Assessing Chile's analytical framework for long-term fiscal sustainability
















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Foreword

Independent fiscal institutions are key in supporting well-designed fiscal frameworks that ensure long-term sustainability while allowing for adequate fiscal space and counter-cyclical policy in the short run. The Autonomous Fiscal Council *(Consejo Fiscal Autónomo, CFA*) is Chile's independent fiscal institution tasked with contributing to the responsible management of the central government's fiscal policy through independent, non-partisan analysis and advice. While still relatively young as it started operating in June 2019, the CFA has already established itself as a respected institution relying on a wide range of analytical tools to assess the sustainability of public finances. In the current context, marked by a sharp increase of public debt, it is key to ensure that the models and tools used by the CFA remain "fit-for-purpose" and aligned with international best practices and standards.

This report presents the advice provided by the OECD on how the CFA can further strengthen its models and tools. It highlights the quality of the tools already developed by the CFA and advises on refinements and further improvements with a particular attention for fiscal sustainability analysis and reporting, expenditure forecasts and communication on fiscal sustainability.

The report is the result of the work of an interdisciplinary OECD team bringing together expertise on country analysis, macroeconomic analysis and policy advice from across the Economics Department. It builds on insights and peer learning from a series of seminars organised in June and July 2020 with other independent fiscal institutions. A draft of the report was discussed at a seminar of the OECD Economic and Development Review Committee in September 2020.

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Key messages and advice

The Autonomous Fiscal Council *(Consejo Fiscal Autónomo, CFA)* was established by law in February 2019 as an independent institution with the mandate of contributing to the responsible management of the central government's fiscal policy. The CFA has established itself as a respected institution, providing independent advice on, among others, possible deviations from the fulfilment of the goals of the structural balance and propose mitigation measures. It is also responsible for evaluation of the medium and long-term sustainability of public finances. After a sharp increase of public debt driven by the local and global crisis and measures to mitigate the COVID-19 pandemic, it is even more important to ensure that the institutional framework, models and tools used by the CFA are aligned with international best practices and standards, such as the OECD Principles for Independent Fiscal Institutions (IFIs)((OECD, 2014[1]).

At the request of the CFA, the OECD has been providing advice on how the CFA can further strengthen its analytical framework for the assessment of medium and long-term fiscal sustainability. The advice draws on the experience and practices of other OECD IFIs and the analytical work developed by the OECD on macroeconomic and fiscal aspects.

The CFA has already put in place analytical tools to assess Chile's long-term fiscal sustainability. The following actions provide a comprehensive set of measures that the CFA could undertake over time to fine-tune and further strengthen its models and tools.

Sequencing these actions is key to ensure that measures are aligned with the evolution of CFA's role and capabilities. As immediate priorities, the CFA could in particular focus on the following actions:

- **Fiscal sustainability analysis and reporting:** To fulfil its mandate, the CFA has already published reports for Congress (CFA, 2019[1]; CFA, 2020[2]), presenting an overall assessment of compliance with fiscal rules, monitoring and assessment of sustainability of public finances and recommendations on fiscal policy (CFA, 2019[3]). The CFA has also issued some technical papers and opinions on specific issues such as public spending efficiency and fiscal responsibility during the COVID-19 crisis (CFA, 2020[4]). The CFA could start calibrating its reporting with its main functions to increase impact and clarity of what it does. For example, it could release one report on compliance with fiscal rules twice a year, and another report on the long-term sustainability of public finances for the time being. A number of more established IFIs are considering releasing sustainability reports every two years. The CFA might want to consider this option in the future. . The CFA has already developed deterministic and stochastic models for forecasting debt and sustainability indicators that could be used in the report and enriched by analysing different scenarios and shocks.

- **Expenditure forecasts:** In line with the analysis conducted by most leading OECD IFIs, the CFA could start to develop a presentation of a no-policy change scenario which lays down the central situation of public finances. This scenario could include a detailed set of revenue and expenditure forecasts, to be included in the fiscal sustainability report. Analysis of alternative relevant scenarios is also warranted. This scenario could be based on a detailed, most frequently bottom-up, set of revenues and expenditure forecasts. It would build on the current fiscal framework with its indexation rules, clearly defining the assumptions and main parameters. These forecasts would focus in particular on expenditures that affect medium-to long term sustainability, such as expenditures related to ageing.

- **Communication on fiscal sustainability:** The CFA should start to communicate systematically on analysis of fiscal sustainability and indicators in an intelligible and salient fashion. In line with Principle 7 of the OECD Principles for IFIs, it. could publish all documentation, databases, working papers, models and past analysis and forecasts on the website to be fully transparent around its economic and fiscal modelling. Debt forecasts (deterministic and stochastic) and related scenarios, together with the fiscal sustainability indicator and other variables could be combined to show an updated and complete picture of fiscal sustainability in the country. Heat maps and fan charts could be used to indicate vulnerabilities and risks to debt sustainability. The CFA could consider developing a simulator (e.g. https://obr.uk/choose-long-term-projections/ or https://www.airef.es/es/sostenibilidad/observatorio-deuda).

- **External advice:** The CFA could establish an Advisory Panel (similar to the one created by other OECD IFIs such as the Slovak Council for Budget Responsibility) in line with Principle 9 of the OECD Principles for IFIs.. The Panel could provide guidance on methodological developments, enabling the production of high-quality models and tools. The Panel could also give advice on the programme of work. It could include national and international experts, including members of peer IFIs.

Building on these priority actions, over the medium- to long-term, the CFA could continue to strengthen and develop its analytical tools and models through the following actions:

MONITORING COMPLIANCE WITH FISCAL RULES

- **Monitoring and reporting on long-term fiscal risks:** As the CFA becomes more established, it could produce a fiscal risks report. This report could complement the recommended reports on compliance with fiscal rules (biannual) and sustainability of public finances (annual). The fiscal risks report could be released less frequently, for example at the beginning of each administration. Such a report could analyse more in depth the different fiscal risks faced by the country, such as those related to contingent liabilities and climate change.

- **Developing easy-to-understand tools to communicate on compliance with fiscal rules:** The CFA could develop an easy-to-understand tool to communicate regularly on compliance with fiscal rules. The traffic-light system adopted by the Slovak Council for Budget Responsibility (CBR) could provide some inspiration. The tool would need to be adapted to the perceptions of the Chilean public to ensure it is effective. Progressively, the CFA could also step up its communication efforts over time by developing and implementing a communications strategy and employ some dedicated staff to deal with communication, n line with other larger IFIs across the OECD, such as the Portuguese Public Finance Council and the Slovak CBR. This would help it align with Principle 8 of the OECD Principles for IFIs.

- **Considering escape clauses and correction mechanisms:** Defining clear escape clauses and correction mechanisms in legislation would add transparency to the fiscal rule currently in place in Chile, which has been subject to repeated revisions since 2008 to respond to a number of external shocks. If these mechanisms were put in place, the CFA would be expected to play a role in assessing if the conditions of the activation of these correction mechanisms have been met, similarly to most other OECD IFIs.

ANALYSIS OF SUSTAINABILITY OF PUBLIC FINANCES

The CFA has developed a model for debt sustainability analysis composed of deterministic and stochastic components, and fiscal sustainability indicators. This is in line with the work of international organisations and other peer IFIs. Some additional steps could be taken in the short-term to strengthen the analytical framework:

- **Deterministic model for forecasting debt:** The CFA deterministic model is comparable to what other international organisations and OECD IFIs are doing to forecast debt and analyse public debt sustainability. It is detailed and granular, easy to interpret and flexible enough, taking into account Chilean specificities. These features allow for a forecast under different scenarios with many different variables and stress testing. The model could be relatively easily and quickly improved by: 1) checking regularly the performance of the model; 2) building alternative scenarios around fiscal paths and associated risks; 3) adding expenditure forecasting (for example, by building on the OECD long-term expenditure framework); 4) communicating on the methodology and assumptions used. In the long-term the CFA could consider incorporating feedback effects. Building on OECD advice, the CFA has already started introducing some of these improvements.

- **Stochastic model for forecasting debt:** The CFA's stochastic model is similar to the ones used by other IFIs and the international literature. The model is flexible, detailed and granular, allowing the CFA to model different stochastic shocks, taking into account Chilean specificities. The model could be relatively easily and quickly improved: 1) testing the performance of the model; 2) simulating additional shocks related to contingent liabilities and capital

requirements; 3) communicating on methodology, assumptions and results. In the long-term, the CFA could consider developing structural models to simulate shocks and avoid some of the drawbacks from the current specification.

- **Fiscal sustainability indicators:** The fiscal sustainability indicators developed by the CFA are sound and widely used in the literature and by other IFIs. The analysis could be enriched by using different scenarios, based on different assumptions for key variables and different horizons. Enlarging the number of variables to monitor, analyse and track in real time different aspects of fiscal sustainability would be advisable. These additional variables could include the debt profile (for instance, maturity, share of foreign exchange debt, share of debt held by non-residents) and market perceptions (for instance, sovereign Credit Default Swap spreads and Relative Asset Swap spreads). An analysis of the type of the set of S0, S1 and S2 indicators, as used by the European Commission and explained in details below, could be considered. These indicators are designed to allow for early identification of sustainability challenges over the short-, medium- and long-run.

- **Access to data and information, including on contingent liabilities and capital requirements:** Detailed data and information, including forward-looking data, is needed so that the CFA is in the best possible position to deliver informed analysis and opinions. In line with Principle 6 of the OECD Principles for IFIs, contingent liabilities and other capital requirement information should be provided timely by the Budget Office, the Ministry of Finance, the Financial Market Commission (Comisión para el Mercado Financiero, CMF) and the Central Bank. The CFA could seek to develop agreements on access of information with these institutions, through formal protocols or memoranda of understanding (MoU). The CFA could also be given access to existing on-line information systems of the Budget Office to have easy real-time access to fiscal information (similarly to other IFIs).

MACROECONOMIC FORECASTS AND POTENTIAL OUTPUT ESTIMATIONS

- **Developing macroeconomic forecasting:** in the medium-to-long-term the CFA could take a more active role in contributing to the debate around macroeconomic forecasting by assessing the government's forecasts or developing its own forecasts. The CFA currently develops its own scenarios by relying heavily on the Central Bank forecasts as a benchmark. The Chilean Central Bank has a very solid reputation on independent macroeconomic forecasting.

While it makes sense to rely on the Central Bank's macroeconomic forecasts in the short term, especially as the CFA has neither the staff nor the resources nor the mandate to develop its own forecasts, this practice ties the CFA's activities to the calendar of the Central Bank policy meetings. It would thus be valuable for the CFA to have a more official, pre-determined and agreed relationship with the Central Bank to discuss the macroeconomic forecasts. The CFA could also consider setting up a working group, or hold annual workshops, to serve as platforms for analytical discussions on projections and forecasting in Chile. In the medium to long-term, and given the importance of macroeconomic forecasts to assess the sustainability and risks of public finances, the CFA could consider developing in-house tools for macroeconomic forecasting. This would require an increase of analytical and experienced staff dedicated to this task, in line with Principle 4 of the OECD Principles for IFIs.

- **Improving estimations of potential output and the output gap:** The CFA methodology to calculate potential output is the same as the official methodology. One of the CFA's role is to review the official calculations of potential output and express its opinion on them. This methodology has advantages as it is based on expert committee opinions. However, as highlighted already by the CFA (Arend and Sanchez, 2020[5]), potential output has persistently been overestimated. This overestimation is causing cyclical adjustments to non-mining tax revenues to be persistently negative, resulting in an upward bias in structural revenues and fiscal spending. In the medium to long term, the CFA may therefore want to develop alternative measures of potential output and the output gap. This would require a range of different models and approaches as well as the use of judgement, including in trying to identify temporary and permanent shocks. Forecasts for potential output could be published on a regular basis to help with the evaluation of forecasts and improve performance.

DEBT CEILING, LIMIT OR THRESHOLD

- **Estimating an appropriate debt ceiling:** The CFA could consider estimating a debt ceiling as an analytical tool for its own debt sustainability assessment and/or as a way of helping to improve Chile's fiscal framework. Such an estimation would require relying on a suite of models and assumptions to ensure the robustness of the resulting debt limit. The analysis should be transparent, well-documented and made public. Good communication can help with the buy-in of the rules, which is also important for their credibility and effectiveness.

Since the CFA started operating in June 2019, it has established itself as a respected institution, relying on a wide range of analytical tools to assess the sustainability of public finances.

Introduction

This report provides an overview of current practices and relevant literature related to the analysis of medium- and long-term fiscal sustainability that could serve as a basis for strengthening the analytical capacity of Chile's Autonomous Fiscal Council *(Consejo Fiscal Autónomo, CFA)*. Focus is on the techniques and methodologies that would be relevant and could serve as examples for Chile. In particular, the analysis of medium and long-term sustainability of public finances in other Independent Fiscal Institutions (IFIs) will be reviewed. The function of preparing or assessing forecasts and monitoring compliance with fiscal rules is also briefly analysed since these functions are complementary and relevant for IFIs that need to assess the sustainability of public finances. The report also provides advice on how the current methods and tools used by the CFA could be further refined and strengthened.

The report is structured as follows. It first provides an overview of Chile's fiscal policy framework and briefly compares CFA's mandate and functions with those of other OECD selected IFIs. Approaches to monitoring compliance with fiscal rules are analysed. The report then reviews in detail relevant approaches in analysing the sustainability of public finances, including analysing expenditure and revenue forecasts as well assessing contingent liabilities and climate change related fiscal pressures. Afterwards, different approaches to preparing macroeconomic forecasts are studied. Finally, the report provides an overview of methodologies and approaches to estimating prudent debt ceilings.

Since the CFA started operating in June 2019, the institution has been delivering on its mandate, and receiving good media coverage for its assessments and recommendations. The aim is to help the CFA further develop its analytical tools and further align them with best practices. The report includes detailed recommendations for the CFA after each section based on best practices, international standards and experience from peer IFIs and other international organisations. Recommendations distinguish what the CFA can do in the short-term with the staff and resources it currently has, and recommendations for the medium-to-long term when the CFA could consider to grow in staff and resources to further enhance its capabilities.

1. The fiscal policy framework in Chile

In the last two decades, Chile has developed a solid fiscal framework. The discipline enforced by the fiscal rule helped to shield public spending from the copper boom, generating large savings that proved crucial when the country has faced large negative shocks, such as the global financial crisis (Eyraud et al., 2018[6]) and the recent social crisis. This has allowed Chile to sustain resilient economic growth and maintaining low levels of public debt in international comparison and in the region (OECD, 2018[7]). Prudent fiscal management has been rewarded by one of the lowest sovereign bond spreads in the region.

Since 2001, Chilean fiscal policy has been guided by a cyclically adjusted balance (CAB) rule, known in the literature as the total central government structural balance. This policy has a medium-term perspective and puts an *ex ante* ceiling on government expenditures. The structural balance convergence target is set within the first 90 days of each new presidential mandate but can be changed any time, being revised each year with the budget law. Every year, two committees provide technical estimates for trend GDP growth and forecasts for long-term copper price (10 years ahead). Revenues are adjusted cyclically for deviation from trend GDP growth and the long-term copper price based on the estimates of these two committees of experts, while expenditures are not cyclically adjusted.

This fiscal rule seeks to overcome the traditionally procyclical behaviour of fiscal policy by the operation of funds whereby surpluses are saved during good economic times and drawn down during more challenging times. Chile has two sovereign wealth funds, the Social Stabilisation Fund (ESSF) and the Pension Reserve Fund (PRF), which help reduce the impact of commodity fluctuations on activity, as public revenues remain dependent on copper. In particular, the Social Stabilisation Fund finance fiscal deficits that may occur in periods of low growth and/or low copper prices and may also be used to finance the payment of public debt (including recognition bonds) and contributions to the Pension Reserve Fund. In turn, the Pension Reserve Fund complements the financing of pensions and social welfare arising from the old-age and disability solidarity basic pensions as well as solidarity pension complements, means-tested to the 60% of the poorest population.

Chile's fiscal position markedly improved following the adoption of the structural balance rule (Eyraud et al., 2018[8]). However, repeated shocks in recent years (global financial crisis, the 2010 earthquake, social protests at the end of 2019 and the COVID-19 pandemic) have exposed gaps in the framework. Since 2008, the rule has been subject to repeated revisions in the face of these shocks, mainly because of the difficulty of disentangling structural and cyclical factors. In the current Chilean macroeconomic and social context, the deviations from the fiscal rule are testing the fiscal framework and the health of fiscal accounts.

Against this background, the rule has changed several times since its adoption in order to improve measurement and institutional framework. In particular, authorities have broadened the mandate of the CFA (previously an advisory council within the Ministry of Finance) and ensured its independence with the aim to strengthen the fiscal framework, also in line with the OECD Principles for IFIs. The law has given the CFA its own resources. The CFA is composed of five members, who are experts of recognized professional and academic standing in fiscal and budgetary matters. The five board members are nominated by the President of the Republic and approved by the Senate. Their mandate does not coincide with the government term. The President is appointed by the President of the Republic from among the members of the CFA, with a term of three years in office or the shortest remaining time and may be appointed for a new period. The members execute their functions on a part-time basis, so that their functions are compatible with another academic or professional jobs. Board member last five years in their positions, and they can be re-elected only for a new consecutive period and have staggered terms (they are renewed one per year). The vice president is elected by the members of the CFA and will replace the President if the latter is absent or temporarily unable to perform his functions. To support its setting up, since its foundation, the CFA and its staff depend administratively on the Ministry of Finance under a temporary two-year agreement. Under this agreement, the Ministry of Finance commits to support the CFA exclusively with administrative tasks (human resources, purchases, etc.).

Chilean Treasury building in Santiago.

2. Mandate and functions from Independent Fiscal Institutions: how does Chile compare?

In accordance with the provisions of the Law that created it in February 2019, the CFA aims to contribute to the responsible management of the central government's fiscal policy. Its main functions and powers are: i) to evaluate and monitor the calculation of the cyclical adjustment of effective revenues made by the budget office of the Ministry of Finance (DIPRES), ii) to participate as an observer in the procedures established to obtain the opinion of independent experts on the factors that determine the level of trend of the central government's income and expenditure, iii) to make observations and propose to the Ministry of Finance methodological and procedural changes for the calculation of the structural balance, iv) to express its opinion on possible deviations from the fulfilment of the goals of the structural balance and propose mitigation measures, v) to evaluate the medium- and long-term sustainability of public finances and disseminate the results of its evaluations, vi) to advise the Ministry of Finance on fiscal matters expressly entrusted by it and related to its purpose, among others.

HOW DOES THE CFA MANDATE COMPARE TO OTHER INDEPENDENT FISCAL INSTITUTIONS?

The following tasks are typically present in IFIs: the monitoring of fiscal policy and rules; macroeconomic forecasting; an analysis of long-run sustainability of public finances; policy costing; the promotion of fiscal transparency (Table 1). Some IFIs have also the mandate to provide normative recommendations on fiscal policy.

