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Fiscal Sustainability Report 2018

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FOREWORD

The Commission *Fiscal Sustainability Report* (FSR) 2018, the fifth edition of this report introduced in 2006, provides a timely update of fiscal sustainability challenges faced by Member States. As in previous editions, fiscal sustainability challenges faced by Member States are evaluated according to a comprehensive horizontal assessment framework. This framework brings together in a synthetic way results on debt sustainability analysis (DSA) and fiscal sustainability indicators. It presents an overview of fiscal sustainability challenges across different time horizons (short, medium and long term), and allows for the identification of the scale, nature and timing of fiscal sustainability risks. The Commission sustainability framework also considers additional risk factors to further qualify the overall assessment.

The Commission fiscal (debt) sustainability analysis critically contributes to the monitoring and coordination of Member States' fiscal policies, as well as of the aggregate fiscal stance for the EA. Coordination of national fiscal policies in accordance with the common fiscal rules is essential for the proper functioning of the EU/EA. The common fiscal rules are geared towards pursuing debt sustainability at the national level, while providing room for macroeconomic stabilisation. With this aim, the Commission fiscal (debt) sustainability serves multiple purposes: i) an early-warning function, by identifying potential building fiscal risks in Member States; ii) a basis for the formulation of policy requirements, in the context of the Stability and Growth Pact (SGP), and of policy recommendations, in the context of the European Semester; and iii) a key input in the context of EA financial assistance programmes.

This edition of the report brings some methodological and analytical novelties. The approach to assess long-term fiscal sustainability risks has been revised in order to better account for vulnerabilities associated to high debt burdens. Other changes include an enriched set of sensitivity tests, an enhanced reporting of financing needs and financial markets' information, as well as a more comprehensive mapping of government (contingent) liabilities. The report also presents a review of the links between institutional factors and fiscal sustainability, an analysis of the impact of using financial markets' expectations to project interest rates, and a reflection on the consideration of government assets in fiscal sustainability frameworks. Importantly, following the successful completion of the Greek programme mid-2018, this FSR includes for the first time, since the 2009 edition, some results for Greece.

Despite an overall improvement of EU public finances over the last few years, fiscal risks are still present. *In the short-term*, one country (Cyprus) is found to be at risk of fiscal stress in the short-term (based on the S0 indicator), while in four additional countries (Spain, France, Italy and Hungary), some short-term vulnerabilities are also identified (based on the S0 fiscal sub-index). *In the medium-term*, high risks are identified in seven countries (Belgium, Spain, France, Italy, Hungary, Portugal and the United-Kingdom). *In the long-term*, high risks are identified in six countries (Belgium, Spain, Italy, Luxembourg, Hungary and the United-Kingdom).

The FSR 2018 confirms the need for pursing policies aimed at securing fiscal sustainability, on the basis of differentiated policies. The strengthening of fiscal sustainability in the EU/EA requires differentiated national policies in full respect of the SGP. Favourable macroeconomic conditions and an accommodative monetary policy should be used to re-build fiscal buffers, especially in high-debt countries. This is important not only to reduce their vulnerability to shocks, but also to allow for the full functioning of automatic stabilisers in the next downturn. Failure to reduce government debt also increases the risk of heightened market pressures in these countries, which could in turn trigger negative spillover effects on other Member States. At the same time, increasing public investment, in particular in Member States with fiscal space, would support growth and rebalancing.

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CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF BOXES

EXECUTIVE SUMMARY

Despite overall progress in the EU, government debt ratios remain high in a small set of – mainly large - European economies

The EU government debt ratio has been continuously decreasing since 2014, and reached around 81% of GDP in 2018, supported by the solid economic activity – albeit a slower growth pace last year - still favourable financial conditions, and a broadly stable fiscal outlook. At the same time, some other advanced economies exhibit much higher and non-decreasing government debt ratios (around 238% of GDP in Japan and around 106% of GDP in the United-States in 2018). Yet, some high debt countries – such as Italy, Cyprus, France and Spain – are still faced with increasing or not sufficiently receding debt burdens, remaining therefore exposed to unfavourable shocks.

Amid high uncertainties, prudent fiscal policies are needed to secure fiscal sustainability

Favourable macroeconomic conditions and an accommodative monetary policy should be used to re-build fiscal buffers, especially in high debt countries, in time to absorb new shocks when they come, not least a foreseeable rise in interest rates. In the latter, failure to reduce government debt increases the risk of heightened market pressures, which could have negative spillover effects on other Member States. Hence, in a context where uncertainties remain high - both on the external and domestic sides ([1]) - Member States need to run prudent fiscal policies to ensure sound public finances in the short to longer term.

The role of the Commission in terms of policy coordination, and economic and fiscal surveillance, remains essential at the current juncture

The Commission analysis of public finances sustainability critically contributes to the monitoring and coordination of Member States' fiscal policies, as well as of the aggregate fiscal stance for the euro area. As "sound public finances" is one of the guiding principle of the Union's economic policy, the Commission fiscal sustainability analysis plays a key role notably in the context of the Stability and Growth Pact and of the European Semester, the EU integrated surveillance framework (see Chapter 1 of this report). It notably allows identifying fiscal sustainability vulnerabilities that need to be addressed by appropriate policy responses (e.g. in the areas of pension and health care).

The FSR 2018 provides a timely update of fiscal sustainability challenges in the EU

Against this background, this new edition of the Fiscal Sustainability Report (FSR) aims at providing a timely update of fiscal sustainability challenges faced by Member States. The FSR 2018 provides a snapshot of the situation, updating results to the latest available macroeconomic forecasts (based on European Commission's Autumn 2018 forecast). The projections ([2]) also rely on the Economic Policy Committee (EPC) agreed long-term convergence assumptions for the interest - growth rate differential, and the long-term budgetary projections of age-related costs from the joint European Commission - EPC 2018 Ageing Report ([3]). Importantly, the report includes, for the first time since the 2009 edition, some results for Greece. Given the unique composition of

([1]) See European Commission (2018d).

([2]) Over the medium- and the long-term, the assessment mainly relies on macroeconomic and fiscal projections. These *projections* need to be distinguished from *forecasts* in that - over a longer time horizon – they necessarily rely on more conventional assumptions than over the short-term (typically two years for the Commission forecast horizon). Giver higher uncertainties, an extensive set of alternative scenarios and sensitivity tests is considered (see Box 1.1).

([3]) The cut-off date for the preparation of the report was 8 November 2018 (publication date of the Commission Autumn forecast 2018). Therefore, it does not integrate developments that may have occurred since this date.

the Greek public debt and the debt relief measures adopted by the Eurogroup in June 2018, the analysis provided in this report is based on country-specific assumptions, and presented in a dedicated Box (see Box 3.3).

A comprehensive horizontal framework for assessing fiscal sustainability is used

Fiscal sustainability challenges faced by Member States (including those stemming from population ageing) are evaluated according to the comprehensive horizontal fiscal sustainability assessment framework developed in the Fiscal Sustainability Report (FSR) 2015 ([4]). This framework brings together in a synthetic way results on debt sustainability analysis (DSA) and fiscal sustainability indicators. The framework allows gaining a horizontally consistent overview of fiscal sustainability challenges across time horizons (short, medium and long term) ([5]) and across countries, based on a set of transparent criteria.

The FSR 2018 brings one main methodological change in the fiscal sustainability framework, and several additional improvements

In this edition of the FSR, the approach to assess long-term fiscal sustainability risks has been revised in order to better account for vulnerabilities associated to medium and high levels of debt (see Chapter 4). Other changes include an enriched set of sensitivity tests, an enhanced reporting of financing needs and financial markets' information (see Chapter 2 and statistical annex A10), as well as a more comprehensive mapping and reporting of government (contingent) liabilities (see Chapter 5). A set of analytical and methodological Boxes is also included, in particular (but not only) a review of the role of institutional factors in fiscal sustainability analysis (see Box 1.2), an analysis of the impact of using financial markets' expectations to project interest rates (instead of the common assumption, consistent with the Ageing Report, see Box 3.2) and a reflection on the consideration of government assets in fiscal sustainability frameworks, notably based on a recent and original Commission study (see Box 5.1).

Fiscal sustainability challenges remain, despite some overall favourable prospects in the EU as a whole

The EU and EA government debt ratios are set to gradually decline over the next decade, under the baseline no-fiscal policy change scenario ([6]), from a peak of 88% of GDP in 2014 (respectively 94% of GDP in the EA) to 72% of GDP in 2029 (respectively 78% of GDP in the EA). These levels are comparable to the ones projected a year ago (slightly lower for the EU as a whole, see Debt Sustainability Monitor 2017 ([7])), and lower than the ones foreseen in the Fiscal Sustainability Report 2015, in line with a still favourable fiscal and economic outlook. Furthermore, when taking into account a large range of possible temporary shocks to macro-financial and fiscal variables (through stochastic projections), the EA government debt ratio is found to have a high probability to decline in the next 5 years (probability close to 95%).

([4]) See European Commission (2016a).
([5]) The time horizon of the short-, medium and long-term is respectively the upcoming year, the next 10-15 years and the infinite horizon (in practice, with fully-fledged projections up until 2070, and assuming that the main variables remain constant thereafter).
([6]) The no-fiscal policy change scenario relies on the assumption that the government primary balance (in structural terms and before ageing costs) remains constant at its last forecast value (2020) for the remainder of the 10-year projection horizon.
([7]) See European Commission (2018a).

Nonetheless, several elements point to persistent fiscal sustainability risks. First, despite the overall downward trend projected in the baseline no-fiscal policy change scenario, EU and EA overall debt ratios are projected to remain in 10 years' time above their pre-crisis levels, and the 60% of GDP Treaty reference threshold. Furthermore, as usual in debt projection exercises, fiscal assumptions critically drive the results: for instance, assuming government primary balances more in line with historical trends (based on last 15 years' averages) would bring a smaller reduction of debt ratios (-5 pps. of GDP in the EU against -10 pps. of GDP in the baseline no-fiscal policy change scenario) ([8]). Finally, and most important, as highlighted in this report, EU and EA averages mask important cross-country differences, with less favourable prospects in a number of cases. For instance, in a small set of highly indebted – and often large – economies, government debt burdens are projected, at unchanged policies, to decline at a slower pace, or even to increase by 2029.

These remaining important debt-vulnerabilities expose highly indebted Member States to unfavourable shocks, in particular to hikes in interest rates. For instance, an increase of market interest rates of 100 basis points (combined with lower economic growth), compared to the baseline scenario, would raise government debt ratios by 10 pps. of GDP or more in high-debt countries. Stabilising government debt in a higher interest rate environment would thus require larger fiscal efforts.

In this context, the FSR 2018 stresses the importance of adhering to European fiscal rules. A significantly larger decrease in government debt ratios would be achieved, getting close to 60% of GDP at the EU and EA aggregate levels in 2029 if all countries achieved and adhered to medium-term objectives set by the Stability and Growth Pact (SGP) ([9]). The sustained fiscal consolidation implied in the SGP scenario can be deemed relatively ambitious compared with historical fiscal behaviour in the EU. At the same time, lessons from past episodes of debt reduction in some advanced economies highlight that primary balances even larger than the ones assumed in the SGP scenario were sustained (see DSM 2017).

Building on the results of the Debt Sustainability Analysis and on fiscal sustainability indicators, the report provides an assessment of fiscal sustainability risks across time horizons (see chapter 6 and Annex A6 for a detailed description of the classification criteria used).

Overall, short-term risks of fiscal stress have declined for EU countries since 2009,

In 2009, more than half of the Member States were deemed to be at high risk of fiscal stress in the short term. While no country was found to be at such risk in the DSM 2017 (and in the FSR 2015), short-term vulnerabilities are identified in this report in one country

([8]) The description of all the scenarios performed in this report is provided in Box 1.1.
([9]) See section 3.1.1.2 of the report for the results of the SGP scenario.

although risks appear on the rise compared to last year in some countries

(Cyprus) - albeit a borderline value of the S0 indicator ([10]). This result is driven by the strong increase of government debt last year, on the back of banking support measures, and by prevailing macro-financial vulnerabilities (see Chapter 2). Yet, an important reduction of government debt is forecasted for 2019, supported by a large primary surplus ([11]). Similarly to the DSM 2017, short-term challenges are identified in some additional countries on the fiscal side (in Hungary, Spain, Italy and France) ([12]). These vulnerabilities are not deemed acute enough to lead to overall risks of fiscal stress in the short term. Yet, they deserve particular attention, in a context where financial market sentiments can change rapidly. Italy is particularly exposed to sudden changes in financial market perceptions, notably in the light of its still sizeable government financing needs. The report explores the impact of a renewal of liquidity tensions that could lead to a substantial increase of government financial needs in a number of countries (see Box 3.4).

Over the medium term, high risks to fiscal sustainability are identified in seven countries, and medium risks for another four

The assessment of medium-term sustainability challenges relies on the joint use of the debt sustainability analysis (DSA, run over a 10-year horizon) and the S1 indicator ([13]), as in the DSM 2017 (and in the FSR 2015). The joint use of the DSA and S1 allows capturing medium-term sustainability challenges in a comprehensive way, by considering fiscal risks related both to population ageing and to other risk factors affecting future debt developments (see Chapter 3).

Seven countries (Belgium, Spain, France, Italy, Hungary, Portugal and the United-Kingdom) are deemed at high fiscal sustainability risk in the medium term, as a result of inherited high post-crisis debt burdens, weak forecasted fiscal positions in some cases and / or sensitivity to unfavourable shocks. In five of these countries (Belgium, Spain, France, Italy and Portugal), both the DSA and the S1 indicator point to high risks. In Hungary and the United-Kingdom, this high medium-term risk category is driven by the overall DSA assessment, while the S1 indicator signals medium risks. Their DSA results are driven by a debt ratio at the end of projections, under the baseline no-fiscal policy change scenario, above the 60% of GDP Treaty reference value, accompanied by high risks highlighted by one or more of the alternative debt projection scenarios or sensitivity tests.

In four additional countries (Croatia, Cyprus, Romania and Slovenia), medium-term fiscal sustainability risks are deemed medium. In Croatia and Romania, both the DSA and the S1 indicator point to medium risks. In Cyprus, the medium-term risk classification is driven by the DSA results, specifically due to the

([10]) The S0 indicator is a composite indicator aimed at evaluating the extent to which there may be a risk of fiscal distress in the short term, stemming from the fiscal as well as the macro-financial and competitiveness sides of the economy. A set of 25 variables proven to perform well in the past in detecting fiscal distress situations is used to construct the indicator.
([11]) Furthermore, over the medium-term, government debt is projected to strongly diminish (and the country is deemed at medium risk over this horizon, see Chapter 3).
([12]) On the other hand, short-term risks – stemming from the fiscal side - are deemed to have receded in the United Kingdom.
([13]) The medium-term sustainability indicator S1 shows the additional adjustment required, in terms of improvement in the government structural primary balance over 5 years to reach a 60% public debt-to-GDP ratio by 2033, including financing for future additional expenditure arising from population ageing.

debt ratio still exceeding 60% of GDP by 2029 in the baseline and the sensitivity tests considered. Despite the current high debt level, the S1 indicator points to low risks, due to the high initial budgetary position (with borderline results however). In Slovenia, the DSA risk assessment points to low risks, due to the debt ratio remaining below 60% of GDP by 2029 in the baseline and sensitivity tests. Despite a contained level of debt, the S1 indicator signals medium risks as a result of fast increasing projected ageing costs.

The remaining sixteen countries are found to be at low risk in the medium term. These countries include Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Poland, Slovakia, Finland and Sweden. In three cases however (Bulgaria, Latvia and Lithuania), stochastic projections point to some vulnerabilities due to the important underlying volatility of these economies. Furthermore, in the case of Ireland, when scaling government debt with GNI, rather than GDP, which can be considered as a more accurate measure of repayment capacity for this country, medium-term vulnerabilities appear more important than suggested here (see Box 3.1).

The FSR 2018 contains a limited number of changes in the medium-term risk classification, compared with the DSM 2017, overall pointing to reduced risks. In two countries (Croatia and Romania), the risk classification has improved from high to medium risk. In Croatia, the improvement in the forecasted structural primary balance explains the change in the risk category, while in Romania, the lower forecasted debt ratio drives the improvement (the country was borderline medium – high risk last year). In three additional countries (Lithuania, Austria and Poland), the risk classification has improved from medium to low risk, and from high to low risk in the case of Finland. In Lithuania, the improvement is notably driven by the improved projected ageing costs (based on the Ageing Report 2018). In Austria, Poland and Finland, the change in the risk classification can be largely attributed to the improved initial budgetary position. Compared to the FSR 2015, the proportion of countries at high or medium-risk has clearly declined. Yet, high risks identified in some large economies are not receding.

Over the long term, high risks to fiscal sustainability are identified in six countries, and medium risks for another fourteen

Long-term fiscal sustainability challenges are identified based on the joint use of the S2 indicator ([14]) and the DSA. The joint use of the S2 indicator and the DSA, newly introduced in this report, allows capturing long-term sustainability challenges in a more comprehensive way than the assessment based on the long-term fiscal gap indicator S2. In particular, the consideration of the overall DSA results in the long-term risk assessment aims at prudently capturing risks linked to medium to high debt levels (see Box

([14]) The long-term sustainability indicator S2 shows the upfront adjustment to the current primary balance (in structural terms) required in order to stabilise the debt-to-GDP ratio over the infinite horizon, including financing for any additional expenditure arising from an ageing population.

4.1) ([15]).

In the long term, six countries (Belgium, Spain, Italy, Luxembourg, Hungary and the United Kingdom) appear to be at high fiscal sustainability risk. In five of these countries (Belgium, Spain, Italy, Hungary and the United Kingdom), the significant level of the S2 indicator (pointing to medium risk), combined with high risk according to the DSA classification, drive this risk assessment. The substantial fiscal sustainability gap is, in some cases (Belgium, Hungary and the United Kingdom), mainly due to the projected increase in ageing costs. In Spain and Italy, the unfavourable initial budgetary position contributes to a large extent to the S2 indicator. In the case of Luxembourg, the high long-term fiscal sustainability gap, due to fast-increasing projected costs of ageing, explains the high long-term risk category, while low vulnerabilities linked to the limited debt burden - captured by the DSA risk classification – leave the long-term risk assessment unchanged.

In fourteen additional countries, long-term fiscal sustainability risks are deemed medium, including Czech Republic, Ireland, France, Croatia, Cyprus, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia and Finland. In ten countries (Czech Republic, Ireland, Malta, the Netherlands, Austria, Poland, Romania, Slovenia, Slovakia and Finland), the medium risk category is explained by the value of the S2 indicator, with no additional debt vulnerabilities flagged by the DSA. In most cases, the significant long-term fiscal gap is largely (if not only) driven by the projected increase of ageing costs (Czech Republic, Ireland, Malta, the Netherlands, Austria, Slovenia, Slovakia and Finland). In Poland and Romania, the unfavourable budgetary position also adds substantially to the sustainability challenge. In France, Croatia, Cyprus and Portugal, despite a limited (or even negative) fiscal gap indicator to stabilise debt over the long term, the vulnerabilities linked to the substantial debt burden – captured by the DSA risk assessment – lead to a medium long-term risk category.

The remaining seven countries (Bulgaria, Denmark, Germany, Estonia, Latvia, Lithuania and Sweden) are deemed at low long-term fiscal sustainability risks. In some countries (e.g. Bulgaria and Sweden), the low level of the S2 indicator is however conditional on maintaining a relatively high structural primary balance in the long term, and can be deemed ambitious by historical EU standards (a low percentile rank associated to the required SPB). Under more adverse scenarios, long-term fiscal challenges would become more acute in most of these countries (e.g. in Bulgaria and Germany).

Compared to the DSM 2017, the long-term risk classification has changed in fourteen countries. In most cases, the updated risk classification point to more important long-term risks, while in few

([15]) Such an approach allows addressing one of the flaws of the S2 indicator, namely that it abstracts from risks related to the level of the stock of debt. Indeed, the S2 indicator, grounded on the inter-temporal budgetary constraint, does not require that the debt level stabilises at a specific value and the adjustment implied by the S2 indicator might in fact lead to debt stabilising at relatively high levels.

cases less acute risks are identified. In five countries, the change in the risk classification is only due to the revised long-term fiscal gap indicator (notably with the revised projected costs of ageing). This concerns i) (on the downward side) the Czech Republic and Ireland (from low to medium), as well as Luxembourg (from medium to high), and ii) (on the upward side) Lithuania (from medium to low) and Slovenia (from high to medium). In Spain and Italy, the change in the risk classification is driven by both an increase of the S2 indicator, and the change in the methodology to assess long-term risks. In seven additional countries, the consideration of debt vulnerabilities in the risk assessment contributes to the change of risk category. This is the case of Belgium, France, Croatia, Cyprus, Hungary, Portugal and the United-Kingdom. Compared to the FSR 2015, the proportion of countries at high or medium risk in the long-term has also clearly increased.

Additional aggravating and mitigating risk factors are considered in this report

The Commission fiscal sustainability framework provides an analysis of additional mitigating and aggravating risk factors (see Chapter 5). These additional risk factors are considered horizontally in the overall assessment insofar the identified vulnerabilities or supporting factors may materialise in the short, medium or long term. Their consideration in the overall final assessment of risks is needed to arrive at a balanced assessment of fiscal sustainability challenges. In this additional analysis, three main components are considered: i) the structure of government debt financing; ii) additional government liabilities (beyond EDP debt) – including contingent liabilities linked to the banking sector and iii) government assets.

Table 1: **Fiscal sustainability assessment by Member State (in brackets, classification in the DSM 2017, whenever the risk category has changed)**

	Overall SHORT-TERM risk category	Overall MEDIUM-TERM risk category	S1 indicator - overall risk assessment	Debt sustainability analysis - overall risk assessment	S2 indicator - overall risk assessment	Overall LONG-TERM risk category
BE	LOW	HIGH	HIGH	HIGH	MEDIUM	HIGH (MEDIUM)
BG	LOW	LOW	LOW	LOW	LOW	LOW
CZ	LOW	LOW	LOW	LOW	MEDIUM (LOW)	MEDIUM (LOW)
DK	LOW	LOW	LOW	LOW	LOW	LOW
DE	LOW	LOW	LOW	LOW	LOW	LOW
EE	LOW	LOW	LOW	LOW	LOW	LOW
IE	LOW	LOW	LOW	LOW	MEDIUM (LOW)	MEDIUM (LOW)
ES	LOW	HIGH	HIGH	HIGH	MEDIUM (LOW)	HIGH (LOW)
FR	LOW	HIGH	HIGH	HIGH	LOW	MEDIUM (LOW)
HR	LOW	MEDIUM (HIGH)	MEDIUM	MEDIUM (HIGH)	LOW	MEDIUM (LOW)
IT	LOW	HIGH	HIGH	HIGH	MEDIUM (LOW)	HIGH (LOW)
CY	HIGH (LOW)	MEDIUM	LOW (MEDIUM)	MEDIUM	LOW	MEDIUM (LOW)
LV	LOW	LOW	LOW	LOW	LOW	LOW
LT	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW	LOW (MEDIUM)	LOW (MEDIUM)
LU	LOW	LOW	LOW	LOW	HIGH (MEDIUM)	HIGH (MEDIUM)
HU	LOW	HIGH	MEDIUM	HIGH	MEDIUM	HIGH (MEDIUM)
MT	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
NL	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
AT	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW (MEDIUM)	MEDIUM	MEDIUM
PL	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW (MEDIUM)	MEDIUM	MEDIUM
PT	LOW	HIGH	HIGH	HIGH	LOW	MEDIUM (LOW)
RO	LOW	MEDIUM (HIGH)	MEDIUM	MEDIUM (HIGH)	MEDIUM	MEDIUM
SI	LOW	MEDIUM	MEDIUM	LOW (MEDIUM)	MEDIUM (HIGH)	MEDIUM (HIGH)
SK	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
FI	LOW	LOW (HIGH)	LOW (MEDIUM)	LOW (HIGH)	MEDIUM	MEDIUM
SE	LOW	LOW	LOW	LOW	LOW	LOW
UK	LOW	HIGH	MEDIUM	HIGH	MEDIUM	HIGH (MEDIUM)

Source: Commission services

Table 2: **Final DSA risk classification: detail of the classification**

HIGH RISK	MEDIUM RISK	LOW RISK
Baseline scenario at high risk BE, ES, FR, IT, PT	**Baseline scenario at medium risk** HR, CY, RO	**Baseline scenario at low risk (confirmed by other scenarios)** BG, CZ, DK, DE, EE, IE, LV, LT, LU, MT, NL, AT, PL, SI, SK, FI, SE
Baseline scenario at medium risk (At least one) other scenario at high risk due to: Debt level at high risk: UK Debt peak year at high risk: HU		

Source: Commission services

Table 3: **Summary heat map of fiscal sustainability challenges**

	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
	Heat map for short-term risks in EU countries																										
S0 overall index	0,22	0,19	0,18	0,12	0,00	0,17	0,21	0,37	0,29	0,24	0,36	0,46	0,24	0,21	0,12	0,34	0,06	0,08	0,03	0,18	0,33	0,30	0,13	0,27	0,14	0,20	0,42
Overall SHORT-TERM risk category	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
	Heat map for medium-term risks in EU countries																										
	S1 indicator in the EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
S1 indicator - Baseline scenario	4,3	-4,2	-2,9	-5,1	-2,0	-4,3	-0,9	5,2	4,2	0,2	9,4	-0,7	-2,0	-1,8	-4,8	1,1	-4,7	-1,7	-0,8	-0,7	4,3	1,5	0,2	-2,9	-0,1	-4,6	1,3
S1 indicator - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	LOW	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	MEDIUM	LOW	LOW	LOW	MEDIUM
	Sovereign-debt sustainability risks in EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Baseline no-policy change scenario	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	99,9	12,4	25,8	10,8	37,3	9,6	46,7	107,3	99,8	64,3	146,5	61,9	35,0	33,4	8,9	68,7	17,8	38,2	51,2	48,0	106,7	61,6	53,5	31,9	55,1	15,6	73,9
Debt peak year	2018	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Average Structural Primary Balance (2020-2029) Percentile rank	52%	42%	40%	28%	26%	71%	39%	72%	65%	38%	51%	17%	66%	53%	37%	67%	23%	47%	35%	66%	22%	89%	48%	50%	55%	34%	36%
Historical SPB scenario	HIGH	LOW	LOW	LOW	LOW	LOW	MEDIUM	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	LOW	MEDIUM	LOW	LOW	LOW	HIGH
Debt level (2029)	94,8	14,4	38,6	6,5	39,6	8,2	62,9	105,5	107,7	80,7	136,0	73,9	40,2	43,4	3,5	67,0	26,3	38,2	55,9	56,1	126,0	55,3	60,4	47,5	44,0	11,7	96,9
Debt peak year	2018	2018	2029	2018	2018	2029	2018	2029	2029	2029	2029	2018	2029	2029	2018	2018	2018	2018	2018	2029	2029	2029	2018	2018	2018	2018	2029
Average Structural Primary Balance (2020-2029) Percentile rank	42%	45%	65%	23%	29%	69%	69%	70%	75%	68%	30%	29%	73%	69%	29%	66%	35%	47%	44%	76%	55%	84%	62%	75%	34%	28%	75%
Negative shock (-0.5p.p.) on nominal GDP growth	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,3	13,3	27,3	12,2	39,9	9,9	49,3	112,9	105,1	68,2	154,7	66,5	36,7	35,1	9,6	72,4	19,3	40,6	54,5	50,5	113,4	64,0	56,4	33,9	58,1	16,9	78,3
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Positive shock (+1p.p.) to the market interest rates on new debt	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,4	12,7	27,5	11,7	40,0	9,8	49,6	113,2	105,6	69,4	155,9	65,1	36,7	35,5	8,9	73,4	18,8	40,5	53,6	50,6	112,4	65,2	56,3	33,0	56,9	16,0	77,6
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2029	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Negative shock on the PB over the two forecast years	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	103,3	15,2	28,9	11,9	39,5	10,0	48,4	108,6	101,2	68,9	153,5	69,2	37,4	33,7	11,6	72,2	19,2	40,5	53,5	48,3	108,2	67,8	56,4	32,2	56,0	16,3	76,5
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2029	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Stochastic projections	HIGH	MEDIUM	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM	MEDIUM	LOW	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
Probability of debt in 2023 greater than in 2018 (%)	31%	29%	23%	8%	1%	32%	15%	54%	34%	36%	59%	10%	41%	40%	17%	36%	8%	5%	12%	25%	26%	79%	6%	20%	27%	1%	17%
Difference of the 10th and 90th percentile in 2023 (p.p. of GDP)	28,1	29,6	23,4	17,1	15,0	3,0	27,9	17,6	13,9	40,8	25,3	42,2	28,8	29,0	19,3	40,8	27,5	14,7	26,3	16,8	41,7	35,7	23,5	27,4	18,6	11,3	19,3
Debt sustainability analysis - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	HIGH
Overall MEDIUM-TERM risk category	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	MEDIUM	LOW	LOW	LOW	HIGH
	Heat map for long-term risks in EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
S2 indicator - Baseline scenario	4,3	1,8	4,1	-0,5	1,7	0,9	3,3	2,3	-0,1	-2,1	2,9	-0,9	0,7	0,5	8,1	4,1	3,3	3,0	2,6	2,2	0,7	5,9	5,5	2,5	2,7	1,1	3,0
Debt sustainability analysis - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	HIGH
Overall LONG-TERM risk category	HIGH	LOW	MEDIUM	LOW	LOW	LOW	MEDIUM	HIGH	MEDIUM	MEDIUM	HIGH	MEDIUM	LOW	LOW	HIGH	HIGH	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	HIGH

(1) In this table, only the relevant information used for the risk classification is included. The report contains more detailed information. All thresholds used and decision trees are presented in Annex A6.

Source: Commission services

Table 4: **Fiscal sustainability challenges in the EU Member States**

Member State	*Fiscal sustainability assessment*
BE	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Belgium. Over the medium-term, fiscal sustainability risks appear, on the contrary, to be high for Belgium, both according to the sustainability gap indicator S1 and from a DSA perspective. The still high and non-reducing debt-to-GDP ratio over the medium term in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Belgium is deemed at high fiscal sustainability risk. The sustainability gap indicator pointing to medium risk in the long term and the vulnerabilities linked to the high debt burden - captured by the DSA risk assessment - imply that overall Belgium is deemed at high risk over the long term.
BG	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Bulgaria. Fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and from a DSA perspective. The projected low and decreasing debt-to-GDP ratio in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Bulgaria is deemed at low fiscal sustainability risk. The sustainability gap indicator shows that some fiscal adjustment would be needed to stabilise the debt-to-GDP ratio over the long run. Nevertheless, signals from the DSA underpin the low-risk assessment.
CZ	Over the short term (within one year), no significant risks of fiscal stress are foreseen for the Czech Republic. Over the medium term, fiscal sustainability risks also appear to be low for the Czech Republic, both according to the sustainability gap indicator S1 and from a DSA perspective. Over the long term, the Czech Republic is deemed at medium fiscal sustainability risk due to a positive sustainability gap indicator, pointing at some challenge to stabilise debt over the long term.
DK	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Denmark. Similarly, fiscal sustainability risks appear to be low for Denmark over the medium term, both according to the sustainability gap indicator S1 and from a DSA perspective. The low and decreasing debt to GDP ratio at the end of projections in the baseline scenario, and resilience to possible macro-fiscal shocks underpin this assessment. Over the long term, Denmark is deemed at low fiscal sustainability risk, both according to the long-term sustainability gap indicator S2 and from a DSA perspective.
DE	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Germany. Over the medium term, fiscal sustainability risks also appear to be low for Germany, both according to the sustainability gap indicator S1 and from a DSA perspective. Over the long term, fiscal sustainability risks also appear to be low for Germany, both according to the sustainability gap indicator S2 and from a DSA perspective.

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Table (continued)

EE	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Estonia. Similarly, fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and the debt sustainability analysis. The low debt-to-GDP ratio and the low sensitivity to possible macro-fiscal shocks underpin this assessment. Over the long term, Estonia is deemed at low fiscal sustainability risk. The sustainability gap indicator shows that a small fiscal adjustment would be required to stabilise debt in time. Signals from the DSA risk assessment concur.
IE	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Ireland. Over the medium term, fiscal sustainability risks also appear to be low for Ireland, both according to the sustainability gap indicator S1 and from a DSA perspective. Over the long term, Ireland is deemed at medium fiscal sustainability risk. Notwithstanding low vulnerabilities linked to the low debt burden - captured by the DSA risk assessment - the fiscal adjustment to stabilise debt over the long term implied by the sustainability gap indicator points to medium sustainability risks over the long term due to significant projected ageing costs.
ES	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Spain, although some fiscal variables point to possible short-term challenges, especially if financial markets' perceptions were to rapidly change. Over the medium term, fiscal sustainability risks appear to be high for Spain, both according to the sustainability gap indicator S1 and from a DSA perspective. The still high and increasing debt to GDP ratio at the end if projections in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Spain is deemed at high fiscal sustainability risk. The substantial sustainability gap indicator to stabilise debt over the long-term combined with vulnerabilities from the high debt burden reflected in the DSA risk assessment contribute to this assessment.
FR	Over the short term (within one year), no significant risks of fiscal stress are foreseen for France, although some fiscal variables point to possible short-term challenges, especially if financial markets' perceptions were to rapidly change. Over the medium-term, fiscal sustainability risks appear, on the contrary, to be high for France, both according to the sustainability gap indicator S1 and from a DSA perspective. The still high debt-to-GDP ratio over the medium term in the baseline scenario and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long-term, France is deemed at medium fiscal sustainability risk. Despite the slightly negative sustainability gap indicator to stabilise debt over the long term, the vulnerabilities linked to the high debt burden - captured by the DSA risk assessment - imply that France is deemed at medium risk over the long term.

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Table (continued)

HR	Over the short term (within one year), no significant risks of fiscal stress are anticipated for Croatia. Over the medium term, fiscal sustainability risks are assessed to be medium, both according to the sustainability gap indicator S1 and the debt sustainability analysis. This risk assessment is based on the relatively high initial debt-to-GDP ratio and its sensitivity to possible macro-fiscal shocks. Over the long term, Croatia is considered at medium fiscal sustainability risk. While the sustainability gap indicator shows no fiscal adjustment would be required to stabilise debt in the long run, the DSA risk assessment is less positive, signalling a medium risk.
IT	Over the short term (within one year), no significant risks of fiscal stress are detected for Italy. However, some fiscal variables point to short-term vulnerabilities. Italy is particularly exposed to sudden changes in financial market perceptions, notably in the light of its still sizeable government financing needs. Fiscal sustainability risks appear high over the medium term, both according to the fiscal sustainability gap indicator S1 and from a DSA perspective. Over the long term, Italy is expected to face high fiscal sustainability risks. A fiscal sustainability gap indicator pointing to medium risk in the long term, and the vulnerabilities linked to the high debt burden - captured by the DSA risk assessment - imply that Italy is deemed at high risk over the long term.
CY	Over the short term (within one year), Cyprus faces risks of fiscal stress mainly due to the economy's macroeconomic, financial and competitiveness aspects, exacerbated by increased public debt. Over the medium term, overall fiscal sustainability risks appear to be medium for Cyprus, with medium risks from a DSA perspective and low risks according to the sustainability gap indicator S1. Over the long term, Cyprus is deemed at medium fiscal sustainability risk. A slightly negative sustainability gap indicator to stabilise debt over the long term combined with debt burden vulnerabilities - captured by the DSA risk assessment - imply that Cyprus is deemed at medium risk over the long term.
LV	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Latvia. Similarly, fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and the debt sustainability analysis. The manageable initial debt-to-GDP ratio and the limited sensitivity to possible macro-fiscal shocks underpin this assessment. Over the long term, Latvia is deemed at low fiscal sustainability risk. The sustainability gap indicator shows a small fiscal adjustment would be required to stabilise debt over the long run. Signals from the DSA risk assessment concur.

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Table (continued)

LT	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Lithuania. Similarly, fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and the debt sustainability analysis. The moderate initial debt-to-GDP ratio and the limited sensitivity to possible macro-fiscal shocks underpin this assessment. Over the long term, Lithuania is considered at low fiscal sustainability risk. The sustainability gap indicator shows that only a small fiscal adjustment would be required to stabilise debt over the long run. Signals from the DSA risk assessment concur.
LU	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Luxembourg. Over the medium term, fiscal sustainability risks appear to be low for Luxembourg, both according to the sustainability gap indicator S1 and from a DSA perspective. The low and decreasing debt-to-GDP ratio over the medium term in the baseline scenario and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Luxembourg is deemed at high fiscal sustainability risk. Notwithstanding the low vulnerabilities linked to the low debt burden - captured by the DSA risk assessment -, the fiscal adjustment to stabilise debt over the long term implied by the sustainability gap indicator as a result of projected increases in the ageing costs points to high sustainability risks over the long term.
HU	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Hungary, although some fiscal variables point to possible short-term challenges, especially if financial markets' perceptions were to rapidly change. Over the medium term, fiscal sustainability risks appear, on the contrary, to be high for Hungary. While the sustainability gap indicator S1 points to medium risks, the DSA points to high risks. In particular, an increase of interest rates would pose high risks. Over the long term, Hungary is deemed at high fiscal sustainability risk. While the sustainability gap indicator S2 points to medium risks, the DSA points to high risks.
MT	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Malta. Over the medium term, fiscal sustainability risks appear to be low for Malta, both according to the sustainability gap indicator S1 and from a DSA perspective. Over the long term, Malta is deemed at medium fiscal sustainability risk. Notwithstanding the low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment –, the fiscal adjustment to stabilise debt over the long term implied by the sustainability gap indicator due to the substantial increase in the projected ageing costs points to medium sustainability risks over the long term.

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NL	Over the short term (within one year), no significant risks of fiscal stress are foreseen for the Netherlands. Fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and from a DSA perspective. The projected downward trend in the debt-to-GDP ratio in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, the Netherlands is deemed at medium fiscal sustainability risk. Notwithstanding low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment – the fiscal adjustment to stabilise debt over the long term, implied by the sustainability gap indicator, points to medium sustainability risks over the long term.
AT	Over the short term (within one year), no significant risks of fiscal stress are anticipated for Austria. Similarly, fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and the debt sustainability analysis. The strong budgetary position and the low sensitivity to possible macro-fiscal shocks underpin this assessment. Over the long term, Austria is considered at medium fiscal sustainability risk. The sustainability gap indicator indicates that a fiscal adjustment is required to stabilise debt over the long run. The DSA risk assessment is less severe, due to the expected downward trend in the debt-to-GDP ratio.
PL	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Poland. Over the medium term, fiscal sustainability risks appear to be low for Poland, both according to the sustainability gap indicator S1 and the debt sustainability analysis. Over the long term, Poland is deemed at medium fiscal sustainability risk. Notwithstanding the low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment –, the fiscal adjustment to stabilise debt over the long term implied by the sustainability gap indicator points to medium sustainability risks over the long term.
PT	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Portugal. Over the medium-term, fiscal sustainability risks appear, on the contrary, to be high for Portugal, both according to the sustainability gap indicator S1 and from a DSA perspective. The still high debt to GDP ratio over the medium term, under the baseline and in some alternative scenarios contribute to this assessment. Over the long-term, Portugal is deemed at medium fiscal sustainability risk. Despite the low negative sustainability gap indicator to stabilise debt over the long-term, the vulnerabilities linked to the high debt burden - captured by the DSA risk assessment - imply that Portugal is deemed at medium risk over the long-term.

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Table (continued)

RO	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Romania. Over the medium term, fiscal sustainability risks appear to be medium for Romania, both according to the sustainability gap indicator S1 and from a DSA perspective. The relatively high and still increasing stock of debt at the end of projections in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Romania is deemed at medium fiscal sustainability risk. The sustainability gap indicator to stabilise debt over the long-term combined with vulnerabilities from the debt burden reflected in the DSA imply that Romania is deemed at medium risk over the long term.
SI	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Slovenia. Over the medium term, overall fiscal sustainability risks appear to be medium for Slovenia, with medium risks according to the sustainability gap indicator S1 and low risks from a DSA perspective. Over the long term, Slovenia is deemed at medium fiscal sustainability risk, notwithstanding low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment. The fiscal adjustment to stabilise debt over the long term implied by the sustainability gap indicator S2 points to medium sustainability risks over the long term due to projected high increase in the ageing costs.
SK	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Slovakia. Fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and from a DSA perspective. The projected decrease in the debt-to-GDP ratio in the baseline scenario and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Slovakia is deemed at medium fiscal sustainability risk. Notwithstanding low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment – the fiscal adjustment to stabilise debt over the long term, implied by the sustainability gap indicator, points to medium sustainability risks over the long term.
FI	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Finland. Fiscal sustainability risks appear low over the medium term, both according to the sustainability gap indicator S1 and from a DSA perspective. The projected downward trend of the debt-to-GDP ratio in the baseline scenario, and the sensitivity to possible macro-fiscal shocks contribute to this assessment. Over the long term, Finland is deemed at medium fiscal sustainability risk. Notwithstanding low vulnerabilities linked to the low debt burden – captured by the DSA risk assessment – the fiscal adjustment to stabilise debt over the long term, implied by the sustainability gap indicator, points to medium sustainability risks over the long term.
SE	Over the short term (within one year), no significant risks of fiscal stress are foreseen for Sweden. Similarly, fiscal sustainability risks appear to be low for Sweden over the medium term, according to the sustainability gap indicator S1 and from a DSA perspective. The low and decreasing debt to GDP ratio at the end of projections in the baseline scenario, and resilience to possible macro-fiscal shocks underpin this assessment. Over the long term, Sweden is deemed at low fiscal sustainability risk, according to both the long-term sustainability gap indicator S2 and from a DSA perspective.

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Table (continued)

UK	Over the short term (within one year), no significant risks of fiscal stress are foreseen for the United Kingdom. Over the medium-term, fiscal sustainability risks appear, on the contrary, to be high for the United Kingdom. While the sustainability gap indicator S1 points to medium risks, the DSA points to high risks. In particular, reverting to historical behaviour – i.e. a structural primary deficit – would pose high risks. Over the long-term, the United Kingdom is deemed at high fiscal sustainability risk. The moderate sustainability gap indicator to stabilise debt over the long-term and the higher vulnerabilities captured by the DSA risk assessment imply that the United Kingdom is deemed at high risk over the long-term.

Source: Commission services.

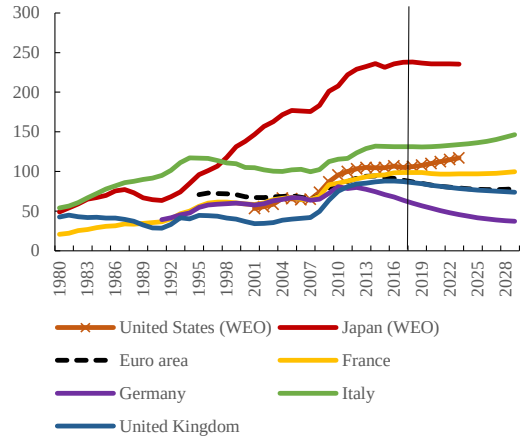
1. SUSTAINABILITY OF PUBLIC FINANCES

1.1. INTRODUCTION

At an aggregate level, EU public finances compare positively to other advanced economies. The euro area government debt ratio has been decreasing since 2014, and reached less than 87% of GDP in 2018. At the same time, some other advanced economies exhibit much higher ratios (around 238% of GDP in Japan and around 106% of GDP in the United-States). Looking forward, the euro area government debt ratio is projected to decrease in the next coming years (at unchanged policies), while less favourable trends are expected for the US and Japan (see Graph 1.1).

Yet, challenges remain, with fiscal risks concentrated on a small set of - mainly large - European economies. If most EU Member States have successfully managed to reduce their debt ratio over the last few years, other countries – such as Italy, France and Spain – are still faced with increasing or not sufficiently receding government debt ratios (see Graph 1.1). In some of these high - debt countries, most notably Italy, fears of disruptive sovereign-bank loops have re-emerged, in a context of increasing interest rate spreads. Cyprus is also among this small set of countries, and illustrates how interactions between government debt and the banking sector are still a concern.

Graph 1.1: **Government debt ratio (% of GDP), United-States, Japan, EA, and selected EU countries**



Source: Commission services, IMF (WEO).

Favourable macroeconomic conditions and an accommodative monetary policy should be used to re-build fiscal buffers. In high-debt countries, failure to reduce government debt increases the risk of heightened market pressures, which could have negative spillover effects on other Member States. Hence, in a context where uncertainties remain high - both on the external and domestic sides ([16]) - Member States need to run prudent fiscal policies to ensure sound public finances in the short to longer term.

The role of the Commission in terms of policy coordination, and economic and fiscal surveillance remains essential at the current juncture. In particular, the Commission analysis of public finances sustainability critically contributes to the monitoring and coordination of Member States' fiscal policies, as well as of the aggregate fiscal stance for the euro area. As "sound public finances" is one of the guiding principle of the Union's economic policy, the Commission fiscal sustainability analysis plays a key role notably in the context of the Stability and Growth Pact and of the European Semester, the EU integrated surveillance framework.

Against this background, this new edition of the Fiscal Sustainability Report (FSR) aims at providing a timely update of fiscal sustainability challenges faced by Member States. The FSR 2018 provides a snapshot of the situation, updating results to the latest available macroeconomic forecasts (based on European Commission's Autumn 2018 forecast). The projections also rely on the Economic Policy Committee (EPC) agreed long-term convergence assumptions for the interest - growth rate differential, and the long-term budgetary projections of age-related costs from the joint European Commission - EPC 2018 Ageing Report. It is the fifth edition of this report (following the FSR 2015 published in January 2016) ([17]), ([18]). Importantly, the report includes, for the first time

([16]) See European Commission (2018d) for a detailed description of the different external and internal risks.

([17]) The Debt Sustainability Monitor 2016 and 2017 provided intermediate yearly updates of the previous Fiscal Sustainability Report 2015.

([18]) The cut-off date for the preparation of the report was 8 November 2018 (publication date of the Commission Autumn forecast 2018). Therefore, it does not integrate developments that may have occurred since this date.

since the 2009 edition, some results for Greece. Greece has successfully exited the EU financial assistance programme mid-2018, and assuming the full implementation of the medium- term measures agreed by the Euro group last June, should progressively reduce its high debt ratio to safer levels (see Box 3.3 of Chapter 3).

The remaining of this chapter is organised as follows: a discussion of the concept of fiscal sustainability is provided (section 1.2), followed by a presentation of the key building blocks of the Commission fiscal sustainability assessment framework (section 1.3). Finally, the chapter contains a description of the different functions played by the Commission fiscal sustainability analysis, notably in the EU economic and surveillance framework (section 1.4).

1.2. FISCAL SUSTAINABILITY FROM A CONCEPTUAL POINT OF VIEW

Fiscal (or debt) sustainability has become an increasingly complex object to define and to assess. Long thought as a concern restricted to emerging countries or to the long-term (for advanced economies), fiscal (or debt) sustainability has been brought to the fore by the euro area sovereign debt crisis that erupted in the aftermath of the 2008 financial crisis. This crisis conducted different international institutions to revisit their definition of fiscal (debt) sustainability, as well as their methodologies to assess it.

Generally speaking, fiscal (or debt) sustainability is broadly understood as the ability of a government to service its debt at any point in time.

– *In a historical perspective*, fiscal sustainability mainly focused on debt trajectories, and was meant as 'solvency' of the government. Given government policies, solvency is considered at stake if these policies fail to generate primary surpluses that are large enough to stabilise the debt to GDP ratio. In other words, solvency equates for a government to meet the intertemporal budget constraint, involving that the present value of current and future primary surpluses is sufficient to repay its outstanding debt (under a 'non-Ponzi game' condition).

– *Recent experience* has however proven that this definition needed to be broaden to consider forms of 'sustainable debt thresholds', shorter-term or liquidity risks, the plausibility of the required fiscal path, the probabilistic nature of the fiscal sustainability concept, as well as fiscal risks stemming from macro-financial imbalances ('hidden debt'). To elaborate further, for example, if the calculation of *sustainable debt thresholds* is empirically subject to large uncertainties ([19]), it is recognised that higher debt levels limit 'fiscal space' and increase vulnerabilities (IMF, 2013a). Another aspect to consider is the concept of *liquidity*. The liquidity condition, which entails that a government is able to service all upcoming (short-term) obligations, is in principle distinct from the solvency condition. Yet, in a context of economic or financial crisis, the frontier between solvency and liquidity may become blurred ([20]). The *plausibility of the fiscal path* is also an important matter as it questions the political and social acceptability of given fiscal policies. This relates to the trade-off that governments may face between their ability and their willingness to repay their debt, e.g. if the costs of the adjustment is considered 'too high' (Bodea and Hicks, 2018).

Notwithstanding the multifaceted nature of fiscal (debt) sustainability, a practical definition established by the IMF (2013) is a useful anchor to frame our analysis. It says that *'In general terms, public debt can be regarded as sustainable when the primary balance needed to at least stabilise debt under both the baseline and realistic shock scenarios is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory rate.'* This statement is deemed to offer a good synthesis of the state of the Debt sustainability analysis (DSA) methodologies after the global crisis (Corsetti, 2018). It also serves as a reference in the ECB framework (Bouabdallah et al., 2017).

([19]) Different definitions and computation methods of these thresholds exist, e.g. steady-state debt ratios, natural debt limits, fiscal limits, and debt thresholds based on the signalling approach.

([20]) For instance, when liquidity risks manifest themselves through strong increases in interest rates, the solvency of the government may eventually be called into question.

Finally, recognising the complexity of the fiscal (debt) sustainability assessment, two guiding principles should underpin such an exercise. On one hand, acknowledging the probabilistic nature of the fiscal (debt) sustainability analysis, and the need for a risk-based approach, the framework used needs being comprehensive, based on a large set of indicators, scenarios and qualifying risk factors. On the other hand, the overall final assessment crucially entails the prudent application of judgment, as an essential complement to model - based mechanical results.

1.3. COMMISSION FISCAL SUSTAINABILITY ASSESSMENT FRAMEWORK

1.3.1. Main building blocks

A multi-dimensional approach is used to assess and differentiate fiscal sustainability risks in the short, medium and long term. As in the FSR 2015 (and the DSM 2016 and 2017), the fiscal sustainability analysis contained in this report is based on a horizontal assessment framework, where fiscal sustainability challenges are characterised over the short, medium and long term. In particular, results are summarised in an overall summary heat map of fiscal sustainability risks per time dimension (short, medium and long term). This framework is meant to allow identifying the scale, nature and timing of fiscal sustainability challenges. It therefore aims at ensuring a comprehensive and multidimensional assessment of sustainability risks, which is key to devise appropriate policy responses. This way, the Commission framework fulfils the different functions of a fiscal (debt) sustainability analysis (see section 1.4). The horizontal nature of the Commission framework is all the more important that the ensuing results are used in the context of the EU integrated system of fiscal and economic surveillance.

A wealth of tools and scenarios are used to support the assessment along the different time dimensions. The *short-term dimension* is assessed by the S0 indicator, which allows for an early detection of short-term risks of fiscal stress (within the upcoming year) stemming from the fiscal and / or the macro-financial and competitiveness sides of the economy. Fiscal sustainability challenges over *the medium term* are captured through the joint use of the medium-term fiscal sustainability indicator S1 ([21]) and the debt sustainability analysis (DSA). The latter ensures due consideration to medium-term public debt dynamics (for which the DSA is the reference toolkit). Challenges over *the long term* are identified through the joint use of the long-term fiscal sustainability indicator S2 ([22]) and the DSA. The joint use of these two tools allows for an identification of long-term challenges deriving from population ageing (mostly through the S2 indicator that is particularly suited to this purpose), while capturing potential vulnerabilities stemming from high debt levels (through the DSA tool - see Chapter 4 for more details) ([23]).

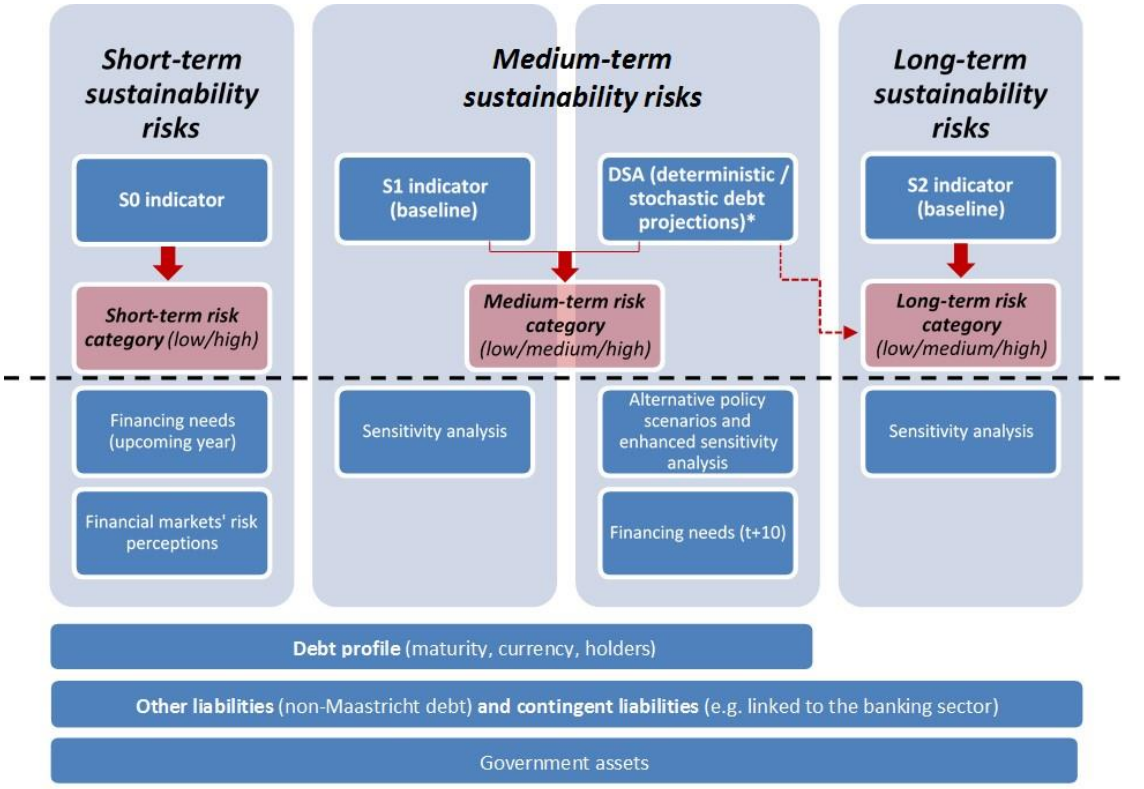
Given important uncertainties surrounding any medium to long-term projection exercise, the Commission fiscal (debt) sustainability analysis relies on a large set of scenarios. *For the DSA*, a wealth of deterministic scenarios is performed to complement the traditional baseline (central) no-fiscal policy change scenario, including for instance the assumption of reversal to historical average for different macro - fiscal variables, or more stringent economic and financial conditions. Additionally, other projections assume a path in line with main provisions of the Stability and Growth Pact, and a path in line with Member States' Stability and Convergence Programmes. A detailed description of the different scenarios and sensitivity tests performed in this report is provided in Box 1.1. Stochastic projections are an important complement to this analysis, whereby a very large number of shocks are jointly simulated, based on the historical volatility of each economy and correlation of shocks. Furthermore, some alternative calculations – to the baseline - are also computed for the *fiscal sustainability indicators*. For example, the 'AWG risk scenario' assumes less favourable developments of future healthcare costs for the S1 and S2 indicators. These additional scenarios are meant to allow qualifying the fiscal

([21]) The S1 indicator shows the additional fiscal adjustment effort required (in terms of improvement in the government structural primary balance) over five post-forecast years to reach the 60% of GDP debt ratio target in 2033.

([22]) The S2 indicator shows the upfront fiscal adjustment (to the government structural primary balance) required to stabilise the debt ratio over the infinite horizon.

([23]) A thorough description of the Commission multi-dimensional approach can also be found in the Chapter 1 of the FSR 2015.

Graph 1.2: **Main building blocks of the Commission fiscal (debt) sustainability assessment framework**



* Baseline no-fiscal policy change scenario, historical primary balance scenario, three stress test scenarios (on growth rate, interest rate and primary balance) and stochastic projections (2000 shocks simulated).
(1) The top panel of the diagram (above the dotted line) presents the core tools used to derive the fiscal sustainability risk classification. The bottom panel of the diagram presents the additional risk / mitigating factors considered in the overall assessment, either specific to the time-dimension considered (e.g. additional sensitivity analysis), or of horizontal nature (e.g. contingent liabilities).
(2) Financing needs of the current year are one variable entering the S0 indicator.
Source: Commission services.

sustainability assessment in the context of the qualitative interpretation of the results ([24]).

The quantitative results and ensuing risk assessments based on this horizontal framework need to be complemented with a broader reading and interpretation of results to give due account to country-specific contexts. For instance, some relevant qualitative factors – such as structural and institutional features – cannot be fully captured through this quantitative analysis (see Box 1.2). Hence, the prudent application of judgement, as a complement to model-based mechanical results, is essential for the final assessment of fiscal sustainability risks. In particular, when a country is deemed to be at high risk in the short, medium or long term, it does not necessarily mean that fiscal stress is inevitable (in the short-term) or that debt is unsustainable (in the medium to long-term), but rather that there are significant fiscal sustainability vulnerabilities that need to be addressed by appropriate policy responses.

With this aim, in addition to the elements already mentioned, the Commission fiscal sustainability framework provides an analysis of additional mitigating and aggravating risk factors. These additional factors are considered in the overall assessment i) for each time dimension;

([24]) Like in any projection exercise (especially as the projection horizon grows), the projections in this report are based on a set of assumptions, which are subject to uncertainties (discussed in the European Commission (2016a)). These uncertainties can be higher in specific cases: for instance, in small open economies where GDP volatility is generally high. Uncertainties are also likely to remain high in the case of the UK, as negotiations on the future relationship between the UK and the EU continue (see European Commission (2018d)).

Table 1.1: **Fiscal (debt) sustainability and Stability and Growth Pact: main legal provisions and content**

EU surveillance process	Legal provisions	Details
Stability and Growth Pact		
-Corrective arm		
Assessment of debt developments following a breach of the debt criterion	Council regulation (EC) no. 1467/97	The Commission, when preparing a report under Article 126(3) of the TFEU, assesses the case for launching an EDP by taking into account all relevant factors, including the medium term economic and budgetary position of the Member State and ***the developments in the medium-term government debt position, its dynamics and sustainability.***
- Preventive arm		
Assessment of Stability and Covergence Programmes	Council Regulation (EC) No 1466/97 (Article 3)	Includes an assessment of ***debt sustainability*** implying a full-fledged DSA according to the methodology presented in the FSR / DSM.
Setting-up of the (minimum) MTOs	Council Regulation (EC) No 1466/97 (Article 2a)	The MTOs are set so as to ensure sustainability or rapid progress towards ***sustainability.*** To that purpose, the Commission estimates country-specific lower bounds of the MTOs, also based on the jointly prepared Commission / Council long-term budgetary projections.
Required fiscal adjustment to the MTO	Regulation (EC) no. 1466/97, and 2015 Council Commonly agreed position on flexibility within the SGP (no. 14345/15)	The 2015 Council Commonly agreed position on flexibility within the SGP includes a 'matrix' of requirements for adjustment towards the MTOs with a specific reference to risks to ***debt sustainability*** as a relevant criterion for differentiating fiscal requirement across countries. Moreover, the quantitative assessment of the long-term budgetary effects and the impact on the long-term sustainability of public finances is assessed by the Commission in case Member States apply for the "structural reform clause" or the "investment clause".
Degree of discretion	Article 6(3) and Article 10(3) of Regulation no. 1466/97	The analysis of ***sustainability*** challenges is used for the exercise of a degree of discretion when considering departures from the fiscal requirements to achieve a fiscal stance that contributes to both strengthening the ongoing recovery and ensuring the sustainability of Member State's public finance.
Assessment of Draft Budgetary Plans	Regulation (EU) No 473/2013 of the European Parliament and of the Council	Includes sensitivity analyses that provide an indication of the risks to ***public finance sustainability*** in the event of adverse economic, financial or budgetary developments.

Source: Commission services.

and ii) horizontally for those that may materialise in the short, medium or long term.

- For instance, the assessment of short-term risks is complemented (beyond the S0 indicator), by a focus on upcoming government financing needs and an analysis of the ease of (re-) financing government debt (through financial markets information, see Chapter 2). Financing needs projections over the medium term, stemming from the debt projection model, are also reported and analysed (see Chapter 3).

- Furthermore, three main types of additional risk factors – of horizontal nature – are considered in the assessment (see Chapter 5), in particular: i) the composition of government debt (in terms of maturity, currency and investor base); ii) 'hidden debt' in the form of implicit and contingent liabilities, notably for the part stemming from the banking sector; iii) government assets, and related indicators (net debt and net worth).

Graph 1.2 provides an overview of the main building blocks of the Commission fiscal (debt) sustainability framework, distinguishing the elements used in the mechanical risk classification, from those considered additionally to arrive at a balanced overall final assessment.

1.3.2. Novelties compared to the Fiscal Sustainability Report 2015

Compared to the Fiscal Sustainability Report 2015, this new edition of the report brings one main methodological change in the fiscal sustainability framework, and several additional improvements. In particular, the approach to assess long-term fiscal sustainability risks is revised in order to better account for vulnerabilities associated to medium to high debt levels (see Chapter 4). Other changes include an enriched set of sensitivity tests (e.g. the introduction of a combined stress test scenario in the DSA, and of additional alternative assumptions for the calculations of the S2 indicator), the introduction of asymmetric stochastic projections (notably to cater for unrealistic primary balance paths), an enhanced reporting of financing needs and financial markets' information (see Chapter 2 and statistical annex A10), as well as a more comprehensive mapping of government (contingent) liabilities (see Chapter 5).

Furthermore, the FSR 2018 includes a set of analytical and methodological Boxes. These boxes cover e.g. a review of the links between institutional factors and fiscal sustainability (Box 1.2), an analysis of the impact of using financial markets' expectations to project interest rates (Box 3.2), and a reflection on the consideration of

government assets in fiscal sustainability frameworks, notably based on a recent and original Commission study on government assets (Box 5.1). These boxes aim at exploring specific topics, either of analytic interest or exploratory in terms of methodology, and thus providing additional insights to the Commission standard sustainability framework.

Last but not least, following the completion of the Greek programme end August 2018, the FSR 2018 includes - for the first time since 2009 - results for Greece. Given the unique composition of the Greek public debt and the debt relief measures adopted by the Eurogroup in June 2018, the analysis provided in this report is based on country-specific assumptions. The results, which are notably based on the elements provided in the enhanced surveillance report published in November 2018, are presented in Box 3.3.

1.4. COMMISSION FISCAL SUSTAINABILITY ASSESSMENT AND THE EU SYSTEM OF SURVEILLANCE

The Commission has a long-standing role and experience in the EU fiscal surveillance architecture, built around the core objective of ensuring sustainable debt. "Sound public finances" is one of the guiding principle of the Union's Economic Policy (Art. 119(3) TFEU), with a monitoring and surveillance role entrusted to the Commission (Art. 126 TFUE).

Against this background, the Commission fiscal (debt) sustainability analysis plays a key role in the EU fiscal and economic surveillance framework. First, it plays an essential role both in the preventive and in the corrective arms of the Stability and Growth Pact (SGP) ([25]) (see Table 1.1). Then, this analysis is also fully incorporated in the EU macroeconomic surveillance framework, in the context of the European Semester, the integrated EU surveillance system, and of the Macroeconomic Imbalances Procedure (MIP) ([26]). The Commission fiscal (debt) sustainability analysis also supports the surveillance function exercised by national independent fiscal institutions (IFIs) ([27]), notably through information sharing.

The Commission fiscal (debt) sustainability analysis intervenes both in the diagnosis phase, and for the formulation of fiscal policy requirements (SGP), and of Country-Specific Recommendations (European Semester, MIP) (see Graph 1.3). Among recent developments regarding the use of the results of the Commission fiscal (debt) sustainability analysis in the implementation of the SGP, there is the modulation of the required fiscal adjustment to reach Medium-Term Objectives (based on a matrix of fiscal requirements, taking into account fiscal sustainability - and cyclical conditions), as well as the implementation of the margin of discretion.

In the context of financial assistance programmes, notably when a Member State requests financial assistance from the ESM, the Commission has also been entrusted with the role of assessing the sustainability of public debt, in liaison with the ECB ("Two-pack" ([28]), ESM Treaty). In that respect, the collaboration with the ESM has intensified through time, having lead to a MoU signed in April 2018, and possible future evolutions (see "Joint position of the European Commission and the European Stability Mechanism on their future cooperation ahead of the Euro Summit of 14 December 2018").

The Commission fiscal (debt) sustainability analysis encompasses several – inter-related – elements, whose results are published in various reports and documents. It includes long-term budgetary projections - jointly prepared by the Commission and the Council (published in the regular Ageing Report) since 2000 - fiscal sustainability indicators and debt sustainability analysis. This analysis is regularly updated and published in various horizontal (e.g. Fiscal Sustainability Report and Debt Sustainability Monitor) and country-specific reports (e.g. Country Reports, Post-Programme Surveillance Reports), as well as Commission assessment notes (e.g. Stability and Convergence Programmes

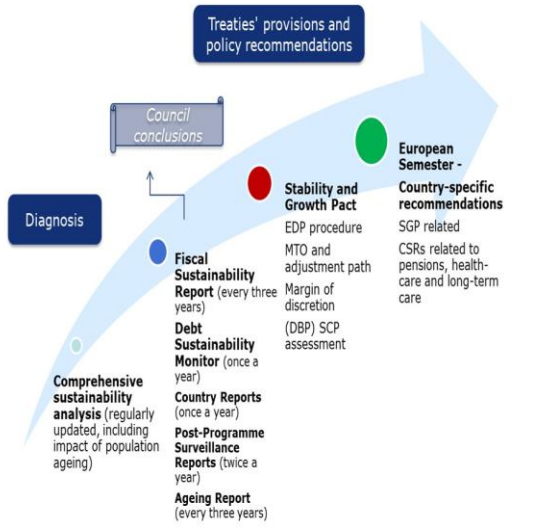
([25]) A recent example of the use of the fiscal sustainability assessment is the report under Article 126 (3) published in November 2018 for Italy.
([26]) See Article 4(3) of Regulation (EU) 1176/2011. See also European Commission (2016b).
([27]) Although, EU regulations do not explicitly foresee a role for IFIs in the conduct of fiscal (debt) sustainability analysis, some IFIs additionally perform such tasks.
([28]) Regulation (EU) no. 472/2013 of the European Parliament and of the Council.

assessment notes, Draft Budgetary Plans horizontal assessment note).

In particular, the Commission debt sustainability analysis toolkit has been substantially strengthened since the euro area sovereign debt crisis, and the framework to perform debt sustainability analysis has been framed in a detailed guidance note published in 2014 (European Commission, 2014b).

Future reforms of European fiscal rules could further enhance the focus on debt (sustainability). In 2011, in light of the damaging impact of sovereign sustainability concerns during the crisis, the debt requirement was already put on an equal footing to the deficit one ([29]). Current discussions foresee a clearer anchor of fiscal rules to the debt ratio (EFB, 2018, Bénassy-Quéré et al., 2018, Eyraud et al., 2018).

Graph 1.3: **The Commission fiscal (debt) sustainability analysis in the context of the EU regular fiscal and economic surveillance**



(1) The analysis is also used in the MIP.
Source: Commission services.

Thus, the Commission fiscal (debt) sustainability analysis fulfils different functions that can be expected from such a tool (see Alcidi and Gros, 2018 and Table 1.2). Part of the EU regular surveillance system, it serves an early-warning purpose, by identifying potential building fiscal risks in Member States. The Commission fiscal (debt) sustainability analysis is also used as a basis for the formulation of policy requirements and advice, and as such is an important tool of the EU economic policy coordination ([30]). This function is specific to the EU context (e.g. this differs somehow from the purpose served by the IMF DSA). This DSA is additionally a key input in the context of EU financial assistance programmes (for the access to such financing, for financing modalities, as well as for the design of conditionalities).

Table 1.2: **DSA functions and EU processes and provisions**

DSA functions	EU processes and provisions (first year of introduction)
Early-warning tool	SGP (1997), MIP (2011), European Semester (2010) / diagnosis phase
Policy requirements and recommandations	SGP (1997), MIP (2011), European Semester (2010) / CSRs
Programme activation and modalities	Two-pack (2013), ESM Treaty (2013)

(1) SGP: Stability and Growth Pact; MIP: Macroeconomic-Imbalance Procedure; CSRs: Country-Specific Recommendations
Source: Commission services.

([29]) Council Regulation (EU) 1177/2011 amending Regulation (EC) No 1467/97.

([30]) See for example Eckefeldt et al. (2014) for a presentation of how the assessment is used in the areas of pensions, health-care and long-term care.

Box 1.1: Deterministic debt projection scenarios: main assumptions

Government debt projections are a stylised set of trajectories a country's government debt may follow in the next 10 years (currently until 2029)**.** Debt projections rely on assumptions about the key macroeconomic, financial and fiscal variables that underpin the debt ratio, with the realism of macro assumptions intrinsically affecting the realism of debt projections themselves. Importantly, the Commission *baseline* debt projections are based on commonly agreed assumptions and methodologies with EU Member States represented in different Council formations ([1]). This ensures that the results are comparable across countries and consistent with other EU processes (European Semester, Stability and Growth Pact (SGP)).

The baseline scenario

The baseline scenario constitutes the starting point for DSA risk assessment and the central scenario around which debt paths for alternative and sensitivity test scenarios are built. The assumptions used in the baseline scenario for the variables entering the debt dynamic equation ([2]) are the following:

- **Real GDP growth rates** are: i) the European Commission forecasts for the first two years of the projections (until t+2, currently 2020); ii) the so-called EPC / OGWG 't+10 methodology' projections between t+3 and t+10 ([3]).
- **Inflation (the GDP deflator)** converges from current country-specific levels to 2% (the ECB target rate) by t+5, that is, by the same year by which the output gap is assumed to close, and it remains constant thereafter.
- The **primary balance** is projected as follows:

  - Assuming 'no-fiscal-policy change', the ***structural primary balance*** (SPB) ***before costs of ageing*** is supposed to remain constant at its last forecast year value (currently 2020) over the remaining projection period. ***Ageing-related expenditures*** (pension, health-care, long-term care, education and unemployment benefits) projected in the joint Commission - Council *Ageing Report 2018*, as well as ***property income*** on state financial and non-financial assets ([4]) are added to the former to obtain the overall ***SPB***.

  - The ***cyclical component*** reflecting the effect of automatic stabilisers is calculated as the product of the output gap and country specific budget balance semi-elasticities (for taxes and expenditure) agreed with the Member States and used in standard EU budgetary surveillance (SGP) ([5]). The cyclical component is by construction equal to zero when the output gap closes in t+5.

([1]) Notably the Economic Policy Committee (EPC)'s technical Output gap working group (OGWG) and Ageing working group (AWG).

([2]) For a detailed description of how macro variables enter debt ratio projections via the debt dynamic equation see Annex 3 in this report. Decomposing debt dynamics, projecting the interest rate on government debt and property incomes.

([3]) The estimates of potential GDP growth and output gaps are based on a production function methodology agreed with the Member States in OGWG (see: http://ec.europa.eu/economy_finance/publications/economic_paper/2014/pdf/ecp535_en.pdf for more details). The output gap, if any, is assumed to close after 5 years, after which 'actual' GDP and potential GDP growth coincide.

([4]) For details see Annex A8 of the Fiscal Sustainability Report 2015.

([5]) The budget semi-elasticities are those reported in: http://ec.europa.eu/economy_finance/publications/economic_paper/2014/pdf/ecp536_en.pdf;

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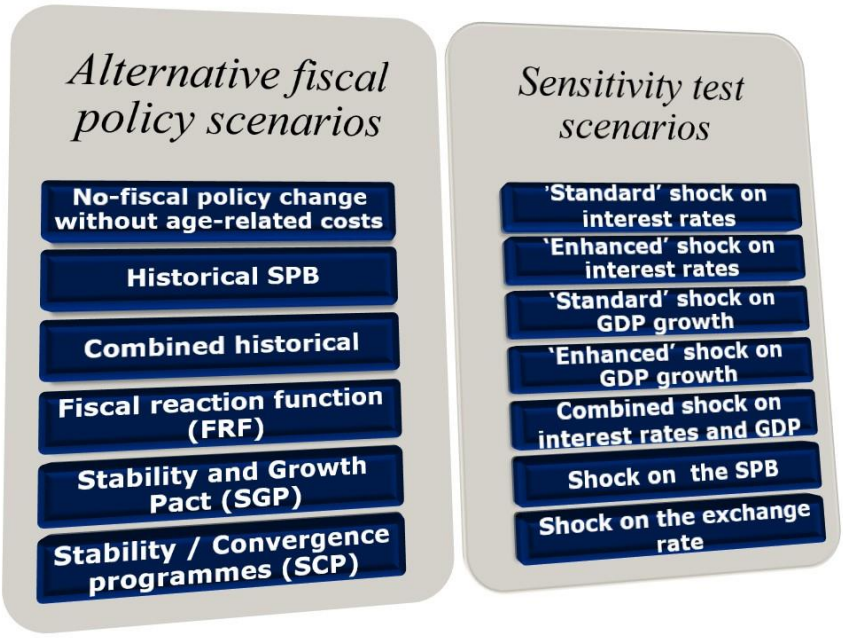
Box (continued)

Map 1: **Deterministic debt projections scenarios: alternative and sensitivity test scenarios**



- ***One-off and other temporary measures*** are set to zero beyond the t+2 forecast.

- **Interest rates** projections assume that:
  - ***Long-term market interest rates*** on new and rolled over debt converge linearly from country-specific current values to 5% / 3% in nominal / real terms by t+10 ([6]);
  - ***Short-term market interest rates*** on new and rolled over debt converge linearly to a value assuming that the pre-crisis slope of the yield curve would be restored in the future; concretely, the t+10 value short-term interest rates converge to around 4% in nominal terms, i.e. the product of the long-term market interest rate at t+10 and the pre-crisis euro area yield curve;
  - ***Implicit interest rates*** are derived endogenously in the debt projection model based on the above assumptions on market interest rates, on the maturity structure of government debt and on projected financing needs([7]).
- **The exchange rate** for non-EA countries is the European Commission forecast for t+2, with no appreciation or depreciation thereafter.
- The **stock-flow adjustment (SFA)** is set to zero after the forecast.

The factors conditioning a government's debt path are of two main sorts: fiscal policy decisions on one hand, and changes in macroeconomic conditions due to internal policies or external shocks, on the other hand. For an array of options, this report proposes different debt projection scenarios (Figure 1).

([6]) This value reflects historical pre-crisis averages in selected EU countries, including the largest EU members. For details, see chapter 4 in "The 2018 Ageing Report – Underlying Assumptions & Projections Methodologies", European Economy Institutional Paper 065, November 2017.

([7]) For a detailed discussion see Annex A3.

(Continued on the next page)

Box (continued)

Alternative fiscal policy scenarios

Policy decisions are often an essential driver of the debt path. Several fiscal policy scenarios presented in this report show debt trajectories associated to different policy options in EU countries, being therefore useful for analysis. Among the scenarios described below, those assuming fiscal consolidation (fiscal expansion, respectively) incorporate a feedback effect on GDP growth whereby a 1 pp. of GDP consolidation effort (expansion, respectively) impacts negatively (positively, respectively) baseline GDP growth by 0.75 pp. in the same year) ([8]).

1. **The no-fiscal policy change scenario without age-related costs** is similar to the baseline scenario, but uses instead a primary balance unaffected by the cost of ageing. This deviation from baseline can inform about the impact of reforms addressing the ageing costs.
2. **The historical SPB scenario** uses the European Commission forecasts until t+2, after which it assumes that the SPB converges gradually to its historical average (last 15 years) in 4 years. This scenario critically helps understanding whether the baseline scenario (or other policy scenarios) is realistic given a country's past performance.
3. **The combined historical scenario** uses, in addition to the assumptions in the historical SPB, macro-financial variables that are set at their historical averages.
4. **The Fiscal reaction function (FRF) scenario** uses European Commission forecasts until t+2; thereafter, the primary balance is determined based on estimated (country-specific) FRFs until t+10. This scenario essentially indicates whether primary balances are responsive enough to ensure sustainable debt paths.
5. **The Stability and Growth Pact (SGP) scenario** assumes that EU countries fully comply with the preventive and corrective arm of the SGP (following excessive deficit procedure recommendations). Under the former it is assumed that EU countries' structural balances converge to the medium term objective (MTO) according to the matrix of required fiscal adjustment ([9]). Once the MTO is reached, the budget is considered balanced in structural terms until the end of the projections (t+10) ([10]).
6. **The Stability or Convergence Programme (SCP) scenario** uses macro-fiscal variables projected to reflect the Members States' fiscal plans submitted to the European Commission each April and covering generally three years beyond forecasts. Thereafter, fiscal policy is assumed unchanged until t+10, with SPB fixed at the last programme year value. This scenario too reflects the rules of the SGP. Depending on the level of ambition in each jurisdiction, SCP outcomes may appear more or less rigorous than under the SGP.

Sensitivity test scenarios

Significant as it is, discretionary fiscal policy is not the only element susceptible to influence a government's debt trajectory. Exogenous shocks, mainly to macro-financial variables, as well as non-discretionary changes in fiscal policy may swing the debt ratio off the expected path. To portray the response of a government's debt trajectory to such shocks, a set of 'standard' and 'enhanced' sensitivity test scenarios run around the baseline no-fiscal policy change is used:

([8]) Carnot and de Castro (2015).

([9]) European Commission (2018b), COM(2015) 12 final, 13/01/2015, and ECOFIN commonly agreed position on flexibility, as confirmed by the ECOFIN Council of 12 February 2016. (Council document number 14345/15).

(Continued on the next page)

Box (continued)

1. ***'Standard' sensitivity tests on short- and long-term interest rates:*** -1p.p./+1p.p. on short- and long-term interest rates on new and rolled over debt over whole projection period, 2019-29).
2. ***'Enhanced' sensitivity test on short- and long-term interest rates:*** +2p.p. on short- and long-term interest rates on new and rolled over debt for the first three projection years, followed by +1p.p. over remaining of projection period until 2029.
3. ***'Standard' sensitivity tests on nominal GDP growth:*** -0.5/+0.5 p.p. on nominal GDP growth over the whole projection period, 2019-29.
4. ***'Enhanced' sensitivity tests on nominal GDP growth:*** -1 standard deviation / +1 standard deviation on nominal GDP growth for first two projection years, followed by -0.5/+0.5 p.p. over remaining of projection period until 2029. The standard deviation is that of the distribution of a country's GDP growth rates over the last 5 years.
5. ***Combined negative/positive shock on interest rates and nominal GDP growth:*** +1p.p./-1p.p. on short- and long-term interest rates on new and rolled over debt and -0.5/+0.5 p.p. on nominal GDP growth over the whole projection period, 2019-29**.**
6. ***Sensitivity test on the structural primary balance:*** negative shock to the structural primary balance equal to 50% of forecasted cumulative change over the two forecast years; the structural primary balance is kept constant at the lower last forecast year level over remainder of projection period until 2029. This scenario incorporates a feedback effect on GDP growth (see previous page).
7. ***Sensitivity test on nominal exchange rate:*** shock equal to maximum annual change in the country's exchange rate, observed over the last 10 years, applied for first two projection years, after which baseline assumption prevails.

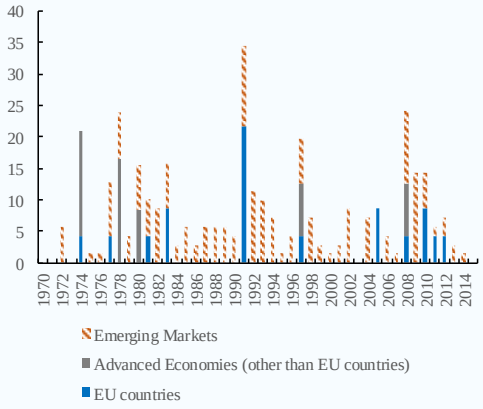
Additionally to this set of deterministic debt projections, stochastic debt projections are run, whereby 2000 shocks affecting the primary balance, GDP growth, interest rates and the exchange rate, are jointly simulated, based on the historical volatility of each Member State's economy and correlation of shocks (see related section of this report).

Box 1.2: Institutional factors and fiscal sustainability: a review of the literature and best practices

The importance of looking into (persistent) structural and institutional determinants of sovereign risk

Historically, fiscal distress episodes have been relatively rare events among EU countries, with a concentration over specific time-periods. The fiscal distress datasets ([1]) built by Gerling et al. (2017), and Baldacci et al. (2011) - further extended by Pamies Sumner and Berti (2017) ([2]) – provide useful tools to pursue a thorough investigation of historical fiscal distress episodes. Drawing on such literature and data sources, a focus on EU countries reveals a relatively limited occurrence of distinct fiscal distress events throughout the 1970 - 2015 period. The incidence of such crises reached 1.7% for EU countries, a level comparable to the one estimated for other advanced economies (AEs), but much lower than the one estimated for emerging markets (EMs, at 4.7%) ([3]). Furthermore, the occurrence of such events is clustered over specific time-periods such as the oil boom-bust period (mid-1970's), during the recession of the early 1990's (and mainly for some Central and Eastern European countries, due to high inflation during the transition to market-based systems) and following the 2008 global financial crisis (see Graph 1).

Graph 1: **Percentage of countries entering a fiscal crisis, per year and regional aggregate**



(1) For each year and regional aggregate, the value reported corresponds to the ratio between the number of countries entering a fiscal crisis (first year of a crisis) and the number of countries composing the regional aggregate.
Source: Gerling et al., 2017.

Assessing debt sustainability is a complex exercise that requires a holistic approach based on a wide range of indicators and tools. As can be seen from a simple statistical analysis and acknowledged by a rich empirical literature, fiscal crises are not simply a matter of high debt ratios. Countries have proven in the past to default or experience fiscal distress at very different levels of debt. For instance, the median debt ratio of EU countries having experienced fiscal stress is around 62% (ahead of a crisis), which is only around 10 pps. of GDP higher than the median debt burden without fiscal stress (see Table 1). The latest fiscal crisis critically highlighted the importance of considering the overall macroeconomic soundness when assessing fiscal vulnerabilities. In particular, several empirical papers have put into evidence the key role played by the build-up of macro-financial imbalances in recent fiscal crises (*hidden debt*) compared to fiscal slippages *per se* (Cerovic et al., 2018; Pamies Sumner and Berti, 2017; Bruns and Poghosyan, 2016; Berti et al., 2012).

([1]) In these papers, a fiscal distress episode is identified if one of the following criteria is met: i) a credit event (notably an outright sovereign default or debt restructuring); ii) a large-scale official financing (notably EU/IMF program); iii) a loss or high price of market access (through high bond yield pressures); iv) an implicit domestic public default (e.g. via high inflation rates).

([2]) Baldacci et al. (2011) provide information on fiscal distress episodes for advanced economies over the interval 1970 - 2010, whereas Pamies Sumner and Berti (2017) extend such information up until 2015.

([3]) These values correspond to the incidence of distinct fiscal crises, not to the number of years in crisis. The latter amounts to 6% in the case of EU countries (and other AEs) versus close to 30% in the case of EMs.

(Continued on the next page)

Box (continued)

Table 1: **Government gross debt-to-GDP for fiscal stressed and non-fiscal stressed countries, by regional aggregate, 1970-2015**

No fiscal stress						
Region	Min	1st Qu.	Median	Mean	3rd Qu.	Max
EU	3.66	34.12	51.83	54.69	68.76	138.14
EM	0.49	19.38	37.34	43.63	58.12	344.32
Fiscal stress						
Region	Min	1st Qu.	Median	Mean	3rd Qu.	Max
EU	7.23	13.81	61.55	54.82	90.53	126.75
EM	7.46	27.07	52.44	61.52	74.07	257.94

(1) Lagged values (1 year) of debt-to-GDP ratio have been used. Sovereign fiscal stress only includes the first year of the episode.
Source: Gerling et al., 2017; World Economic Outlook (IMF), October 2018; Commission services.

