



EUROPEAN CENTRAL BANK

EUROSYSTEM

ECB-UNRESTRICTED

Sovereign Debt Sustainability Analysis: a methodological framework

Airef Workshop on Fiscal Risks

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Cristina Checherita-Westphal

ECB, Fiscal Policies Division

Outline

- 1 Motivation and overview of DSA framework
- 2 The DSA Benchmark scenario
- 3 Adverse shock scenarios
- 4 Additional indicators and cross-checking tools
- 5 Conclusions

1. *MOTIVATION and OVERVIEW*

Why the need to strengthen sustainability assessments?

- Sovereign debt crisis in the euro area made clear that sound public finances limit the scope for fiscal dominance and support an effective monetary policy
- High public indebtedness generally found to:
 - make an economy less resilient to shocks and less able to implement counter-cyclical fiscal policy;
 - limit its growth potential.
- Debt sustainability analysis (DSA) is regular input in country surveillance, policy making, part of investors' and rating agencies' analytical toolkit
- ECB OP 185/2017: basis for a sustainability framework used in fiscal surveillance in E(S)CB since 2015

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", Occasional Paper Series no. 185, April, ECB, Frankfurt am Main.

- Some enhancements to the tool compared to the OP just implemented

ECB OP 185/2017

Harmonised methodology; ensure consistency + transparency



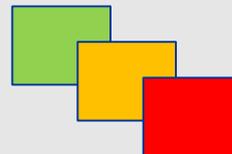
Basis for further qualitative experts' assessment in policy papers



Include elements of DSA in other international institutions, especially EC and IMF



Can derive explicit overall quantitative indicator: DSA heat map/ sustainability score



How to assess sovereign debt sustainability?

DSA: inherently difficult and sensitive to the assumptions used

- No simple rule for determining whether a government's debt is in practice sustainable or not.
- Traditionally, DSA has been about debt stabilisation, but:
 - ✓ at which level?
 - ✓ with how much fiscal effort?
 - ✓ what is the resilience to adverse shocks?
 - ✓ surrounded by which degree of uncertainty?
 - ✓ which other vulnerabilities matter? (Debt structure? Institutions?...)
- Robust DSA assessment requires an encompassing set of information
 - ✓ Ensure that as much relevant information as possible is taken into account
 - ✓ Limit sensitivity with respect to individual pieces of information

ESCB DSA framework, OP 185/2017 and revisions

Deterministic DSA

Debt projection scenarios (10-year horizon)

Benchmark

- Central scenario
- Mechanical and plausible
- Based on ESCB internal forecast (incl. potential output)
- SGP-based fiscal rule (slightly amended)

Adverse scenarios

- Narrative shocks around benchmark:
 1. Historical scenario
 2. NFPC with ageing
 3. Macro (bank) stress
 4. Interest rate shock
 5. NFPC and potential growth shock

Other indicators (refinements)

Stochastic DSA

Liquidity risk

Market uncertainty and political risk

Debt structure

Net financial position

Contingent liabilities

Institutions & governance

Evaluation of all components: Heat map

- Level
- Dynamics
- Fiscal fatigue (only in benchmark)

- Dispersion
- Prob. of
 - debt > 90
 - debt not stable

- Thresholds
- Percentiles

Weighting scheme / aggregation / sustainability score

2. *The Benchmark*

Main challenge: Provide for a harmonised (mechanical) approach across countries, but keep it realistic and prudent

- 10-year horizon for DSA simulations (OP 185: period 2016-25);
- **Stylised model for driving variables**

Real GDP growth path

Internal forecast for the short-to-medium run; beyond, GDP growth path converges to potential growth (ESCB country-specific estimates) following a stylised equation:

- ✓ Takes into account persistence effects;
- ✓ Impact of fiscal policy via the multiplier;
- ✓ Plausible business cycle pattern: gradual closure of the output gap.

GDP deflator

Gradual convergence to 1.9% in line with the ECB objective for price stability.