TABLE 1. **Mandate and functions of OECD IFIs**

Country	Institution name	Functions				
		Monitoring compliance with fiscal rules	Analysis of long-term fiscal sustainability	Assesses only macroeconomic or fiscal forecasts	Prepares macroeconomic or fiscal forecasts	Policy costing
Australia	Commonwealth Parliamentary Budget Office (PBO)		y			y
	Victorian Parliamentary Budget Office (PBO)					y
Austria	Fiscal Advisory Council (FISK)	y	y	y		
	Parliamentary Budget Office (PBO)		y			y
Belgium	High Council of Finance (HRF/CSF)	y	y			
Brazil	Independent Fiscal Institution (IFI)	y	y		y	
Canada	Parliamentary Budget Office (PBO)		y		y	y
	Financial Accountability Office of Ontario (FAO-ON)		y		y	y
Chile	**Autonomous Fiscal Council**	**y**	**y**			
Czech Rep.	Czech Fiscal Council (CFC)	y	y	y		
Denmark	Danish Economic Council	y	y		y	
Estonia	Fiscal Council of Estonia	y				
Finland	Independent Monitoring and Evaluation of Fiscal Policy Function, National Audit Office	y	y	y		
	Finnish Economic Policy Council (EPC)	y	y	y		
France	High Council of Public Finance (HCFP)	y		y		
Germany	Independent Advisory Board to the Stability Council	y		y		

Country	Institution name	Functions				
		Monitoring compliance with fiscal rules	Analysis of long-term fiscal sustainability	Assesses only macroeconomic or fiscal forecasts	Prepares macroeconomic or fiscal forecasts	Policy costing
Greece	Parliamentary Budget Office	y		y		
	Hellenic Fiscal Council	y		y		
Hungary	Fiscal Council	y		y		
Iceland	Icelandic Fiscal Council	y				
Ireland	Irish Fiscal Advisory Council (IFAC)	y		y		
	Oireachtas Parliamentary Budget Office (PBO)					y
Italy	Parliamentary Budget Office (PBO)	y	y	y		y
Korea	National Assembly Budget Office (NABO)		y		y	y
Latvia	Fiscal Discipline Council	y		y		
Lithuania	Budget Policy Monitoring Department – National Audit Office of Lithuania (BPMD)	y	y	y		
Luxembourg	National Council of Public Finances (CNFP)	y	y	y		
Mexico	Center for Public Finance Studies (CEFP)				y	y
Netherlands	Netherlands Bureau for Economic Policy Analysis (CPB)		y	y	y	y
Portugal	Portuguese Public Finance Council (CFP)	y	y	y		
Slovak Rep.	Council for Budget Responsibility (CBR)	y	y			y
Slovenia	Slovenian Fiscal Council	y				
Spain	Independent Authority of Fiscal Responsibility (AIReF)	y	y	y		
Sweden	Swedish Fiscal Policy Council (FPC)	y	y	y		
UK	Office for Budget Responsibility (OBR)	y	y	y	y	y
	Scottish Fiscal Commission (SFC)			y	y	y
US	Congressional Budget Office (CBO)		y		y	y
Share of IFIs with the respective function (% of total of institutions)		70%	62%	54%	27%	38%

Note: y = Yes
Source: Authors and OECD IFI database (OECD, 2019[10])

The CFA has similarities with other OECD IFIs. As is clear from the mandate, the CFA has a clear role in the analysis of medium and long-term fiscal sustainability, as well as in monitoring the compliance with fiscal rules. In contrast, in the mandate there is no clear role for macroeconomic or fiscal forecasts. Additionally, the CFA has no assigned role, in principle, on policy costings.

Other OECD IFIs could provide useful insights for the CFA on reporting, analysis and transparency. For example, the Slovak CBR and the UK Office for Budgetary Responsibility (OBR) use frontier methodologies to analyse different aspects of fiscal sustainability and macroeconomic forecasts; are well-recognised domestically and internationally for the quality and transparency of their work and contribute to the debate on fiscal sustainability. Although these two IFIs have more functions in their mandates than the CFA, such as policy costings (in the case of the Slovak Republic

and on which see below) or publication of official macroeconomic forecasts (in the case of the United Kingdom), their mandates are similar to the CFA. The Spanish and Portuguese IFIs are also young and well-recognised European IFIs with similar mandate than the Chilean CFA. In both cases, a mandate for assessing macroeconomics forecasts is in place. A relevant difference with respect to the Spanish IFI is that assessments of fiscal sustainability also have a regional focus, as regions are subject to fiscal deficit targets given high fiscal decentralization in Spain. This regional focus requires additional analytical and technical resources.

The Slovak CBR has a similar mandate to the CFA and is a leading institution in many of the functions it undertakes (OECD, 2020[9]). As with the CFA, the Slovak CBR has no clear mandate in the forecasting process. But different from the CFA, the Slovak CBR also has the mandate to undertake policy costings. The main tasks of the CBR are defined in the constitution and cover three important areas: preparing a report on the long-term sustainability of public finances, a report on compliance with the fiscal responsibility and fiscal transparency rules, and undertaking analyses on potential risks and alternative macroeconomic scenarios, as well as providing suggestions on how to improve the methodology for the calculation of various indicators in the area of public finances. The Slovak CBR also assesses and publishes evaluations of activation of the correction mechanism in case of significant deviation from the medium-term budgetary objective or the path towards it; and assesses and publishes evaluations of circumstances for triggering and exiting escape clauses that suspend the correction mechanism.

Similarly, the UK OBR is also a leading institution in terms of the tools and analytical framework used to fulfil its mandate. The council has a broader mandate than the CFA. Among its functions, mandated by law, are: detailed economic and fiscal forecasting, evaluating the government's performance against its fiscal targets, assessing the accuracy of its previous fiscal and economic forecasts,, assessment of the long-term sustainability of the public finances, evaluation of fiscal risks, and costing of individual tax and welfare spending measures at each budget.

Outside the OECD, the Brazilian IFI is a young institution created at the end of 2016 with the goal of increasing transparency in public accounts. The main difference with the Chilean CFA is that the Brazilian IFI has a mandate to provide alternative macroeconomic and fiscal forecasts. Its four functions, as laid down in law are: to publish estimates of economic parameters and variables that are relevant to the construction of fiscal and budgetary scenarios; to analyse adherence of tax and budgetary indicators to legally defined goals; to measure the impact of relevant tax measures, and to project the evolution of fiscal variables that are determinant to the long-term equilibrium of the public sector.

As stated earlier, in terms of resources, the CFA has 5 part-time board members (among which one President and one Vice-president) who are experts of recognized professional and academic standing in fiscal and budgetary matters, and three full-time analysts (a Head of Studies, an Analyst, and an Executive Secretary) with a budget of around USD 490 thousand (Table 2). There are no formal indications on whether the President and the other Board members have to work full or part-time (although in practice it is understood to be part-time). The law specifies that their functions are compatible with other professional or academic activities. However, it would make sense for at least one Board member (preferably the President) to be available on a daily basis for practical reasons, such as always being able to respond to the media and to go to seminars and other activities.

Given that long-term sustainability analysis is one of the most staff-intensive functions of IFIs, after policy costings (Figure 1), the CFA could be relatively understaffed given its mandate. Figure 3 shows that the wider the mandate, the more resources and technical staff in the fiscal councils are needed. Undertaking an assessment of fiscal policy, including compliance with fiscal rules, demands relatively fewer resources, between 2 to 10 full-time professionals (IMF, 2013[10]). As the remit is extended to producing independent economic and fiscal forecasts or assessment of long-term sustainability of public finances, the resourcing requirements increase significantly, as more sophisticated models and specific expertise—e.g. on certain tax issues—are needed. The policy costing is the most staff-intensive remit. As a comparison example, the relatively young Brazilian IFI has 5 analysts and 2 interns to conduct technical studies, together with the 3 full-time Directors (with similar functions as the CFA Board members), who produce technical studies alongside the analysists. The Peruvian IFI has started with 3 members of technical staff and five

TABLE 2. **Resources of OECD IFIs**

Country	Institution name	Year	Budget thousand USD	Staffing				
				Staff (full-time)	Chairs	Council/ Board	Board-Full/part time or both	Total
Australia	Commonwealth Parliamentary Budget Office (PBO)	2017	5,364	40			F	40
	Victorian Parliamentary Budget Office (PBO)	2018	2,465	15	1		F	16
Austria	Fiscal Advisory Council (FISK)	n/a	Not disclosed	6	15		P	21
	Parliamentary Budget Office (PBO)	2017	1,015	8			F	8
Belgium	High Council of Finance (HRF/CSF)	n/a	Not disclosed	14	3	24	P	41
Brazil	Independent Fiscal Institution (IFI)	2017	877	8		3	F	11
Canada	Parliamentary Budget Office (PBO)	2018	3,935	27.4			F	27.4
	Financial Accountability Office of Ontario (FAO-ON)	2018	2,006	17			F	17
Chile	**Autonomous Fiscal Council**	**2020**	**556**	**3**		**5**	**P**	**8**
Czech Rep.	Czech Fiscal Council (CFC)	2018	967	8		3	F	11
Denmark	Danish Economic Councils*	2019	4,738	28	4	21	P	53
Estonia	Fiscal Council of Estonia	2017	79	1.5	1	5	P	7.5
Finland	Independent Monitoring and Evaluation of Fiscal Policy Function, National Audit Office	2015	776	4			F	4
	Finnish Economic Policy Council (EPC)	2018	366	2	1	4	P	7
France	High Council of Public Finance (HCFP)	2017	902	2.5		11	P	13.5
Germany	Independent Advisory Board to the Stability Council	2017	113	1	1	8	P	10
Greece	Parliamentary Budget Office	2017	564	11		5	P	16
	Hellenic Fiscal Council	2018	1,298	13	1	4	B	18
Hungary	Fiscal Council	2017	564	3	1	2	B	6
Iceland	Icelandic Fiscal Council	2017	338	0	2	2	P	6
Ireland	Irish Fiscal Advisory Council (IFAC)	2017	902	6		5	P	11
	Oireachtas Parliamentary Budget Office (PBO)	2018	1,003	12			F	12
Italy	Parliamentary Budget Office (PBO)	2017	6,765	24		3	F	27
Korea	National Assembly Budget Office (NABO)	2017	13,100	138			F	138
Latvia	Fiscal Discipline Council	2017	214	4		6	P	10
Lithuania	Budget Policy Monitoring Department – National Audit Office of Lithuania (BPMD)	2018	257	7			F	7
Luxembourg	National Council of Public Finances (CNFP)	2017	113	2		7	P	9
Mexico	Center for Public Finance Studies (CEFP)	2016	2,748	60			F	60
Netherlands	Netherlands Bureau for Economic Policy Analysis (CPB)	2018	20,176	124.75			F	124.75
Portugal	Portuguese Public Finance Council (CFP)	2018	3,186	18		5	B	23
Slovak Rep.	Council for Budget Responsibility (CBR)	2018	1,616	14.5		3	B	20.5
Slovenia	Slovenian Fiscal Council	2017	564	4		3	B	7
Spain	Independent Authority of Fiscal Responsibility (AIReF)	2017	5,717	35			F	35

Country	Institution name	Year	Budget thousand USD	Staffing				
				Staff (full-time)	Chairs	Council/ Board	Board-Full/part time or both	Total
Sweden	Swedish Fiscal Policy Council (FPC)	2019	1,082	5		6	P	11
UK	Office for Budget Responsibility (OBR)	2017	3,434	27	1	2	B	30
	Scottish Fiscal Commission (SFC)	2018	2,134	22	1	2	P	25
US	Congressional Budget Office (CBO)	2016	46,500	235			F	235

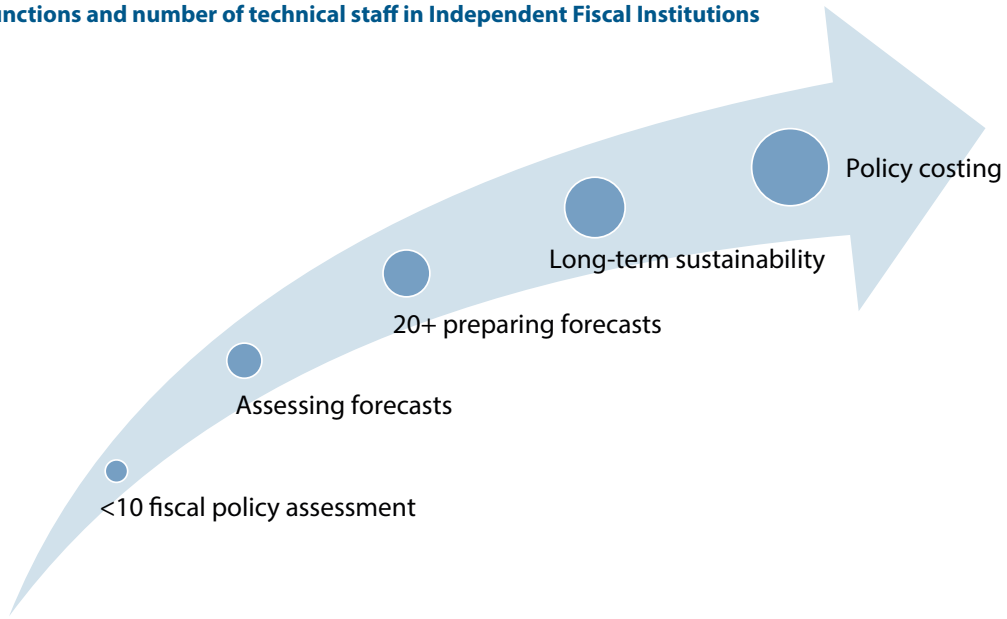
Note: F refers to full-time, P part-time and B for both type of staff.
* The Danish Economic Councils include two councils: the Economic Council and the Environmental Economic Council, with a joint chair and secretariat. The Councils conduct analysis on economic policy and issues related to the environment and the economy. In addition to serve as Denmark's IFI, the Councils also serve as the National Productivity Board (see https://dors.dk/english/institutional-setup, accessed in September 2020).

Source: Authors and the OECD IFI database (OECD, 2019[10])

years later has 8 technical staff. The Portuguese IFI has two governance bodies (the Senior Board and the Executive Committee) and one oversight body (the legislated auditor). In total, the Council has 23 permanent staff, comprising its Senior Board, head of staff, analysts, administration and support staff. Among the technical staff, 11 experts conduct the economic and public finance analysis (OECD, 2019[11]).

The Slovak CBR is governed by a three-person Board, one chair and two other members (that can also be part or full-time). All Board members are elected and can be recalled by Parliament. According to the CBR's internal rules of procedure, decisions are taken by consensus or by majority vote, with each of its Board members having one vote. The CBR benefits from inputs on the work programme through its Advisory Panel, which comprises five well-respected foreign experts on fiscal councils and rules (such as member of other OECD IFIs and academics). The Advisory Panel works as an external evaluator, and its main task is to provide advice on methodological issues, to review the quality of the CBR's work and to discuss strategic issues as well as the forthcoming work programme. In terms of technical staff, in 2018 the council had a head of staff and 11 full-time-equivalent experts, of whom 3.75 were dedicated to fiscal and budget analysis, 1.75 to long-term sustainability, and 1 to macroeconomic forecasts (OECD, 2020[9]).

FIGURE 1. **Functions and number of technical staff in Independent Fiscal Institutions**



Source: (IMF, 2017[12])

RECOMMENDATIONS FOR CHILE'S AUTONOMOUS FISCAL COUNCIL

The IFI mandates may evolve over time as an institution gets established and the budgetary oversight needs of a country change. This is true even for very young institutions. For example, in April 2013, the Irish Fiscal Advisory Council was assigned a new role in endorsing the Department of Finance's macroeconomic forecasts. In 2013, the Portuguese CFP's role was expanded to include endorsing the macroeconomic forecasts underpinning the national medium-term fiscal plans and draft budgets. The undertaking reflects Portugal's commitment to take on a range of duties, separate to the requirements set in national legislation on matters relating to economic governance in the euro area. This gave the CFP a formal role in endorsing the macroeconomic forecasts underlying the national medium-term fiscal plans and draft budgets; the CFP was also assigned a role in the national correction mechanism that is activated in the event of significant deviations from the medium term objective.

An important component ensuring an IFI's independence and credibility is that it has sufficient resources to fulfil its mandate, in line with Principle 4 of the OECD Principles for IFIs. Thus, consideration should be given to whether the CFA has enough analytical capacities and other resources (e.g. data access) to fulfil its current mandate.

The CFA currently has 3 full-time staff producing research and analysis for the part-time 5-member Board. While this staff can allow the CFA to carry out its work in the initial phase, the upgrading and strengthening of the CFA's analytical tools may call for a progressive increase in staff available for the analysis. As a matter of comparison, even relatively young IFIs like in Portugal and the Slovak Republic have respectively 18 and 14.5 members of staff, although their mandates are somewhat broader. The Peruvian Fiscal Council started with three technical staff and five years later has eight technical staff.

It is advisable that the CFA first establishes its staff, tools, processes, reports and other elements of functioning given its current mandate, making sure that staff and other resources, including access to data (on which more later) are sufficient to fulfil the mandate in line with Principles 4 and 6 of the OEC Principles for IFIs. To support this, a short-term action for the CFA would be the establishment of an Advisory Panel (such as the one established by the Slovak CBR), as a mechanism for external evaluation of its work and to help the CFA establish its tools, process and staff. This would align with Principle 9 or the OECD Principles for IFIs. Its members can be national and international experts, including members of peer IFIs. The Panel could be expected to attend prescheduled meetings (quarterly, biannual or annual depending on needs and availability) and be available for consultation electronically. The purpose of the Panel, especially in the initial phases, would be to provide guidance on methodological developments, enabling the production of high-quality models and tools. The Panel could also give advice on the programme of work of the CFA and other relevant issues, if needed.

As the CFA gets more established, the CFA could also take into consideration if there is a need to further extend its work programme and areas of activities. This expansion, however, will need to take into account the resources available to the institution in line with Principle 4 of the OECD Principles for IFIs.

3. Monitoring compliance with fiscal rules

Assessment of compliance with fiscal rules is well-recognised as the core mission of an IFI. Indeed, monitoring and assessing compliance with fiscal rules is a core element of the mandate of most of the OECD IFIs. There is consensus that one of the benefits of the existence of the IFIs is precisely that they can detect non-compliance with fiscal rules and targets early on and help with the monitoring and increased transparency. An independent assessor is a crucial factor for the effectiveness of a given fiscal rule. Assessments typically include judgment on whether the rules have been followed in the past or whether the projected budgetary developments are in line with requirements. To maximize the impact of IFIs within this mandate it is recommended to publish timely assessments, both forward-looking as well as backward-looking and covering most, if not all, of the domestic fiscal rules in force (Jankovics and Sherwood, 2017[13]).

Most of the IFIs publish backward-looking and forward-looking compliance assessments regularly. In most countries, the fiscal councils' monitoring mandate calls solely for a backward-looking view to assess compliance of past budgets with fiscal rules (for example, the Slovak Republic[1] and Brazil). Some IFIs are tasked to look primarily at fiscal rule compliance from an ex-ante, dynamic perspective. For example, the UK OBR is charged only with a forward-looking assessment. It is required to judge in its semi-annual reports whether the government's fiscal policy as announced to that date remains consistent with a greater than 50 % chance of achieving or exceeding the so-called fiscal mandate constituting the main UK numerical rule. The nature of this task is influenced by the design of UK rules, which are defined over a multi-annual horizon without containing specific targets for the intervening years. Also in Denmark and Netherlands this is the case. The rest of countries usually do both exercises.

The frequency of monitoring reports varies, and reflects the mandate and the publication policy of each IFI (see Table 3 with examples of some countries). Most IFIs release two main reports annually, where typically the edition of the first half of the year analyses the country's medium-term budget, and in the second half of year the report deals with the planned (or adopted) budget. These reports encompass many aspects of fiscal policy together with the monitoring part.

Technical analysis and methodologies vary widely across OECD IFIs. Some of the IFIs assess fiscal rules using a spreadsheet approach incorporating mathematical and logical formulas. Most IFIs use one or several reference methodologies, in order to properly assess the budgetary figures in structural terms. For the European Union (EU) countries it may include the commonly agreed EU methodology, but they also use their own methodology or the national authorities' methodology. Careful identification of one-off factors is also a usual element of the assessment.

A very important function of the Slovak CBR is assessing compliance with fiscal and transparency rules. Reports on compliance are mandatory: twice a year the council publishes a report on evaluation of compliance with the balanced budget balance (July and an update on December or January next year). The report meets that mandate by combining a clear assessment of compliance with detailed rationales for the assessments provided and explanations for differences between the CBR's and the Ministry's assessments. As required under the mandate, the report also evaluates the need to activate a correction mechanism and circumstances for triggering and exiting escape clauses that suspend that mechanism. When the conclusion is that there is a significant deviation from the required adjustment path towards the medium-term budgetary objective, the Ministry of Finance needs to propose correction measures. The CBR assesses this proposal and publishes a report on the Evaluation of the correction measures proposal highlighting risks and proposals to make sure the correction mechanism is applied and fulfilled.

Core elements of the CBR's methodology include calculations of the structural balance based, inter alia, on estimations of the output gap and careful identification of one-off factors (e.g. windfall revenues) (OECD, 2020[9]). The analysis of the structural balance is complemented by an analysis of compliance with the expenditure benchmark rule that requires the net growth rate of government spending to not exceed the medium-term potential economic growth rate.

1. In the Slovak Republic, the mandate explicitly calls for an ex-post assessment of compliance with fiscal rules, but the CBR can also point to ex-ante risks of fulfilling them, e.g. when publishing its assessment of the draft budget.

