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STAFF GUIDANCE NOTE ON THE SOVEREIGN RISK AND DEBT SUSTAINABILITY FRAMEWORK FOR MARKET ACCESS COUNTRIES

IMF staff regularly produces papers proposing new IMF policies, exploring options for reform, or reviewing existing IMF policies and operations. The Report prepared by IMF staff and completed on July 19, 2022 has been released.

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STAFF GUIDANCE NOTE ON THE SOVEREIGN RISK AND DEBT SUSTAINABILITY FRAMEWORK FOR MARKET ACCESS COUNTRIES

EXECUTIVE SUMMARY

This note provides operational guidance for the use of the Sovereign Risk and Debt Sustainability Framework (SRDSF), which replaces the Debt Sustainability Framework for Market Access Countries. The SRDSF introduces improvements in organization, methodology, transparency, and communication when analyzing public debt issues in countries that mainly finance themselves with market-based debt. After its phased adoption beginning [June 2022], it will become the Fund's principal tool for assessing public debt sustainability.

The SRDSF supports the Fund's surveillance and lending functions. In surveillance, the framework acts as an early warning system gauging debt-related risks. When risks are detected, the framework can help identify policy recommendations to prevent potential stress from materializing. When a member is already experiencing debt-related stresses that lead to a request for a Fund-supported program, the SRDSF helps assess public debt sustainability, a requirement for all IMF lending. Where public debt is found to be unsustainable, the framework provides a methodology for setting targets to guide debt restructurings undertaken in the context of Fund-supported programs.

The SRDSF is based on several tools that analyze debt risks at various time horizons. A core subset of the framework is applicable to all countries and informs the assessments undertaken at the near- and medium-term horizons. Additional specialized analyses help gauge broader risks at the medium and long-term horizons. These tools are supported by enhanced debt disclosures, indicators of the public debt profile, and forecast realism tools.

Informed judgment is an integral component of assessments undertaken with the SRDSF. Models cannot capture every circumstance. Thus, assessments should reflect additional considerations when relevant, including as indicated in this note.

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SECTION I. INTRODUCTION

1. The Sovereign Risk and Debt Sustainability Framework for Market Access Countries (SRDSF) is one of the two debt sustainability frameworks used by Fund staff. The SRDSF provides a standardized approach to conducting analyses of the risk of sovereign debt-related stress and public debt sustainability. It applies to market access countries (MACs), which refers to countries that are not eligible for the Fund's PRGT facilities. This encompasses all advanced economies and most emerging market economies. Additionally, in special cases, some PRGT-eligible countries that have substantial and durable access to markets may also use the SRDSF.[1] For all other countries, the IMF-World Bank Debt Sustainability Framework for Low Income Countries (LIC DSF) is the applicable analytical tool.[2]

2. Approved by the IMF's Executive Board in January 2021, the SRDSF replaces its predecessor, the Debt Sustainability Analysis for Market Access Countries (MAC DSA). The approval followed a comprehensive review of the MAC DSA (IMF, 2021a) that identified areas for reform, which have been implemented in the SRDSF (Annex I).[3] The SRDSF is being rolled out in a phased fashion beginning in June 2022. After the SRDSF becomes effective for the country being analyzed, Fund staff should include Sovereign Risk and Debt Sustainability Analyses (SRDSAs)—the main output of the SRDSF—in all policy notes and subsequent staff reports that include debt sustainability analyses and are sent for interdepartmental review.

3. The SRDSF, like the predecessor MAC DSA, has several important roles in supporting the Fund's mandate. In the Fund's surveillance role, the SRDSF helps staff to identify a member country's vulnerability to sovereign stress to steer the member away from such stress before it materializes. In the context of precautionary arrangements, the SRDSF has the same functions as in surveillance and in addition helps to verify compliance with the applicable qualification requirements on debt sustainability. In nonprecautionary Fund-supported programs, which generally take place after stress has already materialized, the SRDSF helps determine if the stress can be resolved via a Fund-supported program with adjustment and new financing, or if exceptional measures (such as debt restructuring) are needed to deliver medium-term debt sustainability, which is a prerequisite for all Fund lending. When a debt restructuring is needed to restore medium-term debt sustainability, the SRDSF can inform the overall envelope of debt relief and set targets for that restructuring.

4. Reflecting these roles, the SRDSF provides two outputs: a sovereign risk assessment and a debt sustainability assessment. These assessments aim to capture vulnerability to sovereign stress events, risks that debt could become unsustainable, and prospects for stabilizing the debt

[1]Specifically, PRGT-eligible countries are eligible to use the SRDSF when they (i) have graduated from being IDA-only, as the LIC DSA is required for the World Bank's operations and (ii) demonstrate substantial and durable market access based on one of the tests used for the purposes of assessing eligibility to use the Fund's concessional resources.

[2]See IMF 2018a for guidance on the operation of the LIC DSF.

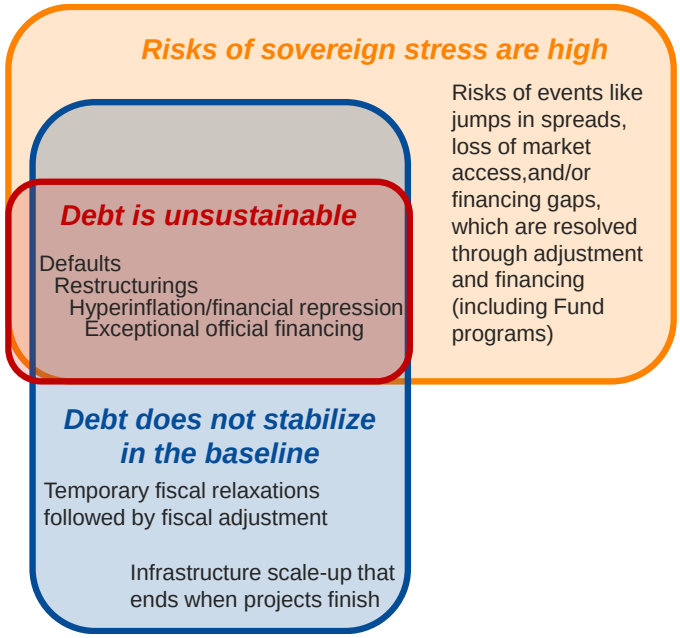
[3]Table 1 of IMF 2021a reports the key areas of reform identified by the Review of the MAC DSA framework.

trajectory in the baseline scenario (Figure 1). These concepts are essential in this framework and are used throughout the remainder of this note:

- *Sovereign stress* refers to an event where market and/or fiscal pressures related to public debt become acute. However, there is no presumption on whether those pressures can be resolved through fiscal adjustment and economic reform, some combination of adjustment/reform and financing, or exceptional measures like debt restructuring.

- *Unsustainable debt* occurs when there are no politically and economically feasible policies that stabilize the debt-to-GDP ratio and deliver acceptably low rollover risk without restructuring and/or exceptional bilateral support, even in the presence of Fund financing.[4] Assessing whether debt has become unsustainable becomes critical after risks of sovereign stress materialize, as it indicates how the problem may be resolved. When debt is assessed to have become unsustainable, it implies that adjustment and new financing are not enough to eliminate the stress and exceptional measures will be necessary. With rare exceptions (when financial markets grossly misprice debt risks) unsustainable debt goes along with sovereign stress.

Figure 1. Debt Concepts: Sovereign Stress, Unsustainable Debt, and Non-Stabilizing Debt



Source: IMF.

Note: Text describes how situations of unsustainable debt, high debt risks (but sustainable debt) and failure of debt to stabilize in the baseline (with low debt risks and sustainable debt) are eventually resolved.

- *Debt non-stabilization under the baseline* describes a situation in which a country's debt/GDP ratio is not expected to stabilize under the best prediction of policies by the end of the projection horizon. However, while non-stabilization is sometimes an indicator of sovereign stress or unsustainable debt, it is not always the case. While an explosive debt trajectory implies that current and projected fiscal policies are unsustainable, there may be feasible adjustment

[4]This definition overlaps with the definition of unsustainable debt that is used in the academic literature: this typically emphasizes debt stabilization as a sufficient condition for ruling out Ponzi schemes involving government debt issuance (see Willems and Zettelmeyer 2021). The IMF's definition is stronger in the sense that it also takes into account rollover risk. The justification for doing so is that ignoring rollover risk may lead to mistaken conclusions about sustainable debt levels and fiscal policies.

policies which would stabilize the debt if implemented. Debt non-stabilization need not trigger sovereign stress if markets expect debt to stabilize outside the projection horizon.

5. Both assessments arise from time horizon-based analyses supported by various modules that are covered in the remainder of this guidance note. The overall framework is summarized in Figure 2. Comprehensive information and guidance on the operation of all tools contained within the SRDSF can be found in the subsequent sections of this note as follows:

- Section II summarizes the main organizational and conceptual element of the framework.
- Section III describes the appropriate debt coverage and disclosure for Fund SRDSAs and sets out the SRDSF's data requirements.
- Section IV presents a suite of "realism tools" designed to detect and discourage overly optimistic debt, fiscal, and macroeconomic projections.
- Section V deals with near-term risk analysis. This takes the form of an Early Warning System that predicts sovereign stress events over short (1-2 year) horizons using reported data outturns on indicators of country's quality of institutions and stress history; cyclical position; debt burden and buffers; and global conditions.
- Medium-term risk analysis is developed in section VI. This combines the results of two modules that capture solvency and liquidity risks implied by the medium-term projections, respectively. The Debt Fanchart Module focuses on solvency risks stemming from a country's debt burden over the next 5 years. Liquidity risks and a country's ability to meet its gross financing needs over the medium term ("financeability") are handled by the Gross Financing Needs Module. In addition to these two modules in the core framework, for some countries, additional stress tests could be triggered to assess a specific vulnerability.
- Section VII describes tools for assessing some longer-term risks, which may not be applicable for all countries. These include (i) climate change; (ii) long-run fiscal costs due to demographics; (iii) large debt amortizations; and (iv) the development or exhaustion of natural resources.
- Section VIII describes how the results of the tools for the time various horizons are synthesized into an overall bottom-line assessment of sovereign risk, inform debt sustainability assessments (for all IMF-supported programs and less frequently, in surveillance), and are used to set targets to restore sustainability when debt restructuring is necessary.
- Finally, section IX covers the required elements for production and publication of Fund DSAs.

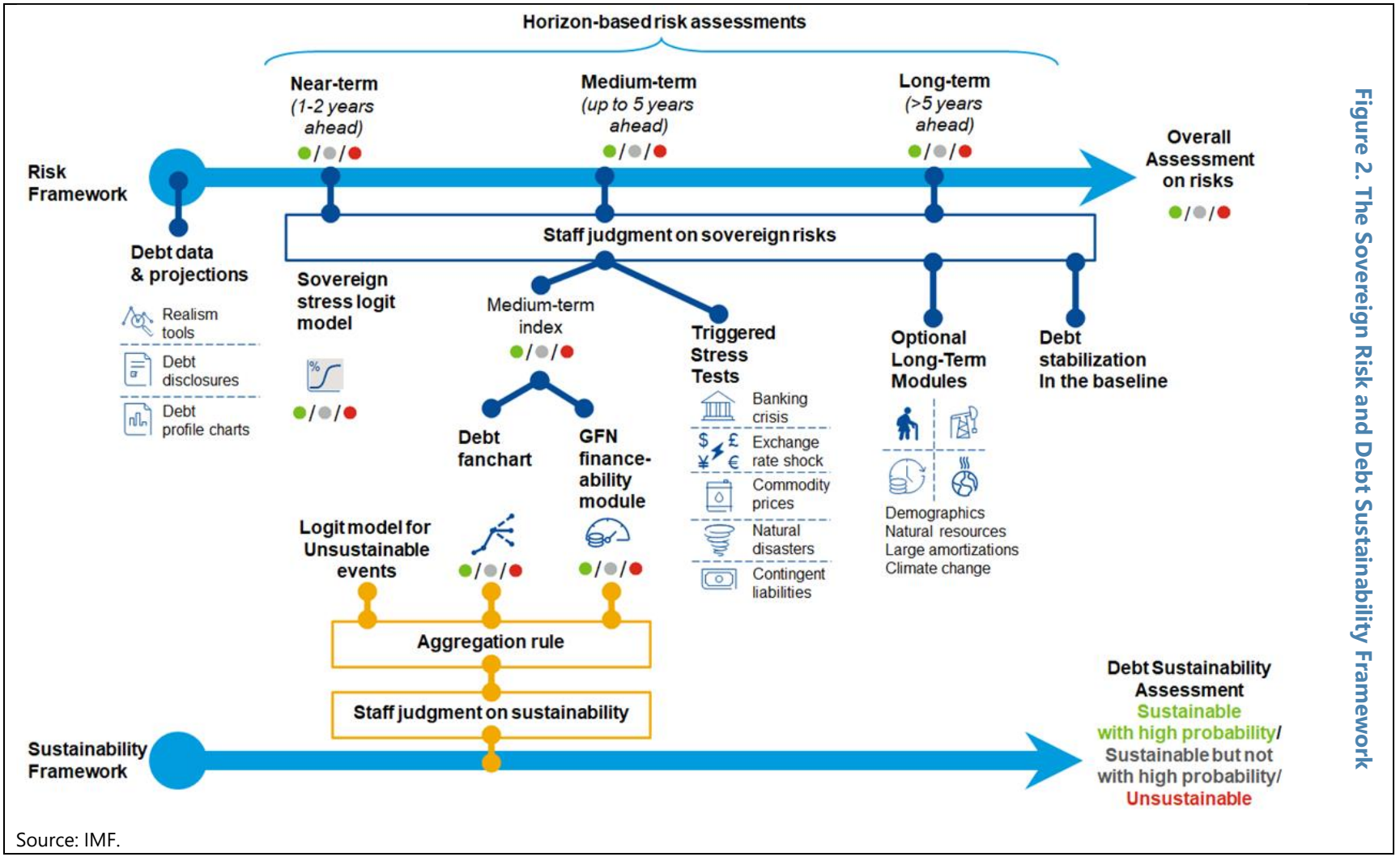
6. Readers of this note are invited to focus their attention on the sections that are most relevant to their needs:

- *First-time users* may want to read Section II, covering key concepts, as well as Sections III and IV, which cover critical inputs to the tools. The operation of the framework is covered in sections V

and VI, but only material under the headings "standard application" and "interpreting the tool" are necessary on a first pass. Readers may also initially skip section VI.C on triggered stress tests. However, sections VII.A on long-term assessments and VIII.A on overall risk assessments are essential as they are standard elements of SRDSAs. If the SRDSA is being prepared for a country with a Fund-supported program, section VIII.B is also important as a sustainability assessment will be required. (Annex II contains a model SRDSA and Annex III summarizes procedures for running the framework.)

- *Finalizing an SRDSA* additionally requires Section IX, which covers requirements for reporting and publication. Whether readers need to refer to other parts of this note will depend on the preliminary results. If any of the results from the tools described in sections V and VI are counterintuitive, users should review the information under the "considerations for special cases" and/or "using judgment" headings of section V and VI. These sections provide specific guidance to help users improve the predictive capacity of the SRDSF tools (e.g., avoid missed crises or false alarms). Similarly, if any stress test is activated, users may want to refer to section VI.C to understand it. Sections VII.B to E could be useful if the user wants to run one of the optional long-term modules to examine a relevant issue. Section VII.B may be useful if users wish to include an optional sustainability assessment in a country that does not currently have a Fund-supported program.

- *To present the SRDSF methodology (e.g., for training) or to review DSAs* it is important to read all sections, focusing particularly on the methodological parts of this note, including section II, as this describes the overall principles behind the SRDSF's methodology. Closer focus on the "considerations for special cases" and "using judgement" sections is useful to prepare for potential questions on the issues covered in those areas. Annex IV also contains additional details on the calibration of the SRDSF.



Source: IMF.

Figure 2. The Sovereign Risk and Debt Sustainability Framework

SECTION II. OVERVIEW

7. The SRDSF is a collection of modules that guide assessments on sovereign stress risks and debt sustainability. The overall framework aims to be comprehensive, looking at risks across a range of subjects and time horizons.

8. The core framework, applied to all MACs, consists of three modules with common design aspects. These comprise (i) the near-term early warning system (logit model), (ii) the Debt Fanchart Module, and (iii) the GFN Module. The three modules share some important features:

- *Numerical risk metrics*: Each module transforms various input variables into a single index (a risk metric), defined such that a higher index value represents a higher risk of sovereign stress. In the case of the near-term module, the index represents the probability of sovereign stress within the next two years, while the inputs are the independent variables of a logit model. In the case of the Debt Fanchart and GFN Modules, the inputs are analytical measures derived from debt and GFN simulations based on macroeconomic projections, weighted by their power to predict past stress events. In a further step, the Debt Fanchart and GFN Module Indices are themselves combined into an aggregate Medium-Term Index (MTI), using simple averaging.

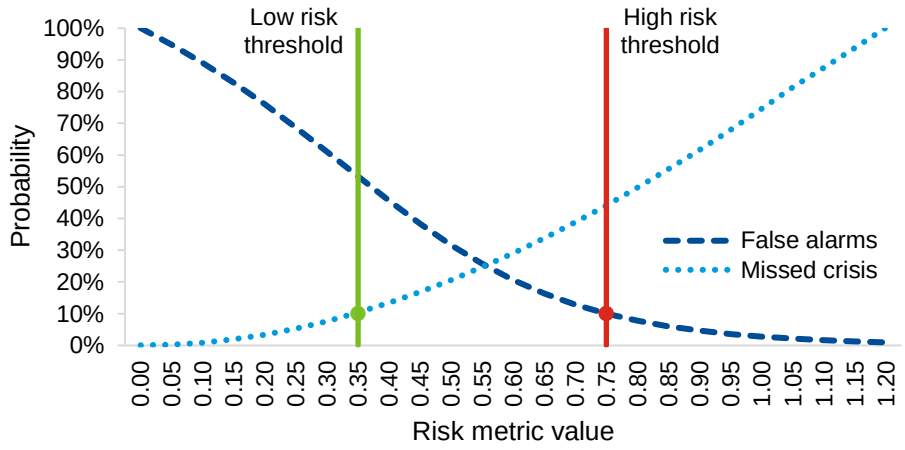
- *False alarms and missed crises*. Suppose one wanted to use the index values to either predict a crisis or predict no crisis. In that case, one would define a decision rule by dividing each index into two zones. If the index value falls into the lower segment, no crisis is predicted; if it falls into the upper segment, a crisis is predicted. Hence, there is a binary decision rule associated with each threshold τ separating the lower and upper segment. Each decision rule gives rise to two types of mistakes (or "misclassifications"). The first type of error, called a "false alarm", is to predict a crisis although no crisis materializes. This corresponds to the "Type I" error in statistical hypothesis testing (the hypothesis in this case would be "no crisis"). The second type of error, called a "missed crisis", is to predict no crisis when a crisis in fact materializes. This corresponds to a "Type II" error in hypothesis testing (where the hypothesis is again "no crisis").

- *Misclassification probabilities*. Based on the sample of sovereign stress events used to calibrate the framework (see IMF 2021a), missed crisis and false alarm probabilities were computed as follows. The probability of a *missed crisis* associated with the binary decision rule using the threshold τ is the share of sovereign *stress* events with an index value of τ or less (the number of crisis events with an index value of τ or less divided by the number of all stress events). The probability of a *false alarm* associated with a binary decisions rule using the threshold τ is similarly computed as the share of *non-stress* events with an index value of τ or higher.

- *Thresholds and mechanical signals*. While the misclassification probabilities associated with any potential threshold are based on an implicit binary decision rule, the framework does not in fact use binary decision rules. Instead, it divides the risk index in a "low", "moderate" and "high risk" zone. These zones are defined by calibrating *two* thresholds —upper and lower—based on the probability of false alarms and missed crises. The *low-risk* threshold τ_l is chosen such that a decision rule that predicts "no sovereign stress" for any index value below τ_l implies a *missed*

crisis probability of 10 percent. The *high-risk* threshold τ_h is calibrated so that a decision rule that predicts "sovereign stress" for any index value above τ_h implies a *false alarm* probability of 10 percent (Figure 3).[5] Index values below the lower threshold are interpreted as indicating low risk, index values above the higher risk threshold as indicating high risk, and values in the middle as indicating moderate risk. This is referred to as the "mechanical signal" of the module.

Figure 3. Missed Crises, False Alarms, and Threshold Calibration



Source: Fund staff estimates.

- *Posterior probabilities of stress*. In addition to computing misclassification probabilities, the crisis event set can also be used to approximate the probability of experiencing a sovereign stress event conditional on the index value being in a certain interval (see Box 3 of IMF 2021a for details).[6] For the near-term tool, the average probability of stress for an index value in the high-risk zone is 0.40 while the average probability of stress for an index value in the low-risk zone is 0.02. For the medium- term index, the corresponding stress probabilities are 0.43 and 0.04, respectively. The *lowest* stress probability associated with a high-risk signal in either of the tools is about 20 percent. Hence, "high risk" does not necessarily imply that a stress event is the most likely outcome, but it does imply that the risk is sufficiently high to be taken seriously.

- *Comparator groups*: To help create a frame of reference, the SRDSF's output contains comparisons of metrics against relevant comparator groups. These peer groups are based on Fund engagement status (programs vs. surveillance-only) and economic development (advanced economies (AEs) vs. emerging markets (EMs). EMs are further sub-divided by export earnings as

[5]The 10 percent missed crisis and false alarm probabilities reflect considerations of risk tolerance and the Fund's interest in avoiding both types of errors.

[6]Compared to the probability of misclassification, this switches the conditioning set and the set of outcomes. For example, the missed crisis probability associated with a low-risk signal is $P(L|S)$, where S denotes a stress outcome and L the low-risk signal. In contrast, the (posterior) probability of stress associated with a low-risk signal is $P(S|L)$. That is, the missed crisis probability associated with a low-risk signal treats the state of the world (in this case, future stress) as realized; and the signal about the world as stochastic (as in classical statistics). In contrast, the probability of stress associated with a low-risk signal treats the signal as realized and the state of the world as stochastic (as in Bayesian statistics).

follows: (i) surveillance-only AEs (e.g., United States and Japan, 2022); (ii) AEs with Fund programs (e.g., Greece, 2010-18); (iii) surveillance-only EM commodity exporters (e.g., Oman, 2022); (iv) surveillance-only EM non-commodity exporters (e.g., China, 2022); (v) EM commodity exporters with Fund programs (e.g., Angola, 2018-21); and (vi) EM non-commodity exporters with Fund programs (e.g., Pakistan, 2019-22).[7]

9. The SRDSF also includes additional modules for specialized analysis in circumstances where they are applicable. First, the framework contains scenario analyses that are triggered when a country exhibits certain characteristics that suggest a need for further scrutiny. Second, optional long-term modules can be included to help SRDSF users analyze issues that may materialize over a longer term.

10. Based on these modules, sovereign stress risk is assessed for each horizon and overall. The near-term risk assessment is informed by the Early Warning System (logit model). The medium-term assessment synthesizes the results of the Debt Fanchart and GFN Modules, and when relevant, includes the alternative scenario analyses. Over the longer-term, the optional long-term modules inform an assessment at that horizon. In a final step, SRDSF users consider all of these results as well as the prospects for debt stabilization in the baseline to arrive at an overall assessment of risks at their discretion.

11. When needed, a debt sustainability assessment can be added to the risk assessment. As mentioned earlier, sustainability assessments are usually performed after stress has materialized and help inform the resolution of the stress, including through the design of Fund-supported programs. This analysis parallels the core modules of the stress framework, but with some differences in design and calibration. In contrast to the stress framework, the output of these tools does not consist in high/moderate/low risk signals, but instead in a single mechanical signal of whether debt is sustainable with a high probability, sustainable but not with high probability, or unsustainable.

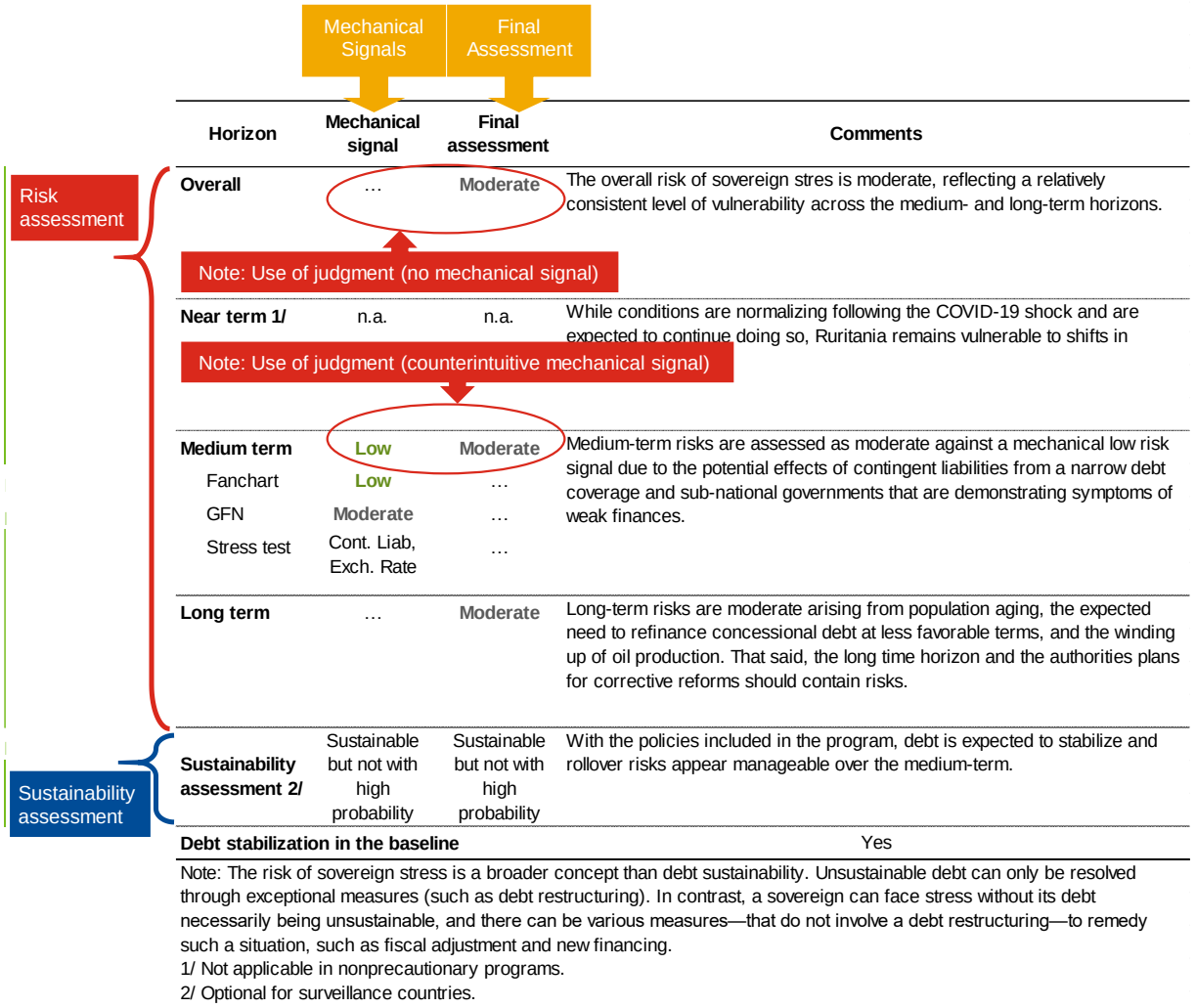
12. The framework also governs and guides the use of judgment. Users need to rely on a judgement-based final assessment either if a mechanical signal is counterintuitive or if the standard tools do not provide a mechanical signal, as is the case in the long-term and overall risk assessments. Relevant considerations corresponding to each tool are elaborated in detail throughout this note. While there are no hard ex-ante constraints, judgment underlying SRDSAs prepared by IMF staff is scrutinized in the interdepartmental review process, with IMF Management arbitrating disagreements across departments.[8]

[7]The commodity/non-commodity exporter comparison is not available for advanced economies, given very few advanced economy commodity exporters.

[8]The IMF's rigorous review process can involve scrutiny of all aspects of SRDSAs, including both the presentation of results as well as the quantitative operation of the tools. This process is collaborative and operates with appropriate information sharing, including the underlying SRDSA files.

13. In any SRDSA, the mechanical signals, final assessments, and uses of judgment are summarized in a standardized reporting table (Figure 4). The intuition behind each assessment and the proper interpretation of these results are developed in the rest of this note.

Figure 4. Summary of SRDSF Results



Horizon	Mechanical signal	Final assessment	Comments
Overall	…	Moderate	The overall risk of sovereign stres is moderate, reflecting a relatively consistent level of vulnerability across the medium- and long-term horizons.
Near term 1/	n.a.	n.a.	While conditions are normalizing following the COVID-19 shock and are expected to continue doing so, Ruritania remains vulnerable to shifts in
Medium term	Low	Moderate	Medium-term risks are assessed as moderate against a mechanical low risk signal due to the potential effects of contingent liabilities from a narrow debt coverage and sub-national governments that are demonstrating symptoms of weak finances.
Fanchart	Low	…	
GFN	Moderate	…	
Stress test	Cont. Liab, Exch. Rate	…	
Long term	…	Moderate	Long-term risks are moderate arising from population aging, the expected need to refinance concessional debt at less favorable terms, and the winding up of oil production. That said, the long time horizon and the authorities plans for corrective reforms should contain risks.
Sustainability assessment 2/	Sustainable but not with high probability	Sustainable but not with high probability	With the policies included in the program, debt is expected to stabilize and rollover risks appear manageable over the medium-term.
Debt stabilization in the baseline			Yes

Note: The risk of sovereign stress is a broader concept than debt sustainability. Unsustainable debt can only be resolved through exceptional measures (such as debt restructuring). In contrast, a sovereign can face stress without its debt necessarily being unsustainable, and there can be various measures—that do not involve a debt restructuring—to remedy such a situation, such as fiscal adjustment and new financing.
1/ Not applicable in nonprecautionary programs.
2/ Optional for surveillance countries.

Source: IMF.

SECTION III. DEBT COVERAGE AND DISCLOSURE, STRUCTURE, AND BASELINE SCENARIO

A. Debt Coverage and Disclosure[9]

14. Risk and sustainability analyses using the SRDSF are conducted using a gross debt concept. Users should not use net debt concepts in the SRDSF, as they are inconsistent with the calibration and design of the standardized tools. The risk-mitigating role of liquid assets (excluding those encumbered in any way, for instance if they are pledged for servicing collateralized debt) is separately accounted for in both the near-term risk assessment and the GFN modules of the SRDSF.[10] However, if desired, users may present net debt measures as a memo item of the standard output tables.

15. All SRDSAs should present comprehensive information about underlying debt concepts using the standard report on Debt Coverage and Disclosure. This reporting aims to encourage transparency in public debt data and evenhandedness across countries being assessed by the SRDSF, with detailed information on public debt statistics summarized in a standardized way. Even when debt data are consistent with the SRDSF's guidelines, there can be subtle, yet important differences in terms of definitions, methods, and coverage for total public debt across countries. In addition, the disclosures offer a practical solution when public debt statistics are not fully prepared according to standards developed in this section. In these cases, the SRDSF tools may still be run on the "as reported" data, but the clear user-supplied disclosures will advise the SRDSA's readers of any gaps. This helps to strike a balance between the tools' operability and their comprehensiveness. Moreover, all SRDSAs (Figure 5) should report the following metadata: (i) overall perimeter; (ii) subsector(s) covered within the overall perimeter; (iii) debt instruments included in public debt: (iv) accounting principles; and (v) consolidation of cross holdings within various government entities.

[9]Further details on public debt coverage can be found in Public Sector Debt Statistics: A Guide for Compilers and Users (IMF 2013a), especially chapter 2, or the Government Finance Statistics Manual (IMF 2014).

[10]See paragraphs 50 and 78 for information on the use of liquid asset buffers (for example, available deposits or securities that can readily be sold in financial markets) in the Near-Term and GFN Modules.

Figure 5. Standard Reporting on Debt Coverage and Disclosures

Ruritania: Debt coverage and disclosures

This SRDSA covers the central government, with no consolidation of other public entities						Comments
1. Debt coverage in the DSA: 1/	CG	GG	NFPS	CPS	Other	
1a. If central government, are non-central government entities insignificant?					No	Subnational govt's may issue debt
2. Subsectors included in the chosen coverage in (1) above:						

		Subsectors captured in the baseline	Inclusion	
CPS / NFPS / GG: expected / CG	1	Budgetary central government	Yes	
	2	Extra budgetary funds (EBFs)	No	EBFs do not exist in Ruritania
	3	Social security funds (SSFs)	Yes	
	4	State governments	No	See commentary below
	5	Local governments	No	See commentary below
	6	Public nonfinancial corporations	No	
	7	Central bank	No	
	8	Other public financial corporations	No	

3. Instrument coverage:	Currency & deposits	Loans	Debt securities	Oth acct. payable 2/	IPSGSs 3/	IPSGSs do not exist in Ruritania
4. Accounting principles:	Basis of recording		Valuation of debt stock			
	Non-cash basis 4/	Cash basis	Nominal value 5/	Face value 6/	Market value 7/	
5. Debt consolidation across sectors:	Consolidated	Non-consolidated				

Color code: chosen coverage | Missing from recommended coverage | Not applicable

Reporting on intra-government debt holdings

Issuer \ Holder			Budget. central govt	Extra-budget. funds	Social security funds	State govt.	Local govt.	Nonfin. pub. corp.	Central bank	Oth. pub. fin corp	Total
CPS / NFPS / GG: expected / CG	1	Budget. central govt		0	11.2	0	0	0	0	0	11.2
	2	Extra-budget. funds	0		0	0	0	0	0	0	0
	3	Social security funds	0	0		0	0	0	0	0	0
	4	State govt.	0	0	0		0	0	0	0	0
	5	Local govt.	0	0	0	0		0	0	0	0
	6	Nonfin pub. corp.	0	0	0	0	0		0	0	0
	7	Central bank	0	0	0	0	0	0		0	0
	8	Oth. pub. fin. corp	0	0	0	0	0	0	0		0
		Total	0	0	11.2	0	0	0	0	0	11.2

1/ CG=Central government; GG=General government; NFPS=Nonfinancial public sector; PS=Public sector.
2/ Stock of arrears could be used as a proxy in the absence of accrual data on other accounts payable.
3/ Insurance, Pension, and Standardized Guarantee Schemes, typically including government employee pension liabilities.
4/ Includes accrual recording, commitment basis, due for payment, etc.
5/ Nominal value at any moment in time is the amount the debtor owes to the creditor. It reflects the value of the instrument at creation and subsequent economic flows (such as transactions, exchange rate, and other valuation changes other than market price changes, and other volume changes).
6/ The face value of a debt instrument is the undiscounted amount of principal to be paid at (or before) maturity.
7/ Market value of debt instruments is the value as if they were acquired in market transactions on the balance sheet reporting date (reference date). Only traded debt securities have observed market values.

Commentary: The coverage in this SRDSA is for the central government, but the authorities are taking efforts to expand the perimeter of public debt statistics. A new census of state and local government finances is being conducted, with preliminary results expected next year.

Source: IMF.

Perimeter: Overall Coverage and Subsectors

16. Public debt coverage can range from narrower to wider perimeters, depending on the government units and sectors whose liabilities are included in the total. Depending on circumstances discussed in this section, the following perimeters can be used in the SRDSF, with each successive perimeter being a superset of the previous ones (Figure 6):

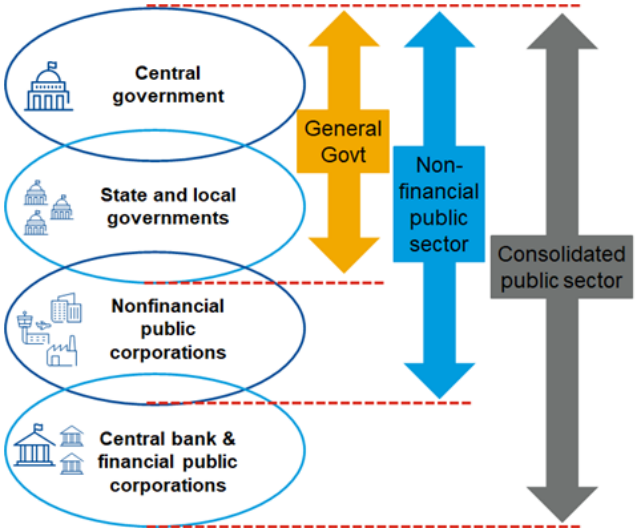


Figure 6. Public Sector Perimeters

Source: IMF.

- *Central government* (CG) consists of the institutional units in a country whose political authority is over the entire territory (e.g., at the national level). It also includes nonmarket, nonprofit institutions controlled by the central government.[11]
- *General government* (GG) consists of the central government and all government units at the state, provincial, regional, and local level as well as any nonmarket, nonprofit institutions controlled by these entities (Box 1). If social security funds are not already included in the central government, then they are treated as part of the general government.
- *Nonfinancial public sector* (NFPS) consists of the general government and nonfinancial public corporations—companies controlled by the government and whose primary activity is the production of market goods and nonfinancial services (e.g., state owned enterprises (SOEs)).
- *Consolidated public sector* (CPS) consists of the nonfinancial public sector and financial public corporations, which consist of government-controlled companies whose primary function is providing financial services.[12] Notably, the central bank is included in this sector.

[11]A nonmarket producer provides all or most of its output to others for free or at prices that are not economically significant (i.e., prices that have little or no influence on the quantities supplied and demanded); see IMF (2014) (§2.65-67) for a complete definition.

[12]The term "consolidated public sector" in this guidance note is equivalent to "public sector" in IMF (2014) (§2.63).

Box 1. Debts of Government-Controlled Nonmarket Entities

The debt (and deficits) of SOEs, SPVs, and other entities that are largely government controlled *and* operate on a nonmarket basis should be included in the DSA as part of the general government even if the authorities' definitions exclude them. SPVs should be treated as part of the general government in accordance with the principles set out in the Government Financial Statistics Manual, 2014 (IMF 2014). An illustration of this principle is the use of an "augmented" debt measure for China which includes the debt of Local Government Financing Vehicles and other government funds that, although legally separate from the government, perform government functions and are generally non-market producers. Similar criteria have been used in other countries (Belgium, Brazil, Russia, United Kingdom) to include nonmarket corporate entities—mainly those undertaking public infrastructure—in the general government.

17. The default institutional perimeter for gross public debt in the SRDSF is the general government.[13] Consistent with the Government Financial Statistics Manual, 2014 (IMF 2014), the GG is generally the most appropriate definition because it consists of all resident institutional units that fulfill the functions of government as their primary activity. The general government also accords well with the institutional arrangements in many market access countries (for example those covered by Eurostat). However, some countries do not currently produce public debt statistics for the general government sector. The SRDSF tools can still be run in these cases, as described below.

18. In a limited set of market-access countries, narrower than GG coverage may be appropriate. For these cases, the CG (or other similar definition) serves, de facto, as the general government due to the lack of units beyond the central administration. Examples include small island states, or highly centralized economies where no significant subnational governments exist, and where social security is part of the central government. In these cases, users should indicate the absence of significant non-central government entities in the disclosures and include an explanation in the commentary box of the Debt Coverage and Disclosures of the SRDSA.

19. Apart from those cases, SRDSAs prepared with a narrower perimeter than the GG should focus on the risk of debt surprises and efforts to broaden coverage. Many countries face capacity constraints or reporting complications that prevent them from producing debt statistics for the full general government. However, while the tools can still be run, missing information from various levels of the government could be hiding risky public debts that could result in or exacerbate sovereign stress. To help capture the potential challenges from omitted risk exposures, a contingent liability stress test is triggered for these countries as described in Section VI.C. SRDSAs conducted by Fund staff in the context of Fund surveillance and programs should also outline the authorities' plans to extend coverage to the general government, and identify technical assistance needs to address data shortcomings. Additionally, when Fund capacity development activities would aid improved coverage, staff should advise the authorities accordingly.

20. SRDSA coverage may be broader than the GG if the broader definition anchors fiscal policy discussions or if there is a conceptual argument for doing so. In some countries, SOEs

[13]In Fund-supported programs, debt conditionality may be measured according to a debt coverage that differs from the general government. However, in these cases, a general government perimeter would remain the default expectation for SRDSAs prepared for that program's documents.

play an important part in public investment (including through public-private partnerships (PPPs)). For this reason, country authorities may choose to anchor their policy discussions at the NFPS level and report NFPS debt in their official statistics. Similarly, some countries report on a CPS basis, including to comply with legislative requirements. In such cases, users should use these broader definitions in the SRDSA, provided that (i) they support the analysis of a country's fiscal situation (including as regards the government's policies and contingent liability risks); (ii) are consistent with Fund surveillance needs; and (iii) are prepared with the appropriate statistical treatment, most notably consolidation. Ad hoc adjustments are inappropriate for debt risk analysis and are to be eschewed. However, when broader coverage is used, it should be accompanied by an explanation in the commentary box of the Debt Coverage and Disclosures reporting.

21. Broader-than-GG coverage may also be necessary to fully capture sovereign risks and potential mitigants from entities outside the GG. A full or partial NFPS coverage could be appropriate if it captures material fiscal risks from nonfinancial public corporations. The inclusion of contingent liabilities in the debt projections should reflect the likelihood of their materialization and associated cost: contingent liabilities, though not generally expected to be included in GG debt, should be included if users are able to anticipate and estimate their likelihood of materialization and the associated cost to be incurred by the government.[14] Central bank consolidation is appropriate in cases of central banks with large negative capital positions (e.g., where the central bank's weak financial position undermines macroeconomic stability and/or the attainment of its mandate) and/or where the user considers the central bank to be involved in significant direct monetary financing of the budget or quasi-fiscal activities.[15] Such consolidation would imply that (i) central bank claims on the government are netted out and (ii) central bank debt liabilities (excluding currency and deposits held by residents) are added. Note that when central banks have healthy balance sheets, the framework already internalizes the mitigating characteristics of central bank holdings and future seigniorage revenues (and potential profit transfers) using GG coverage, i.e., without consolidation, through baseline fiscal projections and the GFN module.

Instrument Coverage

22. All debt instruments as defined in the *Public Sector Debt Statistics: Guide For Compilers and Users* (PSDS Guide; IMF 2013a) should be included in the gross public debt concept used for SRDSAs.[16] These instruments include: debt securities, loans, currency and deposits, SDRs, accounts payables, and insurance, pension and standardized guarantee schemes (IPSGSs).[17] Any omissions should be identified in the disclosure table and included in the contingent liabilities stress test based on available data (Section VI.C). A few specific debt instruments warrant individual discussion:

[14]A corresponding adjustment in the contingent liabilities stress test may be needed in such cases (section VI.C).

[15]Such conditions would normally be associated with high fiscal dominance over central bank policies.

[16]See IMF(2013) Chapter 5, section C.

[17]As per GFSM, repurchase agreements (or repos) are classified as loans and are therefore debt instruments.