Financial assumptions

- In line with market expectations
- Interest rate equation takes into account the structure of government debt

Fiscal policy assumptions

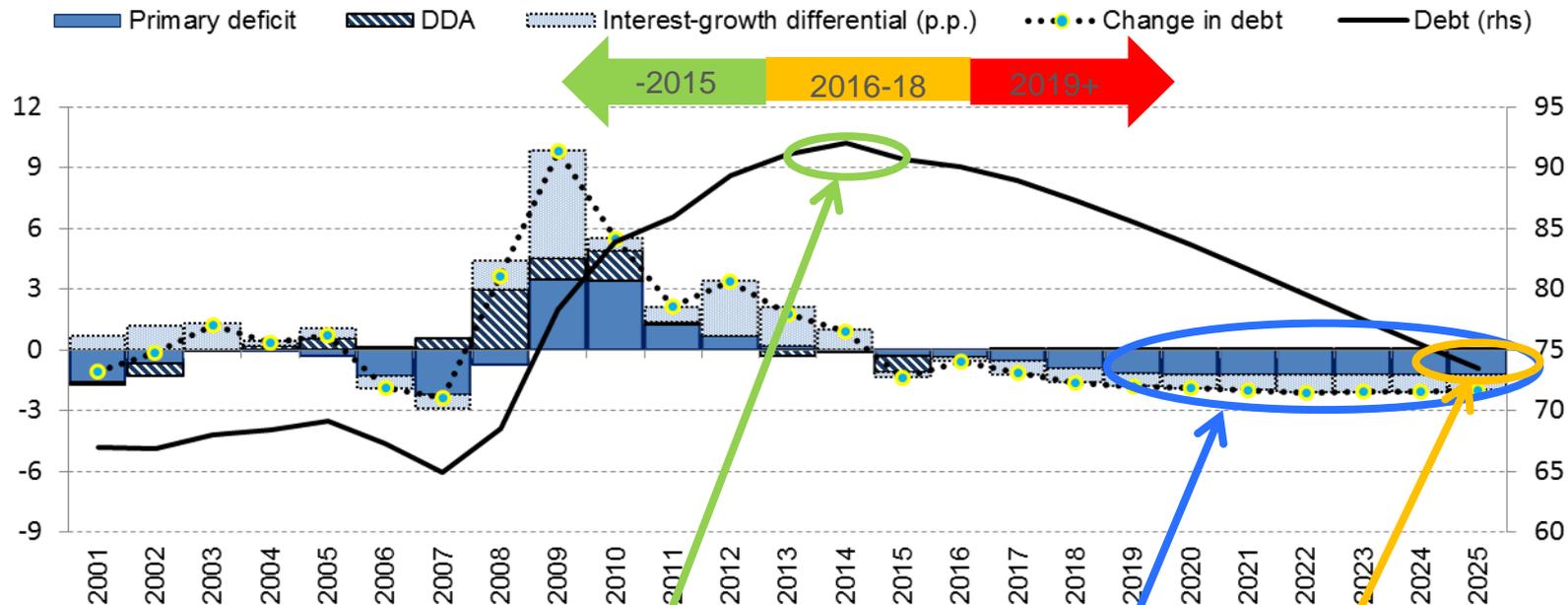
- Aim: construct most likely norm, consistent with other assumptions (financial)
- Many governments likely to take some additional consolidation over the medium-to-long term ⇔ No fiscal policy change is seen as a risk scenario
- Use assumption that governments comply with **minimum requirements to avoid** significant deviations and, potentially, **sanctions** under the SGP
- **Beyond the ESCB fiscal forecasting horizon ($\sim T+3$), use fiscal rule broadly in line with the SGP requirements for convergence towards the MTO** (EC flexibility matrix, with a margin of deviation of 0.25% of GDP and overall fiscal effort capped at 0.5 p.a.)
- For fiscal projections: use disaggregation between cyclical component (automatic stabilisers) and structural position, based on the EC's methodology.

Deficit-debt adjustment (DDA)

- Generally assumed to be zero beyond the projection horizon

For the purpose of this presentation, illustrative debt simulations conducted with EC Spring 2016 as per ECB OP 185/2017 are shown

Euro area aggregate (EA)



Interpretation and assessment:

- Debt in EA **peaked** in 2014 (**green** dynamics in heat map)
- Debt **remains rather high**, projected to decline to 73% by 2025 (**yellow** level in heat map)
- Debt reduction mainly on account of **cumulative primary surplus** (at country level, we calculate a measure of fiscal fatigue depending on specific fiscal track-records and common thresholds).