TABLE 3. **Reporting on compliance of fiscal rules and correction mechanisms in some countries**

Country	IFI	Annual frequency	Backward looking	Forward looking	Current period	Medium term	Publication name
UK	OBR	2		y	y		Economic and fiscal outlook
Slovak Republic	CBR	2	y		y		Evaluation of compliance with the balanced budget rule
		–		y	y		Evaluation of correction mechanism
		1		y		y	Evaluation of Medium-term Budgetary Objectives
Portugal	CFP	1	y	y	y	y	Analysis of the Draft State Budget
		1		y	y	y	Analysis of the Stability Programme
Peru	CFP	1	y		y		Opinión del Consejo Fiscal acerca del cumplimiento de las reglas fiscales vigentes
Germany		2		y		y	Statement of the Advisory board
Spain	AIReF	–					Informes sobre la aplicación de los mecanismos de corrección de estabilidad presupuestaria y sostenibilidad financiera
		1		y	y		Informe sobre el cumplimiento esperado de los objetivos de estabilidad presupuestaria, deuda pública y regla de gasto
		1	y	y	y		Informe sobre la Actualización del Programa de Estabilidad

Source: OECD Secretariat

The evaluation of compliance with the balanced budget balance report from the CBR uses budgetary traffic lights, a framework to assess and communicate short-term risks to the general government budget (CBR, 2018[14]). Within the framework, short-term fiscal models are used to project the in-year fiscal balance to identify the risks of deviating from the initial budget balance target. The end-of-year values are forecasted for the individual revenue and expenditure items of the government budget. Relatively stable elements in the budget, e.g. those that can be relatively well predicted (such as pensions or wages) are forecasted by a simple time-series approach based on the monthly developments in previous years. Non-stable revenue and expenditure items, e.g. capital expenditures or projects funded from the EU budget, are forecasted using various expert assessments.

The budgetary traffic lights consider a projected value of the public finance balance that would most likely be achieved if no additional measures are taken by the government (neither legislative nor operational) during the forecast horizon. Intuitively, the greater the negative deviation from the target, the higher the fiscal stress. As its name indicates, the framework expresses these deviations using colours of the traffic lights. Figure 2 shows an example of presenting the results of this methodology.

The UK OBR publishes the Economic and Fiscal Outlook twice a year. It sets out forecasts for the economy and the public finances over a five year horizon and assesses whether the government is on course to hit its fiscal targets. A whole chapter is devoted to assessing compliance with fiscal targets. Specifically, the report examines whether the government has more than a 50% chance of meeting fiscal targets on current policy settings and given the baseline forecast. The report presents the probability of the government meeting its fiscal targets using the distribution of forecast errors that underpins a fan chart for the cyclically adjusted budget balance. The report also presents the sensitivity of the fiscal forecasts in alternative economic scenarios.

The Spanish AIReF is one of just a few IFIs that is charged not only with verifying compliance with general or central government rules, but also with subnational/regional rules. The AIReF publishes monthly a monitoring of the stability objective and an assessment of the probability of compliance. This is done on top of the annual report on compliance with stability, public debt and expenditure objectives for the government and its regions. The AIReF also has developed a database at municipal levels that draws together a range of information that can be used to monitor early warning indicators that detect risks of non-compliance with fiscal rules (OECD, 2019[16]). The AIReF can also request the Minis-

try of Finance the activation of preventive measures after detecting in their reports significant risks of deviation from compliance with the stability objective and the spending rule at national or regional levels.

In Peru, the Fiscal Council publishes a document issuing an opinion on compliance with the fiscal rules for the Non-Financial Public Sector, the regional governments and local governments on an annual basis. This document comes on top of a document with the council opinion on the multi-annual macroeconomic framework that contains macro and fiscal forecasts for the next four years. These fiscal rules can be temporarily suspended in the event of natural disasters or significant external shocks, defined by law. At the same time, forecasts of the multi-annual Macroeconomic Framework must be updated, and a proposed path of return to fiscal limits (correction mechanism) must be included. It is worth mentioning that, in case of financial volatility, the public debt ratio may temporarily exceed the limit. Such deviation may not exceed 4 percentage points of GDP (Barreix and Corrales, 2019[17]). The Portuguese report is a good example of showing debt and deficit estimates, and their compliance with European fiscal rules (OECD, 2019[11]). The report contains a detailed analysis of the consistency of budget forecasts with the macroeconomic scenario and fiscal policy measures; an assessment of fiscal adjustment, fiscal policy stance and compliance with rules, detailing temporary one-off measures and estimated output gap; and a detailed analysis of indebtedness, gross borrowing requirements and public debt developments (CFP, 2018[18]).

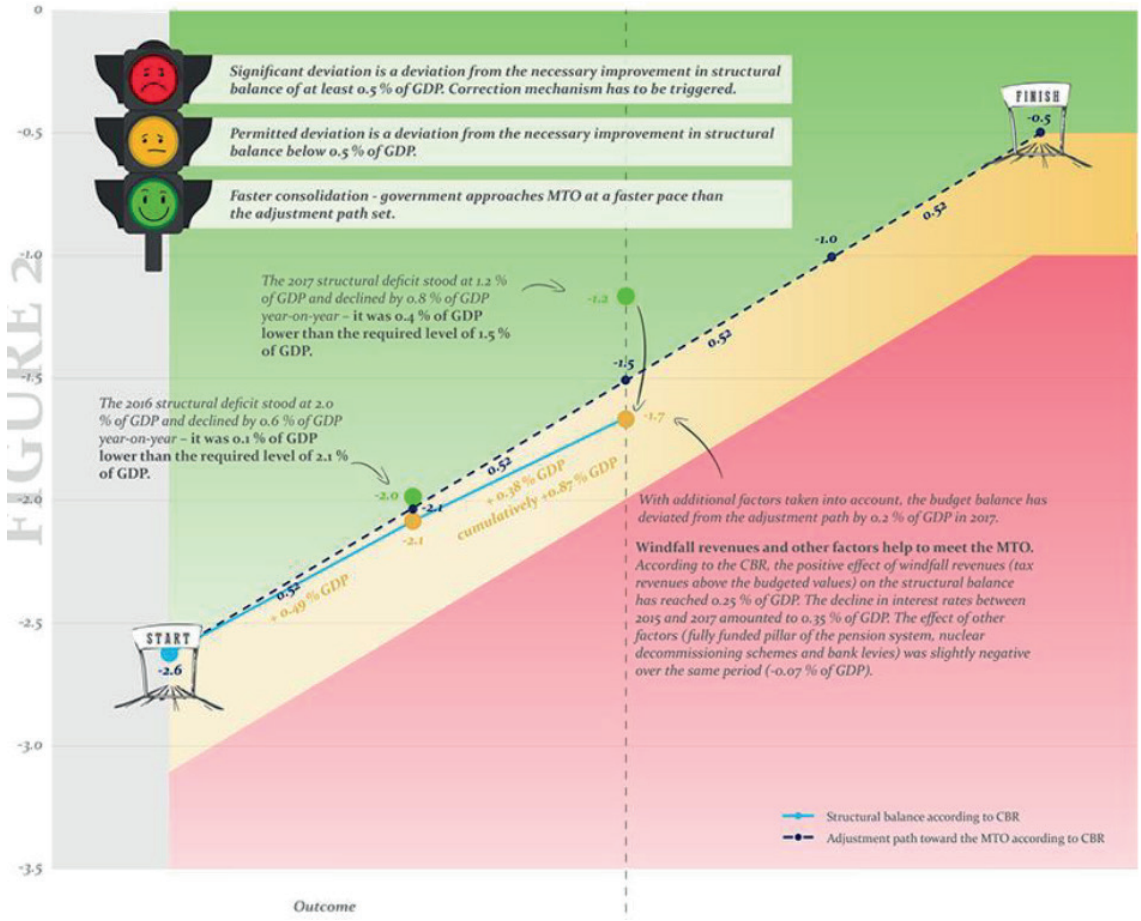
CORRECTION MECHANISMS

Clear and effective enforcement procedures for non-compliance can lead to increased enforceability, transparency and credibility of fiscal rules. These procedures are specified in the legislation and prescribe the action to be taken if fiscal outturns are not in line with the fiscal rules. Different kinds of measures have been implemented in different countries, from the need to present a corrective proposal to the legislature to automatic correction mechanisms and sanctions (Table 4). Automatic correction mechanisms usually specify in advance (in the legislation) when and how to correct deviations from the rule, and personal or institutional sanctions can ensure that cost of breaking fiscal rule is greater than the benefit.

In the EU fiscal framework, countries are subject to annual multi-step revision process of the country's fiscal situation, which in extreme cases of failure to comply with the rules can ultimately lead to sanctions. If the structural balance and/or expenditure of a country deviates significantly from the respective benchmark (medium-term objective for the structural balance, expenditure benchmark) or the adjustment path towards it in the preventive arm of the Stability and Growth Pact (SGP), a set of pre-defined mechanisms will be triggered to correct these deviations. Deviations from the debt limit or headline balance limit are subject to the Excessive Deficit Procedure under the corrective arm of the rules, where the country has to follow an adjustment path to correct the deviation. The individual specifics regarding the nature, size and time frame of the adjustment path of the corrective action to be undertaken are determined by the EU Council following a recommendation from the European Commission. The whole fiscal surveillance process under the EU fiscal rules, including the corrective mechanisms, has a pre-determined sequence of steps and conditions for triggering them (in that sense it could be considered automatic to a certain extent), but it also contains assessments of each potentially problematic situation, as well as decisions by the Council (where voting is involved), involving some degree of discretion (see Box 1).

The Swiss and German structural Budget Balance Rules (BBRs) contain automatic correction mechanisms known as "debt brakes." In both countries, deviations from the structural BBR (positive or negative) are stored in a notional account. When the accumulated deviation exceeds a threshold, improvements in the structural balance are required within a defined time frame to reverse the deviation. The main differences between the two countries are the thresholds (1.0 percent of GDP in Germany per ordinary law and 1.5 percent per constitution; and 6 percent of expenditures in Switzerland) and the type of deviation that needs to be corrected. In Germany, only those deviations that did not result from errors in real GDP growth projections enter the notional account, whereas in Switzerland all errors are tallied. The latter course is more transparent but provides less flexibility to accommodate errors outside the control of government. In Switzerland, the excess amount must be eliminated within the next three annual budgets. In Germany, overruns only need to be reduced during an economic recovery to avoid procyclical tightening and can be corrected via expenditure and revenue measures.

FIGURE 2. **The use of Budget Traffic Lights in the report on compliance with fiscal rules by the Slovak Council for Budget Responsibility**



Source: (CBR, 2018[15])

TABLE 4. **Corrective mechanisms in the fiscal rules**

Type of rule/ Correction mechanisms	Automatic correction mechanisms	Proposal with corrective measures presented to the legislature	Entity must implement measures	Automatic sanctions	Excessive deficit procedures of the Stability and Growth Pact	None
Expenditure	DNK, GRC, USA, ESP	EST, FRA, ISR, NLD, SWE, ESP; ARG, ECU, PER	AUT,GRC, NLD, SWE, CHL, ESP; COL, BRA	USA		AUS, CZE, FIN, FRA, IRL, JPN, KOR, LUX, POL, PRT, RUS, SVN
Budget balance	AUT, BEL, DNK, FIN, FRA, DEU, GRC, IRL, ITA, LUX, PRT, SVK, SVN, ESP, CHE	ISR, ITA, MEX, ESP, COL, PER	GRC, ESP, CHL	NLD, CHE	AUT, BEL, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, IRL, ITA, LUX, NED, POL, PRT, SVK, SVN, ESP, SWE, GBR	AUS, CAN, NOR
Debt	POL, SVK, ESP	POL, SVK, ESP	BRA, GRC, HUN, POL, SVK, ESP	NLD, POL, SVK	AUT, BEL, CZE, DNK, EST, FIN, FRA, GER, GRC, HUN, IRL, ITA, LUX, NED, POL, PRT, SVK, SVN, ESP, SWE, GBR	AUS, USA
Revenues	GRC	NLD				AUS, FRA, RUS, SVK

Source: OECD (2013), *Government at a Glance* and OECD (2014) *Government at a Glance: Latin America and the Caribbean*

The debt brake in Germany was adopted in 2009 and will also apply to the federal states (*Bundesländer*) from 2020. Since 2016, Germany's debt brake has limited the Federal Government's structural net borrowing to 0.35% of gross domestic product. From 2020, Germany's federal states will be generally forbidden from taking on new debt. The debt brake also aims to ensure compliance with European budgetary rules for general government and, if necessary, makes proposals for corrective action. The Stability Council is to carry out this surveillance, i.e. the Federal Minister of Finance and the state ministers of finance. From 2020, the Stability Council will also review the extent to which central government and the individual state governments are adhering to their debt brakes. At the same time, the Stability Council is tasked with ensuring that there are no conflicts with European budgetary rules. The Stability Council is assisted by an independent advisory board, which publishes its evaluations of the Stability Council's projections. In response to the crisis generated by the COVID-19 pandemic, the federal government provided a supplementary budget which raised the federal deficit about 100 billion above the limit set by the debt brake and parliament passed this budget based on "exceptional circumstances". The Independent Advisory Board to the Stability Council is expected to provide a statement regarding compliance with the upper limit to the structural general government budget deficit at the regular meeting of the Stability Council in June 2020.

The Slovak Republic has a 60% debt-to-GDP ceiling including thresholds that trigger actions to prevent the rule from being missed. When the debt-to-GDP ratio reaches 50%, the minister of finance is obliged to explain the increase to parliament and suggest measures to reverse its growth. At 53% of GDP, the cabinet is required to pass a package of measures to trim the debt and freeze wages. At 55%, expenditures are to be cut automatically by 3%, and the next year's budgetary expenditures would be frozen, except for co-financing of EU funds. At 57% of GDP, the cabinet must submit a balanced budget. Ideally, the later trigger points would not be needed if effective action is taken earlier.

Other frameworks take a more procedural approach, for example a requirement that the government put forward a corrective plan in case of non-compliance with the fiscal rules, but without specifying the size of the correction or the timeline.

ESCAPE CLAUSES

Well-designed escape clauses can provide the needed flexibility to adapt to exceptional and unforeseeable economic shocks (Eyraud et al., 2018[8]). This is particularly relevant for rare events that can have very large fiscal and economic impacts, such as the COVID-19 pandemic, and will likely require escape clauses to allow temporary deviations from the rules. However, to sustain the credibility of the fiscal rules framework, and to avoid potential circumvention of the rules, such clauses should only be triggered in rare circumstances based on specific criteria clearly set out in legislation. Well specified and transparent process to preserve the credibility of the framework are essential. Typically, escape clauses include a limited range of factors that allow them to be triggered, and some escape clauses also specify how they can be triggered and/or a pre-determined transition path back to the rules.

Cross-country experiences suggest that a well-defined escape clause should specify (i) a limited and clearly defined set of events triggering the operation of the clause, (ii) the authority to activate it, (iii) the timeline and procedures to revert to the rule, (iv) an effective control mechanism, and (v) a good communication strategy (Eyraud et al., 2018[8]).

The events triggering the activation of an escape clause should be outside government's control and preferably defined in quantitative terms when possible. They typically include severe economic downturns, large natural disasters, and states of emergency (Table 5). It is also important for the credibility of the rules that escape clauses are only activated when necessary to respond to the events—that is, the size of the deviation should be linked to the policies directed at the crisis.

Some escape clauses impose limits on how long fiscal policy can deviate from the targets in the rule, and a requirement for fiscal policy to return to the targets afterwards (Table 5). Specific requirements can make the framework more robust, but they need to strike the right balance between ensuring a timely return to the rule and avoiding abrupt corrections.

BOX 1: **AN EXAMPLE OF PAST APPLICATION OF A CORRECTION MECHANISM IN THE CONTEXT OF THE EU FISCAL FRAMEWORK**

The EU fiscal rules framework based on the Stability and Growth Pact has two main parts: the Preventive arm, in which the compliance with the structural balance rule and expenditure rules is assessed and monitored; and the Corrective arm, which is a correction mechanism (set of procedures and rules) in case a country deviates from one or both of the main fiscal rules (debt rule and nominal deficit rule). Following updates of the SGP, which aimed to put more weight on the structural balance and expenditure rules, a correction mechanism was also established for them within the Preventive arm.

EXCESSIVE DEFICIT PROCEDURE OF CROATIA 2013-2017

In 2013, the European Commission (EC) based on its standard surveillance found that Croatia might have breached the deficit and debt criterion. The EC then prepared a report, as a first step of the Excessive Deficit Procedure (EDP; correction mechanism for the two main EU fiscal rules) and concluded in it that the budget deficit the Croatian authorities planned for 2013 at 5.5% of GDP was significantly above the 3% of GDP reference value. Moreover, based on the EC forecast, it was expected to remain at high levels, reaching 6% during 2014-2015 in the absence of further measures. The authorities themselves expected the deficit to reach 4.6% of GDP by 2015, which was still significantly above the reference value. The deficit was at 5% of GDP already in 2012. The deviation was deemed exceptional in that it resulted from a severe economic downturn, with economic activity contracting by 12% between 2008 and 2012 with a further negative contraction projected for 2012, but it could not be deemed temporary.

The debt-to-GDP ratio stood below the debt limit of 60% of GDP, at 55.5% in 2012 and 59.7% of GDP in 2013, as projected by the EC. However, it was projected to breach the 60% threshold in 2014, with 60.6% of GDP, and to further rise to 65.3% in 2016. Hence it did not fulfil the requirement of the rules to diminish towards the threshold with a satisfactory pace, i.e. it failed to comply with the forward-looking benchmark of the debt. This is considered to be breached if the projected debt two years ahead of the current period is greater than the forward-looking benchmark (bb_{t+2}), computed as:

$$bb_{t+2} = 60\% + \frac{0.95}{3}(debt_{t+1} - 60) + \frac{0.95^2}{3}(debt_t - 60) + \frac{0.95^2}{3}(debt_{t-1} - 60) \quad (1.1)$$

In assessing the potential breach of rules, the fiscal framework stipulates that the EC should under certain conditions also take into account whether the government deficit exceeds government investment expenditure and take into account any other relevant factors, such as medium-term economic and budgetary position, quality of public finances, recent structural reforms or systemic pension reforms undertaken. None of these factors changed the conclusion for breach of the rules.

There are several formal steps leading to final establishment of the existence of an excessive deficit or debt, including formulating an opinion on the EC's report by the Economic and Financial Committee of the Council, issuing an opinion on the existence of an excessive deficit to the member state by the EC. The EC then prepares a Council decision on the existence of an excessive deficit and a recommendation to end the situation that needs to be adopted by the Council of the EU.

In the recommendation to end the excessive deficit, the Council adopted the required adjustment path to bring both deficit and debt back in line with the rules, and a timeline for it. The timeline was set so as not to aggravate the already negative economic situation with too big an adjustment. The required path for the nominal balance was: 4.6% of GDP in 2014, 3.5% of GDP in 2015 and 2.7% of GDP in 2016. The corresponding required structural effort (improvement in the structural balance) was: 0.5% of GDP in 2014, 0.9% of GDP in 2015 and 0.7% of GDP in 2016. To reach these targets, Croatia was deemed as needing to adopt consolidation measures of 2.3% of GDP in 2014 and of 1% of GDP in 2015 and 2016. This was also supposed to lead to compliance with the debt rule by 2016. In addition, the document also contained a recommendation to undertake structural fiscal measures to underpin these goals, namely to carry out an expenditure review, improve tax compliance and improve the institutional framework of public finances. Finally, the recommendation contains a date by which the member state has to prove that it has taken effective action, i.e. that it has taken action to implement the recommendation so as to meet the prescribed targets (e.g. by formulating a consolidation strategy and taking initial measures). The deadline for taking effective action can be up to six months; in the case of Croatia, it was three months.

After the deadline for taking effective action, the EC undertook an assessment of it and found that for the time being, effective action taken seemed sufficient for Croatia. The country and its compliance with the adjustment path set out in the EDP recommendation was then regularly monitored via the standard annual monitoring of compliance with the EU fiscal framework.

In 2017, based on EC recommendation, the Council decided to end the EDP for Croatia. In 2016, the deficit reached 0.8% of GDP, down from 3.4% of GDP in 2015. It was projected to reach 1.1% of GDP in 2017 and 0.9% of GDP in 2018, so to remain well below the reference value. The structural balance improved by 3% of GDP over the period 2014-2016. The debt ratio peaked at 86.7% of GDP in 2015 (the debt-to-GDP ratio shifted significantly also due to reclassification to ESA2010 system of accounts in the meantime), and it decreased to 84.2% of GDP in 2016. The EC predicted a further decline to 79.4% of GDP in 2017. Based on this, the debt ratio complied with the forward-looking benchmark. Croatia was deemed to durably comply with the fiscal rules again and the Excessive Deficit Procedure for Croatia was ended.