- Because many countries currently do not report IPSGSs in either the fiscal accounts or the debt stock, their exclusion can be excused if it is explained in the commentary box of the standard Debt Coverage and Disclosures. As the liabilities of IPSGSs can be large, the commentary should especially discuss whether there is any evidence that they constitute a material risk; if so, the authorities should be urged to take action to expand debt coverage for this item.

- While data on accounts payables may not be available in countries with cash accounting, users should still seek to include an estimate of the total amount, especially where they appear to be a symptom of fiscal stress.

- Debt-like financial derivatives that cannot be clearly distinguished from debt instruments as defined in the GFSM (e.g., off-market swaps) should be dealt with on a case-by-case basis, after consulting with the relevant departments.

23. Fund disbursements should always be included as public debt for SRDSA purposes.[18,19] Fund credit is an obligation of the member country and thus should always be included in the SRDSA's debt concepts even when the disbursements constitute balance-of-payments support and are held at the central bank. There are also clear economic reasons for doing so: Fund credit can be disbursed either to finance the budget or to raise foreign reserves to an adequate level. When used as budget support, Fund credit substitutes for other types of budget financing; when used as balance of payments support, it substitutes for other types of sovereign borrowing required to build up reserves. In both cases, borrowing from the Fund reduces the need for the sovereign to borrow elsewhere to make up for the shortfalls in either budget financing or foreign reserves. At the same time, borrowing from the Fund can help reduce debt-related risks, both through higher reserves and lower rollover risk due to the impact of IMF financing and the conditionality associated with the IMF-supported program. When IMF credit is on-lent to the budget through the central bank, users should ensure that the debt is not doubly counted.

24. Government guarantees are normally considered contingent liabilities and are hence generally *not* included in government debt until they are called.[20] However, pursuant to the PSDS Guide (IMF 2013a, paragraph 4.26), where users assess a *high likelihood* of guarantees being

[18]Even when debt conditionality in a Fund-supported program excludes IMF credit for the purposes of measuring a performance criterion or indicative target (section IV.D of IMF 2021b), the SRDSA's debt measure should always include the Fund's claims on the member.

[19]Unlike Fund disbursements, the inclusion of SDRs in the SRDSA's debt perimeter depends on the member's institutional setup and whether the SDRs are being used. Users should follow the guidance in IMF 2021c. To summarize, SDRs would typically be outside the SRDSA debt perimeter when they are on the central bank's balance sheet. However, when this is the case, if SDRs are used for on-lending to a government agency inside the SRDSA perimeter, this lending should be included as it would be reflected in the GFS debt statistics and the debt service from the agency to the central bank. Alternatively, for some Fund members, SDRs are not on the balance sheet of the central bank, but instead that of a government agency inside the DSA perimeter. In these cases, users must add to public debt the shortfall in the government balance sheet of SDR holdings in relation to SDR liabilities and should add the associated net SDR interest obligations to the future government interest expenditures.

[20]However, expected losses from standardized guarantee schemes should be reported as government debt under insurance, pension, and standardized guarantee schemes (IPSGSs).

called (e.g., a guarantee granted to a corporation in financial distress), those guarantees should be treated as government debt.[21] There may also be other government guarantees not already included in the current debt stock or other contingent liabilities (such as likely legal settlements, SOE/bank, incl. central bank, recapitalization needs) where it is possible to forecast their future materialization with relatively good accuracy.[22] In these cases, and when users assess materialization as being both material and the most likely outcome, users should include the expected losses for the government in the baseline debt projections.

25. Liquidity papers, which are securities issued by the central bank solely for monetary policy operation purposes, would normally be excluded from public debt in the SRDSA provided that key conditions are met. Users may exclude these claims from the stock of public debt in the SRDSA when (i) a strong institutional framework exists to ringfence the proceeds of these securities (e.g., in a segregated account) so no financing to the government can be provided through their issuance; (ii) the government is not responsible for paying interest on these securities; and (iii) the securities do not represent a material fiscal risk (e.g., when there is a track record of central bank independence, or the size of liquidity paper is small relative to the capital position of the central bank).[23] In such a case, the stock of liquidity paper would be included as a memo item in standard reporting on the Baseline Scenario (Section III.C) of the SRDSA. Where any of these three conditions are not met, liquidity papers should be included in the public debt and the gross financing need measures used for the purposes of the DSA.[24] There may also be cases where the three conditions are met, but the central bank is included in the DSA perimeter to align it with government debt reporting on a consolidated public sector basis. If the chosen debt perimeter of the DSA includes the central bank, liquidity papers would be included in public debt for the purposes of the SRDSA.

26. Central bank bilateral FX swap liabilities should be included in public debt when drawn, even when the perimeter is not the consolidated public sector, unless certain conditions are met. Specifically, it would typically be *inappropriate* to include these liabilities in public debt when *both* of the following conditions are met:

[21]As the LIC DSF is prepared according to debt concepts that include government guarantees, a "high likelihood" would be assumed for recent PRGT graduates and expected to adjust over time.

[22]This could also include commitments of government contributions for PPPs, long-term leases, and other debt-like longer term financial liabilities (some of which may be in the form of direct liabilities rather than contingent).

[23]This exclusion extends to central bank-issued government debt securities if the criteria in this paragraph are met.

[24]As with other contingent liabilities, when such paper is included in debt, the corresponding interest payments are not yet included in the interest expenses of the general government, until the liability materializes.

- The FX swap was drawn to support central bank liquidity operations designed to provide FX liquidity for financial stability purposes (as opposed to sovereign-to-sovereign medium-term balance of payments support);[25] *and*,

- The central bank is expected to be able to extinguish the swap position without actions detrimental to government debt levels (e.g., outright government foreign borrowing to pay off the swap). This would typically be the case if the borrower is:

    - a reserve currency issuer, that pays its outstanding debt with its own currency with no consequence for public debt; or

    - a non-reserve currency issuing central bank that is financially strong and expected to discharge its obligations without the support from the sovereign.

A decision tree for evaluating the risk posed by central bank's FX swaps and determining whether the exclusion criteria are met is shown in Box 2, with any additional judgment applied as warranted. In situations when the exclusion criteria are not met, e.g., when the swap is assessed as being used for medium-term BOP support or when the central bank's repayment capacity is in doubt, the gross drawn amount should be included in public debt.[26] The rationale for doing so is a high likelihood that the central bank would not be able to repay the swap liability without increasing government debt ratios through government foreign borrowing. Large undrawn bilateral FX swaps should be fully disclosed and built into the projected debt stock to the extent that drawing is expected (informed by BoP projections).

27. Official creditor deposits at the central bank should be included in SRDSA's debt stock unless the central bank is expected to be able to repay them. These deposits arise from balance of payments support extended by official creditors and are usually unrelated to deposits related to disbursements of project financing or budget support loans. Thus, the criteria for assessing the central bank's ability to extinguish the obligations without actions detrimental to government debt would be the same as for the FX swaps.

[25]Excluding swaps that represent central bank liquidity operations aligns with the treatment of similar transactions in the LIC DSF (e.g., see IMF 2018a, paragraph 21). It also avoids creating differential treatment with other types of balance of payments support like certain official debt obligations, which typically are included in the DSA perimeter.

[26]When the swap is included in government debt, users should follow a similar process as with the inclusion of liquidity paper. In particular, only the nominal value of the swap is added to GG debt but there are no interest payments. Rollovers should be incorporated in GFN estimates unless there are commitments to extend the maturity of the swap.

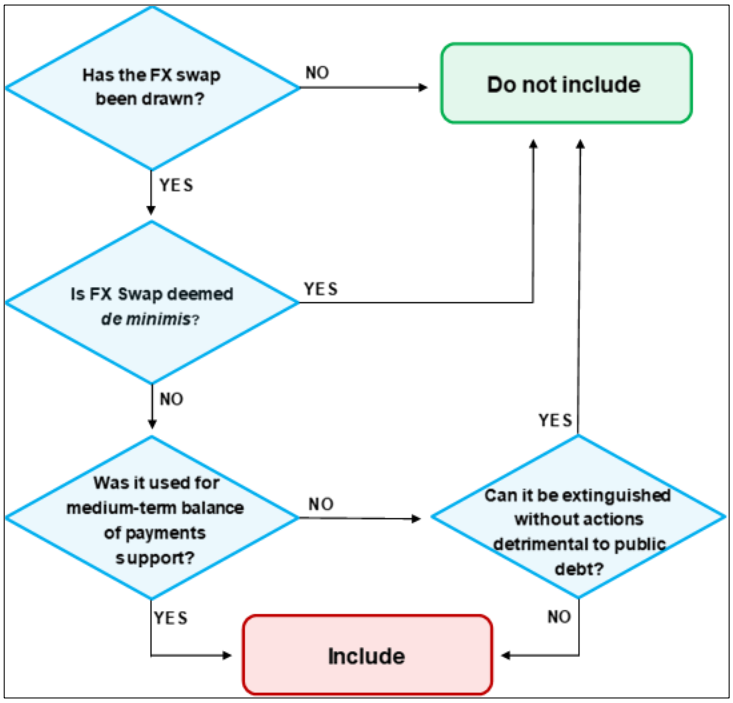
Box 2. Assessing Risks from Central Bank's FX Swaps

The following decision tree helps determine whether liabilities arising from the drawing of a central bank's FX swap (CBFXS) should be regarded as public debt:

1. **Has the FX swap been drawn (i.e., is there an outstanding balance)?** If no, then the swap should not be included in public debt. Otherwise:
2. **Is the value of the swap below the de-minimis threshold?** The liability can be excluded from public debt if the total amount of all swaps drawn is less than 1 percent of GDP.[1] If the swap exceeds the de minimis threshold, then further analysis is required:
3. **What is the purpose of the swap?** The swap should be included in full in the public debt perimeter for SRDSF purposes if it constitutes medium-term BOP support rather than provision of FX liquidity for financial stability purposes. This is likely to be the case if any of the following three criteria hold:

- The swap was drawn for the purpose of paying back another swap, financing government debt service, or sterilizing monetary financing to the government.
- The maturity of the liability is 12 months or more (or there are strong reasons to believe that a short-term liability will be rolled over repeatedly).[2] This refers to the period during which the drawn FX swap can remain outstanding before it is repaid, not the period during with an FX swap agreement is valid.
- There are no matching claims against domestic commercial banks with corresponding maturities and conditions. Swaps contracted for liquidity support are typically on-lent to commercial banks on a short-term basis. If no matching assets are found, the swap cannot qualify as liquidity support.

4. **Does the central bank have capacity to extinguish the swap without actions detrimental to public debt?** If scheduled repayments of all FX swap liabilities lower central bank gross reserves below [60] percent of ARA metric,[3] the central bank's capacity to respond to a BOP crisis would be considered critically impaired. In such a case, the government would need to step in, including by borrowing FX, to pay a portion of the liability so as to prevent central bank reserves from falling to a critical level. For this reason, if the central bank is assessed not to be able to extinguish the swap, it would need to be included as part of the public debt in the SRDSA.



Box 2. Assessing Risks from Central Bank's FX Swaps (concluded)

While the decision tree provides a standardized method to determine whether central bank swap-related liabilities should be regarded as public debt for DSA purposes, some judgement may still be required. In certain circumstances, users may need to reflect country specific circumstances and program monitoring needs. For instance, in cases where the swap liability has a short-term maturity but is rolled over repeatedly, it may take on the characteristics of a long-term liablity and, therefore, warrant inclusion in the DSA.

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[1]In borderline cases, users should consider including these liabilities to avoid year-to-year fluctuations due to the inclusion/exclusion of these liabilities.

[2]It is important to distinguish the duration of the arrangement (i.e., the period when the borrowing central bank can draw from the swap line), and the maturity of the associated liability (i.e., the date when the principal of the drawn amount comes due).

[3]Given the risk-based approach, a cutoff should be set so that the requirement is binding for countries where stress risks are high and thus unexpected deposit repayments would be highly disruptive. To identify an appropriate threshold, a cross-country sample (that excludes reserve currency issuers) shows that nearly 90 percent of the countries that had reserves below 60 percent of the ARA metric in 2021 were exhibiting some indication of a stress event, warranting a comprehensive approach to analyzing risks. For countries between 60 and 100 percent of the ARA metric, only a bit more than half were exhibiting stress, demonstrating a clear differentiation between countries above and below the 60 percent threshold. Setting higher levels of the reserves-to-ARA threshold produced lower share of countries below the threshold and exhibiting stress, suggesting the inclusion of too many countries under the risk-based approach.

Accounting Principles

28. Fiscal accounts should be reported on an accrual basis and the debt stock for SRDSA purposes should be reported at its *nominal* value.[27] As noted in the GFSM (IMF 2014), which is the standard for the Fund's presentation of fiscal data, the integrated framework of Government Financial Statistics (GFS) uses the accrual basis, as this provides comprehensive reporting of the amounts a government owes to its creditors, including any arrears.[28] Furthermore, the PSDS guide advises valuing debt instruments at nominal values for vulnerability and sustainability analysis.[29] However, when national authorities do not prepare data in line with these recommended accounting principles, use of the authorities' data is permitted, which could include cash basis recording and/or face or market valuations for debt instruments. However, when there are deviations from the SRDSF's recommendations, users should disclose them in the table and explain them in the accompanying commentary for Debt Coverage and Disclosures. In particular, when a country reports debt on a cash basis, the SRDSF must clarify if any arrears are included in the debt stock.

[27]The nominal value of a debt instrument reflects the value of the debt at creation plus any subsequent economic flows (for example, repayment of principal) plus exchange rate and other valuation changes other than market price changes. See IMF (2013), paragraph 2.120.

[28]See paragraph 3.69 of IMF (2014).

[29]See paragraph 2.115-2.117 of IMF (2013).

Consolidation of Cross Holdings

29. Claims of government entities on other units within the same perimeter require consolidation. Computing the total government debt within a certain perimeter requires netting out (not including) liabilities among these entities, as these do not constitute outside claims on the consolidated entity. When public debt statistics are prepared on a consolidated basis, users should select "consolidated" in the standard reporting on Debt Coverage and Disclosures. Users should also fill out the accompanying consolidation table consistent with the SRDSA's perimeter showing the gross debt outstanding by each level of government, and the crossholdings that are netted out in the final consolidated debt position.[30]

30. Users should describe any important issues that are obscured by consolidation in the debt coverage commentary. SRDSF users should explore issues posed by consolidation and report any relevant findings in the commentary that accompanies the standardized reporting on Debt Coverage and Disclosures. In certain cases, the netting exercise may result in consolidated debt that is much lower than non-consolidated debt. If this reflects the presence of many borrowing units of the government that are financially sound (e.g., cross-holdings reflect liquidity/sound asset management purposes), it could be an important mitigating factor for debt related risks. On the other hand, when claims are issued by financially weak government units, or when the cross holdings contribute to policy imbalances (e.g., shoring up a public entity's balance sheet with nonmarket public debt issuance, but which does not address the underlying problem), they can be a major source of risk.

B. Debt Structure

31. In addition to public debt disclosures, the SRDSF's standardized reporting includes a set of charts to illustrate vulnerabilities arising from the debt structure.[31] Under any public debt perimeter, risks of sovereign stress can arise from the characteristics of the debt stock. To help identify potential hazards and focus analysis on the most relevant issues, users will need to interpret the following charts after populating the template with the underlying data (Figure 7):

- *Currency composition*: This chart is populated with historical data on debt by currency that is entered by the user. Projections are generated automatically by the template based on the debt issuance assumptions that are entered by the user when designing the baseline scenario. A higher share of foreign currency denominated debt implies that government debt is subject to greater exchange rate risk. Significant exchange rate misalignment (overvaluation) is an

[30]To be consistent with the last published public debt observation, only the cross holdings that were netted out of the public debt calculation should be entered in the table. If the cross holdings are not netted, including because the sector is not in the SRDSA's debt perimeter, users should enter zeros for that item. In a special case, if coverage is at the narrowest perimeter (central government without consolidated social security funds), the table would be entirely composed of zeros as there are no claims to consolidate.

[31]In Fund-supported programs, a debt holder table is required by the Debt Limits Policy in addition to these figures. Please see section III.C. of IMF 2021b.

exacerbating factor, as it increases the risk of sudden depreciations that can lead to debt spikes. In certain cases, users may want to examine the composition of foreign currency debt in closer detail. When denomination is spread over various currencies with diverging movements, the overall valuation effects on debt-to-GDP ratios may be ambiguous and warrant commentary.

- *Debt holder profile*: This chart should be populated using data from the IMF's Sovereign Debt Investor Base Datasets, which are updated semiannually by the Statistics Department and published on the Fund's external website (IMF staff may access these data through a centralized SRDSF database). The construction of these data follows the Arslanalp and Tsuda (2012, 2014) methodology to allocate public debt among five creditor groups: (i) domestic central bank; (ii) domestic commercial banks; (iii) other domestic creditors; (iv) foreign official creditors (including regional central banks); and (v) foreign private creditors.[32] Generally speaking, risks are higher when there is a higher dependence on foreign private creditors, especially when their holdings have been volatile or risen rapidly, which may suggest the presence of hot money flows. This figure complements the GFN Module as described below, which quantifies the impact of financing shocks from riskier creditor groups.

- *Governing law*: Users should classify public debt by governing law (local law, foreign law, or multilateral debt) using the most recently available year. Information on multilateral claims can sometimes be obtained from public debt statistics. Information on the governing law of non-multilateral debt may be harder to obtain and require a data collection by government authorities. The following principles can help guide the classifications: (i) debt issued in local markets would be considered as being subject to local law unless the underlying indenture specifies otherwise; (ii) external debt owed to bilateral creditors should be considered as subject to foreign law; and (iii) debt issued in international markets is usually (but not always) subject to foreign law. The latter should be confirmed by examining debt prospectuses and other relevant documentation, including commercial databases.[33] Governing law, by itself, is not viewed as constituting any risk, but may have implications for the modalities and costs of debt restructurings.[34]

[32]In a few cases, the datasets do not have a breakdown of public debt by holder. When such data are absent, SRDSF users should rely on estimations calculated according to the Arslanalp-Tsuda methodology using the best information available. To do so, public debt should first be divided among external and local creditors (a residency basis, rather than currency basis is preferred). Then, debt held by domestic creditors should be allocated among the central bank and the commercial banking sector using these institutions' claims on the general government (central, state, and local governments) as reported in the balance sheets of these institutions. For Fund staff, these indicators are typically a part of the monetary sector in the standard macroeconomic framework. Claims of other domestic creditors should be the residual obtained after deducting the central bank and commercial banks' holdings from domestic debt. Foreign official claims should be estimated as the sum of all debt owed to bilateral and multilateral creditors (including regional institutions). Foreign private debt calculated as external debt less foreign official claims.

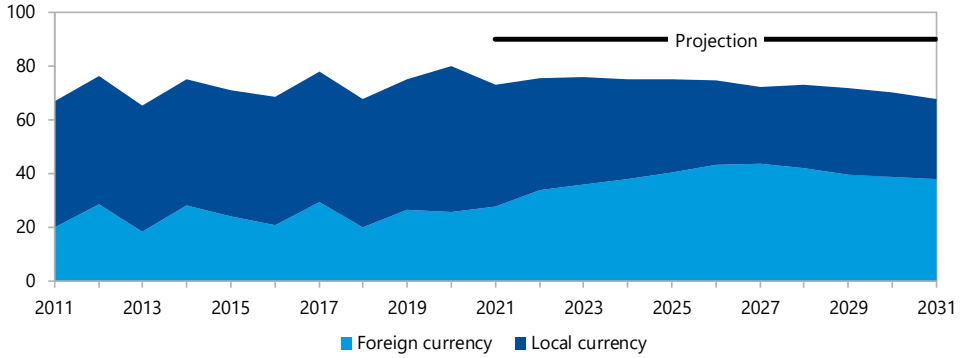
[33]For example, information on international law sovereign bond issuances can be sourced from data compiled by Perfect Information.

[34]See IMF (2021d) and Buchheit et al (2019).

Figure 7. Sample Standardized Reporting on Debt Structure

Ruritania: Public debt structure indicators

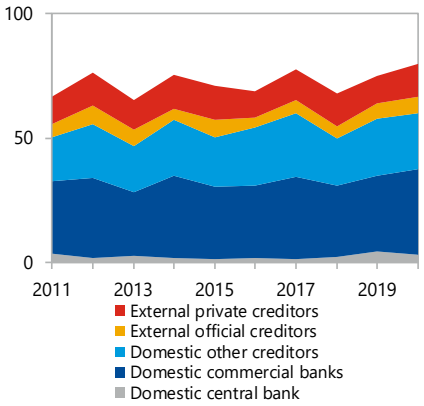
Debt by currency (percent of GDP)



Note: The perimeter shown is central government.

Public debt by holder

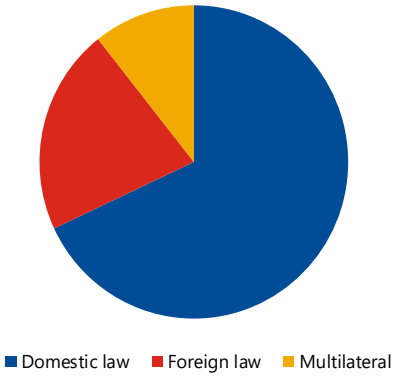
(percent of GDP)



Note: The perimeter shown is general government.

Public debt by legal basis, 2020

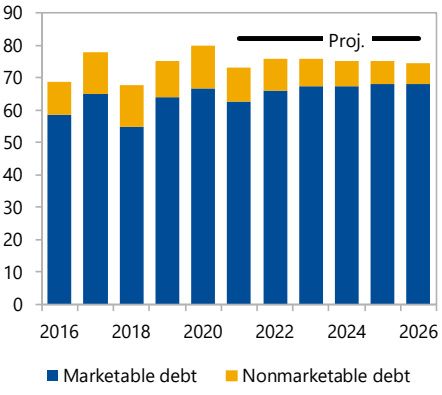
(percent)



Note: The perimeter shown is other.

Debt by instruments

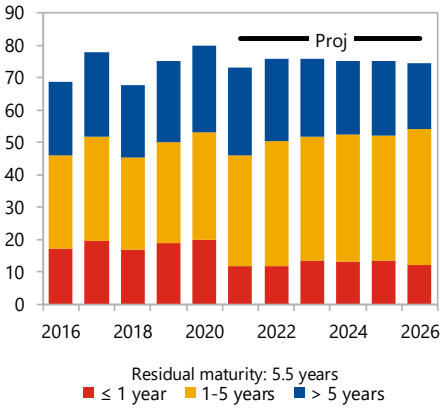
(percent of GDP)



Note: The perimeter shown is other.

Public debt by maturity

(percent of GDP)



Note: The perimeter shown is central government.

Commentary: Public debt will remain about evenly split between foreign and local currency-denominated instruments, but maturities are expected to lengthen. Marketable instruments form the bulk of public debt and it is held by domestic creditors.

Source: Fund staff estimates.

- *Marketability*: Users should classify past debt issuance as marketable or non-marketable instruments; projections are populated automatically by the template based on debt issuance assumptions entered by the user. Marketable instruments refer to debt securities such as bonds that can be readily bought and sold in markets for sovereign debt. Other types of debt are generally not marketable, even though creditors may occasionally transfer a claim of this type to another investor. This transaction typically involves a special sale performed outside of a debt market. Marketability does not have any inherent risk implication, though it should help the user focus attention on the relevant issues for the SRDSA. For example, when debt comprises mainly marketable instruments, rollover risks are especially important. Conversely, in the few cases of MACs with mainly non-marketable debt, the user may want to focus on solvency risks and the debt service profile.

- *Maturity*: Users should enter historical data on debt by *remaining* maturity over the past five years. Short-term debt refers to claims that mature within a year. Medium-term debt refers to debt that matures in a 2–5-year horizon with long-term debt referring to any claim with a maturity beyond five years. Typically, the longer the horizon of public debt, the lower rollover risk.

In certain cases, a detailed breakdown of debt for one or more of these charts may only be available for a narrower perimeter than used for the SRDSA. When this situation happens, users may populate the tables with information for the narrower perimeter, but this should be clearly explained in the note beneath each chart. When data gaps are relevant overall, they should be noted in the commentary box of the standardized report.

C. Baseline Scenario for Public Debt and GFNs

32. SRDSF tools produce projections based on the data, projections, and financing assumptions entered by the user. For the specialized analyses shown earlier in Figure 2, the input requirements will differ across countries and/or across time, depending on whether they are applicable. For the SRDSF's debt reporting and core modules that are applicable for all countries, the required inputs include all macroeconomic, fiscal, and financial data, including 10-year projections, that drive the evolution of the key ratios produced by these modules, namely debt-to-GDP and GFN-to-GDP. These include growth, inflation, interest, maturity, exchange rates, currency composition, the primary (noninterest) fiscal balance, and other transactions that create or extinguish public debt.

33. All SRDSAs include a standardized table that shows the baseline debt-to-GDP and GFN-to-GDP ratios and their main drivers over the framework's 10-year horizon (Figure 8). This table is automatically populated after all projections are entered and provides essential information and analysis about the baseline scenario before the framework's key risk tools are applied. The baseline projections for debt and GFNs arise from the data and projections entered directly by the user. These projections should reflect the user's expectations of the likely outcomes for these variables and there are no ex-ante constraints so long as the scenario is realistic.

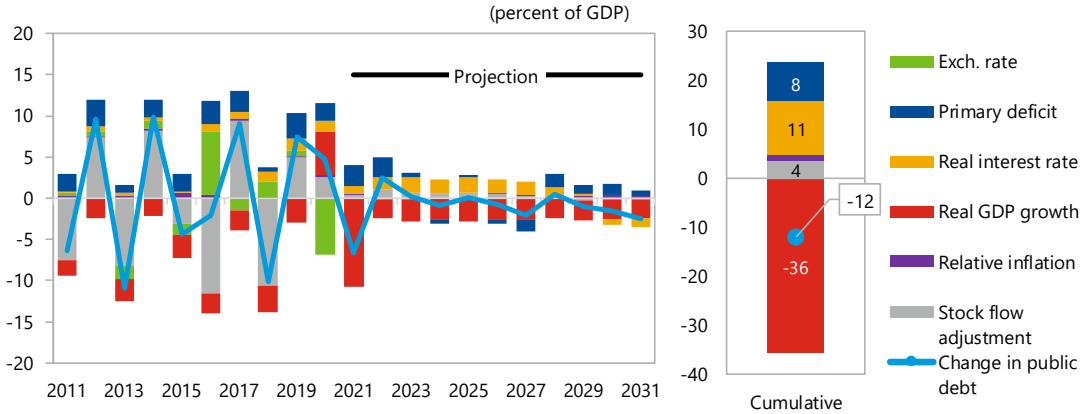
Figure 8. Standard Reporting on the Baseline Scenario

Ruritania: Baseline scenario

(percent of GDP unless indicated otherwise)

	Actual	Medium-term projection						Extended projection				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Public debt	79.8	73.1	75.6	75.9	75.1	75.2	74.5	72.4	72.9	71.8	70.3	67.9
Change in public debt	4.7	-6.7	2.5	0.3	-0.8	0.1	-0.7	-2.1	0.5	-1.1	-1.5	-2.5
Contribution of identified flows	2.2	-10.6	1.5	-0.2	-1.4	-0.4	-1.4	-4.0	0.4	-2.6	-1.7	-4.1
Primary deficit	2.2	2.6	2.4	0.6	-0.6	0.3	-0.5	-1.5	1.6	1.1	1.4	0.7
Noninterest revenues	20.0	20.4	21.5	21.7	22.6	22.7	23.2	24.0	20.8	21.0	21.8	21.4
Noninterest expenditures	22.2	23.0	23.9	22.3	22.0	23.1	22.8	22.4	22.5	22.1	23.2	22.1
Automatic debt dynamics	0.0	-9.7	-1.0	-1.0	-0.8	-0.8	-0.8	-0.8	-1.1	-2.0	-2.7	-3.1
Int. rate-growth differential	6.5	-9.8	-0.9	-0.8	-0.8	-0.8	-0.9	-0.9	-1.2	-2.2	-3.1	-3.4
Real interest rate	1.3	0.9	1.4	1.9	1.7	1.9	1.6	1.6	1.3	0.3	-0.7	-1.0
Real growth rate	5.2	-10.7	-2.3	-2.7	-2.5	-2.7	-2.6	-2.5	-2.4	-2.5	-2.4	-2.4
Exchange rate	-6.8	...	...	...	...	...	...	...	...	...	...	...
Relative inflation	0.3	0.1	-0.1	-0.2	0.0	-0.1	0.2	0.2	0.1	0.2	0.4	0.3
Stock-flow adjustment	2.6	0.4	1.1	0.7	0.6	0.6	0.5	0.2	0.0	-0.2	-0.2	-0.1
Contingent liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other transactions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residual	2.6	0.4	1.1	0.7	0.6	0.6	0.5	0.2	0.0	-0.2	-0.2	-0.1
Gross financing needs	15.4	14.6	16.5	14.8	15.4	16.4	19.5	14.2	18.2	19.0	17.1	15.2
of which: debt service	13.2	12.0	14.1	14.2	15.9	16.0	20.0	15.7	16.6	17.9	15.7	14.5
Local currency	11.7	9.1	11.0	10.9	12.6	12.4	16.1	11.5	9.1	10.2	10.4	10.4
Foreign currency	1.5	3.0	3.1	3.3	3.3	3.6	3.9	4.2	7.5	7.6	5.3	4.1
Memo:												
Real GDP growth (percent)	-6.5	15.5	3.3	3.7	3.4	3.8	3.6	3.5	3.5	3.5	3.5	3.5
Inflation (GDP deflator; percent)	2.2	2.4	1.9	1.7	2.0	1.8	2.3	2.4	2.2	2.6	3.0	2.9
Nominal GDP growth (percent)	-4.4	18.3	5.2	5.4	5.5	5.6	6.0	6.0	5.7	6.2	6.6	6.5
Effective interest rate (percent)	3.9	3.8	4.0	4.3	4.4	4.5	4.7	4.7	4.0	3.0	2.1	1.3

Contribution to change in public debt



Staff commentary: Public debt will rise a bit but then stablize, reflecting expectations of a narrowing of primary deficits and stable economic conditions.

Source: Fund staff estimates and projections.

When constructing the longer-term scenario (e.g., years 6-10) users may extrapolate the values of key debt drivers at the end of the medium-term horizon (e.g., year 5). The baseline also reflects projections for new debt stocks, interest, and amortization computed by the SRDSF template based on user-entered assumptions on new debt issuance. A decomposition of changes in the public debt-to-GDP ratio reveals the contributions to debt dynamics from: (i) the primary deficit, a measure of fiscal effort;[35] (ii) automatic debt dynamics (real interest-growth differential and exchange rate movements; see Box 3 for a derivation); and (iii) other factors including interest revenues, contingent liabilities materialization in the years that they are recognized, arrears clearance, and asset transactions. The GFN-to-GDP projection is complemented by a projection of its debt service component, decomposed into local and foreign currency flows.

34. Users should accompany the standard reporting with commentary flagging relevant aspects of the baseline. Users should give a sense of the main themes underpinning the baseline scenario, including the economic environment and relevant policies. A description of the baseline debt and GFN trajectories is also crucial. In cases where a debt or GFN trajectory is strongly upward or downward, it would be important to indicate which drivers are responsible.[36] Additionally, any irregular movements in the debt path (jumps or drops) should be explained.

Box 3. Debt Dynamics and Drivers in the SRDSF

In its most basic formulation, public debt in one year can be related to the previous year's debt, the interest bill; the primary balance; and other factors in the stock-flow adjustment. When countries have debt in foreign currencies, those obligations also need to be revalued for exchange rate changes. These concepts can be expressed mathematically as follows, and according to the symbols defined in the table:

$$D_t = \frac{e_t}{e_{t-1}} D^f_{t-1} + D^d_{t-1} + I_t - PB_t + SFA_t$$

For the purposes of analysis, it is common to express the interest bill in terms of "effective" (i.e., implicit average) interest rates multiplied by stocks of last year's debt (noting that $D_t \equiv D^d_t + D^f_t$ and that the foreign currency interest bill is valued using the current-year's exchange rate):

Symbol	Meaning
t, t-1	Time, t=current year, t-1=last year
D	Public debt
I	Interest
i	Implicit average interest rate
e	Nominal exchange rate
1+ε	Nominal exch. rate change (et/et-1)
g	Real GDP growth
π	Inflation (GDP deflator)
ρ	1+nominal GDP growth ((1+g)(1+π))
PB	Primary balance
SFA	Stock-flow adjustment (all other effects)
Y	Nominal GDP (level)
Superscript *f*	Related to foreign currency debt or inflation
Superscript *d*	Related to domestic currency debt
Lower case	Variable expressed as a percent of GDP

[35]Consistent with the predecessor MAC DSA as well as the WEO, the SRDSF's primary deficit measure is defined as noninterest expenditures less noninterest revenues; interest revenue is accounted for separately in the calculation of debt issuance and GFNs. Thus, there is a difference with the GFSM 2014's primary balance definition (IMF 2014, paragraph 4.55), which removes interest expenditures, but not interest revenues from the primary balance.

[36]In SRDSAs prepared by Fund staff, commentary should not refer to projected nominal exchange rate movements and their effects on the debt stock, as they are confidential.

Box 3. Debt Dynamics and Drivers in the SRDSF (continued)

$$D_t = \frac{e_t}{e_{t-1}} D^f_{t-1} + D^d_{t-1} + i_t D_{t-1} - PB_t + SFA_t$$

Public debt is typically analyzed when expressed as a percent of GDP. Dividing all terms by nominal GDP (Y_t) and introducing the term for nominal exchange rate changes $(1+\epsilon_t)$ gives:

$$\frac{D_t}{Y_t} = (1+\epsilon_t)\frac{D^f_{t-1}}{Y_t} + \frac{D^d_{t-1}}{Y_t} + i_t \frac{D_{t-1}}{Y_t} - \frac{PB_t}{Y_t} + \frac{SFA_t}{Y_t}$$

This equation can be rearranged as follows (i) observing that $Y_t = Y_{t-1}(1+g_t)(1+\pi_t)$, providing a way to express the lagged values in percent of the same year's nominal GDP; (ii) using lower-case symbols to denote all ratios to GDP; and (iii) introducing the term for nominal GDP growth ($\rho_t = (1+g_t)(1+\pi_t)$); and (iv) expanding $(1+\epsilon_t)\left(1+i^f_t\right) = \left(1+i^f_t\right) + \epsilon_t(1+i^f_t)$. After performing these steps, the equation is now:

$$d_t = (1+\epsilon_t)\frac{d^f_{t-1}}{\rho_t} + \frac{d^d_{t-1}}{\rho_t} + i_t \frac{d_{t-1}}{\rho_t} - pb_t + sfa_t$$

Debt dynamics (e.g., the change from one year to the next) are a critical area for analysis and are derived as follows: Subtract the previous year's debt stock from both sides of the equation and use $\Delta d_t \equiv d_t - d_{t-1}$ and $d_{t-1} = \left(d^d_{t-1} + d^f_{t-1}\right)\rho_t/\rho_t = (d^d_{t-1} + d^f_{t-1})(1+\rho_t - 1)/\rho_t$. We have:

$$\Delta d_t = \frac{(1+\epsilon_t)d^f_{t-1}}{\rho_t} + \frac{d^d_{t-1}}{\rho_t} + \frac{i_t d_{t-1}}{\rho_t} - \frac{d^d_{t-1} + d^f_{t-1}}{\rho_t} - \frac{(d^d_{t-1} + d^f_{t-1})(\rho_t - 1)}{\rho_t} - pb_t + sfa_t$$

And after consolidating terms:

$$\Delta d_t = \frac{\epsilon_t d^f_{t-1}}{\rho_t} + \frac{(i_t - [\rho_t - 1])d_{t-1}}{\rho_t} - pb_t + sfa_t$$

This equation can be converted to express the debt dynamics in terms of real interest rates, real exchange rates and real GDP growth as follows:

Step 1: Define the real exchange rate (z) as $1+z = (e_t/e_{t-1})(1+\pi^f_t)/(1+\pi^d_t)$, solve this expression for e_t/e_{t-1}, note that $\epsilon_t = e_t/e_{t-1} - 1$, and recall that $\rho_t = (1+g_t)(1+\pi^d_t)$. This term can then be substituted in the first term of the equation above as follows:

$$\frac{\epsilon_t d^f_{t-1}}{\rho_t} = \frac{d^f_{t-1}}{\rho_t}\left(\frac{1+\pi^d_t}{1+\pi^f_t} + \frac{\pi^d_t - \pi^f_t}{1+\pi^f_t}\right) = \frac{z_t d^f_{t-1}}{(1+g_t)(1+\pi^f_t)} + \frac{\pi^d_t - \pi^f_t}{\left(1+\pi^f_t\right)\rho_t} d^f_{t-1}$$

Step 2: Define the real effective interest rate (r) as $(1+r_t) = (1+i_t)/(1+\pi_t)$, solve this expression for $i_t = (1+r_t)(1+\pi^d_t) - 1$. This term should be substituted in the second term of the equation as follows:

$$\frac{(i_t - [\rho_t - 1])d_{t-1}}{\rho_t} = \frac{1}{\rho_t}[(1+r_t)(1+\pi^d_t) - 1 - (\rho_t - 1)]$$

Again recalling that $\rho_t = (1+g_t)(1+\pi^d_t)$, this expression can be factored as:

$$\frac{1}{\rho_t}[(1+r_t)(1+\pi^d_t) - \rho_t] = \frac{1}{\rho_t}[(1+\pi^d_t)(1+r_t - 1 - g_t)] = \frac{1}{\rho_t}[(1+\pi^d_t)(r_t - g_t)] = \frac{r_t - g_t}{1+g_t}$$

Box 3. Debt Dynamics and Drivers in the SRDSF (concluded)

Pulling step 1 and step 2 together, the final equation results in the equation that is used in the SRDSF:

$$\Delta d_t = \frac{z_t d^f_{t-1}}{(1+g_t)(1+\pi^f_t)} + \frac{r_t - g_t}{1+g_t} d_{t-1} + \frac{\pi^d_t - \pi^f_t}{(1+\pi^f_t)\rho_t} d^f_{t-1} - pb_t + sfa_t$$

Where the purple term accounts for the real exchange rate, the blue term corresponds to the real growth-interest differential, and the red term corresponds to the relative inflation component.

Finally, this equation indicates the debt-stabilizing primary balance. Set the change in debt equal to zero, assuming no change in the real exchange rate and no stock-flow adjustments, this equation can be solved for the debt stabilizing primary balance, which in this case is:

$$pb_t = \frac{\pi^d_t - \pi^f_t}{(1+\pi^f_t)\rho_t} d^f_{t-1} + \frac{r_t - g_t}{1+g_t} d_{t-1} = \frac{d_{t-1}}{1+g_t}\left(\frac{\pi^d_t - \pi^f_t}{1+\pi^d_t}\alpha^f_t + r_t - g_t\right)$$

Where α^f_t corresponds to the foreign currency share in public debt. This formula for the debt-stabilizing primary balance is used for calculating the probability of debt non-stabilization, where the time period corresponds to the average of these variables along the trajectory.

SECTION IV. REALISM TOOLS

35. The SRDSF includes a suite of tools to assess the realism of the baseline macroeconomic scenario and guard against excessively optimistic projections that might mask looming stress. Baseline realism is critical in assessing sovereign risks and debt sustainability credibly. To this end, the SRDSF includes nine realism tools, which scrutinize key drivers of public debt using a mixture of cross-country and historical performance, and flag various problems of optimism or pessimism. These tools are automatically produced after all projections are entered into the template and included as standard outputs of any SRDSA. Users are encouraged to interact with the tools at an early stage to provide ample time to revise projections if significant issues are encountered.

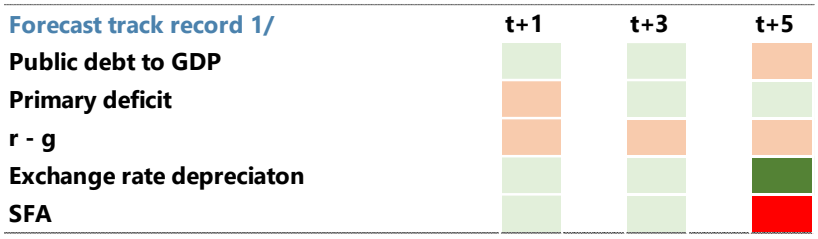
36. The first tool--forecast track record of debt drivers--examines risks to projections that might arise from past forecast errors. This tool includes a color-coded table showing the track record for the forecast errors for all debt drivers—primary deficit, real interest-growth rate differential,[37] exchange rate depreciation, and stock-flow adjustments—and public debt at one-, three-, and five-year horizons vis-à-vis a relevant comparator group, using data from both Spring and Fall WEO vintages (Figure 9.A). The scale shown in the table ranges from pessimism (in dark green; below the 25th percentile of the distribution of peer countries) to optimism (in bright red; above 75th percentile). The user is offered six comparator groups based on the country's relationship with the Fund, income level, and in the case of emerging markets, export earnings (paragraph 8). Users should choose which comparator group is the most appropriate, given the country's characteristics and Fund engagement. When interpreting the tool, a table with many red cells

[37]When interpreting errors arising from the real interest rate differential, users should also need to consider relative contributions of both nominal interest and inflation rates.

indicates persistent forecast optimism in the past and would signal a risk to the projections, particularly if the debt trajectory is projected to improve dramatically.

Figure 9. Realism Tools Based on Information from Past Projections

A. Forecast Track Record Realism Tool



1/Projections made in the October and April WEO vintage.

Note: This figure generally does not show any realism issues as there is a mix of red and green cells throughout the table. However, the exchange rate depreciation and stock-flow adjustment forecast errors have been large at a 5-year horizon (though in opposing directions).

Comparator group:
Emerging market noncommodity exporter with a Fund program

Color code:

Optimistic	> 75th percentile
	50-75th percentile
Pessimistic	25-50th percentile
	< 25th percentile

B. Output Gap Revisions Realism Tool

Source: IMF.

Note: This figure shows a sign of potential at a 5-year horizon represented by the bright red cell.
1/Calculated as the percentile rank of the country's output gap revisions (defined as the difference between real time/period ahead estimates).

37. A second tool calculates output gap revisions from historical data and assesses optimism in potential output projections (Figure 9.B). It is based on Kangur et. al (2019) and staff analyses showing the existence of real-time output gap biases for a majority of market access countries. It is a color-coded table showing the track record for revisions of real-time, three- and five- year ahead output gap projections, defined as the difference between output gap estimates as of the latest WEO October vintage and the projections.[38] The scale shown in the table ranges from green (cases where output gap revisions are below the 25th percentile of the distribution of peer countries) to red (above the 75th percentile). Red cells indicate a negative bias in output gap projections and raise a realism flag.