Beyond macroeconomic and fiscal variables, a growing strand of the literature seeks to identify deep structural and institutional determinants of fiscal sustainability. In their seminal work, Reinhart et al. (2003) and Reinhart and Rogoff (2009) argued for the existence of two major country categories. On the one hand, countries (typically advanced economies) that seldom default, and that are able to sustain persisting high debt levels. On the other hand, the so-called 'serial defaulters', that is, countries (often middle / low-income economies) which appear to suffer from a certain 'debt-intolerance', leading them to default at low debt levels. Hence, this literature highlights that deep structural and institutional features are likely to be key drivers of sovereign stress events, and relatedly, suggests looking into the default history of countries. As recently summed up by Fournier and Bétin (2018), 'for a similar set of financial ratios and macroeconomic performance, two countries with differences in structural and institutional features have a very different risk profile.'

The recent euro area debt crisis has revived discussions on the need for a wider identification of structural factors underlying differences in countries' fiscal vulnerabilities. As pointed out before, the euro area, a deeply integrated monetary union composed mostly of advanced economies, was largely immune to fiscal crises up until recently. However, some Member states experienced fiscal distress following the last financial crisis. Since 2014, debt ratios have receded in most countries and macroeconomic imbalances have reduced, yet a small number of – mainly large - economies are still overburdened by high public (and private) debt ratios. In this context, a growing attention is being paid to the links between (high-quality) institutions, government debt and long-term economic growth, also among EU countries (Masuch et al. / ECB, 2018) ([4]).

Institutional factors: what do we mean?

The notion of 'institutions' encompasses different aspects and can affect fiscal sustainability through various channels. If there is a renewed momentum for considering structural and institutional factors as a determinant of fiscal sustainability, the meaning and scope of this broad concept appears blurred in the literature.

From a fiscal sustainability perspective ([5]), different strands of the literature on the drivers of sovereign default, are based on a broad set of institutional indicators. In this literature, 'institutions' can be categorised into three main types (see Table 2 for a brief overview): i) institutional features of fiscal policy (e.g. fiscal governance frameworks, institutional arrangements regarding fiscal risks and debt management); ii) broader governance features of a country (e.g. government effectiveness, regulatory quality, control of corruption); and iii) broader political features (e.g. nature of political regime / rule of law, political stability).

Fiscal governance frameworks

A vast empirical literature touches upon the effectiveness of fiscal frameworks to ensure sound fiscal policies. For example, a recent extensive study of the IMF (Eyraud et al., 2018) suggests some effectiveness of fiscal

([4]) Early studies focused on developing and emerging economies.
([5]) The notion of institutions can be framed from a political science (or political economy) perspective. For instance, in a pioneering work, North (1989) defines institutions as "rules, enforcement characteristics of rules, and norms of behaviour that structure repeated human interaction".

(Continued on the next page)

Box (continued)

rules on budgetary outcomes, although with some important variability across rules and countries. Interestingly, it also points out that the SGP effectiveness would primarily operate through a signalling channel to financial markets (whereby compliant countries would benefit from lower spreads). Furthermore, the European Commission (2019) shows a positive and statistically significant impact of national fiscal frameworks across the EU – which were substantially strengthened in 2011 and 2013 - on budgetary outcomes ([6]).

Table 2: **Institutional factors: concepts, measures and empirical studies**

Concept	Selected measures	Selected recent empirical studies
Linked to fiscal policy and debt management		
Fiscal governance frameworks (e.g. fiscal rules, fiscal councils, bail-out provisions if federation)	European Commission Fiscal governance database	Eyraud et al. (2018), European Commission (2019)
Debt and fiscal risks management: institutional arrangements	Difficult to measure, case-studies	Badurina and Svaljek (2012), IMF (2016)
Broader governance concept		
Government effectiveness	WGI Indicators (World Bank)	Fournier and Bétin (2018), Pamies Sumner and Berti (2017)
Regulatory quality	WGI Indicators	Fournier and Bétin (2018)
(Control of) Corruption	WGI Indicators CPI Index (Transparency International)	Elgin and Uras (2013)
Broader political concept		
Nature of political regime (rule of law)	WGI Indicators, Database of Political Institutions	Van Rijckeghem and Weder (2009)
Political stability	WGI Indicators, ICRG's Political Risk rating (PRS Group)	Bassanetti et al. (2016)
Voice and accountability, political polarisation, coalition governments, etc.	WGI Indicators, Database of Political Institutions, POLITY IV	Qian (2012), Saeigh (2009)
Global measures		
Policy and Institutional framework	CPIA ratings (World Bank)	Kraay and Nehru (2006), Cohen and Valadier (2012)

Source: Commission services.

Debt and fiscal risks management: institutional arrangements

Debt and fiscal risks management should matter, although the empirical literature is scarce. In a strict reading of fiscal sustainability, defined as the ability to access financial markets at a reasonable cost, some papers – often based on case studies – highlight the importance of debt management to contribute to the prevention of a sovereign debt crisis (Badurina and Svaljek, 2012). More broadly, the importance of institutional arrangements for fiscal risk management is also advocated by the IMF (2016). However, measuring the quality of such institutional arrangements is not straightforward ([7]).

Broader governance aspects

A large set of governance indicators exist, with some measurement issues however. Broad governance aspects are typically examined through institutional quality measures, such as the World Bank's Worldwide Governance Indicators (WGI indicators) ([8]), the World Bank Doing Business Indicators, and Transparency International's Corruption Perception Index (CPI). The WGI indicators, which seem to be the most widely used in the sovereign crisis literature, could however provide imperfect measures of the quality of institutions, being solely based on *perception* measures of governance, hence providing subjective evaluations prone to systemic biases (European Commission, 2018g).

Despite these caveats, and based on samples usually including emerging countries, empirical evidence suggest that governance indicators are an important determinant of fiscal crises. Fournier and Bétin (2018), drawing on sovereign defaults data from Reinhart and Rogoff (2009) ([9]) and the WGI government effectiveness indicator, show that default episodes would be particularly sensitive to institutional weaknesses, in that they can lead to unsustainable debt developments, even at relatively low levels of debt. Their results are robust to alternative measures of institutional characteristics, such as regulatory quality, the rule of law and control of corruption. Elgin and Uras (2013) also explore the links between (notably) the informal sector, the control of corruption and different measures of sovereign fiscal vulnerabilities.

Broader political aspects

Other broader political aspects, such as the degree of polarization, political stability and

([6]) Based on its Fiscal governance database.
([7]) Relatedly, some measures of public financial management quality exist for emerging countries (PEFA - Public Expenditure and Financial Accountability).
([8]) The WGI Indicators report information over six dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption.
([9]) Including emerging markets.

(Continued on the next page)

Box (continued)

the nature of the political regime would also influence fiscal risks. For instance, Qian (2012) considers two measures of government characteristics: government polarization and the quality of political institutions. The former captures the differences in government parties' preferences on specific topics ([10]). The latter encompasses two sub-indicators: i) the International Country Risk Guide (ICRG) institutional index; ii) a measure of regulation of participation that captures the degree of influence of interest groups on government policies ([11]). The paper shows that, irrespectively of the degree of polarization, countries with good political institutions appear to be less prone to default. However, under a weak institutional setting, the probability of default increases along with the degree of polarization. On the same line, in an analysis of a large panel of emerging countries, Bassanetti et al. (2016) confirm the findings by Qian (2012), and identify the relevance of political stability, proxied by the political risk rating published by the International Country Risk Guide (ICRG), on the probability of a sovereign debt crisis. Van Rijckeghem and Weder (2009) look at the impact of democratic and non-democratic regimes on the probability of sovereign default. They find strong evidence that political institutions help countries steer clear of default, with some variability.

Global measures

Finally, a set of more global institutional measures have been also examined, such as the World Bank's Country Policy and Institutional Assessment (CPIA) ratings ([12]). In this regard, on a sample of low- and middle-income countries, Kraay and Nehru (2006) find that countries with better policies and institutions can sustain higher debt burdens than countries with worse policies and institutions without increasing the probability of debt distress. Similar evidence on the CPIA index is found in Cohen and Valadier (2012). Yet, measurement caveats also exist for such indicators ([13]).

The role of institutional factors in DSA's frameworks

Institutional factors are traditionally used by credit rating agencies (CRAs) to assess sovereign risk. The CRAs determine sovereign ratings based on a range of quantitative and qualitative factors, to evaluate not only a country's *ability* to repay its debt, but also its *willingness* to do so - notably given associated potential social or political costs. The latter is assessed through different indicators capturing institutional strength and political stability (see Table 3). Several papers put into evidence the effective role of institutional variables in determining sovereign ratings (see for example Brůha et al., 2011).

The IMF also takes into account institutional features in its debt sustainability analysis. For instance, in its framework for market-access countries, the IMF applies different critical thresholds for emerging markets and advanced economies. Although the underlying classification of countries into these two broad categories is not based on strict criteria and is partly judgment driven (IMF, 2018b), the lower thresholds used for emerging markets – compared to advanced economies – relate to their lower debt carrying-capacity, notably driven by institutional features. In the IMF framework for low-income countries, a differentiation based on a composite indicator of debt-carrying capacity is made (IMF, 2018c). This indicator explicitly

([10]) Government polarization is computed with data from the Database of Political Institutions (2010).

([11]) See Jaggers and Marshall (2000). Data are obtained from POLITY IV. In this case, a five-category scale is used. The higher the index, the greater the influence of interest groups on government policies.

([12]) CPIA scores reflect the quality of a country's policy and institutional framework across 16 criteria grouped into four equally weighted clusters: economic management, structural policies, policies for social inclusion and equity, public sector management and institutions.

([13]) The scores, which are on a scale of 1 to 6 (with 6 being the highest), are computed by World Bank staff and based on quantitative and qualitative information. The assessment also relies on the judgments of World Bank staff.

(Continued on the next page)

Box (continued)

takes into account the quality of institutions and policies (measured by the CPIA).

Other international institutions also consider institutional factors in their sovereign vulnerabilities' toolkits. For instance, the ECB uses a range of 'governance and political risk' indicators as part of its overall assessment of sovereign debt sustainability (Bouabdallah et al., 2017). These indicators include the World Bank governance indicators, the Transparency international corruption perceptions' index, the Commission's fiscal rule index and the PRSG political risk indicator. The ESM considers a similar set of 'institutional parameters' in its scorecard for assessing sovereign vulnerabilities (Lennkh et al., 2017).

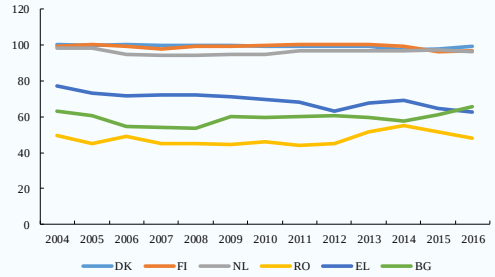
Table 3: **Institutional and political indicators used by Credit Rating Agencies**

	Fitch	Moody's	Standard & Poor's
Structural / institutional	Effectiveness of government	Transparency	Efficiency of public sector
	Openess to international capital flows and trade	Level of innovation	Institutional factors, such as central bank independance
	Strenght of business environment, human capital and governance	Investment in human capital	Timeliness, coverage and transparency in reporting
	Rule of law, respect for property rights	Respect for property rights	Competitiveness and profitability of private sector
	Control of corruption		
Political	War risk	War	Stability and legitimacy of political institutions
	Legitimacy of political regime	Degree of political consensus	Popular participation in political processes
	Relations with international community and institutions	Political chaos	Orderliness of leadership succession
		Efficiency and predictictibility of governement action	Transparency in economic policy decisions and objectives
		Level of political transparency	Public security
			Geopolitical risk

Source: Inspired from IMF (2010).

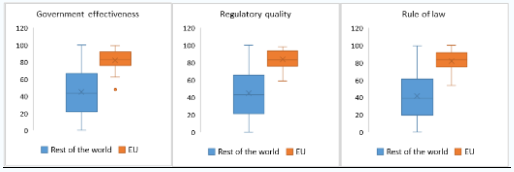
In its fiscal sustainability analysis framework, the Commission does not explicitly take into account institutional factors. Yet, Pamies Sumner and Berti (2017) tested the link between the probability of fiscal distress – an alternative indicator to the S0 indicator - and the World Governance Indicators. The results were inconclusive due to a lack of statistical power – notably stemming from data limitations, a relatively limited 'within country' variability (see Graph 2 and also Kaufmann et al., 2011), and additionally 'between country' variation in the EU compared with other countries (see Graph 3).

Graph 2: **Government effectiveness - WGI Indicators**



(1) A time series for countries with the three highest and three lowest scores is reported.
Source: World Bank, Commission services.

Graph 3: **Government effectiveness, Regulatory Quality, Rule of Law: summary statistics**



(1) Each boxplot displays the distribution of the selected WGI indicators based on five summary statistics: minimum, first quartile, median, third quartile, and maximum. On the left, a boxplot for all countries, other than the EU, is shown. On the right, a boxplot for EU countries is shown.
Source: World Bank, Commission services.

Conclusion

The consideration of structural and institutional factors when assessing fiscal (debt) sustainability seems warranted, with some caveats. First, grasping the quality of institutions appears challenging both conceptually and empirically. Then, most of the empirical evidence has been gathered on large samples of countries, largely composed of emerging economies. Last, in the context of the EU, a deeply integrated region of mainly advanced economies, some evidence suggests that the quality of institutions would be on average higher and less heterogeneous than in other parts of the world. For instance, some institutional features, such as the fiscal governance frameworks, are largely shared across the EU, an important aspect that needs to be considered when assessing fiscal (debt) sustainability.

2. SHORT-TERM FISCAL SUSTAINABILITY ANALYSIS

This chapter presents results for the short-term fiscal sustainability analysis. As in the Fiscal Sustainability Indicator 2015, the short-term fiscal risk classification is based on the Commission early-detection indicator of fiscal stress, the S0 indicator (section 2.1). These results are complemented by a more thorough analysis of short-term government gross financing needs, one component of the S0 indicator that is of particular importance (section 2.2). Finally, this chapter provides an analysis of the ease of (re-)financing government debt, based on different indicators of financial markets' perceptions of sovereign risk (section 2.3).

2.1. SHORT-TERM FISCAL SUSTAINABILITY INDICATOR: THE S0 INDICATOR

2.1.1. The S0 indicator: conceptual elements

The S0 indicator allows an identification of risks of potential fiscal stress in the upcoming year, based on a number of fiscal and structural variables. S0 is more precisely an early - detection indicator of fiscal stress over a one year horizon (Berti et al., 2012). Fiscal stress designates situations ranging from a credit event, a request of large official financing, to an implicit domestic government default and a loss of market confidence (the latter having been the most common situation of fiscal stress in the case of European countries, see Pamies Sumner and Berti, 2017).

The S0 indicator is a composite indicator of fiscal stress stemming from fiscal variables and structural features of the economy. It is based on a wide range of variables that have proven to perform well in the past in detecting situations of upcoming fiscal stress. Thus, unlike the traditional medium- and long-term fiscal sustainability indicators (the S1 and S2 indicators presented in Chapters 3 and 4), the S0 indicator is not a fiscal gap indicator (i.e. it does not quantify the required fiscal adjustment to ensure sustainable public finances over a specific time horizon). The S0 indicator is not either a financial markets' based indicator of sovereign risk (see section 2.3 for an analysis of the latter).

More precisely, the measurement of S0 is based on 25 fiscal and financial-competitiveness variables. Table 2.1 provides the list of the 12 fiscal and 13 financial-competitiveness variables that are used to construct the S0 indicator. Most of the financial-competitiveness variables are also used as part of the scoreboard for the surveillance of macroeconomic imbalances in the context of the Macroeconomic Imbalances Procedure (European Commission, 2016). This reflects the existing rich evidence, also from recent experience in the EU, of the role played by developments in the financial sector and the competitiveness of the economy in generating potential fiscal risks (Cerovic et al., 2018; Pamies Sumner and Berti, 2017; Bruns and Poghosyan, 2016; Berti et al., 2012).

The S0 indicator is computed based on an empirical method, the so-called signalling approach. This method involves setting out endogenously critical risk thresholds, by analysing the behaviour of a large number of variables ahead of fiscal stress events. More precisely, these critical thresholds are determined for each individual variable entering the S0 indicator, by minimising the proportion of missed crises and false alarms (or by maximising the 'signalling power'). Then, S0 is computed as the weighted proportion of variables that have reached their critical thresholds, with weights given by their 'signalling power', and the critical threshold for S0 itself endogenously derived. The same method applies for the two thematic sub-indices that reflect either the fiscal or the financial-competitiveness sides of the economy. The higher the proportion of individual variables with values at or above their specific threshold, the higher the value of S0 (and the sub-indices). The predictive performance of the S0 indicator fares well compared to other studies (Cerovic et al., 2018).

S0's identification of short-term fiscal risks is threefold. First, S0 is a measure of overall short-term risks to fiscal sustainability. Secondly, the fiscal and financial-competitiveness sub-indices help identifying vulnerabilities coming from one of the two thematic areas, though not necessarily at the aggregate level. Additionally, they also give insights into specific areas for those countries where high values of S0 already flag overall sustainability risks. Finally, individual variables of S0 allow for identifying specific sources of

Table 2.1: **Thresholds and signalling power of S0 indicator, fiscal and financial-competitiveness sub-indices and individual variables**

Variables	safety	threshold	signaling power	type I error	type II error	crisis number	no-crisis number
Balance, % GDP	>	-9,61	0,07	0,04	0,89	44	1080
Primary balance, % GDP	>	0,23	0,13	0,47	0,40	43	1058
Cyclically adjusted balance, % GDP	>	-2,50	0,23	0,52	0,25	40	981
Stabilizing primary balance, % GDP	<	2,34	0,08	0,13	0,79	38	983
Gross debt, % GDP	<	68,44	0,12	0,23	0,65	40	1047
Change in gross debt, % GDP	<	8,06	0,12	0,06	0,82	39	1018
Short-term debt gen. gov., % GDP	<	13,20	0,20	0,14	0,67	21	430
Net debt, % GDP	<	59,51	0,20	0,18	0,62	26	586
Gross financing need, % GDP	<	15,95	0,26	0,24	0,50	26	621
Interest rate-growth rate differential	<	4,80	0,08	0,11	0,82	38	977
Change in expenditure of gen. government, % GDP	<	1,90	0,11	0,13	0,76	41	1051
Change in final consumption expend. of gen. governm	<	0,61	0,07	0,17	0,76	38	972
Fiscal index	<	0,36	0,28	0,30	0,42	45	1083
L1.net international investment position, % GDP	>	-19,80	0,29	0,47	0,24	25	500
L1.net savings of households, % GDP	>	2,61	0,33	0,42	0,25	28	699
L1.private sector debt, % GDP	<	164,70	0,18	0,22	0,60	20	418
L1.private sector credit flow, % GDP	<	11,70	0,37	0,28	0,35	20	409
L1.short-term debt, non-financial corporations, %	<	15,40	0,20	0,54	0,26	19	403
L1.short-term debt, households, % GDP	<	2,90	0,21	0,52	0,26	19	403
L1.construction, % value added	<	7,46	0,22	0,27	0,51	43	1006
L1.current account, 3-year backward MA, % GDP	>	-2,50	0,34	0,35	0,31	42	983
L1.change (3 years) of real eff. exchange rate, based or	<	9,67	0,11	0,18	0,71	24	460
L1.change (3 years) in nominal unit labour costs	<	7,00	0,18	0,64	0,18	38	967
Yield curve	>	0,59	0,37	0,34	0,29	35	813
Real GDP growth	>	-0,67	0,10	0,09	0,81	48	1124
GDP per capita in PPP, % of US level	>	72,70	0,22	0,44	0,33	51	1129
Financial-competitiveness index	<	0,49	0,55	0,32	0,13	52	1158
Overall index	<	0,46	0,55	0,22	0,23	52	1158

(1) Variable names preceded by L1 are taken in lagged value.
(2) The signalling power is defined as (1 - type I error - type II error).
Source: Commission services.

vulnerability. Overall, this detailed identification of sources of short-term fiscal risk enables identifying precise areas calling for policy action.

The interpretation of risk assessment results based on the S0 analysis should be made with some caution:

– First, although the framework described above is rather comprehensive, additional dimensions that are relevant for the analysis of short-term sustainability risks are necessarily left aside. For instance, factors of a more qualitative nature or variables for which data availability is limited are not reflected by S0.

– Then, the S0 indicator is based on yearly outturn values of the different variables. This reflects the fiscal stress identification approach underpinning the S0 indicator (whereby the build-up of fiscal and structural imbalances in the past and current years can lead to fiscal stress in the next year). While it allows complementing the traditional forward-looking perspective of the DSA, it can present some limitations in cases where real-time or foreseen developments change rapidly.

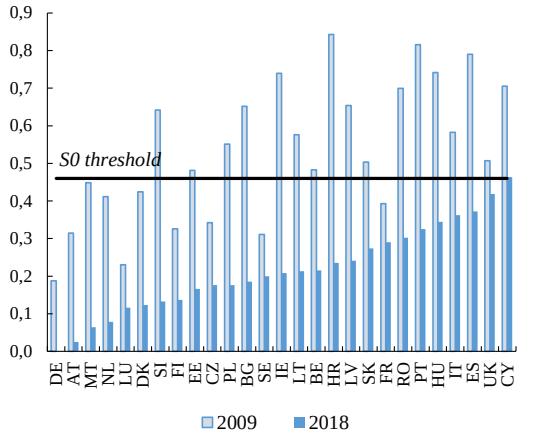
Hence, a broader background of a country-specific context should supplement the interpretation of S0 results.

2.1.2. Results of the S0 indicator

Overall, short-term risks of fiscal stress have declined for EU countries since 2009, although risks appear on the rise compared to last year in some countries. In 2009, more than half of the Member States had values of S0 above its critical threshold signalling risks of fiscal stress in the upcoming year. In 2018, only Cyprus is found to be at risk of facing short-term risks of fiscal stress (see Graph 2.1). This result is notably driven by the strong increase of government debt in 2018, due to one-off banking support measures, in a context where macro-financial vulnerabilities remain significant (see Tables 2.2 and 2.3). However, the value of Cyprus S0 indicator has just reached its critical threshold, as some other fiscal variables are positively oriented in this country. It is the case in particular of the large primary

surplus, which should allow an important reduction of government debt next year.

Graph 2.1: **The S0 indicator for EU countries, 2009 and 2018**

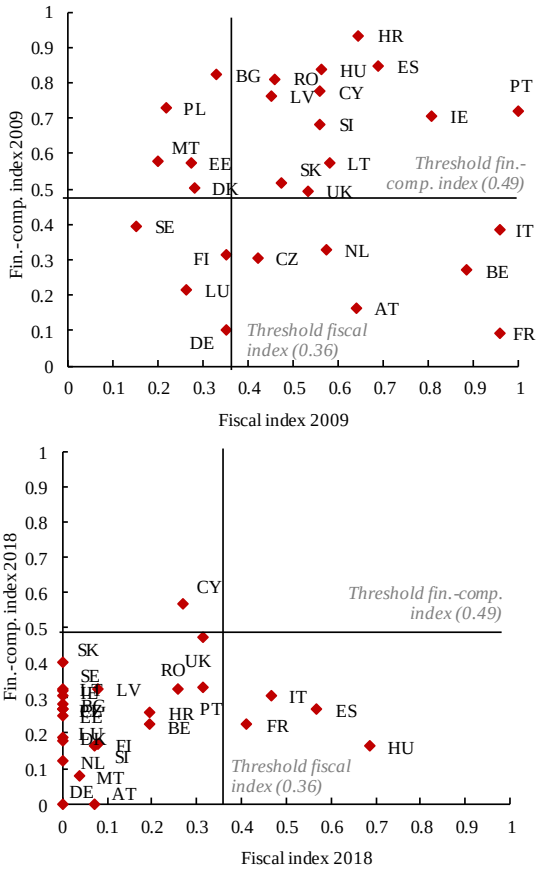


(1) For more methodological explanations, see Berti et al. (2012).
Source: Commission services.

The thematic sub-indices allow identifying specific vulnerabilities on the fiscal side in some countries. In 2018, vulnerabilities are specifically identified on the fiscal side in four Member States (Hungary, Spain, Italy and France, see Graph 2.2). In all four countries, the high level of debt contributes to this assessment, coupled with important financing needs (Hungary, Spain and Italy), a weak fiscal position (Hungary Spain and France) and the weight of short-term government debt as a share of GDP (Hungary and Italy). Yet, the overall S0 indicator does not point to short-term risks of fiscal stress for these four countries, in light with more limited macroeconomic imbalances. All in all, the monitoring of financial market sentiments, which can change rapidly, requires particular attention in these cases. Italy is particularly exposed to sudden changes in financial market perceptions, notably in the light of its still sizeable government financing needs.

The thematic sub-indices also confirm the importance of vulnerabilities coming from the financial-competitiveness side in Cyprus. Indeed, Cyprus is the only country identified as facing high short-term risks stemming from the macro-financial side of the economy (a financial-competitiveness sub-index above its critical threshold), leading to overall short-term risks at the aggregate level. The current account deficit and the large negative net international investment position contribute to this result, as well as some financial variables (short-term debt of households and non-financial corporations, as well as the private debt).

Graph 2.2: **Fiscal and financial-competitiveness sub-indices, 2009 and 2019**



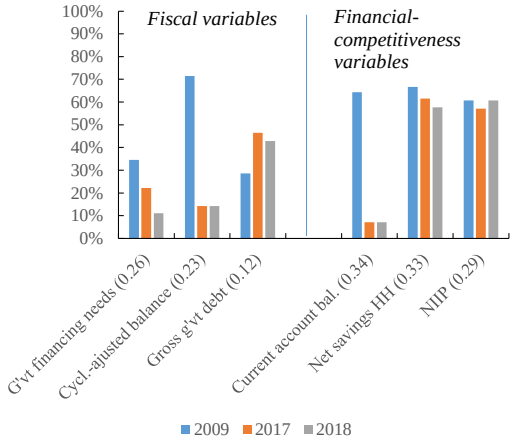
Source: Commission services.

The analysis of individual variables allows tracking down the specific sources of short-term risks, and identifying potential vulnerabilities even in Member States that are not at overall risk (see Tables 2.2 and 2.3). On the fiscal side, gross government debt remains above its critical thresholds in 11 Member States, while financing needs appear on the whole more rarely flagging risks (only in 3 cases), thanks to overall still improving budgetary balances and the lengthening of government debt maturity ([31]). On the financial

([31]) In the particular cases of Portugal and Cyprus, the moderate level of financing needs is in particular explained by the significant share of government debt contracted at concessional terms (through official loans).

- competitiveness side, net international investment positions are still largely negative in many Member States (as many as 16). Households net savings are below safety levels in 14 countries, while non-financial corporations short-term debt as a share of GDP is above its critical threshold in 14 countries (see Tables 2.2 and 2.3). Graph 2.3 shows that since 2009 flow variables have tended to improve in a number of countries, while stock variables still suffer from the legacy of the last crisis.

Graph 2.3: **Key variables entering the S0 indicator: evolution of the proportion of countries at risk (ranked by signalling power)**



(1) In brackets, signalling power of each variable.
Source: Commission services.

Table 2.2: **Fiscal variables used in the S0 indicator, 2018**

	Balance (% GDP)	Primary balance (% GDP)	Cycl. adj. balance (% GDP)	Stabil. primary balance (% GDP)	Gross debt (% GDP)	Change gross debt (pps. GDP)	Short-term debt (% GDP)	Net debt (% GDP)	Gross financing need (% GDP)	Interest growth rate diff. (pps.)	Change expend. gen. govt (pps. GDP)	Change consumpt. gen. govt (pps. GDP)
BE	-1,0	1,4	-1,1	-1,4	101,4	-2,0	8,4	87,8	15,0	-1,4	-0,2	-0,3
BG	0,8	1,5	0,7	-0,8	23,3	-2,3	0,0	11,0	0,0	-3,4	1,1	0,1
CZ	1,4	2,1	0,9	-0,8	33,2	-1,5	1,1	22,7	4,6	-2,4	1,4	0,5
DK	0,2	1,2	0,5	0,2	33,3	-2,8	3,9	15,4	4,0	0,6	0,1	0,1
DE	1,6	2,5	1,3	-1,2	60,1	-3,7	4,4	41,5	6,9	-2,0	-0,2	0,0
EE	0,5	0,6	-0,8	-0,6	8,0	-0,8	0,2	0,0		-7,4	0,1	-0,1
IE	-0,1	1,5	-0,2	-4,4	63,9	-4,6	8,5	56,9	4,0	-7,0	-1,2	-0,4
ES	-2,7	-0,3	-3,2	-1,4	96,9	-1,2	7,7	84,3	17,3	-1,4	0,1	-0,1
FR	-2,6	-0,8	-2,7	-0,7	98,7	0,2	9,3	87,4	15,7	-0,7	-0,3	-0,2
HR	0,2	2,7	-0,5	-1,4	73,5	-4,0	3,7	69,4	7,8	-1,9	-0,1	0,1
IT	-1,9	1,7	-1,8	0,5	131,1	-0,1	16,9	118,3	18,9	0,4	-0,6	0,1
CY	2,8	5,5	1,7	-2,9	105,0	8,8	1,7	78,1	2,5	-3,2	-0,3	-0,4
LV	-0,8	-0,1	-1,8	-2,2	37,1	-2,9	3,4	27,7	3,7	-5,9	-0,1	-0,1
LT	0,6	1,5	-0,6	-1,3	34,8	-4,6	1,0	30,5	4,1	-3,6	1,2	-0,1
LU	1,3	1,7	1,3	-0,8	21,4	-1,6	0,8	-9,9	-1,3	-3,6	0,4	0,2
HU	-2,4	0,1	-3,9	-3,0	72,9	-0,3	13,2	68,0	20,1	-4,4	0,4	-0,4
MT	1,3	2,9	0,9	-2,0	47,9	-3,0	3,5	36,0	3,8	-4,3	1,5	1,7
NL	1,1	1,9	0,4	-1,8	53,2	-3,7	5,3	43,3	6,4	-3,4	-0,1	-0,2
AT	-0,3	1,3	-0,8	-1,7	74,5	-3,8	2,3	51,0	7,1	-2,3	-0,5	-0,2
PL	-0,9	0,6	-2,0	-1,4	49,2	-1,4	0,4	45,3	5,0	-2,9	0,5	-0,1
PT	-0,7	2,7	-1,4	-0,9	121,5	-3,3	21,5	107,6	12,9	-0,7	-1,6	-0,2
RO	-3,3	-1,9	-3,5	-1,9	35,1	0,0	1,8	28,8	7,0	-5,9	1,5	0,7
SI	0,5	2,4	-0,9	-2,6	70,2	-3,9	1,9	51,2	4,9	-3,8	-1,0	0,0
SK	-0,6	0,7	-0,9	-1,9	48,8	-2,2	0,4		4,3	-4,0	-0,3	0,1
FI	-0,8	0,1	-0,9	-1,4	59,8	-1,5	6,4	23,1	7,8	-2,3	-1,0	-0,2
SE	1,1	1,3	0,9	-1,6	37,8	-3,0	10,2	4,8	4,5	-4,1	-0,2	-0,1
UK	-1,3	1,1	-1,8	-0,3	86,0	-1,4	13,8	78,0	8,1	-0,3	-0,4	-0,2

Source: Commission services.

Table 2.3: **Financial-competitiveness variables used in the S0 indicator, 2018**

	Yield Curve (pps.)	Real GDP growth (%)	GDP per capita PPP (% US level)	L. Net intern. invest. position (% GDP)	L. Net savings households (% GDP)	L.Private debt (% GDP)	L.Private credit flow (% GDP)	L.Short-term debt non-fin. corp. (% GDP)	L.Short-term debt households (% GDP)	L.Construction (% value added)	L.Current account (% GDP)	L.Change real eff. exchange rate (pps.)	L.Change nom. unit labour costs (pps.)
BE	1,1	1,5	79,6	52,6	2,1	187,0	-1,5	34,4	1,6	5,2	-0,3	-4,4	1,1
BG	1,0	3,5	35,5	-42,8	4,1	100,1	6,2	15,7	1,5	4,1	3,1	3,0	13,6
CZ	0,9	3,0	61,2	-26,5	2,1	67,4	4,1	9,0	1,5	5,3	1,0	-1,0	5,9
DK	0,8	1,2	84,9	56,3	3,0	204,0	-1,4	24,7	3,7	5,0	8,1	-1,0	3,0
DE	0,8	1,7	84,6	54,0	5,8	100,1	4,9	10,2	1,7	4,9	8,4	-0,4	5,1
EE		3,5	55,1	-31,4	4,3	106,4	3,6	8,8	0,6	7,1	2,3	2,5	12,4
IE	1,3	7,8	131,7	-149,3	1,3	243,6	-7,5	31,0	1,1	2,5	2,9	1,5	-17,2
ES	1,7	2,6	63,9	-83,8	-0,5	138,8	0,2	8,4	2,3	6,1	1,8	0,5	0,0
FR	1,1	1,7	71,1	-20,1	5,0	148,2	7,0	24,5	1,4	5,5	-0,6	-2,3	1,3
HR	1,7	2,8	42,9	-62,4		98,4	1,2	8,4	3,2	5,2	3,6	2,5	-4,3
IT	2,7	1,1	65,7	-5,3	1,4	110,5	2,1	17,5	3,0	4,7	2,3	-2,0	1,1
CY	2,4	3,9	59,4	-121,5	-4,8	316,3	8,7	28,5	9,5	4,8	-5,0	-1,2	-2,7
LV	1,2	4,1	47,9	-56,3	-3,3	83,5	0,3	9,9	1,8	6,1	0,6	0,5	14,7
LT	0,6	3,4	55,5	-35,9	-3,1	56,1	3,7	4,9	0,7	6,6	-0,7	-4,3	16,0
LU	0,9	3,1	171,5	47,0	5,3	322,9	-15,5	69,8	2,3	5,2	5,0	7,4	7,1
HU	2,8	4,3	48,3	-52,9	3,9	71,4	0,9	9,5	2,3	4,3	4,0	-0,8	6,7
MT	1,7	5,4	66,2	62,6		120,2	2,9	10,9	2,5	3,6	8,4	3,8	1,7
NL	0,9	2,8	88,5	59,7	4,4	252,1	3,0	36,3	2,5	4,4	8,3	-3,3	-0,2
AT	1,0	2,7	87,5	3,7	3,8	122,5	4,3	12,1	2,8	6,4	2,1	-1,6	3,7
PL	1,5	4,8	49,4	-61,2	-0,9	76,4	2,7	7,7	2,7	7,0	-0,3	0,3	4,5
PT	2,2	2,2	53,5	-104,9	-2,6	162,2	1,3	20,7	2,5	4,0	0,4	-1,4	3,5
RO	2,2	3,6	44,1	-47,7	-4,4	50,8	1,7	11,1	0,8	6,5	-2,2	-6,5	11,9
SI	1,3	4,3	59,2	-32,3	3,4	75,6	0,8	8,7	2,2	5,5	5,7	-0,3	3,4
SK	1,2	4,0	53,7	-65,6	1,4	96,1	5,9	20,6	2,0	8,2	-2,0	-1,7	6,9
FI	1,0	2,9	75,5	2,4	-1,1	146,4	8,2	17,8	2,8	7,1	-0,7	-1,6	-2,5
SE	1,1	2,4	82,5	1,8	7,9	194,4	13,1	39,3	15,2	6,4	4,0	-1,9	3,7
UK	0,7	1,3	71,6	-8,6	-0,6	169,0	8,4	26,8	10,3	6,1	-4,6	-5,3	5,4

(1) Variable names preceded by L are taken in lagged values.
Source: Commission services.

2.2. SHORT-TERM FINANCING NEEDS

Among the S0 fiscal variables, government gross financing needs (GFN) are the strongest predictor of fiscal stress events. This property warrants closer examination.

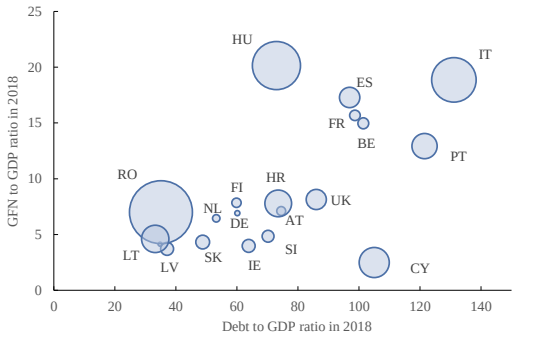
2.2.1. Definition and measurement issues

While debt stock indicators capture *solvency* risks, GFN is fundamentally a flow concept informing mainly ([32]) about the liquidity of government finances in the short to medium term. A given debt stock may be associated to very different schedules of repayment flows and financing needs, depending on the specific borrowing terms such as term-to-maturity structure, amortisation schedules for principal and interest (see Graph 2.4). GFN are usually defined as the flow of payment or financing obligations the government faces to service its debt and cover its budget deficit, if any, over the next period:

> ***GFN = [Primary deficit + Interest payments or] Headline deficit + Debt principal amortisation (+ SFA or other net flows)*** **([33])**

GFN may be measured using different sources and approaches in both backward- and forward-looking manner. Contrary to government debt, which in the EU is an indicator well defined and measured by national statisticians using harmonised definitions set by Eurostat, GFN is an indicator built for practical or analytical purposes, which falls outside of the scope of government finance statistics ([34]). For outturn data, such as the GFN used under S0, different input sources exist to estimate them, among them national statistical institutes (NSIs), national central banks (NCBs), national authorities (ministries), debt management offices (DMOs) or large data providers such as Bloomberg. For forward-looking data, a few institutions provide GFN projections, among them the European Commission and the IMF ([35]).

Graph 2.4: **Government debt stocks and flows, selected countries, 2018 (% of GDP)**



(1) GFN series are the S0 short-term GFN defined as described in Table 2.4. The size of the bubble represents the 10-year government bond yield at end-Oct 2018.
Source: ECB, Commission services.

GFN are, therefore, versatile metrics, useful for a variety of analytical purposes. GFN estimates are a particularly valuable concept in the case of programme countries to define accurately the financing requirements and the necessary sources to cover those needs, including when calibrating the size of the programme. They are also useful in regular fiscal surveillance to monitor potential market roll-over risks in the short to medium term.

GFN are a measure increasingly used by international institutions and creditors in their appraisal of fiscal risks. One and the same institution may use multiple GFN definitions, depending on the purpose of the analysis. For example, in their current DSA frameworks, the European Commission and the IMF use both a narrow definition of GFN to monitor short-term risks as well as a broader indicator of GFN derived from their respective medium-term debt projection models. Different financial instruments may be considered to delineate the universe of GFN. Experts generally agree that a broader definition of GFN flows in line with the components of Maastricht debt stocks seems appropriate, thus including in the demarcation currency and deposits, debt securities and loans, but the scope

([32]) GFN's mixed nature notably in terms of potential adjustments from contingent liabilities' realisations or variation of assets makes it also informative about solvency-related risks.
([33]) To capture additionally government balance sheet changes such as privatisations (- assets) or bank recapitalisations (+ assets), stock flow adjustments (SFA) may also enter the formula.
([34]) See for example Eurostat, ESA 2010, "Chapter 20 – The government accounts", where no mention is made of this indicator.
([35]) The ESM (Gabriele et al. 2017) and the ECB (2017) also provided outturn estimations.

Table 2.4: **GFN definitions used in this report: short- versus medium-term (Components and instruments included, depending on the scope)**

Components - Balance sheet items or financing instruments included in the definition		Short-term (S0), 'Market-reliant', financing needs	Medium-term, 'Overall', financing needs
Budget (Headline) deficit		x	x
Maturing Debt	Currency and deposits		
	Debt securities	x*	x
	Commercial loans		x
	Official loans	x	x
Other debt creating flows (SFA)			x

* non-consolidated data
(1) Short-term, S0 or 'market-reliant' GFN are outturn data or estimates based on the redemption profile of all debt securities issued by the general government and maturing within one year. For ex-programme countries (Portugal, Ireland and Cyprus) official loans (ECFIN internal sources) are additionally included, as they were granted as a substitute to market financing;
(2) Medium-term, 'overall', GFN are projections based on the DSM model.
Source: Commission services.

may vary depending on the purpose of the analysis.

In the European Commission's Fiscal Sustainability Reports and Debt Sustainability Monitors, GFN are regularly examined in the short- and medium-term fiscal sustainability sections (for the latter see chapter 3.3). This particular report discusses, in addition, a stress scenario for medium-term GFN (see Box 3.4).

For the purpose of short-term analysis performed through S0, narrowly defined GFN are a better proxy for market refinancing risks. To disentangle better liquidity pressures that are market-related, short-term GFN under S0 are defined more narrowly to include, besides the headline deficit, only liabilities in tradable instruments such as debt securities maturing within one year. For three ex-programme countries - Portugal, Ireland and Cyprus - short-term GFN include, in addition, official loans, since such resources were granted to these countries as a substitute to market financing and when maturing should be largely rolled-over by market sources. This definition is in line with the approach used by other institutions for short-term GFN ([36]). For a comparison of GFN definitions in the short (S0) and medium term (chapter 3.3), see Table 2.4.

([36]) See for example the ECB (2017a) and the IMF (2018).

2.2.2. Short-term GFN results

Based on the definition for short-term purposes used under S0, GFN appear in check in all but three EU countries in 2018. Hungary, Spain and Italy are the only cases where short-term GFN flag risks above the respective threshold. In Spain and Italy, liquidity risks are expected to diminish in 2019, when short-term GFN estimates converge towards the critical threshold. In Hungary however, risks are set to widen in 2019. In three other countries, Portugal, France and Belgium, where short-term GFN were flashing in 2017, risks have abated in 2018 and are expected to remain below the critical threshold in 2019 – Graph 2.5.

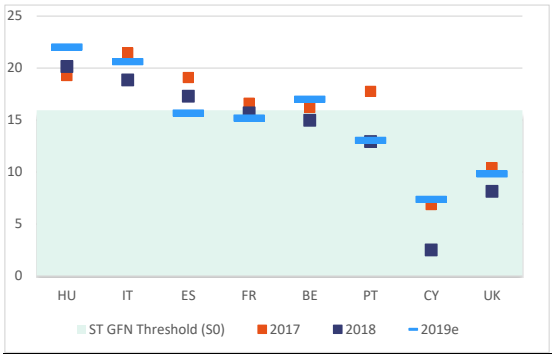
Low fiscal performance and shorter maturity structures are behind the high values of short-term GFN. On one hand, lower fiscal performance implies higher financing needs as fiscal deficits must be financed (the case of ES, FR, HU, IT, UK and BE). On the other hand, debt maturity structure, in particular, a high share of debt with maturity under one year in new debt issuances and a high share of existing debt maturing and to be rolled over, amplify GFN (the case of HU, PT, FR, ES, BE and IT).

Conversely, market-reliant GFN may be low in some countries, despite their government debt ratios being high. Under the S0, 11 countries present medium or high risks from the stock of government debt. However, only the 3 countries mentioned above post short-term GFN above the respective S0 threshold. Such a situation may

occur when countries rely less on short-term market funding and benefit, instead, from longer-term financing and/or official loans – see for example, Cyprus and the UK.

Yet, financing sources with very long maturities are the exception rather than the rule. It is therefore important to monitor closely the evolution of financial market conditions.

Graph 2.5: **Short-term (S0) 'Market-reliant' GFN – selected EU countries (%GDP)**



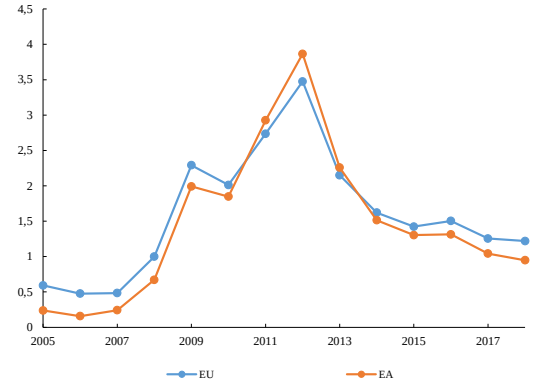
(1) S0 GFN outturn values and estimates are based on all debt securities issued by the general government and their redemption profile. 2019 GFN estimates are partial data, limited to information available on securities with redemption by end-September 2019.
Source: ECB Government Finance Statistics and Commission services.

2.3. FINANCIAL MARKETS' INFORMATION

This section provides an analysis of the ease of (re-)financing government debt, based on different indicators of financial markets' perceptions of sovereign risk. Such information complements debt projection based DSA results, notably to identify, early on, signs of sustainability risks over the short term. In practice, high frequency financial data allows monitoring emergence of potentially self-reinforcing adverse fiscal sustainability developments ([37]). While assessing the nature of such developments in real-time calls for caution, financial data provide an important source of information to monitor market's perception, a driver of short-term debt dynamics and, potentially, of self-reinforcing debt dynamics.

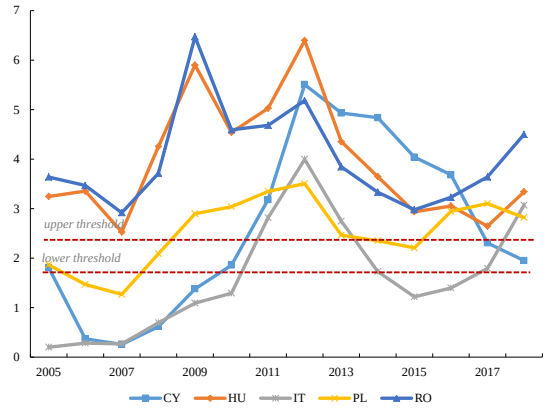
Sovereign yield conditions have remained benign in the EU. Reflecting perceived creditworthiness, low financing costs for a number of countries continues to contribute to mitigating rollover risks across the EU, which continues to post low sovereign yield spread development (see Chart 2.6). However, some countries face higher financing costs (see Chart 2.7), among which some have experienced recent protracted increases in spreads (IT and RO).

Graph 2.6: **10-year government bond yield spreads to the German bund- EU and EA aggregates**



(1) Yield spreads are as of October 2018.
Source: ECB LTIR database, Commission services.

Graph 2.7: **10-year government bond yield spreads to the German bund - Selected countries**



(1) Countries are those whose spreads are above the lower risk threshold: 184.8 bps. Upper threshold: 231 bps.
Source: ECB LTIR database, Commission services.

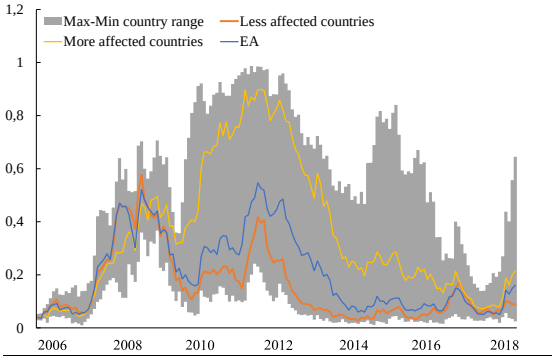
The SovCISS indicator ([38]) shows that stress remained subdued in euro area sovereign debt

([37]) For discussion of the market expectations on sovereign debt default and risks of self-fulfilling crisis channel, see Calvo (1988). For an application the EU sovereign crisis event see Miller and Zhang (2014).

([38]) The SovCISS measures the level of stress in euro area sovereign bond markets, following the CISS methodology

markets although some diverging trends have emerged. This indicator of systemic stress for euro area sovereign bond markets continues to post a low average level but the gap between countries with the lowest and the highest score has increased (see Chart 2.8). At the country level, notable developments concern only Italy, which had a stable low reading for this indicator until April 2018. Thereafter, Italy posted a sharp increase, which also caused the sharp increase in the gap between the minimum and maximum values for that indicator seen in recent data.

Graph 2.8: **Composite Indicator of Systemic Sovereign Stress (SovCISS) in euro area sovereign bond markets**

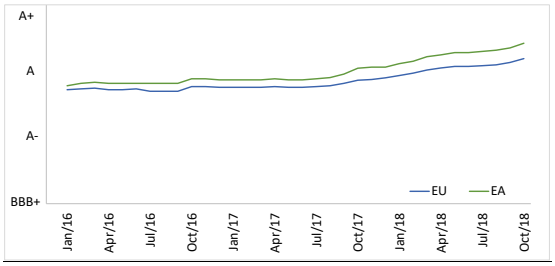


(1) The SovCISS focuses on stress in sovereign bond markets. It is available for the euro area and for 11 euro area countries (AT, BE, FI, FR, DE, EL, IE, IT, NL, PT, ES). The countries more affected by the crisis include EL, IE, IT, PT, ES, whereas those less affected by the crisis include AT, BE, FI, FR, DE, NL.
Source: ECB and Commission services.

The EU and EA average sovereign ratings are high and keep improving further (see Graph 2.9). This reflects stable or improving ratings in most countries, with some exceptions (see Graph 2.10). Notably, Italy is the only country among those with lowest current rating that posted a deterioration of its rating compared to the start of 2016 (see Graph 2.11 and Table 2.5).

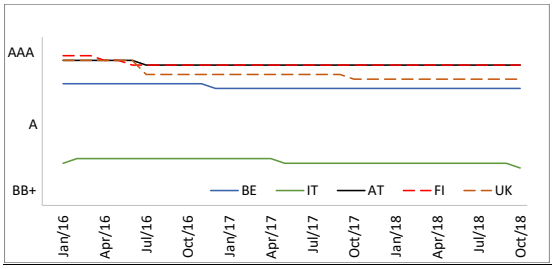
developed in Hollo et al. (2012). See also Garcia-de-Andoain and Kremer (2018).

Graph 2.9: **Sovereign debt ratings - EU and EA aggregates**



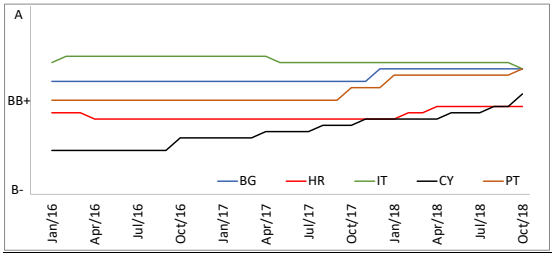
(1) Ratings are computed as average of long-term foreign currency ratings, assigned by the major rating agencies.
Source: Commission services, based on Bloomberg data.

Graph 2.10: **Countries posting a ratings deterioration compared to January 2016**



Source: Commission services, based on Bloomberg data.

Graph 2.11: **Countries with the lowest ratings as of October 2018**



Source: Commission services, based on Bloomberg data.

In sum, markets' perception of EU sovereign risks remains benign, contributing to favourable short-term debt dynamics. However, fiscal sustainability risks in a number of countries expose these to the threat of sudden sovereign risk repricing by market participants, potentially setting in motion less favourable self-reinforcing short – term debt dynamics.

Table 2.5: **Long-term foreign currency sovereign ratings (as of 29 October 2018)**

	Moody's			S&P			Fitch		
	Rating	Since	Outlook	Rating	Since	Outlook	Rating	Since	Outlook
Euro area MS									
AT	Aa1	24/06/2016	STABLE	AA+	13/01/2012	STABLE	AA+	13/02/2015	POS
BE	Aa3	16/12/2011	STABLE	Aau	13/01/2012	STABLE	AA-	23/12/2016	STABLE
CY	Ba2	27/07/2018	STABLE	BBB-	14/09/2018	STABLE	BBB-	19/10/2018	STABLE
EE	A1	23/04/2009	STABLE	AA-	13/01/2012	STABLE	AA-	5/10/2018	STABLE
FI	Aa1	3/06/2016	STABLE	AA+	10/10/2014	STABLE	AA+	11/03/2016	POS
FR	Aa2	18/09/2015	POS	AAu	8/11/2013	STABLE	AA	12/12/2014	STABLE
DE	Aaa	5/07/2000	STABLE	AAAu	13/01/2012	STABLE	AAA	10/08/1994	STABLE
IE	A2	15/09/2017	STABLE	A+	5/06/2015	STABLE	A+	15/12/2017	STABLE
IT	Baa3	19/10/2018	STABLE	BBBu	27/10/2017	NEG	BBB	21/04/2017	NEG
LV	A3	13/02/2015	STABLE	A	21/09/2018	STABLE	A-	20/06/2014	STABLE
LT	A3	8/05/2015	STABLE	A	2/03/2018	STABLE	A-	25/06/2014	POS
LU	Aaa	20/09/1989	STABLE	AAA	13/01/2012	STABLE	AAA	10/08/1994	STABLE
MT	A3	13/02/2012	POS	A-	14/10/2016	POS	A+	11/08/2017	STABLE
NL	Aaa	20/07/1999	STABLE	AAAu	20/11/2015	STABLE	AAA	10/08/1994	STABLE
PT	Baa3	12/10/2018	STABLE	BBB-u	15/09/2017	POS	BBB	15/12/2017	STABLE
SK	A2	13/02/2012	POS	A+	31/07/2015	STABLE	A+	8/07/2008	STABLE
SI	Baa1	8/09/2017	STABLE	A+	16/06/2017	POS	A-	23/09/2016	STABLE
ES	Baa1	13/04/2018	STABLE	A-u	23/03/2018	POS	A-	19/01/2018	STABLE
Non-euro area MS									
BG	Baa2	22/07/2011	STABLE	BBB-	1/12/2017	POS	BBB	1/12/2017	STABLE
HR	Ba2	11/03/2016	STABLE	BB+	23/03/2018	POS	BB+	12/01/2018	POS
CZ	A1	12/11/2002	POS	AA-	24/08/2011	STABLE	AA-	3/08/2018	STABLE
DK	Aaa	23/08/1999	STABLE	AAA	27/02/2001	STABLE	AAA	10/11/2003	STABLE
HU	Baa3	4/11/2016	STABLE	BBB-	16/09/2016	POS	BBB-	20/05/2016	POS
PL	A2	12/11/2002	STABLE	A-	12/10/2018	STABLE	A-	18/01/2007	STABLE
RO	Baa3	6/10/2006	STABLE	BBB-	16/05/2014	STABLE	BBB-	4/07/2011	STABLE
SE	Aaa	4/04/2002	STABLE	AAAu	23/01/2014	STABLE	AAA	8/03/2004	STABLE
UK	Aa2	22/09/2017	STABLE	AAu	27/06/2016	NEG	AA	27/06/2016	NEG

Source: Commission services, based on Bloomberg data.

3. MEDIUM-TERM FISCAL SUSTAINABILITY ANALYSIS

The medium-term fiscal sustainability analysis is based on two main tools. It consists, on one hand, of debt sustainability analysis (DSA), which deploys a rich analytical toolkit to identify fiscal risks associated, essentially, to EU countries' debt ratio level and trajectory (see section 3.1). DSA projections cover a period of 10 years. Medium-term gross financing needs' projections are additionally presented (section 3.2). On the other hand, the DSA is complemented by estimates of the fiscal sustainability gap indicator S1, whereby fiscal gaps in EU countries are studied inter-temporally, over a period of 15 years (see section 3.3). DSA and S1 outcomes matter equally towards the overall assessment of medium-term fiscal risks.

3.1. DEBT SUSTAINABILITY ANALYSIS

The two most important components of the DSA toolkit are the deterministic and stochastic debt projections (results follow in sections 3.1.1. and 3.1.2). The former approach is to project a single outcome or debt trajectory for a set of scenarios. The latter proposes a probabilistic approach, whereby the results constitute a distribution of debt projections resulting from shocks to the baseline value of the debt drivers. Gross financing needs projections are also discussed (see section 3.2). Some specific issues are explored such as alternative measures for debt sustainability assessment (see Box 3.1), the use of market expectations to project interest rates (see Box 3.2), fiscal sustainability analysis for Greece (see Box 3.3), and the sensitivity of medium-term gross financing needs to market shocks (see Box 3.4).

3.1.1. Deterministic debt projections

Deterministic government debt projections presented in this report are of two main kinds: policy scenarios, including the baseline scenario and a set of alternative policy scenarios, and sensitivity tests around the baseline scenario ([39]).

Among these projection scenarios, five are more relevant as their results determine the DSA risk classification. These are the baseline no-policy change scenario, the historical structural primary balance (SPB) scenario (see section 3.1.1.1), the positive shock to interest rates sensitivity test, the negative shock to GDP growth and the negative shock to the SPB (see section 3.1.1.2). These scenarios appear first in this section. The remainder of deterministic debt projection scenarios constitute additional information useful in qualifying DSA risks, but they do not influence the risk classification. These include the Stability and Growth Pact scenario (see section 3.1.1.3), the Stability and Convergence Program scenario (see section 3.1.1.4) and the fiscal reaction function scenario (see section 3.1.1.5). Section 3.1.1.6 provides a comparison of the baseline and historical scenarios with the DSM 2017 results.

3.1.1.1. Baseline and historical scenarios

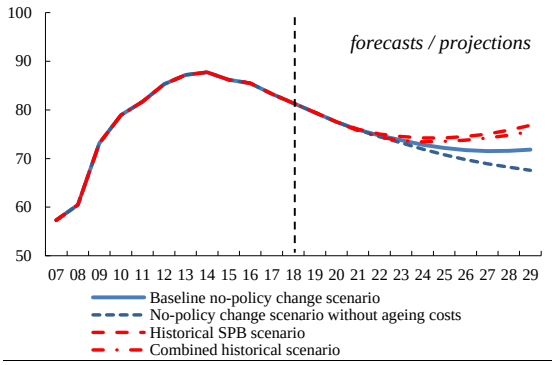
EU and EA aggregate results

Under the baseline no-fiscal policy change scenario, the EU debt ratio would gradually decline in the next decade to pick up again at the end of the projection period. On the basis of budgetary positions from the European Commission's Autumn 2018 forecasts, and under the assumption of unchanged fiscal policy beyond the forecast period, the EU-28 debt ratio would gradually decline from a peak of nearly 88% of GDP in 2014 to around 72% of GDP in 2029 (see Graph 3.1) ([40]). For the EA, the same projection scenario shows a similar decline, from 94% of GDP in 2014 to 78% of GDP in 2029 (see Graph 3.2). Despite this overall downward trend, the debt ratio would remain well above its pre-crisis level in 10 years' time (57½% and 65% of GDP in 2007 respectively in the EU-28 and the EA), and above the 60% of GDP Treaty reference threshold. Both debt ratios would pick up again marginally in 2028.

([39]) See Box 1.1 in Chapter 1 for an overview and definition of the different deterministic scenarios.

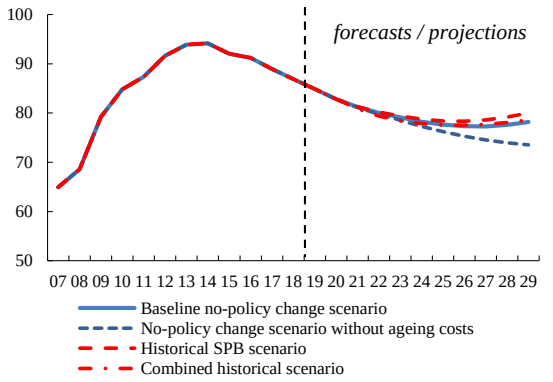
([40]) The no-fiscal policy change scenario assumes that the government primary balance (in structural terms and before ageing costs) remains constant at its last forecast value (2020) for the remainder of the 10-year projection horizon.

Graph 3.1: **Gross government debt projections (% of GDP), European Union 28: baseline no-fiscal policy change and historical scenarios**



Source: Commission services.

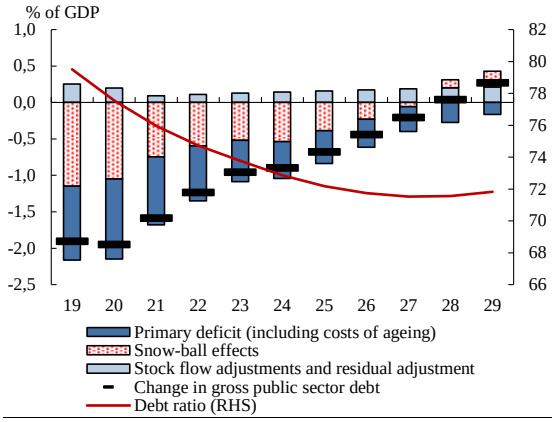
Graph 3.2: **Gross government debt projections (% of GDP), Euro area: baseline no-fiscal policy change and historical scenarios**



Source: Commission services.

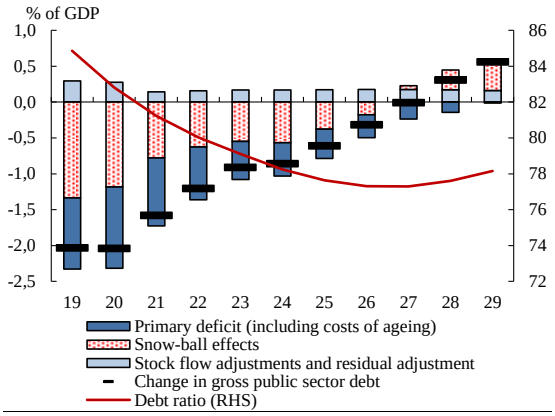
The aggregate debt ratio decline is driven by a sustained primary surplus over the projection period, coupled with favourable snowball effects ([41]). The primary balance would be an important driver of the projected debt reduction (assuming a structural primary balance *before costs of ageing* held constant at 0.7% of GDP in both the EU-28 and the EA over the projection period). Favourable interest rate – growth rate differentials (snowball effects) would also contribute to the decrease of the debt ratio until 2027, given the projected slow increase of interest rates from their current historically low levels (see Tables 3.1 – 3.2 and Graphs 3.3 – 3.4). Towards the end of the projection period, debt ratios would pick up a tad, in line with progressively rising interest rates ([42]) and implicit liabilities related to population ageing (the growing impact of ageing costs is also visible in Graphs 3.1–3.2 when comparing the no-fiscal policy change scenario with and without ageing costs).

Graph 3.3: **Gross government debt ratio variation breakdown (% of GDP), European Union 28 - Baseline no-fiscal policy change scenario**



(1) Reading note: In 2019, a forecast primary surplus of 1.0% of GDP contributes to reduce the government debt ratio.
Source: Commission services.

Graph 3.4: **Gross government debt ratio variation breakdown (% of GDP), Euro area - Baseline no-fiscal policy change scenario**



(1) Reading note: In 2019, a forecast primary surplus of 1.0% of GDP contributes to reduce the government debt ratio.
Source: Commission services.

([41]) Snowball effects refer to the net impact of the counter-acting effects of interest rates, inflation and real GDP growth (as well as exchange rates in some countries) on the evolution of the debt ratio (see Annex A3 for more details).

([42]) In particular, market long-term interest rates are assumed to converge to 3% in real terms in all countries by the end of projections (see Annex A4 for more explanations).

Table 3.1: **Gross government debt projections (% of GDP) and underlying macro-fiscal assumptions, European Union 28 - Baseline no-fiscal policy change**

	2018	2019	2020	2021	2022	2023	2026	2029
Gross debt ratio	**81,4**	**79,5**	**77,5**	**76,0**	**74,7**	**73,8**	**71,7**	**71,8**
of which *Oustanding (non maturing) debt*	*65,2*	*63,9*	*62,5*	*61,2*	*60,0*	*59,1*	*57,0*	*56,3*
Rolled-over short-term debt	*8,5*	*8,2*	*7,9*	*7,7*	*7,4*	*7,3*	*6,9*	*7,0*
Rolled-over long-term debt	*6,1*	*6,0*	*6,0*	*5,9*	*5,9*	*5,8*	*5,8*	*5,9*
New short-term debt	*0,2*	*0,1*	*0,1*	*0,1*	*0,2*	*0,2*	*0,2*	*0,3*
New long-term debt	*1,4*	*1,2*	*1,1*	*1,1*	*1,2*	*1,4*	*1,8*	*2,3*
Changes in the debt ratio (-1+2+3)	**-1,9**	**-1,9**	**-2,0**	**-1,6**	**-1,2**	**-1,0**	**-0,4**	**0,3**
of which (1) Overall primary balance (1.1+1.2+1.3)	**1,2**	**1,0**	**1,1**	**0,9**	**0,8**	**0,6**	**0,4**	**0,2**
(1.1) Structural primary balance *(1.1.1-1.1.2+1.1.3)*	***1,0***	***0,8***	***0,7***	***0,7***	***0,6***	***0,6***	***0,4***	***0,2***
(1.1.1) Structural primary balance (before CoA)	*1,0*	*0,8*	*0,7*	*0,7*	*0,7*	*0,7*	*0,7*	*0,7*
(1.1.2) Cost of ageing (incl. revenues pensions tax)				*0,1*	*0,1*	*0,2*	*0,5*	*0,7*
(1.1.3) Property incomes				*0,0*	*0,0*	*0,1*	*0,1*	*0,2*
(1.2) Cyclical component	***0,3***	***0,4***	***0,4***	***0,2***	***0,1***	***0,0***	***0,0***	***0,0***
(1.3) One-off and other temporary measures	***0,1***	***0,1***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***
(2) Snowball effect (interest rate/growth differential) (2.1+2.2+2.3)	**-1,2**	**-1,1**	**-1,1**	**-0,7**	**-0,6**	**-0,5**	**-0,2**	**0,2**
(2.1) Interest expenditure	*1,8*	*1,7*	*1,7*	*1,7*	*1,7*	*1,8*	*2,1*	*2,5*
(2.2) Growth effect (real)	*-1,7*	*-1,5*	*-1,4*	*-1,0*	*-0,9*	*-0,8*	*-0,9*	*-0,9*
(2.3) Inflation effect	*-1,3*	*-1,4*	*-1,4*	*-1,4*	*-1,4*	*-1,4*	*-1,4*	*-1,4*
(3) Stock flow adjustments	***0,5***	***0,3***	***0,2***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***
PM : Structural balance	***-0,9***	***-1,0***	***-1,1***	***-1,1***	***-1,2***	***-1,4***	***-1,9***	***-2,5***
Key macroeconomic assumptions								
Actual GDP growth (real)	2,1	1,9	1,8	1,4	1,2	1,2	1,3	1,3
Potential GDP growth (real)	1,7	1,7	1,8	1,6	1,4	1,4	1,3	1,3
Inflation (GDP deflator)	1,6	1,8	1,8	1,9	1,9	2,0	2,0	2,0
Implicit interest rate (nominal)	2,2	2,2	2,2	2,3	2,3	2,5	2,9	3,6

(1) Given that the drivers of the EU28 change in the government debt ratio are calculated as GDP-weighted averages of country-specific debt projections, small differences may exist between the total change in the government debt ratio and the sum of its drivers.
Source: Commission services.

Table 3.2: **Gross government debt projections (% of GDP) and underlying macro-fiscal assumptions, Euro area - Baseline no-fiscal policy change**

	2018	2019	2020	2021	2022	2023	2026	2029
Gross debt ratio	**86,9**	**84,9**	**82,8**	**81,2**	**80,0**	**79,1**	**77,3**	**78,2**
of which *Oustanding (non maturing) debt*	*69,8*	*68,3*	*66,9*	*65,6*	*64,4*	*63,4*	*61,4*	*61,2*
Rolled-over short-term debt	*8,3*	*8,0*	*7,7*	*7,5*	*7,3*	*7,1*	*6,9*	*7,0*
Rolled-over long-term debt	*7,1*	*7,0*	*6,9*	*6,9*	*6,8*	*6,8*	*6,9*	*7,0*
New short-term debt	*0,2*	*0,2*	*0,1*	*0,1*	*0,2*	*0,2*	*0,2*	*0,3*
New long-term debt	*1,5*	*1,3*	*1,2*	*1,1*	*1,3*	*1,5*	*1,9*	*2,6*
Changes in the debt ratio (-1+2+3)	**-2,0**	**-2,0**	**-2,0**	**-1,6**	**-1,2**	**-0,9**	**-0,3**	**0,6**
of which (1) Overall primary balance (1.1+1.2+1.3)	**1,2**	**1,0**	**1,1**	**0,9**	**0,7**	**0,5**	**0,3**	**0,0**
(1.1) Structural primary balance *(1.1.1-1.1.2+1.1.3)*	***1,1***	***0,8***	***0,7***	***0,7***	***0,6***	***0,5***	***0,3***	***0,0***
(1.1.1) Structural primary balance (before CoA)	*1,1*	*0,8*	*0,7*	*0,7*	*0,7*	*0,7*	*0,7*	*0,7*
(1.1.2) Cost of ageing (incl. revenues pensions tax)				*0,1*	*0,2*	*0,3*	*0,5*	*0,9*
(1.1.3) Property incomes				*0,0*	*0,0*	*0,1*	*0,1*	*0,2*
(1.2) Cyclical component	***0,2***	***0,4***	***0,4***	***0,3***	***0,1***	***0,0***	***0,0***	***0,0***
(1.3) One-off and other temporary measures	***0,1***	***0,2***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***
(2) Snowball effect (interest rate/growth differential) (2.1+2.2+2.3)	**-1,3**	**-1,3**	**-1,2**	**-0,8**	**-0,6**	**-0,5**	**-0,2**	**0,4**
(2.1) Interest expenditure	*1,7*	*1,7*	*1,7*	*1,7*	*1,7*	*1,8*	*2,1*	*2,7*
(2.2) Growth effect (real)	*-1,8*	*-1,6*	*-1,4*	*-1,0*	*-0,8*	*-0,8*	*-0,8*	*-0,8*
(2.3) Inflation effect	*-1,3*	*-1,5*	*-1,4*	*-1,5*	*-1,5*	*-1,6*	*-1,5*	*-1,5*
(3) Stock flow adjustments	***0,5***	***0,3***	***0,3***	***0,0***	***0,0***	***0,0***	***0,0***	***0,0***
PM : Structural balance	***-0,7***	***-1,0***	***-1,1***	***-1,2***	***-1,3***	***-1,4***	***-2,0***	***-2,8***
Key macroeconomic assumptions								
Actual GDP growth (real)	2,1	1,9	1,7	1,2	1,0	1,0	1,1	1,0
Potential GDP growth (real)	1,6	1,6	1,6	1,5	1,3	1,2	1,1	1,0
Inflation (GDP deflator)	1,5	1,7	1,7	1,8	1,9	2,0	2,0	2,0
Implicit interest rate (nominal)	2,0	2,0	2,0	2,1	2,2	2,3	2,8	3,6

(1) Given that the drivers of the EA change in the government debt ratio are calculated as GDP-weighted averages of country-specific debt projections, small differences may exist between the total change in the government debt ratio and the sum of its drivers.
Source: Commission services.

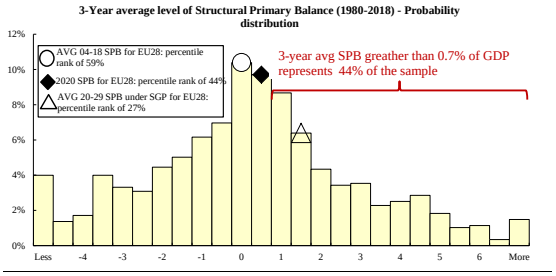
Assuming fiscal and economic conditions would revert to historical trends, the government debt ratio would fall less than in the baseline (see Graphs 3.1 – 3.2)**.** For instance, if the structural primary balance (before ageing costs) reverted to its historical average beyond the forecast (an average structural primary balance in equilibrium / with a value of 0.5% of GDP, respectively, for the EU-28 / EA as in the historical SPB scenario) ([43]), the debt ratio would start to pick up earlier, in 2026 and 2027, respectively. In this context, the EU-28 government debt ratio would decrease only by around 5 pps. of GDP over the period 2018 – 2029, compared to a reduction of around 10 pps. of GDP in the baseline scenario. If real interest rates and real GDP growth were, in addition, reverting to their historical averages such as in the combined historical scenario, the EU-28 debt ratio would decrease by around 6 pps. of GDP over 2018-2029. In this scenario, the EU-28 debt ratio would stand at some 4 pps. of GDP above the baseline scenario debt ratio in 2029. Gaps between the baseline and historical scenarios are found to be lower at the EA aggregate level (around 1 – 2 pps. of GDP) notably given that baseline fiscal assumptions are closer to historical averages (see Table 3.4).

The aggregate structural primary balance assumed for the EU in the baseline projections appears plausible by historical standards, lying nearly in the middle of the distribution of EU primary balances observed in the past. At both the EU-28 and the EA aggregate levels, the structural primary balance forecast for 2020, on which the baseline scenario is grounded, appears plausible by the European historical track record (see Graphs 3.5–3.6).

For example, the structural primary balance assumed in the EU-28 projections, 0.7% of GDP, corresponds to a percentile rank of 44% in the historical distribution. In other words, looking at all EU countries' structural primary balances over the period 1980 – 2018, outturn structural primary balances were in 44% of cases at or above 0.7% of GDP. This means that, by historical standards, there is a sizeable (44%) probability that the EU as a whole would achieve such structural primary surplus over the next decade.

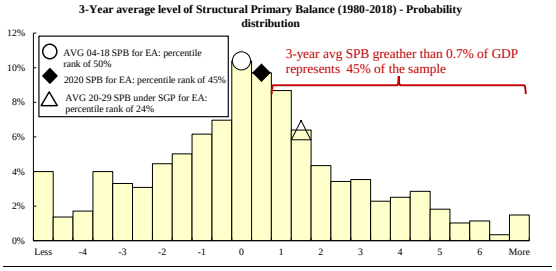
([43]) Averages over the period 2003-17.

Graph 3.5: **EU 28 projected structural primary balance (SPB) level and percentile rank in different scenarios against the distribution of EU countries' outturn SPBs over 1980 – 2018**



(1) The distribution (yellow histograms) is calculated over a dataset of all EU countries for the period 1980 - 2018.
Vertical axis: % sample; horizontal axis: SPB values as % GDP.
Source: Commission services.

Graph 3.6: **EA projected structural primary balance (SPB) level and percentile rank in different scenarios against the distribution of EU countries' outturn SPBs over 1980 – 2018**



(1) The distribution (yellow histograms) is calculated over a dataset of all EU countries for the period 1980 - 2018.
Vertical axis: % sample; horizontal axis: SPB values as % GDP.
Source: Commission services.

Cross-country main results ([44])

The baseline no-fiscal policy change scenario projects a decline in government debt ratios in most EU Member States. Debt ratios are expected to decrease in 21 countries with particularly large reductions foreseen in CY, MT, AT, DE, DK, and SE (by at least 22 pps. of GDP between 2018 and 2029). In these 6 countries, the substantial projected decrease of government debt ratios is largely explained by high forecasted primary surpluses in 2020 (at 2.9% of GDP in CY and close to 2.0% of GDP in MT, DE and DK) and / or favourable snowball effects. On the other hand, government debt ratios would increase in 5 other countries, namely RO, IT, ES, EE and FR.

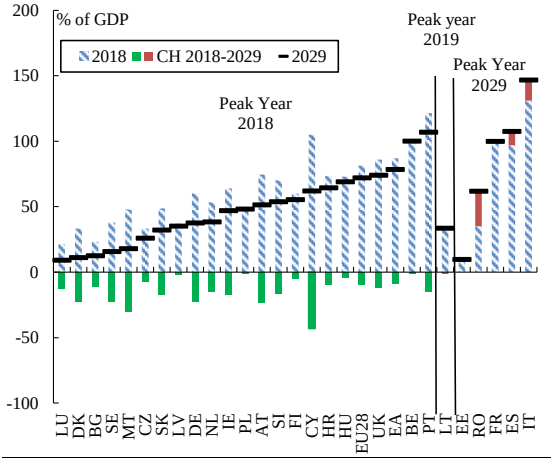
([44]) Detailed results by country are provided in the country-specific fiscal sustainability assessment in Chapter 7 and the statistical country fiches presented in the Volume 2 of this report.

Table 3.3: **Gross government debt projections (% of GDP) - Baseline no-fiscal policy change and historical scenarios, by country**

	Debt in 2020	(A) Debt in 2029 - Baseline no-policy change scenario	(B) Debt in 2029 using the Historical last 15 years average (04-18) on the following variables:				(B - A)			
			SPB	IIR	potential GDP growth	all variables combined	for SPB	for IIR	for potential GDP growth	for all variables combined
BE	98,7	99,9	94,8	100,1	96,9	92,1	-5,1	0,2	-3,0	-7,8
BG	19,5	12,4	14,4	12,1	10,4	12,0	2,0	-0,3	-2,0	-0,4
CZ	31,2	25,8	38,6	25,7	23,9	36,2	12,9	-0,1	-1,9	10,5
DK	30,5	10,8	6,5	11,1	11,1	7,0	-4,3	0,3	0,3	-3,8
DE	53,7	37,3	39,6	37,2	36,6	38,7	2,3	-0,1	-0,8	1,4
EE	7,5	9,6	8,2	8,9	9,1	7,2	-1,4	-0,7	-0,5	-2,4
IE	56,0	46,7	62,9	48,5	38,9	55,7	16,1	1,8	-7,9	9,0
ES	95,4	107,3	105,5	107,9	101,3	100,1	-1,8	0,6	-6,0	-7,2
FR	97,2	99,8	107,7	99,9	97,3	105,2	7,9	0,1	-2,5	5,4
HR	68,2	64,3	80,7	64,6	60,9	77,7	16,5	0,4	-3,3	13,4
IT	131,1	146,5	136,0	148,0	147,6	138,4	-10,5	1,5	1,0	-8,1
CY	91,0	61,9	73,9	62,0	54,3	66,3	12,0	0,1	-7,6	4,4
LV	35,7	35,0	40,2	33,3	32,6	35,8	5,2	-1,7	-2,4	0,8
LT	37,6	33,4	43,4	32,8	29,7	38,5	10,0	-0,6	-3,6	5,1
LU	20,6	8,9	3,5	8,9	8,3	3,0	-5,4	0,0	-0,5	-5,8
HU	68,6	68,7	67,0	69,0	71,0	69,5	-1,8	0,3	2,2	0,7
MT	42,1	17,8	26,3	17,9	16,7	25,2	8,5	0,1	-1,0	7,4
NL	46,9	38,2	38,2	38,2	36,9	36,9	0,0	0,0	-1,3	-1,3
AT	67,8	51,2	55,9	51,2	51,9	56,5	4,6	0,0	0,6	5,3
PL	47,4	48,0	56,1	47,9	45,5	53,2	8,1	-0,2	-2,5	5,2
PT	116,8	106,7	126,0	106,6	107,4	126,7	19,3	-0,1	0,7	20,0
RO	38,2	61,6	55,3	55,2	59,0	47,3	-6,3	-6,4	-2,7	-14,3
SI	62,6	53,5	60,4	54,9	56,3	64,9	6,9	1,3	2,8	11,4
SK	44,2	31,9	47,5	32,2	29,5	45,1	15,5	0,3	-2,5	13,2
FI	57,5	55,1	44,0	54,7	54,0	42,6	-11,1	-0,5	-1,2	-12,5
SE	33,5	15,6	11,7	15,5	15,3	11,4	-3,9	-0,1	-0,3	-4,2
UK	82,6	73,9	96,9	74,1	73,6	96,8	23,0	0,2	-0,3	22,9
EU-28	**77,5**	**71,8**	**76,9**	**72,0**	**70,5**	**75,6**	**5,0**	**0,1**	**-1,4**	**3,7**
EA	**82,8**	**78,2**	**80,0**	**78,5**	**76,6**	**78,6**	**1,8**	**0,3**	**-1,6**	**0,5**

(1) The combined historical scenario assumes that the SPB, interest rate and GDP growth rate are reverting to their historical averages (calculated over the period 2004-18).
(2) Percentile ranks are calculated on the distribution of 3-year average SPB level over all EU countries for 1980 – 2018.
Source: Commission services.

Graph 3.7: **Gross government debt in 2018 and 2029 (% of GDP) - projections under the baseline no-fiscal policy change scenario, by country**



Source: Commission services.

The debt ratio is forecast to remain stable in LT (see Graph 3.7).

In some highly indebted countries, government debt burdens are projected to increase or to only marginally decline. In Italy, Spain and France, the debt ratio would increase in the coming decade, while in Belgium government debt would remain almost unchanged compared to 2018. Therefore, in these four countries, debt would remain (well) above 90% of GDP in 2029. In another highly indebted country, Portugal, debt burden would ease more markedly (by some 15 pps. of GDP), yet the government debt ratio would remain above 90% of GDP in 2029. Weak fiscal positions (a structural primary deficit in Spain and France and an insufficient fiscal effort in Italy and Belgium) contribute to these unfavourable trends. A positive interest rate - growth rate differential (unfavourable snowball effects) would also be an

Table 3.4: **Main macro-fiscal assumptions used in the baseline and historical scenarios, by country**

	Baseline no-policy change scenario						Historical last 15 years average (04-18)			*Percentile rank of 2020 SPB (1)*	*Percentile rank of AVG 04-18 SPB (2)*
	2020			Average 2020-29							
	SPB (1)	Real IIR	Real GDP growth	SPB	Real IIR	Real GDP growth	SPB (2)	Real IIR	Potential GDP growth		
BE	0,4	0,4	1,5	0,4	0,7	1,1	1,1	2,0	1,4	*52%*	*38%*
BG	0,9	0,7	3,7	0,9	1,1	2,0	0,6	0,7	3,4	*42%*	*47%*
CZ	1,0	0,5	2,9	1,0	0,9	1,9	-0,8	1,9	2,7	*40%*	*70%*
DK	1,7	0,9	1,8	1,7	1,0	1,4	2,3	2,6	1,1	*28%*	*21%*
DE	1,9	-0,4	1,8	1,9	0,3	1,2	1,6	1,8	1,4	*26%*	*30%*
EE	-0,8	-2,4	2,8	-0,8	-0,8	2,0	-0,6	-1,7	2,9	*71%*	*68%*
IE	1,0	0,2	4,5	1,0	0,8	2,7	-1,3	3,2	4,9	*39%*	*76%*
ES	-1,0	0,6	2,2	-1,0	1,0	0,9	-0,7	2,3	1,4	*72%*	*69%*
FR	-0,4	0,4	1,6	-0,4	0,7	1,1	-1,5	1,9	1,3	*65%*	*78%*
HR	1,0	1,6	2,8	1,0	1,8	1,0	-1,2	2,6	1,2	*38%*	*75%*
IT	0,4	1,6	1,2	0,4	1,6	0,5	1,9	2,5	0,2	*51%*	*28%*
CY	2,9	0,6	3,5	2,9	0,9	1,0	1,3	2,6	1,7	*17%*	*35%*
LV	-0,5	-0,6	3,2	-0,5	0,5	2,2	-1,2	-0,1	3,0	*66%*	*74%*
LT	0,3	-1,6	2,8	0,3	0,2	1,8	-1,1	1,2	3,1	*53%*	*74%*
LU	1,1	0,0	3,0	1,1	-0,2	2,2	1,9	0,1	2,7	*37%*	*25%*
HU	-0,6	0,6	3,4	-0,6	1,7	2,3	-0,3	2,4	1,7	*67%*	*65%*
MT	2,2	1,0	4,9	2,2	1,2	3,6	1,0	2,3	3,9	*23%*	*40%*
NL	0,6	-0,6	2,4	0,6	0,2	1,1	0,6	1,9	1,3	*47%*	*47%*
AT	1,3	0,2	2,0	1,3	0,5	1,7	0,6	1,9	1,5	*35%*	*47%*
PL	-0,4	0,6	3,7	-0,4	1,5	2,9	-1,6	2,5	3,5	*66%*	*78%*
PT	2,3	1,2	1,8	2,3	1,4	0,8	-0,5	2,3	0,4	*22%*	*66%*
RO	-3,1	0,9	3,8	-3,1	2,2	3,3	-2,2	-0,7	3,9	*89%*	*83%*
SI	0,6	0,0	3,3	0,6	0,8	2,7	-0,4	2,9	1,9	*48%*	*66%*
SK	0,5	-0,1	4,1	0,5	0,6	2,9	-1,7	2,6	3,7	*50%*	*80%*
FI	0,2	-0,5	2,2	0,2	-0,1	1,1	1,7	1,3	1,1	*55%*	*29%*
SE	1,3	-0,8	1,8	1,3	-0,7	1,8	1,9	0,8	2,1	*34%*	*26%*
UK	1,2	0,9	1,2	1,2	1,2	1,4	-2,1	2,1	1,5	*36%*	*83%*
EU-28	**0,7**	**0,4**	**1,9**	**0,7**	**0,8**	**1,3**	**0,0**	**2,0**	**1,5**	***44%***	***59%***
EA	**0,7**	**0,3**	**1,9**	**0,7**	**0,7**	**1,1**	**0,5**	**2,0**	**1,3**	***45%***	***50%***

Source: Commission services.

important driver in some countries, given initial debt burdens (e.g. in Italy and Portugal). These countries would thus remain vulnerable to unfavourable shocks (see section 3.1.1.2).