There is a similar correction mechanism, called the Significant Deviation Procedure in the Preventive arm of the EU fiscal framework, which assesses compliance with the operational fiscal rules (structural balance and expenditure benchmark) for countries which are not in the Corrective arm/EDP (i.e. countries which comply with the debt and deficit fiscal rules).

Source: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/stability-and-growth-pact/corrective-arm-excessive-deficit-procedure/closed-excessive-deficit-procedures/croatia_en

TABLE 5. **Escape clauses in example countries**

	Natural disaster	Economic recession	Banking system bailout, guarantee schemes	Other events outside government control	Voting mechanisms defined	Transition path defined
Brazil	y	y			y	
Colombia		y		y		
Germany	y	y		y	y	y
Mexico		y				
Peru	y	y		y		y
Slovak Republic	y	y	y	y		
Spain	y	y		y	y	y
Switzerland	y	y		y	y	y
EU countries		y				y

Source: OECD Secretariat based on IMF independent fiscal institutions database.

Some examples of pre-defined conditions activating escape clauses and transition paths, if defined, are the following:

- **Brazil** (since 2000): Real GDP growth below 1 percent over four quarters, and natural disaster but can only be invoked with Congressional approval.

- **Germany** (since 2010): Natural disasters or unusual emergency situation which are outside government control and have major impact on the financial position of the government. Absolute majority of parliament is needed to trigger the escape clause. Parliament must approve also a "reimbursement plan" for the extra borrowing "within a reasonable time frame".

- **Peru** (since 2000): If real GDP declines or in case of other emergencies, declared by the Congress at the request of the Executive, the deficit ceiling can be relaxed up to 2.5 percent of GDP. The Executive must specify deficit and expenditure ceilings to be applied during the exception period. In both cases a minimum adjustment of 0.5 percent of GDP is required until the 1 percent deficit ceiling is reached.

- **Spain** (since 2002): In case of natural disasters, exceptional slowdown, exceptional budget deficits are accompanied by a medium-term financial plan to correct this situation within the next 3 years (to be approved by a majority vote by the parliament).

- **Switzerland** (since 2003): The government can approve by supermajority a budget deviating from the balance budget rule in "exceptional circumstances," which are defined in Budget Law as natural disaster, severe recession, and changes in accounting methods. This deviation needs to be zeroed over the next six years by running structural surpluses.

- **EU member states/euro area** (since 2005): An excessive deficit procedure may not be opened when the 3 percent deficit limit is exceeded only temporarily and exceptionally, and the deficit is close to the deficit limit (both conditions need to apply). Deadlines for excessive deficit correction can be extended in case of adverse economic developments. The Stability and Growth Pact also states that the pace of fiscal consolidation may depart from the required goals in case of an unusual event outside of the control of the Member state concerned that has a major impact on the financial position of the general government or in periods of a severe economic downturn in the euro area or the European Union as a whole, provided that this does not endanger fiscal sustainability in the medium term. In the preventive arm of the Pact, this is operationalised by defining exceptionally bad times as period of negative real GDP growth and/or periods when the negative output gap exceeds 4% of potential GDP. This threshold is supported by the data, as between 1980 and 2019, the output gap has exceeded this threshold in Member states in one year out of twenty (European Commission, 2019[19]). The exceptional treatment of the respective deviation from the rules is granted if the deviation (e.g. extra spending) is linked to the unusual event. While the following are modifications of the rules, rather than true escape clauses, the European Commission also takes into account the so-called pension reform clause, structural reform clause and investment clause when assessing compliance with the rules. This means that under certain conditions specified by the rules, a country can deviate from the structural balance rule, if this deviation is due to costs of a pension or structural reform or public investment with positive effects on growth.

The proposal to invoke the escape clause should preferably explain (i) the reasons for activating the clause; (ii) why these are in line with the triggers predefined in the legislation; (iii) the period over which the rule will be suspended; and (iv) the adjustment to be applied to revert to the rules. Parliamentary approval is important given the budgetary impact and help ensure the escape clause is being used appropriately.

During the current crisis due to the COVID-19 outbreak several countries have activated escape clauses (IMF, 2020[20]). In Brazil, the government asked Congress to declare state of "public calamity", which allows to breach the primary balance target and other restrictions under the fiscal responsibility law. The request included an end date (end-2020), explained the reasons, and included an estimate of the economic impact.

The European Union activated the general escape clause, as proposed by the European Commission, to suspend the adjustment member states have to do to meet their fiscal targets. Moreover Austria, Bulgaria, Croatia, Czech Republic, Germany, Estonia, France, Greece, Italy, Lithuania, Latvia, Portugal, Romania, Slovenia have activated their national escape clauses. In some cases, this activation is automatic as countries national rules are linked to the EU rules. These are the case of Portugal, France, Italy. Others have their own rules and escape clauses. For example, in Germany the parliament approved with a supermajority a supplementary budget—with a large fiscal package—and suspended the debt brake rule.

IFIs can play a key role in effective control and monitoring activations and implementation of escape clauses. IFIs can determine if an escape clause is being appropriately triggered. For example, in Peru, the Fiscal Council supported the decision to suspend the rule in 2020-21, but recommended the publication of reports assessing the exceptional measures being adopted and explain the target for the deficit in 2021 to ensure transparency and accountability. Regular reports could be essential mechanism for transparency and accountability. Among EU IFIs, the majority have deemed the current circumstances to qualify to activate the escape clauses and suspend fiscal rules. The remainder have indicated that they are likely to follow; however, some must wait for their governments to first activate the escape clause.

RECOMMENDATIONS FOR CHILE'S AUTONOMOUS FISCAL COUNCIL

The CFA has already published two reports (in September 2019 and April 2020) for Congress (*Informe del Consejo Fiscal Autónomo sobre el Ejercicio de sus Funciones y Atribuciones*) in order to fulfil its mandate (CFA, 2019[1]; CFA, 2020[2]). These reports are broad-based containing CFA judgement on compliance with fiscal rules, monitoring and assessment of sustainability of public finances and recommendations on fiscal policy. The CFA has also published some technical papers and opinions or recommendations on diverse themes such as the public spending efficiency, reform to the calculation of the structural balance, reform of the committees of experts, fiscal responsibility during Covid-19, determinants of the sovereign risks, among others (see for example, (CFA, 2020[4]; CFA, 2020[21]; CFA, 2020[21]; CFA, 2020[22])).

Most IFIs present different reports for each of the functions of the mandate, such as reports on compliance with fiscal rules, reports on fiscal sustainability, reports on assessment and evaluation of the budget laws, etc. As the CFA grows and matures as an institution in the medium to long-term, it would be useful to produce targeted reports. The CFA could produce one report on compliance with fiscal rules (twice a year for example), and another report on the sustainability of public finances (every year). In the long-term, once the CFA has grown and has enough expert staff, the CFA could think of preparing also a fiscal risks report (probably less frequently, at the beginning of each administration for example); this report would analyse in greater depth the different fiscal risks faced by the country, such as those related to contingent liabilities and climate change.

As highlighted in the forthcoming Economic Survey of Chile, repeated shocks in recent years (global financial crisis, the 2010 earthquake, 2019 social protests and recently the COVID-19 pandemic) have exposed gaps in the fiscal framework. Since 2008, the rule has been subject to repeated revisions in the face of these shocks, mainly because of the difficulty of disentangling structural and cyclical factors. The target set out by decree has been modified several times. Defining clear escape clauses and correction mechanisms would add transparency to the fiscal rule. Additionally, specifying a long-term debt target clearly linked to the medium-term structural balance target would provide a direct link with sustainability objectives. This would in turn help add further transparency and credibility to the management of public finances. Within this strengthened fiscal framework, the role of the CFA would need to evolve. The CFA, as most peer OECD IFIs, would be expected to provide a public assessment over the occurrence of the circumstances warranting the activation of a correction mechanism and whether the correction is proceeding in accordance with national rules and plans.

In the short- and medium-term the CFA should increase efforts to communicate more and differently on its publications to help increase the impact of its work. The CFA could for example choose an easy-to-understand tool to communicate regularly on compliance with fiscal rules. The traffic-light system adopted by the Slovak CBR could provide some inspiration. The tool would need to be adapted to the perceptions of the Chilean public to make it more intelligible and effective. Progressively, the CFA could also step up its communication efforts by developing and implementing a communication strategy and have some dedicated staff to deal with communication over time, in line with other IFIs of larger size across the OECD. The communication strategy and actions could include increased engagement with parliamentary stakeholders and monitoring of the impact of the CFA's opinions through the collection of data on access to CFA publications, social media interactions and similar.

4. Analysis of sustainability of public finances

This section reviews the publications on fiscal sustainability of peer OECD IFIs and useful fiscal sustainability frameworks used by international organizations.

Key lessons include:

- **The framework for analysing medium and long-term fiscal sustainability builds on some core elements**, including (i) medium-to-long term projections of debt ratios, (ii) measures of uncertainty around the projections, (iii) indicators of potential liquidity stress, and (iv) discussions of other country-specific risks or mitigating factors (Debrun et al., 2019[23]).

- **Many IFIs report annually on long-term fiscal sustainability** (Table 6). Reporting is done regularly enough to make a contribution to public and political discussion on public finances, with the frequency ideally specified under law. The time horizon of the analysis needs to be sufficient to assess the budgetary implications of demographic change, spanning usually 30 years or longer. The appropriate time horizon for long-term sustainability projections may vary depending on the nature of the problems to be analysed.

- **There is a set of measures and indicators that are commonly used** (Table 6). A frequent way to introduce a fiscal sustainability analysis is with a baseline scenario. A no-policy change scenario lays down the central situation of public finances. This scenario is usually based on the current fiscal framework with its indexation rules, clearly defining the assumptions and main parameters, based on a set of fiscal projections. This is usually followed by a series of sensitivity tests applied to the baseline scenario, providing a probabilistic upper bound for the main fiscal variables dynamics under various assumptions regarding policy variables, macroeconomic developments, and financing costs.

- **Many fiscal councils make use of fiscal sustainability indicators in their reports.** Fiscal sustainability indicators are useful because are simple to understand and communicate to a non-technical audience. The indicators or definitions tend to be informative and amenable to quantification. The indicators also serve to facilitate international and historical comparison. Indicators and their underlying methodology and assumptions need to be sufficiently

TABLE 6. **Reporting on fiscal sustainability by OECD IFIs**

	Brazil	Canada	Lithuania	Portugal	Slovak Republic	UK	US
Frequency of report	Monthly	Every 1-2 years	Not decided	Every 2 years	Annual	Every 1-2 years	Annual
Horizon of analysis	10 years	70 years	20 years	15 years	50 years	50 years	30 years
Baseline scenario	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alternative scenarios	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal sustainability indicators	No	Yes	Yes	Yes	Yes	Yes	No
DSA	No	No	Yes	Yes	No	No	No
Projections of budget balance and debt	Yes	Yes	Yes	No	Yes	Yes	Yes
Detailed revenue forecasts	Yes	Yes	No	No	Yes	Yes	Yes
Detailed expenditure forecasts	Yes	Yes	No	No	Yes	Yes	Yes
Contingent liabilities	No	No	No	Yes	Yes	Yes	No

Note: DSA is debt sustainability analysis

Source: OECD secretariat

transparent so as to generate a sound understanding of how conclusions are drawn. Most IFIs have chosen to follow the IMF and European Commission indicators, e.g. the fiscal gap and/or the inter-temporal budget constraint.

- **Well-staffed and established IFIs tend to do detailed revenue and spending forecasts.** Usually IFIs have a suite of models for separate projections for revenues and expenditures depending on their functional classifications wherever long-term cost drivers may differ. More recent established IFIs tend to rely on debt sustainability analysis, which can be less time consuming. Some leading institutions also present debt sustainability analysis as part of a more comprehensive analysis.

- **Leading practices for reporting on medium- and long-term fiscal sustainability include illustration of feedback mechanisms between macroeconomic and fiscal variables.** For example, this could include feedback effects to economic growth from increasing debt, including the impact on the risk premium.

DEFINING FISCAL SUSTAINABILITY

There is no consensus on how to define or measure fiscal sustainability. Most commonly, fiscal or debt sustainability are understood in the way the International Monetary Fund (IMF) defines it (IMF, 2013[24]): "in general terms, public debt can be regarded as sustainable when the primary balance needed to at least stabilise debt under both the baseline and realistic shock scenarios is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory rate."

The IMF's approach to debt sustainability is that debt cannot grow faster than incomes and the capacity to repay it. The debt is sustainable if projected debt-to-GDP ratios are stable, decline, and are sufficiently low and if a country can service its debt without the need for implausibly large policy adjustments, renegotiation, or default. Sustainability rules out the accumulation of debt at a rate greater than the capacity to service debt (especially in the long run). In the same vein, the European Commission in its 2018 Fiscal Sustainability report defines fiscal (or debt) sustainability as the ability of a government to service its debt at any point in time (European Commission, 2018[25]).

Fiscal sustainability has mainly focused on debt trajectories, and was meant as "solvency" of the government. Given government policies, solvency is considered at stake if these policies fail to generate primary surpluses that are large enough to stabilise the debt-to-GDP ratio. After the 2008 global financial crisis and consequent sovereign crisis in developed economies, different international institutions revisited their definition of fiscal (debt) sustainability, as well as their methodologies to assess it.

More recently, the concept has been broadened to consider forms of "sustainable debt thresholds". The analysis should include short-term or liquidity risks, the plausibility of the required fiscal path, the probabilistic nature of fiscal sustainability, as well as fiscal risks stemming from macro-financial imbalances ("hidden debt").

TIMEFRAMES FOR REPORTS ON FISCAL SUSTAINABILITY

One of the most important tasks of IFIs is to provide unbiased assessments of medium and long-term sustainability of public finances. There is no consensus on the optimal frequency of publishing long-term fiscal sustainability analysis. However, in OECD countries, governments produce reports with regularity (Shaw, 2017[26]). Most OECD countries that produce long-term fiscal projections do so on an annual basis, although more recently a few IFIs have moved to reporting every two years given that the situation may not evolve substantively on an annual basis. No country publishes less frequently than every 5 years, or at the start of a new government. The OECD Recommendation of the Council on Budgetary Governance concludes that sustainability reports should be published regularly enough to contribute to public and political discussion on budgetary issues.

In some countries, the frequency of publication is specified by law. In the United Kingdom, the Budget Responsibility and National Audit Act 2011 requires the OBR to produce "an analysis of the sustainability of the public finances".

An external review of the OBR done in 2015 recommended decreasing the frequency of the long-term economic forecasts for the fiscal sustainability reports, done once a year, while keeping the legislative requirement to produce some analysis on an annual basis, such as analytical papers related to long-term fiscal sustainability. As the OBR is a well-stablished IFI, the annual update of 50-year long-term projection has become so stable that would add little to already known forecasts. In the Slovak Republic, the Report on the Long-term Sustainability of Public Finances is one of the main tasks of the Council for Budget Responsibility laid down in the Fiscal Responsibility Act and has to be published annually by 30 April and always within 30 days after consideration of a government programme and expressed confidence in government.

Portugal's Public Finance Council (CFP) publishes a fiscal risks and sustainability report every two years. The CFP takes as a starting point its most recent medium-term projections for the main macroeconomic and fiscal variables under a 'no policy change' scenario and analyses the fiscal risks Portuguese economy faces. The CFP focuses the risk analysis in five areas: macroeconomic performance, public revenue and public expenditure, contingent liabilities and public debt. In this report, risk is understood as a measure of uncertainty regarding the possible deviation from the expected result of one of the variables. Sustainability is understood as the ability of the Government to sustain the commitments made with its citizens and creditors.

In Brazil, legislation does not require a specific number of reports by the IFI. However, there is a resolution making it mandatory for the IFI to present its projections and fiscal analyses bi-annually to the Economic Affairs Committee. The IFI has decided to publish monthly updates on its fiscal analysis and forecasts in their report Fiscal Monitoring Report (RAF).

In the case of the Lithuanian IFI, they decided to report on long-term fiscal sustainability, although not on an annual basis.

There is no consensus on the appropriate time horizon for long-term fiscal sustainability analysis. However, observed practice suggests a minimum length of 30 years or more. Over 80% of OECD governments producing long-term fiscal sustainability analyses (20 of 24) make projections over a time horizon of 31-50 years. The OECD Recommendation of the Council on Budgetary Governance suggests an approximate horizon appropriate for long-term analyses of 10 to 40 years (Shaw, 2017[26]).

THE ANALYSIS OF FISCAL SUSTAINABILITY

The literature distinguishes between two types of indicators: i) baseline projections of the budget balance and debt; and ii) synthetic indicators (Shaw, 2017[26]):

- **Baseline projections of the budget balance and debt:** unconstrained baseline projections for major fiscal aggregates (primary spending, general balance, debt) taking into account the current tax system and spending programmes based on certain assumptions for demographics and the economy. Constrained baseline projections are those imposing a constraint on the major fiscal aggregates to determine what spending or revenue track would be required to continue to meet these constraints.

- **Synthetic indicators** (based on the government's inter-temporal budget constraint e.g. fiscal gap) which are an extension of baseline projections (Box 2). They measure the size of an increase in tax revenue and/or reduction in non-interest expenditure required to set the present value of all future primary spending surpluses equal to a specific level of debt. They may be calculated against a specific terminal date and/or an infinite time horizon to illustrate the magnitude of the policy response necessary to maintain a specific level of debt in the future.

Most OECD IFIs' reports on fiscal sustainability use both types of indicators in their analysis to achieve a complete and multidimensional picture of the sustainability of public finances. International organisations have developed frameworks to analyse the sustainability of public finances, typically using both types of indicators. OECD IFIs have also based their analysis on similar frameworks.

BOX 2: **DEFINITION OF SYNTHETIC INDICATORS**

The government flow budget constraint relates the change in debt to current fiscal policy and leads to the government's intertemporal budget constraint. The change in nominal government debt ($D_t - D_{t-1}$) is given by the sum of primary expenditure (Et) and interest payments on outstanding government debt ($r_t D_{t-1}$) minus government revenue (T_t)

$$D_t - D_{t-1} = G_t - T_t + r_t D_{t-1}$$

In a growing economy, where output grows at rate of g_t ($Y_t = (1 + g_t)Y_{t-1}$), the flow budget constraint can be rewritten by dividing its elements by GDP:

$$\frac{D_t}{GDP_t} = \frac{G_t - T_t}{GDP_t} + \frac{(1 + r_t)D_{t-1}}{GDP_{t-1}}$$

Computing recursively until an infinite time, the government budget constraint could be rewritten showing the initial debt to GDP ratio (lower-case letters denote ratios to GDP):

$$d_{t-1} \leq \sum_{i=0}^{\infty} \rho_i (t_i - g_i)$$

$$\text{With } \rho_i = \left(\frac{(1 + r_i)}{(1 + g_i)}\right)^{-i} \text{ assuming constant values of } r \text{ and } g, \text{ and } \lim_{T \to \infty} \rho_T \frac{D_t}{GDP_t} = 0.$$

This equation says that a fiscal policy is sustainable if the present discounted value of the ratio of primary surpluses to GDP is greater than, or equal to, the current level of public debt. In other words, this solvency condition for the government sector states that, for a fiscal policy to be sustainable, a government that has debt outstanding will have to run primary budget surpluses in the future. Those surpluses should be large enough to satisfy the equation.

The fiscal gap represents the difference between the current government debt and the present value of future primary budget balances (pb_t) summed over an infinite period:

$$\pi_0 = d_0 - \sum_{i=1}^{\infty} \rho_i pb_t$$

If this indicator is positive, the sustainability gap has a simple interpretation. It is the cumulative present discounted value of the increase in primary surpluses that is necessary to guarantee that the intertemporal budget constraint is fulfilled and measures the minimum effort required by the government to restore long-term fiscal sustainability. From a different perspective, the sustainability gap represents the share of the public debt-to-GDP ratio that would make the fiscal policy plan sustainable.

The sustainability gap can also be expressed in terms of annual difference between current primary balance and a primary balance that would make the debt-to-GDP ratio sustainable (i.e. the necessary annual permanent spending decrease or revenue increase or a combination of them, that would satisfy the budget constraint):

$$GAP = \frac{r - g}{1 + g} d_0 - \frac{r - g}{1 + g} \sum_{i=1}^{\infty} \rho_i pb_i = \frac{r - g}{1 + g} d_0 - pb_0 - \frac{r - g}{1 + g} \sum_{i=0}^{\infty} \rho_i \Delta pb_t$$

$$\text{Where } \Delta pb_t = pb_t - \Delta pb_0.$$

The gap consists of the gap between current primary balance to the primary balance that would stabilise current debt ratio and any additional discounted future deviations from this primary balance (e.g. due to aging costs). Various other indicators can be constructed based on debt dynamics and the inter-temporal budget constraint, stressing different aspects of sustainability (e.g. explicitly singling out ageing costs, deriving a sustainable tax rate), using different time horizons and/or assumptions (e.g. a specific target debt ratio), etc.