38. A third tool compares the projections for variables that affect the public debt-to-GDP ratio with their recent realizations. This realism tool (Figure 10) graphically reports the cumulative contributions of key debt drivers (the primary balance, contributions from growth, interest, and other factors) over both the past 5 years of historical observations and the projection period (next 5 years). Users should identify and scrutinize whether there are large shifts in the behavior of the debt

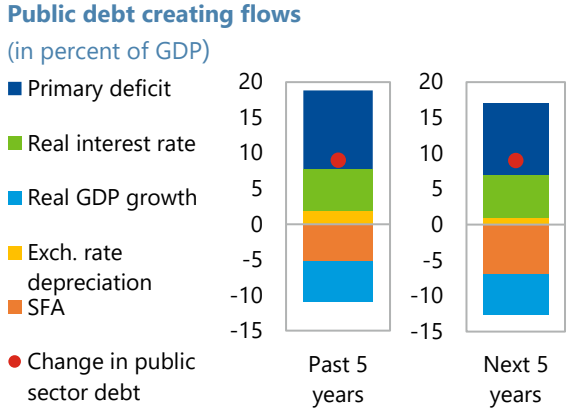
[38]For most countries, October WEO estimates are used as they proxy real-time projections much more than April WEO estimates which are made at the beginning of each year. An exception can be made for countries on a fiscal-year basis, where the April WEO corresponds to the second half of the year.

drivers (e.g., a drop in the contribution from the real growth-interest differential). If so, it could constitute a realism concern, unless it can be adequately justified.

Figure 10. Realism Tool for Debt Drivers Decomposition

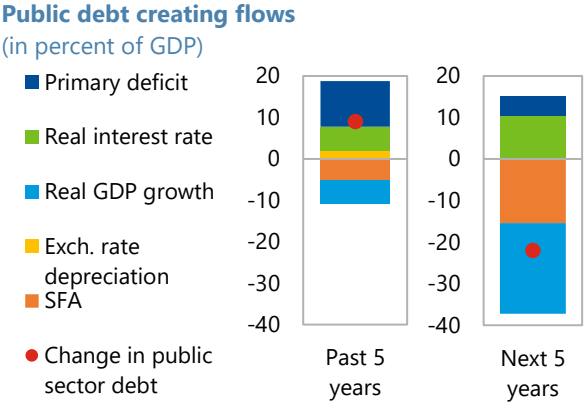
No Realism Issues

The projected change in public debt is similar to the past 5 years, and the pattern of contributions is broadly similar between the baseline and the recent past.



Realism Issues

Baseline debt falls substantially over the next 5 years due to downward contributions from growth and stock-flow adjustments that are large by historical experience.

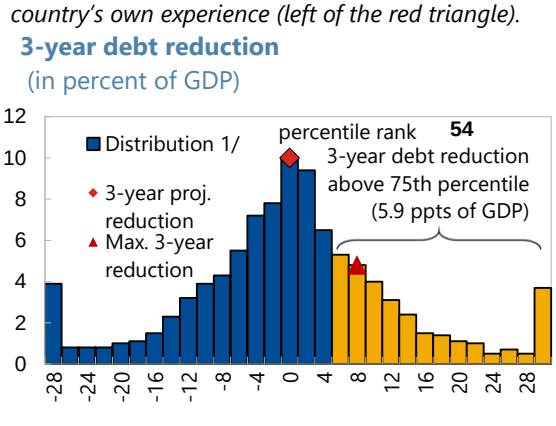


Source: IMF.

Figure 11. Realism Tool for Distribution of Debt-to-GDP Ratio Reductions
(Percent of GDP)

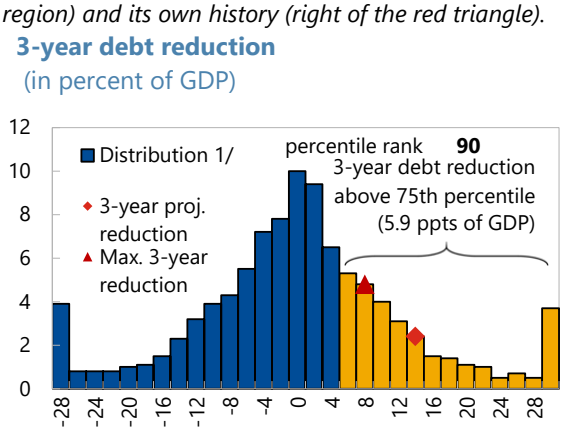
No Realism Issues

A 3-year debt reduction (red diamond) that is modest in a cross-country comparison (in the blue region) and the country's own experience (left of the red triangle).



Realism Issues

A large projected 3-year reduction in the debt-to-GDP ratio in comparison across countries (in the yellow region) and its own history (right of the red triangle).



Source: IMF.

1/Data cover annual observations from 1990 to 2019 for MAC advanced and emerging economies. Percent of sample on vertical axis.

39. A fourth tool compares the projected change in debt-to-GDP to historical realizations for all market access countries. The tool displays a distribution of observed changes in debt-to-GDP ratios over a three-year horizon and places the country's projected change in debt-to-GDP

ratio in this distribution (Figure 11). The sample includes data from the October 2020 WEO for all market access countries between 1990 and 2019. A large projected debt reduction, defined as being greater than the 75th percentile of all the reductions in the sample, would suggest potential over-optimism in projections. This tool also contains an observation showing the largest (downward) change in the debt-to-GDP ratio observed in the country's own past during 1990-2019. A projection that exceeds this observation would also be a sign of a potential realism concern, regardless of the cross-country comparison.

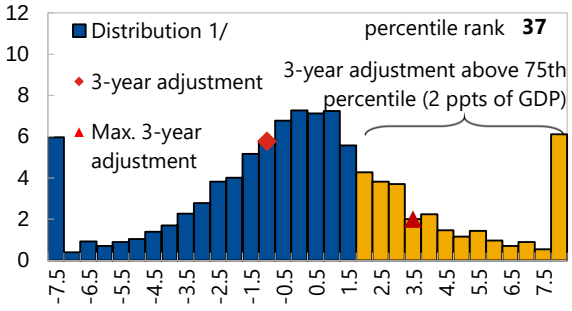
40. The fifth tool attempts to spot optimistic assumptions on fiscal adjustments. Like the distribution of changes in debt-to-GDP, it shows the distribution of fiscal adjustments (three-year change in cyclically adjusted primary balance) from data from the October 2020 WEO for the period 1990-2019, with which a country's projected adjustment is compared (Figure 12). In addition, the chart also shows the maximum adjustment done by the country in the historical sample. If projections for the cyclically adjusted primary balance are unavailable, the tool uses a calculated version of the cyclically adjusted primary balance relying on a measure of the output gap.[39] The tool signals a realism flag if the projected adjustment is larger than the 75th percentile of the cross-country database, or if the adjustment is larger than the maximum of the historical adjustments for the country.

Figure 12. Fiscal Adjustments Realism Tool
(in percent of GDP)

No Realism Issues

A small fiscal relaxation (red diamond) is not ambitious by either cross-country or own history (in the blue region and left of the red triangle).

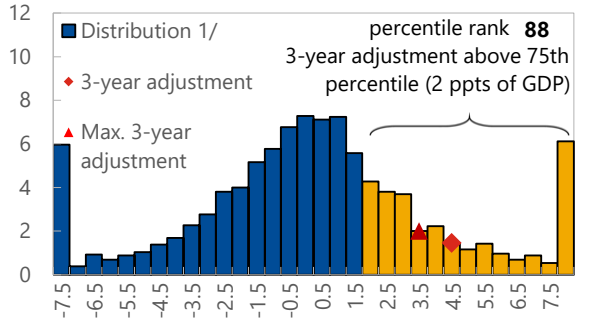
3-year adjustment in cyclically-adjusted primary balance
(in percent of GDP)



Realism Issues

Projections of ambitious fiscal tightening in comparison to other countries and country history (red diamond in the yellow region and right of the red triangle).

3- year adjustment in cyclically-adjusted primary balance
(in percent of GDP)



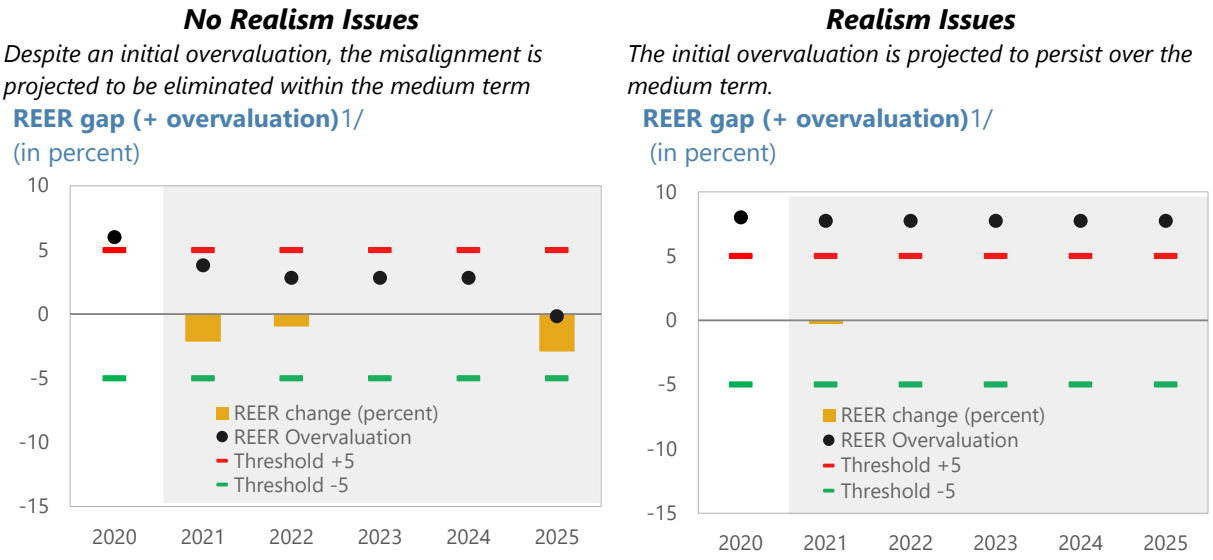
Source: IMF.

1/Data cover annual observations from 1990 to 2019 for MAC advanced and emerging economies. Percent of sample on vertical axis.

[39]The calculation of the cyclically adjusted primary balance is done in accordance with the technical manual on cyclical adjustment of budgetary aggregates (Escolano 2010). In cases where country teams do not calculate output gaps, staff used a HP filter to create the output gap.

41. A sixth tool checks whether REER projections are optimistic (Figure 13). Based on a user-provided estimate of initial REER misalignment, the tool extrapolates the REER over/undervaluation gap using baseline projections of the REER.[40] This indicative calculation assumes no change in the equilibrium REER. An initial over- or under-valuation that is not unwound (i.e., gap that exceeds ±5 percent) by the end of the 5-year horizon might signal the possibility of an unexpected exchange rate movement and therefore constitutes a realism flag. Given the confidential nature of REER projections, this tool will be included in policy notes, but not in staff reports.

Figure 13. REER Gap Realism Tool
(in percent, +=overvaluation)



Source: IMF.

1/Starting point reflects the team's assessment of the initial overvaluation from EBA (or EBA-Lite).

42. The baseline real GDP growth projection is scrutinized against several benchmarks in the seventh realism tool. This tool assesses the realism of real GDP growth projections through a chart showing how real GDP growth projections compare with potential growth projections, output gap and the historical average growth (Figure 14). Signs of optimism would arise if the output gap without fiscal stimulus is positive at the end of the projection period or there is a significant increase in real growth over the projection period relative to the historical average.

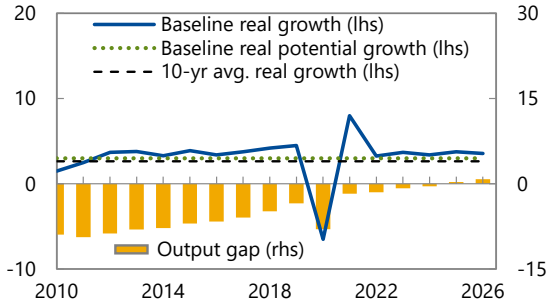
[40]In cases where country teams do not project REER, the tool proxies this with the change in the nominal exchange rate against the dollar.

Figure 14. Real GDP Growth Realism Tool
(in percent)

No realism issues

Projected growth is in line with potential and the 10-year average; the output gap is close to zero after five years.

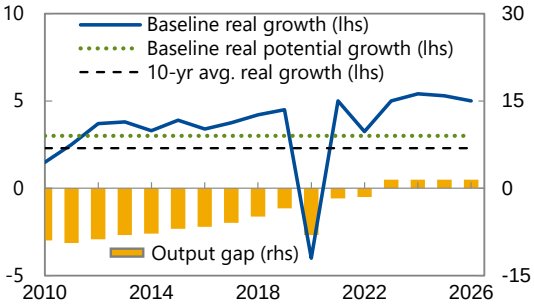
Real GDP growth
(in percent)



Realism issues

Projected growth exceeds potential and the 10-year average, with a positive output gap in the medium-term

Real GDP growth
(in percent)



Source: IMF.

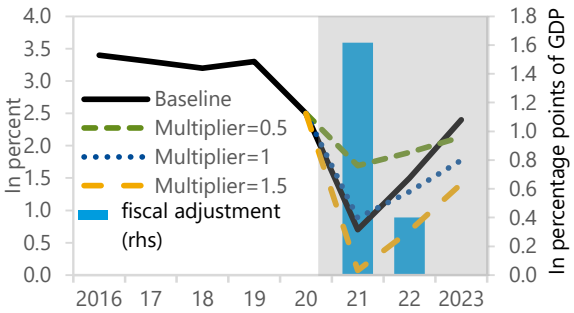
43. The eighth tool checks consistency between fiscal adjustment and growth assumptions (Figure 15). It compares the impact of the planned fiscal adjustment on growth under a range of plausible fiscal multipliers (namely, 0.5, 1 and 1.5, in line with the literature) and persistence parameters (annual AR (1) persistence of 0.6) with the baseline projected growth path. Large discrepancies between the baseline and growth implied by fiscal adjustment paths (e.g., a growth pickup during a consolidation) trigger a realism flag.

Figure 15. Fiscal Multiplier Realism Tool
(in percent)

No Realism Issues

Growth weakens while a large fiscal adjustment is undertaken, consistent with reasonable multiplier estimates.

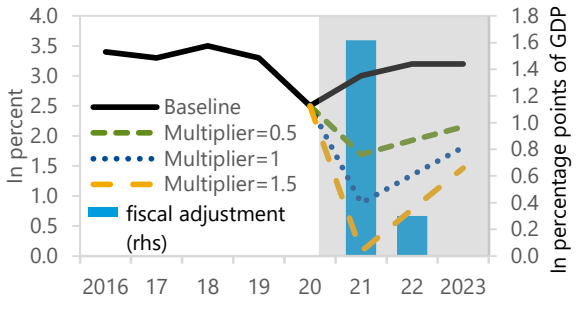
Fiscal adjustment and possible growth paths
(lines, real growth using multiplier (LHS), bars, fiscal adj. (RHS))



Realism Issues

Growth remains high while a large fiscal adjustment is undertaken, inconsistent with reasonable multiplier estimates.

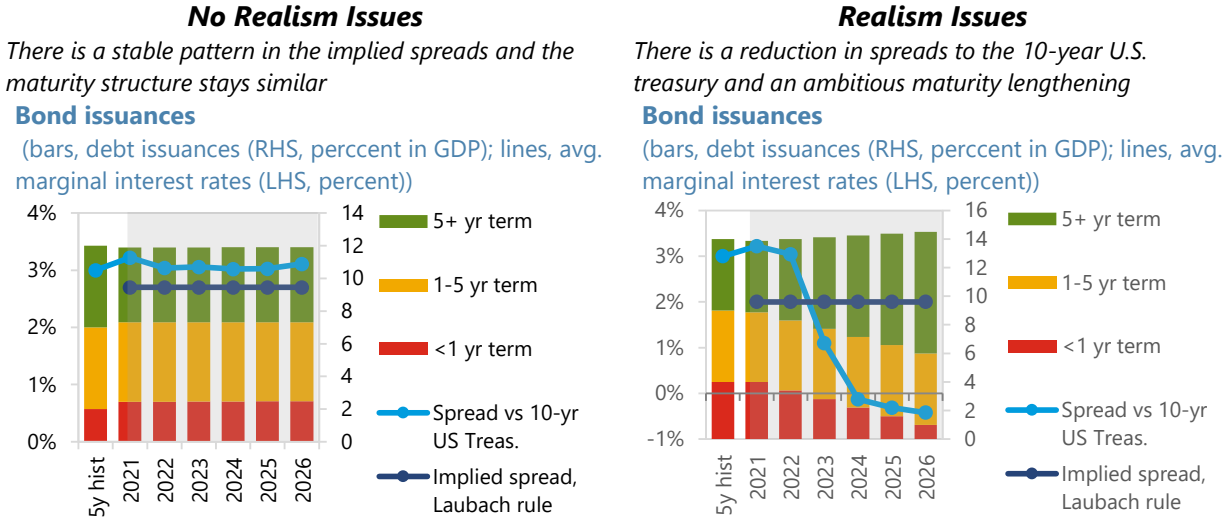
Fiscal adjustment and possible growth paths
(lines, real growth using multiplier (LHS), bars, fiscal adj. (RHS))



Source: IMF.

44. The realism of financing terms is assessed in a ninth tool by scrutinizing assumptions on new private borrowing and financing terms. The tool shows the difference in composition of issuances in terms of maturity across three timeframes (long term, medium term, and short term) against the historical average for that country (Figure 16). If the composition shifts quickly towards new long-term financing, this is a sign that gross financing needs may be understated. In addition, the tool also displays the projected spread against the 10-year US Treasury bond yields, and the spread implied by the Laubach rule, which links spreads to debt-to-GDP ratios.[41] A projected compression in spreads that greatly exceeds the reduction in spreads implied by the Laubach rule might also flag a potential realism issue.

Figure 16. Financing Terms Realism Tool
(in percent)



Source: IMF.

45. Whenever realism flags are raised, the SRDSA should explain why they do not signal overoptimism. Where the tools show large differences compared to other countries, or the country's historical experience, users should discuss why a realism flag does not signal overoptimism using the commentary fields available in the output. This could include reasons why the comparator benchmarks (whether historical or cross-country) are less relevant in a particular case, or why the future is expected to constitute a break from past patterns. When a strong justification is not evident, realism concerns would suggest a need to re-examine and revise the macro framework projections. This would especially be the case if the warnings span multiple tools or arise from large deviations from the relevant benchmarks.

46. Cases where a realism flag can be discounted include, but are not limited to the following:

[41]The Laubach (2009) rule states that bond spreads increase linearly by about 4 bps in response to a 1 ppt increase in the projected debt-to-GDP ratio.

- When aggressive fiscal adjustment has been recently completed or legislated and is thus included in the baseline, the tools may trigger flags for the fiscal adjustment and debt decline. These flags can be discounted if the adjustment measures have a very high probability of being executed and delivering the expected yield (in terms of an improved primary balance).

- There may be cases where there is a track record of divergence from cross-country norms. In such cases, realism flags for tools that primarily use cross-country norms can be discounted. However, before discounting these flags, users should understand the reasons for the diverging track record and include an explanation in the SRDSA output.

- COVID-19 and other severely exogenous and large events may distort the realism tools. In such cases, cross country and historical norms may not be the best benchmarks, and users should explain why a particular realism flag is less relevant. One clear example is the expected rebound in primary balance and GDP growth after a temporary shock (as observed with COVID-19), which may cause the fiscal adjustment and growth tool to raise optimism flags. Such projected recovery could be justified by the temporary nature of the shock.

SECTION V. NEAR-TERM RISK ASSESSMENT

A. Logit Model to Predict Sovereign Stress Events

Standard Application

47. The SRDSF's multivariate logistic (logit) regression model is the workhorse tool for the standardized near-term risk analysis. The key output from this model is the fitted probability, or Logit Stress Probability (LSP), which measures the chances of a stress event materializing within 1-2 years. It uses a battery of explanatory variables that account for both country-specific characteristics and global conditions. These can be organized in four categories (Table 1), based on the channels through which they affect the likelihood of sovereign stress:

- *Structural characteristics:* Stress history and a proxy for institutional quality aim to capture a country's debt carrying capacity and its predisposition to sovereign stress events.[42]
- *Cyclical position*: The current account balance, credit-to-GDP gap and three-year change in the REER are included to detect a buildup of vulnerabilities from an overheating economy.
- *Debt burden and buffers*: Four indicators track risks related to public debt levels, changes, and currency composition as well as reserve buffers to meet debt obligations.

[42]When preparing SRDSAs, Fund staff should be aware that the institutions index used in the near-term assessment and debt fanchart (sections V and VI.A) is a perceptions-based third-party indicator (TPI) obtained by averaging the index levels of the regulatory quality and government effectiveness components of the Worldwide Governance Indicators, compiled by Daniel Kaufmann (Natural Resource Governance Institute and Brookings Institution) and Art Kraay (World Bank). This indicator provides a measure of debt carrying capacity and its use in the SRDSF has produced indicators with strong predictive capacity. However, in line with the guidance to Fund staff on the Use of TPIs in Fund Reports (IMF 2018b), staff should be aware that such indicators may be subject to uncertainty and should be considered carefully.

Table 1. Sovereign Stress Logit Model: Summary of Explanatory Variables

Category	Explanatory Variable	Intuition	Calculation	Source
Structural factors	Institutional quality	A proxy for debt carrying capacity where stronger institutions point to lower probability of stress	Average of government effectiveness and regulatory quality components of the World Governance Indicators	Fund staff calculation on World Governance Indicators (Kaufmann and Kraay)
	Stress history	Summarizes the track record of stress episodes, with recent events indicating higher probability of renewed stress	If a country is in stress, previous observation + 1. If a country is not in stress, 0.9 x previous year's observation.	Fund staff calculation
Cyclical position	Current account/GDP	Weaker current accounts may signal overheating that is subject to reversal	Current account/GDP x 100, with appropriate currency conversion to GDP	Country authorities or WEO
	Three-year change in REER	Strong appreciation can raise risks of abrupt exchange rate depreciations that can cause FX debt to spike	[REER(t)/REER(t-3)-1]x100	IMF, Information Notice System (INS) University of Bruegel when INS unavailable
	Credit-to-GDP gap, lagged (if positive)	Positive gaps suggest potential excess in the financial system that could result in contingent liabilities for the government if financial sector instability emerges	Cyclical component from a one-sided HP filter run on credit-to-GDP ratios with smoothing parameter of 400,000 if positive (zero otherwise). Credit-to-GDP calculated as private credit/GDP x 100.	Bank for International Settlements or Fund staff calculation on IFS data when BIS unavailable
Debt burden and buffers	Change in debt-to-GDP ratio	Sudden spikes in debt tend to be difficult to manage and result in stress	[Total Public Debt(t)/GDP(t) - Total Public Debt(t-1)/GDP(t-1)]x100	Latest WEO or SRDSF user (when updated data available)
	Public debt/revenues	More readily available resources to service debt make stress less likely	[Total Public Debt(t)/Total Revenues(t)]x100	Latest WEO or SRDSF user (when updated data available)
	FX public debt/GDP	Higher FX debt increases vulnerability	[Forex Debt(t)/GDP(t)]x100	Latest WEO or SRDSF user (when updated data available)
	International reserves/GDP	Higher buffers to service foreign currency debt reduce stress risks	[Gross International Reserves(t)/GDP(t)]x100	Latest WEO or SRDSF user (when updated data available)
Global conditions	Change in VIX	Weaker global market sentiment can raise probability of stress	Year-to-year level change in VIX, with VIX indexed to 2010 = 100.	Fund staff calc., Chicago Board of Trade via Haver Analytics
	Currency union members in stress (alternate specification)	When stress is spreading around the currency union members, vulnerability to contagion is higher	Number of countries in stress (e.g. where stress history defined above = 1) divided by number of countries in currency union	Fund staff calculation

- *Global environment:* The variables in this category aim to capture global financial market volatility and contagion risks.

48. The LSP cannot suffer from optimism bias, because it is based only on realized values of the explanatory variables, rather than projections. For convenience, all the required variables are available from a centralized SRDSF database and can be downloaded to the template automatically. When the template is populated with these data, the LSP is calculated automatically. However, if users have access to updated statistical releases that have not yet been reflected in the central database, they may update these values manually. For the institutional quality indicator, values are published with a lag and users should extrapolate the last available observation when current-year data are unavailable. In contrast, the financial market volatility indicator (VIX) is available at a daily frequency and users should input the year-to-date change, even when the other explanatory variables correspond to the previous year.

Table 2. Criteria for Determining the Existence of Sovereign Stress

Stress category	Criteria
Large IMF-supported programs and exceptional financing from other IFIs and donors	(i) IMF-supported programs: nonprecautionary programs with access > 100 percent of quota and positive disbursement in first year of program; if positive disbursements occur in later years, the country is still in stress; (ii) other IFIs: arrangements > 5 percent of GDP and positive disbursements in year; or (iii) donors: exceptional disbursement > 5 percent of external debt
Default	(i) External arrears ≥ 5 percent of public external debt and increasing at least 10 percent in nominal terms; or (ii) defaults on domestic debt instruments
Debt restructurings	Renegotiations of repayment terms on outstanding debt instruments (not to be confused with liability management operations)
Chronic excessive inflation (incl.	(i) Doubling of inflation rate compared to the pervious year and inflation above 25 percent; or (ii) any event with inflation above 100 percent
Market indicators	Advanced economies: (i) spreads ≥ 1.5 standard deviations above 10-year mean and above 150 bps; or (ii) spreads above 500 bps 1/ Emerging markets: (i) Doubling of EMBIG spreads relative to year before and spreads ≥ 500 bps; or (ii) if EMBIG spreads unavailable, doubling of real domestic interest rate relative to year before and real interest rate ≥ 10 pct
Loss of market access	An inability to issue debt in markets when there is a financing need 2/
Financial repression	(i) Central bank claims on government: ≥ 4 pct of GDP and growth of 100 pct (y/y); (ii) Commercial bank claims on govt: ≥ 9.1 pct of GDP and growth of 100 pct (y/y); (iii) T-bill rate: y/y change > 4.5 percentage points (if rate < 11 percent) or y/y change > 50 percentage points (if rate ≥ 11 percent); or (iv) Other reports derived through MCM TA reports or FSAPs

1/Spreads for European Union countries calculated in nominal terms relative to corresponding German bund maturity. Spreads for other countries calculated in nominal terms relative to corresponding U.S. Treasury maturity.

2/See IMF 2015, Annex III for indicators of loss of market access.

49. The near-term risk assessment should not be undertaken if the country is already in stress. As the near-term tool gives an ex-ante probabilistic assessment of the risk of sovereign stress, the module is not meaningful when stress has already materialized. Thus, SRDSAs should not report the LSP, the mechanical signal, or any of the standardized reporting for the near-term assessment when any of the criteria in Table 2 are satisfied. When SRDSAs are prepared in the context of Fund-supported programs, IMF staff should take note of these requirements when determining whether the near-term assessment should be included:

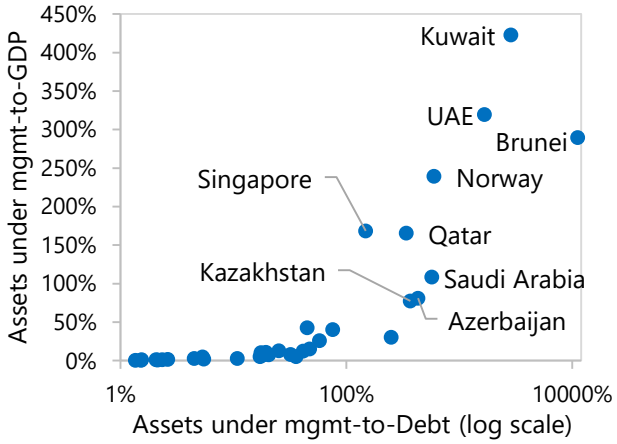
- As a matter of principle, SRDSAs prepared for any *nonprecautionary* program should not include any elements of the near-term assessment.[43] Instead, the entry for the summary table at the beginning of the SRDSA should indicate "not applicable",[44] and the SRDSA's focus would be squarely on the medium- and long-term analytics.

- For approved *precautionary* arrangements, the near-term sovereign stress signal and assessment should be produced as long as arrangement remains non-drawing. If the country makes a purchase, it is considered to be in stress, and no near-term stress signal would be produced, in line with the publication policy for regular drawing programs.

Considerations for Special Cases

50. An adjustment to the international reserves variable may be appropriate when a country has large financial assets, which can be readily deployed to offset any near-term pressures. A country's shock absorption capacity may be understated when financial assets not included in international reserves, including holdings of sovereign wealth funds (SWFs) are large relative to GDP and public debt (Figure 17). For the purposes of the near-term assessment, it may be appropriate to augment the international reserves variable with financial asset buffers outside international reserves when they are reserve-like in the sense of being readily available (and able to be liquidated at prices reflecting their fair value) and under the control of the government.[45] When assessing the appropriateness of this adjustment, users should ensure that these assets can

Figure 17. SWF Assets to GDP and Public Debt



Sources: IE Foundation, Sovereign Wealth Funds, 2018; World Economic Outlook; and Fund staff calculations.

[43]SRDSAs prepared for emergency financing requests should include a near-term assessment unless another stress criterion in Table 2 has been met.

[44]This disclaimer should also be reported if any other stress event criterion is satisfied.

[45]During times of global stress, it might be difficult to liquidate some classes of assets.

be used without (i) creating conflicts with fiscal rules; (ii) violating regulations, laws, or conventions, especially when SWFs are concerned, (for example, that asset usage should not entail major balance sheet effects for the fund); and (iii) clashing with other encumbrances on the assets (for example, if they are used as collateral).[46] Users may add the reported amounts of financial assets meeting these criteria to the observations for international reserves. Adjustments should be done consistently for all years shown in the standardized reporting to prevent LSP dynamics arising from measurement issues. The LSP should subsequently be recalculated using this augmented reserve metric, which will lower the LSP and may favorably affect the mechanical signal.

51. An adjustment may also be needed if there is a discontinuity in the lagged observation of the credit gap that is not reflective of an increase in financial sector risks. Credit-to-GDP ratios, which are the input to the credit gap calculations, can sometimes show unusual jumps (in either direction). Such events can arise for many reasons, including financial inclusion policies, the entrance/exit of banks into the system (including from business model changes in existing non-bank financial institutions), mergers and acquisitions, regulations, and on occasion, data anomalies. When these events arise, users should carefully assess the evolution of credit-to-GDP ratios. If it can be confirmed that the change does not indicate a change in financial sector risks, an adjustment to credit-to-GDP ratios can be made that corrects the discontinuity (e.g., based on past trends). However, users must clearly explain valid reasons for the adjustment as well as its methodology in the commentary box of the standardized reporting in the SRDSA.

52. Users should consider whether an alternate specification is warranted for currency union members. The risk of contagion may be high for countries in currency unions when regional risks are elevated. For this reason, there is an alternate version of the logit model with a variable indicating the share of members—in the country's currency union—that are currently experiencing a stress event. Users should implement the alternate specification if they assess contagion risks from the region as being high. Users should not use this alternate version if the country is not a currency union member or no member of the currency union of which the country is a member is in stress.

Interpreting the Tool

53. The standardized reporting for the near-term assessment is based on the results of the logit model. It consists of:

- *A mechanical signal* automatically shown in the SRDSF's main summary table. The signal is low risk if the LSP is below 6.3 percent and high risk if the LSP is above 19.5 percent; otherwise, the signal is moderate risk (Annex IV.A)

[46]Additionally, users should reflect on the maturity of swap-related liabilities before adding the corresponding assets to international reserves. A short maturity for a swap liability would imply that its corresponding assets are available only for a limited amount of time. For consistency with the liability side, when the swap-related liability is added to the DSA, the unused swap-related assets (i.e., the part of swap-related assets that remain in the central bank's custody) should be added to international reserves for the purposes of the near-term tool.

- *Additional outputs* that include the level of the LSP and its evolution in recent years compared to a group of similar countries;[47] contributions to the change in LSP by major variable category; and the probabilities of erroneous predictions associated with that level of LSP. These outputs are also generated by the template.

- *Commentary*: Users should summarize points of interest in the space provided in the standard report, including considerations described below. When applied, any judgment-based final signals should be disclosed along with their rationale.

54. The LSP is intended only for assessing the likelihood of a sovereign experiencing stress in the near-term and should be interpreted carefully. This tool is intended to act as an early warning system to steer countries away from stress. It does not, however, provide any information as to whether any potential stress could be resolved with a combination of policy adjustment/new financing, or whether exceptional measures like debt restructuring may be required. Hence, the LSP does not signal whether debt is sustainable or not and should never be interpreted in this way. Additionally, the near-term assessment refers to a horizon of "1-2 years ahead", which generally still leaves time for the implementation of policy measures that reduce the risk of a crisis. Therefore, a high-risk signal does not mean stress is inevitable, although it generally indicates a situation that warrants prompt attention.

55. When considering the near-term assessment, users should take note of the contributions of groups variables to the LSP. With contributions to the change in the LSP organized by major variable category, users should examine whether the contributions are relatively consistent with each other, or if there is one bucket that is driving the result. Consistent with this analysis, users should examine whether the contributions are intuitive and point to a specific development that affects the assessment of near-term risks. On the other hand, if results are unintuitive and driven by a single variable, it may suggest a role for judgment as described below.

56. Users may also use the near-term assessment to emphasize the importance of certain policies. The policy advice may vary according to which variables in the model are contributing to risks:

- *Structural characteristics*: Structural and governance reforms that help build debt carrying capacity could be more beneficial when this category is elevating the LSP. However, users should be cognizant that these reforms typically take some time to show results when considering policies to avert stress at the near-term horizon.

- *Cyclical Position*: When this group of regressors is contributing to risks, efforts to lean against the wind may be appropriate including macroprudential measures, fiscal adjustment, and policies to avoid exchange rate misalignment.

[47]SRDSF users have discretion over the choice over the appropriate comparator group, which would be one of advanced economies, commodity-exporting emerging markets, and non-commodity exporting emerging markets.

- *Debt burden and buffers:* Risks highlighted by these variables could be mitigated in various ways, not only fiscal adjustment (including efforts to mobilize revenues to service debt) but also debt management in terms of currency, maturity, and terms.

- *Global risk appetite:* Sovereigns relying on foreign financing are more exposed to the risk of reversal of global financial flows. Policymakers may need to recalibrate the balance between local and international debt issuance going forward, weighing the relevant tradeoffs, including the cost of debt and potential for crowding out domestic investment.

Using Judgment

57. Judgment may be needed in cases where the near-term model does not fully capture the factors that determine a country's near-term risk profile. Users should determine whether the mechanical signal is sensible. Unintuitive results—in either direction—can arise due to several causes, including:

- *Proximity to a stress event*: When market or other high-frequency indicators suggest that countries are moving close to one of the event triggers (e.g., due to waning market access that may be soon lost entirely; upwardly-trending spreads that will likely soon exceed the stress event cutoff; or near-term financing shortfalls which will likely turn into arrears), the final near-term assessment should be high risk regardless of the mechanical signal.

- *Temporary distortions in the explanatory variables*: Macroeconomic indicators can often show fluctuations due to identifiable, one-off events unrelated to underlying debt-related risks.

- *Permanent, country-specific characteristics*: Users may assess certain regressors as being structurally different from those in other market access countries, including in some cases the WGI-based institutions index. In cases where this difference is exerting a dominating and counterintuitive impact, a judgment-based final assessment may be appropriate. Patterns of missed crises/false alarms in the model's recent track record would usually provide evidence for a systematic misstatement of near-term risks. However, users should be cautious to avoid minimizing false alarms when near-term risks are slowly rising, as these could reflect a genuine increase in the risk of sovereign stress.

- *Timing issues*: Policymakers may take credible corrective action to reverse a buildup of risks, but the effects of these measures will not immediately show up in the logit model's explanatory variables. In these cases, a judgmental upgrade could be warranted, particularly if market reaction to those policies has been favorable.

- *Factors outside the model*: There may be some additional information that is not being captured by the variables that are relevant to near-term risks. These considerations, which are difficult to enumerate ex ante, should be linked to specific factors and properly disclosed.

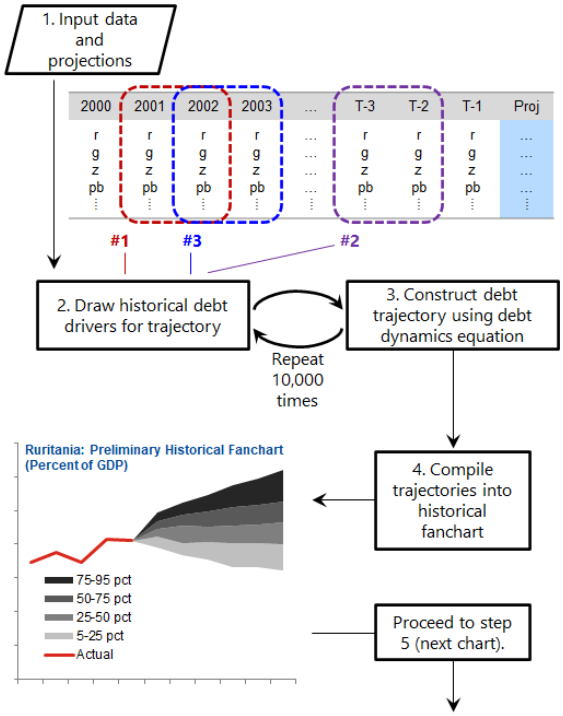
SECTION VI. MEDIUM-TERM RISK ASSESSMENT

A. Debt Fanchart Module

Standard Application

58. The Debt Fanchart Module analyzes risks arising from the evolution of indebtedness over the medium term. The fanchart module in the template automatically simulates many debt trajectories using a debt dynamics equation and randomly drawn shocks to the key variables in that equation. These stochastic trajectories imply distributions of debt outcomes for each year of the projection horizon, which can be summarized by key percentiles and presented as a debt fanchart. When shown in this way, these tools can illustrate the degree of uncertainty around baseline debt projections, the balance of risks around the baseline, and prospects for debt stabilization.

Figure 18. First Steps of the Debt Fanchart Algorithm



Source: IMF.

59. The first step in running this module is to prepare a preliminary historical fanchart based entirely on realized historical data (Figure 18). While the preliminary historical fanchart is produced automatically by the SRDSF tool, users need to enter historical observations in the template beginning in 2000 until the most recent year for which data are available for: (i) debt-to-GDP; (ii) real effective interest rates; (iii) real GDP growth; (iv) the primary (noninterest) deficit; (v) real exchange rates; (vi) domestic inflation; and (vii) foreign inflation (measured as inflation in the United

States).[48] The user must also enter the share of debt in foreign currency—both history and projections.[49] The standard deviation of debt revisions—available centrally in the SRDSF common database—is also required to calibrate the tool.[50] Based on these data inputs, the mechanical tool then samples these variables by selecting all debt drivers in a randomly chosen previous year together with the drivers for the following year. This approach, called block bootstrapping, aims to capture correlations among the drivers as well as their persistence. Thus, for a standard time horizon (6 observations, corresponding to the current year and the five subsequent years), three blocks will be chosen. Given these blocks, the tool simulates a public debt trajectory using those draws and the debt dynamics equation described earlier in Box 3.[51] This process is repeated until many trajectories have been calculated (the standard setting is 10,000).

60. The preliminary historical fanchart serves as realism diagnostic for the baseline debt-to-GDP projections entered by the user (Figure 19). As the preliminary historical fanchart only uses previous values of the debt drivers, it shows how the baseline debt projections compare to those implied by past behavior. Thus, the fanchart acts as a realism check, which can result in one of the following three outcomes:

- In some cases, the baseline will rise toward or exceed the *upper* edge of the fan. When this situation happens, the baseline is indicating a substantial weakening of debt ratios relative to the past. If such a result is evident, users should confirm that such baseline dynamics are intuitive, for example because policies are expected to be looser than in the past. When such justifications are evident and no realism issue is detected, users should proceed as described in paragraph 61. In the absence of such a cause, users should revisit the baseline.

- The baseline may converge to the *lower* edge of the fan or fall below it. These situations suggest potential optimism bias. For the purposes of the SRDSF, concerns about baseline realism are

[48]While users may have alternative analytical measures of the primary balance (e.g., adjustments to exclude items like resource revenues or grants), for consistency with the debt dynamics equation, the debt fanchart module must use the standard definition of the primary balance, which excludes interest revenues and expenditures only.

[49]While there is an option to include stock-flow adjustments in the construction of the fanchart, it should only be activated in exceptional circumstances where (i) there are good reasons to believe that past stock-flow adjustments are informative for the future; and (ii) that the activation results in a more intuitive fanchart result. For Fund SRDSAs, this invoking this option needs to be agreed through the review process. However, when activated the historical variables for this variable are calculated automatically by the template.

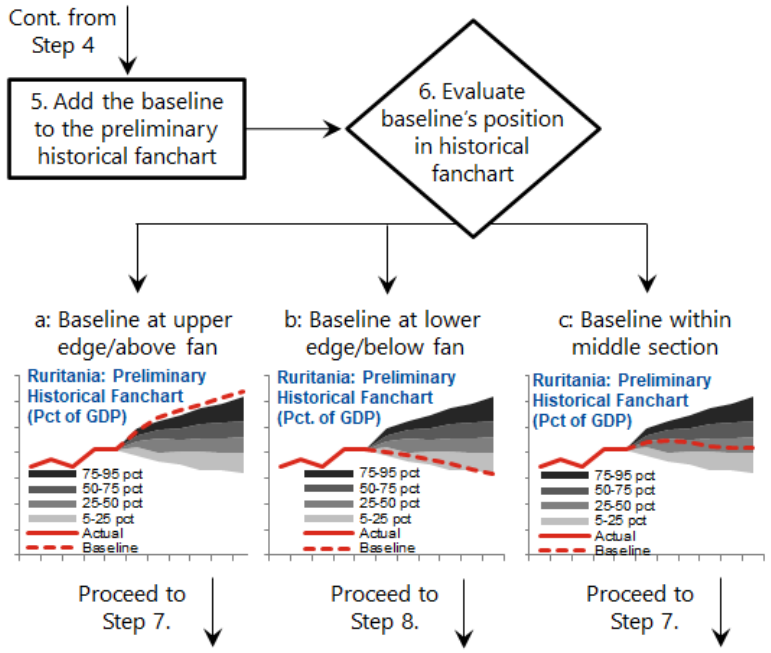
[50]The standard deviation of debt revisions is used to account for uncertainty around the initial level of debt. For a given year, debt revisions are calculated as the difference between the debt-to-GDP ratio in the two-year ahead WEO versus the one-year ahead Spring WEO. For example, the 2018 debt revision would be calculated as the 2018 debt-to-GDP ratio reported in the 2020 Spring WEO less the 2018 debt-to-GDP ratio reported in the 2019 Spring WEO. These observations are to be updated annually by SPR following the publication of each Spring WEO.