The outlook would be overall less favourable if future fiscal policy replicated historical performance. If the structural primary balance (before ageing costs) were reverting, after 2020, to its historical average, government debt ratios would be higher in 2029 than in the baseline scenario in a majority of countries (16). The largest gaps would be recorded for 2029 in the UK, PT, HR, IE and SK (more than 15 pps. of GDP; see Table 3.3) given the important differences between recent and historical primary balances (see Table 3.4). In the combined historical scenario, a higher debt ratio in 2029 compared to the baseline is projected in 16 countries, with the highest differences in the UK, PT, HR, SK, SI and CZ (more than 10 pps. of GDP). In a few cases, assuming that interest and growth rates were to evolve in line with historical averages would lead to higher debt ratios than in the historical SPB scenario, given weaker historical growth performance (e.g. Portugal, Slovenia, Italy, and Hungary).

In some cases, fiscal assumptions under the baseline scenario seem ambitious. In several countries, the forecasted structural primary balance in 2020 may appear high by historical EU standards: this is the case in CY, PT and MT (structural primary surpluses above 2% of GDP) and to a lower extent in DE and DK (structural primary surpluses of 1.9% and 1.7% of GDP, respectively) - see Table 3.4. In such cases, only 17% of the distribution in the case of CY (22% in that of PT, 23% in that of MT, 26% and 28% in the cases of DE and DK, respectively) displays a structural primary balance greater than the level assumed for these countries in the baseline scenario. In Denmark and Germany, however, the baseline levels of SPB is either below or not far from the historical average in these specific countries (average SPB of 2.3% of GDP in DK and 1.6% of GDP in DE), pointing that these countries are likely to sustain a stronger fiscal effort over a longer period than other EU countries. In other cases, risks of 'fiscal fatigue' cannot be excluded over our 10-year projections ([45]).

([45]) A caveat to keep in mind when considering the percentile rank measures used in this chapter is that while each country's fiscal balance is analysed against the overall

In currently highly indebted countries, most fiscal positions appear, on the other hand, relatively weak compared to historical experience. Within the group of vulnerable countries (IT, PT, CY, BE, FR and ES) fiscal positions appear relatively weak in some cases based on both EU historical experience and national past trends (e.g. Italy, Belgium, France, and Spain). For example, in the case of Spain, 72% of the EU historical distribution is above the 1% of GDP structural primary deficit assumed in the baseline scenario ([46]). This value is however close to Spain's historical average SPB (-0.7% of GDP).

3.1.1.2. Sensitivity analysis on deterministic debt projections

A set of sensitivity tests around the baseline scenario adds to the information provided in the policy scenarios. These sensitivity tests introduce a change or a shock to key underlying assumptions of the baseline scenario i.e. on market interest rates, economic growth, the primary balance and exchange rates (see Graph 3.8 for example). As a novelty with respect to past editions, this report proposes a combined shock on interest rates and growth. Moreover, this report also shows complementary analysis and alternative assumptions on interest rates, together with their effect on debt ratios. In particular, it proposes market expectations as alternative method to project interest rates (see Box 3.2).

Main sensitivity tests

Three sensitivity tests – simulating, respectively, a positive shock to interest rates, a negative shock to GDP growth, and a negative shock to the SPB -are particularly important, since they influence the DSA risk classification. These scenarios determine, alongside other factors, a country's level of risk – see Annex A6. The remainder of deterministic debt projection scenarios constitute additional information useful in qualifying DSA risks, but they do not influence the DSA risk classification.

A standard permanent shock on interest rates on newly and rolled-over debt (-1 / +1 pp.) would impact sizeably government debt dynamics by 2029, with some country differences. Such a shock would lead to a difference between the most favourable and the least favourable scenarios of around 8 – 9 pps. of GDP in 2029 at the aggregate EU-28 / EA level (see Table 3.5). The impact would be particularly large in highly indebted countries such as IT, ES, FR, PT and BE or in countries with shorter maturity structures such as HR and HU. For instance, 1 pp. permanently higher market interest rates would lead to a much higher debt ratio in Italy by 2029 (around +9 pps. of GDP compared to the baseline scenario) and in Spain and France (around +6 pps. of GDP).

Countries' vulnerabilities to interest rate shocks differ, depending on the maturity of government debt. In some countries, the effect of market interest rate shocks on government debt is amplified by the relatively short maturity of government debt (e.g. HU, RO, HR), implying rapid transmission on the implicit interest rate. Other countries, such as CY, PT, the UK or IE where the average maturity of government debt is particularly high, seem less exposed to market interest rate shocks (despite medium to high government debt levels; see also Box 3.4 for more details).

distribution of fiscal balances of all EU countries, history may prove that a certain country is more / less able to sustain stronger fiscal positions.

([46]) The closer the percentile rank of the last forecast SPB of a given country is located to any of the tails of the distribution, the less plausible is the baseline scenario and the more relevant become the results of the SPB historical scenario.

Table 3.5: **Sensitivity tests on interest rates (+1 /-1 pp. on short- and long-term interest rates on newly issues and rolled-over debt) around the baseline no-fiscal policy change scenario, by country**

	End forecast (2020)			2029							
				Baseline no-policy change scenario		Standardized (permanent) positive shock (+1p.p.) to market interest rates			Standardized (permanent) negative shock (-1p.p.) to market interest rates		
	SPB	Implicit interest rate	Debt	Implicit interest rate	Debt	Implicit interest rate	Debt	*Debt (diff. with Baseline scenario)*	Implicit interest rate	Debt	*Debt (diff. with Baseline scenario)*
BE	0,4	2,2	98,7	3,6	99,9	4,4	105,4	5,5	2,8	94,8	-5,1
BG	0,9	3,0	19,5	3,5	12,4	3,9	12,7	0,3	3,1	12,1	-0,3
CZ	1,0	2,5	31,2	3,8	25,8	4,6	27,5	1,8	2,9	24,1	-1,6
DK	1,7	2,9	30,5	3,2	10,8	3,7	11,7	0,9	2,7	10,0	-0,8
DE	1,9	1,5	53,7	3,4	37,3	4,2	40,0	2,7	2,5	34,9	-2,5
EE	-0,8	0,5	7,5	2,7	9,6	3,4	9,8	0,3	2,1	9,3	-0,3
IE	1,0	2,3	56,0	3,6	46,7	4,4	49,6	2,8	2,8	44,1	-2,6
ES	-1,0	2,3	95,4	3,8	107,3	4,6	113,2	5,9	3,0	101,8	-5,5
FR	-0,4	1,9	97,2	3,6	99,8	4,4	105,6	5,9	2,8	94,3	-5,4
HR	1,0	3,2	68,2	4,4	64,3	5,3	69,4	5,1	3,5	59,5	-4,7
IT	0,4	3,1	131,1	4,2	146,5	5,0	155,9	9,4	3,3	137,8	-8,7
CY	2,9	2,4	91,0	3,6	61,9	4,3	65,1	3,2	3,0	58,9	-3,0
LV	-0,5	2,1	35,7	3,5	35,0	4,3	36,7	1,7	2,8	33,4	-1,6
LT	0,3	1,9	37,6	3,5	33,4	4,4	35,5	2,1	2,7	31,4	-2,0
LU	1,1	1,7	20,6	1,8	8,9	1,8	8,9	0,1	1,7	8,8	-0,1
HU	-0,6	3,6	68,6	4,4	68,7	5,3	73,4	4,7	3,6	64,4	-4,3
MT	2,2	3,1	42,1	3,4	17,8	4,0	18,8	1,1	3,0	16,8	-1,0
NL	0,6	1,4	46,9	3,2	38,2	4,0	40,5	2,3	2,4	36,1	-2,1
AT	1,3	2,1	67,8	3,1	51,2	3,7	53,6	2,3	2,5	49,1	-2,2
PL	-0,4	3,1	47,4	4,3	48,0	5,1	50,6	2,6	3,5	45,6	-2,4
PT	2,3	2,8	116,8	4,1	106,7	4,8	112,4	5,7	3,4	101,4	-5,3
RO	-3,1	4,4	38,2	4,8	61,6	5,7	65,2	3,6	3,8	58,3	-3,3
SI	0,6	2,5	62,6	3,8	53,5	4,6	56,3	2,8	3,0	51,0	-2,6
SK	0,5	2,4	44,2	3,1	31,9	3,7	33,0	1,1	2,6	30,9	-1,0
FI	0,2	1,5	57,5	2,6	55,1	3,1	56,9	1,8	2,1	53,5	-1,6
SE	1,3	1,0	33,5	1,3	15,6	1,4	16,0	0,4	1,2	15,2	-0,4
UK	1,2	2,9	82,6	3,7	73,9	4,4	77,6	3,7	3,1	70,5	-3,4
EU-28	**0,7**	**2,2**	**77,5**	**3,6**	**71,8**	**4,3**	**76,0**	**4,2**	**2,8**	**67,9**	**-3,9**
EA	**0,7**	**2,0**	**82,8**	**3,6**	**78,2**	**4,4**	**82,9**	**4,7**	**2,8**	**73,8**	**-4,4**

Source: Commission services.

Table 3.6: **Sensitivity tests on the nominal GDP growth rate (+0.5 / -0.5 pp.) around the baseline no-fiscal policy change scenario, by country**

	End forecast (2020)			Baseline no-policy change scenario		Standardized (permanent) positive shock (+0.5p.p.) on GDP growth			Standardized (permanent) negative shock (-0.5p.p.) on GDP growth		
	SPB	Actual GDP growth	Debt	Actual GDP growth (average 2019-29)	Debt 2029	Actual GDP growth (average 2019-29)	Debt 2029	*Debt (diff. with Baseline scenario)*	Actual GDP growth (average 2019-29)	Debt 2029	*Debt (diff. with Baseline scenario)*
BE	0,4	1,4	98,7	1,1	99,9	1,6	94,8	-5,1	0,6	105,3	5,4
BG	0,9	3,6	19,5	2,1	12,4	2,6	11,6	-0,8	1,6	13,3	0,9
CZ	1,0	2,6	31,2	2,0	25,8	2,5	24,3	-1,4	1,5	27,3	1,5
DK	1,7	1,6	30,5	1,4	10,8	1,9	9,6	-1,2	0,9	12,2	1,3
DE	1,9	1,7	53,7	1,3	37,3	1,8	34,9	-2,4	0,8	39,9	2,5
EE	-0,8	2,6	7,5	2,1	9,6	2,6	9,2	-0,4	1,6	9,9	0,4
IE	1,0	3,8	56,0	2,8	46,7	3,3	44,3	-2,4	2,3	49,3	2,6
ES	-1,0	2,0	95,4	1,1	107,3	1,6	102,0	-5,3	0,6	112,9	5,6
FR	-0,4	1,6	97,2	1,1	99,8	1,6	94,7	-5,1	0,6	105,1	5,4
HR	1,0	2,6	68,2	1,2	64,3	1,7	60,5	-3,7	0,7	68,2	4,0
IT	0,4	1,3	131,1	0,6	146,5	1,1	138,8	-7,7	0,1	154,7	8,2
CY	2,9	2,9	91,0	1,3	61,9	1,8	57,5	-4,3	0,8	66,5	4,6
LV	-0,5	2,9	35,7	2,3	35,0	2,8	33,3	-1,7	1,8	36,7	1,8
LT	0,3	2,5	37,6	1,8	33,4	2,3	31,7	-1,7	1,3	35,1	1,8
LU	1,1	2,7	20,6	2,3	8,9	2,8	8,2	-0,7	1,8	9,6	0,7
HU	-0,6	2,6	68,6	2,4	68,7	2,9	65,2	-3,5	1,9	72,4	3,7
MT	2,2	4,4	42,1	3,7	17,8	4,2	16,3	-1,5	3,2	19,3	1,6
NL	0,6	1,8	46,9	1,2	38,2	1,7	36,0	-2,2	0,7	40,6	2,3
AT	1,3	1,8	67,8	1,7	51,2	2,2	48,2	-3,0	1,2	54,5	3,2
PL	-0,4	3,3	47,4	2,9	48,0	3,4	45,8	-2,3	2,4	50,5	2,4
PT	2,3	1,7	116,8	0,9	106,7	1,4	100,4	-6,3	0,4	113,4	6,7
RO	-3,1	3,6	38,2	3,3	61,6	3,8	59,3	-2,3	2,8	64,0	2,4
SI	0,6	3,0	62,6	2,8	53,5	3,3	50,8	-2,7	2,3	56,4	2,9
SK	0,5	3,5	44,2	3,0	31,9	3,5	30,1	-1,8	2,5	33,9	1,9
FI	0,2	1,9	57,5	1,2	55,1	1,7	52,3	-2,8	0,7	58,1	2,9
SE	1,3	1,8	33,5	1,8	15,6	2,3	14,3	-1,2	1,3	16,9	1,3
UK	1,2	1,2	82,6	1,4	73,9	1,9	69,8	-4,1	0,9	78,3	4,4
EU-28	**0,7**	**1,8**	**77,5**	**1,4**	**71,8**	**1,9**	**67,9**	**-3,9**	**0,9**	**76,0**	**4,1**
EA	**0,7**	**1,7**	**82,8**	**1,2**	**78,2**	**1,7**	**73,9**	**-4,2**	**0,7**	**82,6**	**4,5**

Source: Commission services.

Similarly, a permanent shock on nominal GDP growth would have large effects on debt ratios. The gap between the two extreme standard scenarios (-0.5 / +0.5 pp.) would reach 8 – 9 pps. of GDP in the EU-28 / EA by 2029, with larger effects in highly indebted countries (e.g. IT, PT, ES, BE, FR and CY; see Table 3.6).

A mild 'fiscal fatigue' scenario ([47]) would increase the debt ratio compared to the baseline scenario by around 2 ½ - 3 pps. of GDP in the EU-28 / EA by 2029 (see Table 3.7). In this case, the negative effect of a looser fiscal position on government debt compared to the baseline scenario would be partly compensated by some positive feedback effects on growth. Larger gaps found in CY, IT, RO and HR are explained by the design of the scenario (the structural primary balance drops by 50% of the forecast SPB cumulated change).

([47]) This scenario assumes a negative shock on the SPB equivalent to cutting in half the SPB cumulated change in the two forecast years.

Table 3.7: **Sensitivity test on the structural primary balance around the baseline no-fiscal policy change scenario (negative shock equivalent to a SPB reduction by 50% of the forecasted SPB cumulated change), by country**

	End forecast (2020)		2029				
			Baseline no-policy change scenario		Standardized negative (permanent) shock on SPB (reduced by 50% of forecasted cumulated SPB change)		
	SPB	Debt	SPB	Debt	SPB	Debt	*Debt (diff. with Baseline scenario)*
BE	0,4	98,7	0,4	99,9	0,0	103,3	3,4
BG	0,9	19,5	0,9	12,4	0,6	15,2	2,8
CZ	1,0	31,2	1,0	25,8	0,6	28,9	3,1
DK	1,7	30,5	1,7	10,8	1,7	11,9	1,0
DE	1,9	53,7	1,9	37,3	1,7	39,5	2,1
EE	-0,8	7,5	-0,8	9,6	-0,9	10,0	0,4
IE	1,0	56,0	1,0	46,7	0,8	48,4	1,6
ES	-1,0	95,4	-1,0	107,3	-1,1	108,6	1,3
FR	-0,4	97,2	-0,4	99,8	-0,5	101,2	1,4
HR	1,0	68,2	1,0	64,3	0,6	68,9	4,6
IT	0,4	131,1	0,4	146,5	-0,3	153,5	7,0
CY	2,9	91,0	2,9	61,9	2,2	69,2	7,3
LV	-0,5	35,7	-0,5	35,0	-0,7	37,4	2,5
LT	0,3	37,6	0,3	33,4	0,3	33,7	0,4
LU	1,1	20,6	1,1	8,9	0,8	11,6	2,8
HU	-0,6	68,6	-0,6	68,7	-0,9	72,2	3,5
MT	2,2	42,1	2,2	17,8	2,0	19,2	1,4
NL	0,6	46,9	0,6	38,2	0,3	40,5	2,3
AT	1,3	67,8	1,3	51,2	1,0	53,5	2,3
PL	-0,4	47,4	-0,4	48,0	-0,5	48,3	0,3
PT	2,3	116,8	2,3	106,7	2,1	108,2	1,5
RO	-3,1	38,2	-3,1	61,6	-3,6	67,8	6,2
SI	0,6	62,6	0,6	53,5	0,2	56,4	2,9
SK	0,5	44,2	0,5	31,9	0,4	32,2	0,2
FI	0,2	57,5	0,2	55,1	0,1	56,0	0,9
SE	1,3	33,5	1,3	15,6	1,2	16,3	0,7
UK	1,2	82,6	1,2	73,9	1,0	76,5	2,7
EU-28	**0,7**	**77,5**	**0,7**	**71,8**	**0,4**	**74,4**	**2,6**
EA	**0,7**	**82,8**	**0,7**	**78,2**	**0,4**	**80,9**	**2,7**

(1) In this sensitivity test, a feedback effect on growth is included.
Source: Commission services.

Indeed, in these countries, Commission forecasts show a high variation in the SPB over the period 2018-20 (further fiscal *deconsolidation* compared to already loose fiscal positions in Italy and Romania; lower fiscal *consolidation* in Cyprus and Croatia).

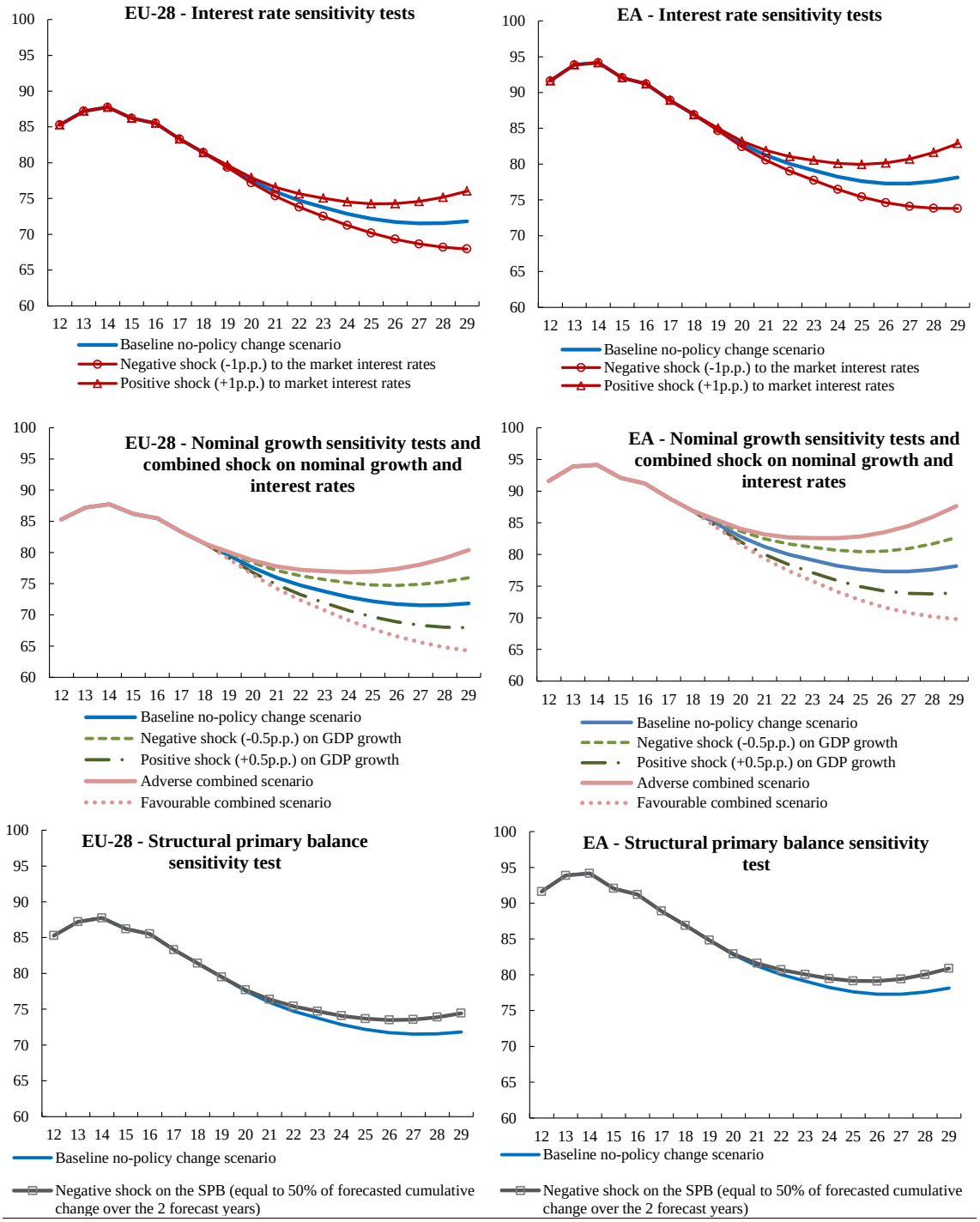
Additional sensitivity tests

A new scenario, the dual stress test of a +1/-1 pp. shock on short- and long-term interest rates coupled with, respectively, a -0.5/+0.5 pps. shock on nominal GDP growth for the adverse / favourable scenario is added in this report. This scenario shows the largest effects on debt ratios in 2029. When considering such simultaneous changes in economic conditions, the gap between the debt ratios in the two extreme scenarios – adverse combined and favourable combined – would widen to as much as 16 - 18 pps of GDP in the EU-28 / EA by 2029 (see Graph 3.8).

Several EU sovereigns are also exposed to foreign exchange risks. As several EU countries issue a non-negligible share of their government debt in a foreign currency (see chapter 5), exchange rate fluctuations may cause some fiscal risks in particular in countries with a floating exchange rate regime. Therefore, a sensitivity shock on the nominal exchange rate is also computed, with substantial effects in a number of countries (see country fiches in Volume 2 of this report and Box 2.2 of the Debt Sustainability Monitor 2016 for more details).

Finally, enhanced scenarios on interest rates and growth are presented in the country-specific analysis (see FSR 2018 volume 2).

Graph 3.8: **Sensitivity tests around the baseline scenario on interest rates, nominal GDP growth and the structural primary balance, EU 28 and EA (% of GDP)**



Source: Commission services.

Table 3.8: **Gross government debt projections and underlying structural fiscal efforts (% of GDP) under baseline no-fiscal policy change and SGP scenarios, by country**

	End forecast (2020)			Baseline scenario	SGP scenario						
	Structural balance	Structural primary balance	Debt	Debt 2029	Debt 2029	AVG 20-29 SPB (1)	AVG 20-29 SPB percentile rank (1)	AVG 20-29 change in SPB percentile rank (2)	Structural balance 2018	MTO	MTO reached in
BE	-1,7	0,4	98,7	99,9	75,5	2,2	23%	45%	-2,3	0,0	2022
BG	0,3	0,9	19,5	12,4	10,2	0,9	42%	55%	0,3	-1,0	2019
CZ	0,2	1,0	31,2	25,8	20,0	1,0	40%	55%	0,9	-1,0	2019
DK	0,8	1,7	30,5	10,8	15,9	1,6	30%	55%	0,1	-0,5	2019
DE	1,1	1,9	53,7	37,3	32,8	1,9	25%	53%	0,7	-0,5	2019
EE	-0,9	-0,8	7,5	9,6	8,1	-0,4	66%	51%	-0,7	-0,5	2020
IE	-0,3	1,0	56,0	46,7	40,9	0,8	43%	54%	-1,0	-0,5	2019
ES	-3,1	-1,0	95,4	107,3	76,7	2,0	24%	35%	-3,3	0,0	2024
FR	-2,2	-0,4	97,2	99,8	79,0	1,6	30%	39%	-2,7	-0,4	2023
HR	-1,1	1,0	68,2	64,3	57,9	1,6	30%	52%	-0,7	-1,75	2019
IT	-3,5	0,4	131,1	146,5	111,2	3,6	12%	35%	-1,5	0,0	2024
CY	0,7	2,9	91,0	61,9	59,4	3,3	14%	56%	1,3	0,0	2019
LV	-1,2	-0,5	35,7	35,0	32,0	-0,2	62%	47%	0,0	-1,0	2021
LT	-0,4	0,3	37,6	33,4	30,5	0,3	53%	52%	-0,4	-1,0	2019
LU	0,8	1,1	20,6	8,9	5,4	1,3	34%	55%	1,4	-0,5	2019
HU	-3,0	-0,6	68,6	68,7	57,7	0,7	44%	44%	-1,8	-1,5	2022
MT	0,9	2,2	42,1	17,8	18,9	1,9	25%	57%	0,3	0,0	2019
NL	-0,1	0,6	46,9	38,2	37,3	0,6	47%	52%	0,5	-0,5	2019
AT	-0,2	1,3	67,8	51,2	52,5	1,0	39%	52%	-1,1	-0,5	2019
PL	-1,8	-0,4	47,4	48,0	37,6	0,4	50%	48%	-1,9	-1,0	2021
PT	-1,0	2,3	116,8	106,7	90,4	3,6	12%	46%	-2,1	0,25	2021
RO	-4,6	-3,1	38,2	61,6	32,6	0,0	58%	40%	-2,2	-1,0	2024
SI	-1,0	0,6	62,6	53,5	38,1	1,6	30%	50%	-1,0	0,25	2021
SK	-0,6	0,5	44,2	31,9	31,9	0,5	49%	53%	-2,1	-0,5	2020
FI	-0,7	0,2	57,5	55,1	47,6	0,4	50%	51%	-0,5	-0,5	2020
SE	1,0	1,3	33,5	15,6	16,8	1,2	35%	53%	0,8	-1,0	2019
UK	-1,1	1,2	82,6	73,9	66,6	1,6	30%	50%	-3,4	-0,75	2020
EU-28	**-1,1**	**0,7**	**77,5**	**71,8**	**58,8**	**1,8**	**27%**	**46%**	**-1,3**	**:**	**:**
EA	**-1,1**	**0,7**	**82,8**	**78,2**	**62,8**	**2,0**	**24%**	**45%**	**-1,0**	**:**	**:**

Source: Commission services.

3.1.1.3. The Stability and Growth Pact (SGP) scenario

Under the Stability and Growth Pact scenario, countries are assumed to comply with the main provisions of European fiscal rules. In this scenario, fiscal policy is projected during and beyond the forecast horizon. The scenario assumes strict compliance with respectively i) preventive arm provisions and ii) and EDP (Excessive Deficit Procedure) recommendations for countries under the corrective arm of the SGP. Regarding the former, the structural balance is supposed to converge to its Medium-Term Objective (MTO), following the adjustment path required by the 'matrix of requirements of the preventive arm' as defined in the European Commission 2015 Communication ([48]) and in the 'Commonly agreed position on Flexibility' endorsed by the ECOFIN ([49]), ([50]). Moreover, as done in previous reports, this scenario is run by taking into account a feedback effect of fiscal consolidation on GDP growth (a 1 pp. of GDP consolidation effort

([48]) See at the following link: http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/2015-01-13_communication_sgp_flexibility_guidelines_en.pdf.

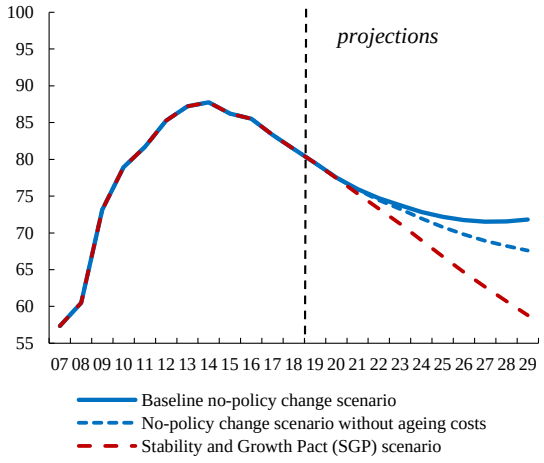
([49]) The "Commonly agreed position on Flexibility" was endorsed by the ECOFIN Council of 12 February 2016 (Council document number 14345/15, available at http://data.consilium.europa.eu/doc/document/ST-14345-2015-INIT/en/pdf).

([50]) The SGP scenario does not take into account the possible further granting of flexibility (on top of the one granted in the context of the European Semester) to temporarily deviate from the MTO or adjustment path towards it, under the structural reform and / or investment clause. Furthermore, the scenario only mirrors compliance with the adjustment path towards the MTO and does not explicitly incorporate the debt criterion. Nevertheless, one should keep in mind that in general, though not always, under normal economic circumstances, the convergence to the MTO under the preventive arm tends to imply the respect of the debt criterion.

impacting negatively on baseline GDP growth by 0.75 pps. in the same year ([51]).

Adhering to European fiscal rules would allow gross government debt ratios to drop more significantly than under a no-fiscal policy change assumption. The debt ratio would fall right below 60% of GDP in the EU-28 in 2029 (around 63% of GDP in the EA), a level about 13 pps. of GDP lower than in the baseline scenario (see Graphs 3.9 - 3.10). This substantial debt reduction compared to current levels would be achieved only through a large and sustained fiscal consolidation, with an average structural primary balance of 1.8% of GDP in the EU-28 (2% of GDP in the EA) during the period 2020-29. This level is relatively ambitious by EU historical standards, although not unprecedented (with only one quarter of outturn SPBs standing above this value (see Table 3.8).

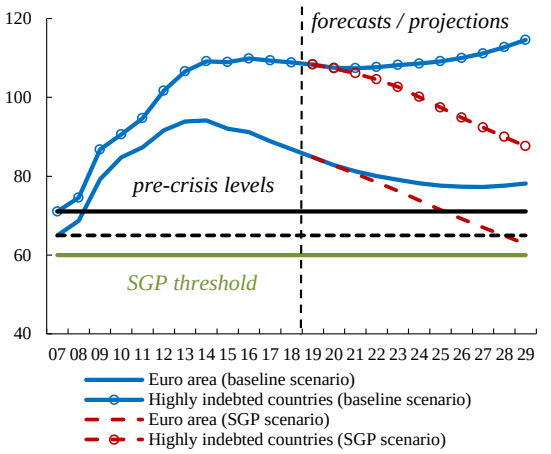
Graph 3.9: **Gross government debt projections (% of GDP), baseline no-fiscal policy change and SGP scenarios, European Union 28**



Source: Commission services.

([51]) See Annex A5 for more details on this scenario.

Graph 3.10: **Gross government debt projections (% of GDP), baseline no-fiscal policy change and SGP scenarios, Euro area and highly indebted EA countries ***



(1) (*) Highly indebted EA countries were considered to be those with debt ratios above 90% of GDP in 2018, except EL, that is: BE, ES, FR, IT, CY and PT.
Source: Commission services.

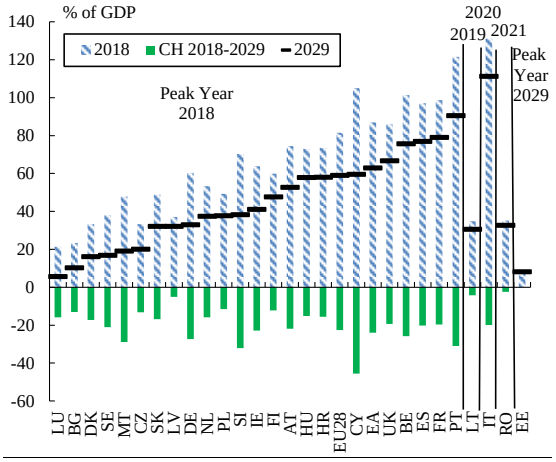
Government debt ratios would decrease in all Member States under the SGP scenario, with a strong decline in certain cases. Particularly large reductions are projected in SI, PT, and BE (by around – 25 pps. of GDP or more by 2029). The smallest decreases are foreseen in Romania and Latvia in line with low levels of government debt in 2018 (see Graph 3.11). More generally, a strong (negative), correlation between the initial level of debt and the required fiscal consolidation under the SGP scenario is observed, as can be expected ([52]).

At the same time, even in this case of strict compliance with SGP rules, government debt reduction would be sluggish in some countries, with debt burdens still high by 2029. Despite the assumed fiscal consolidation and decreasing debt ratios, government debt burdens would still linger at above 90% of GDP on average in 2029 in some highly indebted Member States (Italy and Portugal) and above 70% of GDP in others (e.g. France, Spain and Belgium see Graph 3.11). These still high levels reflect crisis legacies, the assumed

([52]) This correlation is not perfect, however, since other factors are taken into account when defining the required fiscal adjustment (such as cyclical conditions in the definition of the MTO path or future ageing costs in the calculation of the MTO level).

'normalisation' of interest rates and some negative feedback effects on growth in this scenario ([53]).

Graph 3.11: **Gross government debt projections (% of GDP) under the SGP scenario, by country**



Source: Commission services.

The sustained fiscal consolidation implied in the SGP scenario would constitute a remarkable departure from historical patterns in a number of countries ([54]). This is particularly the case of IT, RO, ES, FR, BE where the required fiscal position would be both substantially higher than the country-specific baseline scenario SPB forecast for 2020 (see Table 3.8) and the 'country-specific historical averages' (see Table 3.4). For instance, in Portugal and Italy, the required SPB of 3.6% of GDP under the SGP scenario is associated to a percentile rank of 12%, that is a rather ambitious level by EU historical standards. In the UK, France and Croatia, the lower value of 1.6% of GDP required under the SGP scenario, more plausible by EU standards (a percentile rank of 30%), appears nevertheless ambitious compared with these countries' track-records. The degree of ambition of the SGP scenario, in terms of change of the fiscal balance, is also important for other countries where the fiscal consolidation assumed thereby is large over time (i.e. countries with an important change in the 2020-29 SPB percentile rank) e.g. in Spain, France and Romania (see Table 3.8).

3.1.1.4. The Stability and Convergence Programme (SCP) scenario

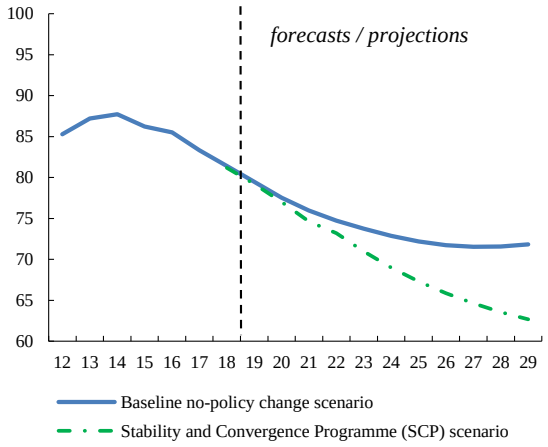
Debt projections based on Member States' April 2018 round of Stability and Convergence Programmes constitute specific policy scenarios. Economic governance rules under the Stability and Growth Pact require Member States to lay out in the SCPs their fiscal plans for the next *three years*. These programmes are updated once a year and submitted to the Commission and the Council (ECOFIN) in spring. In the SCP scenario, the baseline no-fiscal policy change assumptions apply beyond the programme and plan horizon.

The implementation of Stability and Convergence Programmes would lead to a substantial decline in debt ratios, but this outcome would fall short of the results projected under the SGP scenario. According to the SCPs submitted in April 2018 by Member States, and assuming no-fiscal policy change after the programme horizon, the government debt ratio would substantially decline by 2029 in the EU-28 and the EA (by around 19 and 21 pps. of GDP, respectively, see Graphs 3.12 - 3.13). In 2029, the debt ratio would reach around 63% of GDP in the EU-28 (respectively 66% of GDP in the EA), a level significantly lower than under the baseline scenario, by around 9 pps. of GDP (12 pps. of GDP for the EA). On the other hand, the projected government debt ratio in 2029 appears higher than the one projected in the SGP scenario (see section 3.1.1.3). Thus, overall, EU countries' consolidation plans embedded in the SCPs appear more ambitious than their current policies, but still fall short of the results (debt ratios) achievable in case of full compliance with the SGP rules.

([53]) In a limited number of countries, projected debt ratios under the SGP scenario are slightly higher than under the baseline scenario, e.g. in DK in line with decreasing costs of ageing over the projection horizon. More explanations can be found in the Annex A5.

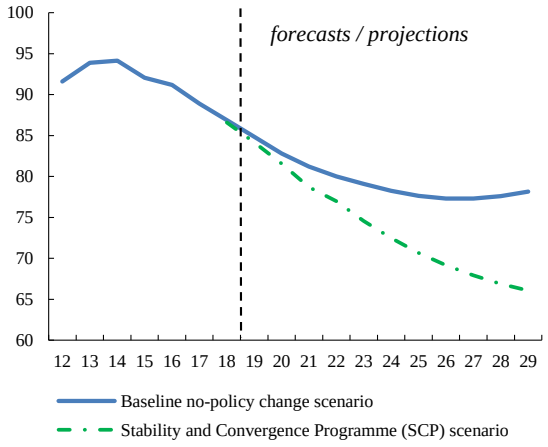
([54]) Past debt reduction episodes show that key ingredients to successful government debt reduction were large sustained primary surpluses, an improving (external) growth environment, and mobilisation of different policy levers such as accommodative monetary policy and structural reforms (see for details Box 2.3 in the DSM 2017).

Graph 3.12: **Gross government debt ratio (% of GDP), European Union 28 - baseline no-fiscal policy change and SCP scenarios**



(1) The SCP scenario is based, beyond the programme horizon, on Commission Spring 2017 assumptions.
Source: Commission services.

Graph 3.13: **Gross government debt ratio (% of GDP), Euro area - baseline no-fiscal policy change and SCP scenarios**

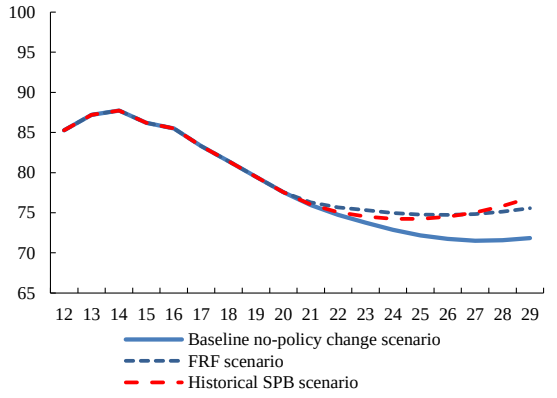


(1) The SCP scenario is based, beyond the programme horizon, on Commission Spring 2017 assumptions.
Source: Commission services.

3.1.1.5. Debt projections based on estimated fiscal reaction functions

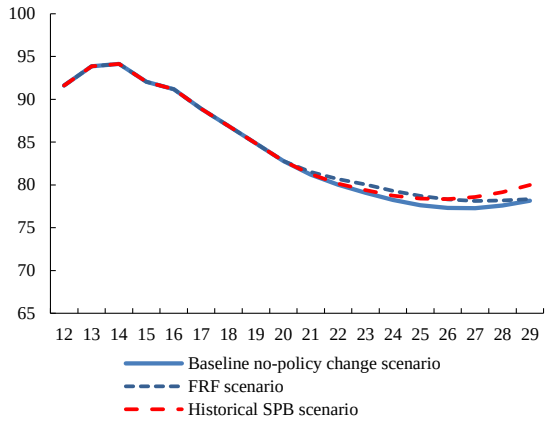
This section reports simulations based on behavioural fiscal reaction functions as an alternative scenario to the standard baseline no-fiscal policy change scenario. Unprecedented high levels of government debt both at EU and OECD levels since WWII have inspired a growing literature about governments' responsiveness to raising government debt. For instance, Bohn's (1998) seminal paper, revisited more recently by Gosh *et al* (2011), proposed to estimate fiscal reaction functions (henceforth FRFs) as a prerequisite for assessing fiscal sustainability. Under this FRF scenario, fiscal policy is supposed to react, over the projection period, to the debt ratio in the previous period and to macroeconomic conditions (i.e. output gap, real interest rate, inflation) ([55]).

Graph 3.14: **Gross government debt ratio (% of GDP), fiscal reaction function scenario compared to the baseline and historical SPB scenarios, European Union 28**



Source: Commission services.

Graph 3.15: **Gross government debt ratio (% of GDP), fiscal reaction function scenario compared to the baseline and historical SPB scenarios, Euro area**



Source: Commission services.

([55]) See the FSR 2015 and Berti et al. (2016) for the behavioural equations used and additional information on this scenario.

Table 3.9: **Comparison of the Fiscal Sustainability Report (FSR) 2018 with the Debt Sustainability Monitor (DSM) 2017 (each based on the respective Autumn forecasts), baseline and SGP scenarios (all variables in differences between FSR 2018 - DSM 2017)**

	End forecast (t+2)			Baseline scenario Debt			SGP scenario					
	Structural balance	Structural primary balance	Debt	t+3	t+5	End projection	Debt end projection	AVG projection period SPB	AVG SPB percentile rank	Structural balance last outturn year	MTO	MTO reached in
BE	0,0	-0,1	-2,5	-2,1	-0,9	5,1	-0,6	0,0	0%	-0,1	0,0	0
BG	0,3	0,1	-3,3	-3,4	-3,4	-1,4	-6,9	0,3	-5%	0,2	0,0	0
CZ	0,1	0,1	-1,4	-1,4	-1,3	-0,2	0,3	-0,1	4%	0,2	0,0	0
DK	1,5	1,5	-4,1	-5,2	-7,0	-13,3	-13,1	1,2	-19%	-0,1	0,0	-1
DE	0,1	-0,2	-4,2	-4,3	-4,2	-3,2	-3,6	-0,1	1%	-0,2	0,0	0
EE	0,6	0,6	-1,6	-2,4	-4,0	-9,8	-0,8	0,0	2%	-0,3	0,0	-1
IE	-0,6	-1,0	-11,2	-10,4	-7,9	-1,5	-8,0	-0,3	7%	0,8	0,0	0
ES	-0,2	-0,2	0,0	0,2	1,8	12,2	2,5	-0,2	2%	0,0	0,0	1
FR	0,8	0,9	0,4	-0,4	-1,4	-6,0	-0,4	0,3	-3%	-0,1	0,0	0
HR	0,9	0,6	-6,3	-6,7	-7,8	-10,7	-13,1	0,6	-9%	0,3	0,0	-1
IT	-1,2	-0,8	1,1	2,3	5,1	16,6	3,4	0,1	-2%	0,2	0,0	1
CY	0,8	0,9	-2,8	-3,6	-3,9	-6,3	-9,3	1,1	-8%	0,2	0,0	0
LV	0,4	0,4	0,0	0,0	-0,1	1,1	3,0	0,1	1%	0,6	0,0	0
LT	0,4	0,3	-1,3	-1,9	-4,1	-15,4	-5,1	0,1	-1%	-0,2	0,0	0
LU	0,4	0,5	-2,3	-2,7	-3,6	-7,6	-7,1	0,8	-13%	-0,6	0,0	0
HU	0,5	0,4	-0,8	-1,2	-1,8	-1,2	-0,9	-0,1	3%	0,1	0,0	0
MT	0,5	0,2	-6,7	-6,6	-7,5	-11,5	-10,2	0,5	-6%	-0,5	0,0	0
NL	0,1	0,0	-4,6	-4,1	-3,0	-0,4	-2,6	-0,1	5%	-0,4	0,0	0
AT	0,7	0,5	-5,6	-6,2	-7,2	-10,5	-3,7	-0,2	4%	-0,1	0,0	-1
PL	0,6	0,6	-5,6	-6,3	-7,6	-11,9	-5,6	-0,1	3%	-0,4	0,0	-1
PT	0,9	0,7	-4,4	-5,4	-6,3	-7,8	-4,8	-0,1	0%	-0,1	0,0	-2
RO	0,0	-0,1	-2,3	-2,0	-2,2	-3,2	-4,2	0,2	-2%	-0,2	0,0	-2
SI	0,4	0,2	-9,4	-10,2	-11,3	-11,4	-8,8	-0,3	4%	0,4	0,0	-1
SK	0,0	-0,2	-3,0	-3,2	-3,2	-3,2	-2,3	-0,1	3%	-0,1	0,0	-1
FI	0,7	0,6	-4,0	-4,8	-6,4	-12,8	-3,1	-0,2	6%	-0,2	0,0	-1
SE	0,3	0,4	-1,0	-1,0	-1,5	-4,8	-2,6	0,1	-1%	-0,4	0,0	0
UK	0,4	0,3	-1,6	-2,0	-2,8	-6,5	-1,8	0,0	1%	-0,1	0,0	-2
EU-28	**0,2**	**0,1**	**-2,3**	**-2,4**	**-2,3**	**-1,6**	**-1,8**	**0,0**	**0%**	**-0,1**	:	:
EA	**0,0**	**0,0**	**-2,4**	**-2,4**	**-2,0**	**0,2**	**-1,4**	**0,0**	**-1%**	**-0,1**	:	:

Source: Commission services.

Debt projections based on behavioural fiscal reaction functions are broadly in line with the baseline scenario and the 'mechanical' historical SPB scenario. Taking into account government primary balance reaction to changes in government debt (and macroeconomic conditions) would lead to a higher level of government debt ratio for EU-28 in 2029 compared to the baseline scenario (by nearly 4 pps. of GDP), but would stay very close to the outcome of the historical SPB scenario; at EA level the gaps between the FRF scenario and the baseline or the historical SPB scenarios would be negligible; see Graphs 3.14 - 3.15. Indeed, projected SPB under the FRF scenario would be virtually identical to those assumed under the baseline or historical SPB scenario over the period 2021-2029 (a difference of around - 0.4 / 0.0 pp. of GDP on average for the EU-28 / EA, respectively between the FRF and the baseline scenario and a difference of 0.2 pp. of GDP on average for the EU-28 / EA between the FRF and the historical scenario scenario).

Country-specific results are presented in the statistical country fiches presented in Volume 2 of this report.

3.1.1.6. Baseline and the SGP scenarios' results comparison with the DSM 2017

This round of projections shows a more favourable fiscal outlook in the short term compared to the Debt Sustainability Monitor 2017. The structural primary balance at the end of the forecast period appears overall slightly higher with this Autumn 2018 Commission forecast compared to the previous round of forecasts (difference of +0.1 pp. of GDP at the EU-28 level, while at EA level the SPB remains unchanged with respect to last round; see Table 3.9). This slightly more positive fiscal position (that would be observed in 18 countries) would be particularly important in DK, CY, FR, PT, FI, PL, HR and EE (+1.5 to +0.6 pps. of GDP difference). On the other hand, IE, IT, ES, SK and DE are expected to have less favourable fiscal positions compared to

Autumn 2017 forecast (-1.0 to -0.2 pps. of GDP). Except in Italy and France, end-forecast government debt ratios are expected to be lower or stable in all EU-28 compared to the DSM 2017 (by around -2 pps. of GDP at the EU-28 / EA level). In Italy and France the debt ratio is now 1.1 and 0.4 pps. of GDP, respectively, higher in the end-forecast year compared to the DSM 2017. The more favourable aggregate fiscal outlook reflects the economic growth that continued to strengthen over the past year, although at a less dynamic pace compared to 2017.

Lower debt ratios are projected in 2029 both in the baseline and the SGP scenarios compared to a year ago. In the baseline scenario, government debt ratios are expected to reach moderately lower levels by the end of the projection period compared to the trends foreseen in the DSM 2017 (a difference of around -1.6 pps. of GDP at the EU-28 level). A few notable exceptions exist, namely IT, ES and BE where end-of-projections debt ratios are higher than projected in the DSM 2017, by values between 5.0 and 16.6 pps of GDP, driving the EA debt ratio at the end of projections to marginally increase with respect to the DSM 2017, by 0.2 pps. of GDP. Under the SGP scenario, government debt ratios are also expected to reach in most countries lower values compared to the DSM 2017 (-1.8 pps. of GDP on average for the EU-28) see Table 3.9. In this case, this revision mainly reflects lower initial debt values, as the overall projected fiscal balance is overall similar to last year (measured in terms of structural primary balance).

3.1.2. Stochastic debt projections

Stochastic projections complement the more traditional deterministic government debt projections by featuring the uncertainty of macroeconomic and fiscal conditions in the analysis of debt dynamics in a comprehensive way. Stochastic projections produce a distribution of debt paths, corresponding to a wide set of possible underlying macroeconomic conditions, obtained by applying shocks to macroeconomic and fiscal variables (government primary balance, interest rates, economic growth and exchange rate) ([56]) to a central scenario (here the deterministic baseline no-fiscal policy change scenario). Hence, stochastic projections capture in a more comprehensive way than standard deterministic projection uncertainties in macroeconomic conditions. The advantages of this approach are three-fold: i) running a very large number of sensitivity tests; ii) calibrating the shocks so that they reflect past observed uncertainty (country-specific volatility); iii) capturing the correlation between the different variables (country-specific correlation) ([57]) .

Results presented in the form of fan charts allow grasping the minimum and maximum levels of government debt ratios that would be reached under a large range of macroeconomic conditions. Stochastic projection results are generally presented in the form of fan charts, featuring the cone of the debt-to-GDP ratio distribution over the 5-year projection horizon. In the fan charts, the projected debt path under the central scenario (around which shocks apply) and the median of the debt ratio distribution are reported respectively (as a dashed and a solid black line at the centre of the cone) (see Graphs 3.16 and 3.17). The cone covers 80% of all possible debt paths obtained by simulating 2000 shocks to primary balance, nominal growth, interest rates and exchange rate (the lower and upper lines delimiting the cone represent respectively the 10th and the 90th distribution percentiles), thus excluding from the shaded area simulated debt paths (20% of the whole) that result from more extreme shocks, or "tail events". The differently shaded areas within the cone represent different portions of the distribution of possible debt paths. The dark blue area (delimited by the 40th and the 60th percentiles) includes the 20% of all possible debt paths that are closer to the central scenario.

In this new edition of the FSR, asymmetric fan charts are introduced, together with the standard symmetric ones. In symmetric fan charts, upside and downside risks are treated as equally likely, while in the asymmetric ones, a higher likelihood is assumed for negative primary balances. More specifically, the asymmetric fan

([56]) Shocks to the exchange rate are simulated only for non-EA countries, for which the share of public debt denominated in foreign currency can be significant.

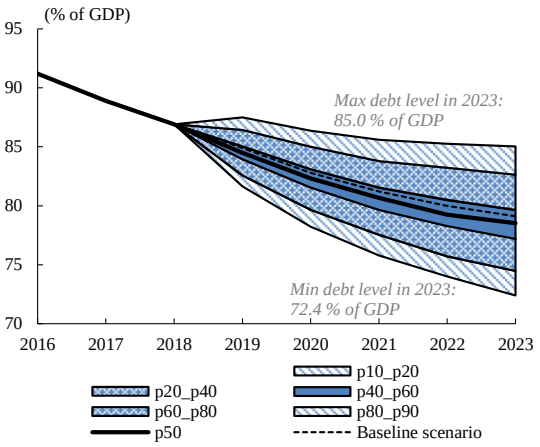
([57]) See Berti (2013) and Annex 4 for more details on the methodology used.

charts show the distribution of the projected debt paths by restricting the distribution of the primary balance upside shocks ([58]). This maximum positive shock to the primary balances aims at better capturing the risk associated with an environment of lower primary balances, given the assumed relatively high primary balance of several countries in the central scenario.

When taking into account a large range of temporary shocks to macro-financial and fiscal variables, the EA government debt ratio in the symmetric debt projections is found to have a high probability to decline in the next 5 years. From around 86.9% of GDP in 2018, the EA debt ratio is projected to lie between around 72.4% and 85.0% of GDP in 2023 with an 80% probability (see Graph 3.16). In terms of debt dynamics, the probability that the EA debt ratio would rise in 2019 is low (10%). The debt ratio would decline afterwards with an 80% probability. Therefore, the probability that the EA government debt ratio would be higher in 2023 than its current level is very small (around 5%; see Table 3.10). By increasing the likelihood of more adverse developments in the primary balance than in the stochastic symmetric debt projections, the EA debt ratio would be slightly higher, ranging from 75.2% to 86.1% of GDP in 2023 with an 80% probability (see Graph 3.17). The probability that the EA government debt ratio would be higher in 2023 than its current level remains very small (around 7%). In both symmetric and asymmetric projections, the relatively low probability of higher EA government debt in 2023 than its current level reflects a probability of a debt decrease of more than 90% over the next five years in several countries, such as Germany, Netherlands, Malta, Slovenia and of more than 60% in some of the highly indebted countries, such as Belgium, France and Portugal.

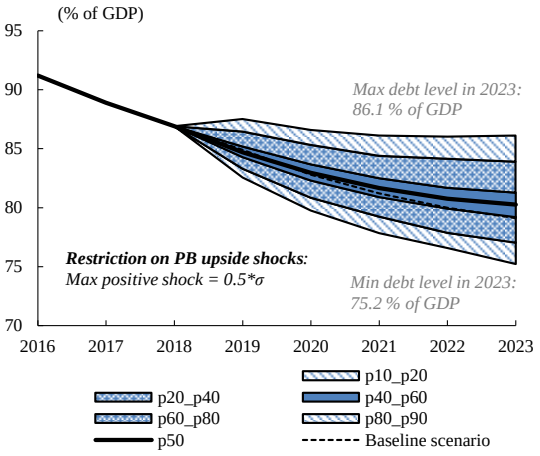
([58]) The restriction on the primary balance upside shocks is defined as one half standard deviation of the primary balance sample. As a result, the cone of the fan chart shifts asymmetrically upwards compared to the symmetric fan charts.

Graph 3.16: **Gross public debt (% of GDP) from symmetric stochastic projections (2018 - 23), Euro area**



Source: Commission services.

Graph 3.17: **Gross public debt (% of GDP) from asymmetric stochastic projections (2018 - 23), Euro area**



Source: Commission services.

Cross-country differences in terms of projections' distribution reflect underlying heterogeneity of Member States business cycles. In countries such as Sweden, France, Netherlands and Germany, the distance between the upper and the lower tails of the debt ratio distribution is relatively limited (a difference below 16 pps. of GDP). For instance, in Sweden, the debt ratio is projected to lie between 22% and 33% of GDP with an 80% probability. On the other hand, in countries such as CY, PT, HR, HU and RO, a higher volatility of macro-financial and fiscal conditions lead to much wider debt distribution cones (of around 35 to 42 pps. of GDP). In Cyprus for example, the interval between the 10th and the

Table 3.10: **Stochastic debt projections results by Member State (% of GDP)**

Country	Debt ratio in 2018	Median debt ratio in 2023	10th percentile of debt ratio distribution in 2023	90th percentile of debt ratio distribution in 2023	Diff. btw. percentiles 90th and 10th of debt ratio distribution in 2023	Probability of debt ratio in 2023 greater than in 2018, symmetric (%)	Probability of debt ratio in 2023 greater than in 2018, asymmetric (%)
BE	101.4	95.6	82.2	110.2	28.1	31	49
BG	23.3	16.3	1.8	31.4	29.6	29	46
CZ	33.2	26.5	14.5	37.9	23.4	23	41
DK	33.3	23.9	15.6	32.7	17.1	8	13
DE	60.1	45.8	38.6	53.7	15.0	1	1
EE	8.0	7.5	6.2	9.1	3.0	32	32
IE	63.9	50.8	38.3	66.2	27.9	15	18
ES	96.9	97.4	89.2	106.8	17.6	54	73
FR	98.7	96.2	89.6	103.5	13.9	34	45
HR	73.5	68.2	50.9	91.7	40.8	36	36
IT	131.1	133.6	121.2	146.6	25.3	59	82
CY	105.0	83.3	63.5	105.7	42.2	10	17
LV	37.1	34.6	21.8	50.5	28.8	41	60
LT	34.8	32.1	20.3	49.3	29.0	40	54
LU	21.4	13.9	4.7	24.0	19.3	17	28
HU	72.9	67.5	47.5	88.3	40.8	36	56
MT	47.9	31.7	18.7	46.2	27.5	8	12
NL	53.2	43.4	36.3	51.0	14.7	5	7
AT	74.5	61.4	49.1	75.4	26.3	12	19
PL	49.2	44.7	36.4	53.2	16.8	25	39
PT	121.5	109.5	90.2	131.9	41.7	26	41
RO	35.1	45.6	28.9	64.6	35.7	79	97
SI	70.2	55.0	43.7	67.2	23.5	6	9
SK	48.8	38.8	26.0	53.4	27.4	20	31
FI	59.8	55.3	46.4	65.0	18.6	27	38
SE	37.8	27.6	21.9	33.2	11.3	1	2
UK	86.0	78.9	69.3	88.7	19.3	17	24
EA-19	86.9	78.5	72.4	85.0	12.6	5	7

(1) In the case of Estonia, due to the data limitations on historical primary balances, the asymmetric stochastic debt projections are in fact equivalent to the symmetric stochastic debt projections.
Source: Commission services.

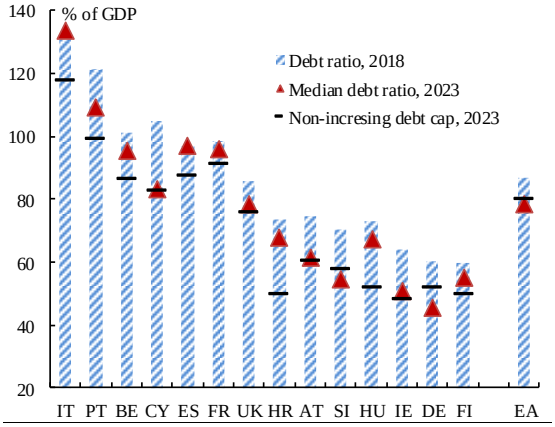
90th percentiles is at 64 - 106% of GDP. This clearly points to higher uncertainty surrounding baseline projections for this latter group of countries (see Table 3.10).

If the probability of a continuing rise of EA government debt is limited, some countries are nevertheless more likely to experience upward trends in the next 5 years. Relatively high probabilities of increasing debt are in particular estimated in some medium to high debt countries in both symmetric and asymmetric debt projections such as France (34 % and 45%), Spain (54% and 73%), Italy (59% and 82%), Portugal (26% and 41%) and Finland (27% and 38%) (see Table 3.10).

Stochastic debt projections can also be used to derive 'non-increasing debt caps'. Non-increasing debt caps are defined as the median level of public debt to target in 2023 to ensure that, even in the case of adverse shocks, public debt ratios will not increase relative to their current values with a 90% probability (see FSR 2015 and DSM 2017 for more details). These values may provide useful insights compared to conventional uniform targets used in fiscal rules, by taking into account country-specific economic features. In other words, countries, characterised by large uncertainties, such as the Baltics or Ireland, may need to target lower debt levels, than more stable economies.

Non-increasing debt caps largely differ between Member States depending on current debt levels, and country-specific economic volatility. The EA non-increasing debt cap is estimated at around 80% of GDP, with values ranging from 48.5% of GDP in Ireland to 118% of GDP in Italy (see Graph 3.18). An illustration of the impact of uncertainties on non-increasing debt caps can be given by Austria and Croatia: despite similar debt levels in 2018 (around 74% of GDP), Austria could target a higher median debt value in 2023 (around 60% of GDP) than Croatia (that would need to target a value of 50% of GDP), given the larger economic volatility in the latter.

Graph 3.18: **Non-increasing debt caps and median debt ratio in 2023 in selected Member States**



Source: Commission services.

For the vast majority of countries under examination, the debt ratio that is projected to be reached in 2023 under a no-fiscal policy change assumption would not be sufficient to contain debt trajectories in case of unfavourable shocks. Indeed, with the exception of Austria, Cyprus, Germany and Slovenia, the median debt ratio projected in 2023 is above non-increasing debt caps. Therefore, pursuing current policies would not ensure that countries would be immune to continuing debt increases (with a 90% probability) in case of negative shocks.

3.2. MEDIUM-TERM FINANCING NEEDS

As explained in Section 2.2, gross financing needs (GFN) are a measure able to serve a variety of fiscal analysis purposes, being also quantifiable from diverse sources and methods.

For the purposes of medium-term analysis, this section examines 'overall' financing needs, which differ from short-term GFN shown under S0 in three main ways. First, medium-term GFN include a broader range of government balance sheet instruments (see Table 2.4 in Section 2.2.) Second, while short-term GFN are mainly outturn data, medium-term GFN represent projections closely linked to the Commission's debt projection model, from which they derive. Third, short-term financing needs are based on non-consolidated data, while the medium-term GFN use consolidated figures.

Medium-term GFN projections capture the maturity of government debt and thereby provide key complementary information on liquidity-related vulnerabilities. If the debt to GDP ratio remains a crucial metric to assess fiscal sustainability, the current environment of low interest rates and the extension of debt maturities call for a careful account of gross financing needs ([59]). Gross financing needs, calculated here as the sum of the budgetary deficit, debt amortisations and other flows ([60]), provide a measure of a government's liquidity, or its facility to face upcoming financial obligations. Hence, the projected dynamics of gross financing needs usefully measures the extent to which governments might need to tap financial markets over the current and the coming years, thus enabling an assessment of rollover risks ([61]). For a discussion of medium-term GFN under stress, see Box 3.4.

([59]) The indicator is widely used by other institutions such as the IMF, the ECB and the ESM.

([60]) Debt amortisations include both securities and loans, but not 'currency and deposits'- see also Section 2.2 Table 2.4 for the definition of medium-term government GFN. Other flows (i.e. stock-flow adjustments – SFA) include debt reducing / increasing items such as privatisation revenues and valorisation effects.

([61]) Medium-term GFN projections have been introduced with the DSM 2016. Outturn values for this variable have been used in the S0 indicator since 2012 (see chapter 2). More details on the calculations can be found in the DSM 2016.

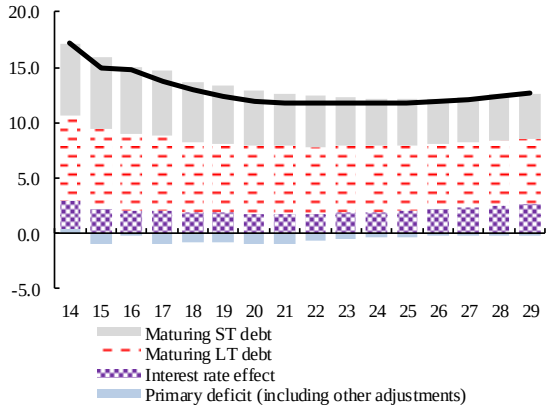
Table 3.11: **Medium-term government gross financing needs (% of GDP) in the baseline no-fiscal policy change scenario, by country**

	2012	2018	2019	2020	2029	Average 2018-29
BE	26,1	17,4	17,3	17,4	20,0	18,0
BG	3,0	0,5	0,6	0,6	1,0	0,8
CZ	11,3	5,9	5,5	5,3	3,9	4,3
DK	8,0	4,0	4,5	3,9	-0,5	1,9
DE	22,5	11,0	10,2	9,4	6,6	7,9
IE	18,6	6,3	8,7	6,1	5,8	6,1
ES	28,6	17,0	17,2	17,1	22,3	19,1
FR	22,9	18,3	18,4	17,4	20,9	18,9
HR	16,0	16,9	15,4	15,7	13,6	14,7
IT	26,9	21,2	21,3	21,9	27,4	23,6
CY	26,9	18,1	3,5	3,0	9,0	7,0
LV	3,9	3,9	3,9	5,6	5,4	4,7
LT	10,7	2,8	9,3	6,2	4,9	4,8
LU	4,7	0,4	0,8	1,1	-0,2	-0,3
HU	14,1	22,9	19,7	19,5	20,7	20,3
MT	9,9	5,5	4,7	4,3	0,3	2,3
NL	20,6	9,4	7,4	6,7	6,8	6,9
AT	9,3	8,1	7,4	6,7	5,9	6,4
PL	8,9	6,1	6,3	6,3	7,1	6,4
PT	27,9	12,5	13,5	13,6	19,3	15,9
RO	12,7	7,7	7,9	9,5	14,0	10,9
SI	10,3	9,0	8,2	7,6	10,4	8,7
SK	14,1	3,1	2,9	2,6	2,5	2,5
FI	13,6	7,1	6,6	7,1	7,7	6,9
SE	10,2	6,7	5,6	4,8	-0,4	2,4
UK	12,6	9,3	8,8	8,6	9,3	8,9
EU-28	**19,6**	**12,9**	**12,4**	**12,0**	**12,6**	**12,1**
EA	**22,6**	**14,6**	**14,1**	**13,5**	**14,6**	**13,8**

(1) Medium-term government GFN are calculated as the sum of the government budgetary deficit (+) / surplus (-), debt amortisations and other debt decreasing / increasing flows (stock-flow adjustments – SFA) - see also Section 2.2 Table 2.4 for the definition of medium-term government GFN. Debt amortisations cover both debt securities and loans, but not 'currency and deposits'. The data sources used are Eurostat for the share of short-term and long-term public debt and the ECB (Government Finance Statistics) for the share of outstanding debt securities maturing within the year. For post-programme surveillance countries Portugal, Ireland and Cyprus, the estimates take into account the redemption profile of official loans. Discrepancies may appear with other institutions' estimations (e.g. ECB, IMF) due to differences in the scope and sources used. Forecasts and projections are based on the assumptions of the baseline no-fiscal policy change scenario. More information on these calculations can be found in the DSM 2016.
Source: Eurostat, ECB, Commission services.

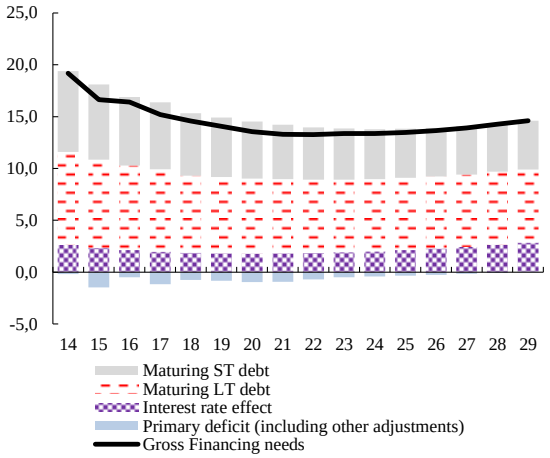
Based on the aforementioned medium-term definition, government gross financing needs are overall contained in the EU compared with the onset of the crisis. Medium-term gross financing needs are estimated at around 13% of GDP in 2018 at the EU-28 aggregate level (around 15% of GDP for the EA), down from around 20% of GDP in 2012 (respectively 23% of GDP). Important cross-country differences reflect the heterogeneity in terms of government debt stock, maturity structure, financing conditions and government primary balance - see Table 3.11.

Graph 3.19: **Government GFN projections breakdown, baseline scenario, EU 28 (% of GDP)**



Source: Commission services.

Graph 3.20: **Government GFN projections breakdown, baseline scenario, Euro area (% of GDP)**



Source: Commission services.

GFN are foreseen to remain stable in the EU over the next 10 years, with some Member States nevertheless projected to see their gross financing needs rising. Over the next 10 years, government gross financing needs are estimated to stay at similar levels to those of 2018 (falling by a mere 0.3 pps. of GDP at the EU-28 level and remaining unchanged in the EA). GFN reductions are expected in 13 Member States, with the largest decreases projected in CY, SE, MT, DE, and DK (by at least -4 pps. of GDP). Other Member States should experience an increase in their borrowing requirements by 2029 (e.g. PT, RO, IT, and ES, all above 5 pps. of GDP).

These trends are largely driven by the projected dynamics of the primary balance (in line with often increasing ageing costs) and the increase of the interest bill, given the assumed 'normalisation' of financial conditions (see Graphs 3.19 and 3.20). In 2029, medium-term GFN values would remain below their 2012 peak in all countries except Hungary, Latvia and Romania.

3.3. MEDIUM-TERM FISCAL SUSTAINABILITY INDICATOR: THE S1 INDICATOR

Fiscal sustainability in the medium term typically refers to the achievement of the government's intertemporal budget constraint over a finite horizon ([62]). This constraint, which is also known as the solvency condition, refers to the capacity of a country to meet its net debt obligations, with a stream of future primary surpluses. Other things equal, the greater the projected cost of ageing, the more difficult it is to fulfil the intertemporal budget constraint, as higher revenue (in present terms) is required to cover these additional costs, in addition to the other non-interest expenditure and the cost of servicing the outstanding debt.

Sustainability gap indicators measure the budgetary adjustment that would ensure sustainable public finances. Medium-term sustainability is captured by the S1 indicator. The latter measures the additional adjustment effort required, in terms of a cumulated gradual improvement in the structural primary balance over five years (starting from the year after the last forecast year, i.e. starting from 2021) ([63]), to reach a specific public debt-to-GDP ratio in fifteen years' time from now (currently 2033), including paying for any future additional expenditure (until the target date) arising from an ageing population. The debt target is set at 60% of GDP in the standard definition of the indicator, the Treaty reference threshold, or, alternatively, at the pre-crisis debt ratio or the end-of-forecast debt ratio. The timescale of the indicator has been chosen to be sufficiently long to allow the impact of ageing to be analysed in a meaningful way, while still remaining subject to influence from decisions by current taxpayers and policy makers.

([62]) See Chapter 4 for the infinite horizon version, which assesses fiscal sustainability over the long term.

([63]) After 2025, the structural primary balance remains constant at its 2025 value, which incorporates the additional consolidation efforts made up to that year. This means that no consolidation (or deconsolidation) is assumed to take place after 2025.

3.3.1. Results of the medium-term sustainability indicator

The risk to medium-term sustainability reflects the initial structural primary balance, the starting debt ratio and the forecast increase in ageing costs. Under the baseline no-fiscal policy change scenario, Table 3.12 shows the updated results for S1 for the standard definition of the indicator of a target debt ratio based on 60% of GDP (in 2033). The table also reports the decomposition of the S1 indicator into: i) the gap to the debt-stabilising primary balance, which shows the additional required adjustment in the primary balance to stabilise debt at its current level; ii) the cost of delay, which shows the additional required adjustment due to the gradual improvement in the primary balance compared to an immediate adjustment; iii) the debt requirement to reach the 60% target debt; and, iv) the required adjustment to cover the ageing costs until 2033.

An improvement in the EU structural primary balance is necessary to achieve a government debt ratio of 60% of GDP by 2033. As shown in Table 3.12, the required improvement for the EU and the EA to achieve the debt-to-GDP ratio target of 60% by 2033 amounts, respectively, to a cumulative effort of 1.4 and 2.1 pps. of GDP over the period 2021-2025, i.e. an average budgetary consolidation effort of around 0.3 and 0.4 percentage points per year, respectively. In other words, the average structural primary balance for the EU would have to improve from a projected surplus of 0.7% of GDP in 2020 to 2.1% in 2025, while for the EA the structural primary balance would have to improve from a surplus of 0.7% of GDP in 2020 to 2.8% in 2025.

Table 3.12: **The medium-term sustainability indicator (S1) and its components, pps. of GDP**

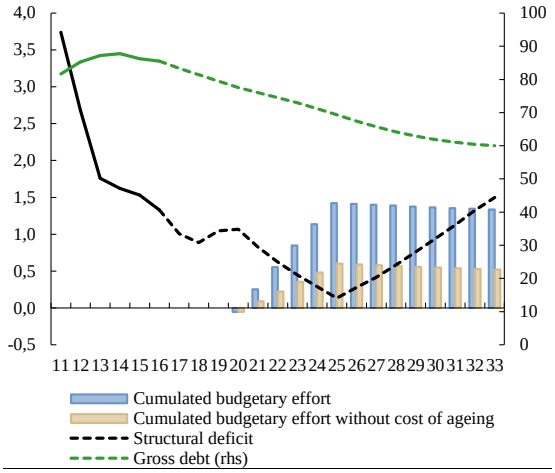
	S1	Due to			
		Initial Budgetary position		Debt requirement	Ageing costs
		Gap to the debt-stabilizing primary balance	Cost of delaying adjustment		
BE	4,3	-0,4	0,7	3,0	1,2
BG	-4,2	-0,9	-0,6	-3,0	0,4
CZ	-2,9	-1,2	-0,4	-2,2	0,9
DK	-5,1	-2,2	-0,8	-2,2	0,1
DE	-2,0	-2,3	-0,3	-0,5	1,1
EE	-4,3	0,7	-0,6	-4,1	-0,3
IE	-0,9	-1,6	-0,1	-0,3	1,1
ES	5,2	1,4	0,8	2,6	0,4
FR	4,2	0,3	0,7	2,8	0,4
HR	0,2	-0,3	0,0	0,6	-0,1
IT	9,4	2,0	1,6	4,9	0,9
CY	-0,7	-2,8	-0,1	2,3	-0,1
LV	-2,0	0,1	-0,3	-1,9	0,2
LT	-1,8	-0,5	-0,3	-1,7	0,6
LU	-4,8	-1,7	-0,7	-3,2	0,8
HU	1,1	0,4	0,2	0,7	-0,2
MT	-4,7	-2,9	-0,7	-1,5	0,3
NL	-1,7	-0,9	-0,3	-1,0	0,4
AT	-0,8	-2,0	-0,1	0,6	0,6
PL	-0,7	0,1	-0,1	-1,0	0,3
PT	4,3	-0,9	0,7	4,1	0,5
RO	1,5	3,0	0,2	-1,6	-0,1
SI	0,2	-1,2	0,0	0,2	1,2
SK	-2,9	-1,3	-0,4	-1,3	0,1
FI	-0,1	-1,2	0,0	-0,2	1,3
SE	-4,6	-2,1	-0,6	-2,2	0,3
UK	1,3	-1,4	0,2	1,7	0,7
EU-28	1,4	-0,7	0,2	1,2	0,7
EA	2,1	-0,5	0,3	1,6	0,7

Source: Commission services.

Stabilising debt at its current level would be less demanding, although in some cases, given the initial budgetary position and the cost of ageing, the adjustment gap would remain high. For countries with a debt-to-GDP above the 60% mark, stabilising the debt at its current level would imply an S1 level recomputed by removing the debt requirement component. For the EU and the EA, this would imply an S1 level of -0.1 and 0.2, respectively, while for some countries the S1 level to stabilise the debt would remain relatively high (e.g. RO, IT and ES).

For the EU as a whole, an additional fiscal effort is required to offset the effect of the rising cost of ageing on medium-term sustainability. The consolidation to the structural primary balance implied by the S1 indicator in the EU is also shown in Graph 3.21, together with the resulting path of debt and the structural balance. When compared with the required consolidation without budgetary costs due to ageing populations, an additional fiscal effort of 0.7 pps. of GDP is required in the medium term to compensate for the negative impact on sustainability of higher government expenditure as a result of population ageing. This also underlines the scope and importance for further structural reforms to contain ageing-related upward pressure on government spending in the medium term.

Graph 3.21: **Required fiscal adjustment (% of GDP) until t+5 in the EU to reach 60% public debt-to-GDP ratio by 2033**



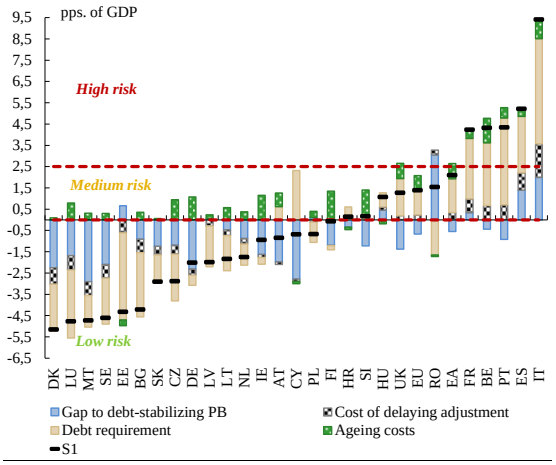
Source: Commission services.

Italy, Spain, Portugal, Belgium, and France are considered at high risk in the medium term based on the S1 indicator. In these five countries a significant fiscal adjustment is required to ensure medium-term sustainability by achieving the debt target of 60% of GDP in 2033. Another five Member States would also have to make a consolidation effort, although not exceeding 0.5 pps. of GDP per year, to achieve the 60% of GDP debt target. These Member States, which are therefore considered at medium risk ([64]), are HR, SI, HU, RO, and the UK. Finally, seventeen countries (DK, LU, MT, SE, EE, BG, SK, CZ, DE, LV, LT, NL, IE, AT, CY, PL and FI) have an S1 indicator with a negative value, thus indicating that already under current policies these countries are not expected to breach the 60% of GDP threshold by 2033. Except CY and AT, these countries are expected to have a debt level already below the 60% of GDP target in 2020.

For the EU-28 and the EA, the initial budgetary position contributes to reducing medium-term sustainability risk, whereas the debt requirement and ageing costs increase the S1 indicator. The additional adjustment due to the debt requirement of 60% of GDP accounts for the largest adjustment in both the EU and the EA, by respectively 1.2 and 1.6 pps. of GDP. Finally, the cost of ageing component accounts for 0.7 pps. of GDP of the S1 sustainability gap for both the EU and the EA respectively.

The additional adjustment due to the debt requirement is particularly high for Italy and Portugal (exceeding 4 pps. of GDP). This value is positive only for those countries with an initial level of debt above 60% of GDP. As can be seen in Graph 3.22, the additional fiscal consolidation if the gradual adjustment of the primary balance is delayed (the so-called "cost of delay" subcomponent), is highest for IT, ES, PT, BE and FR. An improvement in the structural primary balance is required to even stabilise debt at its current levels by RO, IT, ES, EE, HU, FR, PL and LV. On the other hand, the required adjustment from the increase in the cost of ageing is highest in FI, SI, BE, IE, DE, CZ, IT and LU.

Graph 3.22: **The S1 sustainability indicator and its components**



Source: Commission services.

3.3.2. The required structural primary balance

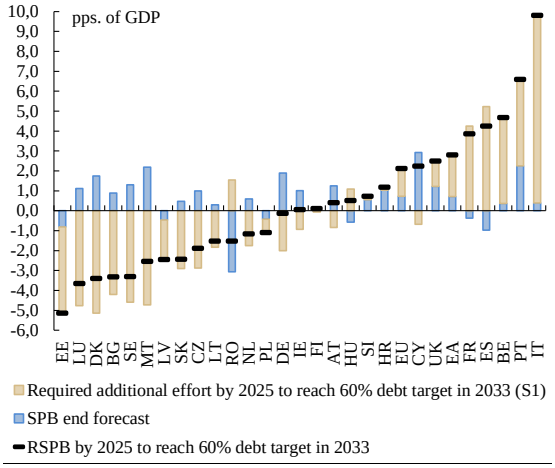
The required structural primary balance (RSPB) is informative about the fiscal policy that needs to be sustained in order to achieve medium-term sustainability. The RSPB reflects the overall size of the structural primary balance required to close the medium-term sustainability gap, i.e. to reach a debt ratio of 60% of GDP by 2033. It is calculated as the total of the structural

([64]) The thresholds used to assess the scale of the sustainability challenge based on the S1 indicator are as follows: 1) if S1 is less than zero, the country is assigned low risk; 2) if S1 is between 0 and 2.5 (thus requiring an adjustment in the structural primary balance of up to 0.5 pps. of GDP per year until 2025), the country is assigned medium risk; 3) if S1 is greater than 2.5 (implying an adjustment in the structural primary balance of more than 0.5 pps. of GDP per year), the country is assigned high risk.

primary balance at the end of the forecast period and the required adjustment quantified by S1.

The overall required structural primary balance to ensure medium-term sustainability varies significantly across the EU Member States. Graph 3.23 shows the RSPB and its decomposition into the starting structural fiscal position at the end of the forecast period and the S1 sustainability gap for each EU country. For the EU and the EA, the RSPB reaches 2.1% and 2.8% of GDP, respectively. At the individual country level, the size of the RSPB varies substantially from -5.1% of GDP for Estonia to more than 4% of GDP for Spain and Belgium and to 6.6% of GDP for Portugal and 9.8% for Italy.

Graph 3.23: **The required structural primary balance by 2025 to reach 60% debt target in 2033**



Source: Commission services.

Required structural primary balances appear large in some countries, although past episodes of sustained large fiscal consolidations are not unprecedented. While for a few Member States, the RSPB appears large, and may be deemed politically and socially unsustainable, empirical evidence suggests that the required adjustments implied by the S1 results would not be unprecedented. During the past three decades, there have been 14 episodes in advanced economies and 26 episodes in emerging economies when individual countries adjusted their structural primary balance by more than 7 pps. of GDP ([65]).

3.3.3. Sensitivity analysis of S1 indicator

Sensitivity to baseline fiscal assumptions

The S1 indicator is sensitive to changes in key assumptions of the baseline no-policy change scenario as well as to the targeted debt ratio. Fiscal projections under the baseline scenario, which assumes that current fiscal policies remain unchanged in the medium term, are surrounded by uncertainties over this horizon. Given these uncertainties, risks can be assessed by comparing current fiscal policies with alternative scenarios. In particular, the two risk scenarios considered here are based on alternative health-care and long-term care projections ('AWG risk scenario') and the historical patterns of the structural primary balance ('historical SPB scenario'). Furthermore, given the large contribution of debt requirement (in several countries), sensitivities to alternative debt target assumptions are checked.

The 'AWG risk scenario' quantifies sustainability challenges arising from higher non-demographic cost drivers of health-care and long-term care spending. Sensitivity of the age-related spending to non-demographic cost pressures outlines the impact from rising healthcare and long-term care costs in excess of those expected from purely demographic factors. The drivers of upward pressures on health and long-term care spending are typically associated with technological changes (e.g. development of new drugs and treatments) and institutional factors, see chapter 4 section 4.1 (e.g. widening of healthcare coverage).

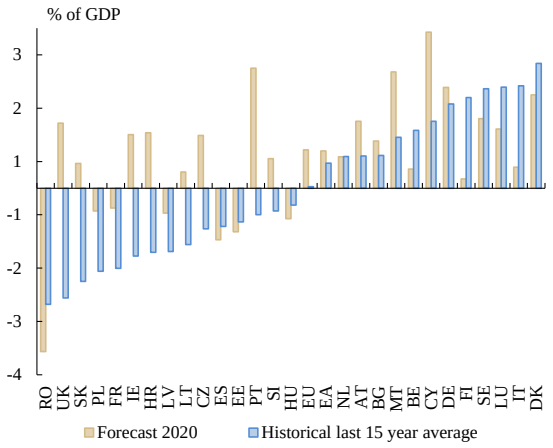
The 'historical SPB scenario' outlines sustainability challenges based on the past pattern of structural primary balances. The underpinning assumption is that the structural primary balance beyond the forecast period converges gradually over a 4-year horizon to the last 15-year historical average of structural primary balances.

The outcomes of the historical SPB scenario provide indications of oversized sustainability challenges. As illustrated in Graph 3.24, the structural primary balance after the last forecast

([65]) See IMF (2010). The list includes the following countries (end date of episodes in parentheses): BE (1998), CY (2007), DK (1986), FI (2000), GR (1995), IE (1989), IT (1993), PT (1985), SE (1987, 2000), UK (2000).

year (2020) is significantly higher than the 15-year historical average for UK, PT, IE, HR, SK and CZ. This suggests that a current high primary balance might lead to 'fiscal fatigue' beyond the medium term and thus fiscal sustainability risks might be greater than those outlined by the baseline fiscal sustainability gaps. By contrast, projections of a particularly loose current fiscal position after 2020 compared to the historical SPB average might not be the most likely outcome beyond the medium-term horizon. This suggests that risks to fiscal sustainability could be overestimated for some countries, such as BE, LU, RO, FI and IT. As shown by Graphs 3.24 and 3.25, sustainability risks from the historical SPB scenario can be much higher or lower than those highlighted by the baseline scenario ([66]).

Graph 3.24: **The 15-year average of historical SPB average versus the SPB forecast in 2020**

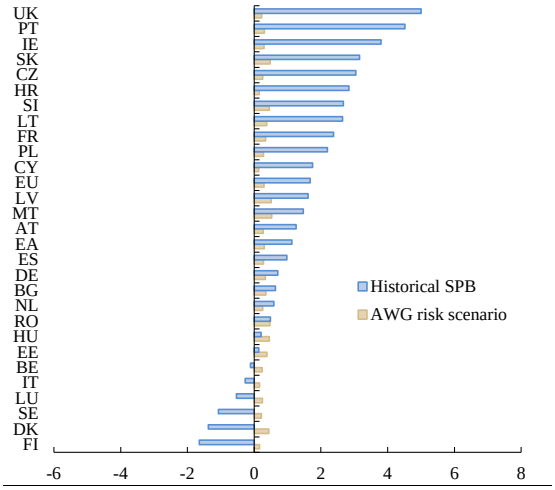


Source: Commission services.

The required fiscal adjustment in the medium term relative to the historical pattern of structural primary balances varies widely across the EU. The required adjustment would be higher by 2.3 and 2 pps. of GDP for the EU-28 and the EA as a whole than under the baseline scenario. The deviations from the baseline required adjustment are close or above 4 pps. for IE, PT and the UK. A negative deviation is displayed by several countries, such as FI, DK, SE, LU, IT and BE, which imply that the fiscal consolidation history of these countries would allow a better fiscal sustainability than in the baseline scenario.