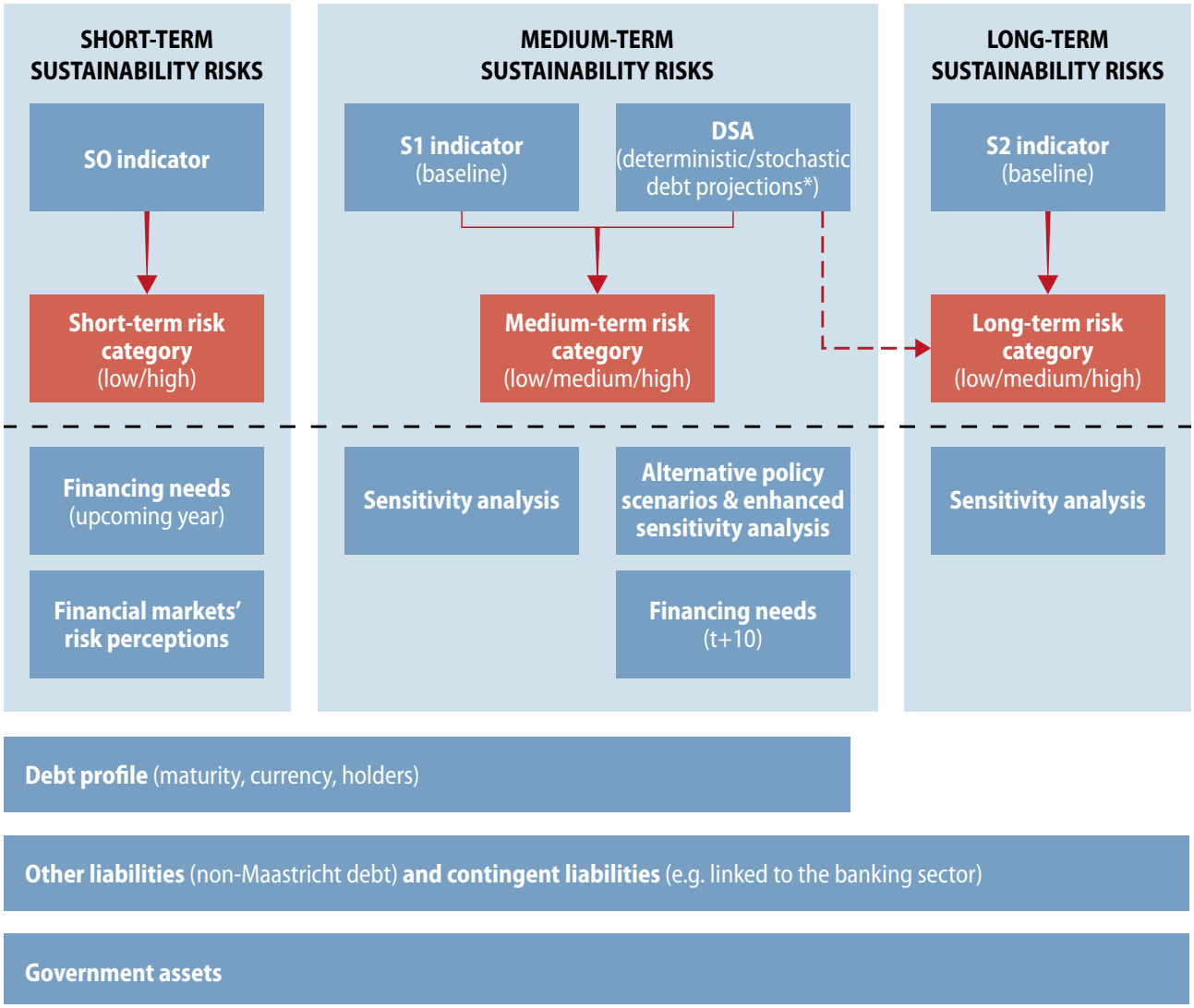
Source: (Giammarioli et al., 2007[27]), (Escolano, 2010[28])

The European Commission uses a multi-dimensional approach to assess and differentiate fiscal sustainability risks in the short, medium and long term (Figure 3). Results are summarised in an overall summary heat map of fiscal sustainability risks per time dimension (short, medium and long term). The framework aims at ensuring a comprehensive and multidimensional assessment of sustainability risks, which is key to devise appropriate policy responses (Box 3).

The IMF also uses a multi-dimensional framework mostly focused on debt sustainability analysis and the surrounding risks (Box 5). In Box 4 the methods used by the OECD are briefly illustrated.

The OBR's sustainability framework analyses past and future government actions focusing on flows (future revenues and spending, including those generated by existing assets and liabilities) and stocks (existing assets and liabilities, plus the present value of expected future revenues and spending) (Figure 4). Past activities look in detail at the assets and

FIGURE 3. **European Commission fiscal sustainability framework**



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

Source: *European Commission Fiscal Sustainability Report 2018*

liabilities on the public sector's balance sheet, including from the national accounts framework and from the whole of government accounts. Future activity refers to long-term spending and revenue projections. They analyse future flows by undertaking a bottom-up analysis, aggregating long-term projections of different spending and revenue streams as shares of GDP, plus future financial transactions, on the presumption of unchanged government policy.

The OBR's fiscal sustainability report presents also summary sustainability indicators (OBR, 2018[30]). The definition of fiscal sustainability is built on the concept of solvency – the ability of the government to meet its current and future obligations. In formal terms, this solvency condition is given by the government's inter-temporal budget constraint. The indicator measures the extent of the adjustment needed, defined as the immediate and permanent increase in taxes and/or cut in public spending as a share of GDP that would be just sufficient to ensure the government's inter-temporal budget constraint is satisfied. Satisfying this condition requires that, over an infinite time horizon, the government raises enough revenue to cover all its non-interest spending and also to service its debt obligations.

BOX 3: THE EUROPEAN COMMISSION'S FISCAL SUSTAINABILITY FRAMEWORK

A wealth of tools and scenarios are used to support the assessment of fiscal sustainability along the different time dimensions. The European Commission focuses on three solvency indicators that measure a country's ability to pay current public debt through the expected current value of future primary balances (intertemporal budget constraint) including the forecast increase in public expenditure due to the ageing population.

The short-term dimension is assessed by the S0 indicator, which allows for an early detection of short-term risks of fiscal stress (within the upcoming year) stemming from the fiscal and / or the macro-financial and competitiveness sides of the economy. Fiscal sustainability challenges over the medium term are captured through the joint use of the medium-term fiscal sustainability indicator S1 and the debt sustainability analysis (DSA). Challenges over the long term are identified through the joint use of the long-term fiscal sustainability indicator S2 and the DSA. The joint use of these two tools allows for an identification of long-term challenges deriving from population ageing (mostly through the S2 indicator that is particularly suited to this purpose), while capturing potential vulnerabilities stemming from high debt levels.

These indicators differ as regards their time horizon, finite (S1) or infinite (S2), and the fact that S1 includes a decreasing or stable debt ratio at a particular level. When developing these indicators consideration is also given to the no-policy-change assumption (no discretionary changes to expenditure or revenue) across the projection entire time horizon.

The S0 indicator is a composite indicator of fiscal stress stemming from fiscal variables and structural features of the economy. The measurement of S0 is based on 25 fiscal and financial and competitiveness variables using the signalling approach. The signalling method involves setting out endogenously critical risk thresholds, by analysing the behaviour of a large number of variables ahead of fiscal stress events. The selected variables are then weighted according to their signalling power.

The medium-term fiscal sustainability analysis is based on two main tools, debt sustainability analysis (DSA) and the fiscal sustainability gap indicator S1. The DSA toolkit is based on the deterministic and stochastic debt projections. Deterministic government debt projections are based on the baseline scenario and a set of alternative policy scenarios, and sensitivity tests around the baseline scenario. The macroeconomic forecasts are of most importance for this exercise. The baseline scenario is a no-policy-change scenario, which assumes fiscal policy remains the same over the projected horizon. Alternative scenarios include primary balance is calculated by means of a fiscal reaction function, and also different assumptions for interest rates, GDP and inflation. Stochastic projections produce a distribution of debt paths, corresponding to a wide set of possible underlying macroeconomic conditions, obtained by applying shocks to macroeconomic and fiscal variables (government primary balance, interest rates, economic growth and exchange rate) to a central scenario (mainly the deterministic baseline no-fiscal policy change scenario). The approach extracts the shocks to the non-fiscal determinants of debt dynamics are extracted from the variance-covariance matrix of historical shocks (rather than from the estimated variance-covariance matrix in the context of VAR modelling). Results are usually presented in the form of fan charts that allow grasping the minimum and maximum levels of government debt ratios that would be reached under a large range of macroeconomic conditions.

This is accompanied by the S1 indicator (fiscal sustainability gap), which measures the additional adjustment effort required, in terms of a cumulated gradual improvement in the structural primary balance over five years, to reach a specific public debt-to-GDP ratio in fifteen years' time, including paying for any future additional expenditure (until the target date) arising from an ageing population. The intervals used to assess a country's sustainability challenges based on indicator S1 are as follows: i) S1 less than zero, signifying low risk; ii) S1 between 0 and 2.5 (thus requiring a structural primary balance adjustment of up to 0.5 p.p. of GDP per year until 2024), classified as medium risk; iii) S1 greater than 2.5 (requiring a structural primary balance adjustment of over 0.5 p.p. of GDP per year), which is classified as a high risk.

The long-term sustainability of public finances is focused on the assessment of the ageing cost projections (incorporating pensions, healthcare, long-term care, and education and unemployment benefit projections) as reported in the European Commission Ageing Report. This is complemented with the S2 indicator of fiscal sustainability that relates to the achievement of the government's intertemporal budget constraint. This constraint, which is also known as the solvency condition, refers to the capacity of a country to meet its net debt obligations, over an infinite horizon, with a stream of future primary surpluses. The S2 indicator shows the needed adjustment to the current structural primary balance (subsequently kept constant at the adjusted value forever) that is required to stabilise debt-to-GDP ratio over the infinite horizon, taking into account also any additional expenditure arising from an ageing population that, over time, add up to the current structural primary balance. The long-term sustainability indicator S2 uses the following intervals when assessing the sustainability challenges: i) if S2 is less than 2, the country is designated a low risk; ii) if S2 is between 2 and 6 the country is assigned a medium risk; iii) if S2 is greater than 6 the classification is that of a high risk.

Source: (European Commission, 2018[25])

BOX 4: OECD FRAMEWORK FOR FISCAL SUSTAINABILITY USED IN ECONOMIC SURVEYS

Given the importance of sustainability of public finances for inclusive and sustainable growth, all OECD Economic Surveys include debt sustainability analysis.

This exercise is based on critical short and long-term assumptions for potential output growth, interest rates, inflation and primary balance. Estimates of, other variables, such as the elasticity of primary balance to GDP are also part of the analysis. For some economies, like Chile or Colombia, the price of copper or the oil price, respectively, is also an important assumption in the analysis. Different scenarios considering structural reforms or different consolidation paths are analysed to understand the sensitivity of the baseline scenario.

Source: OECD Secretariat

BOX 5: THE IMF FRAMEWORK FOR FISCAL (DEBT) SUSTAINABILITY

IMF's debt sustainability analysis has two components: external debt and public debt, plus a forecast horizon of 5 years. Each component consists of a baseline scenario and sensitivity tests, which assesses various policy assumptions, macroeconomic variables and the cost of borrowing, including the possible materialisation of contingent liabilities, as well as the vulnerability of the debt profile. Chile's debt sustainability analysis (DSA) is conducted according to the model for countries with access to the market, complemented by reference indicators that divide the countries into two groups: "high scrutiny" and "low scrutiny". For emerging market economies these indicators are:

- Public debt-to-GDP ratio of over 50% for an emerging market economy;
- Gross borrowing requirements greater than 10% of GDP for emerging markets;
- Having or seeking exceptional access to IMF loans.

If an economy does not exceed any of these limits it is placed intro the "low scrutiny" group, and basic DSA with baseline and alternative scenarios are conducted and, where relevant, analysis of contingent liabilities and customized scenarios.

If a given economy exceeds one of these limits it is placed into the "high scrutiny" group, and is subject to more detailed analysis by way of growth, fiscal and debt profile risk indicators, namely:

- Accumulated adjustment to primary balance in the last 3 years (% of GDP);
- Rate of growth coefficient (ratio of standard deviation/average);
- Bond yield spreads or EMBI global spreads (basic points);
- External borrowing requirements (% of GDP);
- Public debt held by non-residents (% total);
- Public debt in foreign currencies (% total);
- Annual change in percentage of short-term debt at original maturity (%).

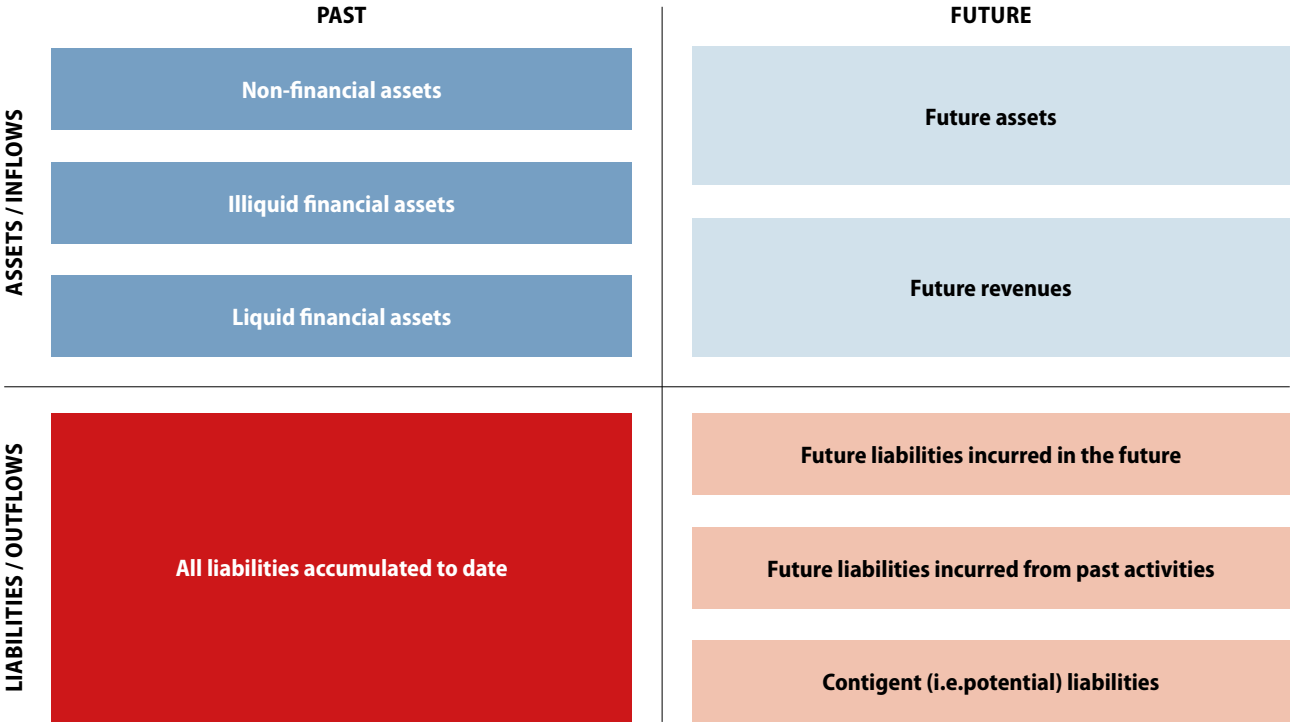
The analysis is also undertaken under alternative scenarios to the baseline scenario based on historic averages: a scenario with constant primary balance, scenarios with shocks to key macroeconomic variables (single shocks and combined shocks), and a scenario with materialisation of contingent liabilities.

The coverage of public debt in the debt sustainability analysis should be as broad as possible, but consistent with the coverage of the fiscal accounts monitored for surveillance, and should take into account the availability (and frequency) of fiscal data. Government intervention in the financial sector should be carefully reflected in fiscal accounts and public debt either directly or through stress tests. While the analysis should be based on gross debt, complementary analysis based on net debt could be presented to show the impact of risk-mitigating factors, when relevant.

Source: (IMF, 2013[24])

The inter-temporal budget gap is calculated from revenue and spending flows over the indefinite future. The primary balance required to satisfy the inter-temporal budget constraint depends on not only the stock of debt outstanding but also the gap between the (nominal) interest rate that the government has to pay on its debt and the long-run (nominal) growth rate of the economy. The inter-temporal budget constraint has the advantage of providing a rigorous accounting framework, but it also has limitations as a practical guide to policy. Revenue and spending projections over 50 years are uncertain enough; projections over an infinite horizon are clearly even more so. The inter-temporal budget constraint might also be thought insufficiently constraining, because it allows to run large deficits if they can be compensated by surpluses in an indefinite future.

FIGURE 4. **The UK Office for Budget Responsibility Framework for fiscal sustainability: government activity, stock and flows**



Source: (OBR, 2019[29])

The OBR's fiscal sustainability report has also other alternative criteria such as the fiscal gap. The fiscal gap is the immediate and permanent change in the primary balance needed to achieve a chosen debt-to-GDP ratio in a given year. One of the main strengths of fiscal gaps is that they are intuitive and can be interpreted easily in the context of any policy rules on the level of government debt relative to GDP. But in the case of the United Kingdom there is no consensus regarding the optimal debt ratio and how quickly one should aim to return to it if the public finances move off course. The UK government does not target a specific debt-to-GDP ratio, but are subject to that specified in the Stability and Growth Pact. UK governments since 2010 have instead targeted the profile of the debt ratio from year to year. It is also important to remember that while a fiscal gap of zero implies that the public finances are sustainable for a given debt target and timetable, this does not necessarily mean that the fiscal policy setting is optimal or is sustainable after the target date.

Table 7 shows an example of presentation of this exercise for different demographic and health spending scenarios discussed in the fiscal sustainability report (OBR, 2018[30]). As with the inter-temporal budget gap calculation, the primary balance necessary to achieve a given level of debt as a share of GDP depends on the difference between the interest rate and the long-term economic growth rate. Hence, the table shows the gaps not only for the central assumption that the long-run interest rate exceeds the long-term economic growth rate by 0.2 percentage points, but also alternative assumptions where the difference between the interest rate and the growth rate is 1 percentage point higher or lower.

Table 7 shows that to return the debt-to-GDP ratio to its pre-crisis level (of around 40 per cent of GDP) in 2067-68 would require a permanent increase in taxes and/or cut in spending of 5.2 per cent of GDP in 2023-24. A more realistic alternative adjustment is illustrated via the 'gradual progress' scenario. Targeting debt ratios of 20 and 60 per cent of GDP would require larger and smaller adjustments respectively. The adjustment needed to hit any given debt target would be larger if the pace of excess cost growth in the health sector was greater than the assumed in the baseline scenario, if the long-term interest rate were to exceed the economic growth rate by more than assumed in the baseline, or if migration flows were lower than in the central projection. The table also shows what would be required to achieve a debt to GDP ratio of 40 per cent ten years earlier, in 2057-58.

TABLE 7. **Table example of fiscal gap estimate in the 2018 Fiscal Sustainability Report of the UK Office for Budget Responsibility**

	Adjustment in primary deficit, per cent of GDP			
Target year	**2067-68**	**2067-68**	**2067-68**	**2067-68**
Target debt to GDP ratio (per cent)	**20**	**40**	**60**	**40**
Baseline projection	–5.7	–5.2	–4.8	–4.6
Baseline projection (gradual progress)[1]	–2.0	–1.9	–1.7	–2.0
Pre-June health policy	–4.4	–4.0	-3.6	–3.4
3.4 per cent real growth in health care	–4.8	–4.3	–3.9	–3.8
No other cost pressures in health care	–3.3	–2.8	–2.4	–2.7
Lower other cost pressures in health care[2]	–4.8	–4.4	–4.0	–4.0
Higher other cost pressures in health care[3]	–6.6	–6.2	–5.7	–5.2
Interest rate 1 percentage point higher	–5.7	–5.3	–5.0	–4.8
Interest rate 1 percentage point lower	–5.6	–5.1	–4.6	–4.4
Old age structure	–6.1	–5.7	–5.3	–4.7
Young age structure	–4.7	–4.2	–3.8	–3.9
High net migration	–5.2	–4.7	–4.3	–4.1
Low net migration	–6.3	–5.8	–5.4	–5.1
50 per cent lower net EU migration	–6.0	–5.6	–5.2	–4.9

1 Adjustment required each decade.

2 Other cost pressures converging to 0.5 per cent annual growth by 2038–39.

3 Other cost pressures converging to 1.5 per cent annual growth by 2038–39.

Source: (OBR, 2018[30])

The Slovak CBR has as a starting point for the report of long-term fiscal sustainability the determination of the structural primary balance adjusted for the impact of the economic cycle, one-off or temporary measures and debt interest payments. Projections of individual budgetary values over the next 50 years using macroeconomic and demographic assumptions follow.