[51]Specifically, a two-year "block"— that is, two consecutive annual realizations of the debt drivers (growth, the primary balance, interest, etc.) is randomly drawn from the sample period. The first annual realization of the drivers is substituted into the debt stock-flow equation to generate a predicted debt ratio at time t, conditional on debt at time t-1 (the most recent realization). Conditional on the debt ratio at t, the second annual realization of debt drivers from the block is used to compute debt at t+1. Debt at t+2 and t+3 are computed similarly, based on a newly drawn two-year block. Finally, debt at t+4 and t+5 are computed based on a third draw. This process generates one debt path between t and t+5.

triggered when the projected debt-to-GDP ratio falls below the 20th percentile of the fanchart in two or more years. In these cases, users should consider revisions to the baseline to make the evolution of the debt-to-GDP ratio more in line with historical experience. Otherwise, a realism adjustment is activated in the next step to capture risks from potential exuberance in the projections as described in paragraph 62.

- Finally, the baseline may reside well within the middle section of the fanchart in all years (though usually not exactly in the center). In these cases, the evolution of the debt-to-GDP ratio is in line with past experience, and the historical fanchart's realism diagnostic indicates no concerns.

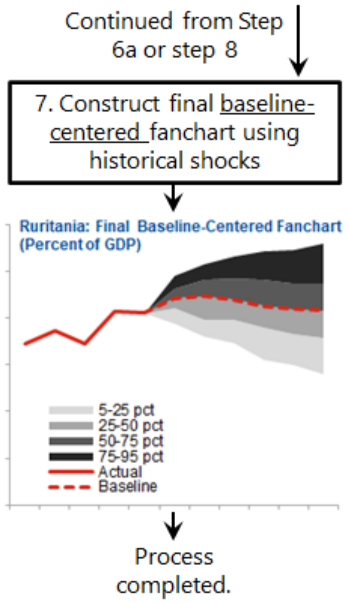
Figure 19. Realism Diagnostic in the Debt Fanchart Algorithm



Source: IMF.

61. When the preliminary historical fanchart does not reveal a realism issue, the module constructs a final fanchart centered around the baseline (Figure 20). This final baseline-centered fanchart is to be included in the standard reporting from this tool. It is calculated automatically by the mechanical framework by adding the de-meaned shocks for the debt drivers used to prepare the historical fanchart to the user's baseline. This fanchart should be interpreted as indicating an adequate balance of risks, and thus the baseline determines the direction of the fanchart (upward or downward). That said, the centered final fanchart also reflects the past, as revealed by the preliminary historical fanchart, through its width and skew.

Figure 20. Final Baseline-Centered Fanchart



Source: IMF.

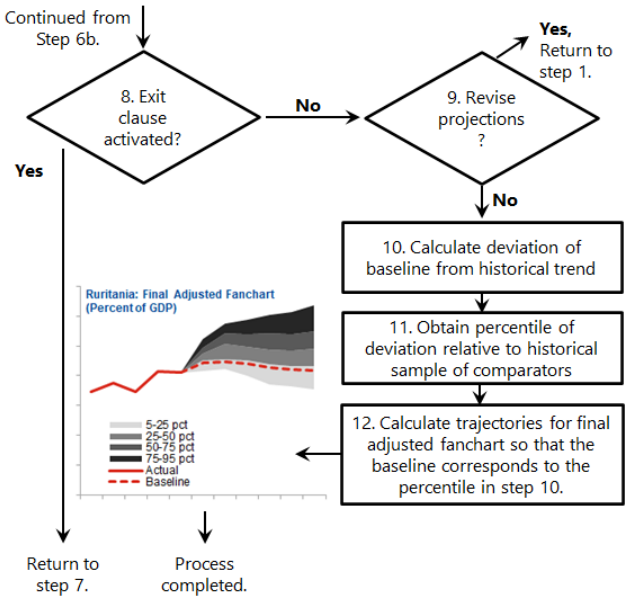
62. Alternatively, in cases where a realism adjustment is triggered, a final adjusted fanchart is produced (Figure 21). When activated, this fanchart will be used in the final standardized reporting instead of the final baseline-centered fanchart. It follows the same method as the centered version, but with an additional procedure at the end to better reflect the balance of risks around the baseline. The first step in this procedure is to calculate the deviation of the baseline projection from historical trends, in this case represented by the median debt trajectory in the historical fanchart. Then, the deviation corresponding to the terminal year in the forecast horizon is compared to a histogram of these deviations calculated for a relevant group of comparator countries to find its percentile within that distribution. These comparator groups provide a relevant basis for assessing baseline realism and are comprised of advanced economies, commodity exporting emerging markets, and non-commodity emerging markets.[52,53] Finally, the fanchart is shifted upward so that the baseline corresponds to the percentile obtained from the histogram.[54] While the baseline remains unaffected, the upward shift implies that the simulated debt trajectories in the fan are associated with a higher level of debt-to-GDP indebtedness than would be the case if the adjustment had not been activated.

[52]The comparator groups for the purposes of the histograms are simplified and do not divide countries by type of IMF engagement (program or surveillance-only), which is used for other comparisons in the SRDSF.

[53]The histograms of deviations of debt projections are calculated from historical fancharts prepared centrally using Spring WEOs and are to be updated annually.

[54]Specifically, this rotation is operationalized by adding to each debt trajectory in the baseline-centered fanchart the difference between the baseline debt-to-GDP level and the debt-to-GDP level in the histogram's percentile.

Figure 21. Process for Resolving Fanchart Realism Flag



Source: IMF.

63. The information contained in the final fanchart—whether baseline-centered or adjusted—is summarized by three metrics, which are combined into the Debt Fanchart Index (DFI):

- *Fanchart width*: This is calculated by subtracting the terminal debt level at the final fanchart's 95th percentile from the 5th percentile. It is higher when countries have a history of high volatility, and therefore should be interpreted as a measure of uncertainty around the baseline. Importantly, the width is invariant to the realism adjustment described above, which only affects the fanchart's central tendency.

- *Probability of debt non-stabilization*: For each trajectory in the final fanchart, the tool calculates a debt stabilizing primary balance as follows: Using the equation in Box 3, a trajectory-specific debt stabilizing primary balance is calculated using the baseline projection for the debt drivers in the final year of the forecast plus their average shock along that trajectory. Then, the mechanical tool compares the primary balance at the final year of the trajectory to this debt stabilizing level. If the projected primary balance exceeds this debt stabilizing level, then this debt trajectory is assessed as stabilizing. After checking this condition for all trajectories, the probability of stabilization is calculated as the number of trajectories resulting in a debt-stabilizing primary balance divided by the total number of trajectories. Finally, this metric is transformed to the probability of non-debt stabilization (1-the probability of stabilization) so that higher values indicate weaker prospects for stabilizing debt and consequently higher risk. The probability of non-stabilization is usually higher when the realism correction is activated

because this generally raises debt levels, leading to higher debt stabilizing primary balances and fewer trajectories that meet the stabilization criterion.[55]

- *Terminal debt level, adjusted using an institutions index*: The median level of debt in the final year of the projection period is interacted (multiplied) with an institutional quality index. This governance index is based on the same variable used in the near-term assessment's logit model. However, it is transformed such that higher values of the index (stronger governance) indicate higher debt carrying capacity, and therefore lower risk from a given debt level.[56] This metric generally signals higher risk with the realism adjustment, as this fanchart will have a higher median debt level than the standard centered fanchart.

Considerations for Special Cases

64. Users may exclude years from the standard historical sample used for drawing shocks for any of the following three reasons.

- *Short or spliced time series*: While most market access countries will have data back to 2000 for the debt drivers required to run this module, a few may not. When there are gaps, users should first check to see whether there are historical time series and/or appropriate estimates that could be used to extrapolate the series back to the standard starting date or at least as far as possible. However, when this is impossible, users may set the start of the historical sample to the first year in which all debt drivers have observed values. A related problem could occur if data are available to construct an input series for the full historical period, but it requires splicing source data prepared under different coverage definitions (e.g., debt perimeter) or methods (e.g., revisions to national accounts that do not cover the whole history). When splicing causes counterintuitive results, users may apply best estimates to try to improve consistency of the series, noting the adjustment in the commentary.

- *Clear structural breaks*: Observations corresponding to structural breaks may introduce excessive volatility into the fanchart and distort results. However, users should not begin the process of producing debt fancharts with any ex-ante expectations of excluding certain years. Instead, the process should be iterative and involve careful analysis of whether clear evidence exists for a structural break. After this scrutiny, decisions to drop years prior to the break from the historical sample should seek to balance the objective of giving less weight to information which may not be representative of the present with the need to maintain an informative sample. If this is not possible (e.g., if the sample would need to be shortened by more than 3-4 historical observations), then the questionable years should be retained, with any required judgement incorporated in the final medium-term assessment.

[55]A special case arises when the real interest rate-growth differential is negative.

[56]The transformation involves (i) inverting the sign of the institutional quality index; (ii) subtracting the minimum value observed in the cross-country sample; and (iii) dividing by range of the sample.

- *Debt restructurings*: Users should always exclude years with deep debt operations that imply unusual changes in debt levels and drivers, especially when nominal haircuts occur.[57] In these cases, there will be large shifts in public debt and its drivers that will not repeat in the future. Moreover, if these years were kept and sampled to construct the fanchart, the corresponding debt trajectories built from those observations would implicitly assume a restructuring, which is inappropriate.

Whenever one or more observations are dropped from the historical sample, users should note each exclusion, including its justification, in the commentary box of the standardized reporting. However, users should never alter the historical sample to deliver a particular result. If a counterintuitive result is found to be caused by individual historical observations, but there is no clear-cut case for dropping them using the criteria above, then users should explore using judgment for the final medium-term assessment, as described below.

65. During the recovery from the COVID-19 shock in 2022, preliminary historical fancharts will incorporate a special adjustment for the realism diagnostic. The rebound from this unprecedented severe shock is likely to produce significant reductions on public debt when compared with 2020. To avoid triggering excessive and unwarranted realism corrections, the preliminary historical fanchart should be centered around the baseline for the first two years of the forecast horizon for SRDSAs prepared in 2022. The SRDSF template implements this adjustment automatically. However, after 2022, when the recovery is expected to be entrenched, this option should be de-activated in the template. As a result, preliminary historical fancharts will revert to the standard approach and return to being fully de-linked from baseline projections.

66. In rare situations, an exit clause may be invoked to switch off the realism adjustment even when it would otherwise be activated. These unusual circumstances should be confined to cases where the preliminary historical fanchart ceases to be a relevant diagnostic. This requires, first, strong arguments that the adjustment was erroneously activated by some artifact of the past performance of debt drivers. Additionally, there must be a substantial degree of confidence in the underlying features of the baseline that produce the unusually benign debt dynamics, including the absence of warnings flagged by the realism tools. These assessments should be based on credible and exceptional country-specific factors unrelated to routine or cyclical developments. While there is no exclusive list of situations that satisfy these criteria, users may wish to examine whether such a case can be made when there are recently concluded debt restructurings, major sudden and unplanned changes in the economy's structure or policy frameworks (e.g., a forced transition to a new exchange rate regime), or abrupt political transitions that produce major social and economic changes. For SRDSAs prepared by Fund staff, any de-activations must be agreed upon through the interdepartmental review process (or via Management adjudication if not agreement is found. When the realism adjustment is deactivated, the rationale for doing so should be elaborated in the

[57]These exclusions would generally not apply to light transactions including liability management operations, light reprofiling, or targeted operations on only a narrow subset of public debt instruments.

commentary box of the standardized reporting of the medium-term modules along with future conditions for re-activation.

67. Special adjustments can be introduced when countries are close to reaching or have recently concluded a debt restructuring agreement. First, since debt restructurings typically produces a lower debt burden going forward, the realism adjustment is usually inappropriate and should be deactivated. Thus, final fancharts in debt restructurings should be centered around the baseline. Additionally, adjustments to account for lower volatility of the effective nominal interest rate post-restructuring, may be warranted if such an outcome is likely. In these cases, the volatility of the real interest rate could be scaled down by a factor corresponding to the ratio of new and past debt issuances.

68. The debt fanchart module uses gross debt only, but liquid asset buffers should be considered when they are material. When a government holds large financial asset buffers (for example, in a SWF, see also paragraph 50), its solvency is typically stronger than would be suggested by the standard debt fanchart analyses, since the sovereign can neutralize explosive debt paths by drawing down on the assets. Thus, when assets exceed 75 percent of GDP and 100 percent of public debt, the mechanical signal from the debt fanchart module should automatically be low, regardless of the DFI's level.[58] When implemented, users should clearly indicate the adjustment in the commentary box of the standardized reporting on the medium-term modules.

Interpreting the Tool

69. The tool's results should be presented based on several automatically produced outputs that are included in the standardized SRDSA reporting:

- The module automatically produces the final fanchart for inclusion in the output, whether it is baseline-centered or adjusted.
- The DFI consistent with the final fanchart produces a mechanical signal that is low risk for DFIs below 1.13 and high risk for DFIs above 2.08; otherwise the signal is moderate risk (Annex IV.B).
- A graphical comparison of the components of the DFI to values observed in a relevant group of peers provides an additional point of reference for analysis. Users should select the group whose members illustrate characteristics most consistent with the country being analyzed and it should be consistent with the same group as the near-term assessment (described above) and GFN Module (described below). This information can complement the absolute levels of the metrics.

[58]As this adjustment essentially involves disregarding the fanchart analysis, these cutoffs have been purposely set at very high levels so that this adjustment is only implemented in countries where solvency risks are low and likely to remain so on a durable basis.

70. Users should investigate the DFI's components to see how the tool is detecting sovereign risks. The three underlying metrics are generally related, but each illustrates a distinct source of risk:

- *Fanchart width*: A wide fanchart indicates substantial uncertainty around the baseline and the possibility of large projection errors. If they were to materialize, public debt could turn out to be much higher than envisaged, and therefore a source of potential vulnerability.
- *Probability of debt non-stabilization*: A high probability that debt does not stabilize in the medium-term is a key warning that policies are not correctly configured to deliver fiscal and macroeconomic stability.
- *Terminal debt level, adjusted for institutions*: If the debt level remains elevated at the end of the projection horizon, then it is likely to represent a significant burden and limit options to cushion shocks if they were to materialize.

In addition to scrutinizing these metrics individually, users should examine whether any DFI component points to a different finding than the others. Explaining such a divergence (including in the commentary box of the standardized reporting), would be important information toward understanding the robustness of the mechanical results.

71. Policy advice to contain sovereign stress risks can be informed by the DFI. Particularly when the tool is signaling an elevated level or risk, the next step is to understand what can be done to prevent stress from materializing. In this respect, particular components can help identify specific policy actions that could be deployed to build resilience, when relevant. For example, when a wide fanchart is contributing to the risk signal, then it would typically be appropriate to build buffers which could limit the fallout from shocks that tend to be large in that country. Alternatively, a high probability of debt non-stabilization or an elevated terminal debt level points to a need to identify additional fiscal adjustment measures beyond those envisaged in the baseline. Even when the terminal debt level is high, risks could be mitigated by a favorable repayment structure (as indicated by the GFN Module described below).

Using Judgment

72. There is no final signal from the fanchart module, but users should consider whether the output from this tool warrants use of judgment in the medium-term assessment. The fanchart index feeds directly into the medium-term mechanical signal (section VI.D), together with the results of the GFN Module (see Section VI.B below), which also produces a risk index. If warranted, any judgment is applied to the resulting medium-term signal that combines both the Debt Fanchart and the GFN Indexes. However, if the mechanical result from the fanchart tool is counterintuitive, users should determine whether it may be inappropriately biasing the overall medium-term mechanical signal in either direction. When this is the case, there may be a case for judgment-based final signal at the medium-term horizon that differs from the medium-term

mechanical signal. Key considerations for users when examining the use of judgment include, but are not limited to these cases:

- Large liquid asset buffers, which may imply that the fanchart causes the medium-term index (described in section VI.D) to signal excessive risk, requiring a judgmentally determined final medium-term assessment.
- One component of the DFI acting as an outlier and pushing the overall signal to another result that is fundamentally inconsistent with the risk profile signaled by the other two indicators.
- Situations where the fanchart is wide, where policy adjustments are expected (with a high degree of confidence) to result in substantially less future volatility.
- Expectations of structural shifts in the future that will fundamentally change the underlying behavior of the macroeconomic and fiscal debt drivers. These cases could include the discovery/depletion of natural resources, where fundamental changes will be phased in over several years.
- A history of repeated false alarms or missed crises as revealed through SRDSAs conducted in the recent past (e.g., for previous Article IV consultations) and developments consistent with lower risks.

B. Gross Financing Needs Module

Standard Application

73. The Gross Financing Needs (GFN) Module is the SRDSF's main tool for assessing liquidity risks at a medium-term horizon. The underlying analysis examines these risks across several dimensions: First, it gauges the size of a country's financing needs (as defined in Box 4) over the medium term. It also examines debt holders and new financing instruments across various creditor groups. In this respect, the module checks for whether the creditor composition and debt structure are risky. For example, a reliance on foreign private investors suggests a vulnerability to a sudden reversal in capital flows. Finally, the domestic banking system is also examined to see if it can act as a residual creditor in adverse conditions—not only in an economic downturn, but also due to debt holder shocks.

Box 4. Measurement of Gross Financing Needs

In the SRDSF, GFNs and debt issuance are related concepts, but there are some differences. GFNs are calculated as the sum of the primary deficit, debt service (interest and amortization), and realization of explicit and implicit contingent liabilities,[1] less any interest revenue. This definition is to be used consistently for both historical reporting and projections.[2] Debt issuance refers to the amount of public debt placed with creditors to either meet the GFN or to finance other transactions, including financial asset accumulation/ decumulation. In particular, any purchase (sale) of liquid assets should be included as a transaction that raises (lowers) debt issuance.

In several special circumstances, users should ensure that there is no double counting of transactions in GFNs or debt issuance.

- When the government incurs costs related to transactions that support or take over firms that are no longer going concerns, these costs should be recorded in the primary deficit as capital transfers/grants instead of contingent liability materializations.
- Debt relief can give rise to entries under capital grants—a component of the primary deficit—and should be recorded in that location instead of other transactions that decrease debt issuance.

In cases where the accounting basis is cash instead of the recommended accrual standard, users should adjust GFNs if arrears arise. Accrual basis accounting will reflect any arrears at the time that they occur. In cash-based systems, the emergence of arrears is not reflected in GFNs or debt issuance until they are paid. These lags can give a misleading indication of the emergence of stress. Thus, users should add arrears (both external and domestic) to GFNs in these cases to improve upon the risk analysis. When a concurrent record of accumulation of arrears is available, users should attempt to record the buildup of arrears in the year of the respective spending. If accumulated arrears are recognized ad hoc at discrete points of time (i.e., not monitored in real time), users should ensure that balancing entries are made in the fiscal accounts in the period when arrears are recognized or repaid.

[1] Explicit contingent liabilities are defined as legal or contractual financial arrangements that give rise to conditional requirements to make payments of economic value. The requirements become effective if one or more stipulated conditions arise. By contrast, implicit contingent liabilities do not arise from a legal or contractual source but are recognized when a condition or event is realized (see paragraph 7.252 of IMF 2014, GFSM). Examples of implicit contingent liabilities include net obligations of future social security benefits, ensuring solvency of the banking sector, covering the obligations of subnational (state and local) governments, or the central bank, in the event of default, environmental liabilities, unguaranteed debt of public sector units, obligations to meet the guarantees of other public sector units if they cannot meet them, and spending for natural disaster relief." (paragraph 4.21 of IMF 2013a, PSDS Guide).

[2] The SRDSF's GFN definition consistently includes contingent liabilities realizations in both historical and projected observations in contrast to the MAC DSA, when they were only included in projections.

74. Assumptions on financing by instrument and debt holder in the baseline are critical inputs to the module and warrant careful consideration. For the same set of underlying macro-fiscal assumptions, different financing structures or creditor bases can lead to drastically diverging risk profiles on liquidity risk. Thus, it is important that SRDSF users enter these assumptions with a view toward their plausibility as follows:

- *By instrument*: All new debt issuance needs to be entered in the SRDSF template according to types of instruments. For each instrument, the following characteristics need to be defined: (i) whether the instrument is denominated in local or foreign currency and whether it is linked to an underlying index, such as inflation; (ii) whether the interest is calculated as a fixed rate, floating rate, or zero-coupon; (iii) if the instrument is marketable or not; (iv) a local or external market of issuance; (v) the frequency of debt payments; (vi) grace period; (vii) duration until maturity; and (viii) the borrowing entity (e.g., if the perimeter is the general government, the

options would be central government or state and local government). Once the array of potential instrument classes has been defined, the next step is to allocate all new debt issuance among these debt types. This process should internalize all committed financing (especially in program contexts) and plans communicated by the authorities, including published borrowing plans and medium-term debt strategies. When financing is less certain, users should enter assumptions reflecting the most likely outturn, which may be guided by past performance and current market conditions.

- *By holder*: For each instrument type defined above, users need to attribute a portion of this financing across five potential creditor classes: (i) the domestic central bank; (ii) domestic commercial banks; (iii) other domestic creditors, including non-bank financial institutions; (iv) external official creditors; and (v) external private creditors. The share of each of these creditors can range from zero (no holdings) to 100 percent (all holdings) and they can vary from one year to the next in the forecast horizon. Users should allocate these shares according to the levels that they judge to be most likely. In certain cases, determining the debt holder of a certain instrument will be straightforward (Table 3). When it is not obvious who will hold future debt issuance, users can be guided by the past debt holder shares provided in the template, implicitly forecasting that the creditor structure will not change. However, users should reflect any relevant information on policies (e.g., unconventional monetary policies (below); financial regulations and exposure limits; and any relevant government funding plans/initiatives). Users should also examine realism, ensuring consistency between a creditor group's uptake of new debt and the size of their balance sheets, among other things.

Table 3. Examples for Debtholder Share Settings When Holders Are Clear

	Suggested holder share parameterization (percent)				
	External creditors		Domestic creditors		
Type of debt	Official	Private	Central bank	Commercial banks	Other
IMF credit	100	0	0	0	0
Other multilateral and bilateral loans	100	0	0	0	0
Central bank advances, overdrafts, recapitalization bonds	0	0	100	0	0
Syndicated international bank loans	0	100	0	0	0
Local bank loan financing	0	0	0	100	0
Bonds issued to non-consolidated social security fund	0	0	0	0	100

Source: IMF.

75. The centerpiece of the module is a generalized stress scenario, featuring macro-fiscal and debt holder shocks, that is automatically implemented by the template. First, a combination of macro-fiscal shocks similar to those in the previous MAC DSA and a maturity shortening is layered on top of the baseline projections. Under the default settings (Table 4), these shocks are based on those recently observed in a country's history. The projections resulting from this scenario generally produce larger GFNs for the government. Additionally, the scenario incorporates a debt holder shock, in which foreign private investors roll over only part of their existing holdings for several years and do not acquire new debt issued by the government to meet

any other financing needs. Instead, the scenario assumes that the domestic banks act as the residual creditors, in line with empirical regularities in past country stress episodes.[59] In cases where a government has financial asset buffers, these can be deployed mechanically in the template to reduce the demand on the banking system.[60]

Table 4. Generalized Stress Scenario: Default Calibration

Shock	Default setting
Macro fiscal shocks	
Growth	Growth is reduced for two years by 1 standard deviation based on the last 10 years' outturns.
Interest rate	Nominal marginal effective interest rates rise by 300 bps upfront; shock phased out over 5 years.
Exchange rate (where flexiblity observed)	One-off depreciation equal to the maximum depreciation observed in last 10 years.
Inflation	
Currency unions and inflexible exchange rate regimes	Inflation rate decreased by one half of the largest decrease in inflation observed in the last 10 years.
Flexible exchange rate regimes	Combination of an economic slack effect and an exchange rate passthrough effect. The slack effect is a reduction in inflation by 25 basis points for every 1 percentage point reduction in real GDP growth. The passthrough effect is a 25 basis point increase per 1 percentage point depreciation in EMs and a 3 basis point increase per 1 percentage point depreciation in AEs.
Primary balance	Baseline noninterest revenue/GDP ratio and baseline nominal noninterest expenditures held constant.
Maturity shortening shock	In year of shock, debt issuance split 50 percent between short-term and long-term (unless the baseline's maturity assumptions are shorter, in which case the baseline is carried over).[1/] Share of long-term financing rises gradually over 5-year interval.
Debt holder shock	
Rollover rate	Foreign private creditors rollover rate is 67% for two years, thereafter 100 percent. Banks absorb the shortfall and fully roll over their holdings. Other creditors' rollover rates do not change.
New financing	Foreign private creditors provide no new financing other than for existing debt rollover. Creditors groups other than domestic commercial banks provide financing proportionate to their shares in the baseline. Commercial banks are the residual source of financing.

Source: IMF.
1/In cases where the baseline maturity assumption indicates more than 50 percent of issuance in the short-term, an adjustment is made to keep the stress scenario's maturity assumption at least as unfavorable as in the baseline.

76. The module also automatically constructs the GFN Financeability Index (GFI), which combines risks measured by its three components. The latter become available after the financing assumptions have been entered and the stress scenario in the template has been converged, and include:

[59]See Arslanalp and Tsuda (2012, 2014).

[60]In contrast to the Near-Term Assessment and Debt Fanchart Module, there is no minimum size for incorporating these assets in the GFN Module. As a starting point for SRDSAs prepared by Fund staff, this module should take the amounts of general government financial assets used in the calculation of net debt, as submitted to the WEO and Fiscal Monitor databases.

- *Average GFN-to-GDP ratio in the baseline*: The baseline financing need remains a critical indicator of potential stress. In general, larger financing needs are an indicator of higher vulnerability to funding shocks.

- *Initial (current) bank exposures to the government*: This indicator gives a sense of potential space for the domestic banking system to step in as a residual financier to the sovereign amid funding shocks. An elevated value implies higher risk because significant existing exposures may constrain further financing from the banks.

- *Change in bank claims on the government in a generalized stress scenario:* The results of the generalized stress test described above are summarized into the change in bank claims on the government in that scenario. This metric gives a measure of the potential demand on the banking system if stress materializes.

Considerations for Special Cases

77. If a sovereign can count on key creditor groups to exhibit certain behaviors, several adjustments to the GFN Module may be appropriate. For the adjustments outlined below to be valid, the assumed transactions should have very high prospects of clearing their requisite approval processes, corroborated by public announcements or other indications of firm commitments. Such commitments could include:

- *Quantitative easing by the central bank*: When a central bank has announced government bond purchases, its holder share would generally be rising over time. The reverse is true when these policies are being unwound. In either case, SRDSF users should set the central bank's holder shares accordingly, so that their purchases/rollovers of new government debt issuance correspond to the amounts stipulated in the central bank's policy intentions during the easing (normalization) period.[61] For countries in currency unions, an additional adjustment may be warranted for the foreign official sector, because regional central banks are to be treated as external creditors. Since neither the domestic commercial bank nor the foreign official sector is subjected to holder shocks, a higher share for these institutions lowers the amount of "risky" financing that is subjected to shocks, and thus points to lower risks.

- *Live precautionary Fund arrangements*: Such programs provide access to Fund resources that can be tapped if adverse shocks were to materialize. To operationalize this factor in the GFN module's mechanics, users should add the amount of resources to which the country could draw

[61]Under quantitative easing, users should set the central bank's share of new debt issuance such the level of new debt acquired by the central bank equals the announced level. In a gradual unwinding through partial rollovers, users should set decreasing holder shares of new issuance to achieve the announced lower level of debt purchases. Finally, in cases where the central bank is tightening policy through large-scale sales in the secondary market rather than organically reducing exposures by not rolling over maturing debt, users should directly reallocate its holdings to other creditor groups through a special customization in the template.

to the pool of available liquid assets. Such an adjustment would reduce the demands on the banking system and improve the related risk metric.

- *Nonmarket financing*: Governments may have firm commitments on non-market debt disbursements (e.g., loans). When these flows are sufficiently substantial as to severely blunt any funding shock, these amounts may be used to finance the GFN in the stress scenario according to the same terms and conditions as in the baseline (muting the maturity shortening and interest rate shocks on this instrument).

78. Other mitigating adjustments are appropriate only in a limited set of countries that exhibit special characteristics:

- *Revising the pool of available government liquid asset buffers*: In some cases, sovereign asset holdings are sufficiently large that there are remaining buffers even after accounting for the holder shock in the stress scenario. If so, users may subtract the residual assets (expressed in percent of bank assets) from the change in bank claims on the government in the stress scenario. After making this adjustment, the value of this risk metric as well as the GFN Financeability Index will decrease, pointing to lower risk. However, when considering this adjustment, in addition to verifying the magnitude of the assets, it is important to assure that they can be liquidated in a manner reflective of their fair value, not encumbered in any way, and legally available for the government's use.

- *Domestic non-banks as a mitigating factor*: In some countries, the domestic non-bank financial system is significantly larger than the banking system, is a major holder of sovereign debt, and/or can be called upon to provide reliable financing to the government. Such a situation would typically arise when there are large institutional investors with long-term investment strategies in government debt like retirement/pension funds, life insurance companies, or other mutual/bond funds. When these conditions are evident, it may be reasonable to assume that these institutions would step in as a residual creditor along with the domestic banking system. To account for this possibility, the tool has an option to aggregate both sectors' claims on the government and express them as a percentage of their combined assets. Then, it is straightforward to calculate their change in the stress scenario and use this indicator to replace the standard banking system-only measure in the standard framework.

When implementing either adjustment, the accompanying commentary in the standardized output should note both the existence of the adjustment and the factors that led to a determination that the relevant criteria were satisfied.

79. In exceptional circumstances, users may introduce the following changes to reflect special circumstances affecting a country's current risk profile:

- *Domestic non-banks as an aggravating factor*: In contrast with cases in which domestic non-banks could step in as debt holder in a crisis, there are cases where domestic non-bank public debt holdings could be more volatile than those of other domestic holders. This situation could

occur, for example, due to a short-term nature of these investors' strategies and/or funding structures. In these cases, it would be appropriate to adjust the standard stress scenario in order treat them like the foreign private investors. When activated, this variation reduces the rollover rates of private other investors temporarily and in parallel to those of private external creditors, and this sector is assumed to provide no new financing to the government in the shock scenario. Any financing demands that arise from this calibration are assigned to the commercial banks, increasing the demand on the banks and signaling higher risk.

- *Changing the size of banking system assets in the stress scenario*: The stress scenario makes an implicit assumption that the domestic banking system is sufficiently strong to step in as a residual creditor. However, when users have clear information about illiquid banks, plans to resolve troubled assets (e.g., through a bad bank arrangement), or reorganizations/liquidations of banking institutions, they may lower the projection for banking assets to the level that are expected to continue as going concerns. For consistency, a parallel adjustment would be warranted to bank assets when measuring the initial claims.

- *Modifying the magnitude of the stress scenario's shocks*: historically-drawn shocks may sometimes be distorted by either an extreme crisis (for example, a default and/or currency crisis) or an extreme recovery (such as after the COVID-19 crisis), skewing the calibration of the shocks in the stress scenario. If users are highly confident that these events will not be repeated, they can scale down these macro-fiscal shocks, which could lessen the risk signaled by the stress scenario. However, the implications of such potential shocks—such as a stress scenario debt ratio that rises well above the upper bound of the debt fanchart—should be analyzed before making any changes. In rare circumstances when robust capital flow measures are put in place effectively lock in foreign private investors, users may also consider adjusting the rollover rates upwards in the years in which they are shocked.

- *Revising the timing of shocks in the stress scenario*: In some cases, users may have knowledge that the stress scenario's shocks might materialize in a year other than the standard setting (the year after the first projection year). Such events would need to be well defined, but could reflect investor concerns about political cycles, lumpy maturities, and generalized global conditions. When relevant, users can shift the onset of the shocks across the medium-term horizon.

In contrast to the adjustments outlined in the two previous paragraphs, these changes imply significant deviations from the underlying design or assumptions of the tool. Hence, they would need to be exceptionally well justified. For SRDSAs prepared by Fund staff, this analysis and decisions on any changes will be subject to interdepartmental review and Management approval. When the underlying assumptions are less certain, it is generally better not to interfere with the mechanics of the tool, but instead apply judgment when the results of the tool are reflected in the overall medium-term assessment (see below).[62] To the extent that any changes are implemented,

[62]Such judgment could be informed by using the tool to perform a sensitivity analysis of the GFI and the ensuing mechanical signal with and without the changes, while reporting the components of the GFI, the GFI and the resulting mechanical signal without the changes.

users should clearly explain the changes and how they impact the interpretation of the tool in the accompanying commentary.

Interpreting the Tool

80. The standard reporting on the GFN Module consists of the following elements that are automatically produced when the module is completed:

- A mechanical signal based on the GFI is reported in the overall summary table. The signal is low risk for GFIs below 7.6 and high risk for GFIs above 17.9; otherwise, the signal is moderate risk (Annex IV.C). As final signals (that incorporate judgment, if any) are only reported for each of the three horizons in the SRDSA, users should not report a final signal for this module.

- Figures showing the evolution of GFNs in the baseline and stress scenarios along with the financing provided by domestic banks and comparisons of the three GFI components relative to a relevant comparator group.[63]

81. Beyond reporting the mechanical risk signal, users should interpret GFN-related risks using the intuition behind the module. When describing the GFI and the mechanical signal, users may want to consider the following factors:

- *The trajectory of financing needs*: Persistently high GFN-to-GDP ratios are a sign of potential risk, especially if they are on an upward trajectory. Users should also consider the degree to which large GFNs are driven by fiscal balances and/or debt service. This may point to the appropriate corrective measures to stave off stress, as described below.

- *The riskiness of the debtholder profile*: Users should consider how the creditor structure affects the susceptibility to shocks. In general, foreign private investors are more likely to be subject to a sudden loss of appetite for sovereign debt, particularly if their debt holdings were accumulated during a capital inflow surge. Conversely, official and domestic creditors are usually more stable, and therefore less likely to trigger financing shocks.

- *The capacity of banks to absorb government debt*: When banks are already heavily exposed to the government, they may have limited space to increase their exposure further in the face of shocks.

- *Frequency and magnitude of shocks*: In general, countries that suffer from high macroeconomic volatility will also be exposed to higher liquidity risks. Such countries require larger financing buffers to allow shocks to be absorbed without creating significant strains.

[63]As with the other core risk tools, the relevant comparator group would be one of: advanced economies; commodity exporting EMs; and non-commodity exporting EMs.

- *The level of buffers*: Even when countries are volatile, ample liquid asset buffers can be a crucial risk mitigator. Conversely, when assets have been drawn down, risks will rise unless buffers are restored.

82. Any policy advice on how to reduce liquidity risks should be linked to the interpretation of the results. The appropriate actions to avoid stress will often reflect the key drivers behind the risks, as follows:

- *Fiscal adjustment*: When the primary deficit is primary cause of elevated GFNs, fiscal adjustment could be the appropriate policy lever.

- *Debt management*: Borrowing plans and initiatives to promote local market development frequently need to internalize tradeoffs between interest rates, currency composition, and duration. However, these plans may need to be recalibrated to strike an appropriate balance between costs and acceptable risks. For example, debt management may be an effective tool for lengthening maturities, reducing rollover risks, and containing risks from excessive reliance on certain market segments, which may saturate specific creditor groups.

Using Judgment

83. There may be occasions where the tool's result motivates a use of judgment for the final medium-term signal. Any judgment should be applied to the medium-term final assessment, as there is no final assessment for the GFN Module that combines the mechanical signal and judgment. However, users should pay careful attention to whether any of the individual metrics are distorted, providing an inaccurate description of risks. For example:

- A one-year outlier may skew the calculation of the average GFN-to-GDP ratio in the baseline. While large GFNs usually suggest heightened vulnerability, a lumpy GFN could have been caused by well-defined and lower risk transactions. Examples include debt repayments that have already been pre-financed, large capital expenditures financed by committed loans (particularly if terms are favorable), liability management operations, and non-market operations that settle legacy issues and improve economic stability (like arrears clearance or central bank recapitalization). In Fund-supported programs, firm commitments obtained in the process of gathering financing assurances are also a relevant mitigating factor for elevated GFN.

- On the other hand, a large one-year GFN may indicate a high liquidity risk, particularly if it is upfront and its financing is highly uncertain.

- Relatively high levels of GFNs and/or current bank exposure to the government might be less concerning if there was a recent track record of indicators at these levels not resulting in stress. However, to avoid a slowly building crisis going undetected, it would be important that the trend in these variables is moving toward less risk. Users should also examine whether there are important country-specific explanations as to why these metrics have been manageable.

- The module implicitly assumes that banks are sufficiently healthy, liquid, and willing to act as a residual financier for the government. However, this assumption may not always be correct. In certain cases, the banking system may be unwilling to provide additional financing even if its exposure is low (including due to concerns about the sovereign's creditworthiness). Additionally, if the banking system is strained, it may become a cause of government funding pressures through contingent liabilities. In circumstances such as these, users may have more detailed information on the banking system's capacity to absorb additional government debt in a stress situation. Analysis performed in the context of an FSAP could be especially valuable in such cases. Other information about the banking system, including applicable regulations, should also be considered. In particular, when exposure limits exist, the change in bank claims in the stress scenario should be considered against those limits for feasibility.

- Other factors may impact the analysis of government financing risks in either direction. In this regard, as judgment is being applied at the level of the medium-term risk assessment, it is important to reflect any trade-offs between liquidity and solvency risks. For example, policies that lower liquidity risk and are hence reflected in a lower GFI (for example, by forcing the central bank to provide financing) could increase future solvency risks (if the central bank accumulates a negative capital position), warranting an upward adjustment of medium-term risks. External sector characteristics should also be examined. For example, the existence of capital flow measures may prevent the emergence of the holder shock featured in the stress test or a country's membership in global government bond indexes may help limit the volatility of foreign private investor flows. Likewise, additional financing from key development partners may be available to meet GFNs if shocks arise. Finally, nonfinancial assets would usually not be an important mitigating factor, as they are rarely available to be quickly deployed to meet unexpected government funding demands. However, there may be exceptional cases where these assets could be promptly sold, for example, in the context of an ongoing privatization program that is being conducted according to best practices.

C. Triggered Stress Tests

Common Features

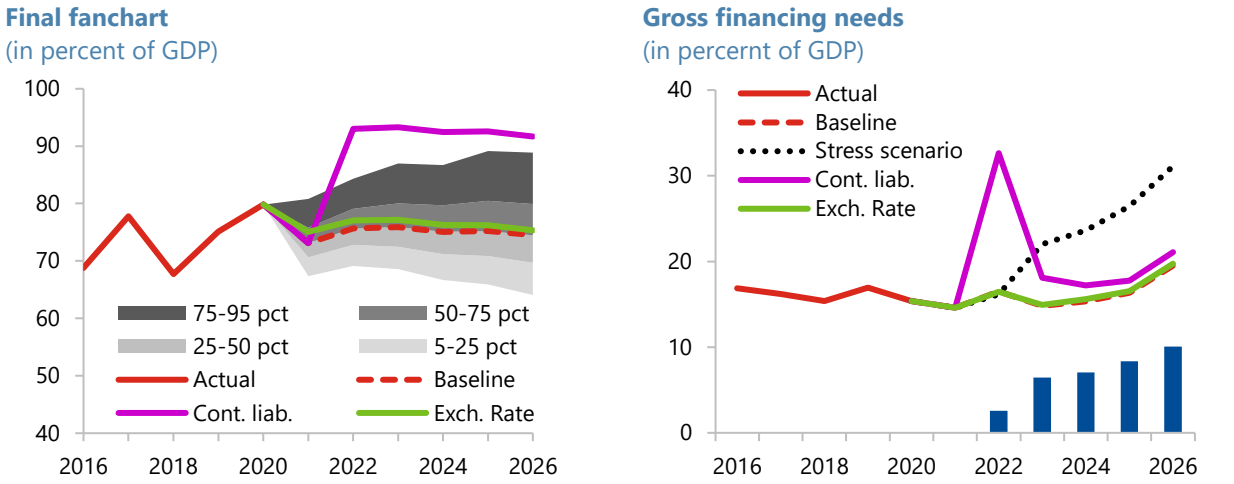
84. Triggered stress-tests help capture specific risks facing countries that are not fully covered by the fanchart and GFN tools. For some countries, risks of extraordinary events may be relevant although these shocks have not materialized in the recent past. In such a case, the standard Debt Fanchart and GFN Modules would not fully internalize these vulnerabilities. To address this gap, the SRDSF includes scenario analyses for five such events: (i) banking sector instability; (ii) commodity price shocks; (iii) contingent liabilities due to narrow public debt coverage; (iv) corrections of misaligned exchange rates; and (v) natural disasters.

85. All scenarios are "triggered" in the sense that a country typically needs to meet certain relevance criteria to activate the stress tests for the SRDSA. Some countries will satisfy multiple criteria, resulting in more than one triggered stress test being added to the SRDSA. Conversely,

other countries may satisfy no criterion and this module will go unutilized. It is also possible that over time, a country will either begin or cease to meet the criteria for a triggered stress test. In special cases, users may view a scenario as potentially relevant even though a trigger is not activated, including because the country has no record of these shocks, and thus there is a gap with the Debt Fanchart and GFN Modules. In these cases, users may manually activate the test.

86. The activation of a stress test should not be construed as an early warning signal. The fact that a stress test is triggered does not by itself indicate any specific likelihood that that a shock will materialize—this is a matter for judgement. Hence, a country triggering multiple stress tests is not inherently riskier than a country that satisfies fewer or no stress test criteria. Likewise, if over time, an additional stress test is activated, it is not necessarily an indication of higher risk. Whether a triggered stress test impacts the overall risk assessment for a country depends on the *result* of the test as well as the user's judgment of the likelihood that the shock represented in the test may materialize. Hence, this determination can only be made after the analysis performed by this module.

Figure 22. Output from the Triggered Stress Test Analysis



Source: IMF.

87. The application of the triggered stress tests follows some common principles. All tests require a baseline that is entered by the user, with the effects of the shock layered on top, reflecting the way in which it is likely to propagate. Moreover, while there is a standard calibration for each test, users can adjust key parameters to make it more relevant to individual country circumstances (guidance on customizations is provided below for each scenario). After settling on the shocks, the mechanical SRDSF tool simulates debt-to-GDP and GFN-to-GDP paths automatically, which are superimposed on the standardized reporting for the two medium term tools described earlier. Users then analyze the effects of these shocks on debt and GFN. Figure 22 shows an example, which assumes that two stress tests are triggered: realization of contingent liabilities due to narrow public debt coverage; and a correction of misaligned exchange rates. In this example, the realization of

contingent liabilities would make a large difference to the debt fanchart but only create a temporary spike in GFN.

88. The triggered stress tests inform judgment when they are activated, but they do not entail their own mechanical signal. As the tests are not universally applied, it is difficult to integrate them with the core SRDSF modules that are run for all countries. Instead, users should consider both the magnitude of shocks and their (qualitative) probability of materializing. When users perceive shocks as being relatively more likely and where their appearance would produce major impacts, a use of judgment could be warranted for the final medium-term signal. Specific directions on incorporating considerations related to any activated stress tests are included in Section VI.D below.

Individual Tests

89. The banking crisis stress test aims to capture contingent liabilities stemming from the risk of banking crises and associated fiscal costs of shoring up the financial sector,[64] with the view of limiting negative spillovers to the real economy:

- *Triggers*: Quantitative triggers defined for two macrofinancial indicators help identify settings in which sovereign risks posed by potential banking stress warrant further analysis (Table 5): (i) the credit-to-private-sector-to-GDP gap generated by a one-sided HP filter;[65] and (ii) an asset market mispricing risk index.[66] The test is activated when the country realizations of either indicator equals or exceeds the respective thresholds.