In the medium term, non-demographic related costs of ageing contribute to a higher S1 sustainability gap in all the EU countries. For the EU-28 and the EA, the cumulated adjustment required by 2025 to reach a debt-to-GDP ratio of 60% in 2033 under the AWG risk scenario, is around 0.3 pp. of GDP higher than under the baseline scenario. Across countries, the gap between the two scenarios ranges narrowly from around 0.1 pp. of GDP for CY, HR, FI and IT to 0.5 pp. of GDP for MT, LV, SK, RO, HU and SI (see Graph 3.25). These gaps relative to the baseline are also lower than those resulting from the historical SPB scenario, as shown in Graph 3.25.

Graph 3.25: **S1 - Difference from the baseline scenario (pps. of GDP)**



Source: Commission services.

Sensitivity to debt targets and interest rates

A higher adjustment of the structural primary balance would be required to achieve pre-crisis debt levels or to offset higher interest rates (see Table 3.13). For the EU as a whole, the required adjustment to reach pre-crisis (2007) levels in 2033 would be even higher than with the 60% of GDP debt target. This is due to the fact that several Member States had debt levels in 2007 that were well below 60% of GDP. If the reference targets were set at the debt ratio in 2007, only MT, SE, DE, DK, AT, BG, NL, CY and SK among the

([66]) When interpreting results of fiscal indicators calculated over the historical SPB scenario, two different effects must be taken into account: one is clearly related to the different pattern between the historical SPB and its baseline; while the other one derives from the historical scenario's specific design (which implies delayed adjustment, after the 4-year convergence of the SPB toward its historical average).

current low-risk countries would still have a negative value of the S1 indicator, thereby retaining their low-risk category (Table 3.13 reports the cumulated adjustment needs for different debt end-points). Moreover, the structural primary balance adjustment required to stabilise the debt-to-GDP ratio at pre-crisis levels would be particularly demanding (a cumulated budgetary consolidation effort close to 6 pps of GDP or more) for ES, RO and IT. Finally, Table 3.13 presents the simulation results for a one percentage point increase in the interest rate on new and rolled over debt. The increase in the required adjustment to achieve a debt ratio of 60% of GDP by 2033 is highest (at least 0.5% of GDP) for IT, HR, PT, and FR, reflecting the current debt ratio and / or the medium-term financing needs.

Table 3.13: **The required adjustment of primary balances until 2025 to reach a given target for the public debt-to-GDP ratio by 2033 (all data as % of GDP)**

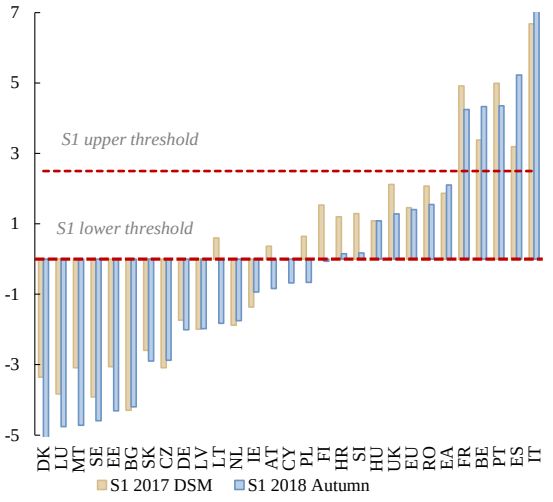
			+1p.p in the short-term/long-term interest rate on maturing and new debt from 2021	
	Budgetary effort by 2025 (cumulated SPB)		Difference in budgetary effort by 2025 (cumulated SPB)	
	60 percent of GDP (S1)	Pre-crisis levels (2007)	60 percent of GDP (S1)	Pre-crisis levels (2007)
BE	4,3	1,9	0,5	0,6
BG	-4,2	-0,4	0,2	0,1
CZ	-2,9	0,0	0,3	0,2
DK	-5,1	-2,2	0,3	0,2
DE	-2,0	-2,3	0,4	0,4
EE	-4,3	0,7	0,3	0,0
IE	-0,9	2,4	0,4	0,2
ES	5,2	7,4	0,5	0,4
FR	4,2	3,8	0,5	0,5
HR	0,2	2,2	0,5	0,4
IT	9,4	5,8	0,7	0,9
CY	-0,7	-0,1	0,3	0,3
LV	-2,0	2,8	0,3	0,1
LT	-1,8	2,0	0,3	0,1
LU	-4,8	0,1	0,2	0,0
HU	1,1	0,6	0,5	0,5
MT	-4,7	-4,9	0,3	0,3
NL	-1,7	-0,3	0,3	-0,3
AT	-0,8	-1,3	0,3	0,3
PL	-0,7	0,8	0,4	0,3
PT	4,3	3,6	0,5	0,5
RO	1,5	5,9	0,4	0,2
SI	0,2	3,6	0,3	0,2
SK	-2,9	-0,1	0,3	0,1
FI	-0,1	2,3	0,2	0,1
SE	-4,6	-2,7	0,2	0,2
UK	1,3	3,0	0,4	0,3
EU-28	1,4	1,8	0,5	0,4
EA	2,1	1,9	0,5	0,4

Source: Commission services.

3.3.4. Comparison with previous S1 results

This section compares the results of the S1 indicator with those presented in the Debt Sustainability Monitor 2017 (DSM 2017 henceforth). The variation in the fiscal indicators is mainly due to the changes in the initial budgetary position and/or the debt requirement (in relation to S1), as well as in the cost of ageing in some cases ([67]).

Graph 3.26: **S1 comparison with DSM 2017 (pps. of GDP)**



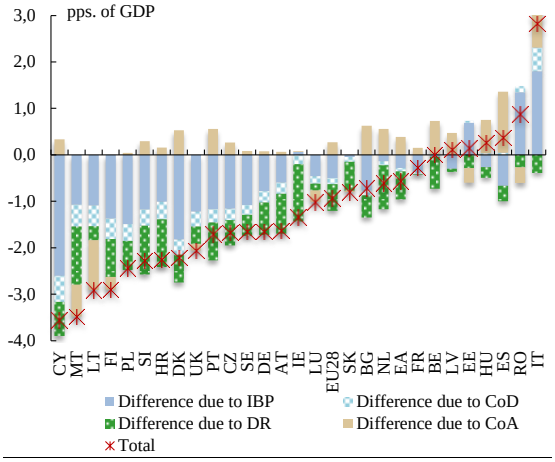
Source: Commission services.

Medium-term sustainability risks remained broadly stable. The S1 sustainability gap is lower by 0.1 pps. of GDP for the EU-28 and higher by 0.2 pps for the EA as a whole. As shown by Graph 3.26, most of the EU Member States have maintained their risk category, except for LT, AT, PL and FI, for which the sustainability risk improves from medium to low risk. Although they remain in the same risk categories, latest S1 results show that for BE and IE and, especially, for ES and IT a higher fiscal adjustment is needed to ensure medium-term sustainability. The Member States with a substantial drop in their required adjustment include LT (-2.4 pps. of GDP) as well as FI and MT (-1.6 pps. of GDP for these two countries).

([67]) The positive changes mean that the fiscal indicators and/or their components have increased between the DSM 2017 and this report. This report includes the updated costs of ageing as from the Commission - EPC Ageing Report 2018.

The changes in medium-term sustainability risks seen in most countries are driven by changes in the budgetary position and the debt requirement components. As shown in Graph 3.27, in the case of Italy and Romania, the significant increase in the additional adjustment required to ensure medium-term suitability almost entirely reflects a deterioration in the initial budgetary position, in terms of a deterioration in the structural primary balance in this new round of forecasts. For the four Member States with the highest drop in their required adjustment required (Cyprus, Malta, Lithuania and Finland), the improved S1 indicator reflects the improved initial budgetary position and the significant contribution from lower debt requirement (except for LT). In the case of MT and LT, lower projected ageing-related costs also contributes to the lowering of the S1 indicator.

Graph 3.27: **Components of change in S1 (FSR 2018 based on Commission 2018 Autumn forecast compared to DSM 2017 based on Commission 2017 Autumn forecast)**



Source: Commission services.

The S1 indicator for the EU-28 stands at its lowest level of the past six years (EA stands close to its 6-year average). This may be seen from Graph 3.28, which shows a cross-country comparison by risk classification based on the S1 indicator along various waves of Commission forecasts ([68]). For the EU aggregate, the drop in the S1 indicator to 1.4 pps. of GDP on the basis of the Autumn 2018 forecast follows a period since 2012 when the indicator appeared to broadly stabilise at around 2.0 pps. of GDP. This underlines the impact of the continued consolidation effort and structural reforms undertaken in the aftermath of the economic and financial crisis, as well as the improved economic outlook. The number of high-risk countries had widened from five to nine between 2012 and 2014, while five countries (IT, PT, FR, BE and ES) are classified as still facing high risk in the medium term, according to the S1 indicator, in this edition of the Fiscal Sustainability Report.

([68]) The threshold value between the medium and high risk categories has been set to reflect the 0.5 pps. of GDP benchmark fiscal consolidation effort per year (over 5 years) since the Spring 2015 forecasts; while previously the adjustment period was assumed to end by 2020. So, in the FSR 2012 the threshold was set at 3.0 pps. of GDP to reflect a fiscal adjustment period of 6 years and later it was further reduced to 2.5 and 2.0 pps. of GDP (Spring and Autumn 2014).

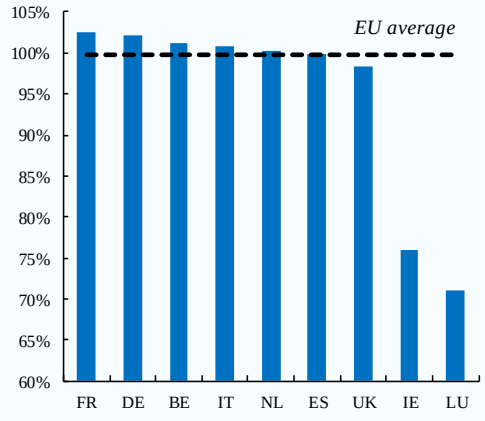
Graph 3.28: **The S1 sustainability indicator across Commission forecast vintages (pps. of GDP)**

Source: Commission services.

Box 3.1: Alternative metrics to assess debt sustainability: the use of GNI

Traditional measures of government debt ratios may present an overly benign assessment of debt burdens in some specific cases. In the context of assessing debt sustainability, general government debt is traditionally expressed as a share of GDP, which constitutes a broad measure of a country's repayment capacity. However, GDP can sometimes overstate the living standards of a country. This is notably the case in countries characterised by a large presence of foreign - owned multinationals. In these cases, a more appropriate measure of living standards often put forward is the Gross National Product (GNP) or the Gross National Income (GNI), as it excludes the repatriated profits of foreign - owned multinationals based in a given country ([1]). This indicator will therefore represent a more accurate measure of a country's repayment capacity.

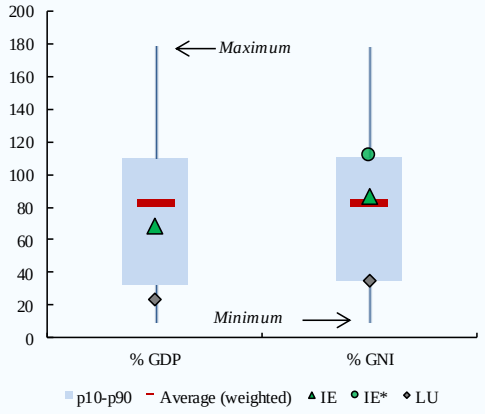
Graph 1: **Ratio of Gross National Income (GNI) to Gross Domestic Product (GDP) in 2018, %**



Source: Ameco.

Within the EU, GDP and GNI indicators are equivalent in the vast majority of countries (the ratio of GNI to GDP being close to 1, within a range of 0.93 to 1.02 in 26 countries). However, **in two countries, namely Luxembourg and Ireland, an important discrepancy is observed between the two measures, with GNI representing respectively only 71% and 76% of GDP** (see Graph 1). Furthermore, in these countries, this gap has increased over time, in particular with the on-shoring of sizeable volumes of intangible assets such as intellectual property.

Graph 2: **Ireland and Luxembourg debt ratios against the distribution of EU countries in 2017, % of GDP and % of GNI**



(1) IE* represents the IE debt ratio scaled by the modified GNI (GNI*).
Source: Commission services, CSO.

When debt metrics are measured relative to GNI, the debt burden in Luxembourg and Ireland appears significantly higher than traditionally measured (see Graph 2). In the case of Luxembourg, it remains however low by European standards. Furthermore, based on a modified measure of GNI ([2]) recently released by the Irish Central Statistics Office (CSO), the debt ratio was even well above 100% in Ireland in 2017 (at 111% of GNI*), a high level by historical standards and by comparison with other EU countries. Additional scaling metrics such as government revenue, or per-capita terms, also show

([1]) Gross national income, abbreviated as GNI, is the sum of incomes of residents of an economy in a given period. It is equal to GDP minus primary income payable by resident units to non-resident units, plus primary income receivable from the rest of the world (from non-resident units to resident units).

([2]) With a view to better account for the effects of globalisation on measuring the Irish economy, the Irish CSO had published a modified series of GNI since 2017. It excludes *inter alia* the depreciation of foreign-owned, but Irish-resident, capital assets (most notably intellectual property and assets associated with aircraft leasing) and the undistributed profits of firms that have re-domiciled to Ireland. In 2017, this modified GNI (GNI* - read as GNI "star") amounted to 77% of the standard GNI indicator (see https://www.cso.ie/en/releasesandpublications/ep/p-nie/nie2017/mgni/ for more information).

(Continued on the next page)

Box (continued)

that Ireland's government debt remains elevated (see Table 1).

In this context, with the view to provide a more accurate assessment of debt vulnerabilities, **our debt projections, traditionally expressed as a share of GDP, are complemented by alternative metrics based on GNI**. Such a complementary analysis has been introduced in the DSA recently carried out by the IMF for Ireland ([3]). Results are here only commented for the two countries for which a significant discrepancy between GDP and GNI figures is observed, namely Luxembourg and Ireland.

Table 1: **General government debt in 2018 in euro area countries according to different scaling metrics**

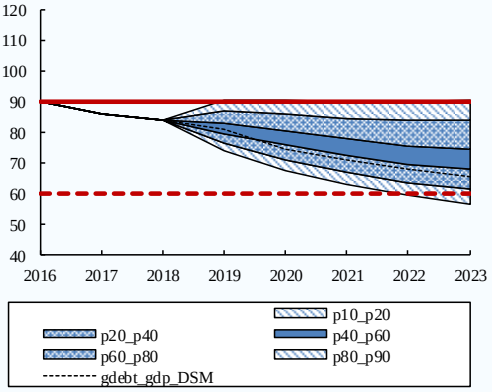
	Total (Bls euros)	Per capita ('000 euros)	% GDP	% GNI	% total g'vt revenue
BE	462	40	101	100	199
DE	2,039	25	60	59	133
EE	2	2	8	8	20
IE	206	42	64	84 (111*)	256
EL	338	32	183	183	378
ES	1,176	25	97	97	252
FR	2,321	34	99	96	184
IT	2,316	38	131	130	284
CY	22	25	105	108	262
LV	11	6	37	37	101
LT	16	6	35	36	100
LU	12	20	21	30	48
MT	6	12	48	51	123
NL	411	24	53	53	122
AT	288	32	74	75	154
PT	245	24	121	124	281
SI	32	16	70	71	164
SK	44	8	49	50	124
FI	139	25	60	59	115
EA-19	**10,085**	**29**	**87**	**87**	**189**
5 highest values	FR, IT, DE, ES, BE	IE, BE, IT, FR, AT	EL, IT, PT, CY, BE	EL, IT, PT, CY, BE	EL, IT, PT, CY, IE

(1) Based on the modified value of GNI estimated by the Irish CSO, the government debt would represent more than 111% of GNI* in Ireland in 2017.
Source: Commission services.

Although improving, Ireland's government debt sustainability remains vulnerable to unfavourable shocks. When debt metrics are measured relative to GNI, most of the distribution of the debt burden lies above the 60% threshold over the projection period considered (see Graph 3). Furthermore, in case of combined negative shocks (corresponding to the 90th percentile rank of the debt distribution), the debt ratio would lie close to or slightly above the 90% threshold. Standard deterministic sensitivity analysis would also point to higher vulnerabilities than traditionally measured on the basis of GDP (see Table 2). In the case of Luxembourg on the other hand, given the low level of debt ratio, even expressed as a share of GNI (30% of GNI in 2018), the debt burden would remain (well) below vulnerability thresholds all through the projection period.

In order to reflect these results based on GNI in the DSA, we introduce a complementary analysis in the framework whenever a large discrepancy is observed between GDP and GNI figures. This complementary analysis will be better reflected when preparing DSA write-ups ([4]) and factored-in qualitatively within the overall assessment of debt sustainability.

Graph 3: **Asymmetric stochastic government debt projections in Ireland, % of GNI**



(1) In asymmetric stochastic projections, the distribution of shocks on the primary balance are restricted by giving a higher likelihood to unfavourable shocks (in practice by setting the maximum positive shock to 0.5. standard deviation).
Source: Commission services.

Table 2: **Government debt projections in Ireland, baseline and selected alternative scenarios and sensitivity tests**

	% of GDP		% of GNI	
	2018	2029	2018	2029
Baseline no-policy change scenario (% of GDP)	**63.9**	**46.7**	**84.1**	**62.2**
Historical SPB scenario	63.9	62.9	84.1	83.7
Combined historical scenario	63.9	55.7	84.1	74.2
Standardized (permanent) positive shock (+1p.p.) to the short- and long-term market interest rates	63.9	49.6	84.1	66.0
Standardized (permanent) negative shock (-0.5p.p.) on GDP growth	63.9	49.3	84.1	65.7
Standardized (permanent) negative shock on the PB equal to 50% of the forecasted cumulative change over the 2 forecast years	63.9	48.4	84.1	64.4
Adverse combined scenario (+1p.p. on interest rates and -0.5p.p. on GDP growth)	63.9	52.3	84.1	69.6
Enhanced (permanent) positive shock (+2p.p./+1p.p) to the short- and long-term market interest rates	63.9	50.7	84.1	67.4
Enhanced (permanent) negative shock (-stdev(14-18)/-0.5p.p.) on GDP growth	63.9	58.2	84.1	77.5

(1) Medium risks (yellow) are associated with the level of the debt ratio at the end of the projection period (2029) when the value projected is at 60% or above (but below 90% of GDP). Risks are deemed low (green) if below.
Source: Commission services.

([3]) See IMF (2018e).

([4]) For example, in the European Commission Country Reports and Post-Programme Surveillance Reports when relevant.

Box 3.2: **Using financial markets' interest rate expectations to project interest rates: does it change the risk assessment?**

Financial assumptions are a key input of DSA frameworks, along with fiscal and macroeconomic assumptions. The aim of this box is to assess the impact of an alternative interest rate assumption – to the one currently used in the Commission DSA framework – reflecting current market expectations, notably allowing for more cross-country diversity, and involving a slower increase in interest rates in the medium-term. This alternative interest rate scenario is computed using standard measures of interest rate market expectations.

Rationale for reconsidering the interest rate assumption

The interest rate assumption currently embedded in the Commission's DSA presents several advantages. First, while assuming a convergence towards common market interest rates' values in the medium-term, the baseline scenario reflects current market conditions at the start of the projection horizon, thus allows for taking into account cross-country diversity in the short-term. Indeed, in practice, the Commission DSA framework uses market rates to initiate interest rate projections paths, reflecting the current low and diverse interest rate environment at the start of the projection horizon. Furthermore, the convergence assumption applies only gradually - in 10 years' time - and transmits even more slowly to implicit interest rates, given the current maturity structure of debt.

Then, the current framework assumes a convergence towards commonly agreed values in the medium- to long-term, in line with euro area pre-crisis averages and other institutions' practices. The interest rate projection assumption entails converge of short and long-term rates to common reference values, by the end of the horizon. Specifically, within 10 years, short and long-term nominal interest rates converge to 4% and 5%, respectively. Such reference values provide convergence targets, set in line with EU historical averages ([1]), and other advanced economies. For instance, the CBO's assumes US long-term rate convergence to around 5% by 2047, most similar to the Commission approach, though allowing for more gradual convergence, over a longer period ([2]). Furthermore, this simple and transparent interest rate assumption is part of the set of commonly agreed assumptions with the Council ([3]), and reflects the assumed convergence of European economies in the medium- to long-term. It also ensures that the results are easily comparable across countries and consistent with other EU processes (European Semester, Stability and Growth Pact (SGP)).

Other DSA frameworks allow for more persistent cross-country diversity. The ECB relies on market expectation estimates (i.e. standard forward rates indicators) to set long-term interest rates convergence values, while assuming convergence to a common EURIBOR projections within three years for short-term rates ([4]). The IMF relies on country-specific interest rate paths, reflecting historical averages, amending those as needed, via expert judgment, to account for relevant additional information ([5]). Although, in this latter case, the projection horizon is limited to 5 years.

Persistent deviation of the interest rate environment from historical averages suggest the need to monitor the impact of the Commission's interest rates assumptions ([6]). Rates have been "low for long" and cross-country spreads have tended to resume. The average yield has declined and there is more

([1]) For details, see chapter 4 in "The 2018 Ageing Report – Underlying Assumptions & Projections Methodologies", European Economy Institutional Paper 065, November 2017.
([2]) See CBO (2017).
([3]) Ibid footnote (1).
([4]) See Bouabdallah et al. (2017).
([5]) See IMF (2013).
([6]) For related earlier discussions, see Box 2.3 entitled "Public debt sustainability in an environment of low interest rates and low economic growth", in *The 2016 Debt Sustainability Monitor*, European Economy Institutional Paper 047, January 2017.

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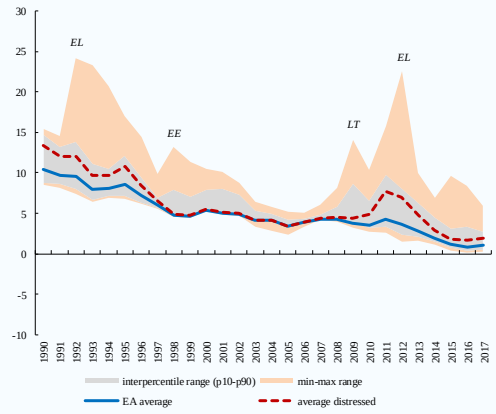
Box (continued)

diversity than in the pre-crisis period. Such diversity partly reflects exchange rate premiums in non-euro area countries (e.g. HU, PL, and BG) but re-emergence of spreads among euro area countries (e.g. PT, CY, IT and ES) is also discernible (see Graph 1). As such, the convergence to common interest rate targets across countries in the medium-term may appear less justifiable. The assumption of compression of spreads, bolstered by EMU, warrants review in light of recent developments. As it stands, the interest rate assumption allows for short and medium-term interest rate diversity but assumes that over the medium-term spreads subsume, as the integrated EU government securities market normalises. Hence, the impact of persistent long-term spreads on relative debt dynamics across countries warrants monitoring.

Graph 1: **Evolution of long-term interest rates, across the euro area countries, %**

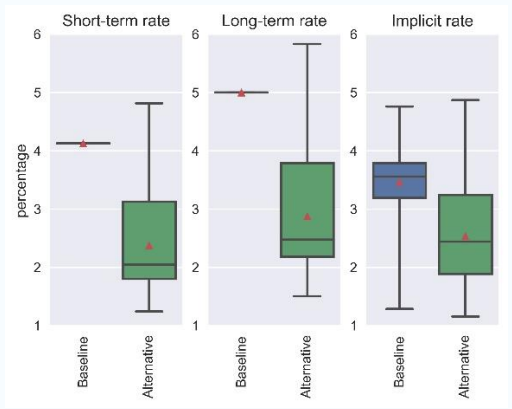


(1) Limited timespan for some countries: EE 1998-17, EL 1992-17, CY 1997-17, LV 2001-17, LT 2001-17, MT 2000-17, SI 2002-17, SK 2000-17;
(2) Distressed: IE, ES, IT and PT.
Source: Commission services.

Alternative assumptions based on financial markets' expectations

To illustrate the impact of a lower and more diversified interest rate environment, we compute country-specific interest rate targets. These targets, derived from standard forward rate computations, aim at reflecting current market expectations. They point at less sharp increases in rates and less convergence across countries over the projection horizon. Graph 2 illustrates the shift in assumption. The alternative targets imply a shift in the average from 4% to 2.4% and from 5% to 2.9% for the short and long-term rate, respectively. They also imply substantial remaining cross-country diversity by 2028 – i.e. ranges rather than unique values.

Graph 2: **Range of nominal interest rates, across the EU countries, by 2029, under the baseline and alternative scenario, %**



(1) Red triangles represent mean;
(2) Box represents interquartile;
(3) Wide bar (in box) represents median;
(4) Narrow bars represent minimum/maximum.
Source: Commission services & Bloomberg.

The impact of the change in assumption on the implicit interest rate is however more limited. For this variable, both ranges and averages appear more comparable across the two scenarios, due to the dampening effect of the existing stock of debt, with averages across the two scenarios being just 1 pp. apart – i.e. declining from 3.5% to 2.5%.

Market expectations estimates rely on standard forward rate computations. Concretely, alternative targets for the long-term rates are set equal to the forward long-term interest rates ($lti_{10,t+10}$) at *t+10*, computed as follows ([7]).

([7]) Moreover, for countries for which yield curve data are missing, we rely on the following assumptions:
CY, LT: the long-term spread vis-à-vis DE follows the same pattern as the average spread across available EA countries (excl. DE & EL);
EE: the long-term interest rate is the average of the projected interest rate of LV and LT;
HR: the long term spread vis-à-vis DE follows the same pattern as the average spread across available non-EA countries.

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Box (continued)

$$(1 + lti_{10,t+10})^{10} = \frac{(1 + lti_{20,t})^{20}}{(1 + lti_{10,t})^{10}}$$

where $lti_{20,t}$ and $lti_{10,t}$ stand for the 10 and 20 years maturity spot yields and $lti_{10,t+10}$ stands for the (forward) 10 years maturity yield at t+10. Yield data represent average of available data for year 2018, collected up to the month of October.

In turn, short-term rate targets are computed by applying a 0.8 scaling factor to the long-term rates targets. This factor reflects the standard slope of the euro area yield curve, a factor also retained under the current baseline – i.e. short-term baseline target (4%) is equal to 0.8 times the long-term baseline target (5%).

A number of caveats however apply when relying on such forward rate estimates to measure market expectations. Such estimates proxy market expectations under the pure expectation hypothesis model, which purports that long-term rates represent an aggregation of expectations of future rates on similar bonds at shorter maturities. This hypothesis has however been refuted ([8]), revealing the importance of an additional element, namely the term premium. Hence, forward rate estimates provide a good proxy of interest rate expectations only if the term premium is empirically negligible. This appears to be the case recently ([9]), offering an opportunity to exploit such information. Yet, the term premium tends to be larger for longer maturities, as those considered here. Moreover, it varies over time, affected by a wide range of factors ([10]), including unconventional monetary policy measures at the current juncture. Targets based on such estimates may thus be somewhat volatile. Importantly, the term premium also appears to be counter-cyclical ([11]). This would cause forward rates to be more upwardly biased (as a measure of expectations) during recessions, generating some pro-cyclicality in the setting of convergence targets. Overall, forward rates may provide a useful mean to set country-specific targets to reflect current interest rate expectations in an alternative scenario. Relying on them as a regular feature of the DSA framework may however present some practical challenge in terms of volatility, interpretation and cross-vintages comparison, if the term premium varies significantly over time ([12]).

Using financial expectation measures to set interest rate assumption would however help track changes in the interest rate environment and reflect its impact throughout the projection horizon. In practice, to avoid excessive volatility, scenarios or baseline computations could rely on average financial expectations measures over recent months. In turn, dedicated simulation could assess the impact of sudden changes in market expectation by relying on such targets to account for changes in financing conditions that may last beyond the short and medium term, allowing to illustrate the impact of increasingly (or decreasingly) adverse market perception of sovereign risks, as reflected in the (forward) yields.

Implications on debt projections and fiscal sustainability assessment

Turning to the results, Graph 3 shows the impact on projected debt-to-GDP levels, by 2029, of using alternative market-based interest rate convergence targets. On average, the impact appears modest, reflecting the moderate change in the implicit interest rate. For the EU, the (unweighted) average difference across the two scenarios is 2 pps. by the end of the projection horizon. However, in some cases (BE, FR), the difference reaches around -6.5 pps. A similar picture (not shown) emerges for the S1 indicator, with an average impact of -0.55 pps. and larger impacts in some cases (DE, FR, NL). Similarly, the average impact, for year 2029, on gross financing needs

([8]) See e.g. Fama and Bliss (1987) and Campbell and Shiller (1991). For discussion and interpretation of forward interest rate computations see also Svensson (1994).

([9]) For recent analysis of evolution of term premium see e.g. Cohen et al. (2018) and Kopp and Williams (2018).

([10]) See Bauer and Hamilton (2017), for discussion of models that parsimoniously account for factors affecting the term premium.

([11]) See e.g. Favara et al. (2016).

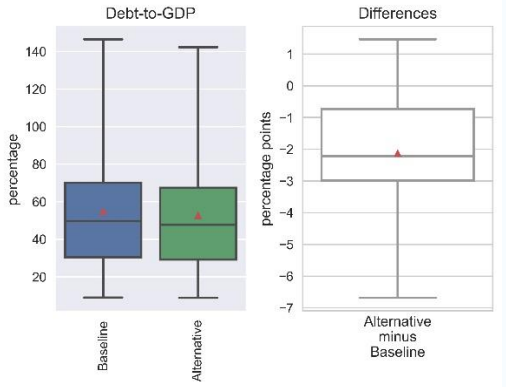
([12]) For a recent illustration of an alternative approach to forecast long-term interest rates, see Bauer (2017). For a general review of approaches to forecast interest rates, see Duffee (2013).

(Continued on the next page)

Box (continued)

(not shown) is somewhat small at -0.8 pp., with some countries posting larger impacts (around -2.5 pps. for FR and BE).

Graph 3: **Range of debt-to-GDP levels, across the EU countries, by 2029, under the baseline and alternative scenario, %**

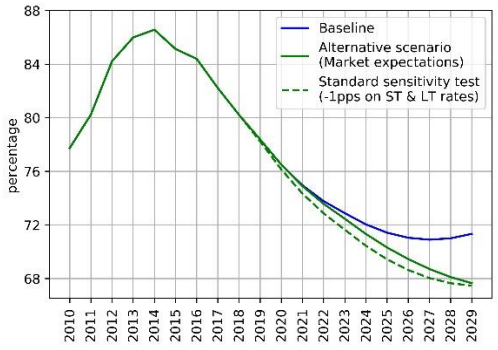


(1) cfr. Graph 1.
Source: Commission services.

Note that the results presented here can also be inferred from information provided by the current DSA framework. The standard interest rate sensitivity test points at a similar impact under its more benign interest rate scenario (i.e. -1 pp. interest rate shock). Shifting our focus to the EU aggregate by reporting *weighted* averages, the impact of shifting to alternative market-based targets would stand at around -4 pp. for EU debt-to-GDP, by 2029. This matches closely the impact highlighted by the standard lower interest rate test scenario for the EU aggregate (see Graph 4) ([13]).

([13]) Ibid footnote (6).

Graph 4: **EU(2) government debt projection, under the baseline and alternative scenario and the standard sensitivity test, %**



(1) See Box 1.1, for details on the standard interest rate sensitivity test;
(2) EU aggregate excludes Greece.
Source: Commission services.

In terms of policy implications, country-level results reported in Table 1 reveal a limited impact of the alternative interest rate scenario on risk classification. Risk classification based on the end-of-horizon debt-to-GDP level is unaffected, while the classification based on the S1 indicator changes only for Croatia and Slovenia, which both lay close to the zero threshold distinguishing low from medium risk ([14]).

Table 1 also shows the country impacts for debt-to-GDP, S1, gross financing needs and the implicit interest rates. Countries posting the largest impact (e.g. FR, BE) tend to do so consistently across debt-to-GDP, S1 and GFNs. These tend to be countries witnessing large changes in their implicit interest rate and / or having a relatively large stock of debt. In particular, the latter increases substantially sensitivity (of debt, S1 & GFNs) to changes in the interest rate. Overall, Table 1 confirms differentiated sensitivity across countries vis-à-vis interest rate conditions. This deserves particular attention from a fiscal sustainability perspective, as interest rates are heading for a general gradual increase.

([14]) Interest rates are assumed to remain unchanged beyond 2029.

(Continued on the next page)

Box (continued)

Table 1: **Impact of alternative interest rate assumptions on debt-to-GDP, S1, GFNs and risk assessment, in EU countries**

	Debt-to-GDP in 2029			Risk assessment based on Debt-to-GDP in 2029		S1 indicator			Risk assessment based on S1 indicator		GFNs-to-GDP in 2029			Implicit interest rate in 2029		
	Baseline	Alternative	Impact	Baseline	Alternative	Baseline	Alternative	Impact	Baseline	Alternative	Baseline	Alternative	Impact	Baseline	Alternative	Impact
BE	99,9	93,7	-6,2	High	High	4,3	3,5	-0,8	High	High	20,0	17,7	-2,3	3,6	2,1	-1,5
BG	12,4	12,0	-0,4	Low	Low	-4,2	-4,8	-0,6	Low	Low	1,0	0,9	-0,1	3,5	2,7	-0,8
CZ	25,8	24,6	-1,1	Low	Low	-2,9	-3,3	-0,4	Low	Low	3,9	3,5	-0,4	3,8	2,8	-1,0
DK	10,8	10,1	-0,8	Low	Low	-5,1	-6,0	-0,9	Low	Low	-0,5	-0,7	-0,2	3,2	2,5	-0,6
DE	37,3	34,0	-3,4	Low	Low	-2,0	-3,0	-1,0	Low	Low	6,6	5,1	-1,5	3,4	1,5	-1,9
EE	9,6	9,1	-0,5	Low	Low	-4,3	-5,0	-0,7	Low	Low	-	-	-	2,7	1,3	-1,4
IE	46,7	44,0	-2,8	Low	Low	-0,9	-1,6	-0,7	Low	Low	5,8	5,0	-0,8	3,6	2,2	-1,4
ES	107,3	103,0	-4,3	High	High	5,2	4,7	-0,5	High	High	22,3	20,7	-1,6	3,8	2,8	-1,0
FR	99,8	93,1	-6,7	High	High	4,2	3,3	-0,9	High	High	20,9	18,3	-2,5	3,6	2,0	-1,6
HR	64,3	62,0	-2,2	Medium	Medium	0,2	-0,2	-0,4	Medium	Low	13,6	12,8	-0,8	4,4	3,7	-0,7
IT	146,5	142,3	-4,3	High	High	9,4	9,0	-0,4	High	High	27,4	25,8	-1,5	4,2	3,5	-0,7
CY	61,9	60,9	-1,0	Medium	Medium	-0,7	-0,9	-0,2	Low	Low	9,0	8,6	-0,4	3,6	3,2	-0,4
LV	35,0	33,0	-1,9	Low	Low	-2,0	-2,6	-0,6	Low	Low	5,4	4,8	-0,6	3,5	2,1	-1,4
LT	33,4	30,7	-2,7	Low	Low	-1,8	-2,7	-0,8	Low	Low	4,9	4,1	-0,8	3,5	1,6	-1,9
LU	8,9	8,8	0,0	Low	Low	-4,8	-5,3	-0,5	Low	Low	-0,2	-0,2	0,0	1,8	1,7	0,0
HU	68,7	66,5	-2,3	Medium	Medium	1,1	0,7	-0,4	Medium	Medium	20,7	19,7	-1,0	4,4	3,7	-0,8
MT	17,8	17,2	-0,6	Low	Low	-4,7	-5,2	-0,5	Low	Low	0,3	0,1	-0,1	3,4	3,0	-0,5
NL	38,2	35,1	-3,1	Low	Low	-1,7	-2,7	-0,9	Low	Low	6,8	5,5	-1,3	3,2	1,4	-1,8
AT	51,2	48,6	-2,6	Low	Low	-0,8	-1,5	-0,7	Low	Low	5,9	4,9	-1,0	3,1	1,9	-1,1
PL	48,0	46,7	-1,3	Low	Low	-0,7	-1,0	-0,3	Low	Low	7,1	6,7	-0,4	4,3	3,6	-0,7
PT	106,7	103,7	-3,0	High	High	4,3	4,0	-0,4	High	High	19,3	18,2	-1,1	4,1	3,4	-0,7
RO	61,6	61,9	0,3	Medium	Medium	1,5	1,6	0,0	Medium	Medium	14,0	14,1	0,1	4,8	4,9	0,1
SI	53,5	50,6	-3,0	Low	Low	0,2	-0,5	-0,7	Medium	Low	10,4	9,3	-1,1	3,8	2,4	-1,4
SK	31,9	30,9	-1,0	Low	Low	-2,9	-3,4	-0,5	Low	Low	2,5	2,2	-0,3	3,1	2,4	-0,8
FI	55,1	52,9	-2,2	Low	Low	-0,1	-0,6	-0,5	Low	Low	7,7	6,9	-0,7	2,6	1,6	-1,0
SE	15,6	15,4	-0,2	Low	Low	-4,6	-5,1	-0,5	Low	Low	-0,4	-0,4	0,0	1,3	1,2	-0,1
UK	73,9	70,1	-3,7	Medium	Medium	1,3	0,6	-0,6	Medium	Medium	9,3	8,1	-1,2	3,7	2,6	-1,2
EU	71,3	67,7	-3,7			1,4	0,7	-0,7			12,7	11,3	-1,4	3,6	2,3	-1,3
EA	77,6	73,4	-4,2			2,1	1,4	-0,8			14,7	13,1	-1,7	3,6	2,1	-1,4

(1) Boxes in the table highlight changes in risk classification across scenarios;
(2) EU & EA aggregates exclude Greece.
Source: Commission services.

Conclusion

The results point at an overall limited impact of using interest rates assumptions based on financial market expectations – notably in terms of risk classification – although impacts are larger for some countries. The latter are those that tend to have higher debt, shorter average maturity and for which market expectations substantially deviate from assumed convergence, by the end of the horizon, to a common interest rate target level. The dampening effect of the existing maturity structure of stock of debt also reflects the fact that many countries have used the low interest rates environment to lengthen the maturity structure of their public debt ([15]). Overall, such differentiated sensitivity vis-à-vis interest rate changes warrants close monitoring of high debt countries from a fiscal sustainability perspective.

([15]) For further discussions on differentiated sensitivities vis-à-vis interest rate changes, see also Box 2.2 entitled "The sensitivity of public debt to a rise in interest rates in EU countries", in *The 2017 Debt Sustainability Monitor*, European Economy Institutional Paper 071, January 2018.

Box 3.3: Fiscal sustainability analysis for Greece

Greece successfully completed its European Stability Mechanism (ESM) stability support programme on 20 August 2018. Following the end of the programme, Greece has been integrated into the regular economic surveillance framework for EU Member States under the European Semester for economic policy co-ordination. In order to cater for the specific needs and challenges of Greece, the Commission has activated enhanced surveillance for Greece under Regulation (EU) No 472/20131, effective as from 21 August 2018. A first Enhanced Surveillance Report was issued in November ([1]) - alongside the 2018 autumn Semester package – including a debt sustainability analysis (DSA) and repayment capacity.

Following the integration of Greece into the EU regular surveillance framework, this edition of the Fiscal Sustainability Report provides for the first time since 2009 an analysis of fiscal sustainability challenges for Greece. Given the specificities of the Greek debt composition, and the debt relief measures agreed by the Eurogroup in June 2018, the analysis differs somehow from the standardised horizontal approach followed in the rest of this report. This Box presents i) the DSA presented in the enhanced-surveillance report; and ii) the standard Commission fiscal sustainability indicators (S0, S1 and S2). These calculations are in-line with post-programme commitments.

Debt sustainability analysis

A technical update ([2]) of the debt sustainability analysis carried out in June 2018 and published in the Compliance Report after the fourth review of the ESM programme shows that the assessment of the sustainability of Greece's debt is broadly unchanged. The changes since June are due to the sizable revision of the GDP level for 2017, the updated macroeconomic projections and interest payment forecast updates.

Under the baseline scenario, a declining trend for the government debt ratio is projected, yet remaining at a high level until 2050. Assuming the full implementation of all the medium term measures politically agreed in June ([3]), the baseline scenario shows the debt remaining on a downward path until 2033, when the deferred interest is to be capitalised and included in the EDP debt ([4]), which results in a hike of government debt. After this, debt declines further but remains above 100% of GDP until the end of the 2040's. By 2060, it goes down below 90% of GDP (see Graph 1 and Table 1 for the underlying assumptions).

The baseline scenario shows government gross financing needs increasing, yet staying at sustainable levels. Gross financing needs (GFN) will hover around 10% of GDP until 2032. Later, GFN starts to increase slowly, but remains around 17.5% of GDP at the end of the projection horizon (see Graph 2).

Table 1: **Main assumptions underlying the DSA**

		2018	2019	2030	2040	2050	2060	Average 2019-60
Primary surplus (% of GDP)	Baseline	3,7	3,5	2,2	2,2	2,2	2,2	2,4
	Adverse	3,7	3,5	1,5	1,5	1,5	1,5	1,7
Nominal growth (%)	Baseline	2,6	3,4	3,0	3,0	3,0	3,0	3,1
	Adverse	3,0	3,4	2,8	2,8	2,8	2,8	2,9
Re-financing rates (%)	Baseline		3,8	5,1	4,7	4,3	3,9	4,6
	Adverse		3,7	5,4	5,4	5,6	6,0	5,4

Source: Commission services

Less favourable trends are foreseen in case of more adverse macro-financial conditions. In the adverse scenario, debt remains on a downward path until the end of the deferral period, but then starts to rise and remains on an increasing path from 2036 onwards. Under this scenario, GFN reaches 20% in the late 2030's and then keeps increasing over time.

([1]) European Commission (2018e).

([2]) The technical update includes: incorporation of updated gross debt figures for 2017, updated GDP data and macroeconomic scenarios, updated assumption on risk free rates, updated interest and amortization payments on GLF, EFSF and ESM loans as well as other non-official loans.

([3]) The abolition of the step-up interest rate margin related to the debt buy-back tranche of the 2nd Greek programme as of 2018; the use of 2014 SMP profits from the ESM segregated account and the restoration of the transfer of ANFA and SMP income equivalent amounts to Greece (as of budget year 2017); a further deferral of EFSF interest and amortization by 10 years and an extension of the maximum weighted average maturity (WAM) by 10 years, respecting the programme authorized amount.

([4]) In the programme documents, the deferred interests have been added to the debt stock in the year of their deferral. Under the EDP definition of debt, however, they should be added only once the whole deferral period is over. If market rates are assumed the same under the two approaches (which they are), the two approaches result in an identical outcome for GFN-to-GDP on the whole horizon, and identical debt-to-GDP figures after the end of the deferral period.

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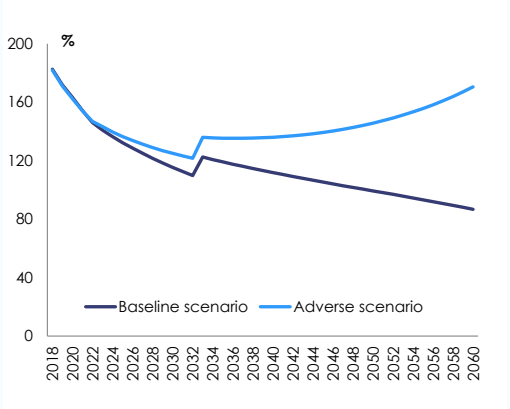
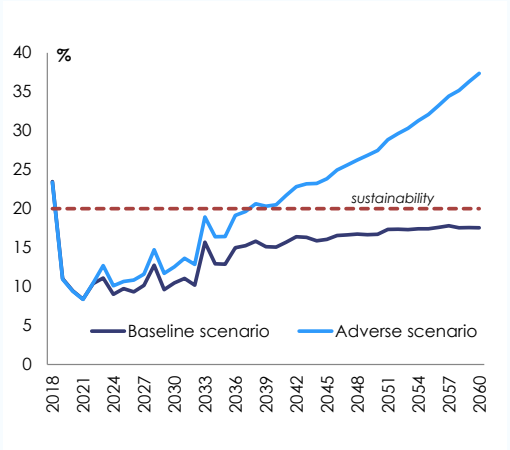
Box (continued)

Graph 1: **Government debt to GDP ratio projections, baseline and adverse scenarios**



Source: Commission services

Graph 2: **Government gross financing needs to GDP ratio projections, baseline and adverse scenarios**



Source: Commission services

Commission fiscal sustainability indicators

In addition to the updated DSA, the standard Commission fiscal sustainability indicators (S0, S1 and S2 indicators) are provided. In the case of Greece, some caveats should be kept in mind in the interpretation of the results. First, for the *S0 indicator* ([5]), as the majority of the government debt is held by official lenders, Greece is in principle largely immune to risks of fiscal distress in the short-term. Then, the computation of the fiscal gaps *S1 and S2 indicators* is based on assumptions and fiscal paths, agreed with national authorities and partners, which differ somehow from the common methodologies applied in this report ([6]). Given this comparability issue, the results are presented in this separate Box. Furthermore, when interpreting the *S1 indicator* results, it should be kept in mind that reaching the SGP reference debt ratio of 60% of GDP in 15 years is clearly very demanding for (very) high debt countries. The *S2 indicator* measures the long-term fiscal adjustment required to ensure that debt is not on an ever-increasing path. Although anchored to the traditional solvency definition, this condition may not be sufficient to ensure long-term sustainability for (very) high debt countries. This issue is addressed in the report by further qualifying long-term fiscal challenges with the DSA results. Last, as both the *S1 and the S2 indicators* are computed by reference to a baseline scenario, the plausibility of the associated primary balance needs to be considered (as done with the percentile rank measure provided in the table below).

Short-term fiscal risks appear limited. According to the S0 indicator, no risks of short-term fiscal distress are identified for Greece (see Table 2). Indeed, despite the very high debt to GDP ratio, the exceptional structure of the Greek debt, as well as the sizeable primary surplus imply that financing needs are contained. The macro-financial sub-index points to remaining vulnerabilities (yet a value below the critical threshold). The decade-long crisis in Greece has many legacy effects notably in the form of private debt, negative net international investment position and non-performing exposures (see European Commission, 2018c and European Commission, 2018d).

The medium- and long-term traditional fiscal sustainability indicators point to remaining challenges. Given the very high debt burden, the *S1 indicator* (at around 6½ pps. of GDP) reaches a value well above the upper threshold. Yet, the solid initial budgetary position moderates this value, while also clearly pointing to a very challenging sustained fiscal position to bring the debt to GDP

([5]) The S0 indicator allows identifying structural vulnerabilities coming from the fiscal and / or the macro-financial sides of the economy, and which could lead to fiscal distress in the short-term (see Chapter 2 of the report).

([6]) For instance, the standardised approach in this report is to assume that the structural primary balance of the last forecast year (2020) is modified in the following years by adding projected changes in the cost of ageing.

(Continued on the next page)

Box (continued)

ratio to the SGP reference threshold in 15 years (as measured by the percentile rank of the associated primary balance). The estimated *S2 indicator* shows, on the basis of the current sizeable primary balance, that stabilising debt over the long-term would be compatible with a primary balance permanently reduced by around 1 pp. of GDP (a value of 1.3% of GDP rather than 2.2% of GDP in the long-term). Yet, the high 'steady-state' debt level associated to the S2 indicator (around 130% of GDP) implies that stabilising debt would not be sufficient to secure fiscal sustainability.

Table 2: **Fiscal sustainability indicators and additional statistics: Greece and other post-programme countries**

	EL	IE	ES	PT	CY
S0 indicator	**0.3**	**0.2**	**0.4**	**0.3**	**0.5**
Fiscal sub-index	0.3	0.0	0.6	0.3	0.3
Financial-compt. sub-index	0.3	0.3	0.3	0.3	0.6
S1 indicator (pps. of GDP)	**6.4**	**-0.9**	**5.2**	**4.3**	**-0.7**
Required structural primary balance (% of GDP)	8.6	0.1	4.3	6.6	2.2
Percentile rank	0.2%	57%	9%	1%	22%
S2 indicator (pps. of GDP)	**-0.9**	**3.3**	**2.3**	**0.7**	**-0.9**
Required structural primary balance (% of GDP)	1.3	4.3	1.3	3.0	2.1
Percentile rank	33%	9%	34%	17%	23%
Debt ratio (2018)	182.5	63.9	96.9	121.5	105.0

(1) The S0 indicator is a composite indicator, based on a large set of fiscal and macro-financial variables. When S0 is above its critical threshold (0.46), risks of short-term fiscal distress are identified. The two sub-indexes help further qualifying the results, by identifying the main sources of fiscal risks (thresholds are respectively 0.36 and 0.49 for the fiscal and financial-competitiveness sub-indexes). See Chapter 2 for more details.
(2) For Greece, the S1 and S2 indicators are computed based on the baseline assumptions presented in this Box. The critical thresholds for S1 are 0 and 2.5 pps. of GDP, and for S2, 2 and 6 pps. of GDP. See Chapter 3 and 4 for more details.
(3) The RSPB (required structural primary balance) associated to S1 / S2 is the sum of the initial SPB and the required S1 / S2 adjustment. The percentile rank gives a measure of the plausibility of this RSPB. For example, a value of 9% in the case of Spain (S1 RSPB) means that in only 9% of cases (over the distribution of SPB in EU countries since 1980), countries were able to reach (and sustain for at least 3 years) a SPB equal or greater than 4.3% of GDP.
Source: Commission services

Box 3.4: Liquidity requirements and market financing conditions

Liquidity matters. Ten years after the start of the global financial crisis, a lesson learnt is that liquidity and solvency are interrelated and, therefore, equally important.

Healthy public finances must be both solvent and adequately liquid, meaning a government should be able to meet its obligations in the long, as well as in the short term. Evidence from the financial sector has shown that liquidity problems are often rooted in fears of insolvency and, in turn, that liquidity shortages can prompt a solvency crisis. Solvency is a long-term concept, which for the government means the ability to repay its initial debt in the (potentially distant) future by running primary surpluses. The more distant the future, however, more uncertainty investors face about the sources of liabilities financing, changes in asset valuation and other transformations balance sheets may experience over time. This makes it difficult to evaluate whether an issuer is solvent, possibly denting investor trust. If panic sparked amongst investors suddenly drives them towards exit channels for risky bonds, an issue of liquidity may spiral into one of solvency, even when the original setting was on a sustainable footing.

Different circumstances may expose EU countries to greater liquidity requirements if investors shift their preferred habitat to the short term, causing fiscal stress to frail sovereigns. Recent examples such as financial crises, a shortage of safe assets, scarce commitment to reforms, a disregard of rules, asymmetric information and uncertainty about future policies, political or institutional risks may cause investors to favour short-term bonds. Such setting would confine the government's refinancing options to this horizon, and to raising borrowing costs.

Gross financing needs (GFN) are a useful indicator of government liquidity and projections of GFN inform the sustainability analysis ([1]). Technical intricacies aside, GFN are commonly understood as the flow of payment or financing obligations the government faces in order to service its debt and cover its budget deficit, if any, over the next period. Thus, even when budgetary deficits are small or decreasing, new financing needs may be large if high levels of debt have been accumulated in the past and with a significant part maturing in the near term:

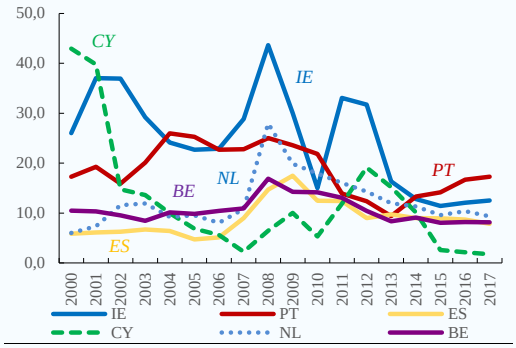
GFN = [Primary deficit + Interest payments or] Headline deficit + Debt principal amortisation (+ SFA or other net flows)

While GFN may be analysed both historically and in forward looking manner, GFN projections are a valuable qualifier for debt estimates.

To understand the effect of sudden liquidity pressures on selected sovereigns, this box presents the thought experiment of a market stress scenario on future GFN, performed by imposing a reliance on short-term issuances together with interest rates hikes ([2]). Concretely, for selected countries we assume a coerced transfer of debt towards short-term and costlier refinancing, which last for a period of five years (see below more details on the design of the stress test).

The stress scenario aims to reflect debt management behaviour observed in times of crisis. Under 'normal' cyclical conditions and financial debt stability, debt managers tend to focus on costs minimisation, and have a preference for issuing debt with a relatively long average maturity. In these cases, changes in the debt maturity structure will usually be limited and be primarily linked to relative yield movements.

Graph 1: **Share of government short-term debt: evolution through time in selected countries (% of total)**



Source: Eurostat

Yet, in the wake of major crises, changes in the debt composition can be large and sudden (Abbas

([1]) See section 3.2 for more details.

([2]) Initial debt stocks remain unchanged, only the structure transforms towards shorter debt maturities.

(Continued on the next page)

Box (continued)

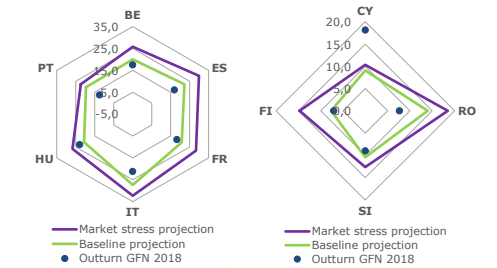
et al., 2014). This can be illustrated by the cases of some distressed countries during the last crisis (see Graph 1).

GFN flows projected in the market stress scenario are, in some cases, significantly higher than in the baseline (Graph 2). **For more heavily indebted governments, the debt stock takes its toll.** A shock potentially leading to a sudden change in market conditions and shifting a proportion of debt to short maturities would confront IT, BE, FR, ES and HU with GFN ratios some 5 to 8 pps. of GDP higher than currently projected.

For some post-programme countries, the shock also leads to higher GFN projections with respect to the baseline, even after accounting for their concessional borrowing terms. For countries such as CY and PT, the shock shortening debt maturity applies only to the part of long-term debt securities excluding loans, to reflect realistically these sovereigns' stable sources of funding. In such cases, a 1 to 3 pps. pf GDP surge in GFN is driven mainly by the shift of government bonds to shorter maturities.

In a few cases, risks embedded in the debt structure trigger the more elevated GFN seen under the shock. A share of short-term debt in new issuances that is already high in the baseline (HU, FI and RO) or shares of maturing long-term debt that are significant even before the shock hits (RO and SI), would prompt, when augmented, even greater GFN.

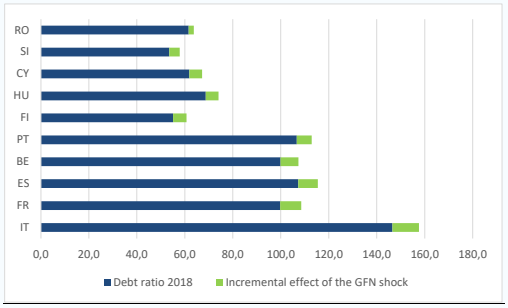
Graph 2: **GFN under stress and baseline scenario projections (max annual flow over 2019-2029) versus historical data (2018)**



(1) The liquidity shock applies over 2019-2024 and is calibrated as described below.
(2) The baseline projections and the 2018 outturn values are those presented in section 3.2.
Source: Commission services

The effect of the liquidity shock on projected debt stocks differs in the sample studied, with current biggest debtors running the largest risks. Among the countries analysed, the incremental effect of the liquidity shock on the debt ratio varies between 2 pps. of GDP in RO and 11 pps. of GDP in IT (Graph 3). Since countries with the largest debt stocks would face the highest incremental effect from a shock as designed above, increased prudence is necessary to keep these governments' powder dry.

Graph 3: **Impact of the liquidity shock on selected government debt ratios (% of GDP and pps. of GDP difference between debt ratios in the stress and baseline scenario)**



Source: Commission services

Calibration of the liquidity shock:

In the baseline scenario, GFN are projected using the usual assumptions on interest rates and debt maturity structure parameters(*). The latter reflect their past behaviour, converging, for each country, to the series' historical average by t+10. For post-programme countries such as Ireland, Portugal and Cyprus the projected share of existing debt maturing and to be rolled-over, accounts, additionally, for the effective repayment schedule of official loans. In the stress scenario, GFN are projected using higher interest rates with faster transmission through the debt structure. This reflects more adverse financing conditions, as follows: i) Short- and long-term future interest rates go up by 2 pps. with respect to baseline projections; ii) key issuance parameters are augmented, for each country, to historical maxima to produce strong liquidity stress.

(*) The key issuance parameters determining the debt maturity structure are i) the share of debt with maturity under one year in new debt issuances and ii) the share of existing debt maturing in one year and to be rolled over.

4. LONG-TERM FISCAL SUSTAINABILITY ANALYSIS

4.1. THE ECONOMIC AND BUDGETARY IMPLICATIONS OF AGEING

The process of population ageing in Europe will intensify in the future, according to Eurostat's latest population projections. While the total population in the EU is projected to increase to 520 million in 2070 from 511 million in 2016, the working age population will decrease significantly (-12%). As a result, the projected demographic old-age dependency ratio will be increase substantially in the period 2016-2070, from 30% in 2016 to 51% in 2070.

The ageing of the European population structure reflects the future dynamics of fertility rates, life expectancy and net migration. However, net migration flows will not be large enough to compensate for the negative effects of these two variables in the ageing process, even in the more extreme case where migration flows will intensify further in the future (higher net migration scenario).

The ageing process will have an important budgetary impact. On the one hand, both pension expenditure and health care and long-term care expenditure would be dramatically impacted by a population structure that is expected to age significantly. On the other hand, the reduction of the working age population will affect potential GDP growth.

Additionally, there are still important uncertainties about the intensity of the ageing process, the macroeconomic outlook and the possible reversal of some policy reforms in some Member States. They represent a clear risk to the long-term sustainability of public finances. This subsection describes the ageing cost projections (incorporating pensions, healthcare, long-term care, education and unemployment benefit projections) as reported in the 2018 Ageing Report. These are key variables in the assessment of long-term fiscal sustainability challenges. They shed light on the economic, budgetary and societal challenges that policy makers will have to face in the future.

4.1.1. Population ageing

The increase in European population, from 511 million in 2016 to 520 million in 2070, will not result in a rise in working-age population. ([69]) On the contrary, population in the group 15-64 years will decrease from 333 million in 2016 to 292 million in 2070. There are wide differences across countries, as the total population is projected to increase in half of the EU countries, and fall in the other half (see Table 4.1).

Table 4.1: **Population and working age population (15-64)**

	Total population (million)			Working age population (15-64)		
	2016	2070	% change 2016-2070	2016	2070	% change 2016-2070
BE	11.3	13.9	23%	7.3	8.1	10%
BG	7.1	4.9	-32%	4.7	2.7	-43%
CZ	10.6	10.0	-6%	7.0	5.7	-19%
DK	5.7	6.8	19%	3.7	3.8	4%
DE	82.5	79.2	-4%	54.1	43.8	-19%
EE	1.3	1.2	-11%	0.9	0.7	-23%
IE	4.7	6.0	29%	3.0	3.5	18%
EL	10.8	7.7	-29%	6.9	4.1	-40%
ES	46.4	49.9	7%	30.7	28.4	-7%
FR	66.8	77.0	15%	41.8	44.1	5%
HR	4.2	3.4	-19%	2.8	1.9	-32%
IT	60.8	54.9	-10%	39.0	29.9	-23%
CY	0.9	1.0	20%	0.6	0.6	-4%
LV	2.0	1.3	-32%	1.3	0.7	-42%
LT	2.9	1.7	-40%	1.9	1.0	-49%
LU	0.6	1.0	78%	0.4	0.6	47%
HU	9.8	8.9	-10%	6.6	5.0	-25%
MT	0.4	0.5	19%	0.3	0.3	-1%
NL	17.0	19.6	15%	11.1	11.1	0%
AT	8.7	10.2	16%	5.9	5.7	-3%
PL	38.0	30.9	-19%	26.1	16.5	-37%
PT	10.3	8.0	-23%	6.7	4.2	-37%
RO	19.7	15.0	-24%	13.2	8.3	-37%
SI	2.1	2.0	-5%	1.4	1.1	-19%
SK	5.4	4.9	-10%	3.8	2.7	-29%
FI	5.5	5.6	2%	3.5	3.2	-9%
SE	9.9	13.9	40%	6.2	8.0	29%
UK	65.6	81.0	24%	42.2	46.7	11%
EU	510.9	520.3	2%	332.9	292.2	-12%

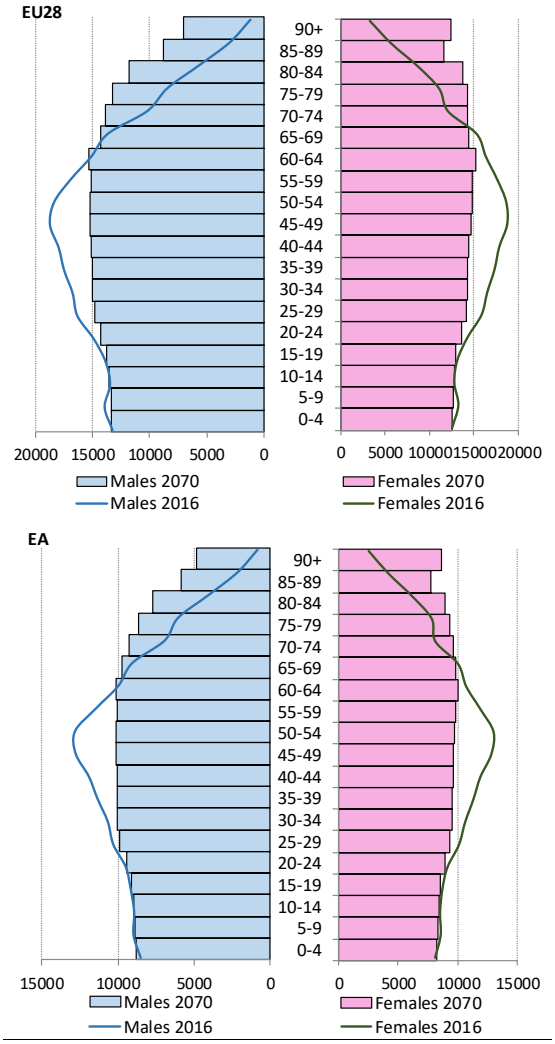
Source: Eurostat, Commission services, EPC.

Europe is becoming older than ever before in the coming decades. For males, the projected population in 2070 is lower than or close to the population in 2016 in all age cohorts between 0 and 64 years old. Conversely, in all age cohorts of 65 years old and above, the projected population in 2070 is higher than in 2016. For females, the projected population in 2070 is lower than or close to the population in 2016 in all age cohorts between 0 and 69. Conversely, in the age cohorts

([69]) See Eurostat (2017). The population projections can be found at: http://ec.europa.eu/eurostat/data/database?node_code=proj

above 69 years old, the projected population in 2070 will be higher than in 2016. Moreover, while in 2016 the largest cohort for both males and females is 45-49 years old, in 2070 the largest cohort will be 70-74 years old for women and 50-54 years old for men (see Graph 4.1). Overall, the median age will rise by 4 years for both men and women by 2070. Similar developments are projected for the euro area.

Graph 4.1: **Population by age group and gender, 2016-2070 (thousands)**



Source: Eurostat, Commission services, EPC.

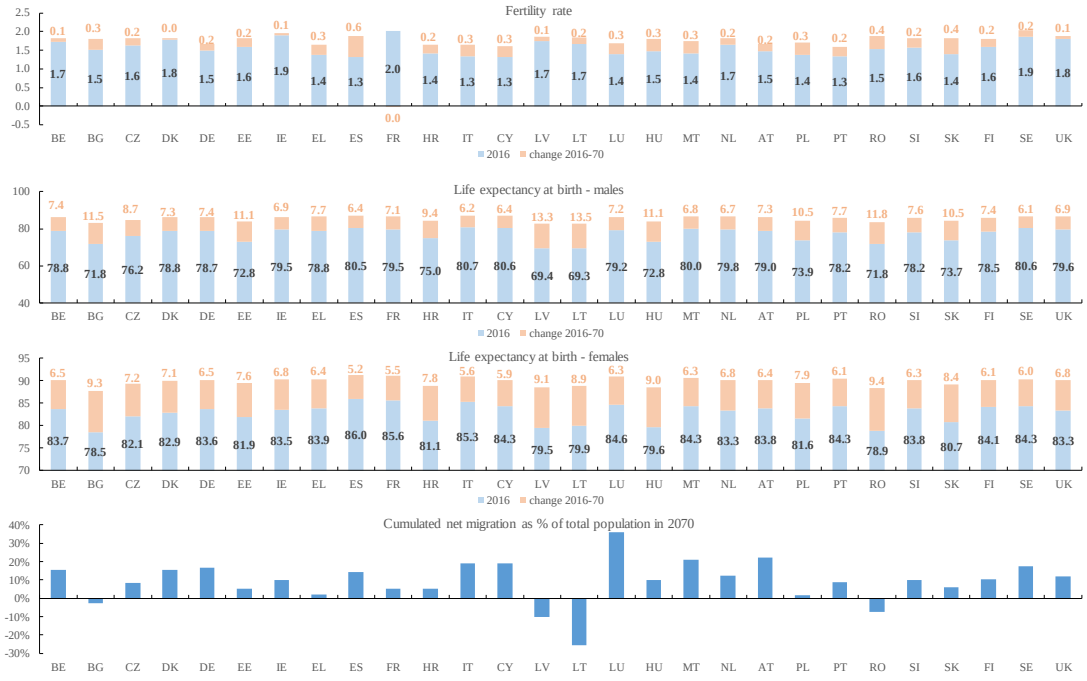
The ageing population process is the result of three factors (see Graph 4.3):

– **Low fertility rates.** Although the fertility rate is expected to increase from 1.58 in 2016 to 1.81 in 2070 in the EU, the value is well below the natural replacement rate necessary to foster the rejuvenation of the European natural population.

– **Lower mortality rates and the consequent higher life expectancy for men and women**. In 2070, life expectancy at birth would reach 86 and 90 years for men and women, respectively. This represents an increase of close to 8 years for men and 7 years for women compared to 2016 values, and close to 20 years if we compare it with 1960.

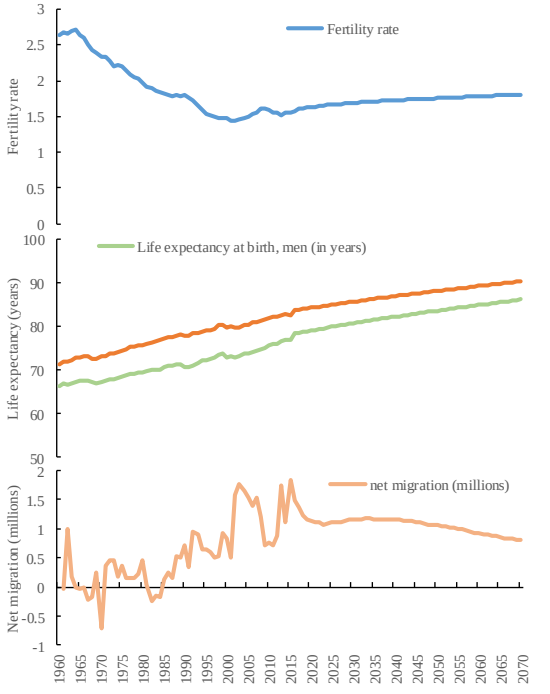
– **High values for net migration inflows but insufficient to compensate the consequences of the previous two factors.** Cumulated net migration in the period 2016-2070 would be around 59 million - 11.3% of 2070 European population. Although positive, the size of the migration flows will not be enough to counteract the ageing process. It will only reduce its intensity. Eurostat has also published a sensitivity scenario for population projections in which net migration increases by 33% compared to the reference scenario. Even in this scenario, the process of ageing is still dramatic.

Graph 4.2: **Fertility rate, life expectancy and net migration by country.**



Source: Commission services, EPC, 2018 Ageing Report.

Graph 4.3: **Fertility rate, life expectancy at birth and net migration. European Union.**



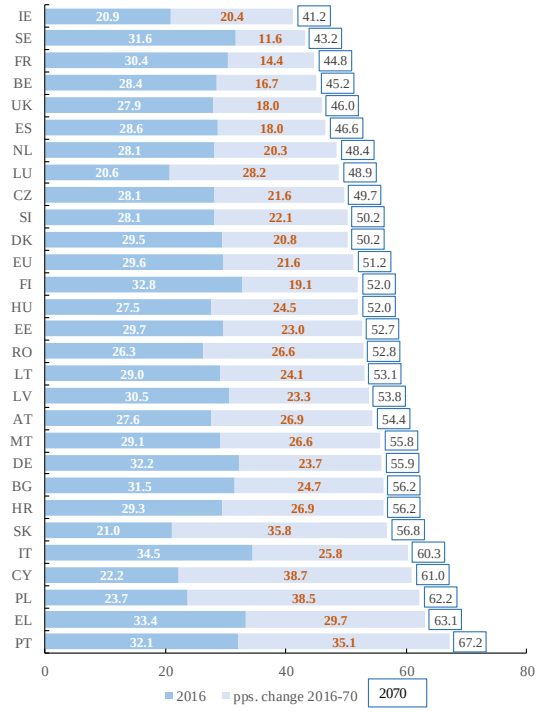
Source: Eurostat, Commission Services, EPC.

There are important differences among Member States in the drivers of population growth. However, all Member States will experience an intense process of ageing on their population structure (see Graph 4.2).

The EU would go from having 3.3 working-age people for every person aged over 65 years to only two working-age persons. The old age dependency ratio, population aged 65 and over as a proportion of the population aged 15-64, will rise from a value of 30% in 2016 to 51% in 2070 (with a peak of 52% in 2060). In the euro area, the ratio will be 31% and 52%, in 2016 and 2070, respectively (see Graph 4.4). Most of this increase is driven by the very old-age dependency ratio (people aged 80 and above relative to those aged 15-64) which is rising by 14 pps. (8% to 22%) over this horizon.

The old age dependency ratio will increase in all Member States, but to varying degrees. Greece (63%), Poland (62%), Cyprus (61%) and Italy (60%) will show the highest values in 2070. Only Ireland and Sweden will remain below 45%, thanks in part to higher fertility rates and intense positive net migration inflows (see Graph 4.4).

Graph 4.4: **Old age dependency ratio by country**



Source: Eurostat, Commission services, EPC.

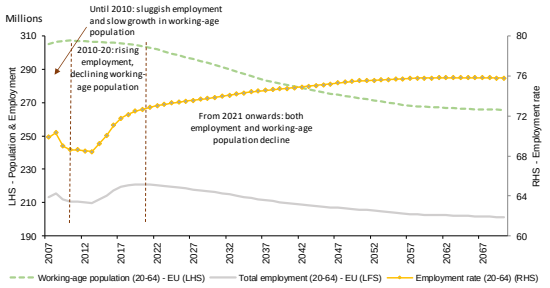
4.1.2. Labour force projections

Despite total population growth in the European Union, the ageing process will have a clear effect on labour growth in the next decades. The reduction in working-age population will put pressure in the labour supply that will fall accordingly. Working longer and more, with an increase in participation rates especially of older population, may not be enough to compensate for the drop in working-age population.

The macroeconomic implications of the demographic trends will therefore intensify budgetary challenges. It will mean fewer resources to support older population. The effects of pension programs and in particular of pension reforms will have an effect on participation rates, as they influence individual decisions on how long to remain active in the labour market. ([70]) The 2018 Ageing Report also includes an assessment of the future impact of pension reforms legislated by Member States on participation and employment rates, and therefore on budgetary projections.

([70]) The 2018 Ageing Report also includes an assessment of the future impact of pension reforms legislated by Member States on participation and employment rates, and therefore on budgetary projections.

Graph 4.5: **Population and employment developments (million), EU**



Source: Commission services, Eurostat, EPC.

In the EU, participation rates is projected to increase over the long term, from 77.5% in year 2016 to 80.7% in 2070 for the group 20-64. The increase would be more intense for women (from 71.4% to 76.9%) and older people 55-64 (from 59.1% to 71.3%). The employment rate would increase accordingly in the population group 20-64, with an increase for the European Union of 4.7 pps., from 71.1% in 2016 to 75.8% in 2070.

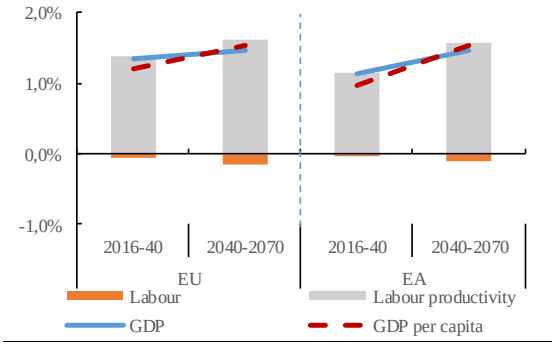
The net effect of declining working-age population and higher employment rates is still negative for employment in the European Union, with employment falling as of the early 2020s (See Graph 4.5).

4.1.3. Labour productivity and potential GDP growth

Potential GDP is projected to remain quite stable in the EU over the long term, averaging 1.4% up to 2070. A production function framework was used in the 2018 Ageing Report to project GDP growth over the long term ([71]). In that framework, potential GDP growth is driven by long-term developments in labour input and labour productivity.

([71]) A standard specification of the Cobb-Douglas production function with constant returns to scale is used. All assumptions were agreed by the EPC, including the 'T+10' methodology for estimating potential GDP developed by the EPC's Output Gap Working Group (OGWG). A detailed description of the production function framework and the key assumptions underpinning the long-term GDP projections can be found in Chapter 3 of the '2018 Ageing Report: Underlying Assumptions and Projection Methodologies'.

Graph 4.6: **Potential GDP growth components, 2016-40 and 2040-70.**

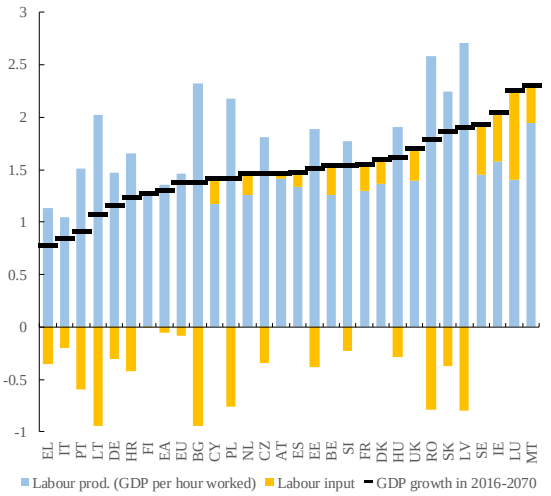


Source: Commission services, EPC, 2018 Ageing Report.

In the 2018 Ageing Report baseline projection, it is assumed that all countries will converge to a labour productivity growth rate of 1.5% in the long term (corresponding to a TFP growth rate of 1%). In the European Union as a whole, labour productivity is projected to grow by 1.5% per year on average in the period 2016-70, and by 1.4% in the euro area (see Graph 4.6).

This assumption could be on the optimistic side, given historical trends in TFP growth. A risk scenario was therefore carried out, where convergence to a labour productivity growth rate of 1.1% was assumed instead (TFP growth of 0.8%).

Graph 4.7: **Annual average potential GDP growth rates, 2016-2070**



Source: Commission services, ECP, 2018 Ageing Report.

Given the decline in the size of the working-age population, labour input contributes negatively, by -0.1% on average. On this basis, GDP is projected to grow by 1.4% per year on average in the period 2016-2070 in the European Union. When population is included, GDP per capita shows an average growth rate of 1.3% per year (see Graph 4.6).

There are large differences across countries, reflecting both the ageing process and the labour productivity trends in the medium term. Malta, Luxemburg and Ireland will show annual average potential GDP growth rates above 2.0%, while Italy, Greece and Portugal will be below 1.0% (see Graph 4.7).

4.1.4. Budgetary projections

Baseline projections

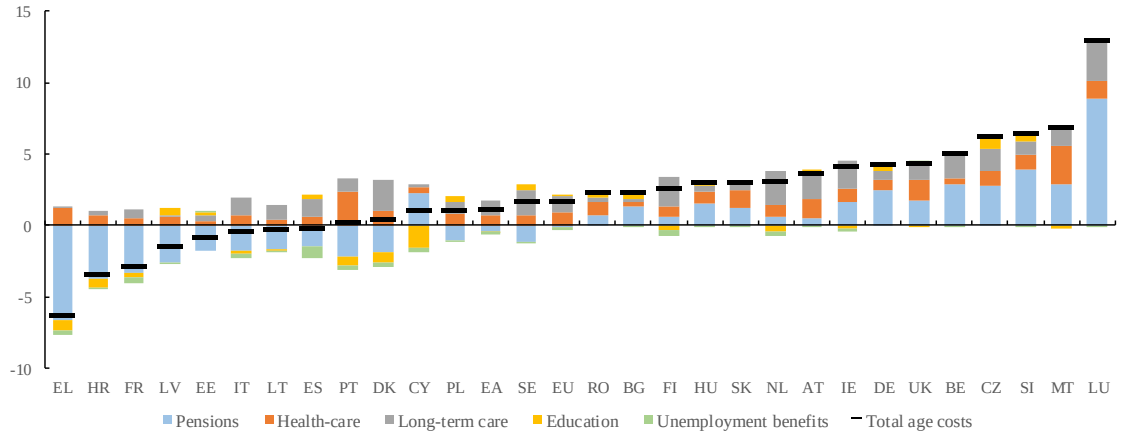
The ageing process has a direct effect on the public finances and will lead to higher age-related expenditure. In the European Union, total ageing cost as percentage of GDP (incorporating pensions, healthcare, long-term care, education and unemployment benefit projections) will increase by 1.7 pps. in the period 2016-2070, from 25.0% to 26.6% (see Graph 4.8).

There are important differences among Member States, reflecting primarily differences in the intensity of the ageing process and the effects of policy reforms in public expenditure. ([72]) Only eight countries show a reduction in the total cost of ageing as percentage of GDP over the projections period (EL, HR, FR, LV, EE, LT, IT, ES). ([73]) On the other side, in five countries the cost of ageing is projected to increase

([72]) The cut-off date for the projection was December 2017, and pension reforms are currently discussion in France, Croatia, Italy, Germany, Spain, Sweden, Czech Republic, Slovakia, Greece, Romania and Lithuania are not included in these projections. In most of these countries, reform measures could increase future pension spending, pointing to upside risks to the long-term projections.

([73]) In all of these cases, implemented pension reforms result (on current policies) in a projected decrease in pension spending despite strong increases in the old–age dependency ratio (see Graph 4.4) and is some cases (EL, LV, LT, PT) a marked projected decline in the size of the working-age population of 35% or more by 2070 (see Table 4.1). The projected fiscal impact of these pension reforms is sufficiently large to offset other projected changes in age-related care spending.

Graph 4.8: **Total age-related expenditure change, 2016-70, breakdown by component.**



Source: Commission services, EPC, 2018 Ageing Report.

by more than 5 pps. (LU, MT, SI, CZ, BE) (see Graph 4.8). For a majority of countries, the highest value is reached before 2070, as the population ageing effect peaks before 2070.

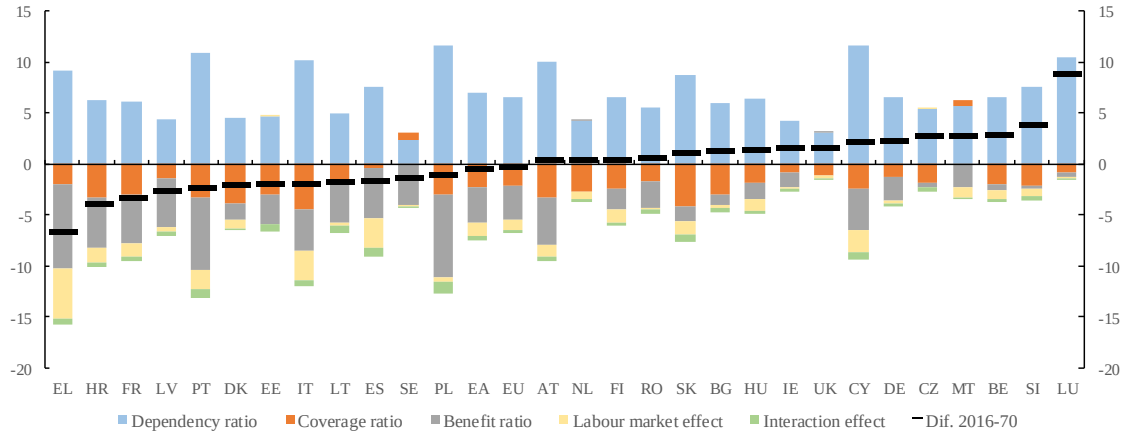
Health care and long-term care contributes to the rise in age-related spending. The increase of 1.7 pps. in the period 2016-2070 is mainly the result of the increase of long-term care (+1.2 pps.) and health care (+0.9 pps.), both strongly affected by the ageing process.

On average on the European Union, pension reforms are sufficient to compensate for the impact of the ageing process on expenditure based on current policies. Pension expenditure would fall slightly over the period, by 0.2 pps. of GDP. However, there are risks to these baseline projections (see risk section below).

Increases in the retirement age and adjustment of pension indexation offset the upward pressure on expenditure posed by population ageing in the EU. To assess the key drivers of projected pension spending, they are decomposed into four factors: i) the dependency ratio effect; ii) the coverage ratio effect; iii) the benefit ratio effect; and, iv) the labour market effect ([74]). The dependency ratio effect pushes up expenditure in all countries. The other three factors, the benefit ratio effect, the coverage ratio effect and the labour market effect, reduces pension expenditure (negative values for the contribution) for almost all countries. Overall in the EU, the offsetting effect of the benefit ratio and the coverage ratio explain that pension spending is almost unchanged by 2070. Although in some countries, this effect is not enough to compensate for the huge deterioration of the dependency ratio (see Graph 4.9).

([74]) These factors are defined as: i) the ratio of people over 65 years over people 20-64 years old; ii) the number of pensioners to the population over 65 years; iii) the ratio of the average pension relative to average wages; and, iv) the ratio of population 20-64 years over the number of hours worked, respectively. See Box II.1.3 in the 2018 Ageing Report for details.

Graph 4.9: **Breakdown of changes in gross public pension expenditure, 2016-70 (pps. of GDP)**



Source: Commission services, EPC, 2018 Ageing Report.

Risk scenarios

There is uncertainty with respect to both future demographic and macroeconomic developments, which could lead to higher expenditure in the future. Negative uncertainties and risks come mainly from three sources: i) a less optimistic macroeconomic outlook in the long term; ii) the impact of non-demographic factors on costs in health care and long-term care; iii) the intensification of the ageing process. Moreover, the budgetary projections are made on a 'no-policy-change' basis and thus rely on unchanged legislation. There are risks related to the possibility of a reversal of implemented pension reforms. Indeed, at the time of the 2018 Ageing Report, two countries had reversed previous reforms which entailed an increase of the retirement age in the future (PL and CZ). Pension reforms (and reversals) are currently discussed in several Member States ([75]). To illustrate these risks, a set of different scenarios are considered below.

i) **TFP risk scenario**. This scenario is based on a more prudent approach on the future European macroeconomic outlook with lower GDP growth in the long term due to a decline in TFP growth performance. Thus, TFP growth converges to a 0.8% growth rate by 2045 instead of the assumed 1.0% target growth rate of the reference scenario. As a result, average potential GDP growth rate in the period 2016-2070 would be 1.1% in the TFP risk scenario instead of 1.4% of the reference scenario.

ii) **AWG risk scenario**. This scenario has a direct impact on health care and long-term care expenditure. As explained in the 2018 Ageing Report, it tries to take into account technological changes and institutional mechanisms that have stimulated expenditure growth in the last decades. Additionally, an upward convergence of coverage and costs to the EU average is also assumed to take place in long-term care for all Member States that start from lower coverage and costs values.

i) – ii) **Combined TFP risk – AWG risk scenario**. This scenario analyses the combined effects of a more prudent macroeconomic scenario and at the same time allow for trend increases that are not related to population ageing that are likely to materialise in the coming decades.

iii) **High life expectancy scenario**. In past population projection exercises, there has been a tendency to underestimate the increase in life expectancy. This scenario assumes a reduction in mortality rates that would result in an increase in life expectancy at birth of about two years by 2070 compared to the baseline scenario.

iv) **Pension reform reversal scenario**. With the median age continuing to rise in the EU, there is the ever-present risk of societies opting for increasing the living standards of older people

([75]) Pension reforms are being discussed in France, Croatia, Italy, Germany, Spain, Sweden, Slovakia, Greece, Romania and Lithuania. In most of these countries, reform measures could increase future pension spending, pointing to upside risks to the long-term projections.