An important part of the long-term fiscal sustainability analysis is the development of a baseline scenario. The public finance baseline scenario is then used to calculate the long-term sustainability indicator. This scenario shows the implications of current policies taking into account anticipated demographic and macroeconomic developments. The Fiscal Responsibility Act defines the public finance baseline scenario as the long-term projection of general government revenues and expenditures which reflects the future economic and demographic developments and the current policy framework including the implicit and contingent liabilities of the general government (CBR, 2015[31]). The baseline scenario considers forecasts for the next 50 years and considers indexation rules in place.

The creation of the baseline scenario distinguishes between the medium (first four years after the last data available) and the long-term (from the 5th to the 50th year of the projection) for the elaboration of forecasts. The medium-term macroeconomic assumptions are based on the latest forecasts by the Macroeconomic Forecasting Committee. The long-term horizon uses the latest assumptions of the European Commission, mainly the growth in productivity, capital stock, number of hours worked, and the unemployment rate. In case of the participation rate, the CBR applies its own estimates based on the European Commission's methodology.

Most forecasts for the medium-term are very detailed and taken from expert committees, such as the Tax Revenue Forecasting Committee forecast. Items of the balance and rules in the long-term part of the baseline scenario show a lower level of detail in comparison with the medium-term part. The projections focuses on selected groups of revenues

and expenditure related to population ageing (pension system, expenditure on healthcare, long-term care, education and unemployment) and other implicit liabilities (Public-Private-Partnership projects, nuclear decommissioning scheme), in which case a model-based approach is also used along with projections based on simple rules. An example that results from the construction of this baseline scenario is provided in Figure 5.

Recognising the high uncertainty surrounding long-term projections, the baseline scenario is supplemented by detailed scenario analysis drawing on several models of the CBR. The scenarios consider various alternative policy paths (e.g. delayed budgetary consolidation) and alternative demographic and macroeconomic assumptions.

The core measure of the report is the long-term sustainability indicator. This indicator measures the change in the budget balance as a percentage of GDP that would be required to ensure that the debt to GDP ratio does not exceed its legal limits over the entire 50-year period (at 50% of GDP), taking into account demographic and economic forecasts. This indicator has the advantage of being easily communicated, and its release receives widespread attention in the media (see, for example, Figure 5). Quantification of the long-term sustainability indicator requires (i) demographic forecasts, (ii) macroeconomic forecasts, (iii) medium-term scenarios of public finances, (iv) the projection of revenues and expenditures sensitive to population ageing, and (v) other implicit and contingent liabilities.

The report on fiscal sustainability devotes a section to analyse the feedback effects from debt to economic growth (CBR, 2014[32]) (see Box 6 for selected literature on this issue). The baseline scenario is based on macroeconomic assumptions that do not consider change in the level of the general government debt. In reality, however, an increasing debt results in higher government bond yields (risk premium) with a subsequent rise in interest rates across the economy. Ultimately, it may reduce private investment as freely available funds are depleted due to purchases of government debt. Economic growth, negatively influenced by demographic changes alone, will thus be slower due to feedbacks between debt and economic growth mainly through the loss of productive investments. Taking into account the dynamic effects of debt on economic growth, the period over which the government would be able to refinance the debt under unchanged policies shortens considerably when compared to the baseline scenario.

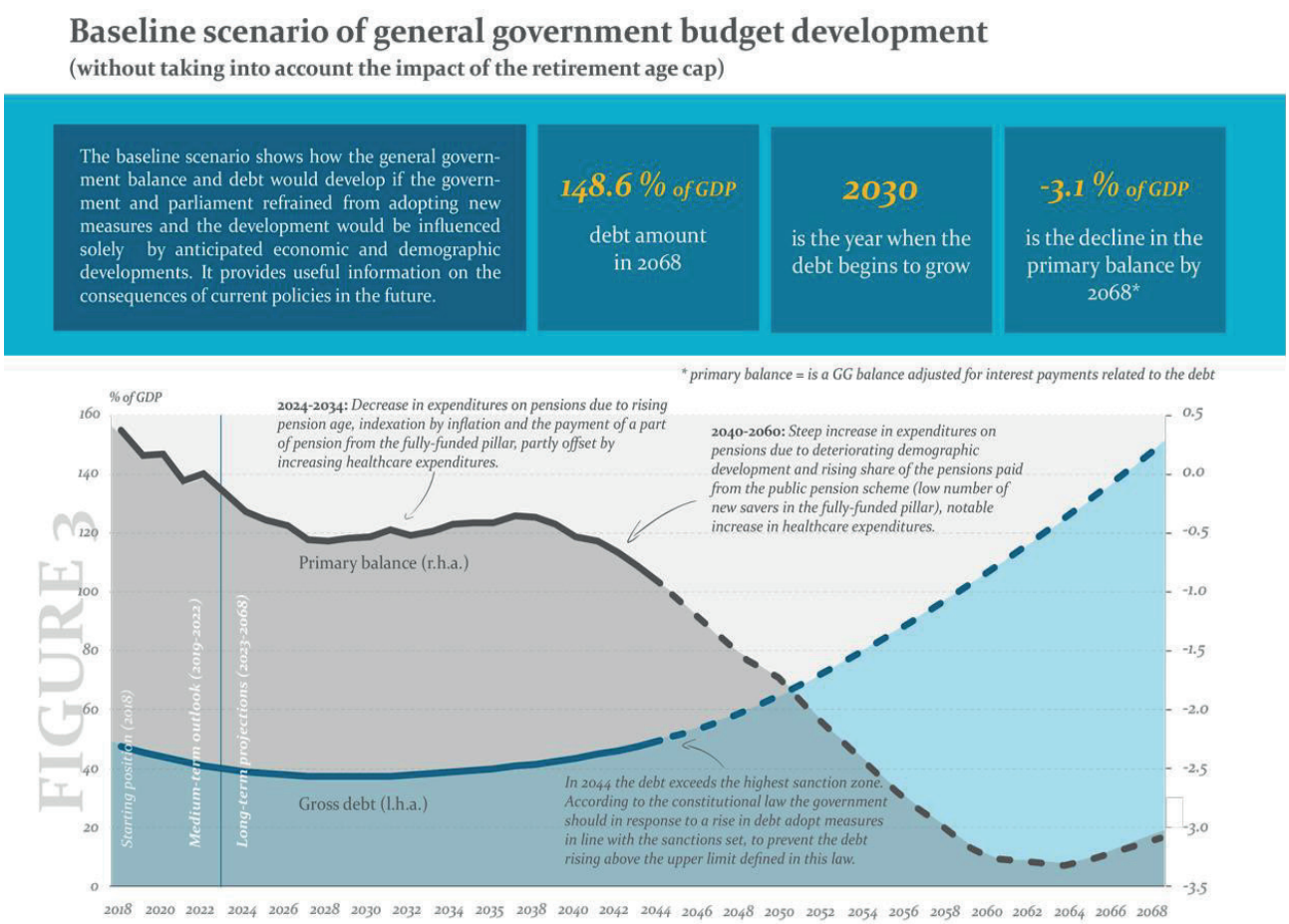
Another aspect the Slovak CBR assesses in the long-term sustainability of public finances report is intergenerational fairness. For this purpose, generational accounts are used, allowing to estimate the magnitude of fiscal expenditure or revenues for individual age cohorts during their lifetime. The generational account indicates how much an average representative individual of a given generation contributes to a general government budget in the form of taxes over the rest of their life and how much they receive in return in the form of various benefits. More accurately, it indicates the present value of a cumulative balance of payments (so-called net taxes) of an average representative individual of the given generation over his/her life. More details can be found in 2014 report of long-term sustainability (CBR, 2014[32]).

The fiscal sustainability reports prepared by the US Congressional Budget Office (CBO) place the main emphasis on the long-term forecasts of revenues and expenditures. Their projections are divided in a relatively detailed manner by sectors and taxes. The analysis serve as a basis for calculating debt scenarios. One scenario is based strictly on to the

BOX 6: SELECTED LITERATURE ON THE RELATIONSHIP BETWEEN PUBLIC DEBT AND ECONOMIC GROWTH

In their famous paper, (Reinhart and Rogoff, 2010[34]) find the "around 90% of GDP" debt threshold for both advanced and emerging market economies, beyond which public debt starts to have detrimental effects on growth. However, (Herndon, Ash and Pollin, 2013[35]) found significant errors in the study and could not replicate the main result. Similarly, other authors also do not find enough evidence for the negative impact of debt on growth, especially once the endogeneity between them is taken into account ((Panizza and Presbitero, 2014[36]) (Égert, 2015[37])). Nevertheless, other authors have found indications of adverse effects of public debt on growth, mostly non-linear (beyond certain threshold), though at low levels of debt the relationship could even be found positive ((Baum, Checherita-Westphal and Rother, 2013[38]), (Kumar and Woo, 2010[39]) and (2015[40]), (Chang and Chiang, 2011[41]) for Latin American and Caribbean countries, (Afonso and Jalles, 2013[42]), (Chudik et al., 2013[43]), (Cecchetti, Mohanty and Zampolli, 2011[44]), (Afonso and Alves, 2014[45])).

FIGURE 5. **Example of baseline scenario prepared by the Slovak CBR in the 2019 Long-term fiscal sustainability report**



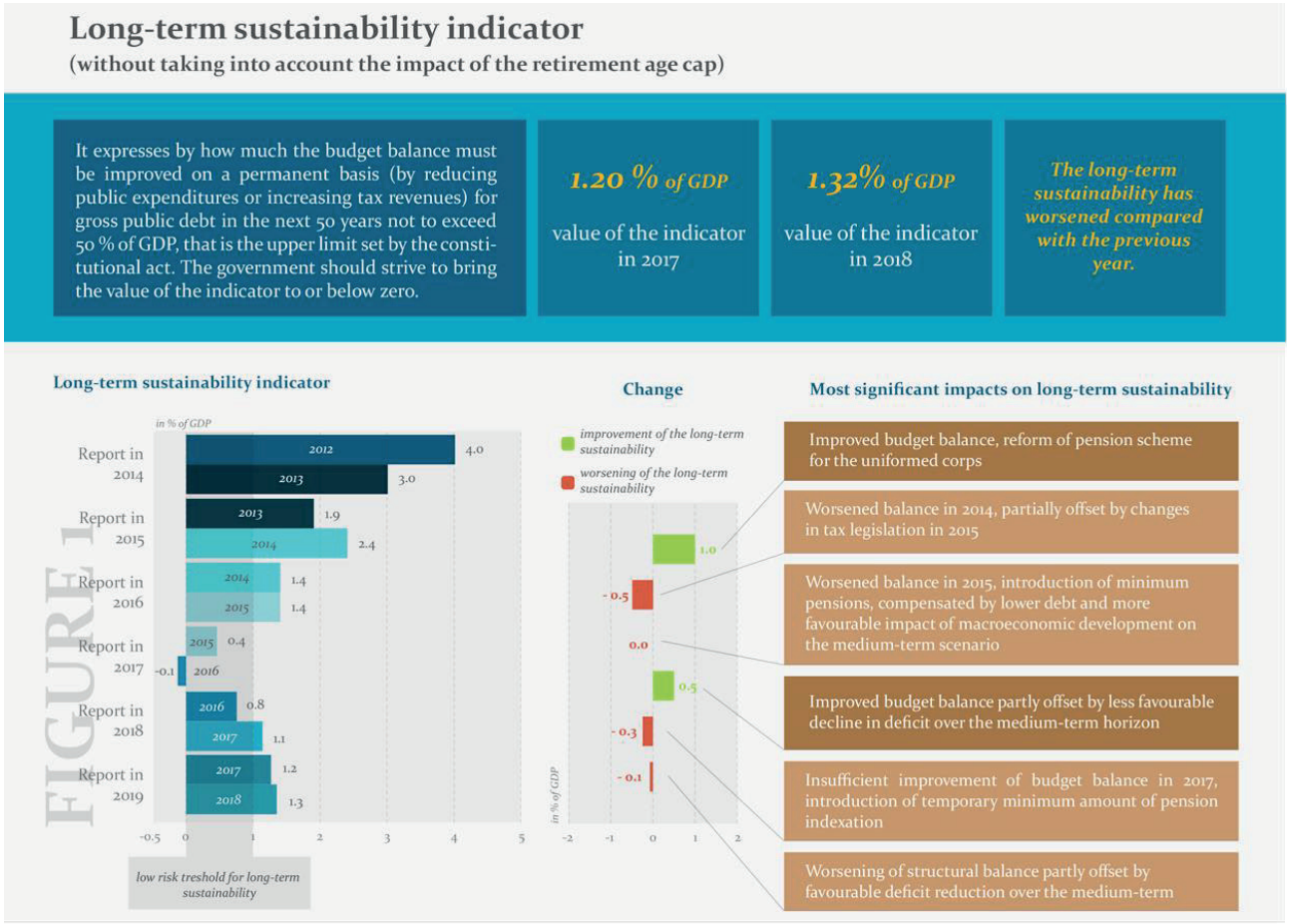
Source: (CBR, 2019[33])

current legislation (i.e., without any indexation of tax brackets on account of inflation or otherwise, but including the time limitation of certain measures). The other scenario can be called an 'unchanged policies scenario', i.e., a scenario that takes into account the usual changes in tax laws in the past. As opposed to other institutions, the added value of CBO analyses is that they quantify the impact of individual scenarios on the macroeconomic environment.

The Parliamentary Budget Officer (PBO) in Canada applies a similar approach as the CBO, i.e., focusing on detailed projections of revenues and expenditures in the long-term horizon. It uses the horizon of 75 years in order to fully capture demographic changes in Canada. Moreover, it quantifies the sustainability indicator and publishes sensitivity analyses. In order to underscore the importance of the issue, the PBO also publishes additional costs to incur should the necessary measures be adopted with a delay of several years (e.g., 5, 10 or 30 years). A separate chapter in the report deals with financial relations between the federal government and individual provinces.

In turn, every two years, Portugal's CFP publishes a review of fiscal risks and debt sustainability. In this report, the Council analyses the fiscal risks related to macroeconomic risks: potential GDP and long-term growth risks, risks underlying economic cycles, risks related to raising revenues and expenditures, especially long-term care, pensions and social expenditures and contingent liabilities. The tool used to build public debt scenarios consists of a deterministic model, based on the debt dynamics equation. According to the algebraic expression of debt accumulation, the change in the ratio of debt to GDP is determined by the primary balance, by the snowball effect (interest effect and growth effect) and one-off stock-flow adjustments, such as the use of deposits, support to the financial sector that is not included in the deficit and revenue from privatisations.

FIGURE 6. **Example graphic from Summary Report on the 2018 Long-Term Sustainability of Public Finances of the Slovak CBR**



Source: (CBR, 2019[33])

Debt forecasts are based on a baseline scenario for the model exogenous variables (nominal GDP growth, primary balance and the implicit debt interest rate). For the first five years of the projection (2018-2022), the CFP uses the figures in the no-policy-change macroeconomic scenario published by the CFP in its public finance position and constraints report and the ageing report. From 2023 onwards the changes in nominal GDP, the primary balance and the implicit public debt interest rate are those assumed by the European Commission in the debt sustainability monitor and sustainability indicators plus other CFP calculations. The report also looks at changes in other variables which, while not employed as inputs in the CFP methodology, help to frame the debt ratio path in each scenario from a broader economic standpoint.

In the alternative scenarios, sensitivity analysis is conducted for each exogenous variable (nominal GDP growth, primary balance and implicit debt interest rate), and a simultaneous shock. Results are presented as fan charts with shaded areas representing the changes in the public debt ratio path with symmetrical shocks of 0.5 p.p. and 1 p.p. in the concerned variables.

The Spanish Independent Authority for Fiscal Sustainability (AIReF) has recently started publishing a new public debt monitor. The report and data lab, available on the web, highlight a series of key indicators useful for debt sustainability analysis at national and regional level. This analysis includes debt forecasts and debt sustainability analysis (DSA). The DSA encompasses three main dimensions: (i) a traditional (deterministic) sustainability exercise for a baseline scenario, based on a simple accounting application involving the debt accumulation equation; (ii) an assessment of the realism of the assumptions underlying the deterministic debt projections, analysing risks to growth and fiscal forecasts and

elaboration of alternative scenarios; and (iii) a stochastic exercise aimed at understanding the uncertainty associated with the deterministic path.

Brazil's IFI publishes the Fiscal Follow-Up Report (*Relatório de Acompanhamento Fiscal*, or RAF, in Portuguese) meeting the objectives set forth in the Federal Senate Resolution of 2016. The RAF presents forecasts for fiscal indicators such as the primary balance and gross debt under different scenarios, optimistic and pessimistic scenarios. These scenarios are presented every 6 months (in May and November) and are simulated by the IFI based on forecasts for the budget parameters, such as GDP, inflation, interest rates and exchange rates. As a result, trajectories for fiscal indicators, such as primary result and gross debt, are presented. The report is published monthly containing updates.

The RAF also contains special topics, which translate the institution's view on specific themes, often preceding the publication of a more in-depth study, which is called a special study. For example, a special study of October 2018 analyses the evolution of the General Government Gross Debt, based on the description of the main debt indicators in Brazil. The report presents an evaluation of the composition of the gross debt and its relationship with the public deficit, discussing the limits of fiscal policy through the so-called public debt sustainability equation. The report also details the simulation method employed at the IFI, the macro-fiscal assumptions and the mechanics of debt estimates, highlighting a number of advances that can still be made in the system of simulations. In addition, the report presents different debt trajectories under three scenarios used by the IFI: baseline, optimistic and pessimistic.

The IFI has also published several technical notes, mainly analysing the fiscal impact of different reforms proposals of the Government, for example the pension reform, different tax reform proposals or special labour contract for youth.

The IFI forecasts the General Government Gross Debt based on the projections for the primary balance, GDP and average cost of debt (Brazil IFI, 2018[46]). Debt trajectories for each of four groups of securities are estimated. They are grouped according to the type of indexation: fixed rate, inflation linked, foreign exchange-linked and floating. Alongside these groups of debt, which are managed by the National Treasury, the IFI also projects the debt under the Central Bank's responsibility (repo operations). The hypotheses used for interest rates are based on the results of the IFI's macroeconomic scenarios; hypotheses regarding maturity and issuances of securities depend on (i) the projected trajectory of the primary balance and (ii) the maturity profile of securities. Forecasts for the interest rates on each slice of debt are done is disaggregated form: the Selic (the Central Bank overnight interest rate)-linked debt moves with the basic interest projection; the inflation-linked debt follows the inflation forecasts; the exchange rate associated debt follows the projections for the exchange rate. Forecast for the inflation, exchange rate and selic rate are described in the section on macroeconomic forecasts.

SETTING BASELINE AND ALTERNATIVE SCENARIOS

Countries differ in how they construct baseline scenarios, but most assume that current policies (or laws) will continue through the period covered by the projections. The basic purpose of baselines (including long-term sustainability estimates) is not to predict the future but to project probable future fiscal consequences of continuing the programme and budget policies already in effect.

Medium-term projections, however, are typically based on current law and are often adjusted by stated rules in the yearly budget. Medium-term policies that are possible to carry out in a short period may be difficult to sustain over decades.

The UK Office for Budget Responsibility produces medium-term projections which are often based on current laws and the present rules for adjustments of the yearly budget. However, assumptions are altered for long-term projections. For example, the 2019 Sustainability report puts clearly upfront the assumptions made for medium and long–term forecasts (OBR, 2018[30]). The no-policy change scenario is based on actual policies, and where policy is not clearly defined over the long term, the Charter for Budget Responsibility is used to make appropriate assumptions. Consistent with the Charter, the report only includes the impact of policy announcements in the baseline projections when they

can be quantified with "reasonable accuracy". The report tests the sensitivity of the baseline projection using several different scenarios, for example health care spending under alternative other cost pressure assumptions (OBR, 2018[30]).