Table 5. Quantitative Triggers of the Banking Crisis Stress Test

	All countries
Credit-to-private-sector-to-GDP gap from one-sided HP filter (percent)	10
Mispricing risk index (within country percentile rank)	67

Source: IMF.
Note: The stress test is activated when the value of either indicator is greater or equal to its respective threshold.

- *Calibration*: The size of the direct, first-round effect of a banking crisis resolution on the level of the primary balance is assumed to be equal 6.8 percent of GDP in advanced economies and 10 percent in emerging markets (Table 6). The calibration is informed by the median fiscal costs of

[64]The banking crisis stress test of public debt is a conceptually different exercise from the banking sector stress-tests carried out under the joint IMF-World Bank Financial Sector Assessment Program. It has not been calibrated and validated to serve as an Early Warning System, and hence should not be construed as such.

[65]The definition follows the methodology developed at the Bank for International Settlements (Drehmann, Pradhan, Wooldridge and Szemere, 2016; Borio and Lowe, 2002).

[66]The asset market mispricing risk captures the potential for mispricing of risk in asset markets. The index is constructed by averaging country-specific percentile ranks of suitably transformed macrofinancial indicators of slack/tightness of financial conditions in asset markets (Iossifov and Dutra, 2021).

systemic banking crises in advanced economies and emerging markets, respectively (Laeven and Valencia 2020). In addition to the first-round effect on primary expenditures, the default scenario includes a second-round effect of the financial sector disruption on the overall fiscal balance, intended to capture the sizeable real costs of banking crisis. Mirroring the 2013 MAC DSA methodology (IMF 2011 and 2013b), the second-round effect is modelled as a negative shock to annual real GDP growth and inflation (proxied by the GDP deflator) in two consecutive years and a positive shock on interest rates in the first year, driven by the higher gross financing needs in this adverse scenario.[67] The primary balance is assumed to remain unchanged from its baseline value in percent of the lower nominal GDP, except for the direct first-round effect of the bank crisis resolution on primary expenditures.[68]

Table 6. Calibration of Fiscal Cost in Banking Crisis Stress Scenario

	Advanced economies	Emerging markets
First-round fiscal cost of bank crisis resolution (Percent of GDP)	6.8	10.0

Source: Fund staff calculations on data in Laeven and Valencia (2020).

- *Customization*: Users should carefully examine and tailor the standard shocks to country-specific circumstances. When the banking system is very large, users should increase the fiscal costs to reflect the likely higher expense that would be associated with stabilizing the system. Any changes to the default calibration should be described and justified in the SRDSF's commentary. However, in the opposite case of small banking systems, users should generally not revise the shock parameters downward. Instead, they should consider whether the scenario is realistic. If not, users may minimize the role of this test in applying any judgment as described in Section VI.D. Additional factors for users to consider when interpreting the test or considering a customization with larger fiscal costs include: (i) whether potential banks at risk are domestically- or foreign-owned; (ii) available first-line-of-defense alternatives to direct government intervention;[69] (iii) a specific bail-in mechanism; and (iv) resolution strategies adopted in the past—such as the provision of unlimited deposit guarantees, open-ended liquidity support, repeated recapitalizations, and regulatory forbearance.

[67]The magnitude of the shock to growth is one standard-deviation, calculated using its last 10 annual realizations. The size of the shock on inflation is set at ¼ percentage point for every percentage point decrease in real GDP growth in the stress scenario. The increase in interest rates equals ¼ percentage point for every one percent of GDP worsening of the primary balance in the stress scenario.

[68]The modelling of the shock as an increase of primary expenditures on a cash basis is a simplifying assumption. In practice, fiscal costs can be incurred in a variety of other ways, such as compensation of the central bank for losses incurred throughout the banking crisis, which would tend to occur later in the process and various transactions in financial assets and liabilities (e.g., capital injections; provision and/or activation of government guarantees; etc.).

[69]For example, countries may have financial stability funds, funded through bank levies, designed to act as a first line of defense. Furthermore, since the global financial crisis, bank resolution policies in some countries have been revamped to include options that would minimize the use of public money in the event of a crisis (e.g., triggering provisions in living wills of banks and bank contingent convertible capital securities.

- *Special considerations:*

  - Even if the test is not triggered automatically, it should be activated if Fund staff analysis suggests that systemic financial risk is high. The inclusion of a well-articulated view on systemic financial risk is a requirement for Article IV staff reports (IMF 2022c). This view should be anchored on an assessment of the relevant vulnerabilities in the economy and be supported by data and tools where feasible. IMF staff should also leverage key FSAP recommendations on macroprudential and other financial policies. A heightened likelihood of materialization of systemic risk would typically be reflected in the Risk Assessment Matrix (RAM) included in all Article IV reports.

    The interpretation of the results from the stress test scenario should consider both the broader assessment of systemic risk and the assessment of the quality of financial supervision and adequacy of financial policies to mitigate systemic risk. In particular, the existence and severity of real-financial feedback loops, as well as spillovers to or from the non-bank financial sector should be assessed. Users may also consider the current overall policy mix and the position of the country in the financial cycle.

  - The results of the stress test should be disregarded, even if it is triggered automatically, if a banking crisis has already recently occurred and its costs have already been reflected in the ratio of public debt-to-GDP.

90. For emerging market commodity exporters and commodity importers with sizable fuel subsidies, the commodity price stress test provides extra scrutiny of vulnerabilities arising from large swings in commodity prices.

- *Trigger*: The shock applies to emerging market and developing economies that are classified in the latest WEO as having fuel or nonfuel primary products as their main source of export earnings, indicating that these economies are vulnerable to commodity price busts. For commodity importers that may be subject to risks from fuel subsidies, users should indicate whether subsidies have been present within the past 5 years. If so, and unless there has been a reform that rules out their reemergence, an alternative version of the test should be applied that examines the fiscal risks from a commodity price boom.

- *Calibration*: The stress test captures the impact of a sudden one standard deviation change in the prices of fuel and non-fuel commodities on debt and GFN dynamics. Commodity exports and imports are shocked by a commodity price gap in the second year of projection, which closes over 5 years.[70] The interactions with macro variables and calibration are based on Fund staff event analysis and the literature, as follows:

[70]Where commodity exporters also import a commodity, a net export figure is applied to capture mitigating effects of decline in commodity imports.

- *For commodity exporters*, real GDP growth is reduced by 1.1 percentage points and fiscal revenues-to-GDP are reduced by 1.4 percentage points for each 10-percent contraction of commodity prices.[71] Inflation, measured by the GDP deflator, is reduced by the impact of price gap and commensurate to the share of commodity exports.

    - *For commodity importers with sizable fuels subsidies*, the default propagation of the shock is to increase the expenditures-to-GDP ratio by 0.9 percentage points for each 10-percentage point increase in fuel prices starting the second year of the projections.[72]

    - *In addition, for both exporters and importers*, the interest rate premium is increased by 25 basis points for each percentage point deterioration in the primary deficit.[73]

    Shocks to (i) real GDP growth; (ii) revenues and the GDP deflator (for commodity exporters); and (iii) expenditures (for commodity importers with sizable fuel sizable subsidies) start in the second year of the projections with full impact in second and third year of projections, with the gap converging to baseline in 5 years with commensurate impact on the fourth and fifth years of the projections. The interest rate shock is applied starting in the second year of the projections and does not converge to the baseline during the projection period.

- *Customization*: The template allows users to customize default stress test settings to account for specific country circumstances, including readily usable liquid assets (e.g., a stabilization fund) or the exchange rate regime. Additionally, users may customize these default scenario parameters with respect to the commodities for which the shock would be applied, the size of the price shock, and responses of real GDP growth and fiscal revenues subject to the price shock. For SRDSAs prepared by Fund staff, any adjustments should be taken after close discussion with country authorities and validated through the review process.

- *Special considerations*: When a country has significant production of more than one commodity, users should examine whether each commodity may be subject to a different price cycle when gauging the likelihood of these shocks. Additionally, if natural resource production is expected to scale up or down in the medium-term, users should keep in mind that the effects of commodity price swings could differ in the future.

91. A contingent liability stress test illustrates potential risks of debt surprises for countries that use a narrower debt perimeter than the general government for the SRDSA.

[71]These elasticities are within the range of estimates found in the literature (e.g., IMF 2012, 2015b; Spatafora and Samake 2012; Céspedes and Velasco 2013), and in line with those used in the LIC DSF.

[72]In cases where users have strong reasons to believe that the subsidies would instead result in cuts to growth-enhancing investment instead of higher total expenditures, a negative growth shock may be imposed, and the expenditure shock reduced. Any changes should be disclosed in the SRDSA's commentary.

[73]The average deterioration from the baseline in the second and third years of projection is taken to calculate the interest rate premium.

- *Trigger*: This test will be activated when the SRDSF user indicates that (i) the debt coverage is for a perimeter narrower than the general government and (ii) where the user indicates that there are units of the general government with financial activities separate from the central administration.

- *Calibration*: The stress test aims to capture the impact of liabilities of public entities that form part of the general government but were excluded from the debt perimeter of the SRDSA. As shown in Table 7, many variables are pre-populated in the template with values collected for key statistical publications. However, users may need to adjust the default estimates if they have better information on the outstanding liabilities of these sectors. In countries where social security funds are not consolidated with the central government, users should provide estimates of their liabilities when they exist. As the test is designed to capture the potential implications of using below-standard debt coverage, information on the debts of any state and local government administrations excluded from the debt perimeter should be incorporated in the standard contingent liability shock, which consists in a one-time contingent liability materialization in the second year of the forecast horizon.

Table 7. Calibration of the Contingent Liabilities Stress Test

	Domestic creditors			External creditors	
	Central bank	Commercial banks	Others	Official	Private
Standard parameters:					
State and local governments	Central bank survey (IFS)*	Other depository corporations survey (IFS)*	Zero or user estimate	General less central govt external debt from Quarterly External Debt Statistics and SRDSA*	Private databases on Eurobond issuances
Unconsolidated social security funds	Zero or user estimate			Zero or user estimate	
Optional customized parameters (typically excluded from default calibration):					
Public sector enterprises (SOEs)	Central bank survey (IFS)*	Other depository corporations survey (IFS)*	Financial statements of SOEs where available	Financial statements of SOEs where available	Private databases on Eurobond issuances
PPPs	Zero or user estimate			Zero or user estimate	

*Denotes item that can be linked to existing database for IMF staff.
Source: IMF.

- *Customizing parameters*: Users may wish to illustrate risks from additional layers of the public sector. To this end, the shock can be augmented to include risks from state owned enterprises and public-private partnerships. However, the accompanying commentary should note the existence, scope, and sources of such customizations and indicate that the test is capturing a broader set of risks than those posed by below-standard debt coverage.

- *Interpretation*: In addition to the standard considerations applicable to all tests, users should describe their understanding of the likelihood that the contingent liabilities modeled in the test will materialize for the sovereign. Additionally, users should describe any efforts that the country authorities are undertaking to boost the comprehensiveness of public debt coverage (if not mentioned in the reporting on debt coverage and disclosures).

92. The exchange rate shock aims to capture risks arising from large exchange rate misalignments that are not expected to be eliminated in the medium term.

- *Trigger*: Countries subjected to the test have a user-entered estimate of high initial overvaluation of real effective exchange rates (REER)—defined as above 5 percent—and changes in REER over the medium-term horizon that are insufficient to eliminate the overvaluation. For SRDSAs prepared by Fund staff, the estimated overvaluation should be consistent with those presented in the External Sector Assessment. The scenario will not be applied to cases in which there is no large initial overvaluation or cases in which this is corrected over the medium-term.

- *Calibration*: The scenario is centered on a depreciation shock sufficient to close the country's over-valuation gap during the projection horizon.

    - In cases of countries with floating exchange rate regimes, the shock is fully applied to the nominal exchange rate against the dollar in the second year of the projection horizon. An additional impact on the deflator mimics the passthrough from currency depreciation to inflation. In line with the literature and the prior MAC DSA, the impact will be larger for emerging market economies (25 basis points per 1 percentage point of depreciation) and weaker for advanced economies (3 basis points per 1 percentage point of depreciation).

    - In cases of countries with inflexible regimes (fixed exchange rates, currency union members, and countries without their own legal tender), an internal devaluation shock equal to the depreciation shock is applied by lowering the GDP deflator in equal steps for the six years of the projection horizon.

    - *Customization*: When internal devaluations are simulated and users foresee a rapid loss of reserves, including due to an attack on the peg, users may adjust the distribution of this shock across various years in the projection horizon.

- *Special considerations*: Users should be aware that this stress test is not designed to analyze risks of exchange rate over-shooting, hence the risks of exchange rate changes beyond the unwinding of the fundamental overvaluation, which could be even more severe, will not be captured by the stress test.

93. Another stress test captures risks arising from natural disasters with potential effects on medium term growth.

- *Trigger*: The test is applied to MAC countries that meet the following criteria: (i) two natural disaster events in a three-year window; (ii) cumulative economic loss of at least 5 percent of GDP caused by the natural disaster events in that window. The natural disaster events considered include: (i) climate-related (droughts, wildfires, glacial lake outburst); (ii) geophysical (earthquakes including tsunamis, volcanic activities, dry mass movements); (iii) hydrological (floods and landslides); (iv) meteorological (storms, and extreme temperature events such as cold and heat waves); (v) biological (epidemics and insect infestations); and (vi) extra-terrestrial

(asteroid impact). Information about natural disaster events and economic costs are taken from EM-DAT database between 1980 and 2021.[74] In addition, the test is also applied to MAC Small States identified in IMF (2016).[75]

- *Calibration*: The standard shock considers: (i) a direct impact: a one-off shock of 4.5 percentage points of GDP to public debt-to-GDP ratio; and (ii) an interaction effect: real GDP growth is lowered by 1.3 percentage points, with no subsequent rebound shock, implying some permanent output loss.[76] Both shocks are introduced in the second year of the projection period.

- *Customization*: Users can adjust the parameters of the shock to better capture the impact of natural disaster events (including quantitative impact of mitigation policies including the effects of catastrophe insurance if relevant) on public finances and GDP growth.

- *Special considerations*: This stress test is not designed to capture structural and gradual impacts associated with physical and transition risks from climate change, which can be analyzed using a tool in the long-term risk assessment described later.

D. Medium-Term Index and Final Medium-Term Assessment

Standard Application

94. For the purposes of informing the mechanical signal at the medium term, the results of the Debt Fanchart and GFN Modules need to be aggregated. In the SRDSF, this aggregation is performed automatically by the template and results in a medium-term index based on the DFI and GFI (Annex IV.D).

Considerations for Special Cases

95. While there are no exceptions to the standard aggregation rule and thresholds, users should be careful when there is a wide divergence between the two medium-term tools. These situations arise when the underlying index from one medium-term tool indicates high risk and the other indicates low risk. Usually, because the medium-term index averages the two metrics, the overall medium-term signal will reside in the moderate risk territory. In these cases, users should explore whether this result is intuitive, which may well be the case. If users assess the result as reasonable, then they should provide a careful explanation in the commentary box of the

[74]The International Disaster Database (EM-DAT) prepared by Center for Research on the Epidemiology of Disasters (CRED) http://www.emdat.be/ .

[75]IMF (2016). "Small States" resilience to natural disasters and climate change – role for the IMF". IMF Policy Paper. December. Page 66.

[76]Estimations using a sample of 160 advanced and emerging economies and jurisdictions, with annual data between 1980 and 2021 from EM-DAT (natural disasters) and IMF-WEO (macroeconomic variables). IMF staff calculations.

standardized reporting. Otherwise, users should follow a judgment-based final signal as described below.

Interpreting the Standard Tool

96. Users should consider both the current level of the index and its evolution in the standardized reporting on the medium-term tools (Figure 23). The template puts the mechanical signal for the medium-term index in the standard SRDSA cover table. The mechanical signal is low risk for MTIs below 0.257 and high risk for MTIs above 0.395; otherwise, the signal is moderate risk. Additionally, the standardized reporting on the medium-term tools includes a figure showing the evolution of the medium-term index for the current observation and the past several years. It would generally be appropriate to describe in the commentary on the SRDSA whether overall medium-term risks are rising or falling, even though the analysis will typically focus on the insights from the individual medium-term tools.

Using Judgment

97. A strong presumption of a judgment-based final signal would exist in these situations:

- If a stress test is triggered, delivers a debt path above the 75th percentile of the debt fanchart, and users assess a high risk of that risk materializing, it indicates a relevant and high-impact risk, which should be highlighted for a more comprehensive assessment. In these situations, a one-notch downgrade to the final signal would typically be appropriate.[77]

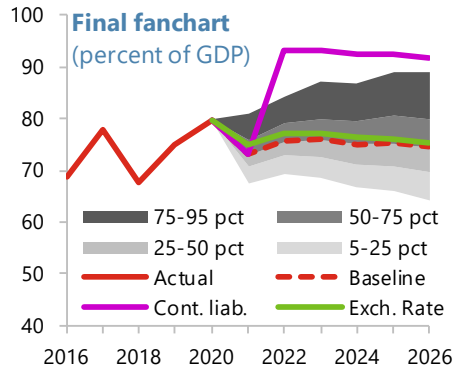
- When users assess the medium-term mechanical signal as invalid due to the considerations for judgment listed in the sections on either the Debt Fanchart or GFN Module (or both tools).

- Cases where there is a wide divergence in the results for the Fanchart and GFN Modules. If there are any triggered stress tests, these may be able to arbitrate between the conflicting core tools. However, users should also always add their own considerations as to which tool is yielding the more reliable result.

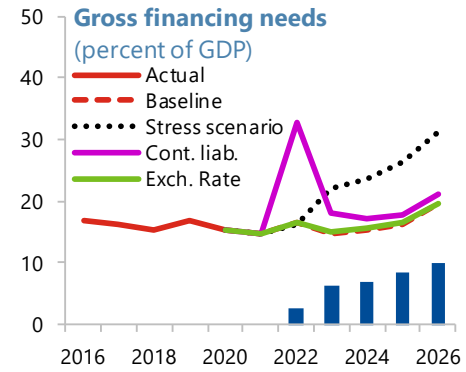
[77]For SRDSAs prepared by Fund staff, expectations of a high risk of materializing should be consistent with a high likelihood of materialization in the Risk Assessment Matrix, when it includes a related risk.

Figure 23. Standardized Reporting on the Medium-Term Risk Analysis

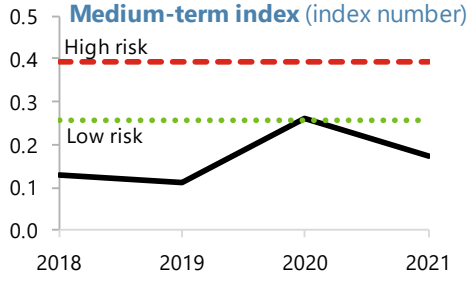
Ruritania: Medium-term risk assessment



	Value	Index contrib.[1/]	Percentile in peer group[2/]
Debt fanchart module			
Fanchart width *(percent of GDP)*	24.8	0.2	
Probability of debt non-stabilizaton *(percent)*	5.9	0.1	
Terminal debt-to-GDP x institutions index	25.1	0.5	
Debt fanchart index (DFI)		**0.8**	0 25 50 75 100
Risk signal:[3/]		**Low**	



	Value	Index contrib.[1/]	Percentile in peer group[2/]
Gross financing needs (GFN) module			
Average baseline GFN *(percent of GDP)*	16.2	5.5	
Banks' claims on the gen. govt. *(pct banks' assets)*	7.4	2.4	
Chg. in banks' claims in stress *(pct banks' assets)*	0.7	0.2	
GFN financeability index (GFI)		**8.2**	0 25 50 75 100
Risk signal:[4/]		**Moderate**	



Medium-term risk analysis

	Value	Weight	Contribution
Debt fanchart index (normalized)	0.19	0.5	0.09
GFN finaceability index (normalized)	0.16	0.5	0.08
Medium-term index			**0.17**

Risk signal:[5/]	**Low**
Final assessment:	**Moderate**

Prob. of missed crisis, 2022-2027 (if stress not predicted): 9.1 pct
Prob. of false alarm, 2022-2027 (if stress predicted): 61.1 pct

Commentary: Of the two medium-term tools, the GFN Financeability Module is pointing to a higher, but still moderate level of risk. This result is further reinforced by the potential for contingent liabilites from government entities outside the central government, which appears possible, given signs of strains in subnational governments' finances.

Source: IMF staff estimates and projections.

1/ See Annex IV of IMF, 2022, Staff Guidance Note on the Sovereign Risk and Debt Sustainability Framework for details on index calculation.

2/ The comparison group is emerging market, non-commodity exporting countries, with Fund-supported programs.

3/ The signal is low risk if the DFI is below 1.13; high risk if the DFI is above 2.08; and otherwise, it is moderate risk.

4/ The signal is low risk if the GFI is below 7.6; high risk if the DFI is above 17.9; and otherwise, it is moderate risk.

5/ The signal is low risk if the GFI is below 0.26; high risk if the DFI is above 0.40; and otherwise, it is moderate risk.

SECTION VII. LONG- TERM RISK ASSESSMENT

A. Common Considerations

98. The long-term assessment covers risks of debt related stress that could materialize after the next five years. Analysis of risks well into the future is necessarily more qualitative and focuses on the evolution of debt and GFN trajectories. Longer-run projections are also generally subject to higher uncertainty and will be strongly influenced by the SRDSF user's assumptions. That said, longer-term analysis is a critical component of the framework, aiming to illustrate potential vulnerabilities to identifiable trends and to model the impacts of crucial trends and policies. Thus, in all Fund SRDSAs, the long-term risk assessment is a required element. Depending on the circumstances, it can include a qualitative discussion, or it can add a deeper analysis of relevant issues, including with information obtained from the tools described in this section. To the degree that the long-term risk analysis reveals a fiscal issue that is likely to have an impact at the 5-10 year horizon but has not yet been reflected in the SRDSF's 10 year baseline projections, users should revise the 10-year baseline to reflect the associated fiscal costs (and any macroeconomic impact).

99. As a first step, when assessing debt vulnerabilities over the longer horizon, users can use the SRDSF's extended (5-10 year) baseline projections for public debt and gross financing needs. These trajectories are reported in the baseline scenario's standardized reporting and users could focus on describing the level and direction of debt, GFNs, and debt-stabilizing primary balances. In certain cases, like debt restructurings (paragraph 151), users may wish to report a 10-year debt fanchart and emphasize the probability of debt stabilization over the next decade. Additionally, if desired, the template can extrapolate debt-to-GDP and GFN-to-GDP paths based on the terminal levels of the medium-term horizon, or under user-customized assumptions. The resulting trajectories can inform a qualitative analysis of risks, with a focus on trends, levels, and comparisons to the past, among other factors.

100. The SRDSF also includes a set of four optional standardized modules to help users analyze key issues that could drive debt-related risks well into the future. These modules are scenario-based and constructed based on the assumptions entered by users. The following sections provide guidance for users in setting the appropriate levels of key parameters, though users should employ any relevant considerations and conduct sensitivity analysis as warranted. The four modules capture the key risks that are relevant for many market-access countries, which include:

- The implications of demographic change on social security/pension funds and public health programs;
- The effects of discovery or depletion of natural resource wealth;
- Rollover risks from large future debt amortizations; and
- The consequences of adaptation and mitigation investments to combat climate change.

The use of these modules is voluntary for Fund users, unless: (i) they need to be included to comply with the requirements for Resilience and Sustainability Facility (RSF) requests and augmentations;[78] or (ii) if the country is highly exposed to natural disasters or is undergoing debt restructuring, in which case the application of the climate-change adaptation submodule is compulsory (see climate-change section below). For Fund Staff, decisions to apply the long-term modules should be taken well in advance and agreed between departments. To focus attention, lists of countries that staff may consider as candidates for each module should be prepared internally and updated periodically. Nevertheless, any discussion of the issues should be supported by the modules or some other form of analysis, especially from the results of careful research or other models beyond the SRDSF. Additionally, in cases where it is impractical to run these modules, but the issues are nevertheless relevant, users should still discuss them qualitatively in the long-term risk assessment. Moreover, SRDSF users are encouraged to incorporate other long-term issues that may be relevant, including by drawing on related studies or analytical tools outside the SRDSF.

101. Assessments performed for the long-term horizon are necessarily more judgment based than those for the short and medium term. None of the four standardized long-term modules produces a mechanical signal. However, users may implement the modules to assess whether the materialization of the events modeled in the scenario would produce a simulated debt trajectory that is explosive. When this is the case, it would generally indicate that there is a risk. Average or maximum GFN-to-GDP ratios that exceed their medium-term levels would also signify potential vulnerability. Whether risks are high or moderate would involve additional considerations, including the breadth of risk indications (e.g., the existence of both rising debt and GFNs in uncharted territory would typically be a sign of higher risk), the SRDSF user's confidence that the risks will materialize, the timeframe and availability of corrective actions to address the vulnerability, and the country's track record of addressing similar challenges before stress materializes.

B. Demographics Module (Social Security, Pension, and Healthcare Expenditures)

102. Social Security, pension and healthcare expenditures will be important contributors to long-term fiscal costs for many countries. Demographic trends can put significant funding pressures on government budgets, particularly if labor force and growth impacts are sizable, which in turn may lead to heightened risks for sovereign stress and debt sustainability. The pension and healthcare modules have been developed to capture these potential long-term fiscal costs and provide SRDSF users with the tools to make longer-term assessments of a country's debt sustainability beyond the standard medium-term projection horizon.

[78]See IMF, 2022a, paragraph 62. The demographics, long-term debt amortization, and climate change mandatory are mandatory for requests for new RSFs and augmentations of existing RSFs. The natural resources module is optional.

The Pension/Retirement Benefit Sub-Module

103. This sub-module generates long-term projections of the financing needs arising from national pension schemes that are funded by the general government, including social security programs. It takes into account the characteristics of the scheme(s), demographic changes, contributions and any other pension assets/reserves. Based on these inputs, the module simulates a path for net pension expenditures, which can be analyzed for their implications for the long-term trajectory of public debt and GFNs and help users form an assessment of the long-term risks.

104. Countries that have significant current or future pension liabilities that are not already reflected in SRDSF's extended baseline projections should use this module and discuss any risks associated in the SRDSF write-up. To determine whether these liabilities might be sufficiently material in the long-term to constitute further scrutiny with this tool, users should consider if pension/social security is currently not included in general government expenditure, and hence excluded from the baseline projection and whether either of these two conditions holds:[79]

- Growth of pension expenditure over the period 2022-50 falls above the 75th percentile in the entire sample of countries.[80]
- Growth of old-age dependence over the period 2022-50 falls above the 75th percentile of the entire sample of countries.

105. The sub-module adopts a model to estimate the net expenditures on pensions as a percent of GDP using the following steps:

- First, a path is generated for annual gross pension expenditures as a share of GDP. These expenditures increase with (i) the old-age dependency ratio, (ii) the coverage of the pension scheme(s), and (iii) the pension benefits per beneficiary, while they decrease with (i) the number of people who are employed and (ii) GDP per worker.[81] Mathematically, it can be expressed as:

$$\frac{Benefits}{GDP} = Dependency\ Ratio \cdot \frac{Benefits/Beneficiaries}{GDP/Workers} \cdot Coverage\ Ratio \cdot \frac{1}{LFPR \cdot (1 - UR)}$$

where LFPR and UR stand for labor force participation rate and unemployment rate respectively. This is equivalent to:

[79]In cases where users can obtain better estimates of unfunded social security/pension liabilities can rely on those estimates rather than using this sub-module. But the long-term fiscal risks associated with pension liabilities should still be discussed in the SRDSA.

[80]Based on estimates by the FAD published in the Fiscal Monitor.

[81]In some cases, demographic measures can be distorted by certain characteristics like a large share of migrant workers or a large refugee population. When this is the case, users should evaluate the reliability of the tool. If it is not reliable, this module should not be run and discussion could focus on the impacts of demographics using other analyses.

$$\frac{Benefits}{GDP} = \frac{Pop^{65}}{Pop^{15-64}} \cdot \frac{Benefits/Beneficiaries}{GDP/Workers} \cdot \frac{Beneficiaries}{Pop^{65}} \cdot \frac{1}{LFPR \cdot (1-UR)}$$

- Then, the annual net pension expenditure is obtained by netting the pension contributions from the gross expenditure obtained by the formula above. The SRDSF imposes an assumption that pension contributions will remain constant as a share of GDP throughout the projection period (from present until year 2100).
- Finally, the annual financing needs for the government are the shortfalls between the pension system's net asset value and its net expenditures. If the assets are sufficient to cover the net expenditures, there would be no financing need for that particular year. The default setting of the template assumes that the value of net assets grows annually at a risk-free rate.

106. The template uses both standardized data from cross-country databases as well as some user-entered parameters. The pre-populated data includes:[82] the dependency ratio, population by age group, pension coverage ratio, real GDP, labor force participation rate, and unemployment rate. Beyond these data, users are required to provide input data for the following variables for the first year of projection:

- Total benefits paid by the pension system (in percent of GDP);
- Total contributions to the system (in percent of GDP);
- An assumption on the growth rate of contributions (either be constant as a share of GDP, or grow at the same rate of GDP per worker);
- Value of the pension system's net assets (in percent of GDP).

The initial year of analysis is set by the user, with the choice ranging from 2020 to 2099. The module computes projections for whichever future years do not have preexisting data. For example, if a user chooses 2021 as the starting year, real GDP data will be drawn from WEO all the way to 2026 (even though some of those numbers are WEO projections). For every year after 2026, the submodule estimates its own GDP projections using the steady state rate of GDP growth. In addition, the module assumes a real discount rate of 5 percent for the computation of NPV and a real risk free rate of 3 percent for pension assets growth. [83] Users have the option to modify these assumptions.

107. The sub-module provides users with long-term projections for key variables related to public pension expenditures. These outputs include the paths for net pension expenditures, net

[82]Population and dependency ratio projections are drawn from the United Nations World Population Prospects 2019. Projections for the coverage ratio and labor force participation rate are provided by the Fiscal Affairs Department. Projections for the real GDP and the unemployment rate are drawn from the World Economic Outlook, October 2021 vintage.

[83]Users are encouraged to adjust the expected rate of return if country-specific projections on pensions returns are available. If existing projections assume a different discount rate, users may want to adjust the module's default values to appropriately reflect the difference between the discount rate and the rate of return in the data.

pension asset balances, and financing needs for the general government from present until year 2100. These financing needs are included with long-term projections illustrate their impact on debt and total GFNs over a longer-term projection horizon. The module further computes the net present value (NPV) of the entire stream of future financing needs arising from the pension system, as well as the permanent increase in primary balances required to offset them.

108. When available, users should present and discuss projections produced by country authorities. Many countries produce estimates of future retirement benefit programs over long-term horizons. In some cases, these estimates are prepared in a highly rigorous manner, considering detailed information. SRDSF users should thus show these estimates alongside those of the standard module when they are available. If there are significant differences, users should explain their sources as well as their judgment on the more likely outcome.

The Healthcare Sub-module

109. The healthcare sub-module provides projections for the future financing needs arising from the healthcare system as a share of GDP. Like pensions, these funding needs are driven by demographic changes and other factors that increase costs within the healthcare sector.

110. Countries that have sizable future public healthcare expenditures should use this sub-module and discuss in the SRDSF write-up any risks associated. Meeting either of these two following criteria would signal potential pressures that might arise in the long-term from rising health expenses, including from demographic changes:[85]

- Growth of healthcare expenditure over the period 2022-2050 falls above the 75th percentile in the entire sample of countries.[86]
- Growth of old-age dependence over the period 2022-2050 falls above the 75th percentile in the entire sample of countries.

111. The healthcare sub-module uses a model to generate projections for annual healthcare spending over the long run. The annual healthcare expenditure, as a share of GDP, can be estimated from the average health spending per population aged 20–64, the relative share of healthcare expenditure for a particular age cohort (α^i) and the distributions of the age cohorts in the population. Mathematically, it can be expressed as:

$$\frac{Health\ Expenditures^{20-64}}{Population^{20-64}} \cdot \frac{Population^{20-64}}{GDP} \cdot \left[1 + \alpha^{0-19} \cdot \frac{Population^{0-19}}{Population^{20-64}} + \alpha^{65+} \cdot \frac{Population^{65+}}{Population^{20-64}}\right]$$

[85]In cases where users can obtain better estimates of health expenditure growth can rely on those estimates rather than using this sub-module. But the long-term fiscal risks associated should still be discussed in the SRDSF write-up.

[86]Based on estimates by the FAD published in the Fiscal Monitor.

where:

$$\alpha^i = \frac{\frac{Health\ Expenditures^i}{Population^i}}{\frac{Health\ Expenditures^{20-64}}{Population^{20-64}}}$$

with i denoting each age cohort. Since α^{65+} is larger than 1 in most cases, the healthcare spending to GDP also grows with the old-age dependency ratio. An additional amount for excess growth of healthcare expenditure due to non-demographic factors is applied to the standard expenditure obtained from the formula above.

112. Users do not need to provide any data except for the choice of the first year of projection, but may manually adjust any of the following for the initial year:

- Health expenditure as a share of GDP; and
- Health expenditure per capita for the age cohort 0-19 as a share of health expenditure per capita for the age cohort 20-64 (i.e., $\alpha^{0\text{-}19}$).

The module assumes a real discount rate of 5 percent, and a constant excess growth rate of healthcare costs of 0.6 percent for EMs and LIDCs, and 1.4 for AEs. Users have the option to modify these assumptions.

113. The key output from the sub-module is a projection for the future path of healthcare expenditures from present until year 2100. The module also estimates the NPV of the future healthcare expenditures, as well as the required fiscal adjustment for every year. As with the pension/retirement benefit sub-module, if the country authorities produce estimates of these expenditures, they should also be shown in the standardized output, along with a discussion of their relative realism.

C. Natural Resources Module

114. The natural resource module captures long-run mitigating factors or debt risks from the scaling up/down of natural resource extraction and its impact on resource revenues, economic growth, and debt profile. Future extraction volumes may be different from those seen in the past, either because of exhaustion, new discoveries,[87] or political choices. Such changes to extraction volumes can affect fiscal balances, growth trajectories and ultimately paths for gross financing needs and debt. Hence, information on the long-run trajectory of natural resource production could reveal a different profile of risk and implications for debt sustainability than

[87]Including technological changes that affect the size of reserves commercially viable for extraction.

suggested by the medium-term analysis. This module does not analyze sovereign risks arising from future price movements of such commodities, which could also be relevant.[88]

115. This module is relevant for commodity exporters whose extraction volumes over a six-to-fifteen-year horizon are expected to deviate strongly from historical averages. Users that prepare SRDSAs for commodity producers subject to the commodity module in external sector assessments should verify whether running this module is warranted. Importantly, this module is only valid for countries producing naturally exhaustible commodities and should not be used for secondary commodities or exhaustible but abundant commodities (such as agricultural commodities and fertilizers). Additionally, in situations of future extraction for countries with currently negligible commodity exports, users can also select to run the module. For convenience, the tool calculates if extraction volumes over years t+6 to t+15 deviate by more than one standard deviation from the historical average (calculated over the past ten years).[89] In case the criterion is met, including the tool's analysis as part of the SRDSA is strongly recommended.[90]

116. Data needs include both user-inputted data and assumptions, as well as data from centralized sources. These can be divided into data on commodity related variables and other macro-economic variables.

- On the commodity side, users will be asked to provide data or assumptions on up to three macro-significant commodities,[91] including information on the size of proven commodity reserves, commercial viability of these reserves, expected discoveries (if any), expected changes in extraction rates and domestic consumption of the commodity, expected capital investment expenditures, share of commodity revenues to budget and share of commodity dependent sectors to GDP. On these data needs, users should utilize authoritative data sources, mainly those prepared by country authorities that have the primary data. While the price projections for the 5-year horizon will be calculated by the module's central database using WEO projections, users may adjust these price changes for the medium term.

- For information on macroeconomic non-commodity variables, users will be asked to report government expenditures, non-commodity revenue, and nominal non-commodity long-run GDP

[88]The module uses WEO price projections up to t+5 and then uses a constant nominal inflation rate of 2 percent thereafter. The new commodity price stress test module could be extended to examine the effects of long-term volatility in commodity prices.

[89]Including new discoveries in the baseline should meet the criteria set by FAD, including government approval of the field development plan for petroleum projections and feasibility study for mining projections and/or investor announcements of the Final Investment Decisions.

[90]Projecting production increase in the baseline (due to new discoveries or developments) should be based on reliable information following FAD's guidance on criteria for inclusion of new extractive industry projects in macroeconomic baseline. In case these guidelines are not met, users could still use the tool to present results as an alternative scenario.

[91]Macro-significant will be defined as commodities with over 25 percent contribution to total goods exports. Users can choose to include commodities with smaller contributions if the contribution to government revenue is deemed significant. In case of commodities with low current production and large future extraction plans, users can use judgment to include these commodities.

growth. While some of these variables are already part of the macro-economic framework that underpins the rest of the SRDSA, others will be additional assumptions users are expected to make for this module.

117. The module produces the cash flow projection associated with the long-term increase or decline in commodity production and traces the net effect on paths for debt and GFNs. Changes in exhaustible commodity production leads to changes in government revenue,[92] and may also affect government capital investment expenditures.[93] GDP growth is endogenously determined in response to changes in production volume projections: changes in commodity production affects both *direct commodity-dependent* sectors (e.g., Oil extraction and mining) as well as *indirect commodity-dependent* sectors (e.g., services and manufacturing activities related to the extractive industry). These two dependent sectors are projected to grow at the pace of commodity production, while *independent* sectors are assumed to follow an exogenous stable growth rate. The net changes in the three sectors determine the aggregate level of real GDP growth. The net changes in revenues and expenditures as well as nominal GDP growth leads to a projection of primary balances-to-GDP ratios over periods t+5 to t+10.[94] The module incorporates this projection into a long-term SRDSA baseline to calculate the change in GFN-to-GDP and debt-to GDP-paths.[95]

118. The changes to GFN and debt paths will be used to interpret the benefits and risks from both resource exhaustion and discovery. Natural resource exhaustion can lead to lower revenue and GDP and thus worse GFN and debt paths than under the non-exhaustion baseline. However, lower investment expenditures might offset some of these effects. On the other hand, discovery can lead to lower GFN and debt paths compared to non-discovery baseline, but this can also be offset by higher expenditures, especially upfront for initial investments required to start production. The overall effect can help users judge whether the scenarios suggest a radically different outlook for sovereign risk and debt sustainability. That being said, the effects of activities in the natural resources sector are complex and subject to substantial uncertainty over the long run. Users are advised to study the sensitivity of results to different parameter values if uncertainty is significant. In addition to this sensitivity analysis, if warranted, users may provide any caveats that

[92]The module accounts for leakages due to discounts for domestic consumption and accounting for other private shareholders.

[93]In cases where the country manages its resource production through state-owned companies and coverage does not extend to SOEs, investment expenditures will not be reflected in the general government budget. Therefore, users are advised to change the share of government revenues to resource exports taking into account expected investment costs.

[94]Depending on the institutional setting, users can choose to channel commodity revenues to a sovereign fund instead of allowing it to directly contribute to the primary deficit. When this option is selected, the module also allows users to simulate the effects of a fiscal rule that determine the share of commodity revenues to be transferred to the government (through depletion of asset buffers).

[95]While more complex cash flow models of revenues and investment expenditures may be available for a particular new discovery/project (e.g., FAD's FARI model used in TA missions), the data requirement of such models makes it prohibitive for a wide cross-country application. However, if such complex and granular data are available, users are recommended to include such data in the total extraction and expenditure projections.

are relevant for the country being examined in the accompanying commentary on the results of this module.

D. Large Debt Amortizations Module

119. This module aims to illustrate potential risks from abnormally large debt amortizations over the longer-term horizon. While this tool is mainly focused on analyzing rollover risks, it also considers the implications of refinancing or repaying these obligations for long-term debt levels. In particular, it aims to answer whether bunching in maturities can be readily mitigated through proactive and effective debt management operations or whether sovereign stress risks are likely to rise to high levels. It is therefore relevant for countries in the following circumstances:

- When recently concluded debt restructuring operations or large-scale financing on concessional terms will require future refinancing operations that could be on significantly less favorable terms, with implications for debt sustainability;
- For countries expecting a sizable pickup in amortization of already-issued debt beyond the medium-horizon, particularly if the associated amortization payments are in foreign currency and due to external creditors. For example, this could include frontier markets that only recently began accessing international debt markets and need to amortize their first market-based issuances;
- Countries that need to conduct a longer-term debt risk analysis as part of the qualification criteria for the Resilience and Sustainability Trust; and/or
- Any country meeting an indicative criterion of debt amortizations 6 to 25 years ahead that significantly exceeds the 10-year historical average.

120. The large debt amortizations module projects GFNs over a 25-year horizon. Since debt service is the focal point of this analysis, users need to input debt service on already existing debt for this period (both principal and interest and separated by currency composition). Additionally, payments on debt that is projected to be issued in the medium-term and to mature in the long-term are automatically calculated by the template. The module offers three alternative standardized assumptions for projecting the remaining components of the GFN-to-GDP ratio (primary deficits, real growth, inflation, interest revenues, effective interest rates and maturity schedules) beyond the medium term:[96]

- The first option assumes constant t+5 values, which are used to extrapolate primary deficits and other non-debt service GFN components for t+6 to t+25. In post-restructuring situations, users

[96]The three options below assume that the user-provided macroeconomic framework ends at t+5, so that the extrapolation period begins in years t+6 (see paragraph 99). For users that have provided projections until t+10, the template will provide an option that overrides the extrapolations starting in t+6 and resets the beginning of the extrapolation period to t+11.

should revise the long-term assumptions for interest rates and maturities to more realistic levels, if warranted.

- A second option assumes uses the t+5 values to compute a primary deficit that stabilizes the debt-to-GDP ratio in the long term. Beginning in t+6, it uses this primary deficit together with constant t+5 values for the remaining variables (implying that debt-to-GDP will be constant for the remainder of the projection horizon).

- A third option assumes historical 10-year averages, which are used to project GFNs into the long term. In cases where previously restructured or highly concessional debt is expected to be refinanced over the longer term, users should interpret these projections with care, as the refinancing terms will generally be less favorable.

- For each projection, users should examine each of the three individual variables to determine if further analysis is appropriate: (i) the GFN-to-GDP ratio, (ii) the amortization-to-GDP ratio, and (iii) the level of amortization (Figure 24). These variables should be considered as giving a risk indication whenever the variable exceeds the 10-year historical average by more than one standard deviation in any year of the long-term projection. Two or more risk indications would strongly suggest including the findings of this module and any other related analysis in the long-term reporting of the SRDSA.