Heatmap criteria **revisions**

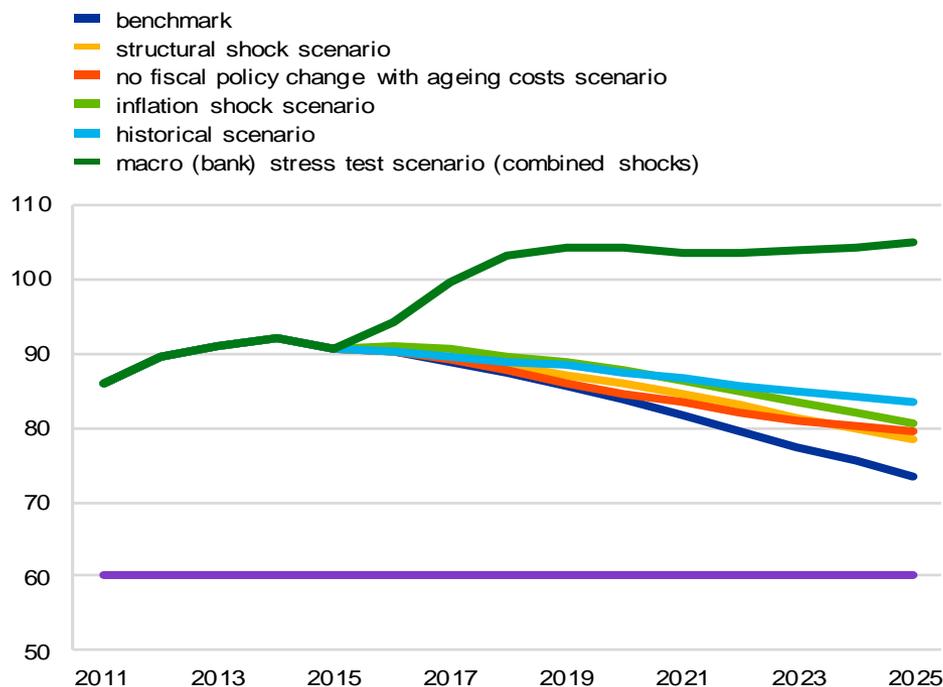
Aim: Mitigate cliff effects and improvement in the DSA scoring

- a) **Debt level criterion**: continuous scheme with non-linear smoothing around the existing thresholds: 60%, 90% and penalties for higher debt levels (120% and 150%).
- b) **Dynamic criterion**: better accounting for both year of stabilisation and slope effect
 - Year of stabilisation: more gradual impact on the score
 - Slope effect: slope of the projected debt path better taken into account in the score (a flatter debt path more risky than a steeply downward path); debt ratio changes in the shorter-term higher weight compared to longer-term (ESCB forecast horizon more informative)
 - No penalty in the dynamic criterion if debt level < 30% of GDP (instead of 20% before)

3. Adverse shock scenarios

- **Standardised shocks** gauge sensitivity to same-sized shock.
 - ✓ Used as additional tests, but not very informative for the likelihood of vulnerabilities.
- Need for narrative scenarios:
 - ✓ designed and calibrated on country-specific basis,
 - ✓ capturing country specific risks,
 - ✓ resulting from commonly applied rules.
- **Narrative scenarios considered:**
 - i. No-fiscal policy change, including ageing costs (NFPC)
 - ii. Macro (bank) stress test scenario
 - iii. Country-specific structural shock (*now on NFPC*);
 - iv. Country-specific inflation shock (*revised to interest rate shock*),
 - v. Historical scenario.

EA aggregate (for illustrative purposes)



- Scenarios with significantly higher debt ratios signal risks to benchmark
- Generally, the combined-shock scenario (macro-bank stress test) most detrimental
- Certain scenarios more relevant for some countries than others.
- Countries particularly vulnerable in case of high debt burden and relatively flat benchmark debt path

4. Additional indicators and cross-checking tools

Methodology:

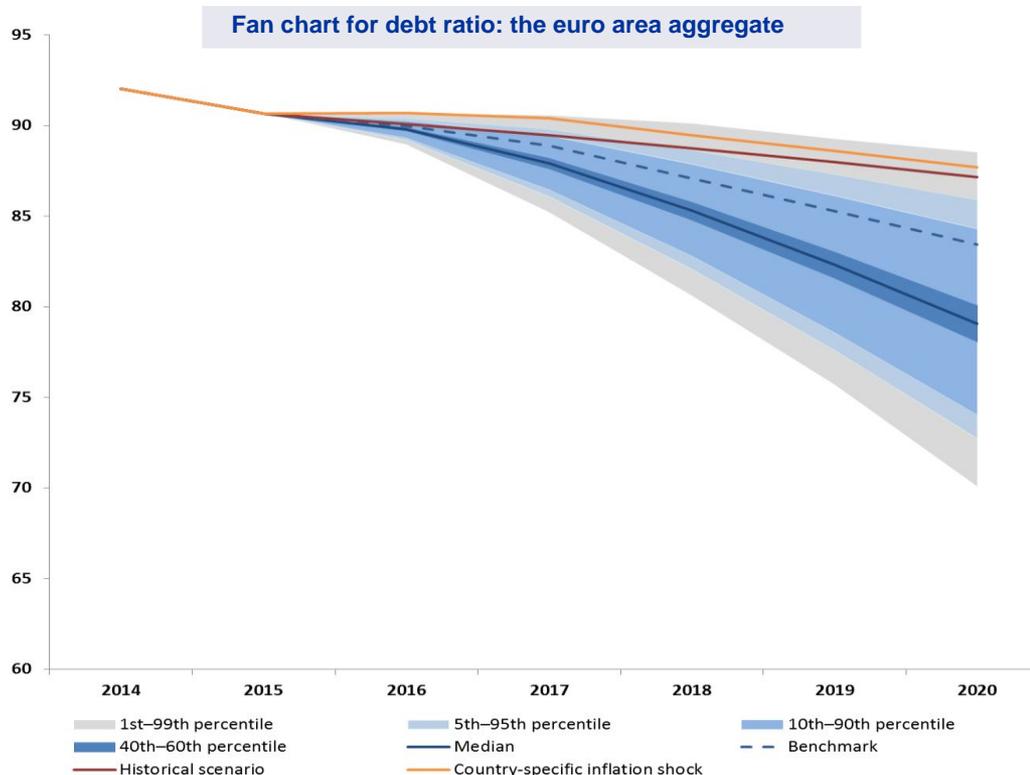
- VAR approach (**revised to BVAR**) to assess the **uncertainty** around the joint path of future macroeconomic developments (growth, interest rates, prices).
- Richer specification and a more precise shock identification scheme
- Uncertainty around fiscal position captured through:
 - ✓ cyclical component and
 - ✓ the rule-embedded reaction of SPB to cyclical conditions
- No uncertainty regarding (extra) reaction of fiscal authority

Cross-checking tool, providing for additional indicators

- Empirical rather than narrative analysis of macroeconomic uncertainty
- Attaching probability to alternative scenarios
- Additional indicators to assess sustainability based on the probabilistic approach

Three stochastic DSA indicators (evaluated at T+5)

Indicators	Additional description	Reference period	Criteria	Heatmap		
Stochastic DSA						
Indicator 1 (debt dispersion)	Simulated difference 95th-5th percentiles of debt ratio distribution	T+5 (2020)	Percentiles EA sample	≤ 33 rd percentile	33 rd < percentile ≤ 66 th	> 66 th percentile
Indicator 2 (Probability of debt above 90% in T+5)	Debt level criterion	T+5 (2020)	Threshold probability	probability ≤ 0.33	0.33 < probability ≤ 0.66	probability > 0.66
Indicator 3 (Probability of debt not stabilizing by T+5)	Stabilisation criterion	T+5 (2020)	Threshold probability			



Short-term

Liquidity indicator

- Net financing needs (T+1) = GFN – liquid assets

Market uncertainty and political risk

- Government bond spreads
- Current ratings
- Political risk indicator

Medium and longer-term

Debt structure

- Share of short-term debt
- Change in the share of ST debt
- Share of public debt in foreign currency
- Share of debt with variable interest rate

Governance and quality of institutions

- WB Governance Indicators
(Voice and Accountability, Government Effectiveness, Regulatory Quality and Rule of Law)
- Corruption Perceptions Index

Scope for contingent liabilities

- LT ageing cost indicator (including EC S2 indicator)
- Eurostat Synthetic indicator
- Assessment of risks from financial sector (internal report)

Financial position of the economy

- Net international invest. position
- Private debt (MIP)
- Other Indicators under MIP external position

5. Conclusions

Enhanced DSA tool:

Comprehensive analysis and more in-depth reporting on sovereign debt risks:

- ✓ Regular input to assess fiscal vulnerabilities
- ✓ Broad risk assessment, but also possibility to summarise risk in explicit overall quantitative indicator (DSA heat map/sustainability score)
- ✓ Rich set of alternative scenarios
- ✓ Large set of additional indicators (including for illustration purposes and to feed into expert judgement)
- ✓ Allow for expert assessment in country specific write-ups

BACKGROUND SLIDES

Overview

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 4. Potential growth shock
 5. Historical scenario

Other indicators

Stochastic DSA

Liquidity risk

Debt structure

Net financial position & ext. comp

Contingent liabilities

Governance and political risk

Evaluation of all components: Heat map

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Possibility for aggregation / sustainability score