In the Slovak Republic, the Fiscal Responsibility Act defines the public finance baseline scenario as the long-term projection of general government revenues and expenditures which reflects the future economic and demographic developments and the current policy framework in the country (CBR, 2015[31]). The baseline scenario should not reflect any future legislative changes, that is, changes that were not in force at the date of preparation of the baseline scenario (e.g. legislation at a preparatory stage). A baseline scenario should also include a projection of implicit and contingent liabilities. A key criterion for the identification and inclusion of such liabilities depends on the possibility to reliably forecast revenues and expenditure. This scenario shows the implications of current policies taking into account anticipated demographic and macroeconomic developments. Recognising the high uncertainty surrounding long-term projections, this baseline scenario is supplemented by detailed scenario analysis drawing on the suite of CBR models. The scenarios consider various alternative policy paths (e.g. delayed budgetary consolidation) and alternative demographic and macroeconomic assumptions, change in individual parameters which affect, in the long term, the macroeconomic developments, as well as outputs from long-term projection models. The modelling also considers the possible feedback effects from debt to economic growth through the channel of sovereign debt default risk premiums.

The medium-term fiscal sustainability analysis is based on two main tools: debt sustainability analysis, and the fiscal sustainability gap indicator. The debt sustainability analysis contains deterministic and stochastic debt projects. The deterministic government debt projections are of two main kinds: policy scenarios, including the baseline scenario (a no-policy change scenario) and a set of alternative policy scenarios, and sensitivity tests around the baseline scenario. These projection scenarios determine the debt sustainability risk. For the long-term fiscal sustainability analysis the economic and budgetary implications of ageing are analysed, and the long-term fiscal sustainability indicator presented (see Box 3).

The US Congressional Budget Office (CBO) uses one scenario based strictly on to the current legislation (i.e., without any indexation of tax brackets on account of inflation or otherwise, but including the time limitation of certain measures). The other scenario is an "unchanged policies scenario", i.e., a scenario that takes into account the usual changes in tax laws in the past. In contrast to other institutions, the added value of CBO analyses is that they quantify the impact of individual scenarios on the macroeconomic environment.

Canada's Parliamentary Budget Officer (PBO) projects that over the long-term, the Canadian economy is assumed to operate at its productive capacity or potential GDP, which is projected to grow in line with trend labour input (total hours worked) and trend labour productivity (output per hour worked). Consequently, real GDP, labour input and labour productivity are projected to remain at their respective trends. For example, trend labour input is determined by the working age population, trends in age and gender-specific employment rates and average weekly hours worked. Over the long-term, projected growth in labour input is due entirely to growth in the working-age population.

The Brazilian RAF brings monthly assessments and updates to the baseline, optimistic and pessimistic scenarios. These scenarios are simulated by the IFI based on assumptions for the budgetary parameters, such as GDP, inflation and interest rates.

EXPENDITURE FORECASTS

Best practices in long-term sustainability analysis in OECD IFIs require that expenditures related to demographic costs (such as, health, education, pensions) should be forecasted separately from other expenditures (environment, contingent liabilities) (Shaw, 2017[26]). A similar forecast decomposition should be made for tax revenues with different tax bases. Many IFIs' long-term fiscal sustainability reports include expenditure forecasts delineated by major functional category, forecasted independently based on major cost drivers.

For government spending, a number of different techniques are common at OECD IFIs (Shaw, 2017[26]). For social programme spending such as health and education, old-age security, and unemployment insurance, an effort is usually made to structurally capture the demographics and income characteristics of programme recipients. For other spending items, techniques range in sophistication.

Some IFIs forecast government spending with simple models. In most cases, institutional arrangements, demographic factors and government policies determine the future path of spending. For example, in Canada, a large percentage of government spending is in the form of transfers to people and other levels of government. These are largely determined by demographic factors and nominal GDP growth. Sometimes they use simple population-plus-inflation relationships. In turn, the Portuguese CFP's approach to forecasting government consumption is done by assuming that it remains constant relative to GDP in the long run, while government transfers are projected based on their specific structure and underlying policies.

In the US, the CBO prepares a detailed "bottom-up" spending outlook that combines current law projections of spending for each of the roughly 1,000 programmes that make up US federal spending. The CBO employs a variety of models to develop those component-by-component estimates, including simple extrapolations of recent spending, Excel- and SAS-based accounting models that reflect both recent trends and forward-looking assumptions about future population and cost component growth, and data-intensive microsimulation models of likely behavioural responses to prices of services in market sectors such as health care insurance.

The UK OBR produces a comprehensive fiscal forecast from a highly disaggregated bottom-up process (OBR, 2011[47]). It requires separate forecasts for numerous categories of revenue, spending and financial transactions, based on a consistent view of the outlook for the economy. This level of disaggregation requires the OBR to work in partnership with various government departments. In particular, the forecasting models for the major components of tax receipts and benefit expenditure are maintained and run by teams in the UK's tax, payments and customs authority and the Department for Work and Pensions, respectively. This reflects their expertise on the individual tax and benefit regimes and on the receipts and payments systems, as well as their access to confidential data on individual taxpayers and benefit recipients. The OBR has access to all information and analysis related to these forecasting models, with the exception of the confidential individual-level data.

For spending and revenues that depend on demographic changes (such as education, health and taxes), the OBR uses individual spending and revenue profiles for males and females, each capturing the age distribution of spending or revenue over a representative individual's lifetime. By applying age profiles and population projections to spending and revenue, the OBR calculates the total spending and revenue per person of a given gender and age. This calculation forms the basis of the projections of the public finances. For all but health spending, these per capita allocations are raised in line with earnings over the projection horizon and are combined with population projections to generate future spending and revenue streams. For health spending, per capita allocations are also increased each year to reflect the non-demographic cost pressures. Forecasts for adult social care and welfare spending are made by the Department for Work and Pensions, which projects social security payments using OBR's economic and policy assumptions. This allows incorporating the complexities of these benefits explicitly, including changes in the state pension age that affect eligibility for many working-age and pensioner benefits. Forecasts for long-term care are also taken from other government departments.

Ageing-related costs forecasts are an important ingredient in many IFIs long-term sustainability analysis. For example, the Slovak CBR uses its own models for long-term projections of the pension system expenditures (universal pension system and the pension system of the armed forces and police corps) and healthcare expenditures. For those ageing-sensitive items (e.g. pension, healthcare, long-term care, education, unemployment benefits and property income) for which the CBR does not have its models, it uses the dynamics of expenditure growth calculated by the Commission. These include, in particular, expenditures on education, long-term care and unemployment insurance.

The Slovak CBR pension model SLOPEM is used to conduct expenditure ageing-related forecasts. It is a cohort model designed for long-term projections of the pension system and quantification of long-term impacts of legislative changes. It has three modules: demographic, macroeconomic (including labour market) and pension. The demographic module compiles demographic projections on the long-term component method. The population is broken down by gender and age (age cohorts 0 to 100+), with development for each cohort being forecasted by component (total fertility, mortality and migration balance). The projections are based on the demographic data for the last available year, while the assumptions of the long-term trend of death, total fertility and migration (all by gender and age cohorts) are taken from the European Commission's demographic projections.

The CBR also prepares its own projections of long-term expenditures in the healthcare sector. Save for the very old age cohorts, it can be observed that with growing age healthcare expenditures increase and with the gradual ageing of the population, ever larger number of people will fall within the higher cost areas of the expenditure profile. The increase in the average life expectancy will, at the same time, affect the development in costs covering the last years of life (so-called death-related costs). The demographic changes in the population structure are not the only factor influencing the healthcare expenditures. A growing demand for a higher quality and greater scope of healthcare services can be expected. The long-term projections are then based on the assumption that unit costs of healthcare services will outpace the growth in GDP.

The macroeconomic module draws up macroeconomic projections using a Cobb-Douglas production function (the economy develops at potential level), with labour simulated in a particularly cohesive way in relation to population projections of the demographic module and the likelihood of participation and unemployment and gender, taking age into account. The projections are based on the long-term assumptions of the European Commission for future growth in total factor productivity as well as the assumption of long-term unemployment according to age cohorts.

Debt interest payments for the long-term are based on the projection of the debt that is affected solely by the general government balance. For the purposes of estimating the debt interest payments, interest rates envisaged in the Commission's macro-economic projection have been used as the source of data. Debt is expected to mature in 10 years, with no changes envisaged in risk premiums due to the given development of the debt (which may reach unsustainable levels during the period of the baseline scenario). However, the fiscal sustainability reports devote one section to the possible feedback effects from debt to economic growth through the channel of sovereign debt default risk premiums.

Other items of the revenue and expenditure balance of the general government are governed by a uniform rule which maintains their equal share in GDP throughout the entire long-term part of the baseline scenario (growth in line with the nominal GDP growth rate). This means that such items are not generating additional pressure on public finances beyond the scope of population ageing effects and other implicit liabilities.

Although the CBR has a suite of models to forecast spending and revenues, some of their forecasts are taken from experts, mainly for the medium-term forecasts. For example, forecasts for the medium-term for the tax revenue and social security contributions, which make up the most significant portion of general government revenue by volume, are based on a Tax Revenue Forecasting Committee forecast. Interest revenues and interest expenditures are projected following the projection of gross debt and financial assets under the baseline scenario. The interest expenditures forecast is based on the Macroeconomic Forecasting Committee forecast of an average yield on ten-year government bonds. Debt instruments with variable interest rates and short-term instruments are not taken into consideration and changes in a risk premium beyond macroeconomic forecasts are not considered. In terms of financial assets, they remain at an unchanged level throughout the entire period covered by the baseline scenario. They have been divided by type to assets with a fixed (credits, loans, repayable financial assistance) and variable interest rate (deposits). For instruments with a fixed rate, the same yield is foreseen as in the previous year and it is assumed that their amount does not change. For instruments with variable rates, the projection incorporates the effect of a change in the forecasted average interest rate on deposits. Expenditure on wages and social contributions is indexed on the basis of the trend projected in private sector wages. Current transfers in the social security system (state social benefits, social security benefits, social contributions paid by the state) take into account the indexation rules governed by specific

BOX 7: OECD PROJECTIONS OF PUBLIC EXPENDITURE IN THE LONG-TERM MODEL

Public expenditure in the long-term model are projected using simple reduced-form equations that rely either on coefficients estimated from historical data (health) or on stylised assumptions (pension and other primary expenditure). These equations represent a "business-as-usual" scenario in which no major reforms are undertaken and public expenditure growth follows historical trends.

PUBLIC HEALTH EXPENDITURE

Projected growth in nominal per capita public expenditure on health care (including long-term care) is a function of real GDP per capita growth (income effect), changes in the share of the population aged 65 and over (population ageing effect), the GDP inflation rate and the excess of inflation in the health-care sector over the broader economy (Baumol effect). This latter effect reflects the cost-pressure phenomenon observed in labour-intensive sectors where labour productivity grows more slowly than in other sectors. This effect is related in the model to the projected rate of aggregate labour productivity growth, as faster productivity growth implies a stronger Baumol effect. See section 4 in Guillemette (2019[48]) for additional methodological details.

PUBLIC PENSION EXPENDITURE

Public pension expenditure is projected on the basis of the projected change in the ratio of retirees to workers and an assumption regarding the evolution of the average benefit ratio (the ratio of the average public pension benefit to the average wage). The evolution of the ratio of retirees to workers depends on the evolution of the population age structure and on projected employment rates by age and sex according to a cohort model, which takes into account already-legislated future changes in statutory retirement ages. See section 3 in Guillemette (2019[48]) for additional methodological details.

OTHER PRIMARY EXPENDITURE

Other primary expenditure (i.e. excluding health and pensions) is projected based on the assumption that governments will seek to provide a constant level of public spending per capita in real terms. Under some reasonable assumptions, the evolution of this expenditure category relative to GDP becomes an inverse function of the projected evolution of the population-to-employment ratio, as expenditure (numerator) follows population whereas GDP (denominator) follows employment. See section 3.1.2 in Guillemette and Turner (2017[49]) for more details.

Source: Guillemette and Turner, forthcoming, "Under pressure: fiscal outlooks to 2060 underline need for structural reform"

legislation. Capital expenditure is indexed on the basis of nominal GDP growth, thus ensuring a constant ratio of general government investments to GDP.

The OECD has developed a simple framework for the forecasting of public expenditures, such as health and pensions, across countries using comparable data (Box 7 for a brief summary). The methodology is simple and based on homogenous data across countries, but important lessons can be drawn from this exercise at a country level.

REVENUE FORECASTS

Best practices in long-term sustainability analysis of IFIs in OECD countries require that tax revenues are decomposed according to their tax base for the forecasting excise (Shaw, 2017[26]). IFIs vary in terms of the analytical tools used for forecasting and the decomposition made of tax revenues for the exercise. Many IFIs use satellite structural models, simple growth accounting identities, and microsimulation models based on tax-returns and survey data to project public revenues over the medium- and long-run (OECD, 2019[16]).

Specifically, forecasting progressive income taxes typically involves estimating an elasticity of revenue with respect to the tax base, where the tax base is taken from the factor income side of the macroeconomic outlook, with adjustments to better match taxable income. Elasticities are estimated using various econometric or microsimulation techniques. Other taxes may apply simple historical average effective tax rates to the base. Smaller taxes of less fiscal importance often use a growth relationship with respect to GDP, which may or may not have an econometrically determined coefficient (that is, some are simply held constant as a share of GDP). In some circumstances, analysts attempt to specify the tax base exactly and apply the statutory tax rate, using a variety of microsimulation approaches or surveys.

The Portuguese CFP forecasts government revenues depend on the projected tax bases, which are derived from the medium-term economic outlook, and the tax rates. However, some organisations, such as the US CBO and the Canadian PBO, use microsimulation tax models to measure tax elasticities and effective tax rates, which are then applied to the projected tax bases derived from the macro outlook.

The Slovak CBR has developed a microsimulation model SIMTASK (Simulation Model of Taxes and Transfers in Slovakia) to simulate the Slovak tax and transfer system (CBR, 2015[50]). Household survey data is usually necessary to calibrate these types of models. The SIMTASK is part of a behavioural microsimulation model that is incorporated into a general equilibrium framework with search and matching frictions. The other two parts of this model are a labour supply module and macro module. The model is based and similar to the European Commission microsimulation model, EUROMOD, an EU-wide tax-benefit microsimulation model that can simulate individual and household tax liabilities and benefit entitlements according to policy rules valid in the respective EU states. Within SIMTASK there is an extension for costing VAT liabilities of households when VAT coverage and rates are changed. The CBR has also developed a framework linking microsimulation models with dynamic general equilibrium frameworks to obtain an evaluation of the impact of detailed tax and benefit measures on the aggregate economy.

The Slovak CBR forecasts on-year VAT revenues in-year by extrapolating the seasonally adjusted time-series from VAT returns. Medium-term forecasts are based on tax bases obtained from Macroeconomic Committee forecasts and a constant VAT elasticity. Corporate income tax and personal income tax in-year forecasts are obtained on the basis of the previous year's revenue collection and forecast change in tax bases, the medium-term forecasts are based on the tax bases obtained from Macroeconomic Committee forecasts and a constant tax elasticity. Together with this, a set of models for forecasting in-year revenues and updating medium-term revenue forecasts are used to identify risks to the official revenue forecasts.

A good practice from forecasting volatile revenue from commodities is the United Kingdom's forecast of oil and gas revenues. Receipts from natural resource production are one of the most volatile streams of UK government revenue and one of the most difficult areas of the public finances to forecast. The OBR devotes a chapter of its Fiscal sustainability report to a detailed medium-and long-term forecast of oil and gas revenues in the North Sea. The OBR models long-term declines in oil and gas revenues due to gradual exhaustion of the natural resources remaining within the UK continental shelf; and new resources, such as shale gas, as potential new sources of revenue. It supplements a central forecast with alternative price and production scenarios.

The UK oil and gas revenues forecast is based on a micro-simulation model that uses production and expenditure data on each individual oil and gas field (OBR, 2011[47]). The main economic determinants are the oil price, which forecast is based on prices implied by futures markets and the exchange rate projection taken from the economic model. The economic model assumes that the exchange rate moves in line with an uncovered interest parity condition, consistent with the interest rates underlying the model.

CONTINGENT LIABILITIES

Contingent liabilities are liabilities which will materialise into budget expenditures only if certain conditions are met. The amount of the liability cannot typically be determined at the time of its origin and, equally so, the period to which it applies may not be obvious. The payment resulting from the existence of contingent liabilities is not always certain because it depends on the occurrence of one or several circumstances. Within general government, contingent liabilities might include, among others, state guarantees, threatened legal disputes or liabilities arising from generally binding regulations.

The analysis of contingent liabilities is critical given the scope and magnitude of off-budget risks. It is usual that both financial and non-financial sectors benefit from government financial interventions, including financial support provided by the central bank. These interventions typically arose out of explicit and implicit guarantees to various public entities including sub-national governments and state-owned enterprises (SOEs) and banks, explicit or implicit guarantees embedded in public-private partnerships (PPPs), or support to private companies that were deemed too big to fail.

When preparing the baseline scenario, the Slovak CBR takes into account other revenues and expenditures resulting from implicit and contingent liabilities of the general government (CBR, 2015[31]). They are liabilities that might not necessary have an impact on the balance with the methodology at present, but they will affect the general government balance and debt when paid in the future. In the baseline scenario and the calculation of the sustainability indicator, an analysis of the impact on the balance and debt is carried out.

The OBR fiscal sustainability report identifies quantifiable contingent liabilities as percentage of GDP, and shows them as part of headline total liabilities if the probability of realization of each of them in isolation is estimated at more than 50 per cent. Still, since contingent liabilities are still fiscal risks, the report describes them as the circumstances that could cause them to crystallise (OBR, 2018[30]). The report also describes other non-quantifiable contingent liabilities. These are judged unquantifiable either because the estimates of possible costs are too uncertain or because quantification would jeopardise the outcome of a legal case.

The Portuguese CFP in its report on Fiscal Risks and Public Finance Sustainability published every two years dedicates a chapter to the analysis of contingent liabilities. In this chapter, after the collection of data on contingent liabilities it analyses the origin and extent of different contingent liabilities (related to the financial sector or guarantees granted, public-private partnerships and public corporations) and the risk of materialization.

Some of the most important contingent liabilities usually come from the financial sector. The European Commission captures contingent liability risks arising from the banking sector through heat maps of variables that measure banking sector vulnerabilities, as well as through model estimates of the theoretical probability of significant bank losses hitting public finances in a simulated bank crisis. Public debt projections are additionally run under a specific banking contingent liability shock scenario, if banking contingent liability risks are highlighted as a concern. For countries that are identified as vulnerable from the point of view of contingent liability risks, the debt sustainability analysis includes contingent liability stress-test scenarios around baseline public debt projections. The direct impact of possible banking losses on public finances is based on the SYMBOL model (SYstemic Model of Banking Originated Losses). The model first estimates an average implied default probability of bank obligors from risk-weighted assets reported by the bank itself to the country's banking system regulator. These estimates are then used to evaluate each individual bank's unexpected losses and potential default risk. The distribution of losses for the country's banking system as a whole is then obtained by aggregating simulated individual banks' losses.

ASSESSING CLIMATE CHANGE-RELATED FISCAL RISKS

Climate change has the potential to inflict both sudden shocks and slower-building pressures on the public finances. Extreme weather events could disrupt economic activity. Diverting investment to adaptation needs could impinge on investment in productive capital. The effects of extreme weather and the cost of adaptation and mitigation measures to fight climate change need to be taken into account as much as sudden global recessions or ageing, as they have direct fiscal implications. Extreme weather events can increase public spending driven by the need to repair damage to private and public assets. Investment in adaptation measures – for example, in flood defences and to manage the consequences of coastal erosion – require public spending. And mitigation policies will typically have either fiscal costs in terms of public spending or fiscal gains where taxes are used to discourage particular activities.

Climate change fiscal implications and related fiscal risks have gained priority in recent decades and some IFIs have started to include analysis as part of the comprehensive study of fiscal risks proving instruments for a credible fiscal risks management.

The UK OBR included a chapter containing detailed and deep analysis on climate change as part of their fiscal risk reports (OBR, 2019[51]). The OBR publishes a comprehensive analysis of fiscal risks every two years in a fiscal risk report. The quantitative assessment of climate-related fiscal risks draws on the Bank of England's scenario analysis.