Figure 24. Indicators for the Long-Term Amortization Module

Projection	Variable	Risk indication
Medium-term extrapolation	GFN-to-GDP ratio	
	Amortizaton-to-GDP ratio	
	Amortizaton	
Medium-term extrapolation with debt-stabilizing primary balance	GFN-to-GDP ratio	
	Amortizaton-to-GDP ratio	
	Amortizaton	
Historical average assumptions	GFN-to-GDP ratio	
	Amortizaton-to-GDP ratio	
	Amortizaton	
Overall risk indication		

Source: IMF.

121. If the projected long-term GFN paths suggest potential risk, users should undertake further scrutiny through a variety of tools provided by the module. First, the medium-term GFN Financeability Index is recalculated using each projection for the average GFN-to-GDP ratio over the 25-year long-term horizon. Users may then compare results to those of the medium-term analysis for any evidence of anticipated deterioration in financeability and heightened liquidity risk, under each of the three scenarios. A realism indicator is also included in the module. This plots the maximum annual change in both the GFN-to-GDP ratio and the Amortization-to-GDP ratio against the distribution of observed outcomes between 2009 and 2019 for all market access countries. Changes to the projected GFN-to-GDP and Amortization-to-GDP ratios that are large, defined as being greater than the 75th percentile of all the changes in the sample, would suggest liquidity risk beyond the medium-term horizon. The module also reports the average deposit accumulation levels required to meet projected debt principal repayment obligations, as levels and as a percentage of nominal GDP for each of the three projections. Users should examine whether such a buildup is feasible.

122. When reporting the results of the long-term debt amortization module, users should be mindful of the following considerations:

- The strength of the module critically depends on users entering a realistic schedule for the amortization and interest payments of existing debt.
- To assist with the discussion of the long-term risks the three projections should be assessed against one another. Comparing outcomes under these alternative projection methods should help in providing context for the nature of the long-term amortization risks.
- Finally, users can bring in any further relevant consideration, with the outputs of this module acting as a starting point for further analysis.

E. Climate Change Module

123. Responding to climate change will have important implications for debt-related risks in some countries, and the SRDSF's Climate Change module can help analyze these issues. In the tool, there are two sub-modules, each covering a distinct issue. The first sub-module models the impact of adaptation investments, which involves building resistance to the effects of climate change. The second sub-module covers climate change mitigation, which involves efforts to reduce greenhouse gas emissions to limit increases in temperatures. While each sub-module pertains to a distinct issue, both tools aim to illustrate the impact of what could be significant public investment needs on public debt and GFN levels.

124. Use of both submodules is required in the context of RSF requests or augmentations, as well as in pre-defined groups of countries in which the fiscal costs of adaptation or mitigation are expected to be significant (see below). Use of the two submodules is compulsory under the rules of the RST (SM/22/63, paragraph 62). Compulsory use for certain groups of countries where the fiscal costs of mitigation and adaptation are likely to be large seeks to ensure that these fiscal risks are reflected in SRDSF assessments. Finally, use of the adaptation module is compulsory in debt restructuring cases, to provide guidance to teams who need to formulate realistic debt restructuring envelopes.[97] For all other MACs, the submodules are optional. In some cases, only one, rather than both, of the sub-modules are relevant. If this is the case, then only the relevant sub-module should be run.

125. The objective of the two sub-modules is to inform judgement on debt-related risks arising from policy commitments (or recommendations) to address climate change. The two sub-modules would allow projections of debt-to-GDP and GFN-to-GDP over a 30-year horizon

[97]The fact that other long-term modules remain optional in debt restructuring cases should not be taken to imply that climate adaptation investments are more important than other spending categories, but rather reflects a cost-benefit calculus with respect to the application of the tools. The adaptation module is "pre-populated" with the currently best set of estimates of adaptation costs, making it easy to use while giving the user plenty of flexibility to change the default assumptions (see below). Furthermore, based on these estimates, the fiscal costs of climate adaptation costs could be sizeable for many developing countries.

under two scenarios: a standard scenario based on the default assumptions in the template, and a customized scenario, where users can adjust the assumptions to country-specific characteristics. The debt drivers under the baseline in the standard scenario would be extended from t+5 to a 30-year horizon in a similar way to the 10-year projections. To this extended baseline the fiscal costs of adaptation and mitigation measures would be added as a deterministic shock from t+6 onwards, (removing any adaptation or green investment from the baseline public investment projections, if some were already assumed from t+6 onwards). The customized scenario would allow adjusting the financing terms of the climate-related investments, underlying primary balance assumptions, and the long-term GDP growth path to more country-specific circumstances. In cases where the t+5 debt drivers are seen as too optimistic to anchor reasonable longer-term projections, a customized scenario with more conservative debt-driver projections should be considered for the period t+6 to t+30. Assumptions underlying the customized scenario would need to be justified in the write-up of the long-term risk analysis.

126. The key outputs from both sub-modules are extended projections for debt-to-GDP and GFN-to-GDP, which can be used to inform the long-term risk assessment. Since there is substantial uncertainty about the future evolution of climate change and its impact on sovereign risks, this assessment would be qualitative (as with the other long-term modules). After entering the required data and assumptions to run the tools, users should scrutinize the resulting debt and GFN paths to come to an overall judgment. In general, debt and GFN trajectories that are substantially higher and/or on an upward trend after factoring in investments in adaptation and mitigation would indicate that climate change may constitute an important risk. Users should qualify their judgment of risks by considering the uncertainty around the level and range of potential climate investment. When both are small, it would usually suggest that climate change may be manageable. However, when the needed investment is likely to be both large and uncertain, interpreting the module is more difficult. In these cases, users should carefully describe the basis for their assumptions (particularly investment needs).[98]

127. Both the standard and the customized scenarios should inform the user's judgement. In general, debt and GFN trajectories will be substantially higher in the standard (default) scenario, while the customized scenario could be used to show how the expected financing terms and policy reactions could mitigate debt-related risks arising from the investment costs of mitigation and adaptation. If the debt and GFN trajectories are still upward trending in the customized scenario—or substantially higher over the extended 25-year period than in the first 5 years of the projections—this would indicate that climate change may constitute an important risk.

128. In addition, the two submodules should be used to inform the SRDSF's extended (5-10 year) baseline projections for public debt and gross financing needs. At a minimum, the customized scenario of the adaptation sub-module must be incorporated in the 5–10-year baseline

[98]This description for likely high-but-uncertain investment needs is likely to be particularly important when the module is run to inform debt restructurings. Users should carefully discuss how assumptions balance the realism of necessary climate-related investments with appropriate conservativism, to generate creditor buy-in.

projection. As fiscal cost estimates for mitigation are even more uncertain that those for adaptation, incorporation of the customized scenario of the mitigation sub-module is optional.[99]

129. Techniques and data used to analyze climate change are expected to evolve and improve over time. At the time of this Guidance Note, there are still important data and modeling gaps for many countries. Thus, the guidance presented in this section should be seen as a starting point for embedding the impacts of climate change into sovereign risk analysis. Its aim is to offer practical workarounds to handle these issues while more comprehensive information is being collected and additional tools are developed. These may lead to supplementary guidance on how to reflect climate risks in the DSA in the future. In the meantime, SRDSF users should monitor trends in both data availability and analytical methodologies and reflect these in their assessments as appropriate.

Adaptation Sub-Module

130. Climate change adaptation is becoming increasingly embedded in public policy and planning, resulting in significant frontloaded fiscal costs over the next decade and beyond. For climate-vulnerable countries, adapting to climate change by boosting resilience to climate stresses and disasters is a critical priority (Duenwald et al, 2022, Aligishiev, Bellon and Massetti, 2022). Even if the objective of limiting the global average temperature rise to 1.5 degrees Celsius above pre-industrialization levels is achieved, climate change is expected to result in an increase in the magnitude and frequency of extreme weather events and natural disasters across the world (IPCC 2021). While some effects will materialize within one or two decades, they may be felt even more in the longer term.

131. In addition to RSF and debt restructuring cases, use of the adaptation submodule is compulsory for countries that are highly exposed to natural disasters. This includes both (1) the set of countries for which the natural disasters stress test is triggered and (2) a set of countries at high risk from climate change. Countries at high risk from climate change are defined as the top quartile of an Adaptation Ranking Index, which combines information on (i) propensity to natural disasters, from EM-DAT; (ii) climate-related adaptation cost estimates, from Aligishiev, Bellon and Massetti (2022); and (iii) climate-related adaptation risk, measured by a Composite Index calculated with data from the Notre Dame University ND-GAIN Index, the IMF-INFORM index, and the United Nations Institute for Environment and Human Security's World Risk Index (WRI). Both sets of countries will be generated and updated automatically.

132. In this sub-module, 30-year debt and GFN projections are generated reflecting the fiscal cost of adaptation investment and main debt drivers in a standard and a customized scenario. To run the module, users need to input estimates of expected capital expenditures together with long-run assumptions on key debt drivers. These are typically pre-populated in the

[99]The mitigation module can provide a useful cross-check when the authorities' baseline envisages large mitigation-related fiscal costs in restructuring cases. However, such cases will likely additionally require case-by-case analysis and dialogue with the member to ensure that the mitigation plans are efficient.

standard scenario and modified by the user in the customized scenario when better estimates and assumptions are available. Users need to enter a separate underlying primary balance-to-GDP assumption beyond the user's 5-year projection—which by default is held constant over the horizon—that assumes no public adaptation investment beyond the 5-year projection period. Expected adaptation investment costs are entered separately, for the years during which they are expected to be implemented.

133. The standard scenario is prepopulated with IMF adaptation cost estimates and by extrapolating the t+5 values of debt drivers over the remainder of the 30-year projection period. The adaptation cost estimates for individual countries are taken from Aligishiev, Bellon and Massetti, 2022 and focus on two types of adaptation investments: strengthening physical assets and investing in coastal protection.[100] This estimate covers floods, storms, and sea level rise, but does not capture investments needed to protect against other important climate risks, including droughts and heatwaves. For very small countries, estimates could also be less accurate when applying these methodologies due to geographic approximations.

134. The standard scenario captures the benefits of adaptation by assuming that adaptation investment offsets the negative long-term impact of climate change on growth. The evolution of growth over the next 30 years will depend partly on the negative impact of climate change and partly on the offsetting impact of adaptation investment. In its current form, this scenario assumes that growth remains constant at the t+5 level projected by the user over the following 25 years. This reflects the implicit assumption that adaptation investment exactly cancels any negative impact of climate change on growth (except for any impact that may already have been incorporated in the t+5 growth projection).

Table 8. Regional Estimates of Public Adaptation Investment Needs
(in percent of GDP per year)

Region	Adaptation cost	Source
World	0.25	Aligishiev, Bellon, Massetti, 2022
Middle East and central Africa	0.1 - 3.3	Duenwald, et al, 2022
Sub-Saharan Africa	2-3	IMF 2020a (regional outlook)
Latin America and the Caribbean	0.5	ECLAC, 2014
Asia and Pacific	0.85	ESCAP, 2019
East and Northeast Asia	3.8	ESCAP, 2019
Pacific SIDS	1.5	ESCAP, 2019

Source: Fund staff estimates.

135. The customized scenario provides users with the flexibility to incorporate better estimates of the impact of climate change, adaptation investment costs, and financing terms.

[100]Based on these estimates, advanced economies on aggregate may need to spend 0.3 percent of GDP, emerging markets 1.15 percent, and small island MACs 0.4 percent annually on aggregate to strengthen public infrastructure resilience to floods and storms.

Users can make modifications to adaptation investment costs, the long-term growth projections, participation of private sector on adaptation investment, financing sources (e.g., via public debt, grants, international cooperation, etc.), and other factors based on available country-level information and the user's in-depth knowledge of the country's macroeconomic conditions. Assessing the full macro-fiscal impacts of adaptation requires understanding of the economic impact of climate change over the long-term and the effectiveness and cost of adaptation. Long-term analysis would be best conducted with scenarios that account for the cumulative effects of climate change and underpinned by coherent adaptation policy. Going forward, the IMF's Debt, Investment, Growth and Natural Disaster (DIGNAD) model may serve as an important tool to examine the nexus between public investment (including in adaptation) and growth, different financing strategies and fiscal reaction rules, especially for countries exposed to natural disasters.[101] For Fund SRDSAs, staff are encouraged to use DIGNAD-based analysis to supplement the estimates from this submodule as DIGNAD is further developed.

136. Finding good estimates of potential investment costs, other than those from Aligishiev, Bellon and Massetti, 2022 included in the standard scenario, is currently a challenge for many countries. While some estimates are available (see Table 8), comprehensive assessments of national adaptation needs are few and far between. Some available sources (ordered from most to least reliable) are the following:

- *Individual country studies* that quantify adaptation gaps are not yet widely available; however, the number and comprehensiveness of individual country studies is expected to increase over time. When available, users may take estimates of investment costs in adaptation from documents like, former joint IMF-World Bank Climate Change Policy Assessments (CCPA) or a Disaster Resilience Strategy, World Bank Country Climate and Development Reports (CCDR), and IMF Climate Macroeconomic Assessments Programs (CMAPs). Country-specific estimates from regional development banks are also useful references (e.g., see Ahmed and Suphachalasai, 2014 from the Asian Development Bank).

- *If deemed reliable, National Adaptation Plans and/or countries' updated Nationally Determined Contributions (NDCs)***.** NDCs embody efforts by each country to reduce emissions and adapt to the impacts of climate change. The Paris Agreement asks countries to update their NDCs every five years, while the Glasgow Climate Pact in November 2021 called on all countries to revisit and strengthen the targets in their NDCs in 2022. Each new round of updates is expected to ratchet up ambition through steeper emission cuts and more expansive adaptation measures often over a 10-year implementation period and provide an increasingly better source of cost estimates. NDCs are submitted to The United Nations Framework Convention on Climate

[101]In particular, this model captures high rates of return on public capital, either standard or resilient, as well as significant inefficiencies in public investment and absorptive capacity constraints. The model captures the main mechanisms and policy issues of interest for debt sustainability analysis, particularly those associated with the linkages between public adaptation investment, economic growth and debt. The DIGNAD model is a good alternative if the stochastic and recurrent nature of natural disaster shocks are internalized, with impacts on long-term return estimates. However, users are encouraged to evaluate the realism of the assumptions used in this framework. See for an application of the DIGNAD model Cantelmo et al (2019).

Change (UNFCCC) and are recorded in the NDC registry: https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx. Alternatively, the Institute for Global Environmental Strategies (IGES) NDC Database summarizes in a master sheet the main climate pledge from each NDC concerning mitigation and adaptation: https://www.iges.or.jp/en/pub/iges-indc-ndc-database/en.[102] However, NDCs may mix the cost of adaptation and development projects. In addition, because of the role that they play in mobilizing financing, NDCs may over-estimate investment needs.

- *Alternative investment cost proxies* can be obtained based on those submitted by similar MACs as part of their NDCs. To this end, the IMF climate INFORM risk index is a useful starting point for identifying appropriate comparators.[103] In particular, proxies can be obtained by using the median NDC adaptation investment cost in a sub-sample of MACs (excluding small developing states) with the same climate INFORM risk category. These values are 1.3 percent of GDP for relatively low climate risk countries (INFORM score between 2-4); 1.6 for medium climate risk countries (INFORM score between 4-6). Since most MACs are classified as low or medium climate risk (INFORM score between 2-6), this approach will ensure broad coverage.[104] For MACs facing very low climate risk, the income group estimate for AE of 0.3% GDP per year from the previous bullet could be implemented when users assess some adaptation is needed. Although none of these very low climate risk vulnerability MACs have specified the investment cost as part of their NDCs, this estimate can serve as an indicative amount for modeling purposes.[105, 106]

Mitigation Sub-Module

137. The sub-module on mitigation costs captures the impact on debt sustainability of the upfront investment estimated to be needed to ensure a transition to a low carbon economy

[102]As of end-2021, 15 MACs have provided financial needs associated with their NDCs: Seychelles, Mauritius, Tunisia, Turkmenistan, Dominican Republic, Georgia, Mongolia, Equatorial Guinea, Morocco, Belize, Iran, Angola, Namibia, India, and Vietnam. Annual adaptation costs range in terms of annual GDP range from 1.2% of GDP to 24% of GDP per year. This excludes outliers, Angola, with its implementation timeframe of 5 years, compared to the standard 10-year horizon, and Belize, which is revising its NDCs.

[103]The climate-driven INFORM risk index is an adaptation of the INFORM Risk Index, a global, open-source risk assessment for humanitarian crises and disasters, adjusted by IMF staff to distill and centralize on climate-driven risks. It has three dimensions: climate-driven hazard and exposure, vulnerability (in terms of socio-economic groups and vulnerable groups) and lack of coping capacity (institutional and infrastructure). The degree of climate risk by country can be found at the IMF's climate change dashboard: https://climatedata.imf.org/pages/fi-indicators.

[104]At the time of this Guidance Note, only one market-access country had a 2021 Climate INFORM risk index above 6, which limits the application of this approach to relatively higher climate risk groups. However, if the evolution of this indicator were to result in more countries exceeding this level, then this approach could become relevant for this group of countries.

[105]Seychelles excluded, which is classified as a very low climate risk country by the IMF climate INFORM index, but as a small island faces specific climate threats over the longer-term that are not representative for other MACs.

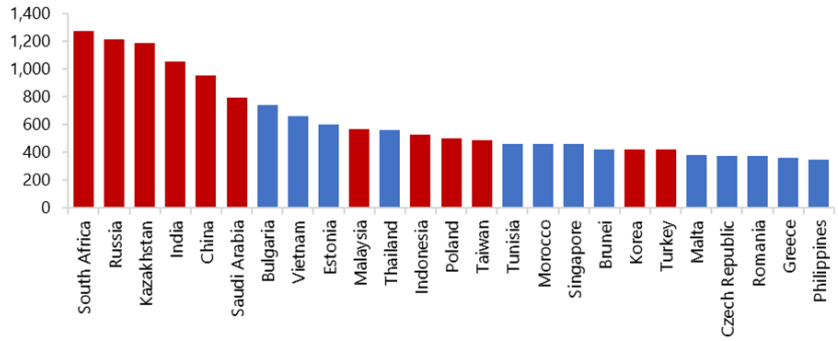
[106]For these calculations, staff could consider different options of available adaptation indices, such as the Notre Dame Global Adaptation Index (ND-GAIN), the United Nations Institute for Environment and Human Security's World Risk Index (WRI), and the Fuzzy Assessment of Climate Security (FACS) by Phillis et al (2018). As explained in Dabla-Norris et al (2021), those indices and their components are well correlated but could differ for some countries. Alternative methodologies to estimate adaptation costs are in Gaspar et al. (2019) and Tiedemann et al (2021).

over a 30-year horizon. A market shift to clean energy production might require non-negligible upfront investment in green technology and infrastructure to support the green transition by complementing carbon pricing and other measures. While revenues from carbon taxation (or emission trading schemes) could be recycled into subsidies and/or transfers targeted to the most vulnerable, upfront investments are generally needed to complement carbon taxation measures to help trigger a timely shift in existing investment from the high-carbon intensive sectors to the low-carbon intensive sectors, create new opportunities and mitigate adverse short-term effects on consumption, or on GDP growth from the shrinkage in carbon-intensive sectors. Reflecting these considerations, this sub-module estimates the impact on public debt-related risks of the necessary upfront investment in main sectors of the economy, if made with public funds.

138. Aside from RST cases, use of the mitigation submodule is required for all countries with an ambitious zero net carbon emission target, as well as for the 25 largest CO_2 emitters per unit of output, even they are yet to set an emissions target. The first criterion covers all countries targeting zero net carbon emission before 2050. Using this module provides an opportunity to analyze transition risks from policy commitments that may involve undertaking large upfront investments. The second criterion refers to the 25 countries that have the highest mitigation needs per unit of output, and hence are likely to have the highest mitigation-related public investment needs (Figure 25). This includes some, but not all of the largest emitters in absolute terms.

Figure 25. Metric tons (Mt) CO2 Emissions from Fuel Combustion per Unit of Output, 2015

25 largest emitters per unit of output
(Weighted average by IOT industry output)



Sources: IMF Climate Change Indicators Dashboard, OECD IOT industries database.

Note1: Countries in red are countries that are also among the 25 largest emitters in total emissions. The list of the largest 25 total GHG emitters is taken from the Global Carbon Project. https://www.globalcarbonproject.org/.

Note 2: Iran is not included in the figures due to unavailable information on CO2 emissions from fuel combustion per unit of output.

139. Just like the adaptation submodule, the mitigation submodule includes a standard scenario and a customized scenario. The standard scenario is prepopulated with public investment estimates for mitigation based on data reported by European economies and the t+5 values of the debt drivers extended through t+30. These are estimates of upfront investment needs for a 10 to

15-year period to meet the zero net carbon emission climate objective by 2050, by addressing the carbon footprint of these sectors (Figure 26):[107]

- Industry / Energy sector / Electricity generation
- Transport / Mobility
- Agriculture and land use
- Buildings / Build-up environment

For the country under analysis, these investment needs are scaled to reflect the carbon intensity of that country's national industries. These data are available from the IMF Climate Change Indicators Dashboard indicator of CO2 emissions from fuel combustion per unit of output using the IOT industries data and are aggregated in four main sectors:[108]

- Energy / Manufacturing industries
- Transport
- Agriculture, Forestry and Other Land Use
- All remaining sectors in the IOT

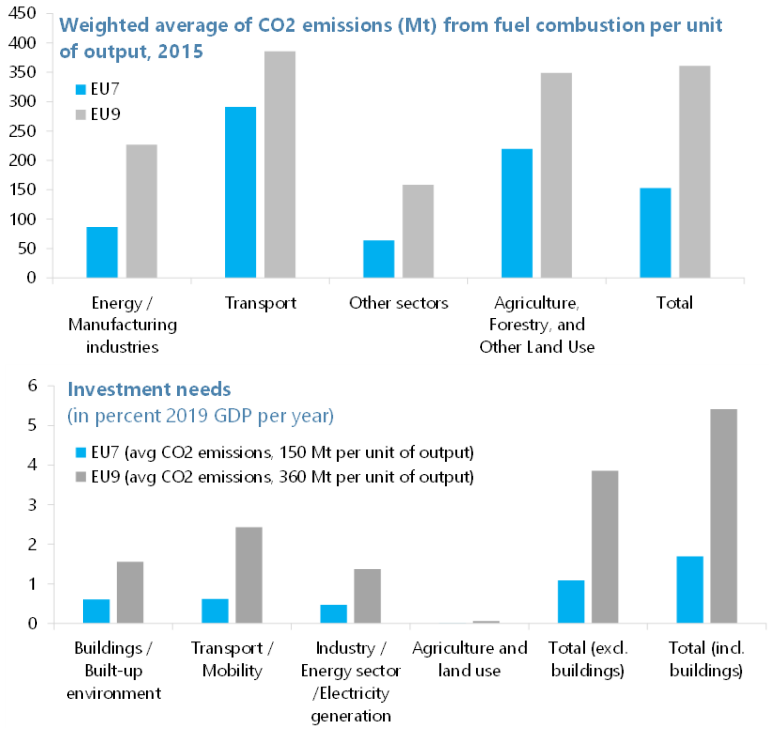
Then, the final proxy of investment needs per year for each country can be obtained by taking the investment cost per 100 Mt of CO_2 emissions in each of the four aggregated sectors (Figure 28),[109] using the EU data presented in Figure 26, and the average CO_2 emissions per unit of output in those respective sectors in the country of interest. Using these data, sectoral investment needs proportionate to the scale of CO_2 emissions can be calculated sector-by-sector by multiplying the EU's investment cost estimates by the Dashboard's average emissions in the country being examined. Then, the individual sectoral investment needs can be aggregated into a proxy of the economy-wide total investment need by calculating an average of the sectoral investment needs, with each sector weighted by its share in total output.

[107]Investment needs reported to the European Commission for a 10-year period with the National Energy and Climate Plans (NECPs). National energy and climate plans | European Commission (europa.eu).

[108]The four main sectors aggregate take the IOT industries from the IMF Climate Change Indicators Dashboard and weigh each sector by its output share in total output. Climate Change Indicators Dashboard (climatedata.imf.org).

[109]The mapping from the IOT industries classification used by the IMF Climate Change Indicators Dashboard into the four aggregated sectors, and their relative size in total output is provided in the template. Energy industries are considered together with manufacturing industries in one aggregated sector for the purpose of calculating investment costs per 100 Mt of CO_2 emissions per unit of output, as the investment needs data was not available at the IOT industries disaggregated level.

Figure 26. Average Mt CO2 Emissions per Unit of Output vs. Investment Needs



Sources: IMF Climate Change Indicators Dashboard, OECD IOT industries output data, investment needs data from EU National Energy and Climate Plans, as reported and reviewed by the European Commission. National energy and climate plans | European Commission (europa.eu).

Figure 26 illustrates the EU countries' reported data on sectoral differences in investment needs per year (in percent of output) given such an estimate of the carbon intensity of the EU national economy structure (Figure 26).[110] Due to limitations in the number of data points simple averages among two homogenous groups of countries (EU7, EU9) in terms of emissions per unit of output were considered for this exercise.[111] A EU7 country with an average CO_2 emissions of 150 Mt per unit of output would need upfront investment of about 1 percent of GDP per year, while a EU9 country with an average CO_2 emission of 360 Mt per unit of output would need close to 4 percent of GDP per year (when excluding the buildings sector).[112]

[110]These estimates of upfront investments hold under the assumption that there are similar complementary measures to reduce GHG emissions as in the EU such as the existence of a carbon market (i.e. an emission trading scheme), and other regulatory type of measures such as EU Land Use, Land-use Change and Forestry (LULUCF) Regulation.

[111]Complete investment needs data is available for 16 EU countries. EU7 refers to the average of EU countries having in 2015 below 200 Mt CO2 emissions per unit of output (Austria, Belgium, Germany, France, The Netherlands, Italy and Slovenia). EU9 refers to the average of EU countries having in 2015 above 200 Mt CO2 emissions per unit of output (Greece, Portugal, Spain, Czech Republic, Hungary, Poland, Romania, Slovakia and Bulgaria).

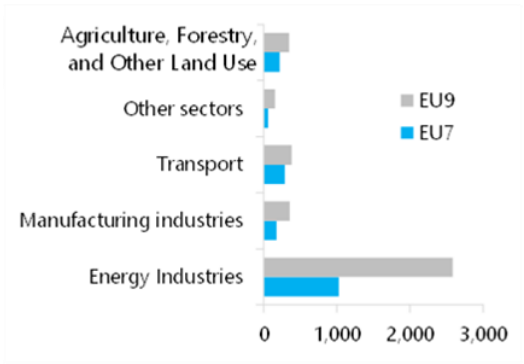
[112]The investment in buildings and built-up environment data do not distinguish between normal maintenance investment and additional green investment, and therefore, it was excluded when estimating the proxy for total investment needs per year in Figure 29. However, for illustrative purposes, we also present the reported data by European economies in Figure 26, right panel, and the respective investment cost including the building sector in Figure 28, right panel.

140. Other considerations may also be relevant when judging potential investment needs, as extrapolating European data to other countries is subject to several caveats:

- Energy industries have the highest CO_2 emissions per unit of output in all countries, however, their share in total output in the EU is generally small—between 3 and 5 percent in EU countries—and therefore, in the EU they are tackled through market mechanisms such as the EU Emissions Trading System to reduce greenhouse gas emissions more cost-efficiently.

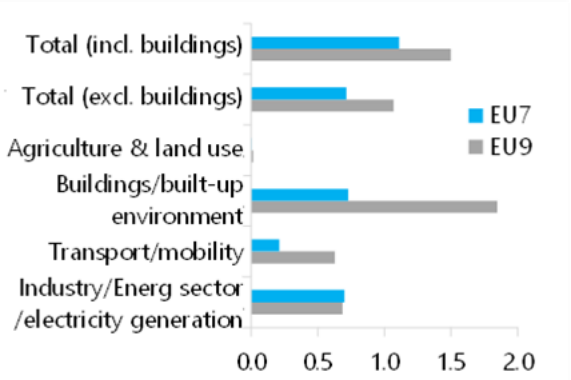
- Advanced economies, such as the EU7, may already benefit from high infrastructure and network quality, and therefore, might have lower costs in sectors such as transport / mobility, or greening of buildings and the environment (as in Figure 28). However, for most countries the green investments will take the form of imported capital goods, with low labor intensity.

Figure 27. Weighted Average of CO2 Emission (Mt) per Unit of Output, 2015



Source: Fund staff calculations.

Figure 28. Investment Cost per 100 Mt of CO2 Emissions: EU9 vs EU7 by Main Aggregate Sector



Source: Fund staff calculations.

Note: the total cost per 100 Mt of CO_2 emissions in total economy is a weighted average, where the weights are the shares of each sector in total output.

141. The default settings can be customized given country-specific characteristics in the customized scenario. The default scenario considers the extended baseline, as described in paragraph 2, the estimated proxy on public investment needs per year from Figure 29, and the off-setting factors on the GDP growth and fiscal revenues described in paragraph 14. This will be automatically generated in the template. Figure 29 shows the upfront investment needs per year estimates for the countries in the IMF Climate Change Indicators Dashboard with average emissions above 200 Mt by applying the same investment costs as in the EU9 per 100 Mt of CO_2 emissions from fuel combustion, given the carbon intensity of their economic structure, and assuming a climate objective of reaching zero carbon net emissions by 2050 as in the EU.[113] In the customized

[113]The Figure 29 estimates are obtained under the assumption that all upfront investment needs are publicly funded. Thus, in general, the proxy would give an upper bound for public investment needs per year. A larger private sector participation and /or a stronger assumption on the ability of carbon taxation to timely shift existing investment from

(continued)

scenario, users should consider calibrating, based on country-specific characteristics, the following assumptions:

a. *Investments needs per year*. Users should consider whether there is a different carbon intensity of the economic structure, as given by the Climate Change Dashboard indicator and/or a different climate objective for reaching zero net carbon emissions (for example, a longer time horizon, which would lead to a smoother investment profile). In a few countries, the authorities have conducted comprehensive studies on climate mitigation investment needs over the next 10 to 15 years to meet their climate objectives, which users could alternatively use

b. *The share of investment financed through government debt, consider the financing mix available other than government debt financing, either through private sector participation, or higher share of concessional lending / foreign aid from international cooperation, which would mitigate the impact on debt ratio and GFNs. The default scenario assumes fully government debt financing, and hence, gives an upper bound of the potential impact on debt ratio and GFNs.*

c. *GDP effects and fiscal revenues.* The default scenario assumes short-term adverse output effects are offset by the benefits of green investment, and these complement a policy mix in terms of carbon taxation/subsidies which is budgetary neutral. Users could depart from this assumption using results from other available tools, such as the CPAT model developed by FAD to adjust the GDP and the primary balance path.

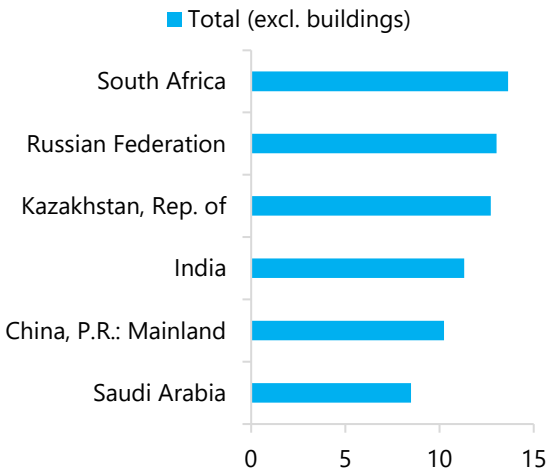
   When investment data is available, users should use the reported data on investment to customize the default settings, including the share of privately financed investment. Alternatively, for Fund SRDSAs when this module is relevant (countries exposed to transition risks as in Figure 25, paragraph 138) but there is insufficient data on emissions, then staff should discuss the missing data in the long-term assessment, noting what would be needed to strengthen information collection over a reasonable period so that the module could be run in the future.

high-carbon intensive sectors to low-carbon intensive sectors would lead to much lower estimates of public investment needs per year. For example, the G20 note on "Reaching net zero emissions" prepared by IMF staff finds additional global public investment needs are 0.27 percent of annual global GDP G20: REACHING NET ZERO EMISSIONS (imf.org). Given the uncertainty surrounding these estimates, for the purpose of this sub-module, which is to provide additional country-specific risk analysis to inform judgement, the tool provides a range of possible outcomes and guides among these possible outcomes.

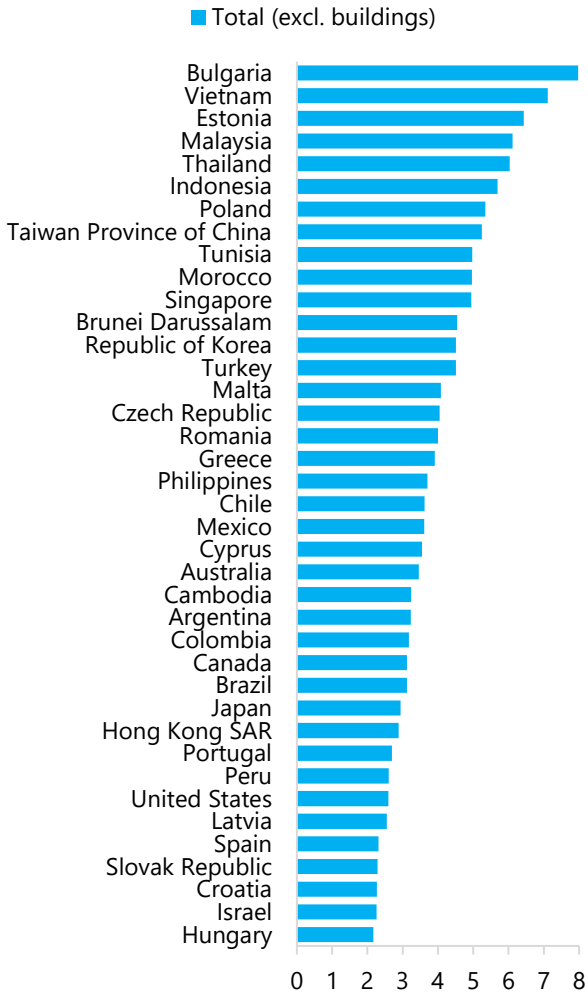
Figure 29. Investment Cost per Year for a 10-year Horizon

(Climate objective reached by 2050)

Top 6 Countries with CO_2 Emissions from Fuel Combustion > 560 Mt



Countries with CO_2 Emissions from Fuel Combustion > 200 Mt and < 750 Mt



Source: Fund staff calculations.

Note. For countries where the share of energy industries is higher than 5 percent of GDP (e.g., in oil-producing countries such Saudi Arabia, Russian Federation) the investment needs are underestimated (e.g., due to lack of data on needed complementary measures such as emission trading schemes, Land Use, Land-Use Change and Forestry (LULUCF) sector).

SECTION VIII. BOTTOM-LINE ASSESSMENTS ON RISKS OF SOVEREIGN STRESS AND DEBT SUSTAINABILITY

A. Overall Risk of Sovereign Stress Assessments

142. SRDSAs should include an assessment of the overall risk of sovereign stress that synthesizes staff's judgment across all horizons in the framework Staff should be guided by the following considerations for determining the overall signal for risk of sovereign stress:

- To be consistent with the underlying horizon-based assessments, any overall signal should lie within the range of final signals at the various horizons.
- If a signal (for example, moderate risk) appeared more often than others across horizons (hence, constituting the "mode" of the distribution of signals), strong reasons would need to be given for a different overall assessment.
- When weighing the relative influence of each horizon to the overall signal, staff should consider key factors like (i) the degree of confidence in the results in each horizon, where more uncertainty would lead to less emphasis; (ii) the existence of time to take feasible corrective actions to avoid risks at later horizons; and (iii) whether risks are lessening or growing over time, including if the medium-term debt trajectory is expected to stabilize.

143. Communication of the risk assessment should be clear that sovereign stress is a broad concept and does not constitute a debt sustainability assessment. As noted in paragraph 4, Sovereign stress refers to a range of potential events, many of which (like financing gaps resolved through Fund-supported programs, jumps in spreads, and loss of market access) can be resolved through some combination of financing and adjustment. Thus, deriving a sustainability assessment entails an additional set of analyses and considerations, which are the subject of the next section.

B. Debt Sustainability Assessments

144. When assessing debt sustainability for Fund SRDSAs, staff should follow the definition approved by the IMF's Executive Board:

"In general terms, public debt can be regarded as sustainable when the primary balance needed to at least stabilize 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 level." (IMF, 2021a).

When interpreting this definition, staff should note that:

- Debt sustainability depends on both solvency (debt stabilization) and liquidity (rollover risk). This fact helps circumvent the difficulties in disentangling solvency and liquidity problems in practice.

It also suits the Fund's operational requirements of using debt sustainability as an indicator of a member's capacity to repay the Fund, as this could be imperiled by either insolvency or a lack of liquidity, particularly if the latter is persistent.

- Debt may be sustainable even if the baseline projection for the primary balance does not stabilize the debt path, so long as economically and politically feasible adjustment measures can be implemented to deliver primary balances consistent with debt stabilization with acceptable rollover risks.

- Determining the economic and political feasibility of delivering a debt-stabilizing primary balance often involves judgment. Many considerations can be relevant for this appraisal and can include a country's track record, cross-country comparisons, legal requirements, and prospects for successfully ratifying potentially sensitive adjustment measures (including the government's mandate to deliver potentially controversial reforms). In general, if potential adjustments are not consistent with several of these realism benchmarks, then it would be unlikely that they are economically or politically feasible.

145. Debt sustainability assessments can be further expressed in probabilistic terms. Any sustainable assessment should be associated with at least a 50 percent probability. Meeting this condition assures that at a minimum, debt is as likely to be sustainable as not. Since an unsustainable assessment could trigger a debt restructuring, this cutoff achieves a balance between avoiding unnecessary restructurings and avoiding labeling a situation as sustainable when it likely is not. When debt is sustainable, a further distinction can be drawn for whether this assessment prevails with high probability or not. For the Fund's purposes, high probability of sustainable debt should refer to a situation when debt is assessed to be sustainable with at least 80 percent probability (see IMF 2021a, paragraph 73). As a complement, this cutoff implies that an unsustainable debt event would occur with less than 20 percent probability, making it a fairly unlikely event.

146. The near- and medium-term risk tools, with some modifications, can be used to derive probabilistic sustainability assessments. The near- and medium-term tools can be used to provide a mechanical assessment of debt sustainability that is consistent with the debt stabilization and rollover risk provisions of the sustainability definition described above (Figure 30). Specifically, the signal is derived as follows:

- *Sustainability logit model*: Since sustainability assessments must be performed for programs, which are themselves stress events, the early warning system model used for the near-term risk assessment is no longer informative. Instead, a separate crisis prediction logit model calibrated on past episodes of unstainable debt—rather than on sovereign stress—estimates the

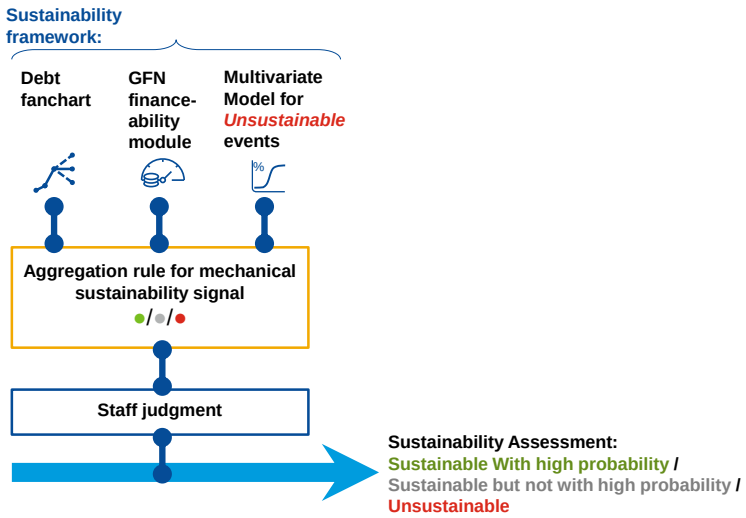
probability of unsustainable debt over a 1-4 year horizon (including defaults and debt restructurings) rather than just stress events.[114] This internal model is available only to Fund staff.

- *Debt fanchart:* The debt fanchart index (DFI) quantifies prospects for medium-term debt stabilization. Its calculation is unchanged from the metric used for sovereign stress analysis.

- *GFN module*: The GFN financeability index (GFI), used as a metric of rollover risk, also does not require any reformulation. However, it is critical that the baseline reflects all components of program financing (including prospective Fund disbursements) when assessing sustainability in program cases.

- *Signal on debt sustainability*: The fitted probability of unsustainable debt, the DFI, and the GFI are combined into a numerical sustainability index, which can be compared against thresholds to derive the mechanical sustainability assessment. These thresholds are calibrated on past instances of unsustainable debt and have been set such that sustainable assessments are associated with at least 50 percent probability and "sustainable with high probability" assessments are associated with a probability of an unsustainable event of less than 20 percent, as described above.

Figure 30. Debt Sustainability Framework



Source: IMF.

147. Staff judgement, validated through the review process, is a further critical input to the sustainability assessment for all Fund SRDSAs. As with the risk framework, no standardized tool can fully capture all considerations with perfect reliability. When the mechanical result is not intuitive due to such issues, staff should use a judgment-based final assessment rather than adjusting projections and/or the mechanical tools. Judgment can differ in either direction from the mechanical

[114]For the purposes of this estimation, as well as the calibration of the index thresholds that determine the mechanical sustainability signal, unsustainable events are assumed to be defaults, debt restructurings, hyperinflations or large transfers.

signal on debt sustainability and with respect to both sustainability and high probability components. While there is no exhaustive list on considerations that could underpin an application of judgment, staff should pay particular attention to:

- *Borderline results*: When metrics are close to a limit, close attention is needed to evaluate that they are sensible and to ensure that there are good prospects for maintaining the assessment even if small shocks occur.

- *Conflicting results across the standardized tools*: In such cases, it is important to explore the reasons for the disagreement. After this scrutiny, staff should evaluate the reasons and explore whether certain signals are more credible than others. If such a case exists, then a judgment-based assessment that places heavier emphasis on the results assessed as more reliable is warranted.

- *Distorted variables*: Developments within a country may impact inputs to the modules in ways that lead to faulty results on sustainability. Ordinarily these impacts would be temporary, tied to a clear reason, and be neutral with respect to whether public debt is manageable or not.[115]

- *Omitted factors*: Specific mitigating or aggravating conditions should be brought into the analysis when relevant—for example, when captured by the triggered stress tests and long-term modules. In particular, if debt is mechanically assessed as sustainable with a high probability and a stress test or long-term module (i) reveals substantial debt vulnerabilities, including that debt would become explosive/unsustainable and (ii) that shock was assessed as having a high likelihood of materialization (e.g., 30-50 percent),[116] then it would generally be appropriate to use judgement to revise the sustainability assessment to sustainable but not with high probability. A parallel downgrade from sustainable but not with high probability to unsustainable is expected to be rare, however. Making such an adjustment would require users to demonstrate that although the baseline (representing the mode of the distribution) is the most likely outcome, the distribution of risks is strongly weighted to the downside, so that outcomes worse than indicated by the (unsustainable) stress test/long-term module scenarios have more than a 50 percent probability of materializing.