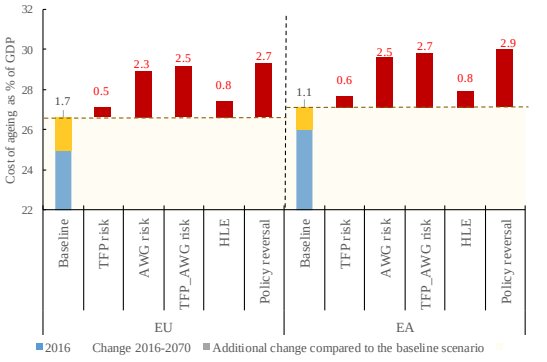
financed by the public sector through higher public pensions. Moreover, there could be resistance among the population to increasing the retirement age so as to better balance the part of life spent as a pensioner with that spent working. Indeed, in some Member States, there is pressure building on whether previous sustainability-enhancing pension reforms should be reversed or delayed. This could eventually result in changes to pension policy as governments possibly accommodate eligibility or generosity criteria, leading to upward pressure on pension spending. To illustrate the impact of a partial reversal of past pension reforms for the EU as a whole, we develop a scenario according to which: i) the fall in the benefit ratio is smaller (assumed to half of the decline in the baseline scenario); and, ii) the fall in the coverage ratio is smaller (assumed to half of the decline in the baseline scenario ([76]).

The pension reform reversal scenario point to significant upside risks to future pension expenditure. For the European Union, our estimation gives us an additional increase of 2.7 pps. of GDP, on top of the increase of 1.7 pps. in the baseline scenario. Pension expenditure would rise by 2 ½ pps of GDP and total ageing costs by 4 ½ pps of GDP. For the euro area, the increase would be even higher, adding 2.9 pps of GDP to the baseline, yielding a total increase of 4 pps of GDP (see Graph 4.10).

The AWG risk scenario also reveals strong upside risks to spending. The AWG risk scenario reflect stronger pressure on health care and long-term care expenditure. It would mean an additional push of 2.3 pps. to public expenditure for the European Union and 2.5 pps. for the euro area. It would entail an increase over the entire projection horizon of 4 pps. in the EU and of 3.6 pps. in the EA.

The impact of the productivity (TFP) and demographic (HLE) risk scenarios suggests smaller risks. In the TFP risk scenario, expenditure would increase by an additional 0.5 pps. compared to the reference scenario for the European Union. The impact is limited by the fact that pensions in payments in some countries are linked to wages (which evolve in line with labour productivity growth, which in turn depends on TFP growth). It also has a small impact on health care and long-term care, as unit costs in these areas are closely linked to labour productivity growth and hence to wage growth. The HLE scenario would increase expenditure by an additional 0.8 pps. compared to the reference scenario. Differences among countries are substantial. Some countries' pension systems link the retirement age to life expectancy. The impact on the aggregate number for the European Union and the euro area is therefore limited to the effect on those countries that do not have a link between the retirement age and life expectancy.

Graph 4.10: **Projected change in cost of ageing, baseline and risk scenarios, 2016-2070**



Source: 2018 Ageing Report, Commission services.

Comparison with the previous long-term budgetary projections

The new long-term projections show a slight increase in age-related spending compared with the 2015 Ageing Report. Over the period 2016-2060, total cost of ageing in the European Union was projected to increase by 1.0 pps. of GDP in the 2015 Ageing Report, compared with a projected change of 1.6 pps. in the current 2018 Ageing Report; a higher increase of 0.6 pps.

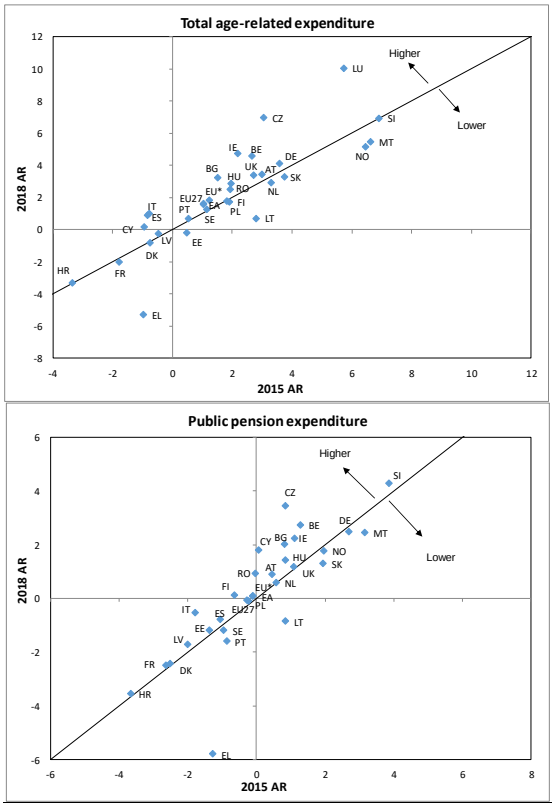
Population and macroeconomic projections in the 2018 Ageing Report reflect a more pronounced ageing process than three years ago. This translates in a stronger change in ageing costs, despite policy reforms. The higher projected change is mainly due to higher increments in pension (+0.2 of difference), but there is also a

([76]) For the benefit ratio effect, this is approximately equal to a fall of 5.5 pps, compared with 11 pps. in the baseline scenario over the period 2016-2070. For the coverage ratio effect, this is approximately equal to a fall by 11 pps, compared with 23 pps. in the baseline scenario over the period 2016-2070.

higher increase in long-term care expenditure (+0.1 pps.) and health care (+0.1 pps.).

Compared with the 2015 Ageing Report, only eight countries show a lower change in ageing costs over the period 2016-60 (EL, EE, FR, LT, MT, NL, SK and FI). The strongest increase is observed in the case of LU (+4.4 pps. port) and CZ (+3.9 pps.) while the highest decrease is EL (-4.3 pps.) compared to the 2015 Ageing Report. The large differences between Member States reflect primarily pension reforms and changes in the underlying assumptions, including the population projections ([77]) (see Graph 4.11). In some cases, pension reform reversals had an adverse impact of pension expenditure (CZ, PL).

Graph 4.11: **Projected change in age-related and pension expenditure compared, 2018 and 2015 AR, 2016-2060, pps. of GDP**



Source: 2018 and 2015 Ageing Report, Commission services, EPC.

([77]) For a detailed comparison of the underlying assumptions with the 2015 Ageing Report, see Table I.1.6 (population projections) and Tables I.2.2-I.2.3 (labor force and GDP projections, respectively).

4.2. LONG-TERM FISCAL SUSTAINABILITY INDICATOR: THE S2 INDICATOR

4.2.1. Baseline results of the S2 indicator

Fiscal sustainability in the long term relates to the achievement of the government's intertemporal budget constraint. This constraint, which is also known as the solvency condition, refers to the capacity of a country to meet its net debt obligations, over an infinite horizon, with a stream of future primary surpluses. Other things equal, the greater the projected cost of ageing, the more difficult it is to fulfil the intertemporal budget constraint, as higher revenue (in present terms) is required to cover these additional costs, in addition to the other non-interest expenditure and the cost of servicing the outstanding debt.

The S2 indicator is the central element of the long-term sustainability analysis. Using the infinite version of the government budget constraint, the S2 fiscal sustainability gap indicator measures the budgetary adjustment that would ensure sustainable public finances in the long term. Specifically, this indicator shows the upfront adjustment to the current structural primary balance (subsequently kept constant at the adjusted value forever) that is required to stabilise debt-to-GDP ratio over the infinite horizon, taking into account also any additional expenditure arising from an ageing population that, over time, add up to the current structural primary balance ([78]) ([79]) .

The S2 indicator points to sixteen Member States at high or medium fiscal risk in the long term. The upfront adjustment to the primary structural primary balance implied by the S2 indicator in the EU is shown in Graph 4.12. Luxembourg, with the highest value of the S2 indicator (8.1 pps. of GDP), faces substantial long-term sustainability challenges ([80]), related in

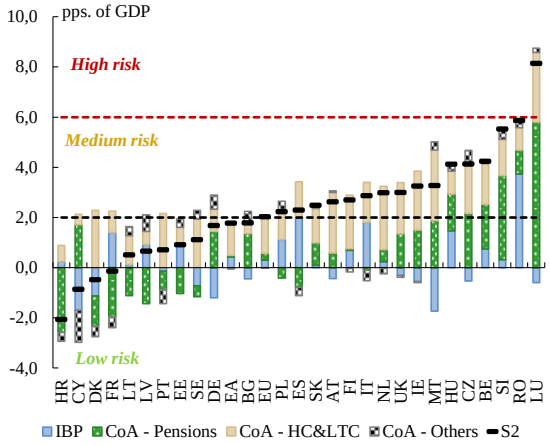
([78]) The upfront adjustment to the structural primary balance is assumed to take place in 2021, which is the first year of the projection horizon after the last forecast year.

([79]) This indicator – a flow measure – can also be presented as a stock indicator, the so-called intertemporal net worth (INW). This alternative form of S2 is defined as the difference between the current net worth (i.e. assets minus liabilities) of the general government and the sum of discounted future primary balances required to achieve intertemporal fiscal sustainability (see section 5.3).

([80]) For the long-term sustainability indicator S2, the following thresholds are used to assess the scale of the sustainability challenge: 1) if S2 is lower than 2, the country is assigned

particular to increasing projected pressure on spending for pension, health and long-term care. Romania and Slovenia have respectively the second and highest long-term sustainability challenges in the EU, although still slightly below the high risk threshold of the S2 indicator. The other countries with fiscal gaps pointing to medium risk are BE, CZ, IE, ES, IT, HU, MT, NL, AT, PL, SK, FI, and the UK.

Graph 4.12: **The S2 sustainability indicator and its components**

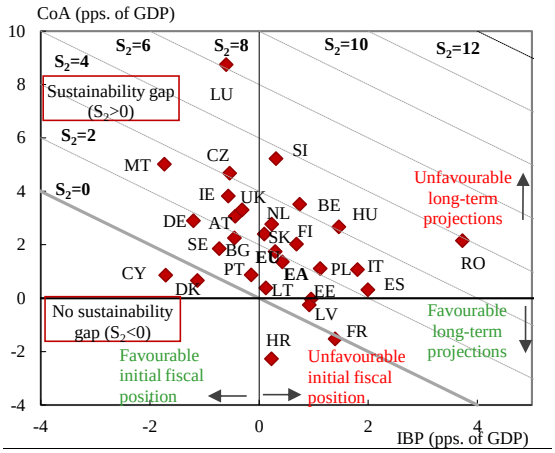


Source: Commission services.

Government spending on health and long-term care contributes to widening the fiscal sustainability gap in all the Member States. Graph 4.12 shows for each Member State a disaggregation of the S2 indicator in terms of the initial budgetary position (IBP) ([81]) and the three components of the long-term cost of ageing (CoA) ([82]), namely pensions, healthcare, long-term care, and other determinants (education expenditure and unemployment benefits, see also Table 4.2). The negative contribution of government spending on health and long-term care to the sustainability gap is particularly high (greater than or equal to 2.0 pps. of GDP) for MT, LU, NL, AT, IE, DK, PT, FI and the UK. Expenditure on pensions is estimated to widen the sustainability gap in eighteen countries, especially in LU, SI, CZ, MT, BE, CY, IE, and HU (greater than or equal to 1.5 pps. of GDP). Overall, the contribution of the total cost of ageing to long-term sustainability risks is expected to be very significant, exceeding 2 pps. of GDP, in LU, SI, MT, CZ, IE, BE, UK, AT, DE, NL, HU, SK, BG, RO, and FI.

The sustainability gap in around two-fifths of the Member States is due to both an unfavourable initial fiscal position and the cost of ageing. This is reflected in the position of a significant number of countries in the top right quadrant in Graph 4.13, which maps the Member States according to their respective values for the S2 indicator and the two components (costs of ageing and IBP). The sustainability gap (S2) is the sum of the vertical and horizontal distances of each point from the solid diagonal line, along which the sustainability gap is equal to zero. Moving from left to right along the horizontal axis, countries are required to undertake a larger adjustment to stabilise their debt ratios given their initial budgetary position (IBP), and before considering the long-term costs of ageing. Along the vertical axis, a higher adjustment is required due to the long-term change in age-related costs (CoA).

Graph 4.13: **The EU countries mapped across the S2 components**



Source: Commission services.

Almost all Member States have an unfavourable initial fiscal position and/or adverse expected developments in the cost of

low risk; 2) if S2 is between 2 and 6, the country is assigned medium risk; 3) if S2 is greater than 6, the country is assigned high risk (see European Commission, 2012 and 2016a).

([81]) More specifically, this component of S2 is given by the gap between the current or initial structural primary balance, and the debt-stabilising primary balance to ensure sustainability and thus abstracting from future changes due to the cost of ageing.

([82]) The long-term budgetary projections (incorporated in the calculation of the sustainability indicators presented here) have been published in European Commission (2015).

ageing. No Member State has both a favourable initial fiscal position and a favourable impact from the projected budgetary cost of population ageing. The dotted diagonals in Graph 4.13 are 'isogap' lines: two countries located on the same line have the same sustainability gap (S2) over an infinite horizon, though they may have different combinations of initial budgetary positions and ageing-related costs. Among the eleven Member States that have a low long-term sustainability risk (S2 less or equal than 2.0 pps. of GDP), Cyprus, Croatia, Denmark and France are the only Member States that have a negative S2 sustainability gap and therefore lie in the area south-west of the solid line. AT, BG, CZ, CY, DE, DK, IE, LU, MT, PT, SE and the UK are located in the top left quadrant reflecting a favourable initial budgetary position in 2020 but an unfavourable impact of projected age-related costs. With the exception of Cyprus and Denmark, the favourable initial budgetary position in these countries (under the assumption of no-fiscal policy change) is not sufficient to guarantee long-term sustainability, given the expected long-term increase in ageing-related expenditure. The other countries (Latvia, France, and Croatia) lie in the bottom right quadrant, with favourable developments in long-term age-related spending but an unfavourable initial budgetary position. In the case of Croatia and France, the drop in age-related spending more than offsets the unfavourable initial fiscal position, thereby leading to a positive conclusion on the country's estimated long-term sustainability.

However, besides the S2 indicator, the overall long-term sustainability risk takes into account the overall results of DSA. Box 4.1 discusses the reviewed approach to the assessment of long-term sustainability challenges. The results of the overall long-term sustainability risks are also presented in chapter 6.

Table 4.2: **Results of the S2 long-term sustainability indicator**

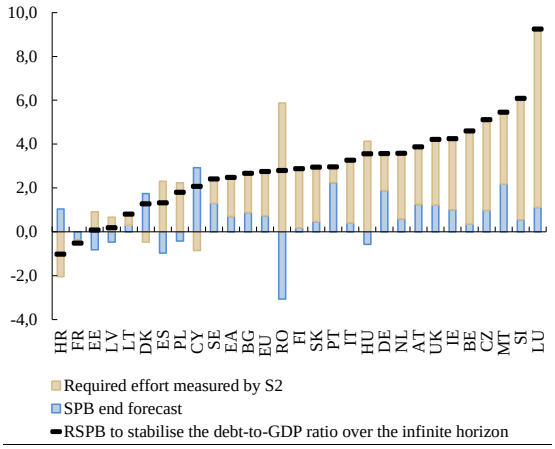
	S2			CoA			
	S2	IBP	CoA	Pensions	HC	LTC	Others
BE	4,3	0,7	3,5	1,8	0,3	1,3	0,1
BG	1,8	-0,4	2,2	1,4	0,3	0,1	0,5
CZ	4,1	-0,5	4,7	2,2	0,8	1,1	0,6
DK	-0,5	-1,1	0,7	-1,2	0,7	1,6	-0,4
DE	1,7	-1,2	2,9	1,4	0,5	0,4	0,6
EE	0,9	1,0	0,0	-1,0	0,3	0,3	0,3
IE	3,3	-0,6	3,8	1,5	0,8	1,6	0,0
ES	2,3	2,0	0,3	-0,8	0,5	1,0	-0,3
FR	-0,1	1,4	-1,5	-2,0	0,3	0,5	-0,4
HR	-2,1	0,2	-2,3	-2,6	0,4	0,2	-0,4
IT	2,9	1,8	1,1	-0,1	0,7	0,9	-0,4
CY	-0,9	-1,7	0,9	1,7	0,2	0,2	-1,3
LV	0,7	0,9	-0,3	-1,4	0,4	0,1	0,7
LT	0,5	0,1	0,4	-1,1	0,3	0,8	0,4
LU	8,1	-0,6	8,7	5,8	0,8	2,0	0,2
HU	4,1	1,5	2,7	1,5	0,6	0,3	0,3
MT	3,3	-1,7	5,0	1,9	1,8	1,0	0,3
NL	3,0	0,2	2,8	0,5	0,6	2,0	-0,2
AT	2,6	-0,4	3,1	0,6	1,0	1,4	0,1
PL	2,2	1,1	1,1	-0,4	0,6	0,5	0,4
PT	0,7	-0,1	0,9	-0,7	1,6	0,5	-0,6
RO	5,9	3,7	2,1	1,0	0,7	0,2	0,3
SI	5,5	0,3	5,2	3,3	0,8	0,7	0,4
SK	2,5	0,1	2,4	0,9	0,9	0,4	0,1
FI	2,7	0,7	2,0	0,1	0,5	1,6	-0,2
SE	1,1	-0,7	1,8	-0,4	0,6	1,4	0,3
UK	3,0	-0,3	3,3	1,3	1,1	1,0	-0,1
EU-28	2,0	0,3	1,7	0,3	0,6	0,8	0,0
EA	1,8	0,4	1,4	0,1	0,5	0,8	-0,1

Source: Commission services.

4.2.2. The required structural primary balance

The overall size of the required structural primary balance (RSPB) is informative about the overall fiscal policy that needs to be sustained to close the sustainability gap. The RSPB is the sum of the structural primary balance in 2020 (i.e. end of forecast period) and the required additional effort measured by S2 to stabilise the debt ratio in the long term. The RSPB is estimated at 9.3% of GDP for Luxembourg, 6.1% of GDP for Slovenia and at or slightly more than 5.0% of GDP for Czech Republic and Malta. Graph 4.14 shows that for twenty one Member States the structural primary surplus required to stabilise debt in the long term exceeds 2.0% of GDP.

Graph 4.14: **The required structural primary balance to stabilise debt-to-GDP ratio over the infinite horizon (% and pps. of GDP)**



Source: Commission services.

The percentile rank of the RSPB implied by the S2 indicator gives an indication of the degree of the plausibility of the implied adjustment. The RSPB can be benchmarked to the history of primary balances in the EU, hence allowing an assessment of how common (or uncommon) the fiscal position assumed in the projections is, relative to the structural primary balance distribution for all EU countries over 1980-2018. In particular, it indicates where a very large primary balance implied by the S2 is unlikely to be sustained in the long term. The required structural primary balances appear large in BE, CZ, DE, IE, IT, LU, HU, MT, NL, AT, SI and the UK (see Table 4.3).

Table 4.3: **Plausibility of the S2 implied fiscal adjustment**

	Intitial SPB	S2	RSPB (% of GDP)	Percentile rank
BE	0,4	4,3	4,6	8%
BG	0,9	1,8	2,7	18%
CZ	1,0	4,1	5,1	5%
DK	1,7	-0,5	1,3	35%
DE	1,9	1,7	3,6	12%
EE	-0,8	0,9	0,1	57%
IE	1,0	3,3	4,3	9%
ES	-1,0	2,3	1,3	34%
FR	-0,4	-0,1	-0,5	67%
HR	1,0	-2,1	-1,0	73%
IT	0,4	2,9	3,3	14%
CY	2,9	-0,9	2,1	23%
LV	-0,5	0,7	0,2	55%
LT	0,3	0,5	0,8	43%
LU	1,1	8,1	9,3	0%
HU	-0,6	4,1	3,6	13%
MT	2,2	3,3	5,5	4%
NL	0,6	3,0	3,6	12%
AT	1,3	2,6	3,9	11%
PL	-0,4	2,2	1,8	27%
PT	2,3	0,7	3,0	17%
RO	-3,1	5,9	2,8	17%
SI	0,6	5,5	6,1	2%
SK	0,5	2,5	3,0	17%
FI	0,2	2,7	2,9	17%
SE	1,3	1,1	2,4	20%
UK	1,2	3,0	4,2	9%
EU28	0,7	2,0	2,8	18%
EA	0,7	1,8	2,5	20%

Source: Commission services.

4.2.3. Comparison with previous results

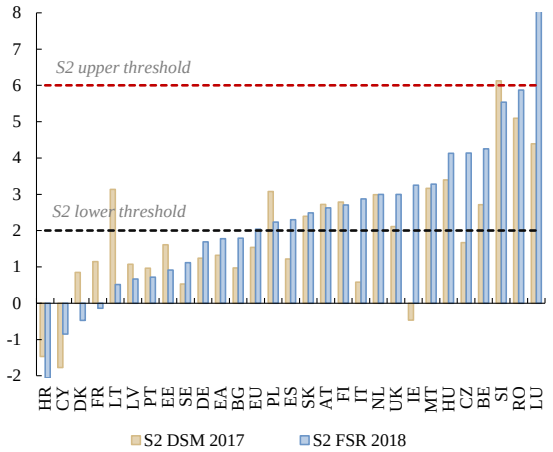
This section compares the results of the S2 indicator with those presented in the Debt Sustainability Monitor 2017 (DSM 2017 henceforth). Compared to DSM 2017, the cost of ageing in this report is updated according to the long-term projections reported in the Ageing Report 2018. Therefore, the variation in the fiscal sustainability indicators is due to both changes in the ageing costs and the initial budgetary position.

Long-term fiscal sustainability gaps have increased in a large majority of Member States. Compared to the DSM 2017, the S2 sustainability gap has increased by 0.5 pps. of GDP for both the EU and the EA. The required permanent fiscal adjustment to ensure long-term sustainability is higher in eighteen Member States. As Graph 4.15 shows, the risk category according to the S2 indicator changes from low to medium for Czech Republic, Spain, Italy and Ireland. The only Member State whose S2 risk profile changes from medium to high is Luxembourg. Romania, although still at medium risk, is closer to the high-risk threshold. Among countries at medium risk, the latest S2 results indicate greater long-term sustainability challenges by more than 0.5 pps. of

GDP compared to DSM 2017 for BE, CZ, ES, IE, HU, RO and the UK.

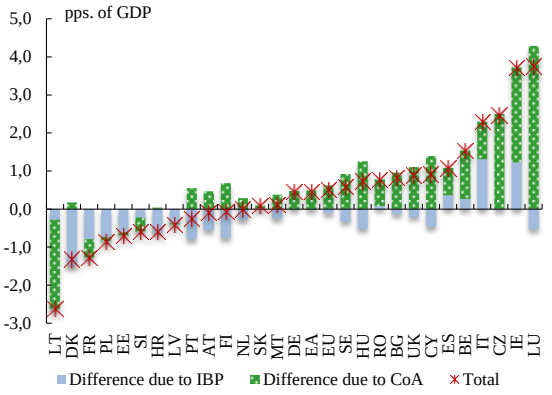
The required adjustment due to the ageing component has become tighter in most Member States. As shown in Graph 4.16, the increase in the additional adjustment required to ensure long-term sustainability reflects almost entirely or entirely an increase in the ageing costs in most Member States. The Member States with a substantial increase in the required adjustment due to the ageing costs of more than 1.0 pp. of GDP are BE, CZ, IE, CY, LU, HU, and the UK. The few Member States where the required adjustment is attributed partially to also a deterioration in the initial budgetary position in this new round of forecast - in terms of a deterioration in the structural primary balance - are BE, ES, IE, IT and RO. In the case of IE and IT, this deterioration is about 1.3 pps. of GDP. For the three Member States with the highest drop in the required adjustment (Lithuania, Denmark and France), the improved S2 indicator reflects either lower ageing costs (Lithuania) or a more substantial improvement of the initial budgetary position (Denmark, France) compared to the DSM 2017.

Graph 4.15: **S2 comparison with DSM 2017 (pps. of GDP)**



Source: Commission services.

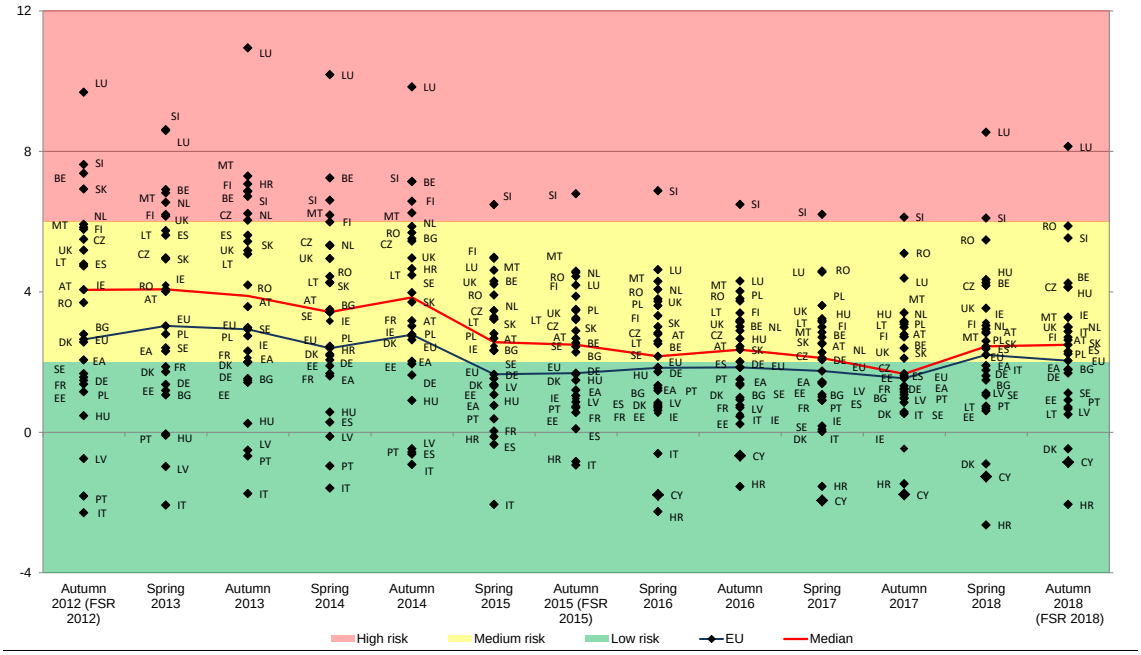
Graph 4.16: **Components of change in S2 (2018 Autumn Forecast compared to DSM 2017 based on 2017 Autumn Forecast)**



Source: Commission services.

According to the S2 indicator, the number of Member States with a low risk for long-term sustainability increased from seven in 2014 to twelve in autumn 2018. This can be seen in Graph 4.17, which allows a comparison between values of the S2 indicator across consecutive Commission forecast vintages (from autumn 2012 to autumn 2018). The S2 sustainability gap for the EU, after an overall downwards trend from medium risk since 2014 to reach low risk in 2017, returns to medium risk in 2018. The downward trend of the S2 indicator between 2014 and 2017 reflects the fiscal consolidation undertaken following the economic and financial crisis, as well as general improvement in pension projections in the 2015 Ageing Report as a result of more favourable demographic assumptions and the impact of enacted pensions reforms. Higher long-term sustainability challenges in the EU as a whole in 2018 reflect the slight increase in age-related spending of about 0.6 pps. of GDP in the long term in the current 2018 Ageing Report compared to the 2015 Ageing Report. In the case of Ireland, Spain and Latvia, the volatility of the long-term fiscal sustainability gap across forecast vintages reflects an initial weak budgetary position around the years of the economic and financial crisis, followed by a substantial consolidation after. The recent increases in the S2 sustainability gap for Belgium, Czech Republic, Ireland, Luxembourg and Romania, are driven largely by higher projected age-related costs in the long term.

Graph 4.17: **The S2 sustainability indicator across the Commission forecast vintages (pps. of GDP)**



Source: Commission services.

4.3. SENSITIVITY ANALYSIS OF THE S2 SUSTAINABILITY INDICATOR

The S2 indicator is sensitive to changes in key assumptions of the baseline no-policy change scenario. Fiscal projections under the baseline scenario, which assumes that current fiscal policies remain unchanged in the long term, are surrounded by uncertainties over a longer horizon. Given these uncertainties, risks can be assessed by comparing the baseline scenario with alternative scenarios. The five alternative scenarios considered in this section are described in section 4.1 and Box 4.1 and include (i) the historical SPB scenario, (ii) the AWG risk scenario, (iii) the population (life expectancy) scenario, (iv) the TFP risk scenario and (v) the interest rate scenario. The S2 results of each sensitivity scenario are reported in Table 4.4.

The S2 fiscal gap varies widely across Member States and sensitivity scenarios. In some countries, the S2 fiscal gap indicator appears overall more sensitive to underlying assumptions than others. This reflects mainly differences in structural and institutional factors, such as the size and volatility of the fiscal position, the presence of automatic adjustment mechanisms in social security systems, the degree of maturity of the social security systems, and indexation rules of social benefits.

The historical SPB scenario depends on the size and the volatility of the fiscal position. Since the last financial and economic crisis, several EU countries have substantially tightened their fiscal stance. In Member States, where fiscal policy was historically 'looser', converging back to past behaviours would imply a larger fiscal gap to ensure long-term fiscal solvency (e.g. Croatia, Ireland, Portugal, Slovakia, and the UK).

The outcomes of the 'historical SPB scenario' point to higher sustainability challenges in many Member States. Sustainability risks based on the past pattern of structural primary balances can be much higher or lower than those highlighted by the baseline scenario. The required fiscal adjustment in the long term would be above 2.0 pps. of GDP for the UK, Portugal, Ireland, Slovakia and Croatia. Negative deviations from the baseline in the case of FI, IT, DK, RO, BE, SE, LU, ES, and EE reflect a more favourable history of fiscal balances, which require a lower fiscal adjustment in order to ensure long-term sustainability.

Table 4.4: **S2 results of sensitivity analysis and associated long-term risk**

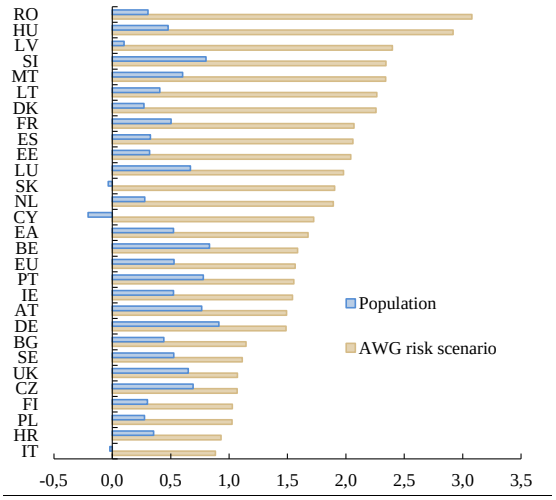
	S2 baseline scenario	S2 alternative scenarios				
		Historical SPB	AWG risk	Population	TFP risk	Interest rate
BE	4.3	3.7	5.8	5.1	5.0	4.4
BG	1.8	2.2	2.9	2.2	1.9	1.6
CZ	4.1	6.2	5.2	4.8	4.1	3.7
DK	-0.5	-1.1	1.8	-0.2	-0.6	-0.6
DE	1.7	2.1	3.2	2.6	2.1	1.7
EE	0.9	0.8	3.0	1.2	1.0	0.9
IE	3.3	5.7	4.8	3.8	3.2	3.2
ES	2.3	2.1	4.4	2.6	2.8	3.3
FR	-0.1	1.0	1.9	0.4	0.9	1.0
HR	-2.1	0.2	-1.1	-1.7	-1.7	-1.3
IT	2.9	1.5	3.8	2.9	3.7	4.1
CY	-0.9	0.8	0.9	-1.1	-0.6	-0.5
LV	0.7	1.4	3.1	0.8	0.9	1.0
LT	0.5	1.9	2.8	0.9	0.6	0.9
LU	8.1	7.7	10.1	8.8	7.9	6.4
HU	4.1	4.1	7.1	4.6	4.5	4.1
MT	3.3	4.7	5.6	3.9	3.3	2.5
NL	3.0	3.1	4.9	3.3	2.9	2.9
AT	2.6	3.4	4.1	3.4	3.6	2.5
PL	2.2	3.6	3.3	2.5	2.7	2.4
PT	0.7	3.7	2.3	1.5	1.6	1.5
RO	5.9	5.3	9.0	6.2	6.2	5.8
SI	5.5	6.8	7.9	6.3	5.7	5.3
SK	2.5	4.9	4.4	2.5	2.7	2.2
FI	2.7	1.2	3.7	3.0	3.2	2.6
SE	1.1	0.6	2.2	1.6	1.0	0.8
UK	3.0	6.5	4.1	3.7	3.2	2.9
EU28	2.0	3.0	3.6	2.6	2.5	2.4
EA	1.8	2.2	3.5	2.3	2.4	2.3

Source: Commission services.

The fiscal sustainability gap under the AWG risk scenario tends to be higher. The long-term projections built around higher impact of non-demographic drivers on future health and long-term care costs (the 'AWG risk scenario') can imply a higher S2 sustainability gap compared to the baseline scenario. In particular, in countries with an upward convergence of coverage and costs in health care and long-term care to the EU averages, the AWG risk scenario has typically a higher impact on public spending (e.g. Slovenia, Latvia, Hungary, Romania). Compared to the baseline scenario, higher non-demographic costs require a higher permanent adjustment by around 1.6 pps. of GDP on average in the EU and 1.7 pps. of GDP in the EA. Across the Member States, this sustainability gap varies from 0.9 pps. in Croatia and Italy to 3.1 pps. of GDP in Romania. Coping with future cost pressures from non-demographic drivers would be more challenging for DK, LT, MT, SI, LV, HU and RO.

Increases in life expectancy imply also higher sustainability gaps. Under the 'population scenario', higher demographic costs due to an additional two-year increase in life expectancy results in higher sustainability gaps compared to the baseline scenario, although lower than those of the 'AWG risk scenario'. Relative to the baseline scenario, the sustainability gaps across Member States remain below 1 pp. of GDP (see Graph 4.18). Specifically, in countries with automatic adjustment mechanisms in the pension schemes, such as linkage of retirement age or pension benefits to life expectancy, sustainability factors, the impact of changes in life expectancy tends to be milder (e.g. Spain, Cyprus, Latvia, Slovakia and the Netherlands) (see section 4.1).

Graph 4.18: **S2 – Difference between the AWG risk/population and baseline scenarios (pps. of GDP)**

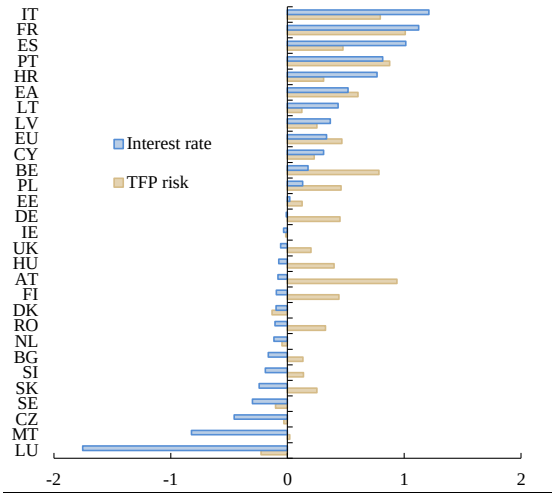


Source: Commission services.

The lower TFP growth and higher interest rate scenarios tend to have overall smaller – yet non-negligible - impacts on the long-term fiscal gap. The difference in the sustainability gaps of the TFP risk and baseline scenarios is highest for Portugal, Austria and France, while remaining below 1.0 pp. of GDP in all Member States (see Graph 4.19). This reflects the fact that pension indexation rules in place tend to affect differently the magnitude of the sustainability gaps. When pension benefits are indexed to wages, the pension-to-GDP ratio is largely invariant to changes in labour productivity developments, compared to countries where they are linked to prices (e.g. France and Italy). Similarly, the impact of a higher interest rate in the long term on the sustainability gaps would be smaller in most Member States. However, a higher interest rate would be more challenging for Croatia, Portugal, Spain, France and Italy (see

Graph 4.19). Under the interest rate scenario, the overall lower impact under the interest rate scenario is explained by two counter-acting effects: on one hand, higher interest rates increase future interest payments, entailing a higher fiscal adjustment needed to meet the IBC; on the other hand, as future ageing costs enter the S2 calculation in discounted terms, higher interest rates decrease their weight in present value.

Graph 4.19: **S2 – Difference between interest rate/TFP risk and baseline scenarios (pps. of GDP)**



Source: Commission services.

Box 4.1: A revised approach to assess long-term fiscal sustainability risks: rationale and impact

The fiscal sustainability challenge arising from demographic changes is a long-standing concern in the EU. Since the early 2000's, the Commission (DG ECFIN) and the Council (Economic Policy Committee) have prepared, on a regular basis, long-term budgetary projections (published in the Ageing Report ([1])). To account for these projections, the Commission introduced in the 2006 Sustainability Report a long-term fiscal gap indicator, named the 'S2 fiscal sustainability indicator'. Since then, the S2 indicator has been mainly used to assess long-term fiscal sustainability challenges in the EU.

The S2 fiscal sustainability indicator is a strong benchmark to measure long-term fiscal sustainability challenges. First, the S2 indicator relies on a well-grounded theoretical framework for assessing intertemporal solvency, i.e. the inter-temporal budgetary constraint (IBC). Indeed, this indicator measures the immediate and permanent budgetary adjustment required to fulfil the IBC over the infinite horizon. It holds under a no-Ponzi game condition, according to which the government does not roll over its debt by continuously issuing new debt (see Annex for more details and Escolano, 2010). As a starting point, it uses the primary balance adjusted for the cycle (SPB) as a neutral proxy for 'no-fiscal policy change'. Then, because of its long-term horizon, it allows gauging the 'full' scale of the fiscal challenge due to population ageing over the coming decades. Second, it provides a benchmark value of the size of fiscal imbalances, without relying on any ad hoc debt target ([2]). The IBC 'only' implies that public debt stabilises in the long-term, in the sense of covering future debt servicing and costs of ageing with a stream of future structural primary balances. Finally, the computation of the S2 indicator relies on commonly agreed methodologies and assumptions, thus fulfilling the double objective of transparency and comparability across EU Member States.

Despite its strengths, the S2 indicator presents a number of shortcomings. *First, the S2 indicator largely abstracts from risks linked to high debt levels.* The intertemporal budget constraint does not require that the debt level stabilises at a specific value and the adjustment implied by the S2 indicator might in fact lead to debt stabilising at relatively high levels. Hence, by looking at the S2 values, some countries are deemed on a sustainable long-term path (low fiscal sustainability gaps) despite their initial high level of debt. Indeed, as can be seen from Graphs 1 and 2 for selected Member States, even after adjusting as of the fiscal gap measured by the S2 indicator, the debt would only stabilise at a very high level in the long run ([3]). *Second, the S2 indicator is based on underlying assumptions that are subject to significant uncertainties* associated inherently with projections over a long period of time. Uncertainties can be about estimations of gains in life expectancy, developments in total factor productivity growth in the far future, convergence trends in interest rates and unemployment rates, or policy implementations risks. Moreover, fast changing societies and current academic debates regarding future economic trends (e.g. the 'secular stagnation' literature including Summers (2014)) call for giving great attention to these uncertainties in sustainability analysis. Also, the recent euro area sovereign debt crisis has provided a stark reminder on how long-term fiscal sustainability risks cannot be assessed independently of shorter term challenges.

([1]) See European Commission (2018c).

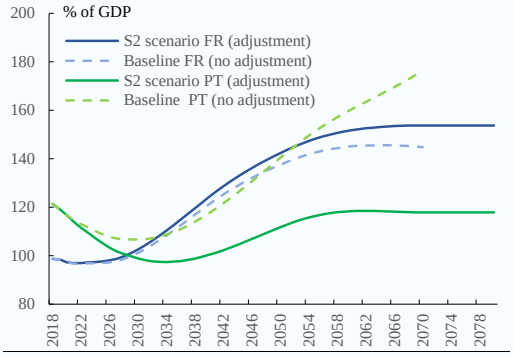
([2]) On the other hand, the S1 indicator, which relies on a finite version of the budget constraint, imposes a convergence to a debt target of 60% of GDP (in line with SGP provisions) in around 15 years.

([3]) For a detailed discussion of the strengths and shortcomings of the S2 fiscal sustainability indicator, see Box 3.2 of the European Commission (2018a).

(Continued on the next page)

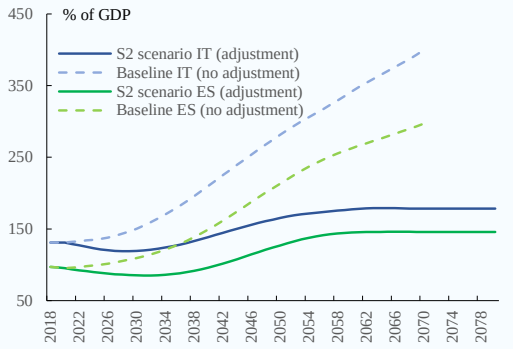
Box (continued)

Graph 1: **Debt-to-GDP ratio in FR and PT under the S2 and baseline scenarios**



(1) The debt profile is linked to the ageing cost profile (contribution to the S2 indicator of -1.5 and 0.9 pps. of GDP for FR and respectively PT). (2) The debt level associated with the 'S2 scenario' corresponds to the long-run debt level reached after the fiscal adjustment.
Source: Commission services.

Graph 2: **Debt-to-GDP ratio in IT and ES under the S2 and baseline scenarios**



(1) The debt profile is linked to the ageing cost profile (contribution to the S2 indicator of 0.3 and 1.1 pps. of GDP for ES and respectively IT). (2) The debt level associated with the 'S2 scenario' corresponds to the long-run debt level reached after the fiscal adjustment.
Source: Commission services.

Therefore, in this edition of the FSR, complementary indicators and an enriched sensitivity analysis are introduced to strengthen the reading and interpretation of the S2 indicator.

First, the S2 indicator is complemented with results from the debt sustainability analysis (DSA). The renewed approach to the overall assessment of long-term fiscal sustainability challenges is grounded on a two-variable interaction, namely (i) the value of the long-term fiscal sustainability indicator S2 of the central scenario and (ii) the results of the debt sustainability analysis (DSA). While the S2 indicator remains the central criterion, especially for catering for the budgetary impact of an ageing population over the long term, the definition of the overall long-term risk category is influenced by the debt sustainability in the medium term.

The inclusion of the overall DSA results in the long-term risk assessment framework aims at prudently capturing risks linked to high debt levels. Such an approach allows addressing one of the flaws of the S2 indicator, namely that it abstracts from risks related to high debt levels ([4]).

The use of supplementary results from the DSA may lead to a revision of the long-term risk classification. In the new approach, if the DSA indicates an upper risk category as compared to the risk indicated by the S2 indicator, the overall long-term sustainability risk is revised upwards by one category. If the opposite applies, such as lower DSA risk than the S2 indicator, the risk category associated with the S2 indicator always prevails ([5]). For instance, a country is assessed to be at a potential *high risk* if (i) the S2 indicator flags high risk irrespective of the risk type implied by the overall DSA results or (ii) the S2 indicator is medium risk, but the overall DSA is high risk. In turn, a country is assessed at *medium risk* instead of low risk in the long-term if, for instance, the S2 indicator flags low risk and the overall DSA either medium or high risk (see Table 1 and Annex 6). If both the S2 value and the overall DSA point to low risk, the long-term sustainability challenges are assessed as *low risk.*

([4]) In particular, the use of the DSA results allows for taking into account the impact of different economic and fiscal assumptions about the projected evolution of public debt over the next ten years. The overall DSA assessment is based on several alternative and stress test scenarios: the baseline no-fiscal policy change scenario, the historical primary balance (SPB) scenario, sensitivity tests on nominal growth, interest rates and the government primary balance, as well as stochastic projections.

([5]) The DSA plays an asymmetric role in the long-term risk classification, leading to an upward (less favourable) risk revision when debt vulnerabilities are identified, but leaving the S2-based classification unchanged otherwise. Indeed, even if the DSA points to limited vulnerabilities in the medium term, a high S2 means that a large fiscal adjustment is needed to stabilise debt in the long term, and implies otherwise an ever-increasing trend if no adjustment is undertaken.

(Continued on the next page)

Box (continued)

Table 1: **Results of long-term risk classification by additional DSA criterion (based on the Autumn forecast 2018)**

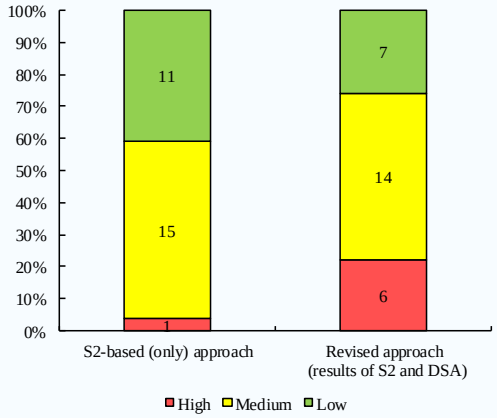
	Overall risk category			
	S2 values	DSA overall risk	S2 values and DSA overall risk	Change
BE	MEDIUM	HIGH	HIGH	x
BG	LOW	LOW	LOW	
CZ	MEDIUM	LOW	MEDIUM	
DK	LOW	LOW	LOW	
DE	LOW	LOW	LOW	
EE	LOW	LOW	LOW	
IE	MEDIUM	LOW	MEDIUM	
ES	MEDIUM	HIGH	HIGH	x
FR	LOW	HIGH	MEDIUM	x
HR	LOW	MEDIUM	MEDIUM	x
IT	MEDIUM	HIGH	HIGH	x
CY	LOW	MEDIUM	MEDIUM	x
LV	LOW	LOW	LOW	
LT	LOW	LOW	LOW	
LU	HIGH	LOW	HIGH	
HU	MEDIUM	HIGH	HIGH	x
MT	MEDIUM	LOW	MEDIUM	
NL	MEDIUM	LOW	MEDIUM	
AT	MEDIUM	LOW	MEDIUM	
PL	MEDIUM	LOW	MEDIUM	
PT	LOW	HIGH	MEDIUM	x
RO	MEDIUM	MEDIUM	MEDIUM	
SI	MEDIUM	LOW	MEDIUM	
SK	MEDIUM	LOW	MEDIUM	
FI	MEDIUM	LOW	MEDIUM	
SE	LOW	LOW	LOW	
UK	MEDIUM	HIGH	HIGH	x

Source: Commission services.

The revised approach alters the long-term risk category for several EU Member States. Overall, the long-term risk category changes for nine EU Member States through an upward revision from a lower to a higher risk category, compared to what indicated by the S2 indicator alone (see Table 1). Four Member States move upward from low to medium risk, namely France, Croatia, Cyprus and Portugal. Five Member States move from medium to high risk, respectively Belgium, Spain, Italy, Hungary and the United Kingdom.

The additional debt criterion results in a higher proportion of countries assessed at high sustainability risk in the long term. The number of countries assessed at low risk decreases from eleven to seven, while the number of countries falling in the high risk category increases from one to six (see Graph 3).

Graph 3: **Proportion of countries by risk category in the S2-only and revised approach**



Source: Commission services.

Second, a more thorough sensitivity analysis is performed to further strengthen the interpretation of the S2 indicator. The S2 indicator is based on a central scenario to analyse whether public finances are on a sustainable path. However, uncertainties surrounding the central scenario due to the very long dimension of the projection horizon are substantial. In order to gauge the additional risk related to the sensitivity of the S2 indicator to underlying assumptions, alternative demographic, macroeconomic and budgetary developments over the long term are tested in a number of sensitivity scenarios.

The sensitivity scenarios introduce a change or a shock to key underlying assumptions of the central scenario. In each of these scenarios, the impact of a more dramatic population ageing, more adverse cost pressures, or of a shock to macroeconomic conditions is isolated by holding all other factors constant. Previous reports, such as the FSR 2015, the DSM 2016 and the DSM 2017, include already two alternative scenarios, namely (i) the *'AWG risk scenario'* assuming higher age-related spending due to non-demographic costs, such as healthcare and long-term care costs in excess of costs expected from purely demographic factors due to technological changes (e.g. development of new drugs) and institutional factors (e.g. widening of long-term care coverage), and (ii) the *'historical SPB scenario'*, which assumes that fiscal policy reverts back to historical behaviours (e.g. gradual convergence of the structural primary balance beyond forecast years to its historical average). Building on the Ageing Report 2018, this

(Continued on the next page)

Box (continued)

sensitivity analysis is complemented by three additional scenarios, notably: (iii) the *'population scenario'*, assuming higher demographic driven costs due to a two-year additional increase in life expectancy at birth in the long term; (iv) the *'TFP risk scenario'*, which assumes a negative shock to the long-term economic outlook in the form of a lower TFP (e.g. TFP growth converges to 0.8% in the long term instead of 1%); and (v) the *'interest rate scenario'*, to test the impact of a higher interest rate paid by the government on its newly issued debt over the long term (e.g. the real long-term interest rate converging to 4% instead of 3% in the central scenario). Table 2 below presents a summary of the S2 sensitivity scenarios.

Table 2: **Overview of alternative sensitivity scenarios**

Alternative scenarios	Changing assumption compared with the central scenario	Change
AWG risk	*Higher non-demographic costs*: healthcare and long-term care costs in excess of costs expected from purely demographic factors (linked to technological changes and catching-up effects)	Previous reports
Historical SPB	*SPB gradual convergence beyond forecasts*: gradual convergence over 4 years to the last 15 year historical average of the structural primary balance	Previous reports
Population	*Higher demographic driven costs*: a two-year additional increase in life expectancy at birth by 2070	New
TFP risk	*Lower TFP growth*: TFP growth assumed to converge to 0.8% in the long-term instead of 1%	New
Interest rate	*Higher interest rate*: Higher real long term interest rate by 1 percentage point, from 3% to 4% in the long-term	New

Source: Commission services.

5. ADDITIONAL RISK AND MITIGATING FACTORS FOR FISCAL SUSTAINABILITY

5.1. PRELIMINARY REMARKS

The consideration of additional risk factors in the overall assessment of fiscal sustainability challenges – as a complement to model - based results - is crucial to arrive at a balanced assessment. The previous chapters presented quantitative results on the basis of (debt) projections (as summarised in the DSA risk assessment) and fiscal gap indicators. Yet, these quantitative results need to be importantly complemented by the analysis of additional aggravating and mitigating risk factors that are only partially factored-in in the standard fiscal sustainability analysis.

A more complete understanding of fiscal risks, beyond simple (deficit and) debt aggregates is needed. First, beyond the size of government debt, its composition is also a key factor in determining public finance vulnerabilities. This composition, notably in terms of maturity and currency, is taken into account when projecting debt and financing needs. Yet, section 5.2 provides a more thorough analysis, by also looking at the debt structure in terms of nature of debt holders. Additionally, 'hidden debt' in the form of implicit and contingent liabilities needs to be carefully monitored, notably for the part stemming from the banking sector (see section 5.3). Finally, government assets can be relevant when analysing sustainability issues (see section 5.4). These additional risk factors considered in this chapter are treated horizontally in the overall assessment, insofar the identified vulnerabilities or supporting factors may materialise in the short, medium or long term.

Other more qualitative, specifically institutional, factors could also be deemed relevant, as stressed in the academic literature and taken into account by other institutions. Box 1.2 (in Chapter 1) provides some insights on such elements.

5.2. RISKS RELATED TO THE GOVERNMENT DEBT STRUCTURE

The structure of government debt can play an important role in ensuring sustainable public finances in different ways. First, by determining the level and response of interest payments to change in economic and financial conditions. Then, by influencing the degree of risks, notably refinancing and rollover risks. According to the IMF (2014), an optimal government debt portfolio should minimise interest payments subject to a prudent degree of refinancing and rollover risks (cost – risk trade-off).

The debt composition needs analysing along several dimensions. In this section, the analysis focuses on three aspects: the maturity structure, the currency denomination composition and the nature of the investors' base ([83]). With this aim, three main variables of debt structure are used: i) the share of short-term debt in total government debt (at original maturity); ii) the share of debt denominated in foreign currency in total government debt, and iii) the share of debt held by non-residents in total government debt.

A risk-based approach is used to capture additional vulnerabilities or mitigating role, stemming from the composition of government debt. The values of the three main variables selected are analysed against critical thresholds of fiscal risk obtained through the signalling approach - the same as in the computation of S0 ([84]). Fiscal risk levels are determined accordingly: i) high risk (red), if the values are at or above the threshold of fiscal risk from the signals' approach; ii) medium risk (yellow), if the values are below the threshold obtained from the signals' approach, but at or above a benchmark of around 80% of the same threshold; iii) low risk (green) otherwise. The results are reported for all countries in the form of

([83]) Other dimensions could also be considered such as the type of interest rates (fixed / variable), and relatedly the presence of indexation mechanisms (e.g. inflation-linked bonds), as well the nature of debt instruments (the latter is analysed to some extent in section 5.3 of this chapter).

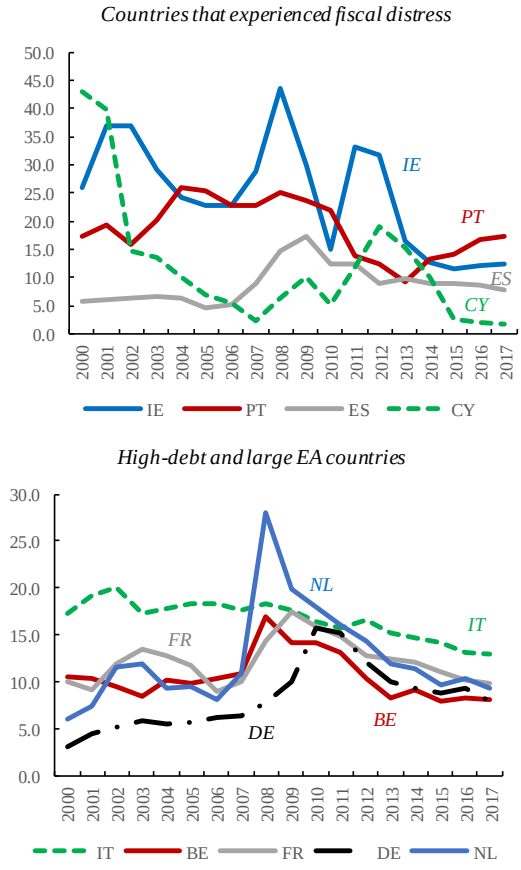
([84]) For details on the signals' approach see Chapter 2. This methodology shows that, based on historical events, the three variables appear to be relatively good leading indicators of fiscal stress. See also Annex A7 for more details.

a joint heat map (see Table 5.1) and separately for each country in the statistical fiches in Annex A10.

The share of short-term government debt matters insofar it captures refinancing and rollover risks. In particular, with a high share of short-term debt, a government may be vulnerable to increases in monetary policy rate, and to rapid changes in financial markets' perceptions. From this angle, fiscal risks exist for several EU countries (see Table 5.1). The share of short-term debt is particularly high in Sweden (close to 25% of total government debt), with the short-term debt ratio also exceeding 10% in Hungary, Portugal, Italy, Denmark and Finland. Yet, these results need to be further qualified. First, the maturity length of long-term debt needs to be considered. Also, the weight of short-term debt as a share of GDP is worth considering in parallel (e.g. in the case of Sweden, given the low level of total government debt as a share of GDP, this ratio is limited) ([85]). In the case of external short-term debt, the level of a country's international reserves equally deserves consideration ([86]).

Looking at historical trends, an overall reduction of the share of government short-term debt is observed in most countries since the last financial crisis (see Graph 5.1) ([87]). The analysis of historical patterns suggests that if changes in the debt composition (here in terms of share of short-term debt) are usually relatively limited (primarily linked to relative yield movements), in the wake of major crises or large scale financial innovation (such as quantitative easing), changes in the debt composition can be large and sudden (see Abbas et al., 2014 and also Box 3.4 in Chapter 3).

Graph 5.1: **Share of government short-term debt: evolution through time in selected countries (% of total)**



Source: Eurostat.

The share of debt denominated in foreign currency is also an important debt composition indicator, capturing governments' exposure to exchange rate fluctuations. A domestic currency denomination traditionally protects governments against currency mismatches between a government's interest expenditure and tax revenue ([88]). Yet, in some countries, the rationale behind foreign-currency denomination debt issuance is to attract foreign investors, not willing to bear the foreign currency risk. Ultimately, this may reduce funding costs for these governments (all else being equal) by reducing liquidity premia (Eller and Holler, 2018). As advanced economies finance themselves overwhelmingly in their own currency,

([85]) See S0 indicator table on fiscal variables.
([86]) The extent to which international reserves are greater or equal than the country's stock of short-term external debt (the Greenspan-Guidotti rule) shows whether the country has enough resources to counter a sudden stop in capital flows and its capacity to service its short-term external debt.
([87]) This overall lengthening of the debt maturity is also observed when looking at other metrics such as the average maturity of debt securities (published by the ECB).
([88]) Note that exchange rate fluctuations not only affect interest payments but also the valuation of the stock of debt. Therefore their impact on the debt dynamic may be particularly large (see European Commission (2017), Chapter 2, Box 2.2).

currency-related fiscal risks are largely absent for the EU countries that have adopted the euro (Table 5.1). Yet, foreign currency-denominated debt may pose risks in some Central and Eastern European countries (CEEC). This is the case of Bulgaria and Croatia (with a share well above 50% of total debt) ([89]), as well as Romania, Czech Republic, Poland, and to a lesser extent Hungary, which have a high exposure to exchange rate risks. For these countries, hedging of foreign currency positions can mitigate such risks ([90]), whereas pegs or currency boards also significantly reduce exposure to fiscal risks from the share of public debt in foreign currency ([91]). All of these countries are not part of the euro area and in most of them, the major share of their foreign currency issuances are denominated in euro. As stressed by Eller and Holler (2018), while the share of foreign-currency denominated debt has remained largely stable on average across CEEC since 2009, some governments have succeeded in reducing their reliance on foreign currency borrowing, e.g. in Czech Republic, Hungary, Poland and Romania.

Another important composition dimension to consider is the investor base, and in particular the share of debt held by non-residents. On one hand, the foreign investor base tends to be more volatile and prone to sudden stops in situations of heightened uncertainty. On the other hand, a large foreign investor base underlines a country's worthiness and thus contributes to lower funding costs in normal times. It may also be beneficial for financial and macroeconomic stability as a higher share of foreign investors reduces the risks of adverse loops between the sovereign and the national banking systems (Bouabdallah et al., 2017) ([92]). In the heat map in Table 5.1, foreign held debt figures are shown against a double shading that blends the colour coding of volatility risks from non-resident tenure (left side of the shaded cells) with that of sovereign risk given by the average spread on 10-year government bonds v Germany (right side of the shaded cells). Several countries with large shares of foreign held public debt are at this juncture associated with creditor confidence (Belgium, Ireland, France, Latvia, Lithuania, Austria, Portugal, Slovenia, Slovakia and Finland), whereas for Poland and Romania the relatively large share of foreign held debt is more prone to volatility due to high sovereign risks and speculative investment.

Table 5.1: **Risks related to the government debt structure, by country (2017)**

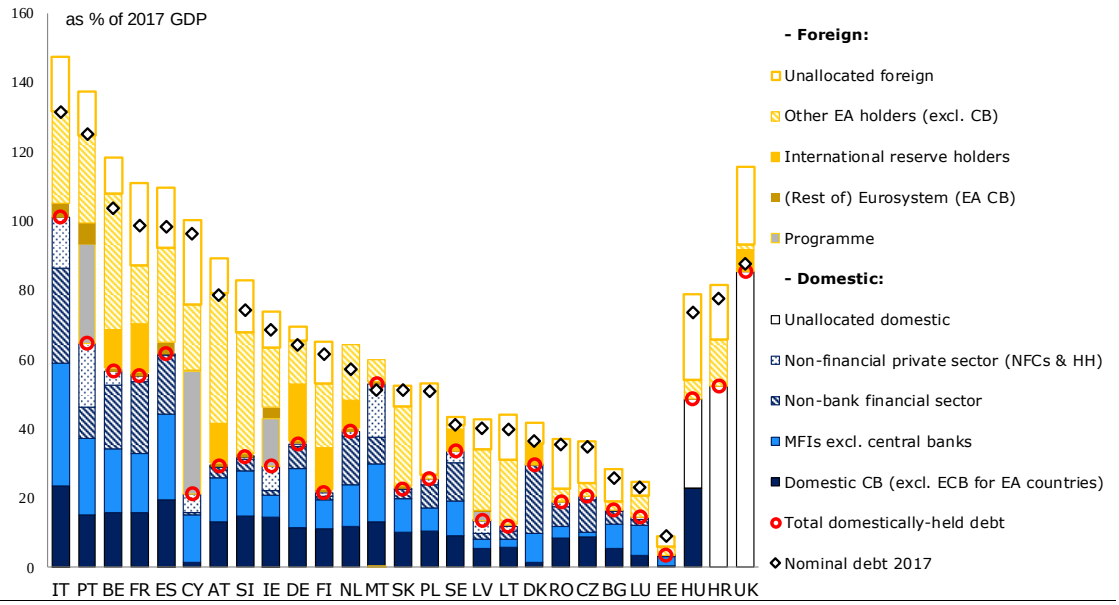
	Short-term government debt (original maturity)	Government debt in foreign currency	Government debt held by non-residents
	Shares of total debt (%):		
BE	**8.1**	0.0	**52.0**
BG	0.0	**80.6**	44.6
CZ	3.0	**45.4**	44.7
DK	**11.5**	0.3	30.4
DE	**7.9**	4.5	**49.5**
EE	2.8	0.0	**62.3**
IE	**7.4**	1.8	**59.6**
ES	**7.7**	0.0	44.1
FR	**9.8**	2.9	**49.9**
HR	4.8	**76.3**	39.0
IT	**12.9**	0.1	32.3
CY	1.8	3.6	**82.2**
LV	**8.4**	0.1	**67.6**
LT	0.6	0.0	**73.3**
LU	3.7	0.0	42.7
HU	**18.0**	25.8	37.5
MT	5.1	0.0	12.2
NL	**9.3**	0.2	35.9
AT	2.9	4.2	**67.1**
PL	0.8	**31.8**	**52.5**
PT	**17.3**	0.0	**54.0**
RO	5.0	**51.7**	**48.5**
SI	2.7	0.1	**66.6**
SK	0.9	0.1	**57.5**
FI	**10.4**	2.9	**67.4**
SE	**24.9**	23.6	22.7
UK	**15.7**	0.0	n.a.

(1) Upper and lower thresholds: (i) Share of short-term government debt: upper threshold 6.57%; lower threshold 5.3%; (ii) Share of government debt in foreign currency: upper threshold 31.58%; lower threshold 25%; (iii) Share of government debt held by non-residents: upper threshold 49.01%; lower threshold 40%. Spread on 10-year; government bonds vs. Germany – 2018 last value - upper threshold 231; lower threshold 185 (see also Annex A6 and A7). (2) Share of short-term debt: based on partially missing information for Netherlands and the United-Kingdom.
Source: Eurostat, ECB.

However, certain international creditors pose no liquidity risks, this being the case for official lenders such as the IMF, EFSF, ESM or other institutions associated to adjustment programmes. A more detailed breakdown of government debt by holder shows that a few countries, which are potentially at some risk

([89]) Bulgaria has a currency board since 1997 and nearly all of its foreign currency debt is issued in euro. While the peg is maintained, shocks to debt in foreign currency are virtually zero. Croatia has tightly managed arrangements, also limiting exchange rate fluctuations.
([90]) Hedging operations are not taken into account in the DSM.
([91]) On the idiosyncrasies of different exchange rate regimes and the extent to which exchange rate shocks could impact the public debt-to-GDP ratios see European Commission (2017) - Chapter 2, Box 2.2.
([92]) Moreover, when government debt is traded on the secondary market, is it sometimes difficult to keep track of the residency of the creditors.

Graph 5.2: **Holders of government debt, 2017-Q4, market value (% of GDP)**



(1) Debt refers to consolidated general government debt at market value, which for some countries differs from debt at nominal value (EDP debt) used in the rest of the report and represented here by white diamonds. For more details see https://www.bis.org/publ/qtrpdf/r_qt1509g.htm and https://www.bis.org/statistics/totcredit/credgov_doc.pdf. (2) Only data for total MFIs (Monetary Financial Institutions) are reported. The split between commercial banks and central banks is an estimate based on annual nominal data. The category 'International reserve holders' represents holdings by international organisations and non-EA central banks as reserve assets. The category '(Rest of) Eurosystem' includes holdings by the ECB. The category 'Non-financial private sector' represents holdings by non -financial corporations (NFCs) and households (HH).
Source: Commission services based on ECB, Eurostat, IMF.

according to the broader foreign creditor base indicated above (Portugal, Cyprus, Ireland), feature such stable sources of lending (see Graph 5.2). In other EU countries debt mostly shifted in the past years either to domestic central banks (and the ECB) or to financial sector holders from the rest of the EA.

For almost all EA countries, the signals of investor confidence illustrated in Table 5.1 **emerge also from the overview of government debt allocation to different holders (Graph** 5.2**).** For larger EA economies comparatively more significant shares of government debt are currently in the hands of non-EA central banks in the form of reserve assets (the case of German, French, Dutch, Belgian, Austrian and Finnish government debt). For smaller EA economies (see Latvia, Lithuania, Slovenia, Slovakia, Finland, Austria, Belgium), the rest of the EA financial sector has become a more important holder of government debt than these issuers' domestic financial sectors, suggesting that home bias here is disappearing or transforming as the EA grows more integrated financially and financial institutions follow harmonised prudential rules under the Single Rulebook.

While evidence of domestic versus foreign debt holdings is mixed, the latter is more likely to entail risks when the foreign tenure is not particularly safe or confidence-driven. In some countries, such as Italy, Netherlands and Malta, a relatively high share of government debt is domestically held. Conversely, in a few cases relatively larger shares of government debt held by foreign and / or unidentified investors outside the euro area that are not reserve asset holders ('unallocated') may reflect risks usually associated to this uncertain, potentially more volatile basis (Poland, Hungary, Croatia) - Graph 5.2.

The analysis of risks arising from the debt profile need not be confined to these indicators and the associated benchmarks. Other factors, some of which mentioned above, such as the exchange rate regime, the role of the central bank in mitigating short-term liquidity needs, the capacity of the market to absorb debt, influence as well the results of the analysis. The underlying

reasons for debt profile vulnerabilities, such as contagion, incomplete credit markets, weak debt management practices, may also be important in this regard.

5.3. LOOKING BEYOND 'GOVERNMENT DEBT': RISKS RELATED TO GOVERNMENT OTHER DIRECT AND CONTINGENT LIABILITIES

While frameworks for debt sustainability analysis traditionally focus on 'government debt' (in particular the so-called Maastricht or EDP debt in EU countries), government liabilities are (much) wider than what this aggregate captures. This section aims at filling this gap by providing an analysis of the size and, when possible, the evolution of other liabilities than 'EDP debt' liabilities in the EU. Such a complementary analysis allows identifying additional risk factors compared to the results of the standard debt sustainability analysis provided in this report (see chapter 3). Together with the analysis of government assets and net debt / net worth (provided in section 5.4), it also allows to broaden the focus of standard DSA frameworks to a balance sheet perspective.

With this aim, this report contain a contingent liability risk analysis module consisting of three tools: i) statistics on explicit contingent liabilities (section 5.3.3 and Annex A10); ii) statistics on potential triggers for contingent liabilities (section 5.3.4 and Annex A10); and iii) model estimations of implicit contingent liabilities using bank stress scenarios (SYMBOL model – section 5.3.5 and Annex A10). Section 5.3.1 provides some preliminary conceptual and practical considerations, while section 5.3.2 shows an analysis of other government direct liabilities that are not included in the EDP debt.

5.3.1. Government liabilities: conceptual and practical considerations

Government liabilities are of diverse nature and classification into clear-cut categories is not a straightforward exercise. A first important distinguishing feature of government liabilities relates to how they are recorded. Some liabilities are recorded on governments' balance sheets (and in general government sector for national accounts purposes), while others are recorded off-balance, and subject only to reporting as memorandum or analytical items. Another distinction can be made between i) direct versus contingent liabilities, and ii) implicit versus explicit liabilities (see Brixi and Mody, 2002; Cebotari, 2008 and OECD, 2015 for a detailed discussion of the classification of government liabilities):

- Government liabilities may be *direct* or *contingent* depending on the certainty of the payment obligation. *Direct* liabilities are payment obligations that will arise with certainty, while *contingent* liabilities may result in future expenditure only if a particular event occurs.

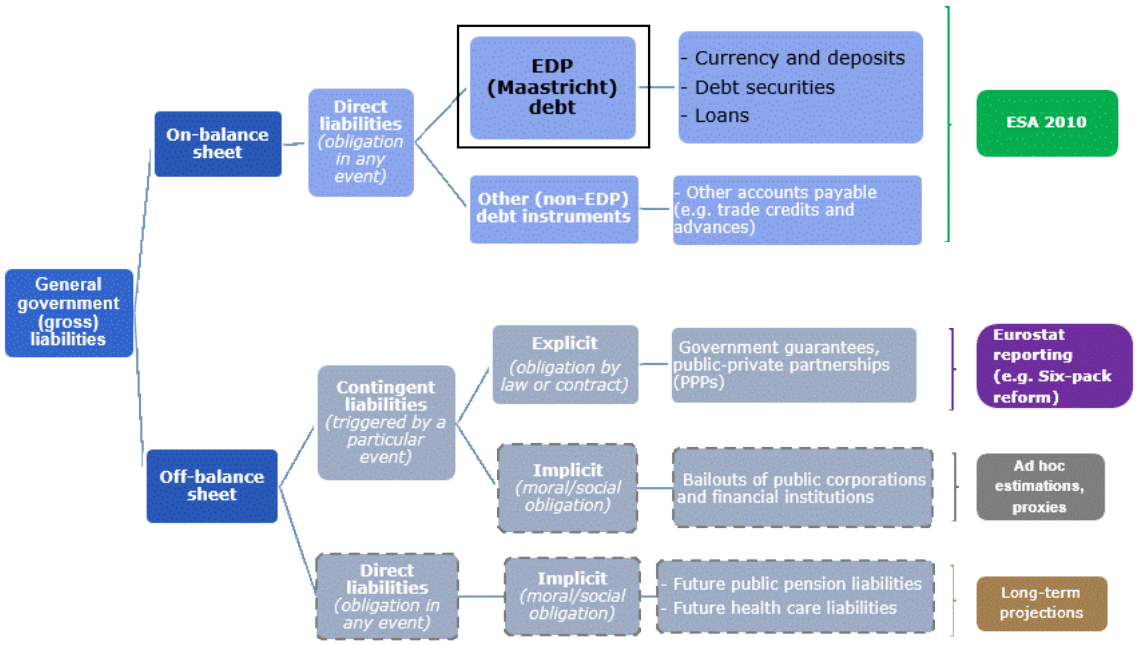
- Irrespective of the direct or contingent nature, government liabilities can be *explicit* or *implicit* depending on whether they are legally binding. *Explicit* liabilities arise from a law or contract, whereas *implicit* liabilities arise from the social or political obligations of a government to intervene in the event of a crisis to either stimulate parts of the economic activity or prevent public sector or market failures.

These different categories are however not mutually exclusive and may overlap, calling for caution when putting together and interpreting the results (see discussion below). Figure 5.3 provides a tentative categorisation of the gross liabilities of the general government. Based on the discussion above, the on-balance sheet liabilities illustrated in this figure are direct and explicit. In the case of the off-balance sheet liabilities, the split is between direct and contingent liabilities and, in turn, each category is decomposed further into explicit and implicit liabilities.

Conventional debt sustainability analysis focuses on on-balance sheet direct (explicit) liabilities. In the EU debt sustainability analysis, the headline indicator is the general government gross debt, more precisely the so-called EDP (or Maastricht) debt ([93]). This measure of debt only includes a narrow set of government liabilities,

([93]) The concept of Maastricht debt is used in the fiscal framework of the Stability and Growth Pact, namely for the Excessive Deficit Procedure (EDP) purposes and, due to this, is also known as the EDP debt. The EDP debt is measured in gross terms, which means that financial assets do not net out liabilities.

Graph 5.3: **Tentative categorisation of gross financing liabilities of general government**



(1) The debt sustainability analysis (DSA) is grounded on the EDP (Maastricht) debt. However, the long-term fiscal sustainability analysis accounts for categories of the off-balance sheet government liabilities, such as other implicit liabilities linked to the payment of future public pensions, health care and social security benefits, where a moral or social obligation of the government to intervene is expected. The long-term projections for these age-related public spending rely on assumptions about (i) the long-term path of the fiscal primary balance, which, for instance, embeds other direct explicit liabilities such as future civil service wages, and (ii) the ageing costs, such as public pensions, health care and long-term care (see the 2018 Ageing Report). Also, risks related to contingent liabilities arising from possible interventions to support the banking sector are estimated notably with the so-called SYMBOL methodology (see section 5.3.5).
Source: Commission services.

namely currency and deposits, debt securities and loans. Other debt instruments such as other accounts payable, insurance, pensions and standardised guarantee schemes, and non-debt financial instruments, such as shares, equity and derivative liabilities, are not included in the EDP measure of debt (see section 5.3.2). However, other definitions of gross debt (IMF, OECD) include all instruments that have a nature of debt liabilities.

Contingent liabilities can be explicit or implicit depending on whether the government's involvement in case of contingency materialising arises from the existence of a formal arrangement. Explicit contingent liabilities are obligations of the government underpinned by contracts or laws. In most countries, they include: (1) one-off state guarantees to sub-national governments and public and private corporations; (2) standardised guarantees for different loan types granted to achieve public policy objectives (e.g. student loans, mortgage loans to support low-income borrowers, export credits); (3) state insurance schemes to cover bank deposits, pension savings, crops, floods, earthquakes and other natural disasters; (4) other financial guarantees linked to the public-private partnerships (PPPs), such as debt, revenue or exchange rate guarantees; (5) other explicit contingent liabilities. Unlike explicit liabilities, the implicit contingent liabilities are not defined in a formal arrangement. They typically include potential bailouts of public entities and private corporations that are strategically important for the economic activity (e.g. public and private firms, financial institutions, or municipal sectors), environmental recovery liabilities or relief for natural disasters.

In the context of the so-called 2011 'six-pack' reform to strengthen the EU economic governance, **the EU Member States publish supplementary information on contingent liabilities** that could

have a sizeable impact on government finances (see section 5.3.3). Such liabilities, which go beyond the debt measure, can be a useful indication of potential fiscal risk in the future. In particular, several indicators are available: (i) government guarantees; (ii) liabilities related to off-balance public-private partnerships (PPPs); and (iii) liabilities of government controlled entities classified outside general government (public corporations) ([94]). In addition to reporting obligations introduced by the 'six-pack', information on actual and potential liabilities from government interventions to support financial institutions during the financial stress periods and the impact of the actual interventions on the government deficit and debt has been published since 2009. Data on government liabilities in relation to the financial sector interventions that are contingent on future events are further detailed as government guarantees on the liabilities and assets of financial institutions, government issued securities under liquidity schemes, and liabilities of special purpose entities ([95]) .

Potential implications of contingent liabilities for government finances should be interpreted cautiously. First, the contingent liability indicators discussed earlier are not mutually exclusive. Risks reflected by one indicator may also be captured by another indicator. For instance, a government guarantee for liabilities of a public corporation classified outside the general government may be reflected by two indicators, respectively the guarantees and the liabilities of government controlled entities classified outside general government indicators. This implies that a summation of the contingent liability indicators may overestimate the fiscal cost of contingent liabilities. Second, in the reporting of contingent liability data, gross liabilities of government controlled entities that are classified outside the general government are not matched by assets. High levels of liabilities of these entities typically reflect the existence of government controlled financial institutions and is driven, for example, by deposits of households and companies in public banks, while disregarding high levels of assets on their balance sheet. By looking only at the liability side, the financial vulnerability of the government with respect to contingent liabilities can be therefore overstated ([96]).

Furthermore, the Commission has developed over the last decade additional original tools to estimate implicit liabilities, notably those arising from an ageing population and those related to the banking sector. The long-term budgetary projections for ageing costs have been regularly prepared by the Commission and the Council and published in the Ageing Report editions since 2009. These projections indicate to what extent a changing demographic structure affects future public spending on pensions, healthcare and long-term care across the EU Member States. Also, implicit contingent liabilities linked to the exposure of public finances to the banking sector in the event of financial instability are estimated with the SYMBOL model (Systematic Model of Banking Originated Losses). Based on severe test scenarios for the banking sector, SYMBOL provides estimates for the residual fiscal burden of banking losses after the legal safety net such as capital, bail-in, and resolution funds has been used. A detailed discussion of the latter is provided in section 5.3.5.

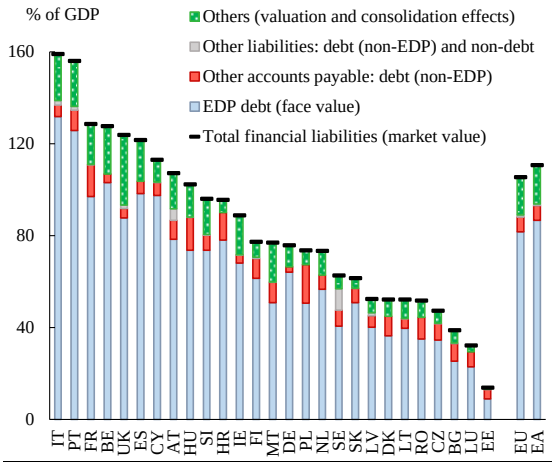
5.3.2. EDP debt, other debt and non-debt financial instruments: a snapshot overview

The EDP debt liabilities were the main component of on-balance government gross liabilities in 2017 in all Member States. In the EU as a whole, the EDP debt was around 82% of GDP and accounted for almost three-quarters of total gross financial liabilities in 2017 (see Graph 5.4). In terms of instrument coverage, debt securities, commonly in the form of bills, commercial papers and bonds, account for more than two-thirds of the government gross debt in most Member States. Contributions of loans, coins when issued by governments and deposits held by entities classified inside general government tend to be less significant in all Member States ([97]).

([94]) Data on explicit contingent liabilities are collected and published by Eurostat and are also published nationally.
([95]) Guarantees extended to financial institutions are a sub-set of guarantees reported under the 'six-pack' obligations.
([96]) See Eurostat (2018a).
([97]) The share of loans can be significant in some Member States, in particular in those that have benefited from financial assistance in the form of official loans over recent years.

The difference between total gross liabilities and the EDP debt varies widely across Member States. In 2017, the portion of total gross government liabilities not included in the EDP debt ranged from 36% to 25% of GDP in the United Kingdom, France, Portugal, Hungary, Austria, Italy, Malta and Belgium and below 10% of GDP in Slovakia, Luxembourg and Estonia. This difference, as shown in Graph 5.4, consists of other debt instruments (so-called non-EDP debt), non-debt financial instruments and a gap due to different valuation and consolidation methods applied to financial liabilities ([98]).

Graph 5.4: **Debt and non-debt financial liabilities in EU Member States in 2017**

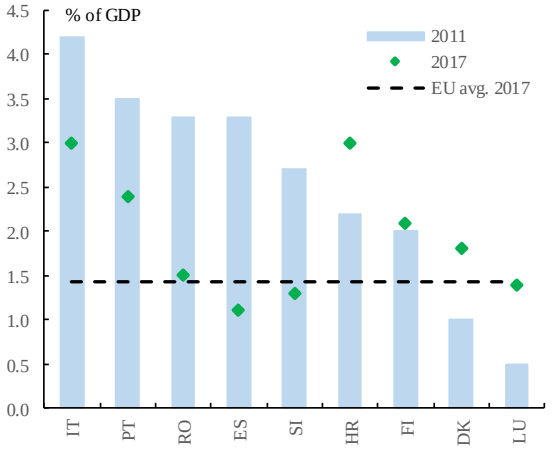


Source: Commission services based on Eurostat data.

Among non-EDP debt liabilities, other accounts payable is the most significant component. Other accounts payable include trade credits and advances. These are in most cases outstanding short-term liabilities of the government from transactions of goods and services, and to a lesser extent other timing differences in settling obligations. During periods of financial distress, this debt instrument can become an important government financing alternative. For instance, in few Member States, such as Italy, Slovenia, Romania, Portugal and Spain, government trade debt tended to be higher during the financial crisis. Over time, stocks of trade credits and advances have increased in some Member States. In 2017, as a share of GDP, these liabilities were highest in Italy (3.0%), Croatia (3.0%), Portugal (2.4%) and Finland (2.1%), and reached less than 1% in Latvia, Lithuania, Malta, Netherlands and Poland (see Graph 5.5) ([99]).

Non-debt financial instruments are typically a narrow set of total government liabilities. In 2017, non-debt financial liabilities of the general government sector, such as financial derivatives, equity and investment fund shares were more relevant for Austria (4.9% of GDP) and Portugal (1.7% of GDP), while accounting for less than 0.6% of GDP in few other Member States with such instruments on their balance sheet.

Graph 5.5: **Trade credits and advances in selected Member States in 2014 and 2017**



Source: Commission services based on Eurostat data.

The gap reflecting valuation and consolidation effects can be relatively large in some Member States. Ranging from 30% to 0.6% of GDP in 2017, this gap was highest in particular in the United Kingdom, Belgium, Italy, Portugal, Spain, France, Malta and Ireland. In most cases, the magnitude of this gap is affected largely by the impact of different valuation bases for the EDP debt (face value) and gross financial liabilities (market value) and to a lesser extent by the impact of the consolidation method (EDP debt is consolidated both within and between the subsectors of the general government, gross financial liabilities only within subsectors).The

([98]) The valuations of the EDP debt and ESA 2010 balance sheets are different. For EDP purposes, total gross EDP debt of the general government is valued at face value, while in ESA 2010, government gross liabilities are valued at market prices.

([99]) Eurostat (2015) and (2018b).

consolidation effects are in fact small in most Member States ([100]).

5.3.3. Contingent liabilities in the EU

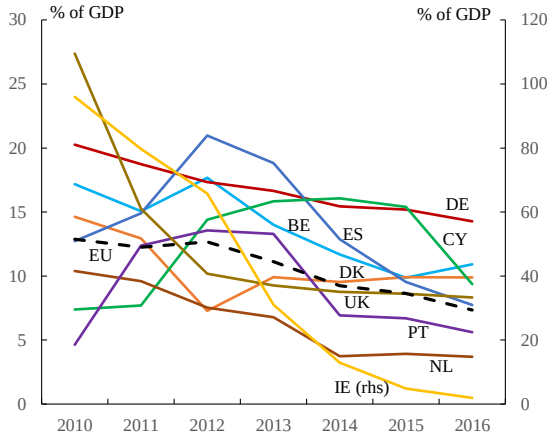
As part of the analysis of contingent liabilities proposed in this report, this section contains an overview of *explicit* contingent liabilities, as reported by Eurostat. These explicit contingent liabilities include government guarantees, liabilities related to off-balance PPPs (public - private partnerships) and contingent liabilities related to government interventions in the financial sector. This information can also be found in Annex A10.

Government guarantees and PPPs

Government guarantees represent a large source of potential fiscal cost in several Member States. Government guarantees are typically designed to reimburse a lender in case of possible losses linked to the debt that it had extended. Government guarantees are issued to promote economic stability or pursue other public policy objectives, with the examples of guarantees on student loans or on the losses incurred by exporters in case of non-payment by a trading partner. In 2016, the highest stocks of outstanding government guarantees were in Finland (28.0% of GDP) and Austria (20.5% of GDP) (see Graph 5.7). In Finland, a sizeable part of the guarantees are related to export guarantees, student loans and funds for supporting housing production ([101]). In Austria, guarantees were largely provided to nonfinancial private entities for export promotion; to public and private financial institutions during the crisis; and to non-financial public corporations such as road and rail infrastructure companies ([102]). In the EU as a whole, public guarantees declined from around 14.0% of GDP in 2010 to 8.4% of GDP in 2016. This reflects largely a decline in the use of government guarantee schemes for financial institutions granted in the context of the financial crisis in number of EU Member States (Graph 5.6).