Marginal sovereign bond yields (for marketable debt): based on implied forward rates from national yield curves

- *Group I (Germany, France, the Netherlands, Spain, Italy, Belgium, Austria, Finland, Portugal and Slovenia):*
 - *10-year (5-year, 1-year) benchmark bond extended with the forward par yields derived on the cut-off date of baseline forecast from the corresponding country-specific spot yield curves*
 - *For longer projection horizons, no negative term premium is allowed to avoid unjustified inversion of the forward yield curve*
- *Group II (the remaining EA countries): the country-specific spread to German bonds (as of latest available quarter) follows the average spread of group I*

Short-term interest rates

- *Country-specific rates convergence linearly to EURIBOR projections in three years.*

THE BENCHMARK – Interest payment equation

Financial assumptions in line with market expectations

$$inp_t = nmd_{t-1} \overset{\uparrow}{iira_{t-1}} + md_{t-1} \frac{1}{2} \overset{\uparrow}{(iira_{t-1} + amir_t)} + \frac{1}{2} (-pb_t + dda_t + inp_t) \overset{\uparrow}{amir_t}$$

NON- Maturing
Maturing
New Financing needs

$$inp_t = \frac{nmd_{t-1} iir_{t-1} + \frac{1}{2} md_{t-1} iir_{t-1} + \frac{1}{2} (-pb_t + dda_t + md_{t-1} + inp_t^{of} - \Delta D_t^{of})^+ amir_t}{1 - \frac{1}{2} amir_t}$$

Marginal interest rate:

$$amir = \frac{1}{2} (stn + stn_{-12m}) * sd1 + \frac{1}{2} (stn_{-12m} + ltn_{-5y}) * sd1_{-5} + \frac{1}{2} (ltn_{-5y} + ltn_{-10y}) * sd5$$

Where

inp = interest payments
nmd = debt with a residual maturity of more than one year
iir = implicit interest rate
md = debt with a residual maturity of one year or less
amir = **“Average Market Interest Rate”**
pb = general government primary balance
dda = deficit-debt adjustment

For *amir* definition:

stn = 3-month government security yield
stn_{-12m} = 12-month government security yield
sd1 = share of debt with residual maturity below 1 year
ltn_{-5y} = 5-year government bond yield
sd1₋₅ = share of debt with residual maturity between 1 and 5 years
ltn_{-10y} = 10-year government bond yield
sd5 = share of debt with residual maturity above 5 years

Shocks applied as of T+1

1. No fiscal policy change with ageing costs

- No additional consolidation compared with the baseline projections as of 2018 (structural balance, EC-method, kept constant at the 2018 level).
- Calibration more adverse for countries with large consolidation needs.
- The projected change in total ageing costs under the 2015 Ageing Report **AGW risk scenario** is added (later revisions as peer-reviewed by EPC)

2. Historical scenario

- Growth and primary balance ratio (net of support to the financial) sector are converging (in three years) to the historical average of each country over 2001-13.
- DDA in Finland and Luxembourg: the (larger) historical average for the period 2001-13 is considered more representative for the historical scenario

3. Macro (bank) stress test scenario

- Real GDP growth, the GDP deflator and the 10-year sovereign bond spreads are shocked over 2016-2018 in line with the 2016 EBA EU-wide bank stress test.
- Shocks to real growth are assumed to have a lasting impact on potential GDP, impacting negatively the fiscal structural position.
- The shocks to GDP deflator are modelled as in the country-specific inflation shock.

4. Country specific inflation shock

- The GDP deflator is shocked according to a measure of past empirical uncertainty: sd of errors from an AR(1) over 2001-2015. With the following channels:
- Denominator effect: The shock feeds one to one into the nominal growth rate.
- Primary balance:
 - ✓ Negatively affect the SPB proportional to the weight of the indexed expenditure, approximated by the public wages and the social payments.
 - ✓ Assuming a three-year adaptive expectation scheme, only the unexpected part of the shock will reflect the downward rigidities of those indexed items.
- Interest rate:
 - ✓ Reduce the nominal (marginal) interest rate by 60 b.p. in the first year of the shock across the whole yield curve. Thereafter, a full pass-through is linearly ensured in 5y
 - ✓ This impact is partly compensated by the reaction of sovereign spreads to worsened fiscal fundamentals.

5. Structural shock scenario

- Potential growth is shocked according to a measure of past empirical uncertainty, that is, standard deviation of errors from an AR(1) over 2001-2015.

All shock scenarios include a reaction of sovereign spreads to worsened fiscal fundamentals.