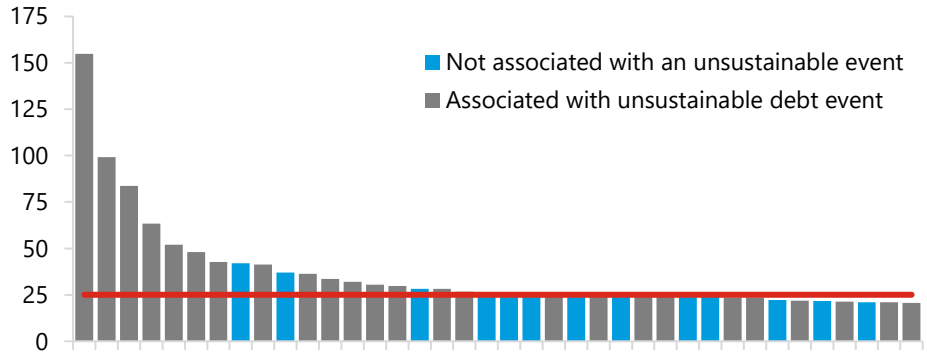
- *A country's track record*: If the mechanical framework delivers a pattern of false alarms or missed crises for a country, this may suggest the existence of a factor that the standardized framework cannot fully capture. However, in these cases, it would be important that staff verifies that there are no changes in the underlying circumstances, so that the track record is expected to remain relevant in the future.

[115]For example, distortions could arise from efforts to correct legacy issues, both in statistical methodologies or transactions related to regularizing outstanding claims (which could raise public debt or GFN levels). If these issues have existed without causing sustainability concerns in the past and are expected to be manageable in the future, then distortions beginning to reflect them in fiscal and debt statistics should not affect the sustainability assessment.

[116]A unsustainable debt scenario having greater than 20 percent probability of materializing would be inconsistent with the criteria for sustainable with high probability assessments, which sets a cutoff at this level.

- *Clear signals that public debt has become unmanageable*: In these cases, debt should be assessed as unsustainable regardless of the mechanical tools' results. Key indications of unmanageable debt would include looming defaults in the near term (e.g., due to a lack of financing to make repayments, signs of creditors' unwillingness to roll over claims, and resistance/inability to implement fiscal adjustment or achieve urgent financing from the official sector); announcements of an intention to restructure debt;[117] defaults or other emergence of arrears of a magnitude that constitutes a default in the SRDSF's event definitions; and sudden, severe explosions of debt that are caused by economic crisis and not the implementation of planned fiscal policies (>25 percent of GDP in one year).

Figure 31. Large One-Year Increases in Public Debt in MACs
(Level difference in debt-to-GDP ratio; 1990-2019)



Source: World Economic Outlook and Fund staff estimates.

148. For DSAs prepared under Fund arrangements, a clear bottom-line debt sustainability assessment that incorporates the mechanical analysis and any judgment is a requirement. This assessment is needed to verify that the prerequisite of sustainable debt has been met, consistent with the requirement of the Articles of Agreement that use of Fund resources requires adequate safeguards. However, the formulation of the sustainability assessment differs based on the type of arrangement:

- *For all Fund arrangements and emergency financing requests, regardless of access*: Since the methodology by which the Fund makes its sustainability (and thus lending) decisions is potentially market-sensitive, the precise aggregation method and the index cutoffs determining the three signals are strictly confidential and must remain internal to the Fund. Nondisclosure also helps to avoid noise and disruptive reactions that undermine the design of Fund-supported programs, particularly if judgment is needed to complement the mechanical framework. Instead, staff should synthesize the overall intuition from the mechanical tools and any judgment factors used into a concise descriptive statement. Reflecting the flexibility allowed for staff judgment, there are no prescriptive requirements, though as with the other aspects of the SRDSA, it is

[117]However, excluded from this criterion are cases where a country can extinguish debt obligations in full, but where a restructuring is nevertheless announced. Such cases would include, for example, strategic defaults, payments disputes/blockages, or goodwill gestures on the part of the creditor.

subject to the interdepartmental review process. However, staff's sustainability statement should clearly note the overall assessment on debt sustainability and provides a justification for it.

- *For arrangements and emergency financing requests that involve normal or no access to Fund resources*: The concise descriptive statement in the SRDSA that accompanies the staff report to the Board should clearly note whether debt is (i) sustainable with high probability; (ii) sustainable but not with high probability; or (iii) unsustainable. For publication, the distinction between sustainable with high probability and sustainable but not with high probability should be removed, as allowed under the Transparency Policy.[118] Thus, assessments of type (i) or (ii) should be replaced with a simple statement that debt is assessed as sustainable.

- *Arrangements and emergency financing requests that entail exceptional access*: The requirements of the second criterion of the Exceptional Access Policy (EA-2) are anchored by the high probability component of the debt sustainability assessment. Hence, when debt is sustainable, the "high probability" component of the sustainability assessment must also be disclosed to the Board and retained in the publication version of the staff report in order to justify the application of the policy. There is therefore no need for a deletion/modification to the versions of the staff report that are issued to the Board and published publicly.

149. In certain circumstances, including arrangements treated as precautionary, sustainability assessments may need to be informed by a scenario that assumes that Fund resources are drawn as well as the baseline. Such additional analysis is required in the following three settings:

- in exceptional access cases, where the sustainability assessment needs to be based on the drawing scenario;[119]

- if shocks that may trigger a drawing are not adequately captured by the medium-term (fanchart and GFN) modules. This situation would arise in cases where the shocks in the drawing scenario have not arisen at a comparable magnitude in the country's historical sample used to run the tools; or

- when review departments have doubts about the realism of the DSA baseline that cannot be resolved through discussions with the country team. This would typically provide additional information to Management when they are called upon to weigh in on the disagreement between departments.

If any of these criteria are applicable (including for precautionary SBAs as well as PLL arrangements) as debt sustainability assessment will need to be undertaken based on the adverse scenario that

[118]See SM/22/118, Revision 1

[119]Exceptional access cases are to be understood as referring to exceptional access arrangements, which under current Fund policies, excludes FCLs and SLLs.

justifies the level of access.[120] This scenario would entail a full draw of the Fund credit (treating the IMF's claims as part of public debt and which may correspond to an overall increase in debt, where the effect of higher debt on the risk signals could be mitigated by any effect of higher buffers arising from the drawing) and would need to be sufficiently specified to serve as an input to the DSA. This additional scrutiny will indicate whether debt is sustainable in the event downside shocks materialize and Fund credit is drawn.[121]

150. Sustainability assessments in SRDSAs prepared for surveillance-only countries are optional and are expected to be undertaken only in special circumstances. Baseline projections in surveillance-only contexts reflect the policies that are most likely to be implemented. Thus, the baseline may not incorporate adjustment policies if none are planned. Clearly, when the projected debt trajectory stabilizes and rollover risks are low with minimal or no adjustment, then debt is sustainable. However, there may be surveillance cases where an upward debt path and/or high rollover risks may occur and debt sustainability is ambiguous. A clear determination may require further scrutiny, and staff may opt to perform additional analysis as follows:

- *Developing an alternative scenario*: This scenario should include reform measures representing the maximum possible effort. When articulating the scenario, the realism of successful implementation of the underlying policies will be a central issue. Users should employ a wide range of inputs to evaluate the plausibility of the alternative adjustment scenario, including diagnostics in the realism tools, the experience of the country or relevant peers, the authorities' commitments, and any relevant constraints.

- *Running the debt sustainability tools for the alternative scenario*: The same procedure for programs, outlined in paragraph 146, should be run for this scenario, as though it was a program baseline. This process provides the three-way mechanical signal on debt sustainability.

- *Apply any judgment*: There is no presumption that final assessment must align with the mechanical signal. The considerations outlined above (paragraph 147), remain relevant for this exercise, and should be applied to the final assessment if appropriate and in a manner parallel to a program engagement with the Fund.

- *Prepare outputs*: While the summary table should report the mechanical and final sustainability assessments, care should be taken to avoid confusing the alternative scenario with the baseline in the SRDSA. To minimize risks of misunderstandings, all the standard reporting for the SRDSA should solely focus on the (no adjustment) baseline. Then, a self-contained final element should be added to the SRDSA reporting (i) a description of the scenario; (ii) a table showing the paths for debt, GFNs, and major economic variables; and (iii) the standard outputs for the Debt

[120]The guidance in this paragraph does not introduce any change to existing FCL or SLL policy, which is currently under review at the time of this guidance note's publication. This review may address the question of whether to subject drawing scenarios in FCL or SLL arrangements to SRDSF tools.

[121]There would generally be a high presumption of meaningful fiscal/debt impacts if adverse shocks arose that led to a drawing of Fund resources, including from a substantial change in the financing mix.

Fanchart and GFN Modules. This practice ensures a similar reporting as in sustainability assessments performed for programs. However, when preparing outputs, Fund staff should be aware of the requirements for deletions of certain SRDSA elements under the Transparency Policy (paragraph 154, below).

In practice, it will often be difficult to identify what policies are feasible outside of a Fund-supported program (where the policy package reflects the result of a negotiation). Thus, users should weigh the benefit of a clear statement on sustainability against the costs of errors in a sensitive exercise that might be subject to an elevated level of uncertainty. Users should be aware that in high-vulnerability countries that remain current on their obligations, have not definitively lost market access, and may soon request a program, a detailed unsustainable debt assessment using this approach could trigger loss of market access. It could also lead to premature disclosures of authorities' adjustment policies under the program. If these were to occur, it could complicate the restoration of debt sustainability and the design of the program. As a result, the costs of adding volatility in these settings would be very high and it is expected that these detailed optional assessments would be performed only rarely and for strong reasons. In cases where a detailed disclosure would be counterproductive, but users view the inclusion of a bottom-line assessment as appropriate, they may choose to add a more qualitative bottom-line assessment on debt sustainability in the accompanying SRDSA commentary.

151. When debt is unsustainable and country authorities have decided on a debt restructuring, the SRDSF tools should inform the determination of targets for debt relief. Because the medium-term tools link naturally with the sustainability definition, they do not require major modification in order to provide information about the magnitude of required debt relief. However, it would be generally appropriate to use a longer (10-year) horizon, which is common in restructurings. This 10-year baseline should include the costs associated with essential adaptation investments to respond to climate change, as recorded in the customized version of the adaptation sub-module discussed in Section VII.E. GFN targets, derived from the GFN module, are a convenient starting point to verify that the resulting financing needs after the restructuring are indeed manageable, including under adverse circumstances. Subsequently, a post-restructuring debt trajectory can be readily derived from the new debt structure that would attain the GFN targets. The new debt trajectory would then be analyzed through the debt fanchart module to assure that there is an appropriately high probability of debt stabilization. If this is the case, the debt trajectory can be used to set an additional target for the future debt level (along with the GFNs); otherwise, the debt relief envelope would need to be adjusted accordingly until both the GFN module and the fanchart module signal sustainability. Judgment and complementary targets to address specific country vulnerabilities should also inform the targets, when warranted. Consideration should also be given to any issues that might arise from the transition back to the standard SRDSF methodology once the restructuring concludes. The targets derived according to the SRDSF are in line with the Fund's usual role in restructurings to define the needed envelope of debt relief to restore sustainability. However, specific restructuring decisions will remain the responsibility of country authorities, in consultation with their legal and financial advisors.

SECTION IX. DSA REQUIREMENTS AND PUBLICATION

152. SRDSAs are required under the following circumstances: For surveillance cases, the SRDSA is a critical input to the Article IV consultation and the SRDSA should be included in the corresponding policy notes and staff reports. Thus, the SRDSA would be updated at roughly an annual frequency. All requests for IMF financing must be accompanied by an SRDSA. Thereafter, for normal-access Fund arrangements, a SRDSA should be included annually, unless major changes to a country's circumstances/outlook warrant an updated assessment because the most recent investment is no longer informative for assessing debt as sustainable. When a program review is combined with an Article IV consultation, an updated SRDSA should be included regardless of the last SRDSA's date. In programs that involve exceptional access, the SRDSA needs to be updated at every program review, in order to verify compliance with the exceptional access criteria.

153. SRDSAs consist of a set of standardized reporting outputs. The reporting charts and tables in the SRDSF clearly report much of the information that typically went in the prior MAC DSA's write-up. Thus, write-up requirements have been streamlined to just a summary chapeau paragraph and any commentary that staff deem relevant, which can be entered in dedicated sections of each of the standard figures/tables. With this in mind, a SRDSA should consist of these elements:

- *An overall summary* consisting of a standard summary table and the chapeau summarizing the key points of interest:

    - The summary table should report: (i) the mechanical and final risk signals at each horizon; (ii) the mechanical signals from the debt fanchart and GFN modules; (iii) any triggered stress tests; (iv) the sustainability assessment;[122] and (v) a statement on whether debt stabilizes in the baseline. For Fund SRDSAs, staff can also add any relevant commentary to the table, especially noting any use of judgment in any row of the table where the mechanical signal differs from the final assessment.

    - A summary assessment in the form of a chapeau paragraph beneath the table that serves as a concise summary of key points of interest. Typically, staff would report the overall assessment of risks and the considerations that support that determination here. When a sustainability assessment is included in the SRDSA, the intuition behind that result (but not the mechanical sustainability assessment) should also be mentioned. Beyond those elements, there is considerable flexibility, but key points of interest that staff could choose to report may include: (i) the final and mechanical risk assessments at the various horizons; (ii) the reasons for any use of judgment (if relevant); (iii) the adequacy of debt coverage, especially if there are major data gaps; (iv) the evolution of debt/GFN indicators and key

[122]In surveillance-only cases where optional sustainability assessments are not provided, this field should be set to "not applicable".

elements of the macro framework including realism; and (v) other relevant risks or mitigating factors outside the analysis that staff wishes to flag.

- *Debt disclosures* reporting key metadata on public debt statistics and details of any consolidations performed to net out any cross-holdings in the various units contained within the SRDSA's debt perimeter (typically general government).

- *Debt profile figures* that illustrate the structure of public debt by (i) currency; (ii) holders; (iii) governing law (foreign or domestic-law); (iv) marketability; and (v) maturity. When necessary, a narrower perimeter than general government can be used for some of these indicators

- *A summary of the baseline scenario* that reports (i) public debt; (ii) contributions to the change in public debt by component (in both tabular and graphical form); (iii) GFNs by component; and (iv) other key macroeconomic variables.

- *The output of the realism tools,* consisting of a panel figure of all the various tools.

- *The mechanical output of the near-term assessment* (if applicable) consisting of a summary table reporting the logit stress probability and contributions to its change by category of regressors and a figure showing the evolution of the logit stress probability vis-à-vis the thresholds.

- *The mechanical outputs of medium-term assessment tools* would consist of the (i) final debt fanchart; (ii) figures illustrating the GFNs analyzed by the GFN Module; (ii) charts illustrating the components of the DFI and GFI, with a comparison to relevant peers; and (iv) a summary figure illustrating the evolution of medium-term index against thresholds.

- *The outputs of long-term modules if they are used*.

154. For Fund documents subject to the IMF's Transparency Policy, certain elements of SRDSAs may require deletion prior to publication.[123] [124]When the country document is sent to SPR for clearance after review department comments have been incorporated, staff should include both the SRDSA that is to be presented to the Board and a version of the SRDSA showing how the required deletions would be implemented before publication. After the country document is circulated to the Board, these deletions would also need to be submitted through the Transparency Portal, like any other deletion to Board documents.

- *Near-term assessment* (when included with the SRDSA): In line with the IMF Executive Board's decision in January 2021,[125] no elements of the near-term assessment are to be published prior

[123]Stand-alone DSAs prepared by Fund staff are not subject to the Transparency Policy. Decisions on publication and modifications prior to publication are decided on a case-by-case basis by the Executive Board.

[124]Detailed examples of these deletions for surveillance and program cases are described in the June, 2022 Board paper "Modification to the Transparency Policy", (IMF, 2022b).

[125]See https://www.imf.org/en/News/Articles/2021/02/02/pr2131-imf-executive-board-reviews-imf-debt-sustainability-framework-for-market-access-countries.

to a review that will be undertaken 12 months after the SRDSF roll-out. Thus, prior to this review, staff should delete the near-term signal, final assessment, and commentary from the summary table. Additionally, the standardized reporting for the near-term assessment should also be deleted prior to publication.[126] A special case arises when the near-term assessment is high risk, the medium and long-term mechanical signals are low or moderate risk, and staff assesses overall risk as high. In these cases, staff should strongly consider how near-term risks could extend past the short-term and judgmentally assess medium-term risks as high when preparing the DSA. This will avoid inadvertently sending a signal about high near-term risks as the overall risk assessment should reside within the final horizon-based assessments.

- *The mechanical signal on debt sustainability* that is provided to the Board should be deleted regardless of whether the assessment was mandatory or optional (surveillance-only).

- *The probability of sustainable debt* should be deleted from final sustainability assessment except when required by the Fund's lending policies. In practice, this deletion involves the removal of the words "with a high probability" or "but not with high probability", which only leaves an indication that debt is "sustainable". In certain cases, the final three-way assessment cannot be deleted because of applicable lending policies: In arrangements subject to the Exceptional Access policy, it is essential for evaluating Criterion 2. Similarly, in certain arrangements, sustainability with a high probability is a qualification criterion which must be noted (e.g., in FCLs, PLLs, and SLLs).

In addition, any commentary in SRDSAs that refer to the elements above that are to be deleted will need to be removed prior to publication. To facilitate parsimonious modifications to staff reports, Fund staff should craft any commentary on sensitive issues so that it can be easily removed to leave the remaining discussion easily understandable and intuitive, with only minor rephrasing as allowed by the Transparency Policy.

[126]For nonprecautionary Fund arrangements, the near-term assessment is not applicable and already not included in SRDSAs.

Table 9. Standard Elements of Fund SRDSAs and Application of the Transparency Policy

	Surveillance-only			Non-precautionary arrangement			Precautionary arrangement		
	Overall figure	Mechanical signal	Final assessment	Overall figure	Mechanical signal	Final assessment	Overall figure	Mechanical signal	Final assessment
1. Summary of the sovereign risk and debt sustainability assessment	✓	…	…	✓	…	…	✓	…	…
Overall risk of sovereign stress		…	✓		…	✓		…	✓
Near-term assessment		✓ / ⊠	✓ / ⊠		⊘	⊘		✓ / ⊠	✓ / ⊠
Medium-term assessment		✓	✓		✓	✓		✓	✓
Debt Fanchart		✓	…		✓	…		✓	…
GFN module		✓	…		✓	…		✓	…
Stress tests activated		✓	…		✓	…		✓	…
Long-term final assessment		…	✓		…	✓		…	✓
Sustainability assessment: 1/									
Sustainable/unsustainable		✓ / ⊠	✓		✓ / ⊠	✓		✓ / ⊠	✓
Probability of sustainable debt		✓ / ⊠	✓ / ⊠		✓ / ⊠	✓ / ⊠ / !		✓ / ⊠	✓ / ⊠ / !
Debt stabilization in the baseline		✓	…		✓	…		✓	…
Summary assessment 2/		…	✓		…	✓		…	✓
2. Debt coverage and disclosures	✓	…	…	✓	…	…	✓	…	…
3. Public debt structure indicators	✓	…	…	✓	…	…	✓	…	…
4. Baseline scenario	✓	…	…	✓	…	…	✓	…	…
5. Realism tools	✓	…	…	✓	…	…	✓	…	…
6. Near-term risk analysis	✓ / ⊠	…	…	⊘	…	…	✓ / ⊠	…	…
7. Medium-term risk analysis	✓	…	…	✓	…	…	✓	…	…
8. Long-term risk analysis	✓	…	…	✓	…	…	✓	…	…
9. Debt sustainability under maximum adjustment effort	**Optional**	✓ / ⊠	✓	⊘	⊘	⊘	⊘	⊘	⊘

Legend: ✓	Include for both Board and published SRDSAs
✓ / ⊠	Include for SRDSA issued to Executive Board, deletions under Transparency Policy required prior to publication
✓ / ⊠ / !	Include for SRDSA issued to Executive Board, deletions under Transparency Policy required prior to publication except if IMF lending policies require disclsoure
⊘	Do not include in either Board or published SRDSA (tool not applicable)
…	Element not available

Source: IMF.

1/ The sustainability assessment is optional in surveillance-only cases. This table reports the application of the Transparency Policy in cases where the optional assessment is included in the SRDSA.

2/ Any references to items subject to deletion in the summary assessment will also require deletion.

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Annex I. Comparison of the SRDSF and MAC DSA

	SRDSF	MAC DSA
Coverage	• GG as default; justification required for narrower coverage; broader coverage (including central bank) in some cases • Disclosure requirements on coverage definitions, debtholder profile, and guidance on certain instruments (like swaps)	• Narrower than GG in some cases; no disclosure requirement on coverage
Horizon	• 10-year debt and GFN projections for all cases • Risk assessments for near-, medium-, and long-term horizons	• 5-years projections • No distinction in horizons
Realism tools	• Cover additional drivers (exchange rate, financing terms on external debt, stock-flow adjustments), and public debt • In-depth tools for potential growth and fiscal multipliers.	• Cover growth, inflation and primary balance.
Near-term risks		
Stress indicators	• 10 indicators, in five categories: quality of institutions, stress history, cyclical, debt burden, and global[1]	**Heatmap** • Debt and GFN levels, five debt profile and market indicators each producing a risk signal for heatmap
Composite index	• Multivariate logistic regression combines indicators in a continuous metric (fitted probability of stress)	
Signal derivation	• Stress probability split in low, moderate, and high-risk zones, (calibrated to 10% missed crisis and false alarm rates)	• No aggregation/overall signal
Medium-term risks	***Debt fanchart***	***Fanchart tool***
Stress indicators	• Three indicators: i) probability debt does not stabilize in medium term, ii) fanchart width, and iii) debt level at t+5 controlling for debt-carrying capacity (fanchart accounts for deviation of baseline projections from historical trends via skewed shocks)	• Visual tool based on symmetric shocks (asymmetric shocks used at team's discretion)
Composite index	• Index based on 3 indicators weighted by predictive power	• No signal/indicators;
Signal derivation	• Index split in low, moderate, and high-risk zones, (calibrated to 10% missed crisis and false alarm rates)	• Interpretation of fancharts at team's discretion.
	GFN Tool	***Macro-fiscal shocks***
Stress indicators	Three indicators: (i) initial bank claims on government, (ii) maximum cumulative change in bank claims over projection period under a generalized stress scenario; (iii) average projected GFN/GDP in baseline.	• Effect of shocks to primary balance, real GDP growth, real interest rate, and exchange rate on debt and GFN levels reflected in heat map signals

[1]Extensive in-sample and out-of-sample testing used to select regressors and check robustness of specification.

	SRDSF	MAC DSA
Composite index	• Index based on 3 indicators weighted by predictive power	
Signal derivation	• Index split in low, moderate, and high-risk zones, (calibrated to 10% missed crisis and false alarm rates).	• No aggregate signal
Triggered stress-tests	• Simulate debt and GFN paths under: (i) contingent liabilities related to narrow coverage, (ii) banking crisis, (iii) natural disasters, (iv) commodity price shocks, and (v) REER shock. • Allows for customized stress-tests for idiosyncratic risks.	• Allows for customized stress-tests for idiosyncratic risks.
Long-term risk analysis	• Optional tools for risks from: population aging, natural resource discovery/depletion, debt amortizations; and climate change.	• Option to extend debt and GFN projections
Judgment and communication	• Judgment-based risk *assessments* at each horizon, with deviation from mechanical signals explained. • Overall risk assessment based on user judgment.	• No aggregate mechanical signals; lack of standardized bottom-line assessments; unclear application of judgment.

Annex II. Model SRDSA Prepared by Fund Staff

This annex presents model SRDSA items along the lines of those to be issued to the IMF's Executive Board. It explains variations in SRDSA output for countries under different circumstances and summarizes items that may be subject to deletions prior to publication under the IMF's Transparency Policy.

Item 1. Summary of the Sovereign Risk and Debt Sustainability Assessment

This item summarizes the results of all elements of the SRDSA including the mechanical and final risk signals, sustainability assessments, debt stabilization in the baseline, and the main commentary provided by the user. However, because certain elements of the SRDSAs are not applicable in all circumstances (based on a country's engagement or circumstances).

- Figure A.II.1a shows this item for a surveillance-only context that is not exhibiting stress and where staff have chosen to perform the optional debt sustainability assessment. Thus, the table shows the near-term assessment. It also contains the sustainability assessment elements.[1]
- Figure A.II.1b shows this figure for a program treated as precautionary (with no drawings expected). It includes the near-term assessment, as the country is not in stress as well as the sustainability assessment, which is required in this case given the program engagement.
- Figure A.II.1c shows this figure for a non-precautionary program case. The near-term assessment is no longer applicable and the sustainability assessment (which was optional in surveillance) is present.

When included, the near-term and sustainability assessments have implications for automatic deletions under the transparency policy which are summarized in section IX.

[1]If this assessment were not performed, the mechanical signal and final assessments would have "n.a." and the commentary would indicate "optional for surveillance-only countries".

Figure AII.1a. Summary for Surveillance-Only Countries

Ruritania: Summary of the sovereign risk and debt sustainability assessment

Horizon	Mechanical signal	Final assessment	Comments
Overall	...	**Moderate**	The overall risk of sovereign stres is moderate, reflecting a relatively consistent level of vulnerability across the medium-, and long-term horizons.
Near term[1]	**Moderate**	**Moderate**	The near-term risk of sovereign stress is moderate. This reflects a large increase in public debt-to-GDP in the past year, and a low level of international reserves-to-GDP.
Medium term	**Low**	**Moderate**	Medium-term risks are assessed as moderate against a mechanical low risk signal due to the potential effects of contingent liabilities from a narrow debt coverage and sub-national governments that are demonstrating symptoms of weak finances.
Fanchart	**Low**	...	
GFN	**Moderate**	...	
Stress test	Cont. Liab, Exch. Rate	...	
Long term	...	**Moderate**	Long-term risks are moderate arising from population aging, the expected need to refinance concessional debt at less favorable terms, and the winding up of oil production. That said, the long time horizon and the authorities plans for corrective reforms should contain risks.
Sustainability assessment[2]	**Sustainable but not with high probability**	**Sustainable but not with high probability**	The projected debt path is expected to stabilize and GFNs will remain at manageable levels, conditional on the implementation of fiscal adjustment measures that are assessed as feasible in spite of not yet being legislated. There continue to be important risks with respect to market sentiment, and therefore debt is assessed as sustainable but not with high probability.
Debt stabilization in the baseline			No

This example assumes that this item, which is optional for surveillance-only cases, has been performed.

DSA summary assessment

Commentary: This SRDSA finds that Ruritania's debt is sustainable but not with high probability. Following a recent shock, public debt increased significantly and international reserves fell to very low levels, raising the risk of stress in the near term and leading the Logit module to provide a risk signal of medium. Market conditions are beginning to show signs of normalization, however, and the strong policy measures set to be implemented should strengthen confidence further. Fiscal adjustment will deliver a debt trajectory that stabilizes at somewhat lower levels. Consequently, the Debt Fanchart module gives a low risk signal. Medium-term liquidity risks as analyzed by the GFN Financeability Module are moderate. Contingent liabilities from sub-national governments that are excluded from the SRDSA's debt perimeter are plausible and would have high impacts if realized. Thus, the medium-term risk assessment has been set at moderate risk despite the low risk mechanical signal. Over the longer run, Ruritania should continue with reforms to tackle risks arising from population aging on the social security fund. However, the long time horizon at which these risks would materialize and the authorities' planned measures will help contain risks.

[1] The near term assessment is not applicable in cases where there is a disbursing IMF arrangement. In surveillance-only cases or in cases with precautionary IMF arrangements, the near-term assessment is performed but not published.

[2] A debt sustainability assessment is optional in surveillance-only cases and mandatory in cases where there is a Fund arrangement. The mechanical signal of the debt sustainability assessment is deleted before publication. In surveillance-only cases or cases with IMF arrangements with normal access, the qualifier indicating probability of sustainable debt ("with high probability" or "but not with high probability") is deleted before publication.

Figure AII.1b. Summary for Countries with Fund Arrangements Treated as Precautionary

Ruritania: Summary of the sovereign risk and debt sustainability assessment

Horizon	Mechanical signal	Final assessment	Comments
Overall	…	Moderate	The overall risk of sovereign stres is moderate, reflecting a relatively consistent level of vulnerability across the medium-, and long-term horizons.
Near term[1]	Moderate	Moderate	The near-term risk of sovereign stress is moderate. This reflects a large increase in public debt-to-GDP in the past year, and a low level of international reserves-to-GDP.
Medium term	Low	Moderate	Medium-term risks are assessed as moderate against a mechanical low risk signal due to the potential effects of contingent liabilities from a narrow debt coverage and sub-national governments that are demonstrating symptoms of weak finances.
Fanchart	Low	…	
GFN	Moderate	…	
Stress test	Cont. Liab, Exch. Rate	…	
Long term	…	Moderate	Long-term risks are moderate arising from population aging, the expected need to refinance concessional debt at less favorable terms, and the winding up of oil production. That said, the long time horizon and the authorities plans for corrective reforms should contain risks.
Sustainability assessment[2]	Sustainable but not with high probability	Sustainable but not with high probability	With the implementation of the policies in the program, the projected debt path is expected to stabilize and GFNs will remain at manageable levels. There continue to be important risks with respect to market sentiment, and therefore debt is assessed as sustainable but not with high probability.
Debt stabilization in the baseline			Yes

DSA summary assessment

Commentary: This SRDSA finds that Ruritania's debt is sustainable but not with high probability. Following a recent shock, market conditions are beginning to show signs of normalization and the strong policy measures to be implemented in the program should strengthen confidence further. Fiscal adjustment will deliver a debt trajectory that stabilizes at somewhat lower levels. Consequently, the Debt Fanchart module gives a low risk signal. Medium-term liquidity risks as analyzed by the GFN Financeability Module are moderate. Contingent liabilities from sub-national governments that are excluded from the SRDSA's debt perimeter are plausible and would have high impacts if realized. Thus, the medium-term risk assessment has been set at moderate risk despite the low risk mechanical signal. Over the longer run, Ruritania should continue with reforms to tackle risks arising from population aging on the social security fund. However, the long time horizon at which these risks would materialize and the authorities' planned measures will help contain risks.

Note: The risk of sovereign stress is a broader concept than debt sustainability. Unsustainable debt can only be resolved through exceptional measures (such as debt restructuring). In contrast, a sovereign can face stress without its debt necessarily being unsustainable, and there can be various measures—that do not involve a debt restructuring—to remedy such a situation, such as fiscal adjustment and new financing.

[1] The near term assessment is not applicable in cases where there is a disbursing IMF arrangement. In surveillance-only cases or in cases with precautionary IMF arrangements, the near-term assessment is performed but not published.

[2] A debt sustainability assessment is optional in surveillance-only cases and mandatory in cases where there is a Fund arrangement. The mechanical signal of the debt sustainability assessment is deleted before publication. In surveillance-only cases or cases with IMF arrangements with normal access, the qualifier indicating probability of sustainable debt ("with high probability" or "but not with high probability") is deleted before publication.

Figure AII.1c. Summary for Countries with Non-Precautionary Fund Arrangements

Ruritania: Summary of the sovereign risk and debt sustainability assessment

Horizon	Mechanical signal	Final assessment	Comments
Overall	…	Moderate	The overall risk of sovereign stres is moderate, reflecting a relatively consistent level of vulnerability across the medium-, and long-term horizons.
Near term[1]	n.a.	n.a.	Not applicable .
Medium term	Low	Moderate	Medium-term risks are assessed as moderate against a mechanical low risk signal due to the potential effects of contingent liabilities from a narrow debt coverage and sub-national governments that are demonstrating symptoms of weak finances.
Fanchart	Low	…	
GFN	Moderate	…	
Stress test	Cont. Liab, Exch. Rate	…	
Long term	…	Moderate	Long-term risks are moderate arising from population aging, the expected need to refinance concessional debt at less favorable terms, and the winding up of oil production. That said, the long time horizon and the authorities plans for corrective reforms should contain risks.
Sustainability assessment[2]	Sustainable but not with high probability	Sustainable but not with high probability	With the implementation of the policies in the program, the projected debt path is expected to stabilize and GFNs will remain at manageable levels. There continue to be important risks with respect to market sentiment, and therefore debt is assessed as sustainable but not with high probability.
Debt stabilization in the baseline			Yes

DSA summary assessment

Commentary: This SRDSA finds that Ruritania's debt is sustainable but not with high probability. Following a recent shock, market conditions are beginning to show signs of normalization and the strong policy measures to be implemented in the program should strengthen confidence further. Fiscal adjustment will deliver a debt trajectory that stabilizes at somewhat lower levels. Consequently, the Debt Fanchart module gives a low risk signal. Medium-term liquidity risks as analyzed by the GFN Financeability Module are moderate. Contingent liabilities from sub-national governments that are excluded from the SRDSA's debt perimeter are plausible and would have high impacts if realized. Thus, the medium-term risk assessment has been set at moderate risk despite the low risk mechanical signal. Over the longer run, Ruritania should continue with reforms to tackle risks arising from population aging on the social security fund. However, the long time horizon at which these risks would materialize and the authorities' planned measures will help contain risks.

Note: The risk of sovereign stress is a broader concept than debt sustainability. Unsustainable debt can only be resolved through exceptional measures (such as debt restructuring). In contrast, a sovereign can face stress without its debt necessarily being unsustainable, and there can be various measures—that do not involve a debt restructuring—to remedy such a situation, such as fiscal adjustment and new financing.

[1] The near term assessment is not applicable in cases where there is a disbursing IMF arrangement. In surveillance-only cases or in cases with precautionary IMF arrangements, the near-term assessment is performed but not published.

[2] A debt sustainability assessment is optional in surveillance-only cases and mandatory in cases where there is a Fund arrangement. The mechanical signal of the debt sustainability assessment is deleted before publication. In surveillance-only cases or cases with IMF arrangements with normal access, the qualifier indicating probability of sustainable debt ("with high probability" or "but not with high probability") is deleted before publication.

Item 2. Debt Coverage and Disclosures

This item (Figure AII.2) summarizes key elements of the public debt concept used in the DSA and has no variations depending on the type of engagement, nor are there any automatic deletions under the Transparency Policy.

Figure AII.2. Debt Coverage and Disclosures

Ruritania: Debt coverage and disclosures

This SRDSA covers the central government, with no consolidation of other public entities						Comments
1. Debt coverage in the DSA: 1/	CG	GG	NFPS	CPS	Other	
1a. If central government, are non-central government entities insignificant?					No	Subnational govt's may issue debt

2. Subsectors included in the chosen coverage in (1) above:

		Subsectors captured in the baseline	Inclusion	
CPS / NFPS / GG: expected / CG	1	Budgetary central government	Yes	
	2	Extra budgetary funds (EBFs)	No	EBFs do not exist in Ruritania
	3	Social security funds (SSFs)	Yes	
	4	State governments	No	See commentary below
	5	Local governments	No	See commentary below
	6	Public nonfinancial corporations	No	
	7	Central bank	No	
	8	Other public financial corporations	No	

3. Instrument coverage:	Currency & deposits	Loans	Debt securities	Oth acct. payable 2/	IPSGSs 3/	IPSGSs do not exist in Ruritania

4. Accounting principles:	Basis of recording		Valuation of debt stock			
	Non-cash basis 4/	Cash basis	Nominal value 5/	Face value 6/	Market value 7/	

5. Debt consolidation across sectors:	Consolidated	Non-consolidated	

Color code: chosen coverage | Missing from recommended coverage | Not applicable

Reporting on intra-government debt holdings

		Holder / Issuer	Budget. central govt	Extra-budget. funds	Social security funds	State govt.	Local govt.	Nonfin. pub. corp.	Central bank	Oth. pub. fin corp	Total
CPS / NFPS / GG: expected / CG	1	Budget. central govt		0	11.2	0	0	0	0	0	11.2
	2	Extra-budget. funds	0		0	0	0	0	0	0	0
	3	Social security funds	0	0		0	0	0	0	0	0
	4	State govt.	0	0	0		0	0	0	0	0
	5	Local govt.	0	0	0	0		0	0	0	0
	6	Nonfin pub. corp.	0	0	0	0	0		0	0	0
	7	Central bank	0	0	0	0	0	0		0	0
	8	Oth. pub. fin. corp	0	0	0	0	0	0	0		0
		Total	0	0	11.2	0	0	0	0	0	11.2

1/ CG=Central government; GG=General government; NFPS=Nonfinancial public sector; PS=Public sector.
2/ Stock of arrears could be used as a proxy in the absence of accrual data on other accounts payable.
3/ Insurance, Pension, and Standardized Guarantee Schemes, typically including government employee pension liabilities.
4/ Includes accrual recording, commitment basis, due for payment, etc.
5/ Nominal value at any moment in time is the amount the debtor owes to the creditor. It reflects the value of the instrument at creation and subsequent economic flows (such as transactions, exchange rate, and other valuation changes other than market price changes, and other volume changes).
6/ The face value of a debt instrument is the undiscounted amount of principal to be paid at (or before) maturity.
7/ Market value of debt instruments is the value as if they were acquired in market transactions on the balance sheet reporting date (reference date). Only traded debt securities have observed market values.

Commentary: The coverage in this SRDSA is for the central government, but the authorities are taking efforts to expand the perimeter of public debt statistics. A new census of state and local government finances is being conducted, with preliminary results expected next year.

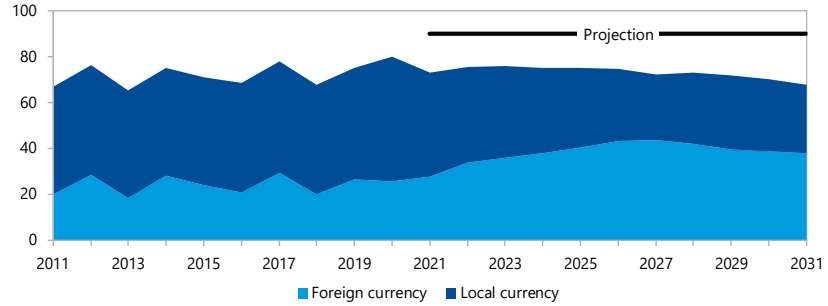
Item 3. Public Debt Structure Indicators

This item illustrates relevant information on the structure and evolution of public debt (Figure AII.3). It is common to all SRDSAs regardless of being prepared in a surveillance-only or program context and there are no automatic deletions under the Transparency Policy.

Figure AII.3. Public Debt Structure Indicators

Ruritania: Public debt structure indicators

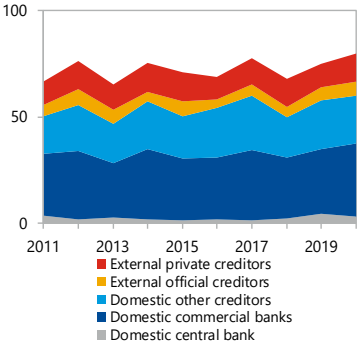
Debt by currency (percent of GDP)



Note: The perimeter shown is central government.

Public debt by holder

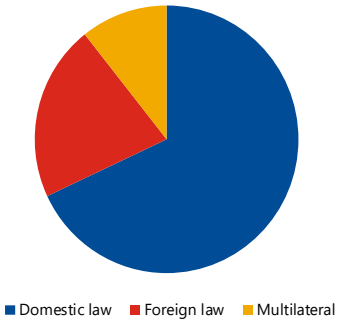
(percent of GDP)



Note: The perimeter shown is general government.

Public debt by legal basis, 2020

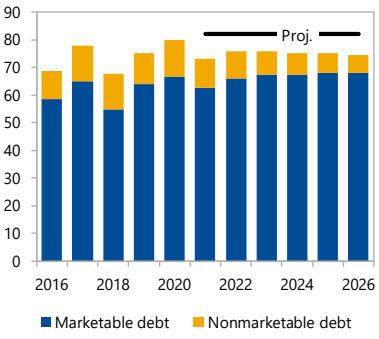
(percent)



Note: The perimeter shown is other.

Debt by instruments

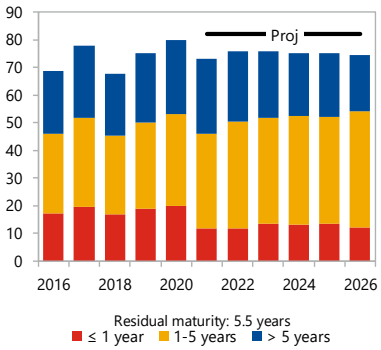
(percent of GDP)



Note: The perimeter shown is other.

Public debt by maturity

(percent of GDP)



Note: The perimeter shown is central government.

Commentary: Public debt will remain about evenly split between foreign and local currency-denominated instruments, but maturities are expected to lengthen. Marketable instruments form the bulk of public debt and it is held by domestic creditors.

Source: Fund staff estimates.

Item 4. Baseline Scenario

This item reports the baseline path for public debt-to-GDP and GFNs-to-GDP, their contributions, and projections for major macroeconomic variables. All SRDSAs include this item, with no automatic deletions under the Transparency Policy.