([100]) Eurostat (2018c).
([101]) http://www.treasuryfinland.fi/en-US/Statistics/State_guarantees
([102]) See IMF (2018d).

Graph 5.6: **Developments in government guarantees in selected EU Member States, 2010-2016**



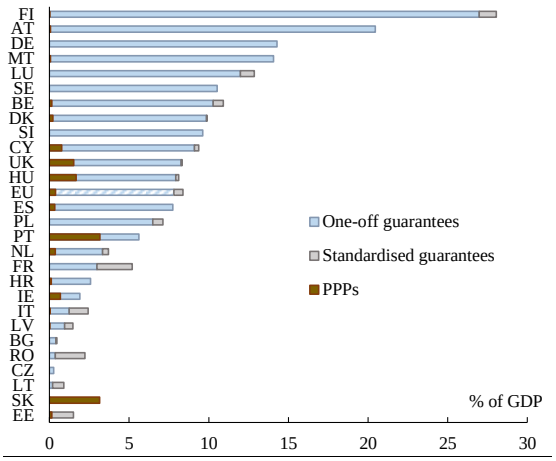
Source: Commission services based on Eurostat data.

Government guarantees can be one-off (based on individual contracts for large amounts) or standardised (issued in large numbers for small amounts). In most Member States, the largest category of government guarantees relates to one-off guarantees granted under individual contractual arrangements, usually involving more sizeable amounts. In 2016, the stock of one-off guarantees ranged from more than 27.0% of GDP in Finland and 20.5% of GDP in Austria to less than 0.5% of GDP in Romania, Czech Republic Lithuania and Slovakia (see Graph 5.7). On the other hand, the total amount committed in standardised guarantee schemes to support public policy objectives carries a modest risk for future public expenditure in most Member States. These schemes account for more than 1% of GDP only in France (2.2%), Romania (1.9%), Estonia (1.5%) and Italy (1.2%).

Contingent liabilities linked to off-balance public private partnerships (PPPs) are a modest source of risk for most Member States. The use of public private partnerships (PPPs) for economic and social infrastructure projects, such as for the development of transport infrastructures and hospitals, can generate additional liabilities for the government. Depending on the distribution of risks and rewards between private and public partner, assets and liabilities related to PPPs can be recorded either on government's balance sheet or on the private partner's balance sheet. The first ones (on-balance PPPs) affect government's debt directly. However, also those PPPs where the private partner is exposed to the majority of risks

and rewards and which are therefore recorded off government's balance sheet, government may be contractually obliged to step in under certain circumstances (for example, failure of the private partner). For the EU as a whole, contingent liabilities related to off-balance PPPs have modestly accounted for around 0.4% of GDP since 2010 and are only affecting few Member States (see Graph 5.7). In 2016, more sizeable contingent liabilities related to off-balance PPPs were in Portugal (3.2% of GDP), Slovakia (3.1% of GDP) and Hungary (1.7% of GDP).

Graph 5.7: **Government guarantees and PPPs in EU Member States in 2016**

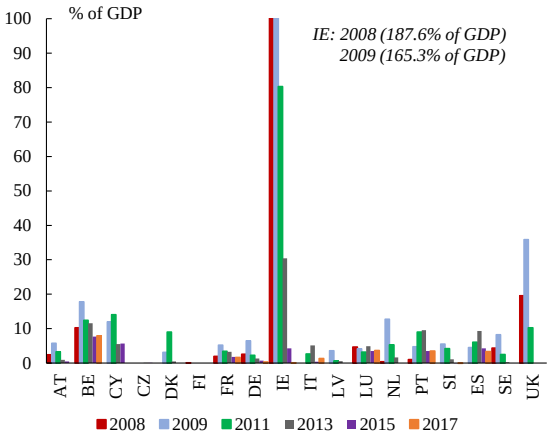


Source: Commission services based on Eurostat data.

Contingent liabilities related to government interventions to support financial institutions

A subset of contingent liabilities related to government interventions to support financial institutions have followed a downwards trend since 2013. Following an increase during and immediately after the financial crisis, the financial exposure of the government due to the financial stability schemes has been declining since 2013-14 in most Member States (see Graph 5.8). Government guarantees to the financial sector peaked in 2008 in Ireland (187.6% of GDP) and in 2009 in the United Kingdom (35.9% of GDP), Belgium (17.8% of GDP) and the Netherlands (12.7% of GDP) ([103]). In 2017, the contingent liabilities linked to financial stability schemes varied from 0.1% of GDP in Ireland and 1.3% of GDP in Italy to 3.7% of GDP in Luxembourg and 8.0% of GDP in Belgium. Lower outstanding contingent liabilities in recent years reflect the fact that improved financial stability did not require a renewal of the expiring guarantees issued as part of support packages for financial institutions. Crystallisation of some government guarantees between 2008 and 2017 also contributed to a lower stock of outstanding guarantees, though it resulted in additional government expenditure, liabilities and debt increase ([104]). In particular, government guarantees were called upon in Belgium (2011), Germany (2011-12, 2014-17), Denmark (2011), Spain (2013-16), Latvia (2014), and Portugal (2010) ([105]).

Graph 5.8: **Contingent liabilities linked to the financial sector interventions in the EU, 2008-2017**



Source: Eurostat.

5.3.4. Risks from contingent (implicit) liabilities related to the banking sector

In order to complement the analysis of potential contingent liabilities specifically related to the banking sector, an additional 'module' is provided (as in the previous reports). This module consists of a heat map reporting values of variables that indirectly capture potential building risks in the banking sector. Indeed, as seen in the previous section, the banking sector is often an important trigger for government contingent liabilities. Adverse developments in terms of private sector credit flows, house prices, bank loan-to-deposit ratios and non-performing loans can represent substantial risks to the government's

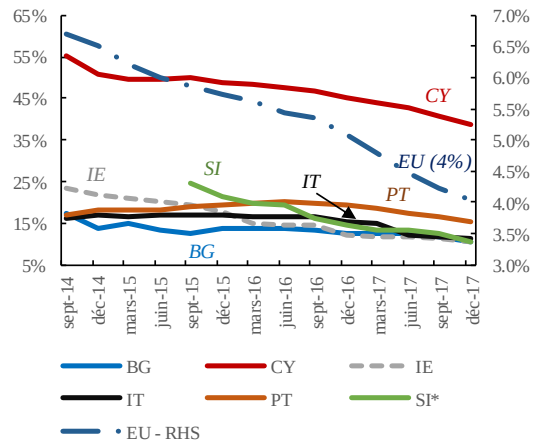
([103]) See Eurostat (2018d).

([104]) See ECB (2018).

([105]) See Eurostat (2018d) for details about the impact of these guarantees on government finances.

financial position in the future and thus give rise to contingent liabilities. A set of six variables, which have proven in the past to be good leading indicators of banking – fiscal crises, is assessed against specific thresholds (see Table 5.2) ([106]).

Graph 5.9: **Non-performing loans ratio (% of total loans), EU average and countries with a ratio above 10% in Q4 2017**



Source: EBA.

Fiscal risks due to contingent liabilities related to the banking sector are still present, although some risk-reduction is taking place. In 2017, the level of non-performing loans (NPLs) ratios is still high in a majority of Member States. However, an overall reduction is observed in most countries since 2014 (see also Graph 5.9). Between 2016 and 2017, NPLs ratios continued to decline in most Member States, with more sizeable reductions in Romania (3.5 pps.), Slovenia (3.9 pps.), Portugal (4.2 pps.), Italy (4.2 pps.), and Cyprus (6.1 pps.) ([107]). The NPL coverage ratio shows that in most countries, NPLs are provisioned for in proportions of at least one third. Only in few cases, NPLs appear both high as a share of total loans, and provisioned for a level lower than 33% (e.g. Ireland). Additional indicators point to contained vulnerabilities. Liquidity risks as indicated by the bank loan-to-deposit ratio are identified only in few Member States, notably in Denmark, Luxembourg, Finland and Sweden. Finally, developments of private sector credit flows and house prices flag low risks in most Member States.

Table 5.2: **Potential triggers for contingent liabilities from the banking sector, by country (2017)**

	Private sector credit flow (% GDP)	House price nominal index change (%)	Bank loan-to-deposit ratio (%)	NPL ratio (% of total gross loans)	NPL ratio change (pps 2017 v 2016)	NPL coverage ratio (%)
BE	-1,5	3,6	105,5	**2,6**	-0,6	43,0
BG	6,2	8,7	69,0	**10,6**	-2,0	54,5
CZ	4,1	11,7	83,2	1,6	-1,0	62,5
DK	-1,4	4,5	**349,9**	**2,4**	-0,7	**28,9**
DE	4,9	4,5	126,4	1,9	-0,6	39,3
EE	3,6	5,5	123,2	1,7	**0,5**	**23,4**
IE	-7,5	10,9	106,1	**10,4**	-1,8	**29,4**
ES	0,2	6,2	114,8	**4,5**	-1,2	41,9
FR	7,0	3,1	113,3	**3,1**	-0,6	51,0
HR	1,2	3,8	75,6	**7,5**	-2,6	58,9
IT	2,1	-0,8	120,3	**11,1**	-4,2	50,6
CY	8,7	2,2	76,7	**38,9**	-6,1	45,0
LV	0,3	8,8	75,1	**2,3**	-0,8	**32,4**
LT	3,7	8,9	104,0	**2,8**	-0,9	**29,2**
LU	-15,5	5,6	**139,0**	0,7	-0,4	43,9
HU	0,9	7,5	75,3	**8,9**	-2,6	61,7
MT	2,9	5,3	52,6	**3,5**	-0,9	35,7
NL	3,0	7,5	124,8	**2,3**	-0,2	**29,1**
AT	4,3	5,3	103,3	**3,7**	-1,4	52,7
PL	2,7	3,8	97,8	**5,8**	-0,3	59,3
PT	1,3	9,2	88,0	**15,2**	-4,2	48,6
RO	1,7	6,1	66,2	**6,5**	-3,5	67,6
SI	0,8	8,0	69,3	**10,5**	-3,9	62,9
SK	5,9	5,9	110,6	**3,4**	-0,9	59,8
FI	8,2	1,6	**166,0**	1,5	-0,1	**27,3**
SE	**13,1**	6,4	**208,9**	1,0	0,0	**29,5**
UK	8,4	4,5	92,0	1,5	-0,4	**32,0**

(1) Upper and lower thresholds (see Annex A7): (i) Private sector credit flow (% GDP): upper threshold 11.7%; lower threshold 9.4%; (ii). Nominal house price index (Y-o-Y Change): upper threshold 13.21; lower threshold 11; iii)Bank loans-to-deposits ratio: upper threshold 133.37%; lower threshold 107%; (iv). NPL ratio: upper threshold 2.3%; lower threshold 1.8%; (v). NPL ratio (Change): upper threshold 0.3 pps; lower threshold 0.2 pps; (vi) NPL coverage ratio: upper threshold 66%; lower threshold 33%.
Source: Eurostat, EBA.

5.3.5. Implicit contingent liabilities from severe stress scenarios on the banking sector (SYMBOL model)

The analysis of potential contingent liabilities specifically related to the banking sector is completed by a last 'module', based on model estimations of implicit contingent liabilities using bank stress scenarios (as in the previous reports).

To estimate the potential impact of banking losses on public finances ([108]) SYMBOL

([106]) The calculation of the specific thresholds for the six variables used in the fiscal risk heat map to assess the potential exposure of government finances to uncertainty over the banking sector relies on the signals' approach. This approach is explained in detail in Chapter 2 and Annex A1 and Annex A7.

([107]) This overall declining trend is also confirmed by ECB data throughout 2018.

([108]) Second-round effects, which would be linked to the fiscal consequences of possible bank failures, are not taken into account. As explained in European Commission (2016a) Part 5.2.2 and in Part IV, Chapter 2 of European Commission (2011a), the relationship between the government's budget and banks' balance sheets is not uni-directional but rather circular and dynamic. Dynamic effects are, however, beyond the scope of the analysis presented here. It is not taken into account, for instance, that a downgrading of sovereign bonds reduces the value of

(Systemic Model of Banking Originated Losses) is used. The model has been developed by the European Commission's Joint Research Centre (JRC) and the Directorate General Financial Stability, Financial Services and Capital Markets Union (DG FISMA). Similarly to previous exercises, the SYMBOL model ([109]) uses unconsolidated balance sheet data to assess the individual banks' losses in excess of bank capital and the recapitalisation needed to enable banks to continue to operate in case of distress ([110]).

The model gauges the potential residual burden on government budgets after all cushioning layers of the legal safety net available to absorb shocks (capital, bail-in, resolution funds) have been deployed (see Annex A8). The impact of a banking crisis is split into that on the government deficit and that on gross government debt directly.

As last year's exercise ([111]), **the model takes into account asset quality via potential increases of the size of bank losses from non-performing loans. The following assumptions are made:** first, results are calibrated to match the gravity of the 2008-2012 crisis ([112]), i.e. a severe and systemic crisis event. Second, the impact of non-performing loans (NPLs) is considered only in the current situation and the effect is supposed to become negligible in the long term. Third, a conservative assumption is used whereby all simulated bank excess losses and recapitalisation needs that cannot be covered by the safety net fall on public finances. Fourth, the safety net is considered able to fully rule out contagion effects; more specifically, in the main scenario systemic banks are recapitalised and non-systemic banks are liquidated ([113]).

Implicit contingent liabilities from total funding needs, i.e. losses in excess of capital and recapitalisation needs at 10.5%, are estimated for the short-term (Q1-2019) and long-term 2029 scenarios (see Table 5.3 for the results and Annex A8 for details on the methodology). Bank losses in excess of capital are assumed to be covered by public injections of funds to the banking sector, affecting equally public deficit and gross and net debt. Conversely, recapitalisation is deemed recoverable since capital injection is done in exchange of shares (partial government ownership of the bank) being recorded as a financial transaction affecting neither the deficit nor net debt, but only gross debt through the stock-flow adjustment ([114]).

The model has been adapted to reflect risks banks face in relation to asset quality, in relation to non-performing loans (NPLs). The effect of non-performing loans on the banking sector is considered to be one whereby NPLs entail risks in the short term, but not in the long term. The initial 2019Q1 scenario considers the case of insufficient provisioning of NPLs may lead to an overestimation of capital and to an underestimation of potential losses. The baseline modelling assumption is that non-collateralised NPLs count as loan losses for the system, while the ones collateralised by immovable property are redeemable subject to a recovery rate. In some cases, this assumption may lead to certain bias, e.g. related to difficult foreclosure of household mortgages (leading to loss underestimation) or where household's mortgages result in better recovery rates than applicable to firms (leading to loss overestimates). Specifically, for each bank *i* and each country *j*, potential loans losses from NPLs are computed as follows:

bank assets and can lead to higher funding costs and further bank downgrading.

([109]) More details are reported in European Commission (2016a). SYMBOL has been used by the European Commission for the ex-ante quantitative impact assessment of several legislative proposals (see Marchesi et al, 2012; European Commission, 2011b; Cariboni et al, 2012; Cannas et al, 2013), for the cumulative evaluation of the entire financial regulation agenda (ERFRA, European Commission, 2014a), and for the estimation of contingent liabilities linked to public support to the EU banking sector (European Commission, 2011a, 2012a and 2016; Benczur et al, 2015).

([110]) European Commission (2016a) provide further details on the SYMBOL model and the methodology used. Annex A8 presents the sample used to run simulations.

([111]) See DSM 2017 Ch.4.

([112]) Bank losses and recapitalisation needs triggered by the last crisis are proxied by state aid data, in particular the total recapitalisation and asset relief provided to banks over 2008-12 (around 615 bn euro), see European Commission's DG Competition State Aid Scoreboard, European Commission (2014b) and Benczur et al. (2015).

([113]) Potential contagion across banks through bail-in (some of the losses absorbed by the safety net re-entering the banking system) is disregarded due to scarce data.

([114]) Under the assumption that such recapitalisations meet the following criteria of the Eurostat's decisions on the statistical recording of public interventions to support financial institutions and markets: the financial instrument used ensures a sufficient non-contingent rate of return and the State Aid rules are complied with (see March 2013 Decision and the earlier July 2009 Decision).

Table 5.3: **Implicit contingent liabilities from banks' excess losses and recapitalisation needs, under alternative scenarios (%GDP)**

Scenarios:	Initial (2019 Q1) short-term scenarios						Final (2029) long-term scenarios			
	Reference		All Banks to Resolution		All Banks to Resolution and 20% RR on NPL		Reference		All Banks to Resolution	
	(a)		(b)		(c)		(a)		(b), (c)	
	Excess Losses	Recap Needs 10.5%	Excess Losses	Recap Needs 10.5%	Excess Losses	Recap Needs 10.5%	Excess Losses	Recap Needs 10.5%	Excess Losses	Recap Needs 10.5%
	To deficit and debt	Directly to debt	To deficit and debt	Directly to debt	To deficit and debt	Directly to debt	To deficit and debt	Directly to debt	To deficit and debt	Directly to debt
BE	0.0%	0.2%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.1%
BG	0.0%	0.8%	0.0%	1.0%	0.1%	1.8%	0.0%	0.1%	0.0%	0.1%
CZ	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%
DK	0.0%	0.2%	0.0%	0.2%	0.1%	0.5%	0.0%	0.1%	0.0%	0.2%
DE	0.0%	0.1%	0.0%	0.5%	0.0%	0.7%	0.0%	0.0%	0.0%	0.1%
EE*	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
IE	0.0%	0.6%	0.0%	0.7%	0.1%	2.4%	0.0%	0.1%	0.0%	0.2%
ES	0.0%	1.4%	0.0%	1.6%	0.1%	2.3%	0.0%	0.5%	0.0%	0.6%
FR	0.0%	0.4%	0.0%	0.4%	0.0%	0.5%	0.0%	0.1%	0.0%	0.1%
HR	0.0%	0.1%	0.0%	0.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%
IT	0.0%	0.8%	0.0%	1.4%	0.2%	3.4%	0.0%	0.0%	0.0%	0.1%
CY	0.1%	3.0%	0.1%	3.2%	4.7%	12.8%	0.0%	0.2%	0.0%	0.4%
LV	0.0%	0.2%	0.0%	0.4%	0.0%	0.6%	0.0%	0.0%	0.0%	0.1%
LT*	0.0%	0.1%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%
LU	0.0%	0.6%	0.0%	0.9%	0.0%	1.1%	0.0%	0.1%	0.0%	0.2%
HU	0.0%	0.1%	0.0%	0.2%	0.0%	0.3%	0.0%	0.1%	0.0%	0.1%
MT*	0.0%	0.4%	0.2%	1.1%	0.4%	1.4%	0.0%	0.0%	0.0%	0.1%
NL	0.0%	0.1%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
AT	0.0%	0.2%	0.0%	0.5%	0.0%	0.8%	0.0%	0.0%	0.0%	0.1%
PL	0.0%	0.1%	0.0%	0.4%	0.0%	0.8%	0.0%	0.1%	0.0%	0.1%
PT	0.0%	0.7%	0.0%	0.8%	0.0%	1.0%	0.0%	0.2%	0.0%	0.3%
RO	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
SI	0.0%	0.3%	0.0%	0.4%	0.0%	1.3%	0.0%	0.1%	0.0%	0.1%
SK	0.0%	0.6%	0.0%	0.8%	0.0%	1.0%	0.0%	0.2%	0.0%	0.2%
FI	0.0%	0.2%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%
SE	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
UK	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%

(1) All figures are % of the corresponding economy's GDP. Data as of December 2017.
(2) (*) Asterisks denote countries with sample representativeness issues.
Source: Commission services.

$$NPLs\ Losses_{i,j} = \left(1 - CollShares_j\right) \times NPLs_{i,j} + CollShares_j \times NPLs_{i,j} \times \left(1 - RR_j\right) - Provisions_{i,j}$$

where *RR* is the recovery rate ([115]). *CollShare* represents the proportion of total loans covered by collateral ([116]). *Provisions* and *NPLs* are, respectively, the amount of provisions and gross non-performing loans declared by banks in their balance sheet.

Extra loan losses from NPLs calculated as per the above equation are then added to those coming from the SYMBOL simulation before the intervention of any safety net tools.

As a novelty in this edition of the report, some additional alternative scenarios are performed (see Annex A8 for details). In particular: (*reference scenario or scenario A*) only the subset of stressed banks considered to be systemic will go into resolution and be recapitalised ("reference

([115]) Based on country data provided by the World Bank in its 2017 Doing Business Report.
([116]) Based on ECB data.

scenario" similar to the DSM 2017). All remaining stressed banks are assumed not to be systemic and to be liquidated in case of distress. (*scenario B*) All stressed banks are assumed to go into resolution ([117]). (*scenario C*) Under the initial 2019Q1 horizon, a worst case scenario is considered, whereby additionally recovery rates for NPLs is set at 20% of World Bank reported levels. Under all scenarios the level of recapitalisation is set to 10.5% of each bank's RWA, representing the minimum level of capital and capital conservation buffer set by the CRDIV. The extra capital buffers built for G-SIIs or O-SIIs are not recapitalised.

Thanks to a cascade intervention of regulatory tools, the estimated budgetary impact of a major crisis associated with excess bank losses is negligible in the short term (2019) for most countries except Cyprus. In the long term (2029) this impact is in all cases almost zero. As for recapitalisation needs with direct impact on debt levels, the situation is more nuanced (see Table 5.3). In the short term, where the effect of NPLs is included, estimates show that, in the *reference scenario (A)*, most EU countries' contingent liabilities are lower than 1% of GDP even in the 10.5% recapitalisation scenario. Two countries (CY, ES) would have final losses larger than 1% of GDP. When all banks are considered to go into resolution (*scenario B*) also BG, IT and MT would exceed the 1% threshold ([118]). In the worst case scenario (*scenario C*), ten countries (BG, CY, ES, IE, IT, LU, MT, PT, SI and SK) would exceed the 1% threshold. In the long term, when NPL effects are considered negligible, all countries would go to below 1% of GDP estimated exposure. Hence, completing the implementation of the safety net implies a decrease of the estimated overall risks at EU level over time.

([117]) Note that all banks going into resolution is not *per se* a plausible or realistic scenario. Rather, it is intended as an exercise to illustrate the outcome of the model under a more extreme scenario.

([118]) Note that in the scenarios (B and C) where all banks (systemic and non-systemic) go in resolution, all banks are treated in the same way. For LSIs this implies that they are subject to bail-in before they are resolved by the national or single resolution fund, and does not take into account different national regulations.

Table 5.4: **Risk (theoretical probability) of public finances being hit by more than 3% of GDP in case of a systemic event involving excess losses and recapitalisation needs**

	Initial (2019 Q1) short-term scenarios			Final (2029) long-term scenarios	
	Reference	All Banks to Resolution	All Banks to Resolution and 20% RR on NPL	Reference	All Banks to Resolution
Scenarios:	(a)	(b)	(c)	(a)	(b), (c)
	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%
BE	0,00%	0,00%	0,00%	0,00%	0,00%
BG	0,00%	0,00%	0,02%	0,00%	0,00%
CZ	0,00%	0,00%	0,00%	0,00%	0,00%
DK	0,00%	0,00%	0,01%	0,00%	0,00%
DE	0,00%	0,00%	0,00%	0,00%	0,00%
EE*	0,00%	0,00%	0,00%	0,00%	0,00%
IE	0,01%	0,01%	0,09%	0,00%	0,00%
ES	0,03%	0,03%	0,07%	0,01%	0,01%
FR	0,00%	0,00%	0,00%	0,00%	0,00%
HR	0,00%	0,00%	0,00%	0,00%	0,00%
IT	0,00%	0,01%	0,16%	0,00%	0,00%
CY	0,08%	0,12%	5,75%	0,01%	0,01%
LV	0,00%	0,00%	0,00%	0,00%	0,00%
LT*	0,00%	0,00%	0,00%	0,00%	0,00%
LU	0,01%	0,01%	0,02%	0,00%	0,01%
HU	0,00%	0,00%	0,00%	0,00%	0,00%
MT*	0,01%	0,03%	0,06%	0,00%	0,00%
NL	0,00%	0,00%	0,00%	0,00%	0,00%
AT	0,00%	0,00%	0,00%	0,00%	0,00%
PL	0,00%	0,00%	0,00%	0,00%	0,00%
PT	0,01%	0,02%	0,03%	0,01%	0,01%
RO	0,00%	0,00%	0,00%	0,00%	0,00%
SI	0,00%	0,00%	0,01%	0,00%	0,00%
SK	0,00%	0,00%	0,00%	0,00%	0,00%
FI	0,00%	0,00%	0,01%	0,00%	0,00%
SE	0,00%	0,00%	0,00%	0,00%	0,00%

(1) Green: low risk (theoretical probability not exceeding 0.05%). Yellow: medium risk (theoretical probability between 0.05% - 0.2%). Yellow: medium risk (theoretical probability exceeding 0.2%).
(2) (*) Asterisks denote countries with sample representativeness issues.
Source: Commission services.

Simulations show that contingent liabilities have a high potential impact on public finances only for a very limited subset of countries and only in the short term. Table 5.4 presents the risk that banking sector-related implicit contingent liabilities of at least 3% of GDP materialise, hitting public finances. The colour coding of the heat map reflects the relative magnitude of the theoretical probabilities of such an event (see Annex A8 for the details of heat map calibration). It is evident that contingent liabilities would have a potentially high impact on public finances only for a very limited subset of countries and only in the short term. In particular under the 'reference' and 'All Banks to Resolution' scenarios, only results for CY would point at some vulnerabilities. In the worst case scenario (*scenario C*) also ES, IE, IT and MT experience a larger probability of public finances being hit by banks generated losses.

5.4. GOVERNMENT ASSETS, NET DEBT AND NET WORTH

Government assets and net debt

The debt concept used in this report is general government debt, also referred to as 'Maastricht debt' or 'EDP debt' ([119])**.** It comprises financial liabilities related to the following debt instruments: currency, deposits, debt securities and loans ([120]). The stock of *gross consolidated* debt at year-end is measured at *nominal* (face) value rather than at market value. Making use of gross debt means that government-owned assets vis-à-vis counterparts outside the general government are not netted out. The fact that figures are consolidated across the general government sector means that any liability of which the counterpart is another general government unit is netted out.

The use of gross government debt, which is central in the EU's fiscal surveillance framework, has a number of advantages. The choice of gross debt as benchmark indicator was laid down in the Treaty ([121]). It is a widely used concept, allowing for international comparison. When assessing risks of fiscal stress, gross debt is the obvious starting point considering that it summarises governments' contractual financial obligations and reveals the magnitude of eventual refinancing needs.

Yet, government assets also impact public finances in several ways and might provide useful supplementary insights. On the one hand, government-held assets can become a source of fiscal risks. This is, for example, the case when state-owned companies run into financial difficulties. On the other hand, government assets generate revenue, such as interests or dividends, which are included in the structural balance calculations and thus accounted for in the S1 and S2 indicators. In addition, government assets can theoretically help to reduce debt when sold off. In practice, effective control, marketability, liquidity, earmarking of financial means and societal concerns limit this possibility. In addition, the valuation of assets is intricate, in particular for non-financial assets (see Box 5.1).

***Net* government debt offsets gross debt with certain types of financial assets.** It is defined as "gross debt minus financial assets corresponding to debt instruments" (IMF, 2013). Net debt thus provides a measurement of how much gross debt would remain after liquidating financial assets to redeem part of the outstanding debt. It should be noted that financial assets are marked-to-market when possible. As a result, in the EU context, net debt entails adding up two items that are valued in a different way as EDP debt is valued at nominal value. This also means that valuation effects will be larger for financial assets than for government debt and fluctuate along the economic cycle. Because of the different ways net debt can be calculated, the potentially differing valuation of assets and liabilities, and, most importantly, given the conceptual shortcomings for policy use, Eurostat does not publish official net debt figures. Eurostat does, however, publish net financial worth figures.

Net debt has a significant effect on financing costs and the occurrence of fiscal crises, though the direct impact of assets is less clear. According to Gruber and Kamin (2012) there is a robust and significant effect of fiscal positions, including net debt, on long-term bond yields for OECD countries. Relatedly and in line with previous research, Berti et al. (2012) highlight that net debt is an important predictor of fiscal stress episodes (the European Commission's S0 early-detection indicator of fiscal stress includes the variable). Ichiue and Shimizu (2015) confirm that net debt helps explain forward rates for a group of advanced economies but find that assets as such do not ([122]). Henao-Arbelaez and Sobrinho (2017) find that the presence of financial assets does not significantly reduce sovereign spreads and the probability of debt crises in advanced economies, contrary to what is the case for emerging economies.

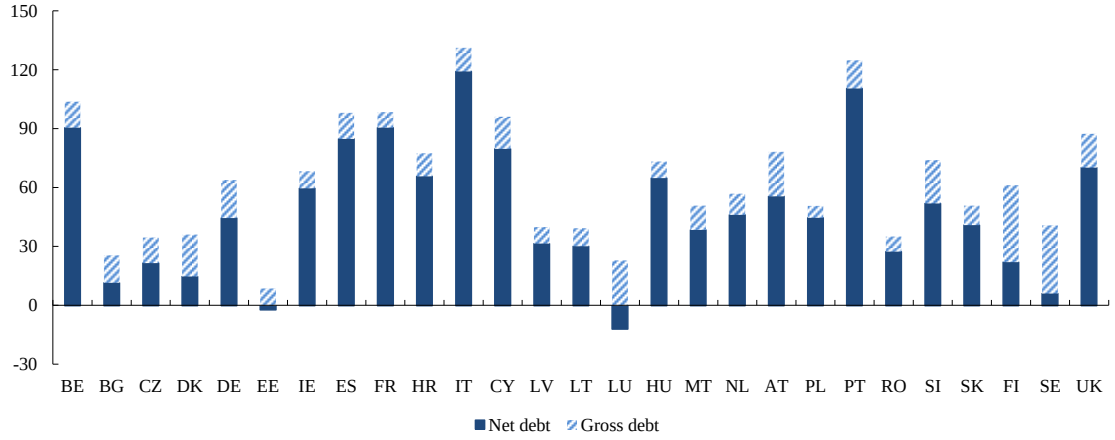
([119]) General government includes central government, state government, local government and social security.

([120]) Maastricht debt does thus exclude monetary gold and SDRs; equity and investment fund shares; insurance, pensions and standardised guarantee schemes; financial derivates; and other accounts payable such as trade credits. See section 5.3 on the difference between Maastricht debt and total financial liabilities.

([121]) Art. 126 and Protocol 12 of the Treaty on the Functioning of the European Union.

([122]) Assets matter, however, for resilience during crisis episodes: IMF (2018a) found that countries that enter recessions with strong balance sheets seem to experience shallower and shorter recessions.

Graph 5.10: **Gross and net government debt (%GDP; 2017)**



(1) The following financial assets are considered for the calculation of net debt: currency and deposits (AF.2), debt securities (AF.3) and loans (AF.4).
(2) When using EDP debt at market value, rather than at face value, to calculate net government debt, the latter is 16 pps. of GDP higher for the EU on average. The difference is the largest for the UK (31 pps.), followed by BE, IT and PT (20-21 pps.).
Source: Commission services based on Eurostat data.

The difference between gross and net debt can be substantial. For instance, when governments sell financial assets, this may have an effect on net debt without immediately affecting gross debt (Eurostat, 2014). Alternatively, when governments intervene to recapitalise financial institutions, gross debt rises but the parallel acquisition of a portfolio of financial assets might fully or partly neutralise the operation's impact on net debt ([123]). Evidently, asset quality could be an issue in such a scenario and the marketability of such assets would realistically be limited in the near term. Moreover, the valuation of financial assets is based on observed market values. As a result, their value might drop substantially in the event of rising market pressures. The sale of large amounts of government assets might itself induce negative effects on market valuation. Also maturity mismatches between liabilities and assets need to be reckoned with. In sum, interpreting net debt indicators requires caution and case-by-case analysis.

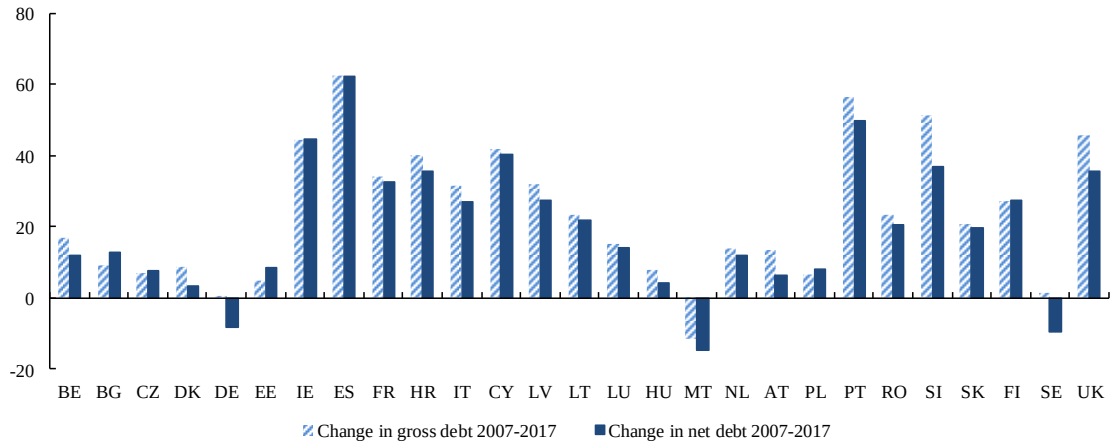
Which financial assets exactly are considered to compute net debt might vary in function of the gross debt concept that is applied. The IMF uses for example a definition of gross debt that is broader than Maastricht debt so that its net debt concept also includes a larger set of assets. In keeping with the Maastricht debt definition, the net debt concept discussed hereafter considers financial assets in the form of currency, deposits, debt securities and loans, i.e. the same items that compose gross debt on the liability side. A more conservative approach would be to restrict assets to those that are considered highly liquid, such as deposits and certain debt securities. Netting *all* financial assets against *all* financial liabilities provides 'net financial worth'. Adding also non-financial assets to the equation results in 'net worth'. Both are national account balancing items and are discussed lower in this section.

In 2017, the average net debt ([124]) was 15 pps. of GDP lower than gross debt in the EU, with differences varying between 6 and 39 pps. of GDP for individual Member States. This essentially reflects the large variation of government financial assets across Member States, which might be due to the set-up of pension systems, the past materialisation of contingent events or country-specific fiscal policies. The difference between gross and net debt was more than 30 pps. of GDP for Finland, Sweden and Luxembourg (see Graph 5.10) and 21-23 pps. in the cases of Denmark, Austria and Slovenia. For Luxembourg and Estonia, the Member States with the lowest gross debt, net debt is even negative as

([123]) Only in case such assets concern bonds or loans, they will impact the net debt calculation used in this chapter, which does not include equity holdings.

([124]) Measured as the difference between, on the one hand, EDP debt and, on the other hand, financial assets in the form of currency and deposits, debt securities and loans.

Graph 5.11: **Change in gross and net government debt (pps. of GDP; 2007-2017)**



(1) The following financial assets are considered for the calculation of net debt: currency and deposits (AF.2), debt securities (AF.3) and loans (AF.4).
Source: Commission services based on Eurostat data.

the considered assets exceed outstanding government debt. The difference between both concepts is less than 10 pps. of GDP for Ireland, France, Latvia, Lithuania, Hungary, Poland, Romania and Slovakia. Among the Member States considered, for those with the highest government debt, i.e. Italy, Portugal and Belgium, net debt is 12-14 pps. of GDP lower than gross debt. Also in net terms, these countries have the highest debt burden among EU Member States. Overall, country rankings for indebtedness are similar when comparing gross and net debt.

Some exceptions aside, gross and net debt rose synchronously over the past decade in the EU (see Graph 5.11**).** In Malta, both concepts decreased between 2007 and 2017. Germany and Sweden show a slight increase in gross government debt, while their net debt decreased by about 10 pps. of GDP as the value of the considered financial assets increased. In the case of Germany, this was mainly due to securities, currency and deposits. For Sweden the driver were loans and, to a lesser extent, debt securities. For all other Member States, debt increased under both concepts. The largest differences between changes in gross and net debt are found for Slovenia and the United Kingdom. In these countries, gross debt rose by 51 and 46 pps. of GDP, respectively, between 2007 and 2017. In contrast, over the same period net debt rose by 37 and 36 pps. of GDP, respectively. Both countries performed large-scale financial sector rescue operations that pushed up deficits and debt but also involved the accumulation of financial assets. These examples illustrate how net debt figures help interpret increases in gross debt that result from financial assistance to companies.

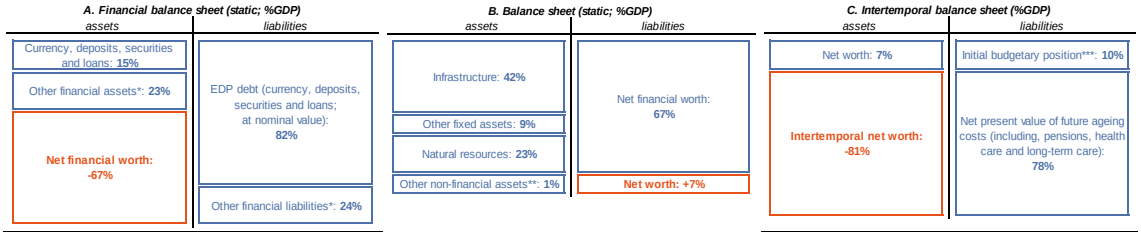
Towards a balance sheet approach

When all financial assets and liabilities are taken into account, 'net financial worth' is calculated. These other financials assets/liabilities include monetary gold and special drawing rights; equity and investment fund shares; insurance, pension and standardised guarantee schemes; financial derivatives; and other accounts receivable or payable ([125]). At the EU aggregate level, these liabilities and assets more or less offset each other so that net financial worth (-67% of GDP) is about the same as net debt (-66%) for the EU in 2017 (see Graphs 5.12 and 5.13).

Netting out all financial and non-financial assets against all outstanding liabilities results in government 'net worth' (see Graph 5.12**).** In contrast to 'net financial worth', 'net worth' also includes non-financial assets, thus considering all elements on both sides of government balance sheets. The main non-financial assets of public authorities in the EU are infrastructure (42% of GDP) and natural resources (23%), with other non-

([125]) At the liability side, there are also valuation and consolidation effects given the difference between the EDP debt definition and financial liabilities in national accounts (see section 5.3).

Graph 5.12: **Net financial worth, net worth and intertemporal net worth (EU; 2017)**



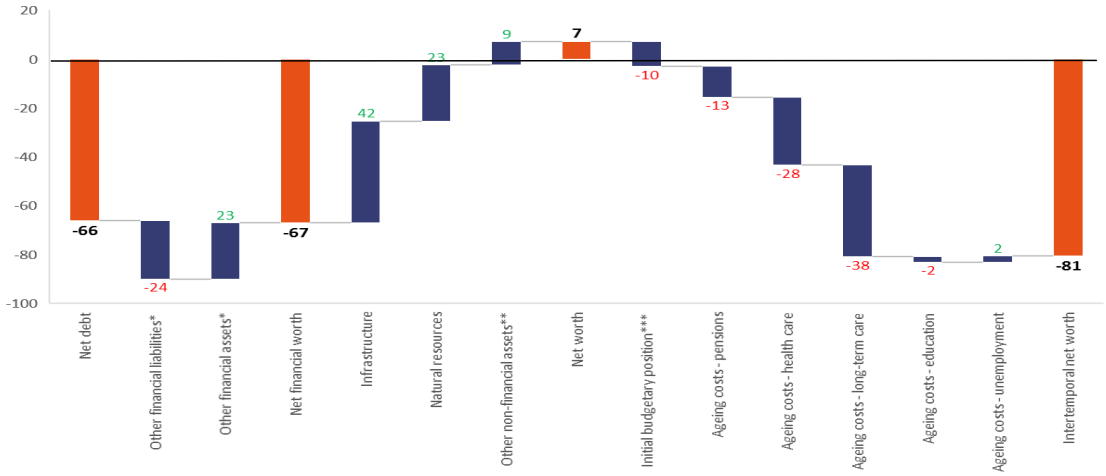
* Monetary gold and SDRs (AF.1); equity and investment fund shares (AF.5); insurance, pension and standardised guarantee schemes (AF.6); financial derivatives (AF.7); other accounts receivable/payable (AF.8).
**Includes Ffixed assets other than infrastructure; inventories; valuables; contracts, leases and licences; goodwill and marketing assets.
All Nnon-financial assets are for 2015, based on available Member States.
***Net present value of the contribution to the S2 indicator of future primary balances before ageing costs. See Annex 2 for more details regarding the calculation of this component and the net present value of future ageing costs.
Source: Commission services calculations based on data from KPMG/Bocconi University (natural resources), the European Commission 2018 autumn forecast (initial budgetary position), the 2018 Ageing Report (ageing costs) and Eurostat (other balance sheet components).

financial assets (e.g. military equipment and intellectual property) representing 9% of GDP on average in the EU (see Graph 5.13). Overall, net worth for the EU is estimated at 7% of GDP. The static balance sheet indicates, in other words, that government assets are on average higher than government liabilities in the EU ([126]).

([126]) These estimates need to be taken with some caution given data discrepancies (see Box 5.1).

The static balance sheet can be expanded with future budget balances, providing an estimate of 'intertemporal net worth'. As shown in Graphs 5.12 and 5.13, the net present value of projected budget balances can be split in, on the one hand, primary balances before ageing costs and, on the other hand, the ageing costs as projected up to 2070. This approach is in accordance with the S2 indicator in that it incorporates both of the indicator's components. When assuming unchanged policies beyond 2020,

Graph 5.13: **Net debt, net financial worth, net worth and intertemporal net worth (EU; 2017; %GDP)**



*Monetary gold and SDRs (AF.1); equity and investment fund shares (AF.5); insurance, pension and standardised guarantee schemes (AF.6); financial derivatives (AF.7); other accounts receivable/payable (AF.8).
**Includes Ffixed assets other than infrastructure; inventories; valuables; contracts, leases and licences; goodwill and marketing assets.
All nNon-financial assets are for 2015, based on available Member States.
***Net present value of the contribution of future primary balances before ageing costs to the S2 indicator. See Annex 2 for more details regarding the calculation of this component and the net present value of future ageing costs.
Source: Commission services calculations based on data from KPMG/Bocconi University (natural resources), the European Commission 2018 autumn forecast (initial budgetary position), the 2018 Ageing Report (ageing costs) and Eurostat (other balance sheet components).

the last year of the European Commission's 2018 Autumn Forecast, future primary deficits imply a present value liability of 10% of GDP. The projected rise in long-term care, health care and pension expenditure represents a further liability of 80% of GDP (see Graph 5.13). Because of those age-related costs, the dynamic balance sheet is less favourable than the static one; the EU's intertemporal net worth is estimated at -81% of GDP, compared to a 7% of GDP net worth estimate.

Box 5.1: Government assets and fiscal sustainability analysis

The theoretical relevance of government assets for fiscal sustainability analysis

Traditionally, fiscal sustainability assessment mostly underplays the asset side's bearings on public finances. Instead, it focusses on gross government debt. However, asset holdings affect public finances in several and opposite ways. In the short term, favourable effects stem from annual revenues in the form of interests, dividends or fees that benefit the budget and are considered in fiscal projections feeding into debt projections. At the same time, government transfers and subsidies often flow towards state-owned companies.

Public assets are also a source of potential fiscal risks that might materialise suddenly. Assets can be volatile revenue sources. Dividends could fall temporarily in the wake of an economic downturn or dwindle steadily because of a structural shift in market conditions, for example in the case of postal or telecom companies. Moreover, a prolonged situation of negative returns could prompt governments into capital injections, for example in the case of loss-making state-owned companies or listed companies in which authorities hold a stake for strategic or economic reasons. This leads, aside from the possible acquisition of extra assets, to an increase in financing needs and government debt.

Balance sheet analysis can reveal the long-term relevance of assets for fiscal sustainability. Through this approach, assets are set out against liabilities. On both sides, *financial* as well as *non-financial* items are considered. The balancing item, net worth, provides a measure of fiscal soundness. The analysis of comprehensive balance sheets has the potential of providing both a more nuanced and fuller picture of public finances than the one obtained from deficits and debt alone (IMF, 2018a). They reckon with the fact that considerable fiscal activity occurs outside of the general government perimeter. Moreover, balance sheets encompass the assets acquired through, for example, debt-financed bailouts and public investment. Conversely, underinvestment and poor maintenance reduce the value of infrastructure assets. As such, balance sheets should show the full fiscal impact of policy choices.

Practical shortcomings and theoretical limitations of government assets

Which assets?

Three types of economic assets exist: financial assets, non-financial produced assets and non-financial non-produced assets (see Table 1**).** The first comprise all financial claims (e.g. deposits, debt securities and loans), equity (e.g. state-owned enterprises or stakes in listed companies) and the gold bullion component of monetary gold. Their value stems from a contractual claim. When this underlying financial instrument is tradable, financial assets are marked to market. If no market price exists, the nominal value is used. Mark-to-market is the governing valuation principle under ESA 2010, both for financial assets and for financial liabilities.

ESA 2010 categorises non-financial assets based on how they are generated. *Produced* non-financial assets are outputs from production processes. They are tangible in nature and encompass fixed assets, inventories and valuables. *Non-produced* non-financial assets come into existence other than through processes of production. They can be either tangible or intangible and include natural resources, contracts, leases and licences, as well as goodwill and marketing assets.

Table 1:
Economic asset categorisation (ESA 2010)

	Valuation principle
A. FINANCIAL ASSETS	
→ **financial claims**	*market value; nominal value*
→ **equity**	*market value (listed); estimated (unlisted)*
→ **monetary gold**	*market value*
B. PRODUCED NON-FINANCIAL ASSETS	
→ **fixed assets**	*market value; purchasers' prices minus accumulated consumption of fixed capital*
→ **inventories**	*purchasers' prices; basic prices*
→ **valuables**	*current price: actual/estimated market price or revalued acquisition price*
C. NON-PRODUCED NON-FINANCIAL ASSETS	
→ **natural resources**[1]	*market value (land); present value of expected future (net) returns (other)*
→ **contracts, leases and licences**	*market information; present value of expected future returns*
→ **goodwill and marketing assets**	*initial value is written down*

[1] *Certain natural resources (e.g. air and river water) are not considered to be economic assets under ESA 2010*

(Continued on the next page)

Box (continued)

Data issues and theoretical limitations

The analysis of government assets is hampered by data problems linked to valuation and data coverage. Non-financial assets derive value from their intrinsic characteristics and properties. However, as they are oftentimes nonmarketable, putting a number on their value can be challenging. In practice, different methodologies are used, depending on the nature of the asset (see Table 1). Another data concern is the limited coverage in official statistics. Whereas data on governments' financial assets is readily available from national accounts, availability for non-financial assets is piecemeal. As shown in Table 2, only the Czech Republic and France provide data for all non-financial items in their national accounts. Seven Member States provide no data at all.

Table 2:
Data availability for non-financial assets in national accounts (general government; 2015, 2016 or 2017)

	produced			non-produced		
	fixed assets	inventories	valuables	natural resources	contracts, leases & licences	goodwill & marketing assets
BE	X	X				
BG						
CZ	X	X	X	X	X	X
DK	X					
DE	X					
EE	X	X				
IE						
EL	X	X				
ES						
FR	X	X	X	X	X	X
HR						
IT	X	X				
CY						
LV	X	X	X			
LT	X	X				
LU	X					
HU	X	X				
MT						
NL	X	X				
AT	X					
PL	X	X				
PT	X	X				
RO						
SI	X	X				
SK	X	X				
FI	X	X	X			
SE	X	X		X		
UK	X	X		X	X	

Source: Eurostat

Theoretical limitations of asset analysis concern effective ownership, marketability, liquidity, earmarking and societal concerns. First, mismatches in ownership of liabilities and assets limit the latter's relevance for debt sustainability. While debt is mostly situated at the central government level, this is not necessarily the case for assets. EC (2018c) finds that a mixed management model tends to prevail in most Member States, with central and local entities involved in both ownership and decision-making ([1]).

The limited marketability of most non-financial assets means that they might not mitigate fiscal risks to the extent current stock valuations suggest. According to EC (2018c), roads, natural resources such as land, and real estate are the main non-financial assets of EU Member States (see below). Secondary roads, woodlands and prisons are not particularly marketable, though.

To matter for fiscal sustainability, there needs to be a possibility of asset sales to effectively help cover financing needs. But even when assets are marketable, markets might be rather illiquid. Moreover, disinvestments might appear evident at the height of fiscal distress when financing needs peak. However, the successful sale of public stakes is generally a lengthy process and hurrying matters risks resulting in a fire sale, which in turn could trigger a public backlash. The experience of Member States with economic adjustment programmes over the past decade confirms that governments cannot swiftly tap into privatisation revenues.

Moreover, certain assets are purposefully state-owned and should reasonably be expected to remain so. Motives to put certain assets under government control relate to security concerns, environmental preservation, the protection of cultural heritage or society's preferences regarding the State's basic functions and services, for example the provision of water, public transport or energy. Financial assets are sometimes also earmarked for specific future expenditure, for example in the case of means accumulated in the context of deposit guarantee schemes or partially funded public pensions schemes ([2]).

Data gaps and attempts at bridging them

National accounts: an incomplete picture

Data on governments' financial assets is readily available from national accounts (see Graph 1). In contrast, data availability for non-financial assets is incomplete, both across countries and asset categories (see Table 2). However, the available

([1]) In crisis times, this limitation can become less stringent as events in some Member States show (e.g. Ireland and France).

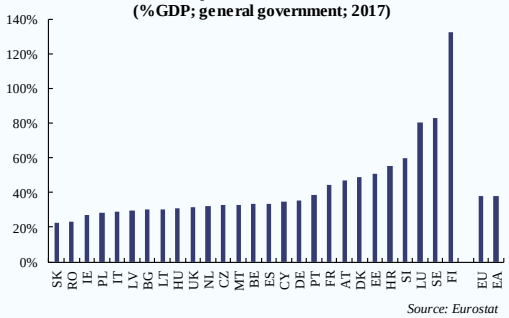
([2]) For example, Finland has a partially funded public pension scheme. This reflects in the country's high stock of government financial assets (see Graph 1).

(Continued on the next page)

Box (continued)

data suggests that inventories, valuables, contracts, leases and licences, as well as goodwill and marketing account for negligible amounts of government assets, as one might expect. Fixed assets and natural resources constitute, in other words, the main non-financial government assets based on partial national accounts data.

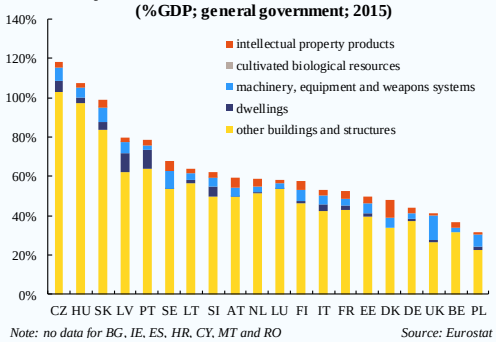
Graph 1: **Financial assets (%GDP; general government; 2017)**



Source: Eurostat

Fixed assets averaged 63% of GDP in 2015 for the available Member States. They ranged from 32% in Poland to 118% in the Czech Republic (see Graph 2). The bulk of them are 'other buildings and structures', generally transport and freight infra-structure, which are valued at more than 60% of GDP in the Czech Republic, Hungary, Slovakia, Latvia and Portugal. Other categories account for less than 10% of GDP, with the exception of 'machinery, equipment and weapons' in the UK.

Graph 2: **Breakdown of fixed assets in national accounts (%GDP; general government; 2015)**



Note: no data for BG, IE, ES, HR, CY, MT and RO *Source: Eurostat*

Natural resources are the prevailing asset type among non-produced non-financial assets. It includes land, mineral and energy reserves, non-cultivated biological resources, water resources and other natural resources such as radio spectra. Only four Member States publish full datasets on natural resources (see Table 2).

Original study into public sector stakes and non-financial assets ([3])

A recent study, commissioned by the European Commission and conducted by KPMG and Bocconi University, provides valuations for the main government assets. The study presents an extensive overview of public stakes in companies (a subset of financial assets) and of a selection of fixed assets and natural resources (the main non-financial assets) ([4]). The dataset compiled for the study totals EUR 16.5 trillion in assets, 111% of the EU GDP in 2015, of which almost two third are fixed assets and natural resources.

The analysis undertaken in the study confirms important information gaps. Data on financial assets are for instance not fully comparable across countries, mostly because of different accounting systems. More importantly, data does often not match with national accounts data. Non-financial asset data is scarce in general and valuation methods are heterogeneous across databases and countries. As a result, cross-country comparisons based on estimated data require some caution.

Public stakes in 37,400 surveyed firms were valued at 41% of the EU GDP in 2015. A large number of those public sector holdings are in fully state-owned, domestic and unlisted firms. These are mainly active in public services, utilities and real estate. While stakes in financial companies are only about 5% of the total number, they nevertheless represent almost 60% of the total value. In 2015, public stakes contributed on average 0.4% of GDP to government revenues.

At around 100% of GDP, the value of assets in public sector holdings is particularly large in Slovenia and Belgium. This reflects stakes in financial companies. The same holds for Luxembourg, which has stakes valued at around 80% of GDP (see Graph 3). However, for most Member States the estimated value of public sector holdings is higher than that of equity according to national

([3]) This section is based on European Commission (2018f), 'Public Assets: What's at Stake? An analysis of Public Assets and their Management in the European Union', *European Economy, Discussion Papers*, No 089; 'ECFIN-KPMG' in the graphs.

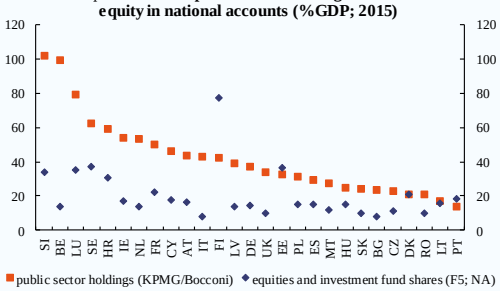
([4]) The study covers buildings, airports, motorways, maritime ports and railways. Natural resources include mineral and energy reserves, and other natural resources (land, non-cultivated biological resources and water resources).

(Continued on the next page)

Box (continued)

account data – and for several Member States it is even higher than that of *total* financial assets in national accounts. This difference could be explained by the fact that, in contrast to Eurostat data, the study also includes indirect stakes, for example through promotional banks. Different valuation methodologies might be another explanation.

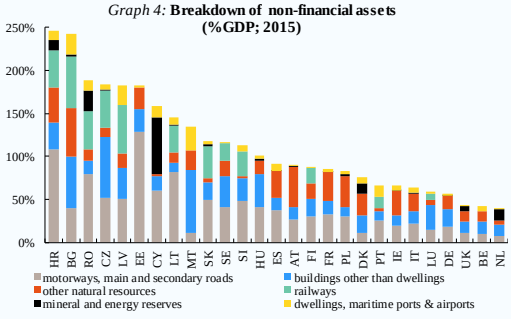
Graph 3: **Value of public sector holdings vs. value of equity in national accounts (%GDP; 2015)**



Note: values for total stock of assets are weighted by stake(s) owned by the public sector
Source: KPMG and Bocconi University calculations based on Orbis database; Eurostat

Non-financial assets tend to be higher as a share of GDP in the newer Member States. They reach almost 250% of GDP in Croatia and Bulgaria according to the study's estimations, followed by around 185% of GDP in Romania, the Czech Republic, Latvia and Estonia. Compared to a weighted EU average of about 70% of GDP, non-financial assets are relatively low in the Netherlands, Belgium and the UK, at around 40% of GDP (see Graph 4).

Graph 4: **Breakdown of non-financial assets (%GDP; 2015)**

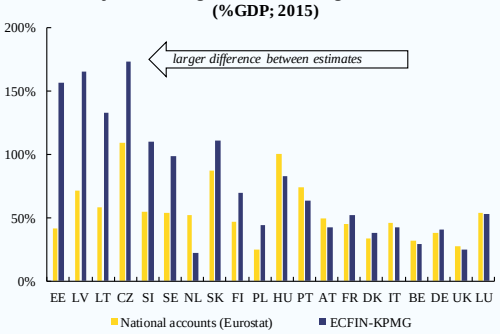


Source: KPMG and Bocconi University calculations

The composition of non-financial assets is broadly similar across Member States with roads, other natural resources and real estate as the main asset types. Railways harbour substantial assets for most of the Member States that own them directly (i.e. not through a public sector holding). Mineral and energy reserves reach more than 10% of GDP in the cases of Denmark, Croatia, the Netherlands, Romania and Cyprus. Dwellings, maritime ports and airports generally do not represent substantial assets.

Comparing estimates for fixed assets with national accounts data again points to large differences. While for some Member States (e.g. Luxembourg, the United Kingdom, Germany, Belgium, Italy, Denmark, France and Austria) both series yield broadly comparable results, differences for most other Member States are quite substantial (see Graph 5).

Graph 5: **Dwellings and other buildings and structures (%GDP; 2015)**



Public sector balance sheet analysis and net worth (IMF)

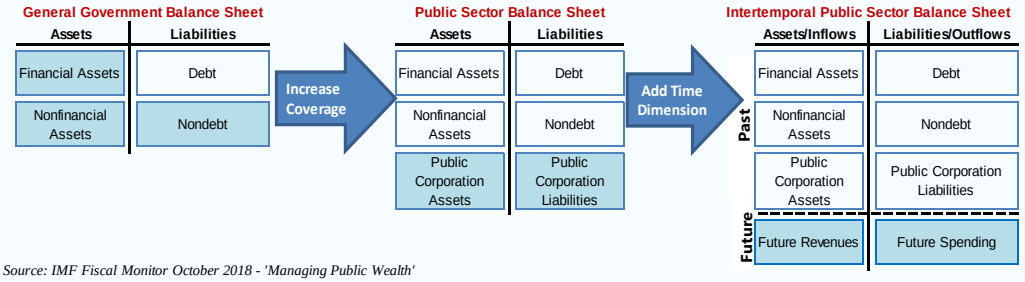
The IMF (2018a) drew up broad-ranging public sector balance sheets for a diverse group of 31 countries. The concept of balance sheet analysis is not new (e.g. Buiter, 1985), though data constraints made that calculations were necessarily limited to small sets of countries. The IMF takes a broad approach: aside from all assets and liabilities of the general government proper – including implicit liabilities such as accrued pension rights of civil servants and state-owned company employees –, assets and liabilities held by public companies are covered as well (see Graph 6).

The study's conclusion that, in order to rebuild crisis-hit balance sheets, governments need to reduce debt and invest in high-quality assets, concurs with the signals given by conventional sustainability indicators. The analysis shows that for the six EU Member States included in the sample (Austria, Finland, France, Germany, Portugal and the UK), public sector assets correspond on average to 203% of GDP against 258% of GDP in liabilities. Only Finland was estimated to have a positive net worth. Expanding the static public sector balance sheet with discounted future revenue and expenditure flows,

(Continued on the next page)

Box (continued)

Graph 6: **The IMF's balance sheet framework**



Source: IMF Fiscal Monitor October 2018 - 'Managing Public Wealth'

notably ageing costs, allows estimating long-term intertemporal net worth.

General government balance sheets can be compiled for more countries but data limitations make for an incomplete picture. The IMF compiled balance sheets covering only the general government for a broader group of 63 countries. However, because of data limitations and to enhance cross-country comparability natural resource assets and civil servant pension liabilities were not included. This underscores how the promising concept of balance sheet analysis at the current juncture suffers from data gaps, data quality and the valuation of non-financial assets.

Conclusion

Practical shortcomings and theoretical limitations reduce the effective contribution of government assets to fiscal sustainability assessment. Limited and erratic data availability is only one of the issues to reckon with when including government assets in the sustainability assessment. Another important issue are the sizeable differences between data sources. Theoretical limitations of asset analysis concern effective ownership, marketability, liquidity, earmarking of financial means and societal concerns.

Putting too much emphasis on government assets for which often neither buyer nor seller exists, might result in an underestimation of sustainability risks in the near term. This does not mean that, over a longer time horizon, government assets cannot contribute to debt reduction. Indeed, the theoretical counterbalancing impact of a country's stock of assets might produce more useful insights for long-term fiscal sustainability. This is the idea behind net worth estimates based on public balance sheets, an interesting concept that currently suffers from the said data problems.

That being said, in many aspects the European Commission's fiscal sustainability framework already considers certain government assets. For example, the composite S0 indicator includes net debt. The S1 and S2 indicators also go beyond sustainability concerns emerging from current debt stocks, incorporating for example also the implicit liabilities from projected age-related spending increases net of contributions and taxes. Moreover, contingent liabilities, of which some are linked to government assets, provide a complementary fiscal sustainability indicator that is also thoroughly analysed in the Commission framework.

6. OVERALL ASSESSMENT OF FISCAL SUSTAINABILITY CHALLENGES

6.1. PRELIMINARY REMARKS

This chapter brings together in a synthetic way the main results on fiscal sustainability analysis presented in the rest of the report. Results (based on Autumn 2018 Commission forecast and on Council / Commission Ageing Report 2018) ([127]) are systematised here in the context of the horizontal assessment framework already presented and used in the FSR 2015 and the DSM 2017. Results are summarised in an overall summary heat map of fiscal sustainability risks per time dimension (short, medium and long term). The framework is meant to allow identifying the scale, nature and timing of fiscal sustainability challenges. It therefore aims at ensuring a comprehensive and multidimensional assessment of sustainability risks, which is key to devise appropriate policy responses. This is all the more important as these results are used in the context of the EU integrated system of fiscal and economic surveillance (the SGP and the European Semester).

However, the quantitative results and ensuing risk assessments based on this horizontal framework need to be complemented with a broader reading and interpretation of results, notably to give due account to country-specific contexts. For instance, some relevant qualitative factors – such as structural and institutional features – cannot be fully captured through this quantitative analysis. Hence, the prudent application of judgement, as a complement to model-based mechanical results, is essential for the final assessment of fiscal sustainability risks. In particular, when a country is deemed to be at high risk in the short, medium or long term, it does not mean that fiscal stress is inevitable (in the short term) or that debt is unsustainable (in the medium to long term), but rather that there are significant fiscal sustainability vulnerabilities that need to be addressed by appropriate policy responses.

([127]) The cut-off date for the preparation of the report was 8 November 2018 (publication date of the Commission Autumn forecast 2018). Therefore, it does not integrate developments that may have occurred since this date.

6.2. APPROACH USED IN THE ASSESSMENT OF SHORT-, MEDIUM- AND LONG-TERM FISCAL SUSTAINABILITY CHALLENGES

6.2.1. Assessment of short-term fiscal sustainability challenges

The fiscal stress risk indicator S0 is used to evaluate fiscal sustainability challenges over the short term (the upcoming year) ([128]). These challenges can capture situations ranging from a credit event, a large financial assistance programme, to an implicit domestic default (e.g. through high inflation) or (more likely in the EU context) a loss of market confidence. In particular, countries are deemed to face high short-term risks of fiscal stress whenever the S0 indicator is above its critical threshold. In all other cases, countries are deemed to be at low short-term risk ([129]).

Beyond the values of S0 used to reach an overall short-term risk assessment, additional indicators / variables contributing to the assessment are considered. These indicators / variables are reported in cross-country tables and country by country fiches (see Annexes A9 - A10), including i) values of the two fiscal and financial-competitiveness sub-indexes (incorporating only fiscal and macro-financial variables respectively), and ii) the individual variables incorporated in the composite indicator S0 (see also chapter 2). These variables are meant to support the reading and interpretation of S0 results on a country by country basis.

Finally, complementary analysis is provided, related to short-term financing needs and financial markets' perceptions of sovereign risk. Short-term financing needs, a particularly important indicator of short-term risks (one component of the S0 indicator) are given particular attention in this report. The analysis of short-term fiscal risks is also complemented by financial markets' information on the ease of (re-)financing government debt (see chapters 2 and 7, as well as statistical country fiches).

([128]) The results of the S0 indicator are presented in chapter 2; the methodology used is presented in Annex A1 and Berti et al. (2012).

([129]) The threshold for S0, calculated using the "signal approach" is 0.46.

6.2.2. Overall assessment of medium-term fiscal sustainability challenges

Approach used in the overall assessment of medium-term challenges

Medium-term fiscal sustainability challenges are assessed based on the joint use of the S1 indicator and the debt sustainability analysis (DSA). The joint use of the S1 indicator and the DSA, introduced with the FSR 2015, allows capturing medium-term sustainability challenges in a more comprehensive way than the assessment based only on the medium-term fiscal gap indicator S1. In particular, the integration of DSA results in medium-term risk assessments enables taking into account the impact of different economic, financial and fiscal assumptions (notably more adverse circumstances than the baseline no-fiscal policy change scenario) on the projected evolution of public debt over the next 10 years ([130]). The integration of DSA results is also expected to confer more stability to medium-term risk evaluations. On the other hand, the S1 indicator appears relatively more suited to capture risks for public finances stemming from population ageing ([131]).

A prudent approach is used to determine the overall medium-term risk category. The horizontal assessment framework on sustainability challenges sets at potential high medium-term sustainability risk countries that are deemed to be either at high risk based on the S1 indicator and / or at overall high risk based on DSA results. In other words, a country is considered to face high sustainability challenges in the medium term if either its baseline S1 or DSA or both point in that direction. For the attribution of a medium risk level, the criterion applies the same way: a country is considered to be at medium sustainability risk in the medium term if either its S1 or DSA points in that direction (while none of the two indicates high risks).

Approach used in the assessment of medium-term challenges based on S1

The medium-term fiscal sustainability S1 indicator measures the size of the fiscal gap that needs to be closed to bring debt ratios to 60% of GDP. More precisely, the S1 indicator measures the fiscal adjustment required (in terms of structural primary balance) to bring debt ratios to 60% of GDP in 15 years (currently in 2033). For the S1 indicator, the identification of medium-term sustainability challenges relies on calculations grounded on the baseline scenario. Countries are deemed to face potential high / medium / low sustainability risks in the medium term, according to S1, depending on the value taken by the indicator under the aforementioned scenario. As in the FSR 2015 and the DSM 2017, the values of the S1 indicator are gauged with regard to the benchmark structural fiscal adjustment required in the SGP (a structural adjustment of up to 0.5 pps. of GDP per year) ([132]).

Additional S1 calculations are provided in order to measure the sensitivity of this indicator to underlying assumptions. S1 calculations under two alternative scenarios are provided in the statistical cross-country tables and country fiches (and commented in chapter 3): i) the historical SPB scenario and ii) the AWG risk scenario (incorporating less favourable ageing cost projections). These alternative calculations aim at supporting the reading and interpretation of the reference S1 results. For each of the scenarios mentioned, S1 values are accompanied by the indication of the relative position (in the SPB distribution for all EU-28 countries over 1980-2018) of the related required structural primary balance (RSPB). This allows grasping more easily how common / uncommon the implied fiscal position is ([133]). Thresholds used for the S1 sub-

([130]) The reference S1 indicator used in the medium-term risk assessment is grounded on the baseline scenario.

([131]) S1 is a particularly suited tool to assess the impact of ageing, thanks to the decomposition of the indicator that allows singling out the cost of ageing contribution to the fiscal gap in terms of overall discounted value. Debt projections are a less appropriate tool to serve this purpose as the contribution of the cost of ageing to the overall debt stock, year by year, as could be extracted from the DSA, would be much less intelligible than the S1 age-related sub-component.

([132]) Given that the adjustment is assumed to take place over 5 years, according to the S1 standard definition, the upper threshold of risk is therefore set at 2.5 pps. of GDP, while the lower threshold is at 0 pps. of GDP. Countries are considered at high risk when the S1 value is above 2.5 pps. of GDP, and at medium risk when S1 is between 0 and 2.5 pps. of GDP.

([133]) As already pointed by Blanchard et al. (1990), what a given fiscal gap value (such as S1 or S2) implies will vary across countries, depending in particular on the initial level of the

components and the percentile rank of the RSPB are reported in Annex A6. Additionally, S1 calculations under alternative debt targets and higher interest rates are presented in chapter 3.

Approach used in the overall DSA assessment

The overall DSA assessment is based on deterministic debt projections under a set of scenarios, and on stochastic debt projections. In particular, two main scenarios are used for the DSA assessment: i) the baseline no-fiscal policy change scenario, and ii) the historical structural primary balance (SPB) scenario. Additionally, the overall DSA assessment relies on results for three adverse sensitivity tests (on nominal growth, interest rates and the government primary balance), as well as stochastic projections, a tool that allows assessing the impact of individual and joint macroeconomic shocks around baseline projections. Finally, in the country-specific fiscal sustainability assessment (provided in chapter 7), due account to the results of the Stability and Growth Pact (SGP) scenario is also made in the DSA section. This scenario assumes compliance with the main provisions of the SGP (see Annex A5 for detailed explanations).

The approach used allows for a transparent and comprehensive risk assessment mapping, from individual scenarios to an overall DSA assessment. Practically, for each of the DSA scenarios, sensitivity tests, and stochastic projections, individual assessments are made (in terms of high / medium / low risk for the country under examination) that are then combined into an overall DSA assessment per country. A country's DSA results into an assessment of potential overall high risk if baseline no-fiscal policy change projections point to such a high level of risk, or alternatively if the latter point to an overall medium risk assessment but potential high risks are highlighted by alternative scenarios (historical SPB scenario; sensitivity tests on macro-fiscal assumptions) or stochastic projections. This second criterion for a high-risk assessment allows prudentially capturing upward risks around baseline projections in cases where the latter appear to entail medium risks. The economic rationale followed to reach the overall DSA assessment is explained in detail through decision trees in Annex A6.

The DSA assessment takes into account debt levels, debt paths, and the plausibility of underlying fiscal assumptions. For the DSA scenarios, variables used in the assessment are: i) the level of gross public debt over GDP *at the end of projections* (2029); ii) the year at which the debt ratio peaks over the 10-year projection horizon (which provides a synthetic indication of debt dynamics); and iii) the position of the average SPB (in the overall SPB distribution for all EU-28 countries over 1980-2018) assumed over the projection period under the specific scenario (as summarised by its percentile rank, which gives a sense of how common / uncommon the assumed fiscal stance is relative to cross-country historical record). The first two variables (end-of-projection debt ratio and debt peak year) are used also in the assessment of each of the sensitivity tests.

Due account is also given to macro-financial uncertainties through stochastic projections. The stochastic projection results are evaluated based on the following two indicators: i) the probability of a debt ratio at the end of the 5-year stochastic projection horizon (2023) greater than the initial debt ratio (in 2018), which captures the probability of a higher debt ratio due to the joint effects of macroeconomic shocks; ii) the difference between the 90th and the 10th debt distribution percentiles, measuring the width of the stochastic projection cone, i.e. the estimated degree of uncertainty surrounding baseline projections. Annex A6 reports all upper and lower thresholds used for each of the individual variables and indicators mentioned above.

Beyond these projections, other scenarios are performed as a way to complement the analysis of medium-term fiscal sustainability challenges. These additional scenarios are reported in chapter 3, the statistical overall cross-country tables (see Annex A9) and country fiches (see Annex A10), and are used to complement the analysis of medium-term challenges. These scenarios include the Stability and Growth Pact (SGP) scenario, the Stability and Convergence Programme scenario, the Draft Budgetary Plan scenario, the fiscal reaction function scenario, combined historical

primary balance. A positive S1 (or S2) value may indeed be considered more worrisome in cases where this initial value is already high (meaning for example limited room to increase tax pressure or reduce spending). The RSPB reported in this report allows considering this aspect.

scenarios, enhanced / combined sensitivity tests on interest rates and growth, as well as sensitivity tests on exchange rates for relevant countries.

6.2.3. Overall assessment of long-term fiscal sustainability challenges

Approach used in the overall assessment of long-term challenges

Long-term fiscal sustainability challenges are assessed based on the joint use of the S2 indicator and the DSA. The joint use of the S2 indicator and the DSA, newly introduced in this report, allows capturing long-term sustainability challenges in a more comprehensive way than the synthetic assessment based on the long-term fiscal gap indicator S2. In particular, the inclusion of the overall DSA results in the long-term risk assessment framework aims at prudently capturing risks linked to medium to high debt-to-GDP ratios. Such an approach allows addressing one of the flaws of the S2 indicator, namely that it abstracts from risks related to the level of the stock of debt. Indeed, the S2 indicator, grounded on the inter-temporal budgetary constraint, does not require that the debt-to-GDP ratio stabilises at a specific value and the adjustment implied by the S2 indicator might in fact lead to debt-to-GDP ratio stabilising at relatively high levels.

A prudent approach is used to determine the overall long-term risk category. If the DSA indicates an upper risk category as compared to the risk indicated by the S2 indicator, the sustainability risk is revised always upward by one category. If the opposite applies, such as lower DSA risk than the S2 indicator, the risk category associated with the S2 indicator always prevails. For instance, a country is assessed to be at a potential high risk if (i) the S2 indicator flags high risk irrespective of the risk category implied by the overall DSA results or (ii) the S2 indicator is medium risk, but the overall DSA is high risk. In turn, a country is assessed at medium risk instead of low risk in the long term if, for instance, the S2 indicator flags low risk and the overall DSA either medium or high risk (see Annex A6). If both the S2 value and the overall DSA point to low risk, the long-term sustainability challenges are assessed as low risk.

Approach used in the assessment of long-term challenges based on S2

The long-term fiscal sustainability S2 indicator allows measuring the long-term fiscal gap to meet the inter-temporal budgetary constraint. The S2 indicator measures the fiscal adjustment required (in terms of structural primary balance) in order to meet the inter-temporal budget constraint over an infinite horizon (including to cover future costs of ageing). Countries are considered at high / medium / low sustainability risk in the long run depending on the value taken by the reference S2 indicator, calculated on the basis of the baseline scenario. These values are considered against a set of relevant thresholds, based on empirical evidence looking at past episodes of fiscal consolidations ([134]).

Furthermore, additional S2 calculations are provided in order to stress test the values of this indicator to alternative assumptions. Such a sensitivity analysis is all the more needed that any long-term projection exercise is surrounded by important uncertainties (see Box 4.1 in the Chapter 4 of this report). In particular, a more extensive sensitivity analysis is provided, compared to previous editions of the report, including five alternative scenarios: i) the 'historical SPB scenario'; ii) the 'AWG risk scenario' iii) the 'population scenario'; iv) the 'TFP risk scenario' and v) the 'interest rate scenario'. These projections are also meant to support the reading and interpretation of S2 results. Similarly to S1, S2 values under all scenarios are accompanied by an indication of the relative position of the related required structural primary balance (in the SPB distribution for all EU-28 countries over 1980-2018).

6.2.4. Other mitigating and aggravating risk factors considered in the overall assessment

In addition to the elements already mentioned, the Commission fiscal sustainability framework provides an analysis of additional mitigating and aggravating risk factors – of horizontal

([134]) Lower and upper thresholds of risk for S2 are set at 2 and 6 pps. of GDP respectively, as in the FSR 2015 and the DSM 2017. Countries with S2 above 6 pps. of GDP are therefore deemed to be at high risk, while being at medium risk if S2 is between 2 and 6 pps. of GDP.

nature. These additional factors are considered horizontally in the overall assessment insofar the identified vulnerabilities or supporting factors may materialise in the short, medium or long term. Their consideration in the overall assessment of risks is needed to arrive at a balanced assessment of fiscal sustainability challenges (see Chapter 7).

In this additional analysis, three main components are considered: i) the structure of government debt financing, in terms of maturity, currency and debt holders; ii) additional government liabilities (beyond EDP debt) – including contingent liabilities linked to the banking sector and implicit liabilities linked to population ageing – and iii) government assets – notably to derive estimations of net debt.

6.3. MAIN RESULTS

6.3.1. Short-term fiscal sustainability challenges

Overall, short-term risks of fiscal stress have declined for EU countries since 2009, although risks appear on the rise compared to last year in some countries. In 2009, more than half of the Member States had values of S0 above its critical threshold, signalling risks of fiscal stress in the upcoming year. In 2018, only Cyprus is found to be at risk of facing short-term risks of fiscal stress (see Chapter 2). This result is notably driven by the strong increase of government debt in 2018, due to banking support measures, in a context where macro-financial vulnerabilities remain significant. However, the value of Cyprus S0 indicator has just reached its critical threshold, as some other fiscal variables are positively oriented in this country. It is the case in particular of the large primary surplus, which should allow an important reduction of government debt next year ([135]). Short-term challenges are identified in some additional countries on the fiscal side (in Hungary, Spain, Italy and France). These vulnerabilities are not deemed acute enough to lead to overall risks of fiscal stress in the short term. Yet, they deserve particular attention, in a context where financial market sentiments can change rapidly. Italy is particularly exposed to sudden changes in financial market perceptions, notably in the light of its still sizeable government financing needs.

6.3.2. Medium-term fiscal sustainability challenges

Seven countries are deemed at high fiscal sustainability risk in the medium term, as a result of inherited high post-crisis debt burdens, weak forecasted fiscal positions in some cases and / or sensitivity to unfavourable shocks. This concerns Belgium, Spain, France, Italy, Hungary, Portugal and the United-Kingdom (see Chapter 3). In particular:

– In five of these countries (Belgium, Spain, France, Italy and Portugal), both the DSA and the S1 indicator point to high risks. In these five countries, the DSA high risk classification is driven by the high level of projected debt by 2029 (above 90% of GDP) in the baseline no-fiscal policy change scenario, due to the inherited elevated post-crisis debt burdens (see Chapter 3). An increasing projected trend of the debt to GDP ratio also reinforces this classification in the cases of Spain, France and Italy pointing to a weak forecasted fiscal position (measured by the structural primary balance).

– In Hungary and the United-Kingdom, the high risk category in the medium term is driven by the overall DSA assessment, while the S1 indicator signals medium risks. In these countries, the DSA result is driven by a debt ratio at the end of projections, under the baseline no-fiscal policy change scenario, above the 60% of GDP Treaty reference value, accompanied by high risks highlighted by one or more of the alternative debt projection scenarios or sensitivity tests (see Table 6.2 and Table 6.3).

Adherence to fiscal rules would bring a lower projected level of debt in these countries, yet remaining above safety levels in some cases. For the countries deemed to be at high fiscal sustainability risk in the medium term, adherence to the SGP fiscal rules would bring the debt to GDP ratio below the upper threshold for high risk of 90% in Belgium, Spain and France.

([135]) Furthermore, over the medium-term, government debt is projected to strongly diminish (and the country is deemed at medium risk over his horizon, see section 6.3.2 and Chapter 3).

Nevertheless, the debt burden would remain above this safety level in some other cases, such as Italy and Portugal.

In four additional countries, medium-term fiscal sustainability risks are deemed medium, often driven by debt ratios still above 60% of GDP by 2029 in the fiscal no-fiscal policy change scenario and / or alternative ones. This concerns Croatia, Cyprus, Romania and Slovenia, in particular:

– In Croatia and Romania, both the DSA and the S1 indicator point to medium risks. In these cases, the medium DSA risk assessment is due to a debt ratio still above 60% of GDP by 2029 in the baseline no-fiscal policy change scenario and several (if not all) alternative scenarios and sensitivity tests. An increasing projected trend of the debt to GDP ratio suggests additional vulnerabilities in the cases of Romania pointing to a weak forecasted fiscal position (measured by the structural primary balance).

– In Cyprus, the medium term risk classification is driven by the DSA, with consistent results across all scenarios. Despite the current high debt level, the S1 indicator points to low risks, due to the high initial budgetary position (with however borderline results obtained) ([136]).

– In Slovenia, the DSA risk assessment points to low risks, due to debt levels remaining below 60% of GDP by 2029 in the baseline and the sensitivity tests considered. Despite a contained level of public debt, the S1 indicator signals medium risks as a result of fast increasing projected ageing costs ([137]).

The remaining sixteen EU countries are found to be at low risk in the medium term. These countries include Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Poland, Slovakia, Finland and Sweden. In three cases however (Bulgaria, Latvia and Lithuania), stochastic projections point to some vulnerabilities due to the important underlying volatility of these economies. Furthermore, in the case of Ireland, when scaling government debt with GNI, rather than GDP, which can be considered as a more accurate measure of repayment capacity for this country, medium-term vulnerabilities appear more important than suggested here (see Box 3.1 in Chapter 3).

([136]) The S1 level is close to the threshold (at -0.7 pps. of GDP), and the required structural primary balance points to an ambitious fiscal effort (given the high forecasted level of the structural primary balance in 2020).

([137]) The S1 level is however very close to the threshold (at 0.2 pps. of GDP), and the required structural primary balance points to a manageable additional fiscal effort.

6.3.3. Long-term fiscal sustainability challenges

In the long term, six countries appear to be at high fiscal sustainability risk. This concerns Belgium, Spain, Italy, Luxembourg, Hungary and the United Kingdom. In particular (see Chapter 4):

– In five of these countries (Belgium, Spain, Italy, Hungary and the United Kingdom), the significant level of the S2 indicator (pointing to medium risk), combined with high risk according to the DSA classification, drive this risk assessment. The substantial fiscal sustainability gap is, in some cases (Belgium, Hungary and the United Kingdom), mainly due to the projected increase in ageing costs. In Spain and Italy, it is the unfavourable initial budgetary position that contributes to a large extent to the S2 indicator.

– In the case of Luxembourg, the high fiscal sustainability gap (S2 indicator), due to fast-increasing projected costs of ageing, explains the high long-term risk category, while vulnerabilities linked to the limited debt burden - captured by the DSA risk classification – are low.

In fourteen additional countries, long-term fiscal sustainability risks are deemed medium, including Czech Republic, Ireland, France, Croatia, Cyprus, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia and Finland. More precisely:

– In ten countries (Czech Republic, Ireland, Malta, the Netherlands, Austria, Poland, Romania, Slovenia, Slovakia and Finland), the medium risk category is explained by the value of the S2 indicator, with no additional debt vulnerabilities flagged by the DSA. In most cases, the significant long-term fiscal gap is

largely (if not only) driven by the projected increase of ageing costs (Czech Republic, Ireland, Malta, the Netherlands, Austria, Slovenia, Slovakia and Finland). In Poland and Romania, the unfavourable budgetary position also adds substantially to the sustainability challenge.

– In France, Croatia, Cyprus and Portugal, despite a limited (or even negative) fiscal gap indicator, due to the expected reduction in the cost of ageing over the long term in some cases (France and Croatia), the vulnerabilities linked to the substantial debt burden – captured by the DSA risk assessment – lead to a medium long-term risk category.

The remaining seven countries are deemed at low long-term fiscal sustainability risks. This concerns Bulgaria, Denmark, Germany, Estonia, Latvia, Lithuania and Sweden. In some countries (e.g. Bulgaria and Sweden), the low level of the S2 indicator is however conditional on maintaining a relatively high structural primary balance in the long term, and can be deemed ambitious by historical EU standards (a low percentile rank associated to the required SPB) ([138]).

Under more adverse fiscal, demographic or macro-financial assumptions, long-term fiscal challenges would be more acute in most countries. For instance, under the AWG risk scenario (with more dynamic projected health-care costs), the S2 indicator would be substantially increased in most countries, to values above the upper threshold in 4 countries and above the lower threshold in another 19 countries. If gains in life expectancy were higher than what is assumed in the baseline scenario, long-term fiscal gaps would also be higher in a large number of countries, although the presence of links to like expectancy in the parameters of the pension systems would limit such increases in several of them (e.g. in Italy, Slovakia and Latvia).

6.3.4. Comparison with the DSM 2017 results

The short-term risk classification has changed in one country compared to last year. In the DSM 2017, no country was found to be at risk of fiscal stress in the short term, according to the S0 indicator. This report identifies such risks in one country (Cyprus), albeit a borderline value of the S0 indicator (see Table 6.1). Vulnerabilities coming strictly from the fiscal side are identified in the same set of countries as last year (Hungary, Spain, Italy and France), at the exception of the United Kingdom (where such risks are deemed to have receded this year).

