.9	-2.4

(1) cells are highlighted in blue when the projected *'r-g'* differential is lower than its historical average.
Source: Commission services

Under this adverse scenario, *'r-g'* projections would remain negative for most countries in 2032, but would have higher values than assumed in the baseline. Indeed, while this scenario is not designed to capture magnitudes of the reversal that *'r-g'* experienced during crises, it does lead to an increase of the differential in all cases. In 2032, the baseline assumptions lead to lower *'r-g'* values than the countries' historical averages (2001-21) in all cases except Bulgaria, Estonia and Romania. Alternatively, the adverse *'r-g'* scenario pushes this differential up to values exceeding historical averages also in Czechia, Ireland, Latvia, Lithuania, Luxembourg, and Hungary the same year, although the differential would remain negative in all but two cases, Italy and Romania (see Table II.3.2).

Consequently, the adverse *'r-g'* scenario would lead to higher projected debt levels by 2032 compared with the baseline, but the risk category would remain unchanged in all but two countries. As expected, this adverse *'r-g'* scenario would lead to higher projected debt levels by 2032 compared to the baseline. Higher impacts are seen in high debt countries (Greece, Italy, Spain, Portugal, Belgium and France) and / or in countries with a shorter average (residual) maturity of debt (Hungary, Portugal, Germany, Italy, Spain and Romania), meaning a faster pass-through of the less favourable assumption. However, in the vast majority of countries, these results do not lead to a different risk category, compared with the baseline ([238]). Only in Portugal and Croatia the risk category of the adverse *'r-g'* scenario is 'high', compared to a 'medium' risk category in the baseline. This worsening occurs in these countries as their debt paths under the adverse *'r-g'* scenario would bounce back more quickly and to higher a level by 2032, compared to the baseline. In all countries where risks were already high under the baseline (Italy, Greece, Belgium, Spain, France, Slovenia and Slovakia), a higher or adverse *'r-g'* would further aggravate risks (see Table II.3.3).

Table II.3.3: **Projected debt levels in 2032, baseline and adverse 'r-g' scenario, % of GDP**

	Baseline	Adverse 'r-g' scenario (+1 pp)	Impact adverse 'r-g' scenario
BE	133.6	143.0	9.4
BG	36.4	38.6	2.2
CZ	67.1	71.6	4.5
DK	15.6	17.5	1.9
DE	61.6	66.8	5.1
EE	25.7	27.2	1.5
IE	45.7	48.8	3.2
EL	154.7	165.6	10.9
ES	126.1	136.1	10.0
FR	122.3	131.4	9.1
HR	76.7	82.6	5.8
IT	161.6	174.8	13.2
CY	77.8	83.6	5.7
LV	48.8	52.5	3.8
LT	39.4	42.4	2.9
LU	18.2	19.5	1.4
HU	68.1	73.7	5.6
MT	73.2	78.4	5.2
NL	62.8	67.5	4.7
AT	76.3	81.8	5.5
PL	48.3	51.7	3.4
PT	126.2	136.3	10.0
RO	76.9	82.0	5.1
SI	95.2	101.6	6.4
SK	72.2	76.4	4.2
FI	63.9	68.2	4.3
SE	11.2	12.4	1.2

Source: Commission services

([238]) For the definition of risk categories, in general and in the specific case of the new *'r-g'* scenario, see Annex A1. Fiscal sustainability analysis: the Commission's framework.

Box II.3.1: **The 'r-g' differential and its importance for debt sustainability, relative to other factors: a snapshot of key concepts**

A glance at the debt law of motion. In the simplified version of a closed economy with all debt issued in domestic currency (i.e. ignoring exchange rate valuation effects([1])), the government debt stock to GDP ratio evolves between two periods as follows:

$$d_t = d_{t-1}.\frac{(1+r_t)}{(1+g_t)} - pb_t + sfa_t \qquad (1)$$

$$\Delta d_t = \underbrace{d_{t-1}.\frac{(r_t-g_t)}{(1+g_t)}}_{\text{automatic debt dynamics}} - pb_t + sfa_t \qquad (2)$$

where

- d_t represents the total government debt stock to GDP ratio in year t
- r_t represents the nominal implicit interest rate on government debt
- g_t represents the nominal growth rate of GDP (in national currency)
- pb_t represents the primary balance over GDP
- sfa_t represents the stock-flow adjustments over GDP.

Alongside other relevant factors, the *'r-g'* differential influences the debt ratio change between two periods. Together with the *existing debt stock* d_{t-1}, *'r-g' captures* the flow of interest payments due on this outstanding debt stock, eroded by nominal effects (% of GDP); then, two other flows - the *primary fiscal deficit* (pb_t) and *stock-flow adjustments* (sfa_t) – influence overall debt dynamics alongside (see the debt law of motion in (2)). Because *'r-g'* applies to the initial debt ratio, the *'r-g'* differential is intrinsically compounded by the latter and produces on debt what is called the *'snowball effect'* or *'automatic debt dynamics'*. This first component of the debt law of motion indicates what happens to the debt ratio automatically, as a result of the *'r'* and *'g'* prevailing in the economy, all else being equal (when the other flows - *pb* and *sfa* - are zero). As such, the snowball effect essentially reflects the macroeconomic *environment's* conditions.

A negative *'r-g'* differential supports debt sustainability (favourable snowball effect), while a positive differential hampers it (unfavourable snowball effect). When $r > g$ (positive differential), automatic debt dynamics are unfavourable and the initial debt stock snowballs into larger debt, with expectedly adverse implications for overall debt dynamics, unless the two other flows, pb and sfa, offset the $r > g$ impact. When $r < g$ (negative differential), automatic debt dynamics are favourable, supporting a passive debt deleveraging. If the automatic reduction in debt from growth exceeding the interest rate is larger than or equal to the effect of the two other flows, *pb* and *sfa*, a persistently favourable snowball effect could lead to an overall reduction or stabilisation of the government debt ratio, even in the presence of primary deficits.

The influence on debt dynamics of other factors such as the primary balance is especially powerful, reason why a favourable *'r-g'* environment cannot (be expected to) stabilise or cut debt in isolation. The primary balance, which essentially reflects fiscal policy, gives the relative importance of government action versus macroeconomic conditions (*'r-g'*). In this manner, a sufficiently large primary fiscal surplus or deficit can, respectively, improve or hamper debt dynamics regardless of the macroeconomic environment. All factors accounted for, the final size of the debt globe d_t is eventually given by the sum of macroeconomic conditions (the rolling snowball or *automatic* debt dynamics), the effect of fiscal policy (the primary fiscal balance), as well as that of other factors affecting debt but not the budget balance (the sfa).

([1]) In the EU, most of government debt is held in domestic currency. Few exceptions are found among non-EA countries (e.g. BG, HR, RO), though in these cases, the bulk of debt held in foreign currency is issued in euro (and BG and HR have their currencies pegged to the latter).