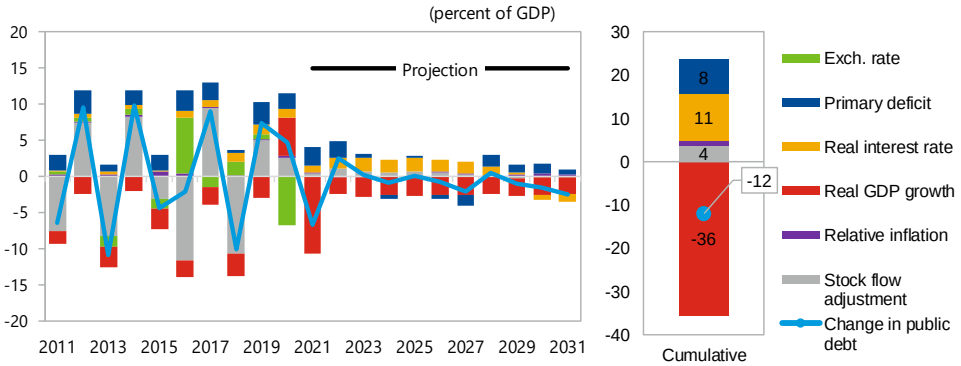
Figure AII.4. Baseline Scenario

Ruritania: Baseline scenario

(percent of GDP unless indicated otherwise)

	Actual	Medium-term projection						Extended projection				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Public debt	79.8	73.1	75.6	75.9	75.1	75.2	74.5	72.4	72.9	71.8	70.3	67.9
Change in public debt	4.7	-6.7	2.5	0.3	-0.8	0.1	-0.7	-2.1	0.5	-1.1	-1.5	-2.5
Contribution of identified flows	2.2	-10.6	1.5	-0.2	-1.4	-0.4	-1.4	-4.0	0.4	-2.6	-1.7	-4.1
Primary deficit	2.2	2.6	2.4	0.6	-0.6	0.3	-0.5	-1.5	1.6	1.1	1.4	0.7
Noninterest revenues	20.0	20.4	21.5	21.7	22.6	22.7	23.2	24.0	20.8	21.0	21.8	21.4
Noninterest expenditures	22.2	23.0	23.9	22.3	22.0	23.1	22.8	22.4	22.5	22.1	23.2	22.1
Automatic debt dynamics	0.0	-9.7	-1.0	-1.0	-0.8	-0.8	-0.8	-0.8	-1.1	-2.0	-2.7	-3.1
Int. rate-growth differential	6.5	-9.8	-0.9	-0.8	-0.8	-0.8	-0.9	-0.9	-1.2	-2.2	-3.1	-3.4
Real interest rate	1.3	0.9	1.4	1.9	1.7	1.9	1.6	1.6	1.3	0.3	-0.7	-1.0
Real growth rate	5.2	-10.7	-2.3	-2.7	-2.5	-2.7	-2.6	-2.5	-2.4	-2.5	-2.4	-2.4
Exchange rate	-6.8	...	...	...	...	...	...	...	...	...	...	...
Relative inflation	0.3	0.1	-0.1	-0.2	0.0	-0.1	0.2	0.2	0.1	0.2	0.4	0.3
Stock-flow adjustment	2.6	0.4	1.1	0.7	0.6	0.6	0.5	0.2	0.0	-0.2	-0.2	-0.1
Contingent liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other transactions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residual	2.6	0.4	1.1	0.7	0.6	0.6	0.5	0.2	0.0	-0.2	-0.2	-0.1
Gross financing needs	15.4	14.6	16.5	14.8	15.4	16.4	19.5	14.2	18.2	19.0	17.1	15.2
of which: debt service	13.2	12.0	14.1	14.2	15.9	16.0	20.0	15.7	16.6	17.9	15.7	14.5
Local currency	11.7	9.1	11.0	10.9	12.6	12.4	16.1	11.5	9.1	10.2	10.4	10.4
Foreign currency	1.5	3.0	3.1	3.3	3.3	3.6	3.9	4.2	7.5	7.6	5.3	4.1
Memo:												
Real GDP growth (percent)	-6.5	15.5	3.3	3.7	3.4	3.8	3.6	3.5	3.5	3.5	3.5	3.5
Inflation (GDP deflator; percent)	2.2	2.4	1.9	1.7	2.0	1.8	2.3	2.4	2.2	2.6	3.0	2.9
Nominal GDP growth (percent)	-4.4	18.3	5.2	5.4	5.5	5.6	6.0	6.0	5.7	6.2	6.6	6.5
Effective interest rate (percent)	3.9	3.8	4.0	4.3	4.4	4.5	4.7	4.7	4.0	3.0	2.1	1.3

Contribution to change in public debt



Staff commentary: Public debt will rise a bit but then stablize, reflecting expectations of a narrowing of primary deficits and stable economic conditions.

Source: Fund staff estimates and projections.

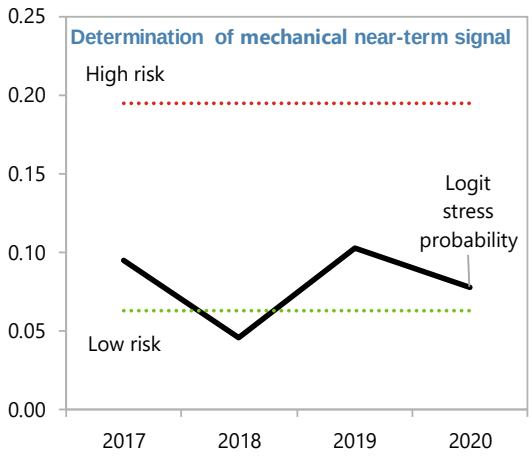
Item 5. Near-Term Risk Analysis

This item summarizes the Logit Stress Probability and is only included for surveillance-only countries and countries with Fund-supported programs that are treated as precautionary. The entire item (Figure AII.5) should be deleted prior to publication. SRDSAs prepared for non-precautionary programs should not include this item for either the version to the IMF Executive Board or for publication.

Figure AII.5. Near-Term Risk Analysis

Ruritania: Near-term risk analysis

Year of data	**2017**	**2018**	**2019**	**2020**
To predict stress in [t+1, t+2]	*2018-19*	*2019-20*	*2020-21*	*2021-22*
Logit stress probability (LSP)	0.095	0.045	0.103	0.078
Change in LSP	0.050	-0.049	0.058	-0.025
due to:				
Institutional quality	0.001	0.000	0.000	0.000
Stress history	0.000	0.000	0.000	0.000
Cyclical position	0.001	0.001	0.001	0.006
Debt burden & buffers	0.058	-0.080	0.077	-0.009
Global conditions	-0.012	0.031	-0.021	-0.022
Missed crisis probability in 2021-22 if stress not predicted				15%
False alarm probability in 2021-22 if stress predicted				72%



Staff commentary: Ruritania's risk of near-term stress has improved, but remains within the moderate risk range. The improvement largely reflects the normalization in global conditions from the COVID-19 shock as well as an improvement in debt indicators as the domestic recovery has gained steam.

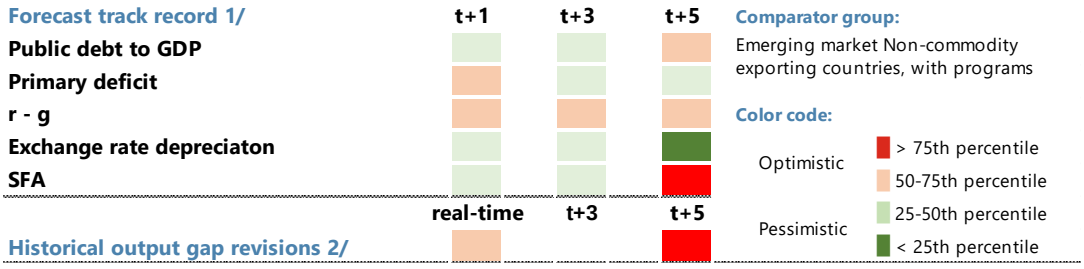
Source: IMF staff estimates.

Item 6. Realism of Baseline Assumptions

The figures showing the realism tools are included in all SRDSAs, with no automatic deletions under the Transparency Policy.

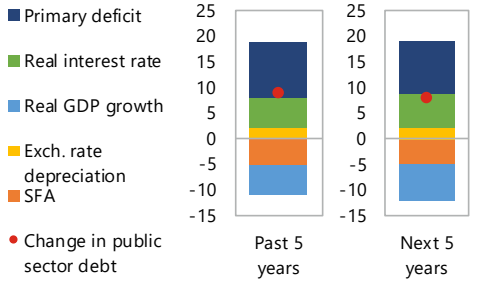
Figure AII.6. Realism of Baseline Assumptions

Ruritania: Realism of baseline assumptions

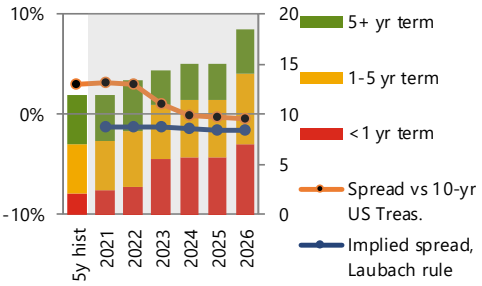


Public debt creating flows

(Percent of GDP)

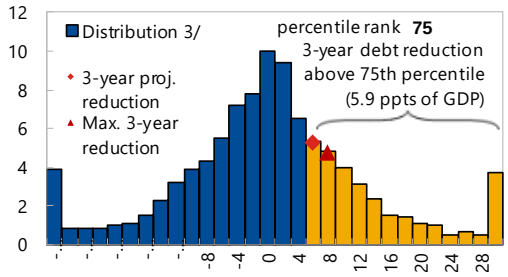


Bond issuances (bars, debt issuances (RHS, %GDP); lines, avg marginal interest rates (LHS, percent))

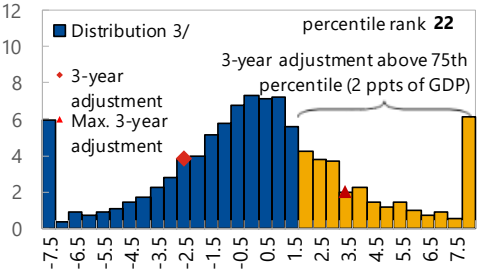


3-year debt reduction

(Percent of GDP)

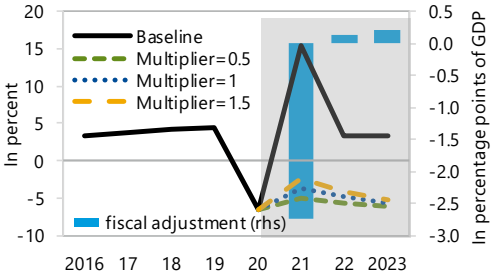


3-year adjustment in cyclically-adjusted primary balance (percent of GDP)



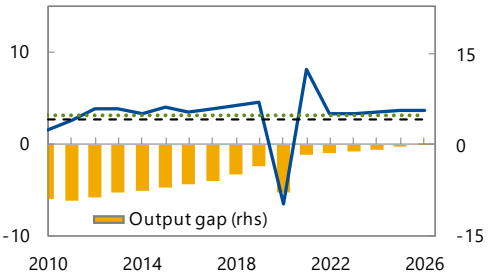
Fiscal adjustment and possible growth paths

(lines, real growth using multiplier (LHS); bars, fiscal adj. (RHS)



Real GDP growth

(in percent)



Commentary: The recovery from COVID-19 will impart complicated effects on the growth path. Realism analysis points to some concerns: past forecast errors do not reveal any systematic biases and the projected fiscal adjustment are well within norms. However, debt reduction projections are in the top-quartile of cross-country database. Also, spreads are projected to compress in a period of tightening global financal conditions.

1/ Projections made in the october and April WEO vintage.

2/ Calculated as the percentile rank fo the country's output gap revisions (defined as the difference between real time/period ahead estimates.

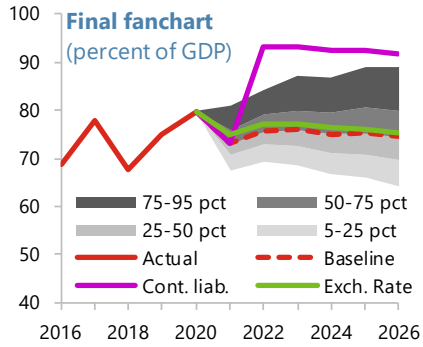
3/ Data cover annual observations from 1990 to 2019 for MAC advanced and emerging economies. Percent of sample on vertical axis.

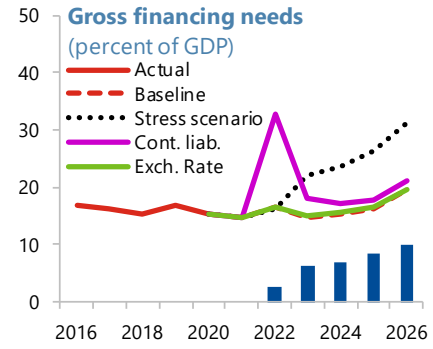
Item 7. Medium-Term Risk Analysis

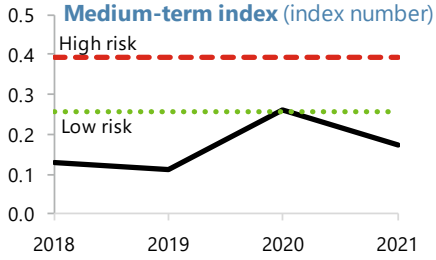
This item reports the results of the medium-term tools (Debt Fanchart and GFN Modules, Triggered Stress Tests (if any) and the Medium-Term Index). All SRDSAs include this item, with no automatic deletions under the Transparency Policy.

Figure AII.7 Medium-Term Risk Analysis

Ruritania: Medium-term risk assessment







	Value	Index contrib.[1/]	Percentile in peer group[2/]
Debt fanchart module			
Fanchart width *(percent of GDP)*	24.8	0.2	
Probability of debt non-stabilizaton *(percent)*	5.9	0.1	
Terminal debt-to-GDP x institutions index	25.1	0.5	
Debt fanchart index (DFI)		**0.8**	0 25 50 75 100
Risk signal:[3/]		**Low**	
Gross financing needs (GFN) module			
Average baseline GFN *(percent of GDP)*	16.2	5.5	
Banks' claims on the gen. govt. *(pct banks' assets)*	7.4	2.4	
Chg. in banks' claims in stress *(pct banks' assets)*	0.7	0.2	
GFN financeability index (GFI)		**8.2**	0 25 50 75 100
Risk signal:[4/]		**Moderate**	

Medium-term risk analysis

	Value	Weight	Contribution
Debt fanchart index (normalized)	0.19	0.5	0.09
GFN finaceability index (normalized)	0.16	0.5	0.08
Medium-term index			**0.17**

Risk signal:[5/]	**Low**
Final assessment:	**Moderate**

Prob. of missed crisis, 2022-2027 (if stress not predicted): 9.1 pct
Prob. of false alarm, 2022-2027 (if stress predicted): 61.1 pct

Commentary: Of the two medium-term tools, the GFN Financeability Module is pointing to a higher, but still moderate level of risk. This result is further reinforced by the potential for contingent liabilites from government entities outside the central government, which appears possible, given signs of strains in subnational governments' finances.

Source: IMF staff estimates and projections.
1/ See Annex IV of IMF, 2022, Staff Guidance Note on the Sovereign Risk and Debt Sustainability Framework for details on index calculation.
2/ The comparison group is emerging market, non-commodity exporting countries, with Fund-supported programs.
3/ The signal is low risk if the DFI is below 1.13; high risk if the DFI is above 2.08; and otherwise, it is moderate risk.
4/ The signal is low risk if the GFI is below 7.6; high risk if the DFI is above 17.9; and otherwise, it is moderate risk.
5/ The signal is low risk if the GFI is below 0.26; high risk if the DFI is above 0.40; and otherwise, it is moderate risk.

Item 8. Long-Term Risk Analysis

Risks related to long-term debt and GFN trends are included in this element, which is included in all SRDSAs, with no automatic deletions under the Transparency Policy.

Figure AII.8. Long-Term Risk Analysis

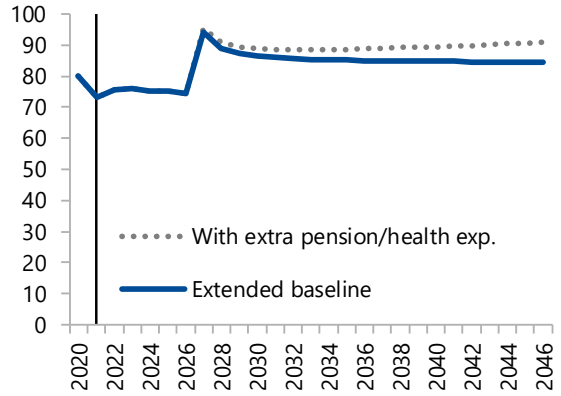
Ruritania: Long-term risk analysis

Relevancy of long-term factors

Topic	Vulnerability factors
Climate change	n.a.
Demographics	Large change in old-age dependency ratio
Long-term amortization	n.a.
Natural resource production	n.a.

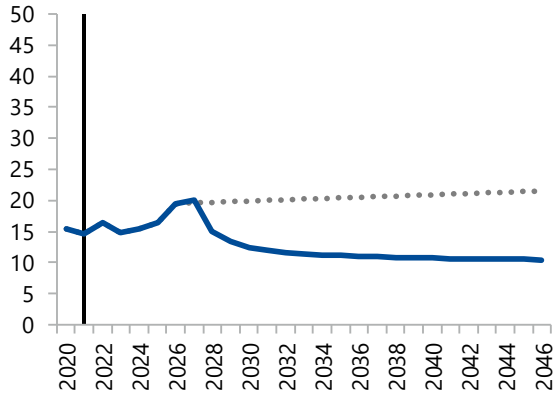
Long-term public debt projection

(percent of GDP)



Long-term gross financing needs projection

(percent of GDP)



Commentary: Over the long-run, Ruritania has meaningful risks from population aging. Under a no-reform scenario, public sector debt and GFNs would be noticeably higher than the long-term baseline. Thurs, parametric reform will be essential to arresting any long-term debt vulnerabilities. In this regard, the authorities have appointed a commission to explore alternatives. Additional fiscal and structural reforms will help ensure that longer-term risks remain contained.

Source: Fund staff estimates.

Item 9. Sustainability Assessment Under Maximum Adjustment Effort

This item is only applicable in surveillance-only cases and even in these cases, is optional. It subjects an alternative "maximum adjustment" scenario to the sustainability analysis and reports the results.

When it is prepared, however, certain elements pertaining to the sustainability assessment are subject to automatic deletions under the Transparency Policy.

Figure AII.9. Sustainability Assessment Under Maximum Adjustment Effort

Ruritania: Debt sustainability under maximum adjustment effort

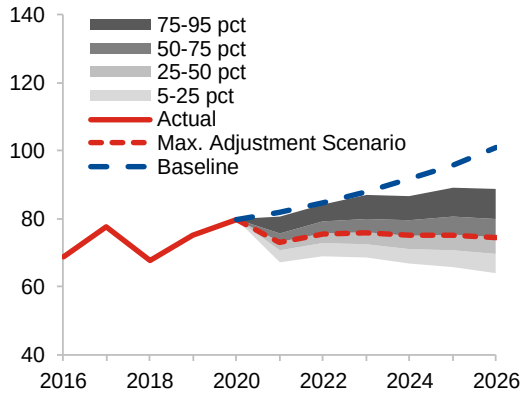
Summary of the maximum adjustment scenario

(percent of GDP unless otherwise indicated)

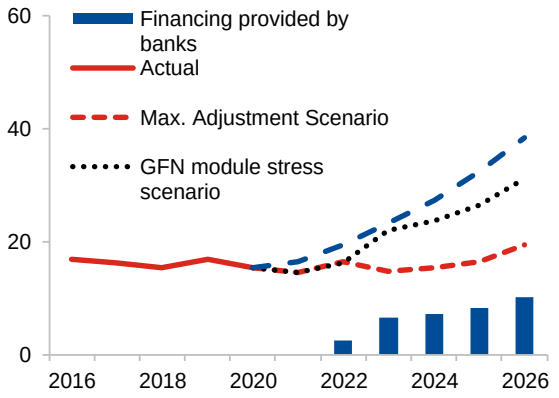
		Projection					
	2020	2021	2022	2023	2024	2025	2026
Public sector debt	79.8	73.1	75.6	75.9	75.1	75.2	74.5
Gross financing needs	15.4	14.6	16.5	14.8	15.4	16.4	19.5
Primary balance	-2.2	0.0	0.5	0.8	1.0	1.0	1.0
Real GDP growth (percent)	-6.5	15.5	3.3	3.7	3.4	3.8	3.6
Inflation (GDP deflator; percent)	2.2	2.4	1.9	1.7	2.0	1.8	2.3
Nominal GDP growth (percent)	-4.4	18.3	5.2	5.4	5.5	5.6	6.0
Effective interest rate (percent)	3.9	3.8	4.0	4.3	4.4	4.5	4.7

Medium-term tools under the maxiumum adjustment scenario

Final fanchart (percent of GDP)



Gross financing needs (percent of GDP)



Debt fanchart index	**0.3**	**GFN financeability index**	**8.2**
Fanchart width	24.8	Avg. GFN, max. adjustment scenario (pct of GDP):	5.5
Probability of debt stabilization	5.9	Bank claims on the gen. govt. (pct bank assets):	2.4
Debt level x institutions index	25.1	Change in bank claims in stress (pct bank assets):	0.2
Mechanical signal on debt sustainability[1,2]		**Sustainable but not with high probability**	
Susainability assessment[1]		**Sustainable but not with high probability**	

Commentary: In a maximum adjustment scenario, revenue mobilization measures (identified through recent Technical Assistance) with a cumulative yield of 2 percent of GDP and realistic cuts to non-priority expenditures totaling about 1 percent of GDP could deliver primary surpluses of about 1 percent of GDP over the medium term. In such a scenario, debt would stabilize and GFNs would reside near current manageable levels. If delivered, these measures would be consistent with a debt sustainability assessment of sustainable but not with high probability.

[1] The mechanical signal on debt sustainability is deleted before publication.

[2] In cases of IMF arrangements with normal access, the qualifier indicating probability of sustainable debt ("with high probability" or "but not with high probability") is deleted before publication.

Annex III. Summary Directions to Run the SRDSF

This annex provides concise operational directions to IMF staff who are running the SRDSF. In addition to providing instructions on running the tools. This annex is provided as a convenience to staff who are running the framework. However, it is not a substitute for the full guidance provided in the main text of this note. Thus, each step below also contains a reference to the section containing the full details in this guidance note.

Running the SRDSF consists of the following steps (Figure AIII.1):

- **Step 1:** Answer the questionnaire on debt disclosures in the template (Section III.A).
- **Step 2:** Upload the debt data and projections into the template to run the standard tools (Table AIII.1) and populate the debt structure charts (Section III.B). For SRDSAs prepared by Fund staff, this involves linking the input sheet to the underlying macro framework database or a bridge file that converts items from the MAC DSA template.
- **Step 3:** Enter the financing assumptions on new debt issuance (e.g., amounts, maturities, interest rates, etc.).
- **Step 4:** Scrutinize the baseline debt and GFN projections (Section III.C) and the realism tools (Section IV). For SRDSAs prepared by Fund staff, the scrutiny of the baseline debt/GFN projections should ensure that the paths for these variables in the template are consistent with the projections in the macro framework. For the realism tools, users should check if there are any flags raised by the tools. If any issues are encountered, users should either revise the baseline to eliminate them or identify explanations to provide in the commentary of the SRDSA output.
- **Step 5:**[1] Perform preliminary analysis by running the debt fanchart module to see if the realism adjustment is activated (Section VI.A, paragraphs 58 to 60). If it is, the baseline should typically be revised so that the downward debt trajectory is less favorable, better reflecting the country's historical performance. After revising the baseline, users should re-run the module to confirm that the realism adjustment is no longer activated. However, if a revision is not possible, then users may explore whether any of the criteria for disregarding this realism diagnostic are met.
- **Step 6:** Prepare the near-term assessment (Section V).
    - For surveillance-only or precautionary program cases: if all data are correctly entered, the template automatically produces the mechanical results. Users should take note of the mechanical signal, Logit Stress Probability, and the contributions to the change in the

[1]Note: Steps 5 and 6 may be interchanged, but a provided in this order so that the horizon-based assessments are completed when the baseline debt projections are finalized.

probability. If any results are counterintuitive, users should explore whether a judgment-based final assessment is warranted.

- In non-precautionary program contexts: the final near-term assessment should be set at "not applicable".

- **Step 7:** Finalize the debt fanchart (remainder of section VI.A). Users should take note of the Debt Fanchart Index, its components, and the mechanical signal. If the result is counterintuitive, users should take note that judgment may be needed in step 10 below.

- **Step 8:** Run the GFN module (section VI.B). As with the Fanchart, users should take consider the GFN Financeability Index, its components, the mechanical signal, and whether any judgment might be needed later (step 10) to explain non-sensible results in the overall medium-term analysis.

- **Step 9:** Observe whether the activation criteria for any triggered stress tests are met (section VI.C). If no, continue to step 10. Otherwise, if a stress test is performed (automatically by the template), check its position on the fanchart shown in the SRDSA's output. If it is in the 75th percentile and the underlying shock is assessed as having a sufficiently high probability of materialization (e.g., a high likelihood of materialization in the risk assessment matrix), then a judgmental downgrade would be expected for the final medium-term assessment in the next step.

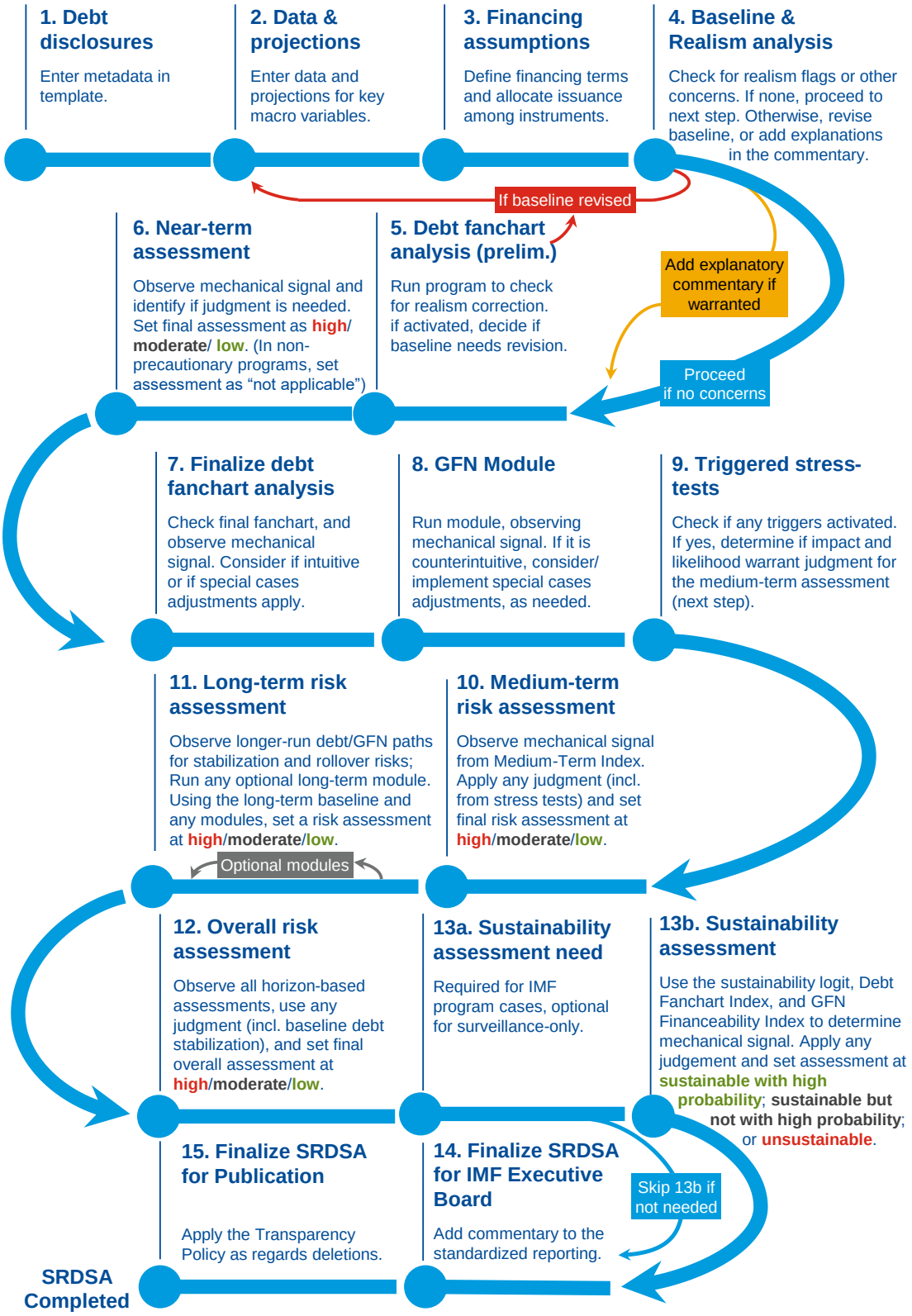
- **Step 10:** Complete the medium-term assessment (section VI.D). Take note of the Medium-Term Index and mechanical signal. Determine if any judgment to revise the final medium-term assessment. Such judgment would be warranted if results were counterintuitive for the Debt Fanchart (Step 7) or GFN Module (Step 8). Additionally, if any stress test (Step 9) coincided with criteria for a judgmental downgrade, then the final medium-term assessment should typically be weakened by one notch.

- **Step 11:** Conduct the long-term risk assessment (section VII), arriving at a final judgment-based assessment of high/moderate/or low risk based on an evaluation the extended baseline and any additional relevant factors. In particular, users should examine the profile of the debt trajectory for stabilization and the levels of gross financing needs (e.g., whether rising or falling). Running the SRDSF's long-term modules is optional but encouraged if a module covers a risk highlighted by the user. The data requirements for the long-term modules are found in Table A.III.2. Users may also discuss long-term risks on the basis of other analytics or qualitative arguments, as warranted.

- **Step 12:** Prepare the overall risk assessment (section VIII.A). This assessment is judgment-based but should reside within the range of assessments at the near-, medium-, and long-term assessments. Users should consider the appropriate arguments underpinning this assessment (including prospects for debt stabilization in the baseline) to be included in the commentary that accompanies the SRDSA's final output.

- **Step 13:** Sustainability assessments (section VIII.B):
  - **Part a:** Determine if a sustainability assessment is warranted. Sustainability assessments are required in DSAs prepared for Fund-supported programs. They are optional for surveillance-only countries (and generally performed rarely). If a sustainability assessment is unnecessary skip to step 14. Otherwise, go to part b, below.
  - **Part b:** Conduct the sustainability assessment (IMF staff only). Calculate the probability of unsustainable debt from the internal sustainability logit model. Combine the results of that tool with the Debt Fanchart Index and GFN Financeability Index (using the approved aggregation rule) to give the mechanical sustainability metric. Compare the sustainability metric against the thresholds to give the mechanical signal on debt sustainability (e.g., sustainable with a high probability, sustainable but not with high probability or unsustainable). If the mechanical result is counterintuitive, then consider scope for a judgement-based sustainability assessment.
- **Step 14:** Finalize the output for the IMF's Executive Board (section IX, paragraphs 152-153). Ensure that all the standard reporting figures and tables are correctly populated. Provide any additional commentary that may be needed to interpret the results or explain any uses of judgment.
- **Step 15:** Finalize the output for publication (section IX, paragraph 154). Items that need to be deleted relate to the near-term assessment (countries with surveillance-only or precautionary program engagement); mechanical signal on debt sustainability (whenever a sustainability assessment is conducted); and the probability of sustainable debt (whenever this element is not required by IMF lending policies).

Figure AIII.1 Process for Running the SRDSF



Source: Fund staff estimates.

Table AIII.1. Data Requirements for the Near- and Medium-Term SRDSF Tools

Variable	Module					Always needed or subj. to trigger	Existing or new data require-ment	Scope for central-ization	Source
	Realism tools, debt	Near-term (logit)	Medium-term						
			Debt fanchart	GFN module	Stress tests				
Fiscal data/projections (up to t+5)									
Primary revenues, expenditures, balance	●	●	●	●	●	Yes	Existing	No*	SRDSF user/WEO
Interest bill (existing debt) and receipts	●		●	●	●	Yes	Existing	No	SRDSF user
Debt						Yes	Existing	No*	SRDSF user/WEO
By residency (incl. external debt)		●		●		Yes	Existing	No	SRDSF user
By currency			●		●	Yes	Existing	No	SRDSF user/WEO
By maturity	●			●		Yes	Existing	No	SRDSF user
By holder	●			●	●	Yes	New	Yes	Arslanalp & Tsuda**
By legal basis	●					Yes	New	No	Authorities
Amortization of existing debt				●		Yes	Existing	No	SRDSF user
Assumptions on new debt issuance	●			●		Yes	Existing	No	SRDSF user
Effective real interest rate			●			Yes	Existing	No	DSA calculation
Gross financing need (calculated)		●		●	●	Yes	Existing	No*	DSA calculation
Stock-flow adjustment	●		●			Yes	Existing	Yes	DSA calculation
Government liquid assets				●		Yes	New	Yes***	Fiscal Monitor
Cyclically adjusted primary balance	●					Yes	Existing	No	SRDSF user
Forecast track record (PB & debt drivers)	●					Yes	Existing†	Yes	SPR
Average maturity of public debt	●					Yes	New	No	Authorities/SRDSF user
Debt coverage disclosures	●					Yes	New	No	Authorities/SRDSF user
Intra-governmental debt holdings	●					Yes	New	No	Authorities/SRDSF user
Major macro variables/proj. (up to t+5)									
Real and nominal GDP and deflator	●		●	●	●	Yes	Existing	No	SRDSF user/WEO
Current account balance		●				Yes	Existing	Yes**	SRDSF user/WEO
Nominal bilateral ER		●	●	●	●	Yes	Existing	Some*	SRDSF user/WEO
Real bilateral ER			●			Yes	New	Yes	DSA calculation
Real effective ER	●	●				Yes	Existing	Some*	SRDSF user/IFS/INS
International reserves		●				Yes	New	Yes	IFS
Potential GDP and output gap	●					Yes	Existing	No	SRDSF user/WEO
Forecast track record for key variables	●						New	Yes	SPR
Financial sector & structural indicators									
Bond spreads	●					Yes	New	Yes	SRDSF user/Bloomberg
VIX		●				Yes	New	Yes	CBOE
U.S. long-term interest rate	●	●				Yes	New	Yes	Haver
U.S. inflation projection			●			Yes	New	Yes	WEO
Governance composite indicator		●				Yes	New	Yes	WGI, Kaufmann & Kraay
Stress history		●				Yes	New	Yes	SPR**
Share of CU MACs in stress		●				Yes	New	Yes	SPR
Banking system assets				●		Yes	New	Yes††	IFS/IMD/Haver
Financial sector deposits					●	Trigger	Existing	Yes	IFS
Mispricing risk index					●	Yes	New	Yes	
Financial sector credit and gap		●			●	Yes	Existing	Yes	
Estimated exchange rate overvaluation	●				●	Trigger	Existing	No	SRDSF user/EBA/EBA lite
Central/comm. bank claims on S&L govt					●	Trigger	New	Yes	IFS/IMD
S&L govt external debt					●	Trigger	New	Some	DSA calculation, QEDS
Liabilities of SOEs, Soc. Sec., & PPPs (optional)					●	Trigger	New	Yes	Optional user supplied data

* For near-term assessment/logit model data can be updated and run centrally for periodic updates. ** Based on existing estimates, which some IMF teams may be periodically requested to validate/update. *** Where data are unavailable in the Fiscal Monitor a default option of zero would exist, though IMF teams may wish to adjust. †SPR is expanding the dataset of forecast errors for several additional variables to also include exchange rate, SFAs, and r-g. ††A limited number of IMF teams may need to provide a source for bank assets, when countries do not report to STA and there is no data coverage in Haver.

Table AIII.2. Data Requirements for the Long-Term SRDSF Modules

Data/projections inputs, by module	Source
Long-term baseline projections (after t+5)	
Primary revenues, expenditures, balance	SRDSF user
Interest bill (existing debt) and receipts	SRDSF user
Debt	SRDSF user
Amortization of existing debt	SRDSF user
Assumptions on new debt issuance	SRDSF user
Gross financing need (calculated)	DSA calculation
Stock-flow adjusment	SRDSF user
Major macro variables/proj. (after t+5)	
Real and nominal GDP and deflator	SRDSF user
Nominal bilateral ER	SRDSF user
Specialized long-term analyses (optional)	
Demographics	
Demographic and labor indicators	UN Pop/ILO
Current beneficiaries	Authorities
Current revenues/GDP	Authorities
Current benefit payments/GDP	Authorities
System reserves	Authorities
Natural resource discovery/depletion	
Proven reserves	Authorities
Investment and production plans	Various
Commodity and noncommodity GDP	SRDSF user
Govt. revenues (commodity & non-commodity)	SRDSF user
Domestic consumption of commodity production	SRDSF user
Large amortizations	
Amorization of existing and new debt	Authorities
Interest on existing and new debt	SRDSF user
Primary revenues, expenditures, balance	SRDSF user
Climate change	
Estimated investments in adaptation	SRDSF user / Default proxy
Estimated upfront investments in mitigation	SRDSF user / Default proxy
Projected investment in adaptation in the baseline in t+5, if any	SRDSF user
Projected investment in mitigation in the baseline in t+5, if any	SRDSF user
IMF's INFORM risk index (score, percentile, risk category)	Climate Change Dashboard
CO2 emissions from fuel combustion per unit of output by industry	Climate Change Dashboard
Output by industry (Input-Output Table)	OECD/SRDSF user
Inputs to customized scenarios*	SRDSF user

Source: IMF.

* Information and assumptions regarding long-term growth rate, private participation in climate change investments, financing options (i.e., via grants, international cooperation, bilateral agreements,etc), among others.

Annex IV. Technical Notes on Risk Indexes and Threshold Derivations

The following annex provides technical details about the design of the risk metrics and the calibration the thresholds used by the SRDSF.[1] *Each of the sections below covers one tool in the core framework of the SRDSF, indicating: (i) the construction of the risk metric, including the aggregation of its component variables; (ii) the thresholds that partition the range of risk metrics into low-moderate-high risk zones; (iii) the average posterior probabilities for each risk zone (e.g., the average ex post probability of a stress event given a signal); and (iv) other relevant information, as warranted.*

A. Logit Stress Probability

1. The logit stress probability (LSP) is the fitted value obtained after evaluating the model using the most recently observed values of the explanatory variables. This metric estimates the probability of a stress event occurring at a 1-2 year ahead horizon. Like the metrics used for the near-term horizon (explained below), the LSP is comprised of several component variables. However, unlike those indicators, the logit model inherently provides a scheme for normalizing components of various units and appropriately weighting to optimally predict risks of sovereign stress.

2. As is standard throughout the SRDSF, the low-to-moderate threshold is associated with a 10 percent missed crisis probability and the moderate-to-high threshold is associated with a 10 percent false alarm probability. In the case of the near-term assessment/sovereign stress logit model, the thresholds are shown in Table AIV.1.

3. The LSP can also be analyzed in terms of posterior probabilities (e.g., the probability of stress, given a particular signal). In this case, the average stress probability based on the historical sample of LSPs is 40 percent for a country whose fitted probability signal is "high", compared to 16 percent and 2 percent for "moderate" and "low" risk countries, respectively.

4. Importantly, the logit model contains features that allow it to capture nonlinearities (e.g., the possibility that "bad news" could have different impacts in two countries, depending on their starting points. In particular, a common change in one variable can impact countries non-homogeneously, depending on their position on the logistic curve. In particular, countries that are in the lower/flatter part of the logistic curve (lower probability of stress) will be impacted less than countries that are in the middle/sinusoidal part of it (e.g., moderate probability). This allows for an accounting of the different vulnerability of MACs to a common chock (for example a rise in VIX): countries with higher starting probabilities of stress will be more vulnerable than countries at lower initial levels. Another source of non-linearity is provided by the thresholds themselves: after a certain probability threshold (that are calibrated on past stress episodes) the country jumps to a new category of risk (from low to medium or from medium to high).

[1]Even further details can be found in IMF 2021a.

Table AIV.1. Near-Term Assessment: Thresholds for Mechanical Signal

Signal	Threshold
Low risk	Below 6.3 percent
Moderate risk	Between 6.3 and 19.5 percent
High risk	Above 19.5 percent

Source: IMF staff estimates.

B. Debt Fanchart Index

5. The three metrics of the debt fanchart index are normalized before they are aggregated. The need for a normalization reflects the different types of units among the three components: the probability of debt non-stabilization resides between 0 and 1 (like any probability); the fanchart width is in percentage points of GDP; and the terminal debt level interacted with the institutions index is a hybrid unit. The normalizing factor for each metric are the empirical standard deviation observed in the historical sample for all market access countries. Thus, each of these items is similar to a z-score, except that the mean is not subtracted.

6. All three metrics are aggregated using weights that reflect the relative explanatory power of each metric in predicting past stress events. In particular, the weights are determined by the AUCs of each indicator obtained from receiver operating curve (ROC) analysis.

7. The normalization factors and weights are summarized in Table AIV.2. Table AIV.3 shows the upper and lower thresholds, which were obtained by determining the level of DFI associated with a 10 percent missed crisis probability (low-to-moderate threshold) and a 10 percent false alarm probability (moderate-to-high threshold). In terms of posterior probabilities, the average posterior probability of stress is 44 percent for a "high risk" signal, 23 percent for a "moderate risk" signal, and 3 percent for a "low risk" signal.

Table AIV.2. Calculation of the Debt Fanchart Index

Metric	Normalization factor	Weight
Fanchart width	0.38	0.32
Probability of debt non-stabilization	0.22	0.33
Terminal debt level x institutions index	0.16	0.36

Source: Fund staff estimates.

Table AIV.3. Debt Fanchart Index: Thresholds for Mechanical Signal

Signal	Threshold
Low risk	Below 1.13
Moderate risk	Between 1.13 and 2.08
High risk	Above 2.08

Source: Fund staff estimates.

C. GFN Financeability Index

8. Unlike the DFI, the GFN Financeability Index (GFI) is built from components that are generally similar in magnitude. The average GFN-to-GDP ratio is in percent of GDP. The initial bank claims on the general government and the change in bank claims on the general government in the stress scenario are both expressed in percent of banking system assets, which is generally proportional to GDP. As a result, the component metrics are aggregated without any normalization.

9. However, like the DFI, the weights of each component are determined by their relative power to predict the onset of sovereign stress. Again, the weights are given by the levels of the AUCs, which in the case of the DFI, are similar for all three metrics, resulting in weighting that is close to equal.

10. Table AIV.4 shows the thresholds associated with the mechanical signals for the GFN module. Again, the low-to-moderate risk threshold is associated with a 10 percent missed crisis probability and the moderate-to-high risk threshold is associated with a 10 percent false alarm probability. In the calibration of the tool, average posterior probabilities were calculated for each of the three risk zones. For the GFN Module, the average posterior probability of stress for a country conditional on the GFI falling in the high-risk zone is 42.1 percent, 4.1 percent for GFIs falling in moderate territory, and 3.5 percent for a GFI associated with low risk.

Table AIV.4. GFN Financeability Index: Thresholds for Mechanical Signal

Signal	Threshold
Low risk	Below 7.6
Moderate risk	Between 7.6 and 17.9
High risk	Above 17.9

Source: Fund staff estimates.

D. Medium-Term Index

11. The Medium-Term Index (MTI) aggregates the DFI and GFI together. As with the underlying components, they are weighted in the MTI based on their relative explanatory power. In the calibration of the SRDSF, ROC curve analysis revealed that both the DFI and GFI had similar levels of AUCs, implying that a simple average is an appropriate aggregation rule. However, prior to

averaging them, a units transformation is necessary. For the MTI, this normalization occurs by dividing the levels of DFI and GFI by the respective maximum level observed for that metric in the historical sample used to calibrate the SRDSF (shown in the upper portion of Table AIV.5). One interpretation of this normalization is that it is the percentile levels of the component indexes that enter the MTI.

12. As with the other thresholds, they are associated with a 10 percent missed crisis (low-to-moderate) and 10 percent false alarm (moderate-to-high) probabilities. These cutoffs are shown in the lower portion of Table AIV.5). Additionally, the average posterior probabilities of stress have been calculated, and they are 43 percent for a MTI in the high-risk zone, 9 percent for a MTI associated with moderate risk, and 4 percent for a low risk MTI.

Table AIV.5. Medium Term Index: Normalization and Thresholds

Normalization factors:	
Debt Fanchart Index	4.5
GFN Financeability Index	52.0
Thresholds for mechanical signals:	
Low risk	Below 0.257
Moderate risk	Between 0.257 and 0.395
High risk	Above 0.395

Source: Fund staff estimates.