A limited number of changes in the medium-term risk classification, based on the joint use of the S1 indicator and the DSA tool, are found, overall pointing to reduced risks:

– In two countries (Croatia and Romania), the risk classification has improved from high to medium risk. In Croatia, the improvement in the forecasted structural primary balance explains the change in the risk category, while in Romania, the lower forecasted debt ratio drives the improvement (the country was borderline medium – high risk last year).

– In three additional countries (Lithuania, Austria and Poland), the risk classification has improved from medium to low risk, and from high to low risk in the case of Finland. In Lithuania, the improvement is notably driven by the improved projected ageing costs compared to the DSM 2017 (updated in this report with the Ageing Report 2018). In Austria, Poland and Finland, the change in the risk classification can be largely attributed to the improved initial budgetary position.

In the long term, the risk classification has changed in as much as fourteen countries. In most cases, the updated risk classification point to more important long-term risks, while in few cases less acute risks are identified. Two main factors drive these notable changes: on one hand, the updated projected ageing costs (as of the Ageing Report 2018), on the other hand, the change in the methodology to assess long-term fiscal sustainability risks (see Box 4.1 in Chapter 4). In particular:

– In five countries, the change in the risk classification is only due to the revised long-term fiscal gap indicator. This concerns i) (on

([138]) This is also the case of Germany, although in this case, the country-specific historical average SPB is found to be relatively high (close to the last forecast value of the SPB).

the upward side) the Czech Republic and Ireland (from low to medium), as well as Luxembourg (from medium to high), and ii) (on the downward side) Lithuania (from medium to low) and Slovenia (from high to medium).

– In Spain and Italy, the change in the risk classification is driven by both an increase of the S2 indicator, and the change in the methodology to assess long-term risks.

– In seven additional countries, the consideration of debt vulnerabilities in the risk assessment contributes to the change of risk category. This is the case of Belgium, France, Croatia, Cyprus, Hungary, Portugal and the United-Kingdom.

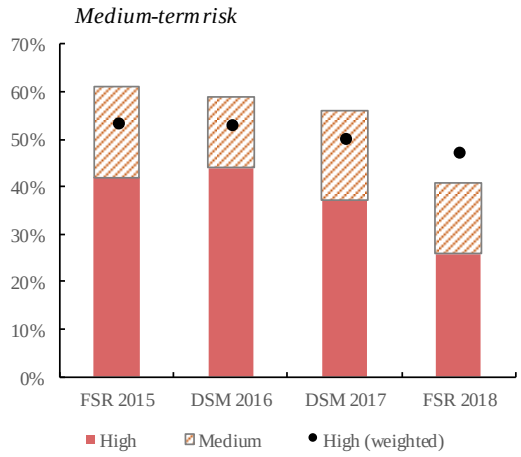
Looking at the evolution of the risk classification across the last editions of the FSR and the DSM, contradictory signals emerge.

In the short term, in this edition of the report, risks have not disappeared, with a clear signal of potential fiscal stress in one case, and looser signs in others.

In the medium term, the proportion of countries at high or medium risk has declined. Yet, high risks identified in some large economies are not receding (see Graph 6.1).

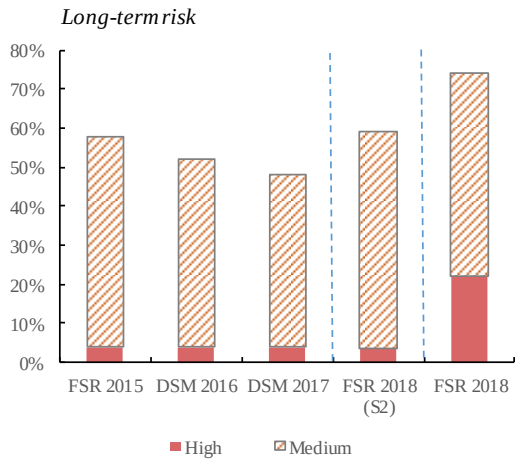
In the long term, updated ageing costs projections, taking into account latest demographic developments and in some cases pension reform reversals, point to prevailing long-term sustainability challenges in an important number of countries. Furthermore, the revised long-term risk classification, which caters for risks linked to medium to high debt ratios, also provides a new (less favourable) insight on the long-term sustainability challenge (see Graph 6.2).

Graph 6.1: **Medium-term risk classification: proportion of countries classified at medium and high risk across reports**



(1) 'High' and 'medium' refer to the (unweighted) proportion of countries classified in these categories. 'High (weighted)' corresponds to the GDP-weighted proportion of countries classified at high risk.
Source: Commission services.

Graph 6.2: **Long-term risk classification: proportion of countries classified at medium and high risk across reports**



(1) 'FSR 2018 (S2)' refers to the FSR 2018 long-term risk classification results - solely based on the S2 indicator, while 'FSR 2018' refers to the FSR 2018 overall long-term risk classification results, also catering for risks linked to medium/high debt burdens (captured through the DSA assessment).
Source: Commission services.

6.3.5. Additional mitigating and aggravating risk factors

Overall, some risks related to the structure of government debt financing prevail in some countries, either linked to the maturity of debt (e.g. Sweden and Hungary), to the share of debt held in foreign currency (e.g. Bulgaria and Croatia), or to the nature of debt holders (e.g. Poland and Romania). Yet, an overall trend of lengthening of debt maturity can be observed in most countries, partially protecting them - in the short term - from potential rapid changes in market interest rates. Moreover, an important share of government debt is still held by the official sector or Central Banks in some countries (e.g. Cyprus, Portugal and Ireland), bringing also some stability in terms of sources of financing (see section 5.1 in Chapter 5).

Fiscal risks due to contingent liabilities linked to the banking sector are still present, although some risk-reduction is taking place. The level of non-performing loans (NPLs) ratios is still high in a number of countries, yet an overall reduction is observed in most countries. Under the assumption of a rigorous application of the regulatory framework and of a further reduction of NPLs in the medium term, the simulated impact of a systemic banking crisis on public finances would have a potential high effect only in a limited subset of countries and in the short term. Less strict assumptions point however to some prevailing vulnerabilities in a number of cases (see section 5.2 in Chapter 5).

Table 6.1: **Fiscal sustainability assessment by Member State (in brackets, classification in the DSM 2017, whenever the risk category has changed)**

	Overall SHORT-TERM risk category	Overall MEDIUM-TERM risk category	S1 indicator - overall risk assessment	Debt sustainability analysis - overall risk assessment	S2 indicator - overall risk assessment	Overall LONG-TERM risk category
BE	LOW	HIGH	HIGH	HIGH	MEDIUM	HIGH (MEDIUM)
BG	LOW	LOW	LOW	LOW	LOW	LOW
CZ	LOW	LOW	LOW	LOW	MEDIUM (LOW)	MEDIUM (LOW)
DK	LOW	LOW	LOW	LOW	LOW	LOW
DE	LOW	LOW	LOW	LOW	LOW	LOW
EE	LOW	LOW	LOW	LOW	LOW	LOW
IE	LOW	LOW	LOW	LOW	MEDIUM (LOW)	MEDIUM (LOW)
ES	LOW	HIGH	HIGH	HIGH	MEDIUM (LOW)	HIGH (LOW)
FR	LOW	HIGH	HIGH	HIGH	LOW	MEDIUM (LOW)
HR	LOW	MEDIUM (HIGH)	MEDIUM	MEDIUM (HIGH)	LOW	MEDIUM (LOW)
IT	LOW	HIGH	HIGH	HIGH	MEDIUM (LOW)	HIGH (LOW)
CY	HIGH (LOW)	MEDIUM	LOW (MEDIUM)	MEDIUM	LOW	MEDIUM (LOW)
LV	LOW	LOW	LOW	LOW	LOW	LOW
LT	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW	LOW (MEDIUM)	LOW (MEDIUM)
LU	LOW	LOW	LOW	LOW	HIGH (MEDIUM)	HIGH (MEDIUM)
HU	LOW	HIGH	MEDIUM	HIGH	MEDIUM	HIGH (MEDIUM)
MT	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
NL	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
AT	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW (MEDIUM)	MEDIUM	MEDIUM
PL	LOW	LOW (MEDIUM)	LOW (MEDIUM)	LOW (MEDIUM)	MEDIUM	MEDIUM
PT	LOW	HIGH	HIGH	HIGH	LOW	MEDIUM (LOW)
RO	LOW	MEDIUM (HIGH)	MEDIUM	MEDIUM (HIGH)	MEDIUM	MEDIUM
SI	LOW	MEDIUM	MEDIUM	LOW (MEDIUM)	MEDIUM (HIGH)	MEDIUM (HIGH)
SK	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM
FI	LOW	LOW (HIGH)	LOW (MEDIUM)	LOW (HIGH)	MEDIUM	MEDIUM
SE	LOW	LOW	LOW	LOW	LOW	LOW
UK	LOW	HIGH	MEDIUM	HIGH	MEDIUM	HIGH (MEDIUM)

Source: Commission services.

Table 6.2: **Final DSA risk classification: detail of the classification**

HIGH RISK	MEDIUM RISK	LOW RISK
Baseline scenario at high risk BE, ES, FR, IT, PT	**Baseline scenario at medium risk** HR, CY, RO	**Baseline scenario at low risk (confirmed by other scenarios)** BG, CZ, DK, DE, EE, IE, LV, LT, LU, MT, NL, AT, PL, SI, SK, FI, SE
Baseline scenario at medium risk (At least one) other scenario at high risk due to: Debt level at high risk: UK Debt peak year at high risk: HU		

Source: Commission services.

Table 6.3: **Summary heat map on fiscal sustainability challenges**

	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
	Heat map for short-term risks in EU countries																										
S0 overall index	0,22	0,19	0,18	0,12	0,00	0,17	0,21	0,37	0,29	0,24	0,36	0,46	0,24	0,21	0,12	0,34	0,06	0,08	0,03	0,18	0,33	0,30	0,13	0,27	0,14	0,20	0,42
Overall SHORT-TERM risk category	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
	Heat map for medium-term risks in EU countries																										
	S1 indicator in the EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
S1 indicator - Baseline scenario	4,3	-4,2	-2,9	-5,1	-2,0	-4,3	-0,9	5,2	4,2	0,2	9,4	-0,7	-2,0	-1,8	-4,8	1,1	-4,7	-1,7	-0,8	-0,7	4,3	1,5	0,2	-2,9	-0,1	-4,6	1,3
S1 indicator - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	LOW	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	MEDIUM	LOW	LOW	LOW	MEDIUM
	Sovereign-debt sustainability risks in EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Baseline no-policy change scenario	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	99,9	12,4	25,8	10,8	37,3	9,6	46,7	107,3	99,8	64,3	146,5	61,9	35,0	33,4	8,9	68,7	17,8	38,2	51,2	48,0	106,7	61,6	53,5	31,9	55,1	15,6	73,9
Debt peak year	2018	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Average Structural Primary Balance (2020-2029) Percentile rank	52%	42%	40%	28%	26%	71%	39%	72%	65%	38%	51%	17%	66%	53%	37%	67%	23%	47%	35%	66%	22%	89%	48%	50%	55%	34%	36%
Historical SPB scenario	HIGH	LOW	LOW	LOW	LOW	LOW	MEDIUM	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	LOW	MEDIUM	LOW	LOW	LOW	HIGH
Debt level (2029)	94,8	14,4	38,6	6,5	39,6	8,2	62,9	105,5	107,7	80,7	136,0	73,9	40,2	43,4	3,5	67,0	26,3	38,2	55,9	56,1	126,0	55,3	60,4	47,5	44,0	11,7	96,9
Debt peak year	2018	2018	2029	2018	2018	2029	2018	2029	2029	2029	2029	2018	2029	2029	2018	2018	2018	2018	2018	2029	2029	2029	2018	2018	2018	2018	2029
Average Structural Primary Balance (2020-2029) Percentile rank	42%	45%	65%	23%	29%	69%	69%	70%	75%	68%	30%	29%	73%	69%	29%	66%	35%	47%	44%	76%	55%	84%	62%	75%	34%	28%	75%
Negative shock (-0.5p.p.) on nominal GDP growth	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,3	13,3	27,3	12,2	39,9	9,9	49,3	112,9	105,1	68,2	154,7	66,5	36,7	35,1	9,6	72,4	19,3	40,6	54,5	50,5	113,4	64,0	56,4	33,9	58,1	16,9	78,3
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Positive shock (+1p.p.) to the market interest rates on new debt	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,4	12,7	27,5	11,7	40,0	9,8	49,6	113,2	105,6	69,4	155,9	65,1	36,7	35,5	8,9	73,4	18,8	40,5	53,6	50,6	112,4	65,2	56,3	33,0	56,9	16,0	77,6
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2029	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Negative shock on the PB over the two forecast years	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	103,3	15,2	28,9	11,9	39,5	10,0	48,4	108,6	101,2	68,9	153,5	69,2	37,4	33,7	11,6	72,2	19,2	40,5	53,5	48,3	108,2	67,8	56,4	32,2	56,0	16,3	76,5
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2029	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Stochastic projections	HIGH	MEDIUM	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM	MEDIUM	LOW	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
Probability of debt in 2023 greater than in 2018 (%)	31%	29%	23%	8%	1%	32%	15%	54%	34%	36%	59%	10%	41%	40%	17%	36%	8%	5%	12%	25%	26%	79%	6%	20%	27%	1%	17%
Difference of the 10th and 90th percentile in 2023 (p.p. of GDP)	28,1	29,6	23,4	17,1	15,0	3,0	27,9	17,6	13,9	40,8	25,3	42,2	28,8	29,0	19,3	40,8	27,5	14,7	26,3	16,8	41,7	35,7	23,5	27,4	18,6	11,3	19,3
Debt sustainability analysis - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	HIGH
Overall MEDIUM-TERM risk category	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	MEDIUM	LOW	LOW	LOW	HIGH
	Heat map for long-term risks in EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
S2 indicator - Baseline scenario	4,3	1,8	4,1	-0,5	1,7	0,9	3,3	2,3	-0,1	-2,1	2,9	-0,9	0,7	0,5	8,1	4,1	3,3	3,0	2,6	2,2	0,7	5,9	5,5	2,5	2,7	1,1	3,0
Debt sustainability analysis - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	HIGH
Overall LONG-TERM risk category	HIGH	LOW	MEDIUM	LOW	LOW	LOW	MEDIUM	HIGH	MEDIUM	MEDIUM	HIGH	MEDIUM	LOW	LOW	HIGH	HIGH	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	HIGH

(1) In this table, only the relevant information used for the risk classification is included. The report contains more detailed information. The thresholds used are presented in Annex A6.

Source: Commission services.

ANNEX A1
The early-detection indicator of fiscal stress risk (S0)

A1.1. THE METHODOLOGY FOR THE CALCULATION OF THE THRESHOLDS

For each variable used in the composite indicator S0 the optimal threshold is chosen in a way to minimise, based on historical data, the sum of the number of fiscal stress signals sent ahead of no-fiscal-stress episodes (false positive signals – type-I error) and the number of no-fiscal-stress signals sent ahead of fiscal stress episodes (false negative signals – type-II error), with different weights attached to the two components**.** The table below reports the four possible combinations of events.

Table A1.1: **Possible cases based on type of signal sent by the variable at t-1 and state of the world at t**

	Fiscal stress episode	No-fiscal stress episode
Fiscal stress signal	True Positive signal	False Positive signal (Type I error)
No-fiscal stress signal	False Negative signal (Type II error)	True Negative signal

Source: Commission services

Formally, for each variable *i* the optimal threshold (t_i^*) is such as to minimise the sum of type I and type II errors for variable *i* (respectively fiscal stress signals followed by no-fiscal stress episodes - False Positive signals - and no-fiscal-stress signals followed by fiscal stress episodes – False Negative signals) as from the following total misclassification error for variable *i* (TME_i): ([139])

$$t_i^* = \arg\min_{t_i \in T_i} \left(TME_i(t_i) \right) =$$

$$= \arg\min_{t_i \in T_i} \left(\frac{FN_i(t_i)}{Fs} + \frac{FP_i(t_i)}{Nfs} \right) \qquad (1)$$

$i = 1,.., n$

where T_i = set of all values taken by variable *i* over all countries and years in the panel; $FN_i(t_i)$ = total number of false negative signals sent by variable *i* (over all countries and years) based on threshold t_i; $FP_i(t_i)$ = total number of false positive signals sent by variable *i* (over all countries and years) based on threshold t_i; *Fs* = total number of fiscal stress episodes recorded in the data; *Nfs* = total number of no-fiscal-stress episodes recorded in the data; ([140]) *n* = total number of variables used.

It is straightforward to see from (1) that in the minimisation problem False Negative signals are weighted more than False Positive signals as:

$$\frac{1}{Fs} > \frac{1}{Nfs}$$

This is due to the fact that the total number of fiscal stress episodes recorded over a (large enough) panel of countries will be typically much smaller than the total number of non-fiscal-stress episodes. This is a positive feature of the model as we might reasonably want to weigh the type II error more than the type I given the more serious consequences deriving from failing to correctly predict a fiscal stress episode relative to predicting a fiscal stress episode when there will be none.

The threshold for variable *i* (with $i = 1,\ldots, n$) obtained from (1) is common to all countries in the panel. We define it as a common *absolute* threshold (a critical value for the level of public debt to GDP, or general government balance over GDP, for instance) but it could also be defined as a common *relative* threshold (a common percentage tail of the country-specific distributions). ([141]) In the latter case, while the optimal percentage tail obtained from (1) is the same for all countries, the associated absolute threshold will differ across countries reflecting differences in distributions (country *j*'s absolute threshold for variable *i* will reflect the country-specific history with regard to that variable). Both the aforementioned methods were applied and a decision was made to focus exclusively on the first, given that the second one tends to produce sensitive country-specific absolute thresholds for variable *i* only for those countries having a history of medium to high values for the variable concerned (or medium to

([139]) Following this methodological approach the optimal threshold will be such as to balance between type I and type II errors. For variables for which values above the threshold would signal fiscal stress, a relatively low threshold would produce relatively more false positive signals and fewer false negative signals, meaning higher type I error and lower type II error; the opposite would be true if a relatively high threshold was chosen.

([140]) Here we simplify on the total number of fiscal stress and non-fiscal-stress episodes as in fact also these numbers vary across variables. This is due to the fact that data availability constraints do not allow us to use the whole series of episodes for all variables.

([141]) See, for instance, Reinhart, Goldstein and Kaminsky (2000); Hemming, Kell and Schimmelpfennig (2003).

low, depending on what the fiscal-stress-prone side of the distribution is), while country-specific thresholds would not be meaningful for the rest of the sample.

The TME function in equation (1) is the criterion we used to calculate the thresholds but it is not the only possible criterion used in the literature. The minimisation of the noise-to-signal ratio (*NSR*) is another possible option. ([142]) In this case the optimal threshold for variable i (t_i^*) is obtained as:

$$t_i^* = \arg\min_{t_i \in T_i} \left(NSR_i(t_i) \right) = \arg\min_{t_i \in T_i} \left(\frac{FP_i(t_i)/Nfs}{TP_i(t_i)/Fs} \right) \quad (2)$$

$i = 1,\ldots,n$

where $TP_i(t_i)$ = total number of true positive signals sent by variable i (over all countries and years) based on threshold t_i. The TME minimisation was preferred to this alternative criterion based on the size of the total errors produced.

A1.2. THE CALCULATION OF THE COMPOSITE INDICATOR S0

The early-detection indicator of fiscal stress (S0) is constructed in a similar way to what done in Baldacci et al. (2011) and Reinhart et al. (2000). ([143]) To a certain country j and year t, a 1 is assigned for every variable i that signals fiscal stress for the following year (a dummy d^i is created for each variable i such that $d_{jt}^i = 1$ if a fiscal stress signal is sent by the variable and $d_{jt}^i = 0$ otherwise, i.e. if a no-fiscal-stress signal is sent or the variable is missing). The value of the composite indicator S0 for country j and year t ($S0_{jt}$) is then calculated as the weighted number of variables having reached their optimal thresholds with the weights given by the "signalling power" of the individual variables:

$$S0_{jt} = \sum_{i=1}^{n} w_i d_{jt}^i = \sum_{i=1}^{n} \frac{z_i}{\sum_{k=1}^{n} h_{jt}^k \cdot z_k} d_{jt}^i \quad (3)$$

where n = total number of variables; z_i = 1 – (type I error + type II error) = signalling power of variable i; and $h_{jt}^k \in \{0,1\}$ is an indicator variable taking value 1 if variable k is observed for country j at time t and 0 otherwise. ([144]) The variables are therefore assigned higher weight in the composite indicator, the higher their past forecasting accuracy. ([145])

([142]) See, for instance, Reinhart, Goldstein and Kaminsky (2000); Hemming, Kell and Schimmelpfennig (2003).

([143]) See Berti et al. (2012). The difference with Baldacci et al. (2011) is that Berti et al. do not use a system of "double weighting" of each variable incorporated in the composite indicator based on the weight of the subgroup of variables it belongs to (fiscal and financial-competitiveness variables here) and the weight of the individual variable within the group. The difference with Reinhart et al. (2000) is in the way the individual variables' weights are computed (Reinhart et al. use as weights the inverse of the noise-to-signal ratios of the individual variables as they apply the NSR criterion, rather than the TME minimisation).

([144]) This ensures that the sum of the weights is equal to 1 regardless of data availability (which is of course necessary to be able to analyse the evolution of the composite indicator).

([145]) Moreover, as evident from (3), the weight attached to each variable is decreasing in the signalling power attached to the other variables, as well as in the number of variables available for a given country and year.

ANNEX A2

The medium- and long-term fiscal sustainability indicators (S1, S2) and the intertemporal net worth indicator

A2.1. NOTATION

t : time index. Each period is one year

t_0 : last year before the long-term projection (e.g. 2020)

$t_0 + 1$: first year of the long-term projection period. Start of the fiscal adjustment

t_1 : end of the fiscal adjustment (relevant for S1)

t_2 : target year for the debt ratio (e.g. 2033, relevant for S1)

t_3 : final year of the long-term projection period (e.g. 2070)

Notice that $t_0 < t_1 < t_2 < t_3$.

D_t : debt-to-GDP ratio (at the end of year t).

PB_t : ratio of structural primary balance to GDP

$\Delta\mathrm{PB}_t \equiv \mathrm{PB}_t - \mathrm{PB}_{t_0}$: change in the structural primary balance relative to the base year t_0. In the absence of fiscal adjustment, it equals the change in age related expenditure (ΔA_t) for $t > t_0$

$\Delta A_t \equiv A_t - A_{t_0}$: change in age-related costs relative to the base year t_0

c : the annual increase in the primary structural balance during fiscal adjustment (i.e. between $t_0 + 1$ and t_1) (relevant for S1).

$S_1 \equiv c(t_1 - t_0)$: the value of the S1 indicator, i.e. the total fiscal adjustment.

r : differential between the nominal interest rate and the nominal GDP growth rate i.e.

$1 + r \equiv \frac{1+R}{1+G}$: where R and G are, respectively, the nominal interest rate and the nominal growth rate.

If the interest-growth rate differential is time-varying, we define

$$\alpha_{s;v} \equiv (1 + r_{s+1})(1 + r_{s+2}) \dots (1 + r_v)$$

$$\alpha_{v;v} \equiv 1$$

as the accumulation factor that transforms 1 nominal unit in period s to its period v value.

A2.2. DEBT DYNAMICS

By definition, the debt-to-GDP ratio evolves according to:

$$D_t = (1 + r_t)D_{t-1} - \mathrm{PB}_t. \qquad (1)$$

That is, the debt ratio at the end of year t, D_t, is a sum of three components: the debt ratio at the end of the previous year (D_{t-1}), interest accrued on existing debt during year t (rD_{t-1}), and the negative of the primary balance $(-\mathrm{PB}_t)$.

Repeatedly substituting for D_t, the debt ratio at the end of some future year $T > t$ can be expressed similarly, as:

$$D_T = D_{t-1}\alpha_{t-1;T} - \sum_{i=t}^{T}(\mathrm{PB}_i\alpha_{i;T}). \qquad (2)$$

The path of the debt ratio is thus determined by the initial debt ratio, accrued interest (net of growth), and the path of primary balances from t through T.

Important warning

It should be noted that the actual calculation of the S1 and S2 indicators also accounts for property income and tax revenue on pensions, although they are not explicitly included in the derivations in order to simplify them and to facilitate the interpretation of results. Their inclusion would be trivial, implying "adding" terms to the formulas similar to that for "ageing costs" ΔA_t.

A2.3. DERIVATION OF THE S1 INDICATOR

The S1 indicator is defined as the constant annual improvement in the ratio of structural primary balance to GDP, from year $t_0 + 1$ up to year t_1, that is required to bring the debt ratio to a given level by year t_2. ([146]) In addition to accounting for the need to adjust the initial intertemporal budgetary position and the debt level, it incorporates financing for any additional

([146]) This is in contrast to the S2 indicator, which is defined as an immediate, one-off adjustment.

expenditure until the target date arising from an ageing population.

During the S1 adjustment, the primary balance (as a percentage of GDP) increases by a constant annual amount $c > 0$ each year starting from $t_0 + 1$ through t_1. The adjustment is assumed to be permanent. Under the assumed consolidation schedule, the change in the primary balance is thus given by

$$\mathrm{PB}_i = \mathrm{SPB}_{t_0} + c(i - t_0) - \Delta A_i + \Delta PI_i + CC_i \qquad \text{(3i)}$$

$$\text{for } t_0 < i \leq t_1$$

$$\mathrm{PB}_i = \mathrm{SPB}_{t_0} + \underbrace{c(t_1 - t_0)}_{= S_1} - \Delta A_i + \Delta PI_i + CC_i \qquad \text{(3ii)}$$

$$\text{for } t_2 \geq i > t_1$$

Using (2), the debt ratio target D_{t_2} can then be written as:

$$D_{t_2} = D_{t_0}\alpha_{t_0;t_2} - \sum_{i=t_0+1}^{t_2} \left(\mathrm{PB}_i \alpha_{i;t_2}\right) \qquad (4)$$

Replacing (3i)-(3ii) into (4) yields:

$$D_{t_2} = D_{t_0}\alpha_{t_0;t_2} - \sum_{i=t_0+1}^{t_1} \left(\mathrm{SPB}_{t_0} + c(i - t_0)\right)\alpha_{i;t_2}$$

$$- \sum_{i=t_1+1}^{t_2} \left(\mathrm{SPB}_{t_0} + \underbrace{c(t_1 - t_0)}_{= S_1}\right)\alpha_{i;t_2} \qquad (5)$$

$$+ \sum_{i=t_0+1}^{t_2} \left((\Delta A_i - \Delta PI_i - CC_i)\,\alpha_{i;t_2}\right)$$

After some straightforward manipulations, ([147]) we can decompose the S1 into the following main components:

$$S_1 \equiv \underbrace{c(t_1 - t_0)}_{T} =$$

$$= \underbrace{\frac{D_{t_0}(\alpha_{t_0;t_2} - 1)}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})} - \mathrm{SPB}_{t_0} - \frac{\sum_{i=t_0+1}^{t_2}(\Delta PI_i \alpha_{i;t_2})}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})} - \frac{\sum_{i=t_0+1}^{t_2}(CC_i \alpha_{i;t_2})}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})}}_{A}$$

$$+ \underbrace{c\frac{\sum_{i=t_0+1}^{t_1}\left((t_1 - i)\alpha_{i;t_2}\right)}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})}}_{B} + \underbrace{\frac{D_{t_0} - D_{t_2}}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})}}_{C} \qquad (6)$$

$$+ \underbrace{\frac{\sum_{i=t_0+1}^{t_2}(\Delta A_i \alpha_{i;t_2})}{\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})}}_{D}$$

where (T) is the total adjustment (the S1 indicator by definition); (A) the strict initial budgetary position (i.e. the gap to the debt-stabilising primary balance); (B) the cost of delaying the adjustment; (C) the required additional adjustment due to the debt target (DR); and (D) the additional required adjustment due to the costs of ageing (LTC). The total initial budgetary position (IBP) is the sum of A and B i.e. includes the cost of delaying the adjustment.

A2.4. DERIVATION OF THE S2 INDICATOR

The intertemporal budget constraint and the S2 indicator

According to a generally invoked definition, fiscal policy is sustainable in the long term if the present value of future primary balances is equal to the current level of debt, that is, if the intertemporal government budget constraint (IBC) is met. Let us define the S2 as the immediate and permanent one-off fiscal adjustment that would ensure that the IBC is met. This indicator is appropriate for assessing long-term fiscal sustainability in the face of ageing costs. ([148])

Since the S2 indicator is defined with reference to the intertemporal government budget constraint (IBC), we first discuss which conditions are required for the IBC to hold in a standard model of debt dynamics. From (2), the debt to GDP ratio at the end of any year $t > t_0$ is given by:

([147]) Add and subtract D_{t_0} on the LHS of (5). In the second term on the LHS, rewrite $c(i - t_0) = S_1 - c(t_1 - i)$, then exchange $-S_1 \cdot \sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})$ on the LHS for D_{t_2} on the RHS. Finally, divide by $\sum_{i=t_0+1}^{t_2}(\alpha_{i;t_2})$, simplify, and group the terms as in (6).

([148]) Note that the derivation of S2 does not assume that either the initial sequence of primary balances or the fixed annual increase (S2) are optimal according to some criterion. S2 should be considered as a benchmark and not as a policy recommendation or as a measure of the actual adjustment needed in any particular year.

$$D_t = D_{t_0}\alpha_{t_0;t} - \sum_{i=t_0+1}^{t}\left(\mathrm{PB}_i\alpha_{i;t}\right). \quad (7)$$

Rearranging the above and discounting both sides to their time t_0 values, we obtain the debt ratio on the initial period:

$$D_{t_0} = \left(\frac{D_t}{\alpha_{t_0;t}}\right) + \sum_{i=t_0+1}^{t}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right). \quad (8i)$$

Assuming an infinite time horizon ($t \to \infty$) we get:

$$\begin{aligned} D_{t_0} &= \lim_{t\to\infty}\left(\frac{D_t}{\alpha_{t_0;t}}\right) + \lim_{t\to\infty}\sum_{i=t_0+1}^{t}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) \\ &= \lim_{t\to\infty}\left(\frac{D_t}{\alpha_{t_0;t}}\right) + \sum_{i=t_0+1}^{\infty}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) \end{aligned} \quad (8ii)$$

Either both of the limits on right-hand side of equation (8ii) fail to exist, or if one of them exists, so does the other.

Let us define the *no-Ponzi game condition* (also called the *transversality condition*) for debt sustainability, namely that the discounted present value of debt (in the very long term or in the infinite horizon) will tend to zero:

$$\lim_{t\to\infty}\left(\frac{D_t}{\alpha_{t_0;t}}\right) = 0 \quad (9i)$$

Condition (9i) means that asymptotically, the debt ratio cannot grow at a rate equal or higher than the (growth-adjusted) interest rate, which is what would happen if debt and interest were systematically paid by issuing new debt (i.e. a Ponzi game).

Combining the no-Ponzi game condition (9i) with (8ii), one obtains the intertemporal budget constraint, stating that a fiscal policy is sustainable if the present discounted value of future primary balances is equal to the initial value of the debt ratio.

$$D_{t_0} = \sum_{i=t_0+1}^{\infty}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) \quad (9ii)$$

On the other hand, substituting the intertemporal budget constraint (9ii) into (8ii) implies the no-Ponzi game condition. This shows that the no-Ponzi game condition (9i) and the IBC (9ii) are, in fact, equivalent.

Assuming that the intertemporal budget constraint is satisfied through a permanent, one-off fiscal adjustment whose size is given by the S2, from $t_0 + 1$ onwards we can write:

$$\mathrm{PB}_i = \mathrm{SPB}_{t_0} + S_2 - \Delta A_i + \Delta PI_i + CC_i \quad \text{for} \quad i > t_0. \quad (10)$$

Then the intertemporal budget constraint (9ii) becomes

$$D_{t_0} = \sum_{i=t_0+1}^{\infty}\left(\frac{\mathrm{PB}_{t_0} + S_2 - \Delta A_i + \Delta PI_i + CC_i}{\alpha_{t_0;i}}\right). \quad (9iii)$$

Here the ratio of structural primary balance to GDP, PB_t is re-expressed in terms of the required annual additional effort, S2, and the change in age-related costs relative to the base year t_0, combining the equation (10) with equation (9ii).

According to the theory on the convergence of series, necessary conditions for the series in equation (9ii)-(9iii) to converge are for the initial path of primary balances to be bounded and the interest rate differential in the infinite horizon to be positive ([149]). The latter is equivalent to the modified golden rule, stating that the nominal interest rate exceeds the real growth rate (i.e. $\lim_{t\to\infty} r_t > 0$). ([150])

After some rearranging, ([151]) we can decompose the S2 into the following two components:

$$\begin{aligned} S_2 = &\underbrace{\frac{D_{t_0}}{\sum_{i=t_0+1}^{\infty}\left(\frac{1}{\alpha_{t_0;i}}\right)} - \mathrm{SPB}_{t_0} - \frac{\sum_{i=t_0+1}^{\infty}\left(\frac{\Delta PI_i + CC_i}{\alpha_{t_0;i}}\right)}{\sum_{i=t_0+1}^{\infty}\left(\frac{1}{\alpha_{t_0;i}}\right)}}_{A} \\ &+ \underbrace{\frac{\sum_{i=t_0+1}^{\infty}\left(\frac{\Delta A_i}{\alpha_{t_0;i}}\right)}{\sum_{i=t_0+1}^{\infty}\left(\frac{1}{\alpha_{t_0;i}}\right)}}_{B} \end{aligned} \quad (11)$$

where (A) is the initial budgetary position i.e. the gap to the debt stabilising primary balance ([152]);

([149]) The latter is an application of the ratio test for convergence.
([150]) See Escolano (2010) for further details on the relationships among the stability of the debt ratio, the IBC and the no-Ponzi game condition.
([151]) In addition, constant multiplicative terms are systematically taken out of summation signs.
([152]) In practical calculations, the present value of property income is also accounted for in the initial budgetary

and (B) the additional required adjustment due to the costs of ageing.

If the interest-growth rate differential r is constant, the accumulation factor simplifies to $\alpha_{s;v} = (1+r_{s+1})(1+r_{s+2})\dots(1+r_v) = (1+r)^{v-s}$. Then equation (10) can be simplified further by noting that:

$$\sum_{i=t_0+1}^{\infty}\left(\frac{1}{\alpha_{t_0;i}}\right) = \sum_{i=t_0+1}^{\infty}\left(\frac{1}{(1+r)^{i-t_0}}\right) = \frac{1}{r} \qquad (12)$$

Thus, for a constant discounting factor, (11) can be rewritten as:

$$S_2 = \underbrace{rD_{t_0} - \mathrm{SPB}_{t_0} - r\sum_{i=t_0+1}^{\infty}\left(\frac{\Delta PI_i + CC_i}{\alpha_{t_0;i}}\right)}_{A} + \underbrace{r\sum_{i=t_0+1}^{\infty}\left(\frac{\Delta A_i}{\alpha_{t_0;i}}\right)}_{B} \qquad (13i)$$

If the interest-growth rate differential and the structural primary balance are constant after a certain date (here $t_3 = 2070$), equation (11) can be rewritten as:

$$S_2 = \frac{D_{t_0}}{\sum_{i=t_0+1}^{2069}\left(\frac{1}{\alpha_{t_0+1;i}}\right) + \frac{1}{r\alpha_{t_{0+1};2069}}} - \mathrm{SPB}_{t_0} - \frac{\sum_{i=t_0+1}^{2069}\left(\frac{\Delta PI_i + CC_i}{\alpha_{t_0+1;i}}\right) + \frac{\Delta PI_{2070} + CC_{2070}}{r\,\alpha_{t_{0+1};2069}}}{\sum_{i=t_0+1}^{2069}\left(\frac{1}{\alpha_{t_0;i}}\right) + \frac{1}{r\,\alpha_{t_{0+1};2069}}} + \frac{\sum_{i=t_0+1}^{2069}\left(\frac{\Delta A_i}{\alpha_{t_0+1;i}}\right) + \frac{\Delta A_{2070}}{r\,\alpha_{t_{0+1};2069}}}{\sum_{i=t_0+1}^{2069}\left(\frac{1}{\alpha_{t_0;i}}\right) + \frac{1}{r\,\alpha_{t_{0+1};2069}}} \qquad (13ii)$$

where $r_t = r$ and $\Delta A_t = \Delta A_{2070}$ for $t \geq t_3 = 2070$.

Derivation of the steady state debt level (at the end of the projection period) corresponding to the S2

Assuming that the intertemporal budget constraint is satisfied and that the primary balance and the interest-growth rate differential are constant at their long-run levels after the end of the projection period, then the debt ratio remains constant at the value attained at the end point of the projection period (i.e. at $t_3 = 2070$).

To see this, rewrite (9ii) as:

$$D_{t_0} = \sum_{i=t_0+1}^{\infty}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) = \sum_{i=t_0+1}^{t_3}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) + \sum_{i=t_3+1}^{\infty}\left(\frac{\mathrm{PB}_i}{\alpha_{t_0;i}}\right) \qquad (14i)$$

Using (7) and the fact that for $t \geq t_3$ the primary balance and interest-growth rate differential stay constant at $\mathrm{PB}_t = \mathrm{PB}_{t_3}$ we can rearrange (14i) to obtain the debt ratio at t_3:

$$D_{t_3} = D_{t_0}\alpha_{t_0;t_3} - \sum_{i=t_0+1}^{t_3}\left(\mathrm{PB}_i\alpha_{i;t_3}\right) = \sum_{i=t_3+1}^{\infty}\left(\frac{\mathrm{PB}_i}{\alpha_{t_3;i}}\right) = \sum_{i=1}^{\infty}\left(\frac{\mathrm{PB}_{t_3}}{(1+r_{t_3})^i}\right) = \frac{\mathrm{PB}_{t_3}}{r_{t_3}} \qquad (14ii)$$

We can generalising the above to each $t \geq t_3$ by using (7) with the initial year changed to t_3 instead of t_0, we see that for each year after t_3, the debt ratio remains unchanged at this value:

$$\begin{aligned} D_t &= D_{t_3}\alpha_{t_3;t} - \sum_{i=t_3+1}^{t}\left(\mathrm{PB}_i\alpha_{i;t}\right) \\ &= \frac{\mathrm{PB}_{t_3}}{r_{t_3}}\left(1+r_{t_3}\right)^{t-t_3} - \mathrm{PB}_{t_3}\sum_{i=t_3+1}^{t-t_3}\left(1+r_{t_3}\right)^{t-i-1} \\ &= \underbrace{\left[\left(1+r_{t_3}\right)^{t-t_3} - r_{t_3}\left(\frac{1-\left(1+r_{t_3}\right)^{t-t_3}}{1-\left(1+r_{t_3}\right)}\right)\right]}_{=1}\frac{\mathrm{PB}_{t_3}}{r_{t_3}} \\ &= \frac{\mathrm{PB}_{t_3}}{r_{t_3}} \equiv \overline{\overline{D}} \quad \text{for} \quad t \geq t_3 \end{aligned} \qquad (15)$$

where $\overline{\overline{D}}$ is the constant debt ratio reached after the end of the projection period.

Using (4), the primary balance at the end of the projection period can be calculated as:

$$\mathrm{PB}_{t_3} = \mathrm{SPB}_{t_0} + \Delta PI_{t_3} + CC_{t_3} + S_2 - \Delta A_{t_3} \qquad (16)$$

Replacing (16) into (15), the constant (steady-state) debt ratio ($\overline{\overline{D}}$) is given by:

$$\overline{\overline{D}} = \frac{\mathrm{PB}_{t_3}}{r_{t_3}} = \frac{\mathrm{SPB}_{t_0} + \Delta PI_{t_3} + CC_{t_3} + S_2 - \Delta A_{t_3}}{r_{t_3}} \qquad (17)$$

for $t \geq t_3$

position. Property income enters the equation in an identical manner as age-related costs ΔA_t (i.e. term (B)), but with an opposite sign.

The S2 adjustment implies that the sum of debt and the discounted present value of future changes in aged-related expenditure is (approximately) constant over time

Replacing equations (16) and (13i) into (15), and assuming a constant interest rate differential, the following equation is obtained:

$$D_t + \sum_{i=t+1}^{\infty}\left(\frac{\Delta A_i}{(1+r)^{i-t}}\right) - \sum_{i=t+1}^{\infty}\left(\frac{\Delta PI_i + CC_i}{(1+r)^{i-t}}\right) = D_{t_0} + \sum_{i=t_0+1}^{\infty}\left(\frac{\Delta A_i}{(1+r)^{i-t_0}}\right) - \sum_{i=t_0+1}^{\infty}\left(\frac{\Delta PI_i + CC_i}{(1+r)^{i-t_0}}\right) \quad (18)$$

Equation (18) can be interpreted as follows. Implementing a permanent annual improvement in the primary balance amounting to S2 (equation 5), which is both necessary and sufficient to secure intertemporal solvency, implies that the sum of explicit debt (the first term in both sides) and the variation in age-related expenditure or implicit debt (the second terms in both sides) is (approximately) constant over time. Equation (17) is exact in the steady state (e.g. after 2070), holding only as an approximation during transitory phases (i.e. for time-varying interest rate differentials). ([153])

A2.5. DERIVATION OF THE INW INDICATOR

The inter-temporal net worth (INW) indicator can be interpreted as a measure of government's net wealth, assuming unchanged policies and including projected/implicit future liabilities due to ageing.

INW is given by net worth (a_{t_0}) in the base year (t_0) minus the discounted sum of all future primary balances required to secure inter-temporal sustainability (i.e. S2). Net worth is the difference between government assets and liabilities.

Accordingly, the inter-temporal net worth indicator is derived from S2 as:

$$\mathrm{INW}_{t_0} = a_{t_0} - S_2 \sum_{i=t_0+1}^{\infty}\left(\frac{1}{\alpha_{t_0;i}}\right) \quad (19)$$

For a constant discount factor, using (12) equation (19) simplifies to:

$$\mathrm{INW}_{t_0} = a_{t_0} - \frac{S_2}{r} \quad (20)$$

A finite version of the INW indicator can also be computed for the period until 2070. In this case, INWfinite would be given by the equation:

$$\mathrm{INW}_{finite,t_0} = a_{t_0} - S_2 \sum_{i=t_0+1}^{2070}\left(\frac{1}{\alpha_{t_0;i}}\right) \quad (21)$$

We can breakdown the INW finite indicator into three components: net worth, INW due to initial budgetary position and INW due to cost of ageing.

$$\mathrm{INW}_{finite,t_0} = a_{t_0} - S_{2,IBP} \sum_{i=t_0+1}^{2070}\left(\frac{1}{\alpha_{t_0;i}}\right) - S_{2,CoA} \sum_{i=t_0+1}^{2070}\left(\frac{1}{\alpha_{t_0;i}}\right) \quad (22)$$

([153]) Moreover, equations (17) and (18) imply that both the debt and the variation in age-related expenditure are constant over time in the steady state.

ANNEX A3

Decomposing debt dynamics, projecting the interest rate on government debt and property incomes

A3.1. DECOMPOSING THE DEBT DYNAMICS

Deterministic government debt projections are based on a general identity characterising the evolution of the stock of debt. In a simplified version, the evolution of the government debt to GDP ratio can be described in the following way:

$$d_t = \alpha^n . d_{t-1} . \frac{(1+i_t)}{(1+g_t)} + \alpha^f . d_{t-1} . \frac{(1+i_t)}{(1+g_t)} . \frac{e_t}{e_{t-1}} - pb_t + f_t \quad (1)$$

where d_t represents the total government debt to GDP ratio in year t

α^n represents the share of total government debt denominated in national currency

α^f represents the share of total government debt denominated in foreign currency

i_t represents the implicit interest rate on government debt ([154])

g_t represents the *nominal* growth rate of GDP (in national currency)

e_t represents the nominal exchange rate (expressed as national currency per unit of foreign currency)

pb_t represents the primary balance over GDP

f_t represents the stock-flow adjustments over GDP.

In order to obtain the debt dynamics, d_{t-1} is subtracted from both sides of equation (1). This gives the following expression:

$$\Delta d_t = \alpha^n . d_{t-1} . \frac{(i_t - g_t)}{(1+g_t)} + \alpha^f . d_{t-1} . \frac{(i_t - g_t) + \varepsilon_t . (1+i_t)}{(1+g_t)} - pb_t + f_t \quad (2)$$

where $\varepsilon_t = \frac{e_t}{e_{t-1}} - 1$ represents the rate of depreciation of the national currency.

([154]) By simplicity, it is assumed that this interest rate is the same for government debt denominated in national currency and in foreign currency.

Decomposing further the nominal GDP growth rate, and rearranging the different terms, we obtain:

$$\Delta d_t = d_{t-1} . \frac{i_t}{(1+g_t)} - d_{t-1} . \frac{gr_t}{(1+g_t)} - d_{t-1} . \frac{\pi_t (1+gr_t)}{(1+g_t)} + \alpha^f . d_{t-1} . \varepsilon_t . \frac{(1+i_t)}{(1+g_t)} - pb_t + f_t \quad (2)'$$

where gr_t represents the *real* growth rate of GDP

π_t represents the inflation rate (in terms of GDP deflator, in national currency)

This expression allows us identifying the key drivers of the debt ratio dynamics, in particular the snow-ball effect, which can be further decomposed into four terms:

- (+) the interest rate effect: $d_{t-1} . \frac{i_t}{(1+g_t)}$

- (-) the real GDP growth effect: $-d_{t-1} . \frac{gr_t}{(1+g_t)}$

- (-) the inflation effect: $-d_{t-1} . \frac{\pi_t (1+gr_t)}{(1+g_t)}$

- (+) the exchange rate effect: $\alpha^f . d_{t-1} . \varepsilon_t . \frac{(1+i_t)}{(1+g_t)}$

As can be easily seen from this expression, both the interest rate and the foreign exchange depreciation rate contribute to the increase of the debt ratio. On the other hand, higher real GDP growth and higher inflation erode the debt to GDP ratio. ([155])

Other key contributors to the debt motion are the primary balance (pb_t) (that is further decomposed in our tables between the structural primary balance before cost of ageing, the cost of ageing, the cyclical component and one-offs and other temporary measures) and stock and flow adjustments (f_t).

([155]) This presentation, based on the government debt ratio identity equation, allows grasping the impact of real GDP growth and inflation on the debt motion coming from direct valuation effects (as government debt is expressed as a share of GDP). However, the primary balance is also influenced by economic activity and inflation. Such behavioural effects are explicitly taken into account in the fiscal reaction function scenario presented in chapter 2 of the report.

As can be seen from the exchange rate effect expression, both valuation effects affecting the *stock* of foreign currency denominated debt and *interest rate* payments (on this share of government debt) contribute to the debt dynamic. ([156]) Looking at historical series, Eurostat includes the exchange rate effect on the *stock* of foreign currency denominated debt in stock and flow adjustments, while the impact due to the cost of servicing debt in foreign currency is included in interest payments. In our tables, we follow this convention (see Box 2.2 of the report for more details).

In practice, the equation used in our model is slightly more complex than equation (1), as we consider three currencies: the national currency, the EUR (foreign currency for non-euro area countries) and the USD (foreign currency for all countries). Hence, equation (1) becomes:

$$d_t = \alpha^n . d_{t-1} . \frac{(1+i_t)}{(1+g_t)} + \alpha^{eur} . d_{t-1} . \frac{(1+i_t)}{(1+g_t)} . \frac{e_t}{e_{t-1}} + \alpha^{usd} . d_{t-1} . \frac{(1+i_t)}{(1+g_t)} . \frac{\tilde{e}_{t-1}}{\tilde{e}_t} . \frac{e_t}{e_{t-1}} - pb_t + f_t \quad (1)'$$

where α^{eur} represents the share of total government debt denominated in euros

α^{usd} represents the share of total government debt denominated in USD

e_t represents the nominal exchange rate between the national currency and the euro (expressed as national currency per EUR)

$\tilde{e}_t$ represents the nominal exchange rate between the USD and the euro (expressed as USD per EUR).

Such a specification allows taking into account the effect of exchange rate movements on government debt not only in non-euro area countries, but also in euro area countries (among which government debt issued in USD can be significant).

([156]) An indirect effect, due to the fact that exchange rate movements affect the value of GDP in domestic currency through changes in prices in the tradable sector, could also be shown. However, in practice, in line with other institutions practices (e.g. IMF), these effects are not isolated (data limitation would require to impose further assumptions; effect likely to be of second-order).

A3.2. PROJECTING THE IMPLICIT INTEREST RATE ON GOVERNMENT DEBT

As seen from equation (1), a key driver of the debt motion is the implicit interest rate on government debt. Projecting the implicit interest rate on government debt requires not only assumptions on *market* interest rates (for newly issued debt), but also taking into account explicitly the current and future maturity structure of government debt (between short-term and long-term government debt, and between maturing, rolled-over or not, and non-maturing government debt). This allows a differential treatment in terms of interest rates applied to successive "debt vintages", and interestingly captures different levels of exposure of sovereigns to immediate financial markets' pressures.

Formally, in our model, the implicit interest rate is expressed in the following way:

$$iir_t = \alpha_{t-1} . i_t^{ST} + (1 - \alpha_{t-1}) . iir_t^{LT} \quad (3)$$

where iii_t is the implicit interest rate in year t ([157])

i_t^{ST} is the *market* short-term interest rate in year t

iir_t^{LT} is the implicit long-term interest rate in year t

α_{t-1} is the share of short-term debt in total government debt (and $(1 - \alpha_{t-1})$ is the share of long-term debt in total government debt). ([158])

Our model considers two types of government debt in terms of maturity: short-term debt (debt issued with an *original* maturity of less than one year) and long-term debt (debt issued with an *original* maturity of more than one year). Furthermore, government debt can be decomposed between new debt (debt issued to cover new financing requirements), ([159]) maturing debt (i.e. existing debt that is maturing within the year ([160]) and that

([157]) This corresponds to i_t in the previous section.
([158]) Hence, as indicated by the t index, these shares may vary through time depending on the debt dynamic.
([159]) This amount also corresponds to the yearly budgetary deficit.
([160]) Another way to describe it is that this existing debt has a *residual* maturity of less than one year.

needs to be repaid), rolled-over (i.e. whose repayment is covered by newly issued debt) or not, and outstanding debt (i.e. existing debt that has not reached maturity). Combining these different aspects, α_{t-1} (and $(1-\alpha_{t-1})$) used in (3) can be described as follows:

$$\alpha_{t-1} = \frac{D_{t-1}^{STN} + D_{t-1}^{STR}}{D_{t-1}} \quad (4)$$

$$1-\alpha_{t-1} = \frac{D_{t-1}^{o} + D_{t-1}^{LTN} + D_{t-1}^{LTR}}{D_{t-1}} \quad (5)$$

where D_{t-1}^{STN} is the new short-term government debt in year $t-1$

D_{t-1}^{STR} is the maturing and rolled-over short-term government debt (i.e. the existing short-term debt that has reached maturity, and whose repayment is covered by newly issued short-term debt)

D_{t-1}^{LTN} is the new long-term government debt

D_{t-1}^{LTR} is the maturing and rolled-over long-term government debt (i.e. the existing long-term debt that has reached maturity, and whose repayment is covered by newly issued long-term debt)

D_{t-1}^{o} is the outstanding (non-maturing) long-term government debt.

Moreover, the implicit long-term interest rate used in (3) can be further decomposed:

$$iir_t^{LT} = \beta_{t-1}.i_t^{LT} + (1-\beta_{t-1}).iir_{t-1}^{LT} \quad (6)$$

where β_{t-1} is the share of newly issued long-term debt (corresponding to both new debt and maturing and rolled-over debt) in total long-term government debt in year $t-1$ (and $(1-\beta_{t-1})$ is the share of outstanding long-term debt in total long-term government debt)

i_t^{LT} is the *market* long-term interest rate in year t.

The share of newly issued long-term debt (respectively outstanding debt) in total long-term government debt, used in expression (6), is described as follows:

$$\beta_{t-1} = \frac{D_{t-1}^{LTN} + D_{t-1}^{LTR}}{D_{t-1}^{o} + D_{t-1}^{LTN} + D_{t-1}^{LTR}} \quad (7)$$

$$(1-\beta_{t-1}) = \frac{D_{t-1}^{o}}{D_{t-1}^{o} + D_{t-1}^{LTN} + D_{t-1}^{LTR}} \quad (8)$$

Hence, replacing iir_t^{LT} in (3) by its expression in (6) gives:

$$iir_t = a_{t-1}.i_t^{ST} + b_{t-1}.i_t^{LT} + (1-a_{t-1}-b_{t-1}).iir_{t-1}^{LT} \quad (3)'$$

From equation (3)', we can see that the implicit interest rate on government debt at year t is a weighted average of market short-term and long-term interest rates and of the implicit interest rate on outstanding (i.e. non-maturing) long-term debt in year $t-1$. Hence, depending on the weight of outstanding debt in total government debt, an increase of market interest rates will transmit more or less quickly to the implicit interest rate on government debt.

In the projections, the following assumptions are made:

- i_t^{LT} is supposed to converge linearly to 5% in nominal terms (3% in real terms) for all countries by the T+10 horizon;

- i_t^{ST} is supposed to converge linearly to i_t^{LT} time a coefficient corresponding to the historical (pre-crisis) EA yield curve (currently 0.83) for all countries by the T+10 horizon;

- new debt (D_{t-1}^{STN} and D_{t-1}^{LTN}) is assumed to be issued in the projections, as a proportion of the variation of government debt, based on the shares given by Estat (of short-term and long-term government debt), ([161]) whenever government debt is projected to increase; ([162])

- short-term debt issued in year $t-1$ is assumed to entirely mature within the year, and to be rolled-over (D_{t-1}^{STR}) as a proportion of past government debt, based on the share of short-term government

([161]) More precisely, we use the average shares over the last 3 years available.

([162]) Otherwise, in the cases where government debt is projected to decrease, for instance, in case of a budgetary surplus, no new debt needs to be issued.

debt given by Estat, whenever government debt is projected to increase; ([163])

- a fraction of long-term debt issued in the past is assumed to mature every year, and to be rolled-over (D_{t-1}^{LTR}), whenever government debt is projected to increase. ([164]) This fraction is estimated based on Estat data on the share of long-term government debt and on ECB data on the share of existing long-term debt maturing within the year. ([165])

Finally, the values of the different variables *over the forecast horizon* (especially i_t^{LT}, i_t^{ST} and iir_{t-1}^{LT}) are set consistently with the available forecast values of the implicit interest rate (iir_t) and information on the maturity structure of debt.

([163]) Otherwise, in the cases where government debt is projected to decrease, for instance, in case of a budgetary surplus, only part of this maturing debt needs to be rolled-over (none when government debt is assumed to strongly decrease, for example, when a large budgetary surplus allows repaying past maturing debt).

([164]) See previous footnote.

([165]) More precisely, the starting point (currently 2018) is calculated based on the 2017 ECB data on the share of long-term debt that is maturing within the year. Beyond this year, it is assumed that the share of maturing long-term debt linearly converges from the value taken in the last available year (2018) to the country-specific historical average by the end of the T+10 projection horizon. Additionally, for post-program countries, IE, CY and PT, the redemption profile of official loans has been taken into account for the calculation of the long-term debt maturing within the year.

ANNEX A4

Stochastic debt projections based on a historical variance-covariance matrix

This Annex provides a description of the methodology used for stochastic debt projections based on the historical variance-covariance matrix approach and the data used to implement it. ([166])

A4.1. THE METHOD TO OBTAIN (ANNUAL) STOCHASTIC SHOCKS TO MACROECONOMIC VARIABLES

Stochastic shocks are simulated for five macroeconomic variables entering the debt evolution equation: the government primary balance, nominal short-term interest rate, nominal long-term interest rate, nominal growth rate and exchange rate. First, the methodology requires transforming the time series of quarterly data for each macroeconomic variable x into series of historical quarterly shocks δ_q^x as follows:

$$\delta_q^x = x_q - x_{q-1}$$

A Monte Carlo simulation is then run by extracting random vectors of quarterly shocks over the projection period (2019-23) from a joint normal distribution with zero mean and variance-covariance matrix identical to that of historical (quarterly) shocks. The quarterly shocks (ε_q) obtained in this way are aggregated into annual shocks to primary balance, nominal short-term interest rate, nominal long-term interest rate, nominal growth, and exchange rate for non-EA countries, as follows:

– the shock to the primary balance b in year t is given by the sum of the quarterly shocks to the primary balance:

$$\varepsilon_t^b = \sum_{q=1}^{4} \varepsilon_q^b$$

– the shock to nominal growth g in year t is given by the sum of the quarterly shocks to growth:

$$\varepsilon_t^g = \sum_{q=1}^{4} \varepsilon_q^g$$

– the shock in year t to the nominal exchange rate e is given by the sum of the quarterly shocks to the exchange rate:

$$\varepsilon_t^e = \sum_{q=1}^{4} \varepsilon_q^e$$

– the shock in year t to the nominal *short-term* interest rate i^S is given by the sum of the quarterly shocks to the short-term interest rate:

$$\varepsilon_t^{i^S} = \sum_{q=1}^{4} \varepsilon_q^{i^S}$$

The calculation of the shock to the nominal short-term interest rate in annual terms is justified based on the fact that the short-term interest rate is defined here as the interest rate on government bonds with maturity below the year. With the equation above, we rule out persistence of short-term interest rate shocks over time, exactly as done in standard deterministic projections. In other words, unlike the case of the long-term interest rate (see below), a shock to the short-term interest rate occurring in any of the quarters of year t is not carried over beyond year t.

– the aggregation of the quarterly shocks to the nominal *long-term* interest rate i^L into annual shocks takes account of the persistence of these shocks over time. This is due to the fact that long-term debt issued/rolled over at the moment where the shock takes place will remain in the debt stock, for all years to maturity, at the interest rate conditions holding in the market at the time of issuance ([167]). A shock to the long-term interest rate in year t is therefore carried over to the following years in proportion to the share of maturing debt that is progressively rolled over (ECB data on weighted average maturity is used to implement this). For countries where average weighted maturity of debt T is equal or greater than the number of projection years (5 years, from 2019 to 2023), the annual shock to long-term interest rate in year t is defined as:

([166]) For more details see Berti (2013).

([167]) The implicit assumption is made here that long-term government bonds are issued at fixed interest rates only.

$$\varepsilon_t^{i^L} = \frac{1}{T}\sum_{q=1}^{4} \varepsilon_q^{i^L} \; if \; t = 2019$$

$$\varepsilon_t^{i^L} = \frac{2}{T}\sum_{q=-4}^{4} \varepsilon_q^{i^L} \; if \; t = 2020$$

$$\varepsilon_t^{i^L} = \frac{3}{T}\sum_{q=-8}^{4} \varepsilon_q^{i^L} \; if \; t = 2021$$

$$\varepsilon_t^{i^L} = \frac{4}{T}\sum_{q=-12}^{4} \varepsilon_q^{i^L} \; if \; t = 2022$$

$$\varepsilon_t^{i^L} = \frac{5}{T}\sum_{q=-16}^{4} \varepsilon_q^{i^L} \; if \; t = 2023$$

where q = -4, -8, -12, -16 respectively indicate the first quarter of years *t*-1, *t*-2, *t*-3 and *t*-4. The set of equations above clearly allows for shocks to the long-term interest rate in a certain year to carry over to the following years, till when, on average, debt issued at those interest rate conditions will remain part of the stock.

For countries where the average weighted maturity of debt is smaller than the number of projection years, the equations above are adjusted accordingly to reflect a shorter carryover of past shocks. For instance, countries with average weighted maturity T = 3 years will have the annual shock to the long-term interest rate defined as follows ([168]):

$$\varepsilon_t^{i^L} = \frac{1}{3}\sum_{q=1}^{4} \varepsilon_q^{i^L} \; if \; t = 2019$$

$$\varepsilon_t^{i^L} = \frac{2}{3}\sum_{q=-4}^{4} \varepsilon_q^{i^L} \; if \; t = 2020$$

$$\varepsilon_t^{i^L} = \sum_{q=-8}^{4} \varepsilon_q^{i^L} \; if \; t \geq 2021$$

([168]) Annual shocks to the long-term interest rate for countries with weighted average maturities of 2 and 4 years will be defined in a fully analogous way.

Finally, the weighted average of annual shocks to short-term and long-term interest rates (with weights given by the shares of short-term debt, α^S, and long-term debt, α^L, over total) gives us the annual shock to the implicit interest rate *i*:

$$\varepsilon_t^{i} = \alpha^S \varepsilon^{i^S} + \alpha^L \varepsilon^{i^L}$$

A4.2. APPLYING STOCHASTIC SHOCKS TO THE CENTRAL SCENARIO

All results from stochastic projections presented in this report refer to a scenario in which shocks are assumed to be temporary. In this case, annual shocks ε are applied to the baseline value of the variables (primary balance *b*, implicit interest rate *i*, nominal growth rate g and exchange rate *e*) each year as follows:

$b_t = \bar{b}_t + \varepsilon_t^b$ with $\bar{b}_t$ = baseline (from standard deterministic projections) primary balance at year *t*

$g_t = \bar{g}_t + \varepsilon_t^g$ with $\bar{g}_t$ = baseline (from standard deterministic projections) nominal GDP growth at year *t*

$i_t = \bar{\imath}_t + \varepsilon_t^i$ with $\bar{\imath}_t$ = baseline (from standard deterministic projections) implicit interest rate at year *t*

$e_t = \bar{e}_t + \varepsilon_t^e$ with $\bar{e}_t$ = nominal exchange rate as in DG ECFIN forecasts if *t* within forecast horizon; nominal exchange rate identical to last forecasted value if *t* beyond forecast horizon.

In other words, if the shock in year *t* were equal to zero, the value of the variable would be the same as in the standard deterministic baseline projections.

A4.3. THE DEBT EVOLUTION EQUATION

Through the steps described above we obtain series, over the whole projection period, of simulated government primary balance, nominal growth rate, implicit interest rate and nominal exchange rate that can be used in the debt evolution equation to calculate debt ratios over a 5-year horizon, starting from the last historical value.

The debt evolution equation takes the following form:

$$d_t = \alpha^n d_{t-1} \frac{1+i_t}{1+g_t} + \alpha^f d_{t-1} \frac{1+i_t}{1+g_t} \frac{e_t}{e_{t-1}} - b_t + c_t + f_t$$

where d_t = debt-to-GDP ratio in year *t*

α^n = share of total debt denominated in national currency ([169])

α^f = share of total debt denominated in foreign currency

b_t = primary balance over GDP in year *t*

c_t = change in age-related costs over GDP in year *t* relative to starting year ([170])

f_t = stock-flow adjustment over GDP in year *t*

All the steps above (extraction of random vectors of quarterly shocks over the projection horizon; aggregation of quarterly shocks into annual shocks; calculation of the corresponding simulated series of primary balance, implicit interest rate, nominal growth rate and exchange rate; calculation of the corresponding path for the debt ratio) are repeated 2000 times. This allows us to obtain yearly distributions of the debt-to-GDP ratio over 2019-23, from which we extract the percentiles to construct the fan charts.

In the construction of the asymmetric fan charts, a restriction is placed on the upside primary balance shocks. This allows to exclude the primary balance shocks that are higher than a one half standard deviation of the primary balance sample.

([169]) Shares of public debt denominated in national and foreign currency are kept constant over the projection period at the latest ESTAT data (ECB data are used for those countries, for which ESTAT data were not available).

([170]) Figures on age-related costs from the European Commission's 2018 Ageing Report were used.

A4.4. THE DATA USED

For the calculation of the historical variance-covariance matrix, quarterly data on government primary balance are taken from ESTAT; nominal short-term and long-term interest rates are taken from IMF-IFS and OECD; quarterly data on nominal growth rate come from ESTAT and IMF-IFS; quarterly data on nominal exchange rate for non-EA countries come from ESTAT.

Results using the methodology described above were derived for all EU countries by using both short-term and long-term interest rates, whenever possible based on data availability, to keep in line with standard deterministic projections. This was indeed possible for the vast majority of EU countries, the only exceptions being Bulgaria, Croatia and Estonia. ([171]) Shocks to the primary balance were simulated for all countries but two (Croatia and Estonia), based on availability of sufficiently long time series of quarterly primary balances.

In general, data starting from the late 90s - early 2000s until the second quarter of 2018 were used to calculate the historical variance-covariance matrix.

([171]) For Estonia and Croatia we only used the short-term interest rate as quarterly data on the long-term rate were not available; for Bulgaria we used the long-term interest rate only as data on the short-term rate were not available for most recent years.

ANNEX A5
The Stability and Growth Pact scenario

The SGP scenario assumes that, in compliance with Council recommendations, countries under the EDP (the corrective arm) maintain the recommended structural fiscal adjustment until the correction of the excessive deficit. Thereafter, a structural consolidation effort, determined according to the preventive arm of the Pact as clarified by the January 2015 European Commission Communication regarding SGP flexibility ('flexibility Communication' hereafter) and the February 2016 ECOFIN Commonly agreed position, ([172]) is maintained until the MTO is reached. For countries that are under the preventive arm, the annual fiscal adjustment required to reach the MTO is determined according to the aforementioned documents ([173]) and applied as from 2020. More details are contained in Table A5.1.

To reflect the feedback effect of fiscal consolidation on GDP, the SGP scenario assumes that a 1 pp. of GDP consolidation effort impacts negatively baseline GDP growth by 0.75 pps. in the same year) ([174]).

Table A5.1: **SGP scenario: main features**

Date	Countries under EDP	Countries not under EDP (but whose SB < MTO in 2019)	Countries not under EDP (and whose SB >= MTO in 2019)
2019	fiscal consolidation (in terms of SB) fixed by Council recommandation	SB = forecast value	SB = forecast value (>= MTO)
2020 until excessive deficit (if any) corrected		fiscal consolidation (in terms of SB) determined by the matrix (for cyclical conditions), investment and structural reforms' clauses (flexibility communication)	SB constant (>= MTO)
excessive deficit (if any) corrected until MTO reached	fiscal consolidation (in terms of SB) determined by the matrix (for cyclical conditions), investment and structural reforms' clauses (flexibility communication)		
MTO reached until end of projections (2029)	SB constant (>= MTO)	SB constant (>= MTO)	

Source: Commission services

In 2019, no EU countries remain under the EDP, meaning that at this stage no EU country is bound by Council-recommended fiscal consolidation under the EDP any longer. Instead, fiscal adjustment in all EU countries is now governed by the matrix applied under the preventive arm. Indeed, for countries under the preventive arm and for countries under EDP once the excessive deficit will have been corrected, the annual fiscal adjustment required to reach the MTO is determined according to the matrix defined in the flexibility Communication (see Table A5.2). This matrix specifies the appropriate fiscal adjustment, required under the preventive arm of the SGP, taking better account of the cyclical situation of individual Member States. The level of requested fiscal effort is also modulated according to the level of the debt ratio (below or above 60% of GDP) and to the presence of sustainability risks. Importantly, the SGP scenario (built on the *Autumn forecasts* for the year t+1) does not consider the possible further granting of flexibility (on top of the one granted in the 2018 European Semester) to temporarily deviate from the MTO or the adjustment path towards it, under the structural reform and / or investment clause (see the aforementioned flexibility Communication).

Table A5.2: **Matrix specifying the fiscal adjustment towards the MTO in terms of the change in the structural balance (preventive arm of the SGP)**

	Condition	Required annual fiscal adjustment	
		Debt below 60% of GDP and no sustainability risk	Debt above 60% of GDP or sustainability risk
Exceptionnaly bad times	Real growth < 0% or output gap < -4	no adjustment needed	
Very bad times	-4 <= output gap < -3	0	0,25
Bad times	-3 <= output gap < -1.5	0 if growth below potential, 0.25 if growth above potential	0.25 if growth below potential, 0.5 if growth above potential
Normal times	-1.5 <= output gap < 1.5	0,5	> 0.5
Good times	output gap >= 1.5	> 0.5 if growth below potential, >= 0.75 if growth above potential	>= 0.75 if growth below potential, >= 1 if growth above potential

Source: Commission services

Under the preventive arm of the SGP, the structural balance is assumed to converge to its MTO value, as set by Member States to ensure sustainability, including taking into account future ageing-related liabilities and debt level (see European Commission, 2018g). Therefore, differently to the baseline no-fiscal policy change scenario, future changes in ageing costs are 'compensated' e.g. through expenditure re-allocation ([175]).

([172]) Regulation 1466/97, as clarified by the Commission Communication regarding SGP flexibility of 13 January 2015 (COM(2015)12 final). See also the Commonly agreed position on flexibility within the SGP as endorsed by the ECOFIN Council of 12 February 2016 (Council document number 14345/15).

([173]) See previous footnote for more details.

([174]) Carnot and de Castro (2015).

([175]) In the baseline no-fiscal policy change scenario, the structural balance is projected by assuming a constant structural primary balance (before costs of ageing) at the

Table A5.3: **Fiscal adjustment required under the SGP scenario (change in structural balance, pps. of GDP)**

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	MTO reached in
BE	0,6	0,6	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2022
BG	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
CZ	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
DK	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
DE	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
EE	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2020
IE	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
ES	1,0	0,6	0,6	0,6	0,3	0,0	0,0	0,0	0,0	0,0	2024
FR	0,6	0,6	0,6	0,1	0,0	0,0	0,0	0,0	0,0	0,0	2023
HR	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
IT	0,6	0,6	0,6	0,6	0,6	0,0	0,0	0,0	0,0	0,0	2024
CY	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
LV	0,5	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2021
LT	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
LU	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
HU	0,7	0,7	0,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2022
MT	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
NL	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
AT	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
PL	0,6	0,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2021
PT	0,6	0,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2021
RO	0,5	0,5	0,5	0,5	0,4	0,0	0,0	0,0	0,0	0,0	2024
SI	0,7	0,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2021
SK	0,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2020
FI	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2020
SE	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2019
UK	0,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2020

Source: Commission services

The fiscal effort required for 2020 and onwards under the SGP preventive arm, taking into account the flexibility allowed by the SGP, is incorporated in our debt projections as reported in Table A5.3. In 2020, the required fiscal adjustment ranges from 0 pps. of GDP for a set of countries that would have already (over-)reached their MTO (DK, NL, BG, LU, SE, AT, LT, DE, MT, CZ, HR, CY and IE) to 1.0 pp. of GDP in the case ES and 0.7 pps. of GDP in that of HU and SI. By 2024, all countries will have reached their MTO in this scenario.

last forecast value, then integrating successively ageing costs and the interest rate bill. Hence, in the baseline scenario, expected increases (or decreases) of ageing costs are not supposed to be compensated.

ANNEX A6

Assessment of fiscal sustainability challenges: criteria used and decision trees

A6.1. THE OVERALL LOGIC FOLLOWED IN FISCAL SUSTAINABILITY ASSESSMENTS

The logic followed in fiscal sustainability assessment is the one used in the Fiscal Sustainability Report 2015 and in the Debt Sustainability Monitor 2016. An overview of the overall logic followed in the new approach and the elements that feature in it is provided in Graph A6.1.

In the remainder of this annex, the renewed approach to reach an overall assessment of medium-term sustainability challenges is described in more detail. A summary overview of the thresholds used in fiscal sustainability assessment (and in particular in the summary heat map in Chapter 6) is provided in Section A6.3.

A6.2. THE APPROACH USED IN THE ASSESSMENT OF MEDIUM-TERM SUSTAINABILITY CHALLENGES

The assessment of medium-term sustainability challenges is based an overall conclusion on the country's DSA *and* on S1 (under the baseline no-fiscal policy change scenario). A country is assessed to be at potential high (medium) risk if either the baseline S1 indicator *or* the DSA or both are highlighted in red (yellow) (see Graph A6.2).

The overall assessment of the country's DSA is reached by looking at debt projection results under two different scenarios (baseline no-fiscal policy change scenario; historical SPB scenario) and a series of negative sensitivity tests (on nominal growth, interest rates and primary balance) around the baseline no-fiscal policy change projections. ([176]) Synthetic stochastic debt projection results are also brought into the picture to reach the overall risk assessment on DSA.

The decision tree that is followed in this respect can be visualised in Graph A6.3. Practically, a country's DSA is deemed to highlight potential high risks if the baseline no-fiscal policy change debt projections are assessed to entail high risks, or if they are deemed to entail medium risks, but high risks are still highlighted by alternative scenarios (the historical SPB scenario or at least one of the sensitivity tests on macro-fiscal assumptions) or by stochastic projections. The high-risk assessment based on the latter criterion is meant to prudentially capture significant upward risks around a baseline that is already considered at medium risk. ([177])

Finally, at the lowest level of granularity, the risk assessment for each debt projection scenario/sensitivity test and for stochastic projections, on which the overall DSA assessment relies, follows an economic rationale that is explained in Graph A6.4. The variables used to summarise deterministic debt projection results are the following:

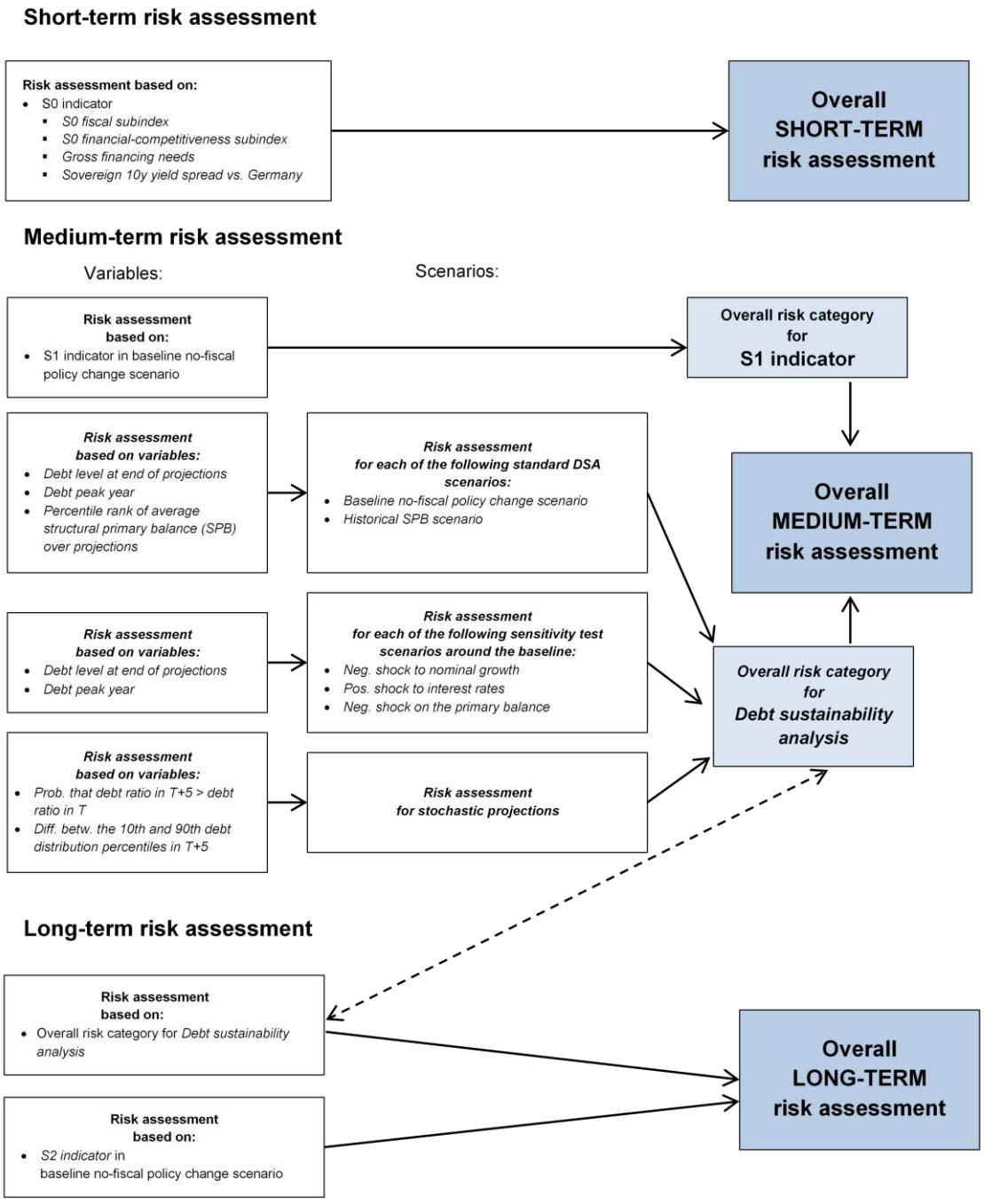
- The level of the debt ratio at the end of projections (2028);
- The year in which the debt ratio peaks over the 10-year projection horizon (providing a synthetic indication of debt dynamics);
- The percentile rank of the average SPB assumed over the projection horizon in the specific scenario (giving a sense of how common/uncommon the fiscal stance assumed in the projections is, relative to the SPB distribution for all EU countries over 1980-2017). ([178])

([176]) Positive sensitivity tests are neglected in the overall assessment as the idea is rather to stress test baseline debt projections against upward risks.

([177]) A prudential approach is what guides this choice. In particular, adopting a high level of prudence has been considered as particularly important in the case of countries being already considered at medium risk under the baseline no-fiscal policy change scenario. In this case, an historical SPB scenario (where fiscal policy is assumed to revert to historical behaviour) in red would be sufficient to lead to a high risk assessment, as indicated in Graph A6.3. This high level of prudence has not been deemed necessary for a country that is, on the contrary, deemed to be at low risk (thus far from vulnerable) under the baseline scenario (in this case a medium or high risk assessment under the historical SPB scenario does not lead in itself to a medium risk assessment).

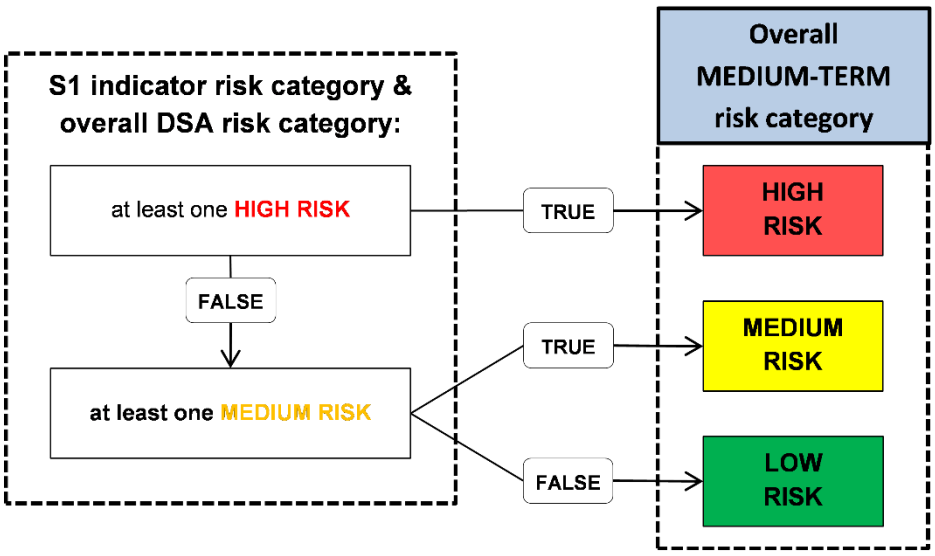
([178]) For the individual sensitivity test scenarios, the percentile rank of the average SPB over the projection horizon is not used for the scenarios' risk assessment (see Graph XXX). The reason is that these sensitivity tests are all run around the baseline no-fiscal policy change scenario, for which the variable percentile rank of the average SPB is already used in the assessment.

Graph A6.1: **Decision tree for the multi-dimensional approach to the assessment of fiscal sustainability challenges**



Source: Commission services.

Graph A6.2: **Decision tree for the assessment of medium-term sustainability challenges**



Source: Commission services.

Stochastic debt projections are summarised using the following two indicators (as indicated in Chapter 3):

- The probability of a debt ratio at the end of the 5-year stochastic projection horizon (2022) greater than the initial (2017) debt ratio (capturing the probability of a higher debt ratio due to the joint effects of macroeconomic and fiscal shocks);

- The difference between the 10th and the 90th debt distribution percentiles (measuring the width of the stochastic projection cone, i.e. the estimated degree of uncertainty surrounding baseline projections).

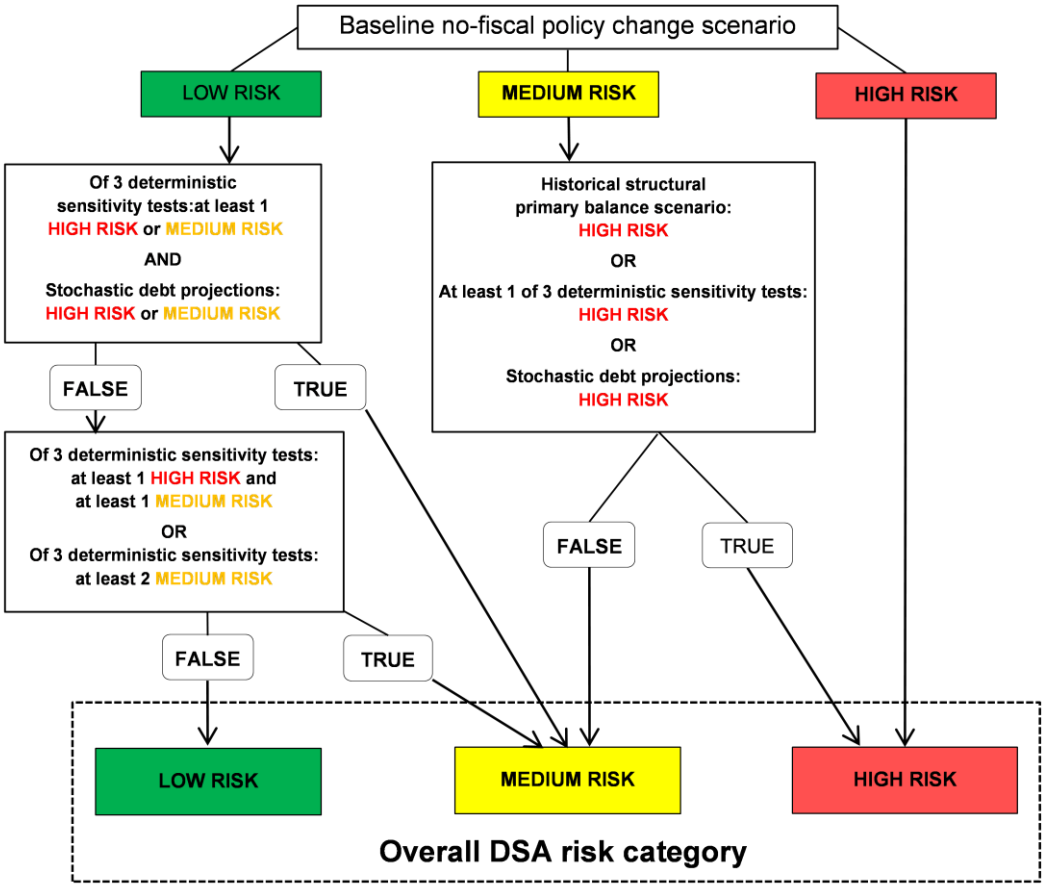
As indicated in Graph A6.4, a DSA scenario is highlighted as high risk in case the debt ratio at the end of projections is considered at high risk (above 90% of GDP – see Table A6.1 for thresholds on all DSA variables) or if the debt peak year and the SPB percentile rank are both assessed as high risk, which means that the debt ratio is on a longer (at least up to T+7) increasing path, even with projections that are based on a relatively ambitious SPB (see again Table A6.1 for precise thresholds). ([179])

A sensitivity test (on growth, interest rate or the primary balance) is highlighted as high risk if it leads to a debt ratio at the end of projections above 90% (red), or if the end-of-projection debt ratio is between 70% and 90% (thus already significantly above the 60% Treaty reference value) and the debt peak year is highlighted in red, thereby indicating that the debt ratio is still on an increasing path towards the end of projections (up to T+7 at least).

Finally stochastic debt projections are summarised in red if the probability of a debt ratio at the end of the 5 years of projections greater than the initial debt level is assessed as high risk (with different thresholds being set in this case for different groups of countries with different initial debt ratios – see Table A6.1). On the contrary, the fact of having a high level of estimated uncertainty around baseline projections is in itself considered

([179]) As indicated in Table A6.1, the SPB percentile ranks used as upper and lower thresholds are 15% and 30%. The 15% percentile rank corresponds to the 85th distribution percentile in the SPB distribution (over all EU countries for 1980-17), which corresponds to an SPB of 3.4% of GDP, while the 30% percentile rank corresponds to the 70th distribution percentile, which is an SPB of 1.5% of GDP.

Graph A6.3: **Decision tree for country risk assessment based on debt sustainability analysis**



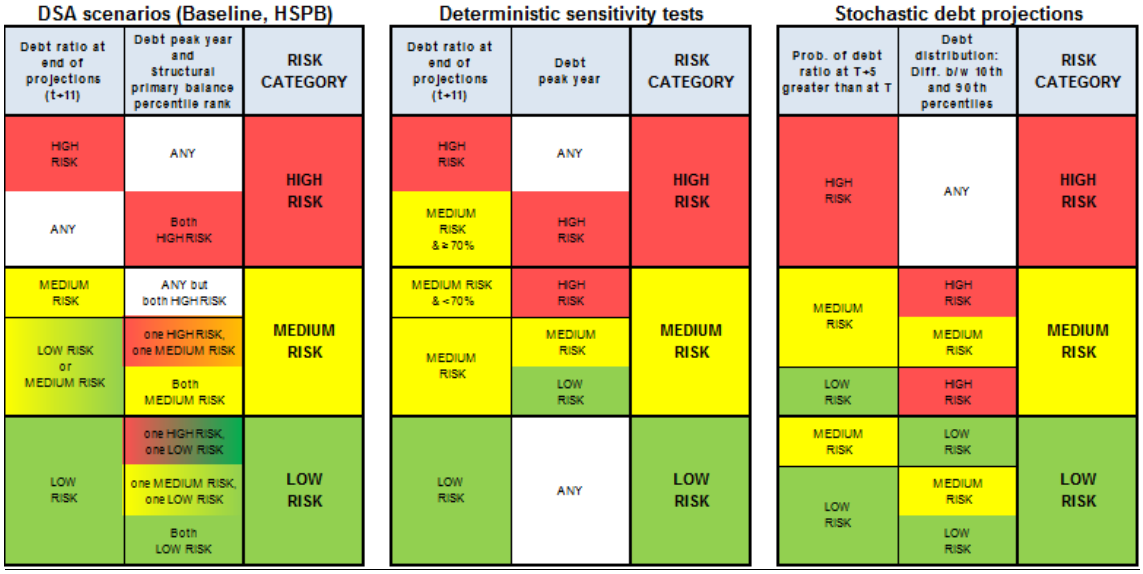
Source: Commission services.

as a sufficient condition for a high-risk assessment but leads to a medium-risk assessment (this high volatility can be associated with very low or relatively low debt levels, in which case it cannot be meaningfully considered as high risk).

As already explained, the overall assessment reached for the country's DSA is then integrated with the assessment reached using the traditional S1 indicator (under the baseline no-fiscal policy change scenario) as indicated in Graph A6.2.

The assessment of overall long-term sustainability challenges is based on the results of the S2 sustainability gap indicator and the overall conclusion on the country's DSA. A country is assessed to be at potential high risk if (i) the S2 indicator flags high risk irrespective of the risk type implied by the overall results of the DSA or (ii) the S2 indicator is at medium risk, but the overall results of DSA point to either medium or high risk. Furthermore, a country is assessed at medium risk instead of low risk if the long-term sustainability S2 is assessed at low risk and the overall DSA flags either medium or high risk (see Table A6.2).

Graph A6.4: **Assessment criteria used for debt projections, sensitivity tests and stochastic debt projections**



Source: Commission services

Table A6.1: **Thresholds used for DSA variables**

Variable	*Threshold*	
Debt ratio at the end of projections (2029)	***Red:*** above 90% ***Yellow:*** between 60% and 90% ***Green:*** below 60%	
Debt peak year	***Red:*** peak year btw. T+7 and end projections (2025-29), or still increasing at end projections ***Yellow:*** peak year between end of forecasts (T+3) and T+6 (2021-24) ***Green:*** peak year within forecast horizon (2018-20)	
Percentile rank of average SPB over projection period (2020-29)	***Red:*** if smaller than (or equal to) 15% ***Yellow:*** between 15% and 30% ***Green:*** greater than 30%	
Probability of debt ratio at the end of 5-year stochastic projection horizon (2023) greater than initial (2018) debt ratio	Initial (2018) debt ratio at or above 90%:	***Red:*** if probability above 30% ***Yellow:*** if probability strictly positive and at or below 30% ***Green:*** if zero probability
	Initial (2018) debt ratio at or above 55% and below 90%:	***Red:*** if probability above 60% ***Yellow:*** if probability between 30% and 60% ***Green:*** if probability below 30%
	Initial (2018) debt ratio below 55%:	***Yellow:*** if probability above 70% ***Green:*** if probability at or below 70%
Difference between 10^{th} and 90^{th} debt distribution percentiles from stochastic projections	***Red:*** the third of the countries with highest dispersion ***Yellow:*** the third of the countries with intermediate dispersion ***Green:*** the third of the countries with lowest dispersion	

Source: Commission services.

Table A6.2: **Assessment approach based on the S2 indicator and the overall results of the DSA**

S2 indicator - baseline scenario	Debt Sustainability Analysis (DSA) - overall risk	RISK CATEGORY
HIGH RISK	HIGH RISK	HIGH RISK
	MEDIUM RISK	
	LOW RISK	
MEDIUM RISK	HIGH RISK	HIGH RISK
	MEDIUM RISK	MEDIUM RISK
	LOW RISK	
LOW RISK	HIGH RISK	MEDIUM RISK
	MEDIUM RISK	
	LOW RISK	LOW RISK

Source: Commission services.

A6.3. A SUMMARY OVERVIEW OF THRESHOLDS USED IN FISCAL SUSTAINABILITY ASSESSEMENT

In this section we provide a summary overview of thresholds used to identify fiscal sustainability challenges (with the only exception of thresholds used for DSA variables that have already been discussed and reported in the previous section – see Table A6.1).

For the indicators / variables discussed in this section, the thresholds themselves, as well as the methodologies used to derive them, have already been described in more detail in other sections of the report (Chapters 2 - 4, Annexes A2 - A3). Here the purpose is to provide a quick reference for the identification of fiscal sustainability challenges reported in the different heat maps presented in this report (see also Annex A9).

As explained in Chapter 2, the thresholds of risk for S0 and the two S0 sub-indexes (fiscal and financial-competitiveness) have been calculated using the signals' approach (see Annex A1 for details), and are reported in Table A6.3.

For all other variables used to identify short-term risks (see Chapters 2, 5), the upper thresholds of risk (above which values are highlighted in red) have also been derived using the signals' approach (see Chapter 5 and Annex A1), while lower thresholds of risk (above which values are highlighted in yellow, till when they remain below the upper threshold of risk) have been set at around 80% of the original signals' approach thresholds, for prudential reasons (see Table A6.3). ([180])

For the S1-S2 indicators and respective ageing sub-components (used in the assessment of medium- and long-term sustainability challenges respectively), upper and lower thresholds are also reported in Table A6.3.

For S1 and S2 ageing sub-components (cost of ageing sub-component for S1; pensions, healthcare and long-term care sub-components for S2), thresholds (above which values are highlighted in red) correspond to the EU average (see Table A6.3). Finally, for the percentile rank of the required structural primary balance (RSPB) associated with S1 and S2 respectively, the same upper and lower thresholds are used as for the percentile rank of the average structural primary balance in DSA scenarios (see Table A6.1).

([180]) Variables common to the scoreboard used in the Macroeconomic Imbalances Procedure (MIP) have here different thresholds than under the MIP because the methodologies used to calculate these thresholds are different.

Table A6.3: **All thresholds used in fiscal sustainability assessment (except for DSA variables)**

	Safety	*Upper threshold*	*Lower threshold*
SHORT-TERM RISKS			
S0 overall index	<	0.46	:
S0 fiscal sub-index	<	0.36	:
S0 financial-competitiveness sub-index	<	0.49	:
Fiscal risks from fiscal context			
Balance (% of GDP)	>	-9.61	-7.69
Primary balance (% of GDP)	>	0.23	0.28
Cyclically-adjusted balance (% of GDP)	>	-2.50	-2.00
Stabilising primary balance (% of GDP)	<	2.34	1.88
Gross debt (% of GDP)	<	68.44	54.75
Change in gross debt (% of GDP)	<	8.06	6.45
Short-term public debt (% of GDP)	<	13.20	10.56
Net debt (% of GDP)	<	59.51	47.61
Gross financing needs (% of GDP)	<	15.95	12.76
Interest-growth rate differential (%)	<	4.80	3.84
Change in governement expenditure (% of GDP)	<	1.90	1.52
Change in governement consumption (% of GDP)	<	0.61	0.49
Fiscal risks from macro-financial context			
Yield curve (%)	>	0.59	0.71
Real GDP growth (%)	>	-0.67	-0.53
GDP per capita in PPP (% US level)	>	72.70	87.23
Net international investment position (% of GDP)	>	-19.80	-15.84
Net savings households (% of GDP)	>	2.61	3.13
Private debt (% of GDP)	<	164.70	131.76
Private credit flow (% of GDP)	<	11.70	9.36
Short-term debt non-financial corporations (% of GDP)	<	15.40	12.32
Short-term debt households (% of GDP)	<	2.90	2.32
Construction (% of value added)	<	7.46	5.97
Current account balance (% of GDP)	>	-2.50	-2.00
Change in REER (%)	<	9.67	7.73
Change in nominal ULC (%)	<	7.00	5.60
Additional variables structure of public debt			
Share of short-term public debt (% of debt)	<	6.57	5.30
Share of public debt in foreign currency (% of debt)	<	31.58	25.00
Share of public debt held by non-residents (% of debt)	<	49.01	40.00
Additional variables contingent liabilites banking sector	<		
Bank loans-to-deposits ratio (%)	<	133.37	107.00
Share of non-performing loans (% of loans)	<	2.30	1.80
Change in share of non-performing loans (p.p.)	<	0.30	0.24
NPL coverage ratio (% loans)	>	66.00	33.00
Change in nominal house prix index (%)	<	13.21	11.00
Fiscal risks from financial market developments			
Sovereign yield spreads (bp) - 10 year	<	231.00	184.80
MEDIUM-TERM RISKS			
S1 indicator (baseline, historical SPB, AWG risk scenarios)	<	2.5	0.0
Cost of ageing sub-component	<	0.5	:
RSPB related to S1 - Percentile rank	>	15%	30%
DSA variables		see Table A6.1	
LONG-TERM RISKS			
S2 indicator (baseline, historical SPB, AWG risk scenarios)	<	6.0	2.0
Pensions sub-component	<	0.4	:
Health care sub-component	<	0.7	:
Long-term care sub-component	<	0.7	:
RSPB related to S2 - Percentile rank	>	15%	30%

Source: Commission services.

ANNEX A7

Signalling approach for the analysis of government debt structure, sovereign yield spreads and banking sector vulnerabilities

Table A7.1: **Thresholds, signalling power, type I and type II errors obtained by applying the signals' approach**

Variables	safety	threshold	signaling power	type I error	type II error
Government debt structure variables					
Government debt held by non-residents, share of total, %	<	49.01	0.30	0.36	0.33
Government debt issued in foreign currency, share of total, %	<	31.58	0.08	0.21	0.71
Government short-term debt, share of total, %	<	6.57	0.21	0.69	0.10
Government bond yield spread					
Govt bond yield spreads relative to Germany/US, 10-year benchmark, basis points	<	231.00	0.37	0.10	0.52
Variables of banking sector vulnerabilities					
Bank loan to deposit ratio	<	133.37	0.24	0.23	0.53
Non-performing loans to total gross loans, %	<	2.30	0.21	0.69	0.10
Change in non-performing loans to total gross loans, %	<	0.30	0.38	0.25	0.37
Change in nominal house price index, YoY growth	<	13.21	0.19	0.17	0.65

Source: Commission services.

Table A7.1 reports results on optimal thresholds, signalling power, type I and type II errors obtained by applying the signals' approach (as explained in Annex A1) to individual variables describing the structure of public debt financing, sovereign yield spreads and variables capturing banking sector vulnerabilities. In all these cases, *optimal thresholds of fiscal stress* are determined (by relating the historical behaviour of the variables to the time series of fiscal stress events, as explained in Annex A1). These variables are notably used in the heat maps on government debt structure and government contingent liability risks (see Chapter 5 and Annex A9) and in the table with financial market information reported in the country statistical fiches (see Annex A10).

ANNEX A8

Estimating the potential impact of simulated bank losses on public finances based on the SYMBOL model

A8.1. DATA SAMPLE

SYMBOL approximates the probability distributions of individual bank's losses using publicly available information from banks' financial statements. In particular, the model estimates an average implied default probability of the individual banks' asset/loan portfolios by inverting the Basel FIRB formula for capital requirements ([181]).

The main data source on banks' financial statements is Orbis Bank Focus, a commercial database of the private company Bureau van Dijk. ([182]). For the reference year 2017, unconsolidated data for commercial, saving and cooperatives banks are included. The database as provided by Orbis Bank Focus lacks information on specific variables for some banks in the sample (e.g. capital, risk weighted assets, provisions, gross non-performing loans). In those cases, capital is imputed via a robust regression by common equity, while risk weighted assets are approximated using the total regulatory capital ratio (at bank or country level) ([183]). While gross losses are available for all banks, values for provisions and non-performing loans are available only for two thirds of the sample. Missing values for provisions have thus been estimated by country aggregates coming from EBA dashboard ([184]), while missing values for non-performing loans have been imputed by applying a robust regression with provisions as explanatory variable. Information on the sample is presented in Table A8.1. Note that the risk weighted assets and capital reported in the table have been adjusted by a correction coefficient to reflect the new definitions proposed in the CRDIV ([185]).

Similarly to past exercises the sample covers roughly 70% of all EU banking assets.

When the sample includes either a small number of banks or the share of total assets covered is low, results should be interpreted with caution, since a minor change to any bank's data or the addition of a new bank could have large effects on results. The cases where this problem arises (Estonia, Lithuania, and Malta) are marked by asterisks in results tables.

As reported in the report of Finansinspektionen (Financial Supervisory Authority) Nordea Bank AB (Nordea) decided on 15 March 2018 to move its head office from Sweden to Finland ([186]). Since our short-term scenario refers to 2019 Q1, in our sample, the move of Nordea from Sweden to Finland is accounted for, even though the dataset running up to end of 2017 still lists Nordea as being in Sweden. Accordingly, for Sweden and Finland, total assets as reported by ECB were modified.

Computation of aggregate banking losses and estimated impact on public finances

Starting from the estimated average probability of default of each individual bank's obligors, SYMBOL generates realisations for each individual bank's credit losses via Monte Carlo simulation using the Basel FIRB loss distribution function and assuming a correlation between simulated shocks hitting different banks in the system ([187]).

In the short-term scenario, losses from SYMBOL are added on top of losses due to non-performing loans ([188]).

Individual bank losses are then transformed into excess losses and recapitalisation needs to be covered and finally aggregated at country and system level. Based on the bank-level balance sheet data and losses simulation, the model can then implement the loss allocation cascade (e.g, capital, bail-in, RF interventions…), distinguishing

([181]) European Commission (2016a) Section 5.2.2 and Annex A7 for more detail on the SYMBOL model.
([182]) Refer to European Commission (2016a).
([183]) The procedure for the imputation of missing values of capital and RWA is described in "SYMBOL database and simulations for 2013, P. Benczur, J. Cariboni, F. E. Di Girolamo, A. Pagano, M. Petracco, JRC European Commission, Technical Report, JRC9298".
([184]) RISK DASHBOARD - data as of Q1 2018: link.
([185]) To properly estimate the effects of these CRDIV improved definitions, the results of the Basel III monitoring exercise (Quantitative Impact Study, QIS), run by the European Banking Authority are used. Since Basel III definitions of RWA and capital reflect better banks' true risk and capital quality, SYMBOL adjusts inputs to reflect these definitions even in scenarios where CRDIV is not yet implemented. These decrease capital and increase RWA.
([186]) Link to the report of Finansinspektionen.
([187]) The correlation is assumed to be 0.5 for all banks in the current simulation. All EU banks are simulated together.
([188]) See European Commission (2017), Box 4.1.

between excess losses and recapitalisation needs. Excess losses are losses in excess of available total capital of a bank, while recapitalisation needs are the funds necessary to restore the bank's minimum level of capitalisation given by the regulatory scenario under consideration ([189]).

Table A8.1: **Descriptive statistics of samples used for SYMBOL simulations**

	Sample ratio Sample TA /Population TA	Nbr. of banks	Total Assets (TA)	Capital (Tier1 + Tier2)	Risk-weighted assets (RWA)	RWA /TA	Capital /RWA
	%		eur bn	eur bn	eur bn	%	%
BE	80,0%	27	815,5	61,6	317,7	39,0%	19,4%
BG	63,0%	17	33,6	3,8	19,3	57,4%	19,9%
CZ	66,6%	16	185,0	14,2	73,4	39,7%	19,3%
DK	58,9%	59	630,3	50,6	222,4	35,3%	22,7%
DE	62,9%	1271	4847,2	366,0	2090,2	43,1%	17,5%
EE*	79,8%	3	20,3	2,9	8,8	43,6%	32,5%
IE	25,7%	24	270,8	36,1	164,9	60,9%	21,9%
ES	75,3%	92	2051,5	195,3	1280,5	62,4%	15,3%
FR	80,2%	158	6776,3	377,8	2162,2	31,9%	17,5%
HR	84,8%	24	49,5	6,6	29,5	59,5%	22,3%
IT	65,1%	388	2419,2	225,9	1085,9	44,9%	20,8%
CY	57,5%	7	46,2	3,9	23,2	50,1%	17,0%
LV	75,7%	12	21,4	2,4	11,4	53,4%	21,2%
LT*	88,3%	6	25,2	2,3	12,4	49,2%	18,6%
LU	38,3%	63	397,7	35,9	145,4	36,6%	24,7%
HU	44,6%	13	54,0	7,0	28,7	53,0%	24,5%
MT*	39,2%	5	18,8	1,4	7,2	38,3%	19,5%
NL	72,8%	16	1729,7	118,3	547,6	31,7%	21,6%
AT	69,9%	479	568,8	54,8	282,6	49,7%	19,4%
PL	74,4%	107	330,8	36,3	204,6	61,9%	17,8%
PT	47,6%	101	187,2	17,8	110,9	59,2%	16,1%
RO	75,0%	18	74,0	7,4	38,8	52,4%	18,9%
SI	81,4%	11	32,9	3,6	19,4	58,8%	18,7%
SK	79,7%	10	61,9	5,7	37,0	59,8%	15,5%
FI	54,6%	34	475,1	35,6	146,9	30,9%	24,2%
SE	62,7%	75	610,2	44,7	169,5	27,8%	26,4%
UK	51,5%	92	4630,0	299,7	1415,7	30,6%	21,2%
EU-28	65,7%	3134	27595,2	2047,0	10824,6	39,2%	18,9%

(1) 2017 data, unconsolidated.
(2) (*) Asterisks denote countries with sample representativeness issues.
Source: Commission services.

Throughout the cascade of safety net intervention, it can then be traced how much of these two types of financing needs are picked up by the different tools. If a bank is failing or if it is left undercapitalised with respect to the minimum level established in the scenarios, the bail-in tool is applied at individual bank level up to 8% of its total assets. Where an RF is available, it is then assumed to intervene up to 5% of the total assets of each bank. Given that the sample coverage in terms of the number and total assets of banks in the sample is not complete, the RF is equipped with an ex-ante fund equal to the appropriate percentage of covered deposits of the banks in the sample. Any leftover losses or recapitalisation needs not covered after all available tools have intervened are finally assumed to be covered by the government, taking into account the ratio between the sample and the population TA of all banks.

Banks are divided into two groups: those assumed to be systemic which in case of distress go into resolution and thus are recapitalised, and those assumed to be non-systemic which can be liquidated in the reference scenario ([190]).

Results give an estimate of the implicit contingent liabilities - banking losses and recapitalisation needs - that would be faced in case of a financial crisis similar to the one started in 2008 ([191]). For the EU as a whole, a loss of similar magnitude would correspond to the 99.95th percentile of the distribution of aggregate losses including recapitalisation needs based on 2009 data and regulatory framework, so this exercise focuses on this percentile of the distribution. It is important to highlight that focussing on the 99.95th percentile does not mean that the event happens with a probability of at most 0.05 percent. SYMBOL probabilities are more appropriately seen as "theoretical probabilities" which cannot be taken literally as frequencies: their magnitudes, however, inform on the relative risks among banks or countries ([192]).

A8.2. SCENARIOS SETTINGS

SYMBOL illustrates how the regulatory framework set up by the Commission in recent years would limit the impact of a systemic banking crisis on public finances.

Three pieces of legislation are considered: the Capital Requirement Regulation and Directive IV (CRDIV), ([193]) which improved the definitions of regulatory capital and risk-weighted assets,

([189]) European Commission (2016a) Annex A7.

([190]) European Commission (2016a) Annex A7.

([191]) Bank losses and recapitalisation needs triggered by the last crisis are proxied by state aid data, in particular the total recapitalisation and asset relief provided to banks over 2008-12 (around 615 bn euro), see European Commission (2014b) and Benczur et al. (2015).

([192]) According to Basel II an institution would suffer losses exceeding its capital once in a thousand years on average (99.9% confidence level). (See Basel Committee on Banking Supervision, (2005)). While Laeven and Valencia (2013) identify 17 systemic banking crisis episodes during 2008-2011 worldwide and 147 episodes since 1970, the Basel model seems to under-predict the actual frequency of bank failures, affecting also SYMBOL estimates.

([193]) See European Parliament and Council (2013).

increased the level of regulatory capital by introducing the capital buffers, including extra capital buffers for European Global Systematically Important Institutions (G-SIIs) and Other Systemically Important Institutions (O-SII) ([194]); the Bank Recovery and Resolution Directive (BRRD) ([195]), which introduced bail-in ([196]) and national resolution funds ([197]), and the Single Resolution Mechanism Regulation (SRMR) ([198]), which introduced the Single Resolution Fund (SRF). To reflect the phasing-in ([199]) of the safety-net tools foreseen by this body of legislation, two regulatory scenarios are modelled ([200]).

An initial (2019 Q1) short-term scenario with safety net in progress, comprising:

Bank total capital and risk-weighted assets (RWA) taken directly from the banks' balance sheets, adjusted to the definitions proposed in the CRDIV ([201]).

Non-performing loans contribute to losses in the banking system of each country and their magnitude has been estimated according to the Equation 1 below.

Extra capital buffers for G-SIIs [and O-SII] prescribed by the Financial Stability Board (FSB) ([202]).

Bail-in: modelled as a worst-case scenario where total Loss Absorbing Capacity (LAC), constituted of bail-in capacity and regulatory capital, is set at 8% of TA ([203]).

Resolution Funds ([204]) - national (NRFs, for Member States not part of the Banking Union) and single (SRF, for Banking Union members) – phased-in in proportion of 4/10 of their target or long-run level ([205]). RFs contribute to resolution by absorbing losses up to 5% of the TA of the insolvent bank ([206]), provided that a LAC of at least 8% of TA ([207]) has already been called in ([208]).

([194]) Very few banks which are OSII are affected by extra buffer (not considered).
([195]) See European Parliament and Council (2014a).
([196]) A legal framework ensuring that part of the distressed banks' losses are absorbed by unsecured creditors. The bail-in tool entered into force on 01/01/2016.
([197]) Funds financed by banks to orderly resolve failing banks, avoiding contagion and other spill-overs.
([198]) See European Parliament and Council (2014b).
([199]) CRDIV increased capital requirements are being phased-in from 2014 to 2019 and banks are progressively introducing the capital conservation buffer; according to BRRD and SRMR, national RFs and the SRF have a target of 1% of covered deposits to be collected over 10 years from 2015 onwards and 8 years from 2016 onwards, respectively.
([200]) In the estimation G-SII buffers are applied only to the parent group. G-SIIs requirements on Total Loss Absorbing Capacity (TLAC) are not considered. See Financial Stability Board (2014).
([201]) These decrease capital and increase RWA. To properly estimate the effects of these CRDIV improved definitions, the results of the Basel III monitoring exercise (Quantitative Impact Study, QIS), run by the European Banking Authority are used. Since Basel III definitions of RWA and capital reflect better banks' true risk and capital quality, SYMBOL adjusts inputs to reflect these definitions even in scenarios where CRDIV is not yet implemented.
([202]) See Financial Stability Board (2016).
([203]) The BRRD does not establish a harmonised level of liabilities eligible for bail-in, but Art. 44 sets out that the RF can kick in only after shareholders and holders of other eligible instruments have made a contribution to loss absorption and recapitalisation of at least 8% of TL (including its own funds). Since bank-level data on bail-inable liabilities is unavailable, the bail-in tool is modelled in both the short and long term by imposing that individual banks hold a LAC of at least 8% of their TL. In practice banks with total capital under this threshold are assumed to meet the 8% minimum threshold via bail-in liabilities. In the simulation, bail-in stops once this limit has been reached. If a bank holds capital above this threshold, there would be no bail-in, but capital might be bearing losses above it.
([204]) In practice, under the Agreement on the transfer and mutualisation of contributions to the SRF (IGA), until 2023 only a part (increasing) of current SRF contributions would be mutualised (i.e. available to all banks irrespective of their location), while the rest of the fund is divided in national compartments which are only available to banks established in the respective Member State. Since a system-wide waterfall under IGA with sequential intervention of national and mutualised SRF is complex to model, the model assumes that the entire SRF is already mutualised.
([205]) Given the aim to portray worst-case fiscal consequences, ex-post contributions to the NRFs/SRF are not modelled, but these can actually go up to 3 times the ex-ante contributions, further reducing the impact on public finances.
([206]) The resolution fund could also intervene for more than 5% after all unsecured, non-preferred liabilities, other than eligible deposits, have been bailed-in in full. This also points in the direction of an upper bound estimate of the impact on public finances.
([207]) More precisely, of total liabilities including own funds.
([208]) In case of excess demand for SRF funds, funds are rationed in proportion to demand (i.e., proportionally to excess losses and recapitalisation needs after the minimum bail-in, capped at 5% of TA at bank level).

A final (long-term) 2029 scenario, when a completely phased-in safety net comprises ([209]):

- Bank total capital reflecting the CRDIV improved definition and an increased minimum level ([210]) set at the maximum between the CRDIV adjusted capital and 10.5% of the CRDIV-adjusted RWA ([211]).

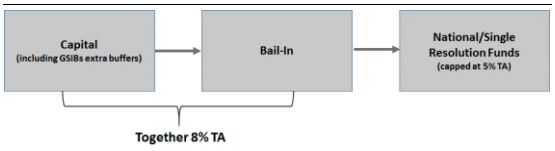
- Extra capital buffers for G-SIIs [and O-SII]: fully built at the levels required by the Financial Stability Board.

- Bail-in: as in the 2019 scenario.

- Resolution Funds: Both NRFs and SRF fully constituted and allowed to absorb losses of up to 5% of the TA of the insolvent bank, provided that a LAC of at least 8% TA has already been called in.

- Graph A8.1 illustrates the order of intervention of different tools. The first cushion assumed to absorb simulated losses is capital, the second tool is bail-in, and the last are RFs, as legally foreseen ([212]). Table A8.2 summarises the scenarios and recapitalisation levels considered.

Graph A8.1: **Implemented order of intervention of the resolution tools**



Source: Commission services.

([209]) Note that this LT scenario does not attempt to include the effects of the Nov 2016 banking package, which is still under negotiation (final stages of trilogues).

([210]) Only mandatory components of total capital, i.e. common equity Tier 1 (CET1), additional Tier (AT1) and capital conservation buffer are included. The discretionary counter-cyclical capital buffer (at the regulator's choice) is not.

([211]) Before running the simulation, banks are "topped up" to this increased level of minimum capital requirement. In practice, it affects only a small subset of banks, as most already hold capital exceeding the long-run requirement.

([212]) Additional tools are available to absorb residual losses and recapitalisation needs, including additional bail-in liabilities, leftover resolution funds and the deposit guarantee scheme. See *Benczur et al. (2015)* for a discussion.

Table A8.2: **Detailed scenarios description**

Components: / *Scenarios:*	TRC	RWA	Bail-in	National/Single RF	Recapitalization	Extra losses due to NPLs	Deposit Guarantee Scheme	Banks in resolution
Initial (2019Q1)			Yes	Yes, 5% TA cap, after LAC of 8% has been called in		*Yes to defaulted banks*		
Baseline	K^{QIS}	RWA^{QIS}	Capital plus bail-in 8% TA	4/10 of full target (end of Q1 2019) No ex-post contributions	10.5% RWA^{QIS}	*RR as reported by World Bank*	No	Only systemic banks
Initial (2019Q1)			Yes	Yes, 5% TA cap, after LAC of 8% has been called in				
All banks	K^{QIS}	RWA^{QIS}	Capital plus bail-in 8% TA	4/10 of full target (end of Q1 2019) No ex-post contributions	10.5% RWA^{QIS}	*RR as reported by World Bank*	No	All banks
Initial (2019Q1)			Yes	Yes, 5% TA cap, after LAC of 8% has been called in				
All banks & 20% lower RR	K^{QIS}	RWA^{QIS}	Capital plus bail-in 8% TA	4/10 of full target (end of Q1 2019) No ex-post contributions	10.5% RWA^{QIS}	*RR 20% of what reported by World Bank*	No	All banks
Final (2029)			Yes					
Baseline	Max {K^{QIS}; 10.5%·RWA^{QIS} + buffers for GSIIs}	RWA^{QIS}	Capital plus bail-in 8% TA	Yes, 5% TA cap, after LAC	10.5% RWA^{QIS}	*NO*	No	Only systemic
Final (2029)			Yes					
All banks	Max {K^{QIS}; 10.5%·RWA^{QIS} + buffers for GSIIs}	RWA^{QIS}	Capital plus bail-in 8% TA	Yes, 5% TA cap, after LAC	10.5% RWA^{QIS}	*NO*	No	All banks

(1) The size of the Single Resolution Fund was on Q2 2018 €24.9 billion (https://srb.europa.eu/en/node/596) which is around 43% of its target size (1% of covered deposits).
Source: Commission services.

Table A8.3 reports statistics at aggregated Member State level for non-performing loans (NPLs) and loans provisions, taken from the EBA dashboard ([213]), while recovery rates (country aggregates) are taken from the World Bank 2018 Doing Business Report ([214]).

([213]) EBA dashboard link.
([214]) 2018 Doing Business Report link.

Table A8.3: **Aggregated statistics at country level: Non Performing Loans (NPL)**

	Sample ratio Sample TA /Population TA	**Gross loans**	**NPL Ratio** Gross NPL /Gross loans	**NPL /TA** Gross NPL /TA	**NPL /Capital** Gross NPL /Capital	**Provisions**	**Recovery Rate** Reference scenario	**NPL losses** Reference scenario	**Recovery Rate** Adverse scenario	**NPL losses** Adverse scenario
	%	eur bn	%	%	%	eur bn	%	eur bn	%	eur bn
BE	80,0%	423,8	2,1%	1,1%	14,5%	4,7	85%	0,4	17%	3,4
BG	63,0%	19,8	15,3%	9,0%	79,0%	1,7	36%	0,9	7%	1,3
CZ	66,6%	100,0	3,2%	1,7%	22,3%	2,0	67%	0,9	13%	1,1
DK	58,9%	341,3	3,5%	1,9%	23,3%	6,5	88%	0,1	18%	4,0
DE	62,9%	2308,0	1,6%	0,8%	10,1%	19,1	81%	6,4	16%	15,6
EE*	79,8%	15,3	1,6%	1,2%	8,5%	0,1	41%	0,1	8%	0,1
IE	25,7%	130,3	11,1%	5,3%	40,0%	7,1	86%	1,4	17%	6,1
ES	75,3%	1143,8	5,8%	3,2%	33,9%	35,5	77%	6,6	15%	25,6
FR	80,2%	2007,1	2,9%	0,9%	15,4%	33,1	74%	14,5	15%	24,3
HR	84,8%	30,7	11,3%	7,0%	52,6%	2,3	33%	0,9	7%	1,1
IT	65,1%	1452,7	15,7%	9,5%	101,3%	128,6	65%	44,5	13%	89,2
CY	57,5%	33,1	29,0%	20,8%	243,8%	6,3	73%	0,4	15%	2,6
LV	75,7%	12,1	7,4%	4,2%	36,9%	0,5	40%	0,3	8%	0,4
LT*	88,3%	17,3	2,7%	1,8%	19,9%	0,2	45%	0,1	9%	0,2
LU	38,3%	157,4	1,0%	0,4%	4,6%	0,8	44%	0,6	9%	0,8
HU	44,6%	20,5	7,0%	2,7%	20,4%	0,9	44%	0,3	9%	0,6
MT*	39,2%	8,2	6,6%	2,9%	38,6%	0,2	39%	0,2	8%	0,3
NL	72,8%	899,9	1,3%	0,7%	9,5%	6,1	90%	0,0	18%	4,0
AT	69,9%	333,1	4,1%	2,4%	24,9%	6,6	80%	1,6	16%	6,0
PL	74,4%	226,3	6,7%	4,6%	41,7%	9,2	63%	0,8	13%	4,8
PT	47,6%	112,9	7,4%	4,5%	47,0%	8,7	64%	0,0	13%	0,2
RO	75,0%	42,6	7,7%	4,5%	44,9%	2,5	36%	0,3	7%	0,7
SI	81,4%	20,7	14,1%	8,9%	80,6%	1,4	89%	0,4	18%	1,3
SK	79,7%	46,5	4,3%	3,3%	35,2%	1,4	47%	0,1	9%	0,5
FI	54,6%	201,4	2,5%	1,1%	14,0%	2,1	88%	0,3	18%	2,3
SE	62,7%	286,8	1,1%	0,5%	7,2%	1,5	78%	0,4	16%	1,4
UK	51,5%	1982,2	1,9%	0,8%	12,6%	17,5	85%	6,9	17%	17,8
EU-28	65,7%	12570,8	5,1%	2,3%	31,2%	30,7	76%	10,4	15%	22,9

(1) 2017 data, unconsolidated.
(2) (*) Asterisks denote countries with sample representativeness issues.
Source: Commission services.

A8.3. CALIBRATING THE HEAT MAP

The model allows estimating the probability distribution of the amount of public funds needed to cover losses after exhausting the protection provided by the financial safety net. To obtain the input for the heat map on government's implicit contingent liability risks, a minimum size of government's contingent liabilities is fixed, and the theoretical probability of the materialisation of the event is assessed.

The heat map illustrates the relative riskiness of countries in terms of public finances being hit by at least 3% of GDP. The colour coding reflects the relative magnitude of the theoretical probabilities of such an event. The allocation of the colours is based on a procedure that was fixed in 2014 (as reported in European Commission, (2014c)), based on simulations using 2012 bank balance sheet data ([215]).

([215]) European Commission (2016a) Annex A7.

A8.4. RECENT MEASURES: THE CASE OF SWEDEN AND FINLAND

The Financial Supervisory Authority (FSA) revised the modalities (from "pillar 2" to "pillar 1") for imposing a risk-weight-floor on residential mortgages in Sweden for banks using internal risk models. Technically, the measure takes the form of a risk weight floor requirement under Article 458 of the EU Capital Requirements Regulation (CRR). It determines the shift of a (previously applied and now discontinued) equivalent capital charge on residential mortgages imposed by the FSA to each Swedish bank as an institution-specific requirement (also known as a "pillar 2" requirement, which does not impact banks risk-weighted-assets and capital ratios). The newly introduced risk-weight floor has instead a general application across banks (also known as pillar 1, which impacts banks risk-weighted-assets and capital ratios). For five banks in our sample we have modified the RWA accordingly to the figure provided by the FSA report ([216]). The impact of

([216]) See diagrams 3 and 4 on page 20 of the FSA report.

Table A8.4: **RWA adjustment: impact on SYMBOL results**

Scenarios:	Initial (2019 Q1) short-term scenarios						Final (2029) long-term scenarios				
	Reference (a)		All Banks to Resolution (b)		All Banks to Resolution and 20% RR on NPL (c)		Reference (a)		All Banks to Resolution (b), (c)		
	Excess Losses	ExL Recap 10.5%	Excess Losses	ExL Recap 10.5%	Excess Losses	ExL Recap 10.5%	Excess Losses	ExL Recap 10.5%	Excess Losses	ExL Recap 10.5%	
Unadjusted RWA	0,000%	0,179%	0,002%	0,213%	0,035%	0,266%	0,000%	0,023%	0,002%	0,064%	**Finland**
Adjusted RWA	0,003%	0,255%	0,006%	0,298%	0,049%	0,375%	0,000%	0,040%	0,002%	0,089%	**Finland**
PPS. change	*0,003%*	*0,076%*	*0,004%*	*0,085%*	*0,013%*	*0,109%*	*0,000%*	*0,018%*	*0,000%*	*0,025%*	**Finland**
Unadjusted RWA	0,010%	0,029%	0,011%	0,044%	0,028%	0,106%	0,009%	0,023%	0,009%	0,028%	**Sweden**
Adjusted RWA	0,015%	0,061%	0,016%	0,092%	0,033%	0,160%	0,013%	0,054%	0,014%	0,061%	**Sweden**

Source: Commission services.

these changes on the data and results are illustrated in the tables below.

Table A8.5: **RWA adjustment: impact on Bank's Solvency Ratio (Capital /RWA)**

Banks	Article 458	Pillar 2	*Percentage change*	
Nordea	23,3	25,2	*8%*	**Finland**
SEB	21,1	24,2	*15%*	**Sweden**
Handelsbanken	21,6	28,3	*31%*	**Sweden**
Swedbank	20,6	27,7	*34%*	**Sweden**
Lansforsakringar	17,2	28,1	*63%*	**Sweden**

Source: Commission services.

Table A8.6: **RWA adjustment: impact on aggregate RWA density**

Unadjusted RWA	Adjusted RWA	*PPS. change*	
30,93%	33,17%	*2,24%*	**Finland**
27,78%	33,55%	*5,77%*	**Sweden**

Source: Commission services.

ANNEX A9
Statistical annex: cross-country tables

A9.1. SHORT-TERM FISCAL SUSTAINABILITY CHALLENGES

Table A9.1: **S0 and sub-indexes heat map**

	S0 overall index	S0 Fiscal sub-index	S0 Financial competitiveness sub-index	Overall SHORT-TERM risk category
BE	0,22	0,19	0,23	LOW
BG	0,19	0,00	0,28	LOW
CZ	0,18	0,00	0,27	LOW
DK	0,12	0,00	0,19	LOW
DE	0,00	0,00	0,00	LOW
EE	0,17	0,00	0,25	LOW
IE	0,21	0,00	0,32	LOW
ES	0,37	0,57	0,27	LOW
FR	0,29	0,41	0,23	LOW
HR	0,24	0,19	0,26	LOW
IT	0,36	0,47	0,31	LOW
CY	0,46	0,27	0,57	HIGH
LV	0,24	0,08	0,33	LOW
LT	0,21	0,00	0,33	LOW
LU	0,12	0,00	0,18	LOW
HU	0,34	0,69	0,16	LOW
MT	0,06	0,04	0,08	LOW
NL	0,08	0,00	0,12	LOW
AT	0,03	0,07	0,00	LOW
PL	0,18	0,00	0,27	LOW
PT	0,33	0,31	0,33	LOW
RO	0,30	0,26	0,33	LOW
SI	0,13	0,07	0,16	LOW
SK	0,27	0,00	0,40	LOW
FI	0,14	0,08	0,17	LOW
SE	0,20	0,00	0,31	LOW
UK	0,42	0,31	0,47	LOW

(1) The following thresholds are used to identify countries at risk of fiscal stress: 0.46 for the S0; 0.36 for the fiscal sub-index and 0.49 for the financial-competitiveness sub-index. They have been derived using the signals' approach (see chapter 2).
Source: Commission services.

Table A9.2: **Fiscal variables used in the S0 indicator, 2018**

	Balance (%GDP)	Primary balance (%GDP)	Cycl. adj. balance (%GDP)	Stabil. primary balance (%GDP)	Gross debt (%GDP)	Change gross debt (%GDP)	Short-term debt (%GDP)	Net debt (%GDP)	Gross financing need (%GDP)	Interest growth rate diff.	Change expend. gen. govt (%GDP)	Change consumpt. gen. govt (%GDP)
BE	-1,0	1,4	-1,1	-1,4	101,4	-2,0	8,4	87,8	15,0	-1,4	-0,2	-0,3
BG	0,8	1,5	0,7	-0,8	23,3	-2,3	0,0	11,0	0,0	-3,4	1,1	0,1
CZ	1,4	2,1	0,9	-0,8	33,2	-1,5	1,1	22,7	4,6	-2,4	1,4	0,5
DK	0,2	1,2	0,5	0,2	33,3	-2,8	3,9	15,4	4,0	0,6	0,1	0,1
DE	1,6	2,5	1,3	-1,2	60,1	-3,7	4,4	41,5	6,9	-2,0	-0,2	0,0
EE	0,5	0,6	-0,8	-0,6	8,0	-0,8	0,2	0,0	:	-7,4	0,1	-0,1
IE	-0,1	1,5	-0,2	-4,4	63,9	-4,6	8,5	56,9	4,0	-7,0	-1,2	-0,4
ES	-2,7	-0,3	-3,2	-1,4	96,9	-1,2	7,7	84,3	17,3	-1,4	0,1	-0,1
FR	-2,6	-0,8	-2,7	-0,7	98,7	0,2	9,3	87,4	15,7	-0,7	-0,3	-0,2
HR	0,2	2,7	-0,5	-1,4	73,5	-4,0	3,7	69,4	7,8	-1,9	-0,1	0,1
IT	-1,9	1,7	-1,8	0,5	131,1	-0,1	16,9	118,3	18,9	0,4	-0,6	0,1
CY	2,8	5,5	1,7	-2,9	105,0	8,8	1,7	78,1	2,5	-3,2	-0,3	-0,4
LV	-0,8	-0,1	-1,8	-2,2	37,1	-2,9	3,4	27,7	3,7	-5,9	-0,1	-0,1
LT	0,6	1,5	-0,6	-1,3	34,8	-4,6	1,0	30,5	4,1	-3,6	1,2	-0,1
LU	1,3	1,7	1,3	-0,8	21,4	-1,6	0,8	-9,9	-1,3	-3,6	0,4	0,2
HU	-2,4	0,1	-3,9	-3,0	72,9	-0,3	13,2	68,0	20,1	-4,4	0,4	-0,4
MT	1,3	2,9	0,9	-2,0	47,9	-3,0	3,5	36,0	3,8	-4,3	1,5	1,7
NL	1,1	1,9	0,4	-1,8	53,2	-3,7	5,3	43,3	6,4	-3,4	-0,1	-0,2
AT	-0,3	1,3	-0,8	-1,7	74,5	-3,8	2,3	51,0	7,1	-2,3	-0,5	-0,2
PL	-0,9	0,6	-2,0	-1,4	49,2	-1,4	0,4	45,3	5,0	-2,9	0,5	-0,1
PT	-0,7	2,7	-1,4	-0,9	121,5	-3,3	21,5	107,6	12,9	-0,7	-1,6	-0,2
RO	-3,3	-1,9	-3,5	-1,9	35,1	0,0	1,8	28,8	7,0	-5,9	1,5	0,7
SI	0,5	2,4	-0,9	-2,6	70,2	-3,9	1,9	51,2	4,9	-3,8	-1,0	0,0
SK	-0,6	0,7	-0,9	-1,9	48,8	-2,2	0,4	:	4,3	-4,0	-0,3	0,1
FI	-0,8	0,1	-0,9	-1,4	59,8	-1,5	6,4	23,1	7,8	-2,3	-1,0	-0,2
SE	1,1	1,3	0,9	-1,6	37,8	-3,0	10,2	4,8	4,5	-4,1	-0,2	-0,1
UK	-1,3	1,1	-1,8	-0,3	86,0	-1,4	13,8	78,0	8,1	-0,3	-0,4	-0,2

(1) The upper thresholds used for each variable have been derived using the signals' approach (see chapter 2). The lower thresholds have been set at 80% of the original signals' approach thresholds, for prudential reasons.
Source: Commission services.

Table A9.3: **Financial-competitiveness variables used in the S0 indicator, 2018**

	Yield curve	Real GDP growth	GDP per capita in PPP (%US level)	L.Net intern. Invest. position (%GDP)	L.Net savings households (%GDP)	L.Private debt (%GDP)	L.Private credit flow (%GDP)	L.Short-term debt nonfin. corp. (%GDP)	L.Short-term debt households (%GDP)	L.Construction (%value added)	L.Current account (%GDP)	L.Change real eff. exchange rate	L.Change nom. unit labour costs
BE	1,1	1,5	79,6	52,6	2,1	187,0	-1,5	34,4	1,6	5,2	-0,3	-4,4	1,1
BG	1,0	3,5	35,5	-42,8	4,1	100,1	6,2	15,7	1,5	4,1	3,1	3,0	13,6
CZ	0,9	3,0	61,2	-26,5	2,1	67,4	4,1	9,0	1,5	5,3	1,0	-1,0	5,9
DK	0,8	1,2	84,9	56,3	3,0	204,0	-1,4	24,7	3,7	5,0	8,1	-1,0	3,0
DE	0,8	1,7	84,6	54,0	5,8	100,1	4,9	10,2	1,7	4,9	8,4	-0,4	5,1
EE	:	3,5	55,1	-31,4	4,3	106,4	3,6	8,8	0,6	7,1	2,3	2,5	12,4
IE	1,3	7,8	131,7	-149,3	1,3	243,6	-7,5	31,0	1,1	2,5	2,9	1,5	-17,2
ES	1,7	2,6	63,9	-83,8	-0,5	138,8	0,2	8,4	2,3	6,1	1,8	0,5	0,0
FR	1,1	1,7	71,1	-20,1	5,0	148,2	7,0	24,5	1,4	5,5	-0,6	-2,3	1,3
HR	1,7	2,8	42,9	-62,4	:	98,4	1,2	8,4	3,2	5,2	3,6	2,5	-4,3
IT	2,7	1,1	65,7	-5,3	1,4	110,5	2,1	17,5	3,0	4,7	2,3	-2,0	1,1
CY	2,4	3,9	59,4	-121,5	-4,8	316,3	8,7	28,5	9,5	4,8	-5,0	-1,2	-2,7
LV	1,2	4,1	47,9	-56,3	-3,3	83,5	0,3	9,9	1,8	6,1	0,6	0,5	14,7
LT	0,6	3,4	55,5	-35,9	-3,1	56,1	3,7	4,9	0,7	6,6	-0,7	-4,3	16,0
LU	0,9	3,1	171,5	47,0	5,3	322,9	-15,5	69,8	2,3	5,2	5,0	7,4	7,1
HU	2,8	4,3	48,3	-52,9	3,9	71,4	0,9	9,5	2,3	4,3	4,0	-0,8	6,7
MT	1,7	5,4	66,2	62,6	:	120,2	2,9	10,9	2,5	3,6	8,4	3,8	1,7
NL	0,9	2,8	88,5	59,7	4,4	252,1	3,0	36,3	2,5	4,4	8,3	-3,3	-0,2
AT	1,0	2,7	87,5	3,7	3,8	122,5	4,3	12,1	2,8	6,4	2,1	-1,6	3,7
PL	1,5	4,8	49,4	-61,2	-0,9	76,4	2,7	7,7	2,7	7,0	-0,3	0,3	4,5
PT	2,2	2,2	53,5	-104,9	-2,6	162,2	1,3	20,7	2,5	4,0	0,4	-1,4	3,5
RO	2,2	3,6	44,1	-47,7	-4,4	50,8	1,7	11,1	0,8	6,5	-2,2	-6,5	11,9
SI	1,3	4,3	59,2	-32,3	3,4	75,6	0,8	8,7	2,2	5,5	5,7	-0,3	3,4
SK	1,2	4,0	53,7	-65,6	1,4	96,1	5,9	20,6	2,0	8,2	-2,0	-1,7	6,9
FI	1,0	2,9	75,5	2,4	-1,1	146,4	8,2	17,8	2,8	7,1	-0,7	-1,6	-2,5
SE	1,1	2,4	82,5	1,8	7,9	194,4	13,1	39,3	15,2	6,4	4,0	-1,9	3,7
UK	0,7	1,3	71,6	-8,6	-0,6	169,0	8,4	26,8	10,3	6,1	-4,6	-5,3	5,4

(1) The upper thresholds used for each variable have been derived using the signals' approach (see chapter 2). The lower thresholds have been set at 80% of the original signals' approach thresholds, for prudential reasons.
Source: Commission services.

Additional indicators

Table A9.4: **Risks related to the structure of public debt financing, by country (2017)**

	Short-term government debt (original maturity)	Government debt in foreign currency	Government debt held by non-residents
	Shares of total debt (%):		
BE	**8.1**	0.0	**52.0**
BG	0.0	**80.6**	44.6
CZ	3.0	**45.4**	44.7
DK	**11.5**	0.3	30.4
DE	**7.9**	4.5	**49.5**
EE	2.8	0.0	62.3
IE	**7.4**	1.8	**59.6**
ES	**7.7**	0.0	44.1
FR	**9.8**	2.9	**49.9**
HR	4.8	**76.3**	39.0
IT	**12.9**	0.1	32.3
CY	1.8	3.6	82.2
LV	**8.4**	0.1	**67.6**
LT	0.6	0.0	**73.3**
LU	3.7	0.0	42.7
HU	**18.0**	25.8	37.5
MT	5.1	0.0	12.2
NL	**9.3**	0.2	35.9
AT	2.9	4.2	**67.1**
PL	0.8	**31.8**	52.5
PT	**17.3**	0.0	**54.0**
RO	5.0	**51.7**	48.5
SI	2.7	0.1	**66.6**
SK	0.9	0.1	**57.5**
FI	**10.4**	2.9	**67.4**
SE	**24.9**	23.6	22.7
UK	**15.7**	0.0	n.a.

(1) The upper thresholds used for each variable have been derived using the signals' approach; the lower thresholds have been set at 80% of the original signals' approach thresholds, for prudential reasons (see Annex A7).
Source: Eurostat, ECB.

Table A9.5: **Potential triggers for governments' contingent liability from the banking sector, by country (2017)**

	Private sector credit flow (% GDP)	Bank loan-to-deposit ratio (%)	NPL ratio (% of total gross loans)	NPL ratio change (pps 2017 v 2016)	NPL coverage ratio (%)	House price nominal index change (%)
BE	-1,5	105,5	**2,6**	-0,6	43,0	3,6
BG	6,2	69,0	**10,6**	-2,0	54,5	8,7
CZ	4,1	83,2	1,6	-1,0	62,5	11,7
DK	-1,4	**349,9**	**2,4**	-0,7	**28,9**	4,5
DE	4,9	126,4	1,9	-0,6	39,3	4,5
EE	3,6	123,2	1,7	**0,5**	**23,4**	5,5
IE	-7,5	106,1	**10,4**	-1,8	**29,4**	10,9
ES	0,2	114,8	**4,5**	-1,2	41,9	6,2
FR	7,0	113,3	**3,1**	-0,6	51,0	3,1
HR	1,2	75,6	**7,5**	-2,6	58,9	3,8
IT	2,1	120,3	**11,1**	-4,2	50,6	-0,8
CY	8,7	76,7	**38,9**	-6,1	45,0	2,2
LV	0,3	75,1	**2,3**	-0,8	**32,4**	8,8
LT	3,7	104,0	**2,8**	-0,9	**29,2**	8,9
LU	-15,5	**139,0**	0,7	-0,4	43,9	5,6
HU	0,9	75,3	**8,9**	-2,6	61,7	7,5
MT	2,9	52,6	**3,5**	-0,9	35,7	5,3
NL	3,0	124,8	**2,3**	-0,2	**29,1**	7,5
AT	4,3	103,3	**3,7**	-1,4	52,7	5,3
PL	2,7	97,8	**5,8**	-0,3	59,3	3,8
PT	1,3	88,0	**15,2**	-4,2	48,6	9,2
RO	1,7	66,2	**6,5**	-3,5	67,6	6,1
SI	0,8	69,3	**10,5**	-3,9	62,9	8,0
SK	5,9	110,6	**3,4**	-0,9	59,8	5,9
FI	8,2	**166,0**	1,5	-0,1	**27,3**	1,6
SE	**13,1**	**208,9**	1,0	0,0	**29,5**	6,4
UK	8,4	92,0	1,5	-0,4	**32,0**	4,5

(1) The upper thresholds used for each variable have been derived using the signals' approach, except for the NPL coverage ratio; the lower thresholds have been set at 80% of the upper thresholds, for prudential reasons (see Annex A7 and chapter 5).
Source: Eurostat, EBA.

Table A9.6: **Risk (theoretical probability) of public finances being hit by more than 3% of GDP in case of a systemic event involving banks excess losses and recapitalisation needs (based on SYMBOL)**

	Initial (2019 Q1) short-term scenarios			Final (2029) long-term scenarios	
	Reference	All Banks to Resolution	All Banks to Resolution and 20% RR on NPL	Reference	All Banks to Resolution
Scenarios:	(a)	(b)	(c)	(a)	(b), (c)
	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%	ExL Recap 10.5%
BE	0,00%	0,00%	0,00%	0,00%	0,00%
BG	0,00%	0,00%	0,02%	0,00%	0,00%
CZ	0,00%	0,00%	0,00%	0,00%	0,00%
DK	0,00%	0,00%	0,01%	0,00%	0,00%
DE	0,00%	0,00%	0,00%	0,00%	0,00%
EE	0,00%	0,00%	0,00%	0,00%	0,00%
IE	0,01%	0,01%	0,09%	0,00%	0,00%
ES	0,03%	0,03%	0,07%	0,01%	0,01%
FR	0,00%	0,00%	0,00%	0,00%	0,00%
HR	0,00%	0,00%	0,00%	0,00%	0,00%
IT	0,00%	0,01%	0,16%	0,00%	0,00%
CY	0,08%	0,12%	5,75%	0,01%	0,01%
LV	0,00%	0,00%	0,00%	0,00%	0,00%
LT	0,00%	0,00%	0,00%	0,00%	0,00%
LU	0,01%	0,01%	0,02%	0,00%	0,01%
HU	0,00%	0,00%	0,00%	0,00%	0,00%
MT	0,01%	0,03%	0,06%	0,00%	0,00%
NL	0,00%	0,00%	0,00%	0,00%	0,00%
AT	0,00%	0,00%	0,00%	0,00%	0,00%
PL	0,00%	0,00%	0,00%	0,00%	0,00%
PT	0,01%	0,02%	0,03%	0,01%	0,01%
RO	0,00%	0,00%	0,00%	0,00%	0,00%
SI	0,00%	0,00%	0,01%	0,00%	0,00%
SK	0,00%	0,00%	0,00%	0,00%	0,00%
FI	0,00%	0,00%	0,01%	0,00%	0,00%
SE	0,00%	0,00%	0,00%	0,00%	0,00%
UK	0,00%	0,00%	0,00%	0,00%	0,00%

(1) The upper threshold is set at 0.2%; the lower threshold is set at 0.05%. For thresholds' definitions, see Annex A8. Asterisks denote countries with sample representativeness issues.
(2) See Annex A8 for details on the scenarios.
Source: Commission services.

Table A9.7: **Financial market information**

	Sovereign yield spreads (bp.) - 10 year - Nov 2018
BE	45
BG	34
CZ	174
DK	2
DE	0
EE	:
IE	61
ES	119
FR	42
HR	169
IT	307
CY	195
LV	61
LT	-9
LU	16
HU	334
MT	116
NL	18
AT	29
PL	282
PT	156
RO	450
SI	52
SK	67
FI	33
SE	27
UK	116

(1) The upper thresholds used for each variable have been derived using the signals' approach; the lower thresholds have been set at 80% of the original signals' approach thresholds, for prudential reasons (see Annex A7).
Source: ECB.

A9.2. MEDIUM-TERM FISCAL SUSTAINABILITY CHALLENGES

Table A9.8: **S1 indicator, cost of ageing sub-component and required SPB related to S1, baseline and alternative scenarios, by country (pps. and % of GDP)**

	S1 indicator - Baseline scenario			S1 indicator - AWG risk scenario			S1 indicator - Historical SPB scenario		
		of wich			of wich			of wich	
		Cost of ageing	Required SPB related to S1 - Percentile rank		Cost of ageing	Required SPB related to S1 - Percentile rank		Cost of ageing	Required SPB related to S1 - Percentile rank
BE	4,3	1,2	7%	4,6	1,3	6%	4,2	1,7	4%
BG	-4,2	0,4	91%	-3,8	0,7	88%	-3,6	0,7	88%
CZ	-2,9	0,9	81%	-2,6	1,2	79%	0,2	1,4	68%
DK	-5,1	0,1	92%	-4,7	0,5	88%	-6,5	0,2	95%
DE	-2,0	1,1	61%	-1,7	1,4	55%	-1,3	1,7	53%
EE	-4,3	-0,3	97%	-3,9	0,1	96%	-4,2	-0,3	96%
IE	-0,9	1,1	57%	-0,6	1,4	52%	2,9	1,7	30%
ES	5,2	0,4	9%	5,5	0,6	8%	6,2	0,7	4%
FR	4,2	0,4	11%	4,6	0,7	9%	6,6	0,6	5%
HR	0,2	-0,1	36%	0,3	0,0	34%	3,0	-0,5	27%
IT	9,4	0,9	0%	9,6	1,0	0%	9,2	1,6	0%
CY	-0,7	-0,1	22%	-0,5	0,0	21%	1,1	0,0	21%
LV	-2,0	0,2	85%	-1,5	0,6	82%	-0,4	0,4	78%
LT	-1,8	0,6	78%	-1,4	0,9	74%	0,8	1,0	64%
LU	-4,8	0,8	93%	-4,5	1,0	92%	-5,3	1,5	92%
HU	1,1	-0,2	49%	1,5	0,2	40%	1,3	-0,1	40%
MT	-4,7	0,3	85%	-4,2	0,8	82%	-3,2	0,6	84%
NL	-1,7	0,4	74%	-1,5	0,6	72%	-1,2	0,9	67%
AT	-0,8	0,6	50%	-0,6	0,9	45%	0,4	1,3	39%
PL	-0,7	0,3	74%	-0,4	0,5	70%	1,5	0,4	60%
PT	4,3	0,5	1%	4,7	0,7	1%	8,9	0,9	0%
RO	1,5	-0,1	78%	2,0	0,3	73%	2,0	0,1	62%
SI	0,2	1,2	44%	0,6	1,5	36%	2,8	2,1	20%
SK	-2,9	0,1	84%	-2,4	0,5	82%	0,3	0,2	78%
FI	-0,1	1,3	56%	0,1	1,5	54%	-1,7	1,8	60%
SE	-4,6	0,3	91%	-4,4	0,5	89%	-5,7	0,4	93%
UK	1,3	0,7	20%	1,5	0,9	18%	6,3	1,1	9%

(1) The upper and lower thresholds used for S1 are 0 and 2.5. The threshold used for the cost of ageing sub-component corresponds to the EU average. The upper and lower thresholds used for the required SPB are 15% and 30%.
Source: Commission services.

Table A9.9: **DSA heat map, by country**

	Sovereign-debt sustainability risks in EU countries																										
	BE	BG	CZ	DK	DE	EE	IE	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Baseline no-policy change scenario	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	99,9	12,4	25,8	10,8	37,3	9,6	46,7	107,3	99,8	64,3	146,5	61,9	35,0	33,4	8,9	68,7	17,8	38,2	51,2	48,0	106,7	61,6	53,5	31,9	55,1	15,6	73,9
Debt peak year	2018	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Average Structural Primary Balance (2020-2029) Percentile rank	52%	42%	40%	28%	26%	71%	39%	72%	65%	38%	51%	17%	66%	53%	37%	67%	23%	47%	35%	66%	22%	89%	48%	50%	55%	34%	36%
Historical SPB scenario	HIGH	LOW	LOW	LOW	LOW	LOW	MEDIUM	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	LOW	MEDIUM	LOW	LOW	LOW	HIGH
Debt level (2029)	94,8	14,4	38,6	6,5	39,6	8,2	62,9	105,5	107,7	80,7	136,0	73,9	40,2	43,4	3,5	67,0	26,3	38,2	55,9	56,1	126,0	55,3	60,4	47,5	44,0	11,7	96,9
Debt peak year	2018	2018	2029	2018	2018	2029	2018	2029	2029	2029	2029	2018	2029	2029	2018	2018	2018	2018	2018	2029	2029	2029	2018	2018	2018	2018	2029
Average Structural Primary Balance (2020-2029) Percentile rank	42%	45%	65%	23%	29%	69%	69%	70%	75%	68%	30%	29%	73%	69%	29%	66%	35%	47%	44%	76%	55%	84%	62%	75%	34%	28%	75%
Stability and Growth Pact (SGP) institutional scenario	MEDIUM	LOW	LOW	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	75,5	10,2	20,0	15,9	32,8	8,1	40,9	76,7	79,0	57,9	111,2	59,4	32,0	30,5	5,4	57,7	18,9	37,3	52,5	37,6	90,4	32,6	38,1	31,9	47,6	16,8	66,6
Debt peak year	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2020	2018	2018	2019	2018	2018	2018	2018	2018	2018	2018	2021	2018	2018	2018	2018	2018
Average Structural Primary Balance (2020-2029) Percentile rank	23%	42%	40%	30%	25%	66%	43%	24%	30%	30%	12%	14%	62%	53%	34%	44%	25%	47%	39%	50%	12%	58%	30%	49%	50%	35%	30%
Negative shock (-0.5p.p.) on nominal GDP growth	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,3	13,3	27,3	12,2	39,9	9,9	49,3	112,9	105,1	68,2	154,7	66,5	36,7	35,1	9,6	72,4	19,3	40,6	54,5	50,5	113,4	64,0	56,4	33,9	58,1	16,9	78,3
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2018	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Positive shock (+1p.p.) to the short- and long-term interest rates on newly issued	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	105,4	12,7	27,5	11,7	40,0	9,8	49,6	113,2	105,6	69,4	155,9	65,1	36,7	35,5	8,9	73,4	18,8	40,5	53,6	50,6	112,4	65,2	56,3	33,0	56,9	16,0	77,6
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2018	2019	2018	2029	2018	2018	2018	2029	2018	2029	2018	2018	2018	2018	2018
Negative shock on the PB equal to 50% of the forecasted cumulative change	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM
Debt level (2029)	103,3	15,2	28,9	11,9	39,5	10,0	48,4	108,6	101,2	68,9	153,5	69,2	37,4	33,7	11,6	72,2	19,2	40,5	53,5	48,3	108,2	67,8	56,4	32,2	56,0	16,3	76,5
Debt peak year	2029	2018	2018	2018	2018	2029	2018	2029	2029	2018	2029	2018	2029	2019	2018	2018	2018	2018	2018	2018	2018	2029	2018	2018	2018	2018	2018
Stochastic projections	HIGH	MEDIUM	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM	MEDIUM	LOW	MEDIUM	LOW	LOW	LOW	LOW	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
Probability of debt in 2023 greater than in 2018 (%)	31%	29%	23%	8%	1%	32%	15%	54%	34%	36%	59%	10%	41%	40%	17%	36%	8%	5%	12%	25%	26%	79%	6%	20%	27%	1%	17%
Difference between the 10th and 90th percentile in 2023 (p.p. of GDP)	28,1	29,6	23,4	17,1	15,0	3,0	27,9	17,6	13,9	40,8	25,3	42,2	28,8	29,0	19,3	40,8	27,5	14,7	26,3	16,8	41,7	35,7	23,5	27,4	18,6	11,3	19,3
Debt sustainability analysis - overall risk assessment	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	LOW	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	MEDIUM	LOW	LOW	LOW	LOW	HIGH

(1) All thresholds used and decision trees to derive the DSA risk assessment are presented in the Annex A6.

Source: Commission services.

A9.3. LONG-TERM FISCAL SUSTAINABILITY CHALLENGES

Table A9.10: **S2, cost of ageing sub-components and required SPB related to S2, baseline and alternative scenarios, by country (pps. and % of GDP)**

	S2 indicator - Baseline		S2 indicator - AWG risk		S2 indicator - TFP risk		S2 indicator - Historical SPB		S2 indicator - High life expectancy		S2 indicator - Interest rate	
		Required SPB related to S2 - Percentile rank		Required SPB related to S2 - Percentile rank		Required SPB related to S2 - Percentile rank		Required SPB related to S2 - Percentile rank		Required SPB related to S2 - Percentile rank		Required SPB related to S2 - Percentile rank
BE	4,3	8%	5,8	2%	5,0	4%	3,7	7%	5,1	4%	4,4	7%
BG	1,8	18%	2,9	11%	1,9	17%	2,2	17%	2,2	16%	1,6	20%
CZ	4,1	5%	5,2	2%	4,1	5%	6,2	4%	4,8	3%	3,7	7%
DK	-0,5	35%	1,8	13%	-0,6	37%	-1,1	35%	-0,2	30%	-0,6	36%
DE	1,7	12%	3,2	5%	2,1	10%	2,1	12%	2,6	8%	1,7	13%
EE	0,9	57%	3,0	23%	1,0	55%	0,8	56%	1,2	50%	0,9	56%
IE	3,3	9%	4,8	3%	3,2	9%	5,7	9%	3,8	7%	3,2	9%
ES	2,3	34%	4,4	13%	2,8	27%	2,1	32%	2,6	29%	3,3	21%
FR	-0,1	67%	1,9	30%	0,9	49%	1,0	66%	0,4	59%	1,0	47%
HR	-2,1	73%	-1,1	61%	-1,7	69%	0,2	73%	-1,7	69%	-1,3	64%
IT	2,9	14%	3,8	10%	3,7	10%	1,5	13%	2,9	15%	4,1	8%
CY	-0,9	23%	0,9	11%	-0,6	21%	0,8	23%	-1,1	26%	-0,5	21%
LV	0,7	55%	3,1	19%	0,9	50%	1,4	54%	0,8	53%	1,0	48%
LT	0,5	43%	2,8	16%	0,6	41%	1,9	42%	0,9	36%	0,9	35%
LU	8,1	0%	10,1	0%	7,9	0%	7,7	0%	8,8	0%	6,4	0%
HU	4,1	13%	7,1	1%	4,5	11%	4,1	11%	4,6	10%	4,1	13%
MT	3,3	4%	5,6	0%	3,3	4%	4,7	3%	3,9	2%	2,5	8%
NL	3,0	12%	4,9	4%	2,9	13%	3,1	12%	3,3	11%	2,9	13%
AT	2,6	11%	4,1	4%	3,6	6%	3,4	11%	3,4	8%	2,5	11%
PL	2,2	27%	3,3	17%	2,7	22%	3,6	24%	2,5	23%	2,4	25%
PT	0,7	17%	2,3	8%	1,6	11%	3,7	15%	1,5	12%	1,5	11%
RO	5,9	17%	9,0	3%	6,2	16%	5,3	16%	6,2	16%	5,8	18%
SI	5,5	2%	7,9	0%	5,7	2%	6,8	1%	6,3	1%	5,3	3%
SK	2,5	17%	4,4	6%	2,7	15%	4,9	16%	2,5	17%	2,2	18%
FI	2,7	17%	3,7	11%	3,2	14%	1,2	17%	3,0	15%	2,6	17%
SE	1,1	20%	2,2	13%	1,0	21%	0,6	20%	1,6	17%	0,8	23%
UK	3,0	9%	4,1	4%	3,2	8%	6,5	8%	3,7	6%	2,9	10%

(1) The upper and lower thresholds used for S2 are 2 and 6. The thresholds used for the cost of ageing sub-components correspond to the EU average. The upper and lower thresholds used for the required SPB are 15% and 30%.
Source: Commission services.

REFERENCES

Abbas, A., Blattner, L., De Broeck, M., El-Ganainy, A. and Hu, M. (2014), "Sovereign Debt Composition in Advanced Economies: a Historical Perspective", *IMF Working papers*, No. 14 / 162.

Alcidi, C. and Gros, D. (2018), "Debt Sustainability Assessments: the State of the Art – Euro Area Scrutiny", *Study requested by the ECON Committee of the European Parliament*, November.

Badurina, A. and Svaljek, S. (2012), "Public Debt Management before, during and after the Crisis", *Financial theory and practice*, Volume 36, No. 1.

Baldacci, E., I. Petrova, N. Belhocine, G. Dobrescu, and S. Mazraani (2011), "Assessing fiscal stress", *IMF Working Paper,* No. 11/100.

Basel Committee on Banking Supervision (2005), "An Explanatory Note on the Basel II IRB Risk Weight Functions", Bank for International Settlements.

Bassanetti, A., Cottarelli, C. and Presbitero, A. (2016), "Lost and found: market access and public debt dynamics", *IMF Working Paper*, No. 16/256.

Bauer, M. (2017) "Bridging the Gap: Forecasting Interest Rates with Macro Trends", FRBSF Economic Letter 2017/21, Federal Reserve Board of San Francisco.

Bauer, M. and Hamilton, J. (2017) "The Spanning Hypothesis and Risk Premia in Long-term Bonds", *Vox CEPR policy portal*.

Bénassy-Quéré, A., Brunnermeier, M., Enderlein, H., Farhi, E., Fratzscher, M., Fuest, C., Gourinchas, P.-O., Martin, P., Pisani- Ferry, J., Rey, H, Schnabel, I., Véron, N., Weder di Mauro, B., and Zettelmeyer, J. (2018), "Reconciling risk sharing with market discipline: A constructive approach to euro area reform", *CEPR Policy Insight*, No. 91.

Berti, K., E. Colesnic, C. Desponts, S. Pamies and E. Sail (2016), "Fiscal Reaction Functions for EU Countries", *European Economy Discussion Paper*, No. 028.

Benczur, P., K. Berti, J. Cariboni, F.E. Di Girolamo, S. Langedijk, A. Pagano, and M. Petracco Giudici (2015), "Banking Stress Scenarios for Public Debt Projections", *European Economy Economic Paper,* No. 548.

Berti, K. (2013), "Stochastic Public Debt Projections Using the Historical Variance-Covariance Matrix Approach for EU Countries", *European Economy Economic Paper,* No. 480.

Berti, K., M. Salto and M. Lequien (2012), "An Early-Detection Index of Fiscal Stress for EU Countries", *European Economy Economic Paper*, No. 475.

Blanchard, O., Chouraqui, J.C., Hagemann, R.P. and N. Sartor (1990), "The Sustainability of Fiscal Policy: New Answers to an Old Question", *OECD Economic Studies*, No. 15

Bodea, C. and Hicks, R. (2018), "Sovereign credit ratings and central banks: Why do analysts pay attention to institutions?", *Economics and Politics*, Vol. 30, Issue 3.

Bohn, H. (1998), "The Behaviour of U.S. Public Debt and Deficits", *The Quarterly Journal of Economics*, Vol. 113, No. 3.

Bouabdallah, O., Checherita-Westphal, C., Warmedinger, T., de Stefani, R., Drudi, F., Setzer, R. and Westphal, A. (2017), "Debt sustainability analysis for euro area sovereigns: a methodological framework", *ECB Occasional paper series*, No. 185, April.

Brixi, H. P. and Ashoka, M. (2002), "Dealing with Government Fiscal Risk: An overview," in Brixi and Allen Schick (eds.) *"Government at Risk: Contingent Liabilities and Fiscal Risk"*, pp. 21–58, World Bank and Oxford University Press.

Bruha, J., Karber, M., Pierluigi, B. and Setzer, R. (2011), "Understanding sovereign rating movements in euro area countries", *ECB Working paper*, No. 2011.

Bruns, M. and Poghosyan, T. (2016), "Leading Indicators of Fiscal Distress: Evidence from the Extreme Bound Analysis", *IMF Working Paper*, No. 16/28.

Buiter, W.H. (1985), "A Guide to Public Sector Debt and Deficits," *Economic Policy*, 1(1), pp. 13-79.

Calvo, G. (1988), "Servicing the Public Debt: The Role of Expectations", *American Economic Review*, 78(4): 647–661.

Campbell, J. and Shiller, R. (1991), "Yield Spreads and Interest Rate Movements: A Bird's Eye View", Review of Economic Studies, 1991, Vol. 58/3.

Cannas, G., J. Cariboni , M. Forys, H. Joensson, S. Langedijk, M. Marchesi, N. Ndacyayisenga, A. Pagano, and M. Petracco-Giudici (2013), "Quantitative Estimation of a Part of the Costs and Benefits of Bank Structural Separation", *European Commission JRC Scientific and Technical Report 88531*.

Cariboni J., Petracco Giudici M., Pagano A., Marchesi M., and Cannas G. (2012), "Costs and Benefits of a New Bank Resolution Framework", *European Commission JRC Scientific and Policy Report,* JRC 78882.

Carnot, N. and de Castro, F. (2015), "The Discretionary Fiscal Effort: an Assessment of Fiscal Policy and its Output Effect", *European Economy, Economic Papers*, No. 543.

CBO (2017) "The 2017 Long-Term Budget Outlook", March 2017.

Cebotari, A. (2008), "Contingent liabilities: issues and practice", *IMF Working Paper,* No. 08/245.

Cerovic, S., Gerling, K., Hodge, A. and Medas, P. (2018), "Predicting Fiscal Crises", *IMF Working paper*, No. 18 / 181.

Cohen, B.H., Hördahl, P. and Xia, D. (2018) "Term Premia: Models and Some Stylised Facts", *BIS Quarterly Review*, September 2018.

Cohen, D., and Valadier, C. (2011), "40 years of sovereign debt crises", *CEPR Discussion paper*, No. 8269.

Corsetti, G. (2018), "Debt sustainability assessments: the state of the art – euro area scrutiny", Study requested by the ECON Committee of the European Parliament, November.

Duffee, G. (2013) "Forecasting Interest Rates", in *Handbook of Economic Forecasting*.

Eckefeldt, P., Schwierz, C., Giamboni, L., Aarnout M., and Carone, G. (2014), "Identifying fiscal sustainability challenges in the areas of pension, health care and long-term care policies", *European Economy Occasional Papers*, No. 201.

EFB (2018), "2018 annual report of the European Fiscal Board".

Elgin, C. and Uras, B. (2013), "Public debt, sovereign default risk and shadow economy", *Journal of financial stability*, No. 9.

Escolano, J. (2010), "A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates", *IMF Technical Notes and Manuals*, No. 10/02.

European Central Bank (2018), "Economic Bulletin", *Issue 6*, September 2018.

European Central Bank (2017), "Financial Stability Review", November 2017.

European Commission (2018a), "Debt Sustainability Monitor 2017", *European Economy*, Institutional Paper, No. 090.

European Commission (2018b), "Vade mecum on the Stability and Growth Pact", *European Economy, Institutional Paper,* no. 075. European Commission (2019), "Report on public finances in EMU", *European Economy Institutional Paper*, forthcoming.

European Commission (2018c), "The 2018 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2016-2070)", *European Economy Institutional Paper*, No. 079.

European Commission (2018d), "European Economic Forecast. Autumn 2018", *European Economy Institutional Papers*, No. 089.

European Commission (2018e), "Enhanced-surveillance report, Greece", *European Economy Institutional Paper*, No. 071.

European Commission (2018f), "Public Assets: What's at Stake? An analysis of Public Assets and their Management in the European Union", *European Economy Discussion Papers*, No. 089.

European Commission (2018g), "Benchmarking institutional indicators", *Internal note*.

European Commission (2017), "Debt Sustainability Monitor 2016", *European Economy Institutional Paper*, No. 047.

European Commission (2016), "The Macroeconomic Imbalance Procedure. Rationale, Process, Application: A Compendium", *European Economy Institutional Paper*, No. 039.

European Commission (2015), "The 2015 Ageing Report. Economic and budgetary projections for the EU 28 Member States (2013-2060)", *European Economy Institutional Paper*, No. 3/2015.

European Commission (2014a), Directorate-General for Internal Market and Services, "Commission Staff Working Document - Economic Review of the Financial Regulation Agenda".

European Commission (2014b), Directorate-General for Competition, "State Aid Scoreboard 2014".

European Commission (2013), "European systems of accounts – ESA 2010".

European Commission (2012), "Fiscal Sustainability Report 2012", *European Economy Institutional Paper*, No. 8/2012.

European Commission (2011a), "Public Finances in EMU 2011", *European Economy Institutional paper*, No. 3/2011.

European Commission (2011b), "Directorate-General for Internal Market and Services: Commission Staff Working Document - Impact Assessment Accompanying the Proposal for a Directive of the European Parliament and of the Council Establishing a Framework for the Recovery and Resolution", SWD(2012) 166 final.

European Parliament and Council (2014a), "Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 Establishing a Framework for the Recovery and Resolution of Credit Institutions and Investment Firms and Amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012, of the European Parliament and of the Council", *Official Journal of the European Union*, L 173/190.

European Parliament and Council (2014b), "Regulation (EU) No 806/2014 of the European Parliament and of the Council of 15 July 2014 establishing uniform rules and a uniform procedure for the resolution of credit institutions and certain investment firms in the framework of a Single Resolution Mechanism and a Single Resolution Fund", *Official Journal of the European Union*, L 225/1.

European Parliament and Council (2013), "Directive 2013/36/EU of the 26 June 2013 on Access to the Activity of Credit Institutions and the Prudential Supervision of Credit Institutions and Investment Firms", *Official Journal of the European Union*, L 176/338.

Eurostat (2018a), "The extent of contingent liabilities and non-performing loans in the EU Member States", *Eurostat News Release* No. 19/2018, 29 January 2018.

Eurostat (2018b), "Note on stock of liabilities of trade credits and advances, October 2018"

Eurostat (2018c), "Structure of government debt", Statistics Explained, June 2018.

Eurostat (2018d), "Eurostat supplementary table for reporting government interventions to support financial institutions", Background note, April 2018.

Eurostat (2017), *"Summary methodology of the 2015-based population projections"*, Eurostat Technical Note, ESTAT/F-2/GL, March 2017. Eurostat's dedicated website on population projections can be found at http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data; the datasets can be found on

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Eurostat (2015), “Note on Stock of Liabilities of Trade Credits and Advances, April 2015”

Eurostat (2014), "Measuring Net Government Debt; Theory and Practice", *Eurostat Statistical Woking Papers*, 2014 edition.

Eyraud, L. Debrun, X., Hodge, A., Lledo, V. and Pattillo, C. (2018), “Second generation fiscal rules: balancing simplicity, flexibility and enforceability”, *IMF Staff discussion note*, No. 18 / 04.

Fama, E and Bliss, R. (1987), “The information in long-maturity forward rates”, American Economic Review, vol. 77/4.

Favara, G., S. Gilchrist, S., K. F. Lewis, and E. Zakrajšek (2016), "Updating the Recession Risk and the Excess Bond Premium," FEDS Notes, Board of Governors of the Federal Reserve System.

Financial Stability Board (2016), "2016 Update Of List Of Global Systemically Important Banks (G-SIBs)", 21 November 2016.

Financial Stability Board (2014), “Adequacy of Loss-absorbing Capacity of Global Systemically Important Banks in Resolution, Consultative Document”,

Fournier, J. M. and Bétin, M. (2018), “Sovereign defaults: Evidence on the Importance of government effectiveness”, *OECD Economics department working papers*, No. 1494.

Gabriele, C., Erce, A., Athanasopoulou, M. and Rojas, J. (2017), “Debt stocks meet gross financing needs: a flow perspective into sustainability”, *ESM Working paper series*, No. 24.

Garcia-de-Andoain, C. and Kremer, M. (2018), “Beyond spreads: measuring sovereign market stress in the euro area”, *ECB Working Paper Series*, No. 2185.

Gerling, M. K., Medas, M. P. A., Poghosyan, M. T., Farah-Yacoub, J. and Xu, Y. (2017), “Fiscal Crises”, *IMF Working paper*, No. 17/86.

Gosh, A. R., J. I. Kim, E. G. Mendoza, J. D. Ostry, and M. S. Qureshi (2011), "Fiscal fatigue, fiscal space and debt sustainability in advanced economies", *NBER Working Paper*, No. 16782.

Gruber, J., and S. Kamin (2012), “Fiscal Positions and Government Bond Yields in OECD Countries,” *Journal of Money, Credit and Banking*, Vol. 44, No. 8, pp. 1563-1587.

Hemming, R., M. Kell, and A. Schimmelpfennig (2003), "Fiscal vulnerabilities and financial crises in emerging market economies", *IMF Occasional Paper*, No. 218.

Henao-Arbelaez, C., and N. Sobrinho (2017), “Government Financial Assets and Debt Sustainability”, *IMF Working Paper*, No. 17/173.

Hollo, D., Kremer, M. and Lo Duca, M. (2012), “CISS – a Composite Indicator of Systemic Stress in the Financial System”, *ECB Working Paper Series*, No 1426.

Ichiue, H., and Y. Shimizu (2015), “Determinants of Long-Term Yields: A Panel Data Analysis of Major Countries,” *Japan and the World Economy*, Vol. 34-35, pp. 44-55.

IMF (2018a), “Fiscal Monitor: Managing Public Wealth”, International Monetary Fund, October 2018.

IMF (2018b), “Fiscal Monitor: Capitalizing on Good Times”, International Monetary Fund, April 2018.

IMF (2018c), “Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries”, International Monetary Fund, February 2018.

IMF (2018d), “Austria. Fiscal Transparency Evaluation”, Country Report, No. 18/193.

IMF (2018e), “Ireland – Article IV Consultation - Staff Report”, No. 18 / 194, June.

IMF (2016), “Analysing and Managing Fiscal Risks: Best Practices”, *IMF staff paper*, June.

IMF (2013), “Staff Guidance Note for Public Debt Sustainability Analysis in Market-Access Countries”, May.

IMF (2010), "Fiscal monitor - Fiscal exit: from strategy to implementation", International Monetary Fund, November 2010.

Kaufmann, D., Kraay, A. and Mastruzzi, M. (2011), “The Worldwide Governance Indicators: Methodology and Analytical Issues”, *Hague Journal on the Rule of Law*, Vol. 3, Issue 2.

Kopp, E. and Williams, P. (2018) “A macroeconomic approach to the term premium”, *IMF Working paper*, June 2018.

Kraay, A. and Nehru, V. (2006), “When is external debt sustainable?”, *The World Bank Economic Review*, No. 20(3), 341-365.

Laeven L., and F. Valencia (2013), "Systemic Banking Crises Database", *IMF Economic Review*, No. 61, pp. 225–270.

Lennkh, R. A., Moshammer, E. and Valenta, V. (2017), "A comprehensive scoreboard for assessing sovereign vulnerabilities", *ESM Working Paper series*, No. 23.

Marchesi M., M. Petracco Giudici, J. Cariboni, S. Zedda, and F. Campolongo (2012), "Macroeconomic Cost-benefit Analysis of Basel III Minimum Capital Requirements and of Introducing Deposit Guarantee Schemes and Resolution Funds", *European Commission JRC Scientific and Policy Report 24603.*

Marshall, M. G. and Jaggers, K. (2000), “Polity IV project”, Center for International Development and Conflict Management, University of Maryland, No. 174.

Masuch, K., Anderton, R., Setzer, R. and Benalal, N. (2018), “Structural policies in the euro area”, *ECB Occasional paper series*, No. 210.

Miller, M. and Zhang, L. (2014) “Saving the euro: self-fulfilling crisis and the ‘Draghi put’”, *VoxEU Column*.

North, D. C. (1989), “Institutions and economic growth: An historical introduction”, *World development*, No. 17(9), 1319-1332.

Pamies Sumner, S. and Berti, K. (2017), "A complementary tool to monitor fiscal stress in European economies", *European Commission Discussion Paper*, No. 049.

Qian, R. (2012), “Why do some countries default more often than others? The role of institutions”, *World Bank Policy research working paper*, No. 5993.

Reinhart, C. M. and Rogoff, K. S. (2009), “This time is different: Eight centuries of financial folly”, Princeton university press.

Reinhart, C., Rogoff, K. and Savastano, M. (2003), “Debt Intolerance”, *Brookings Papers on Economic Activity 1*, 1-74 (Washington DC: Brookings Institution).

Reinhart, C.M., Goldstein, M. and Kaminsky, G. (2000), "Assessing financial vulnerability, an early warning system for emerging markets: introduction", *MPRA Paper*, No. 13629.

Saeigh, S. (2009), “Coalition governments and sovereign debt crises”, *Economics and Politics*, Vol. 21, Issue 2.

Svensson, L. E. (1994) “Estimating and Interpreting Forward Interest Rates: Sweden 1992-1994”, *Centre for Economic Policy Research, Discussion Paper,* No. 1051.

Van Rijckeghem, C. and Weder, B. (2009), “Political institutions and debt crises”, *Public Choice*, No. 138(3-4), 387.

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