The Bank of England has a framework for analysing climate-related risks to financial stability, which the OBR uses to discuss fiscal risks (OBR, 2019[51]; Bank of England, 2018[52]). Financial risks are split into physical risks, those related to extreme weather events and gradual global warming, and transition risks, those related to the shift to a low-carbon economy. The macroeconomic consequences of these were broken down into those affecting the supply-side and demand side of the economy – i.e. affecting potential output and the output gap respectively.

The 2019 fiscal risk report of the OBR surveys some of the climate-related risks to economies and the nature of the fiscal risks that might be posed, and set out some steps to take in considering these risks: to integrate climate-related risks into the broader management of fiscal risks of the UK Government; to analyse the appropriateness of the Bank, and more broader the Network for Greening the Financial System (NGFS), scenario framework for assessing fiscal risks; the analysis of the sources and transmission channels relevant to the public finances; the trade-off between climate and other objectives; the way to manage potential shocks to the public finances from climate change; and the trade-off between longer-term climate-related fiscal pressures and other priorities.

Other fiscal councils have also done analysis on fiscal implications of climate change from different angles. For example, the Canadian PBO has undertaken analysis on the fiscal and distributional analysis of the federal carbon pricing system (PBO, 2019[53]). Similarly, the US CBO has looked at the fiscal and distributional impacts of a tax on emissions of greenhouse gases (CBO, 2018[54]) The Netherlands Bureau for Economic Policy Analysis (CPB), which has a long history of assessing the possible fiscal impacts of new policies, has evaluated policies with environmental implications, such as emissions trading systems and indexed environmentally related taxes (OECD, 2015[55]). The CPB also developed with the Netherlands Environmental Assessment Agency (PBL) an updated protocol on how to conduct social cost-benefit analysis of new policies, with special provisions for quantifying and monetising environmental benefits (Renes, 2013[56]).

Recently, the *Banque de France* set up a Sustainable Finance Unit, hosting the Network for Greening the Financial System (NGFS) Secretariat as well as developing and coordinating the *Banque de France's* expertise regarding sustainability and, especially, climate-related and environmental topics. In a recent paper, the institution highlights that policies implemented to fight global warming could also destabilise the financial system if the transition to a low-carbon economy were too sudden or too late, impairing the value of financial assets (Banque de France, 2019[57]). That is why supervisors and central banks are urging financial institutions to quickly implement the internal arrangements required to monitor and mitigate the risks. In this report the authors discuss the channels through which climate changes could affect financial stability and measure the exposure of French banks and insurers to the transition risk.

The NGFS issued a 'call for action' in 2019 (NGFS, 2019[58]) using the physical/transition framework to set out next steps for assessing climate-related risks to financial stability. It considers the transmission channels and feedback mechanisms that relate the physical risks from climate change and the transition risks associated with reducing greenhouse gas emissions to the financial system. To facilitate central banks' and banking supervisors' work on climate-related financial stability risks, the NGFS is developing a scenario analysis framework for assessing those risks. It has proposed using four high-level scenarios that capture different settings along two important dimensions: the strength of the greenhouse gas mitigating policy response; and how smoothly and foreseeably those actions are taken.

Recently, *Banque de France* has also developed an ACCL (Advanced Climate Change Long-term) projection tool, free-access and user-friendly web application, allowing users to perform simulations of climate change scenarios (Alestra et al., 2020[59]). The resulting projections of the long-term economic consequences of carbon taxation at both the global and country/regional level are provided for two distinct horizons: 2060 and 2100 (see tool).

ASSESSMENT AND RECOMMENDATIONS FOR CHILE'S AUTONOMOUS FISCAL COUNCIL

1. Reports on fiscal sustainability of public finances

Under its mandate, the CFA published a report on deviations from structural balance targets and the limits and risks to fiscal sustainability (*Informe sobre desviaciones de las metas de balance estructural y los límites y riesgos para la sostenibilidad fiscal*) for the first time in December 2019 (CFA, 2019[3]). In this report the forecasts made by the Ministry of Finance are analysed and benchmarked against those of the Chilean Central Bank. The structural balance convergence path is directly related to the financial programme drawn up by the Ministry of Finance's budget office (DIPRES). Based on the estimates prepared by the budget office, a projection of the committed expenditure of the central government is obtained, which, together with the projection of the effective and cyclically adjusted revenues, and in accordance with the path of convergence of the structural balance announced by the Ministry of Finance, allows the CFA to determine the availability of resources. Finally, the report makes a preliminary analysis of fiscal sustainability, by analysing the trajectory of the central government's gross debt estimated by the Ministry of Finance and by developing some preliminary estimates of risk scenarios, notably on GDP and interest rates.

The CFA could consider publishing yearly reports on fiscal sustainability to provide timely assessments and analysis and make a contribution to public and political discussion on the sustainability of public finances. The CFA has developed a model for debt sustainability analysis composed of deterministic and stochastic components, and fiscal sustainability indicators, in line with the work of international organisations and other peer IFIs.

Most OECD leading IFIs focus on the presentation of a no-policy change scenario which lays down the central situation of public finances. This scenario is usually based on the current fiscal framework with its indexation rules, clearly defining the assumptions and main parameters. The scenario is based on a detailed, most frequently bottom-up, set of revenues and expenditure forecasts. These forecasts focus in particular on expenditures that affect medium-to long term sustainability, such as expenditures related to ageing. This analysis is usually followed by a series of sensitivity tests applied to the baseline scenario. The CFA could also consider including in the fiscal sustainability report this type of analysis, with detailed set of revenues and expenditures forecasts. This would require detailed bottom-up forecasts of revenue and expenditures. This type of analysis has the advantage of identifying the source of the main long-term fiscal pressures, needs and risks. The CFA could also think of monitoring the execution of the budget, at least on a quarterly basis, to early detect any issues.

2. Deterministic model for forecasting debt

The CFA has a deterministic model to forecast gross and net debt used to analyse fiscal sustainability in a 50-year horizon, based on the dynamic intertemporal budget constraint of the public sector. The model is composed of several parts. The first is the estimation of potential output using the same methodology of the fiscal authority. This is based on a Cobb Douglas production function where the inputs are the growth rate of total factor productivity, gross fixed capital formation, and the labour force. These inputs are sourced from an independent committee of experts.

In a second stage, the structural balance is estimated, using the official methodology, including estimations for the cyclical adjustment of non-mining fiscal revenues, health insurance contributions, copper revenues from Codelco (the public state-owned mining enterprise), and private mining fiscal revenues. The model is able to include the effects of transitory tax measures of automatic reversion (measures involving advances or delays in the payment of taxes, and have only a cash effect that is automatically reversed and hence does not affect the effective tax revenues), such as the ones used after the social protests at the end of 2019 or during the pandemic in 2020.

Revenues forecasts distinguish between non-mining and mining revenues. For non-mining fiscal revenues and health insurance contributions seven different categories of tax revenues, included in the structural balance estimation, are forecasted according to the GDP elasticities based on historical data. Other categories of tax revenues not included in the estimation of the structural balance are also forecasted using the same methodologies. This detailed analysis and

forecast of tax revenues allows to incorporate impacts of possible tax reforms. For mining fiscal revenues, both Codelco, the public mining company, and private mining are forecasted separately. The model is based on an econometric regression to measure the effect of copper price on mining GDP. Based on these parameters and elasticities of mining fiscal revenues and mining GDP based on historical data, fiscal revenues are estimated. Fiscal expenditure is constructed as a residual of the estimation of the cyclically adjusted revenues and the structural balance projections.

The model also includes a model for the trajectory of the fiscal deficit, scenarios for the behaviour of assets (the six treasury funds available in Chile, including the Pension Reserve Fund and Economic and Social Stabilization Fund) and the other capital requirements.

Debt forecasts are based on the dynamic intertemporal budget constraint of the public sector. The model also allows to distinguish between local and external debt. The model also considers other capital requirements, which correspond to the capitalization of public companies, state-guaranteed loans, *Bonos de Reconocimiento* (compensation for workers who switched from the old pension system to the private system), and movements of other financial assets that do not affect the government's net wealth.

The model is comparable to what other international organisations and other OECD IFIs do to forecast debt and analyse public debt sustainability. The CFA model is detailed and granular; easy to interpret and flexible enough, taking into account Chilean specificities. These features allow for a forecast under different scenarios with many different variables and stress testing. Analysis of fiscal sustainability based on this model could be relatively easily communicated to a non-expert audience. The model is in line with expert literature and has so far performed well.

Against this background, the following improvements or additions could be considered, some of which the CFA is already working on:

- **Testing the performance of the model:** It will be important to test the performance of the model in the near to medium term (not relative to Ministry of Finance projections but rather CFA projections versus actual outcomes). If there are any projection errors, it will be useful to understand to what factors these errors are attributable: government failing to fulfil its goals or macro (or other input assumptions) over/underperformance or elasticities. This information can then be used to gradually improve the model. This information can also potentially be used for communicating planned vs actual fiscal performance. The CFA has done an exercise to analyse forecasting errors 1-year and 8-years ahead. The exercise shows a very good performance of the model, highlighting that estimated elasticities work well. The exercise also shows that forecasts for gross debt are sensible to other capital requirements estimates and information (on which some recommendations are included below). One crucial assumption of the test and its good performance is that the structural budget outcomes are identical with the government plans. However, this assumption should be also tested, as it is one of the baseline assumptions of the model. Ideally, it should be possible to assess whether government's goals are realistic based on the prediction of revenues and expenditures and not vice versa, as it is now (i.e. taking government's goals as basis for projections, projecting expenditures as a residual).

- **Building scenarios:** Building alternatives scenarios is essential to facilitate a sound debate on fiscal paths and associated risks. The CFA has also a stochastic model (on which see more later) that could help build alternative scenarios; the deterministic model could also provide an important contribution. An improvement in this sense would be to add to the deterministic model shocks to interest rates or exchange rates based on past shocks -in the country, or in the region- that can be used as estimates of future interest and exchange rates in worst-case scenarios. Furthermore, several stress-test scenarios could be built, varying each of the key assumptions and a combination of them. These could be calibrated based on reasonable assumptions, e.g. taking the market projections into consideration, historical standard deviations or extreme events, contingent scenarios, credible policy plans etc. (these could also serve to visualize risks around the central debt projection, similar to a fan chart).

- **Expenditure forecasting:** This is the area where the model would need strengthening in the medium term. Optimally, the CFA should be able to assess if the structural balance goal is realistic based on expenditure and revenue forecasts, and

efforts by the CFA to improve the model are welcome in this respect. Using the OECD long-term expenditure framework will be an initial step on which the CFA could build to then expand it to all expenditure (see separate document for a detailed description of the OECD framework). Health, pension and education expenditures are probably the most important item over the long term, but accuracy over the short- to medium- term also matters, as it determines the starting point for all longer-term projections. One possibility, which could be developed in the short-term, could be to look at how the model performs historically in terms of forecasting expenditure as a residual and using this information to correct it. Alternatively and optimally, expenditure forecasts could be delineated by major functional categories and forecasted independently based on major cost drivers. Disaggregating expenditure may help identifying how best to forecast it, starting with a simple extrapolation and/or elasticities with respect to the respective aggregates.

- **More granularity in expenditure (e.g. investment, current expenditure and the main functions e.g. health, education, pensions etc.) to be achieved in the medium-to-long term:** Granularity would help identify sources of potential pressures or even current discrepancies and it may inform analysis on whether the expenditure mix is conducive to fiscal sustainability (e.g. how much is spent on "productive" spending like investment, education, etc.). Over the medium- to long-term envisaging a detailed "bottom-up" spending outlook would be advisable as this is common practice for many leading IFIs (examples can be found at the UK OBR or the Slovak CBR). This approach would combine current law projections of spending for each government programme employing a variety of models to develop component-by-component estimates.

- **Feedback effects:** Finally, and for the long term, it would be good to incorporate some calibrated feedback effects (from the structural balance change to macroeconomic environment). In order to include these effects, it would be advisable to have the information on the composition of expenditure (see e.g. (Cournède, Goujard and Pina, 2013[60]) or (Batini et al., 2014[61]) for an overview).

- **Communicating on methodology and assumptions:** the CFA could also clarify the methodology, data and assumptions informing the model and the analysis produced – this should be done to the extent possible in a user-friendly and intelligible fashion so that the analysis produced is accessible to the public and decision makers. The CFA could:

  – Over the short-term, codify the details of the model and present them on the CFA website in a user-friendly fashion. Also, the CFA could present results in the website with a simulator, for example like https://obr.uk/choose-long-term-projections/;

  – With more time, the details of the model could be turned into frequently-asked questions to explain the methodology and assumptions (especially for non-experts), see for example UK OBR FAQs: https://obr.uk/faqs/

3. Stochastic model for forecasting debt

The CFA stochastic model for fiscal sustainability, for a 50 years horizon, is based on the dynamic intertemporal budget constraint for the public sector, which is similar to the deterministic model composed by seven modules, where the module of macroeconomic forecasts is built on a system of reduced-from equations based on theoretical relationships, such as a demand equation, the Taylor rule and the Phillips curve, where shocks are drawn stochastically from Monte Carlo simulations. This helps construct probability distributions and statistical analysis for a number of variables. The stochastic variables of the model are the copper price, US economic growth (as a measure of global growth) and Chile economic growth. Furthermore, different variables can be shocked or a combination of shocks can take into account the interaction between all variables involved in the model.

The approach is similar to the one used by other IFIs and international literature. The model is very flexible, detailed and granular, allowing the CFA to model different stochastic shocks, taking into account Chilean specificities. These features allow for showing different paths for gross and net debt under a multiplicity of different shocks with many different assumptions and stress testing. The framework is based on excels and running programmes behind the

scenes, which makes documentation easy. The model is simple and clear. This is important as the models developed by the CFA should strike a good balance between the complexity, transparency, clarity and the capacity to achieve business continuity with any new analyst or outsiders being able to run the models.

Against this background, some improvements and additions could be considered:

- **Testing the model:** It will be important to test the performance of the model. One way of doing this would be to see where the actual (historical) realisation of debt would lie in the simulated debt distribution (fan chart). This information might be useful to understand the power of the model against shocks and can then be used to gradually improve the model. Also, a comparison of the stochastic and deterministic model under different shocks would be valuable to facilitate the understanding of the two models, show how and why they differ and ultimately make it easier to present them in a report or on the CFA website.

- **Other shocks:** The model contains already the possibility of simulating many different shocks. Other shocks that could be simulated are contingent liabilities and other capital requirements. This could be easily done, given the full flexibility of the model, and would be extremely important given the current macroeconomic environment, adding credibility to the maximum debt paths. Also, other shocks could be analysed, such as natural disaster shocks, or group some shocks in a bigger group of macroeconomic shocks for ease of exposition.

- **Structural models to be analysed in the medium to long term:** Semi-structural models are widely used and this modelling strategy is possibly the best approach to start simulating shocks for the CFA. The CFA could also consider to develop structural models for Chile in the long-term, like some other IFIs. Dynamic stochastic general equilibrium (DSGE) models provide an example, which, by taking into account the uncertainty around shocks, can be used to understand specific policy questions. This would allow the CFA to have a deeper understanding of fiscal risks. Another intermediate avenue for potential exploration may be taking into account asymmetric macroeconomic risks (Turner, Chalaux and Morgavi, 2018[62]).

- **Communicating on methodology, assumptions and results:** the CFA could also publish the methodology, data and assumptions informing the model and the analysis produced. As for the deterministic model, this should be done to the extent possible in a user-friendly and intelligible fashion so that the analysis produced is accessible to the public and decision makers. The CFA could consider the following actions:
  - *Developing a debt simulator:* Over the short-term, the CFA could codify the details of the model and present them on the CFA website in a user-friendly fashion, where all the models run behind the scenes. Also, the CFA could present results in the website with a debt simulator, for example like https://www.airef.es/es/sostenibilidad/observatorio-deuda/;

  - *Communicating on the shocks:* in future reports, when fan charts will be reported, it would be useful to isolate the most probable shocks, according to CFA judgement, and explain the probability that the debt could surpass certain worrying levels if those shocks happen.

  - *Analysis of fiscal objectives:* Using the Ministry of Finance objectives for fiscal revenues and expenditures, the CFA could analyse in which part of the fan charts they are situated. This analysis could show how important it is to achieve these objectives for the sustainability of public finances.

4. Fiscal sustainability indicators

- The fiscal sustainability indicators developed by the CFA are sound and widely used in the literature and by other IFIs. In order to communicate with the public, it would be useful to choose one key fiscal sustainability indicator that could be tracked over time or to summarize the indicators in one indicator in order to show a summary result.

- In the short-term, **different scenarios**, based on different assumptions for key variables and different horizons, could also be considered, as done by the OBR in its fiscal sustainability report (see Table 7 above). Furthermore, and related to this point, it would also be valuable to test how sensitive the fiscal sustainability indicator is to the underlying parameters, by shocking them based on relevant assumptions, some of which can be summarized in a table.

- Although the primary interest lies in medium and longer-term debt sustainability analysis, most of the times there are issues with meeting short-term primary balance targets. To evaluate this and analyse the short-term situation of public finances, the CFA could consider developing tools to **monitor in-year budgetary developments**. A good example could be the Slovak CBR budgetary traffic light. Also, a refined version of the currently used fiscal sustainability indicator could be used for this purposes. Current budget developments have implications for longer-term sustainability, and they should be linked and their impact discussed.

- **Enlarging the number of variables** to monitor, analyse and track on a real time basis different aspects of fiscal sustainability would be advisable. These additional variables could include, at least, the indicators suggested below; summarizing them in an easy way would be an effective way of communicating and giving a complete picture of fiscal sustainability in the country:

  – *Debt profile:* maturity (at least average of years or share by maturity), the share of foreign exchange debt, the share of debt at fixed rate, the share of debt held by non-residents. This is important information to have and monitor, and could be part of complementary indicators the CFA is looking at.

  – *Markets' perceptions*, such as sovereign Credit Default Swap spreads and Relative Asset Swap spreads could also be considered. Although market perceptions are not usually tracked by most IFIs, these indicators are part of the IMF framework, and could be included in a heat map to complement the analysis of the core fiscal indicators.

  – An *analysis of the type of the set of S0, S1 and S2 indicators* as used by the European Commission could be considered. These indicators are designed to allow for early identification of sustainability challenges over the short-, medium- and long-run (see Box 3). In particular, indicators S1 and S2 allow for the identification of areas that specific challenges stem from (for example, the fiscal stance at the start of projection period and/or the projected dynamics of public spending on pensions and health care). For the short-run, the analysis of the different components of S0 allows for the identification of the determinants of the risk signals sent by the overall indicator, particularly important to identify the appropriate policy responses to address them.

- **Communication and publication of fiscal sustainability indicators and variables:** indicators should be communicated externally, through the webpage, in an easy-to-understand fashion. Debt forecasts (deterministic and stochastic) together with fiscal sustainability gaps and other variables cited above could be combined to show an updated and complete picture of fiscal sustainability in the country. Heat maps and fan charts are very useful to indicate vulnerabilities and risks to debt sustainability, based on the different models, indicators and a set of comprehensive variables. A good example is the European Commission framework summarizing many variables and indicators into one for every time-horizon, e.g. short, medium and long term (see https://ec.europa.eu/info/sites/info/files/european-semester_thematic-factsheet_public-finance-sustainability_en.pdf). Another example is the Slovak CBR's traffic light indicator (see https://www.rozpoctovarada.sk/eng/rozpocet/145/transparent-public-finance and Figure 2 above). Appropriate consideration should be given to what is most effective in Chile as the cultural context and social norms matter.

5. Other recommendations

- **Addressing tax risks**

  There are several factors that can affect the outturn of tax revenues and consequently the accuracy of their predictions:

  i. *Fiscal elasticities* – they represent the relationship between the respective tax base and the tax revenue; they can also be thought of as a measure of an average effective tax rate (average tax relative to the average unit amount of tax base).

  ii. *Tax base evolution* – i.e. macroeconomic projections of the respective tax bases (e.g. wage bill, consumption, GDP, etc.).

  iii. *Discretionary tax measures* – changes in the tax laws, tax bases, rates, etc.

  iv. *Other or one-off factors* – e.g. in the current context of Covid crisis, it can be the suspension of tax payments.

  All of these factors play a role in projecting tax expenditures and need to be monitored closely and frequently. For example, tax elasticities may change due to various factors, including changes in behaviour relating to tax compliance. They may also behave in a non-linear way with respect to large business cycle swings (e.g. they may perform relatively well during normal times, but may not work so well in times of very large output gaps, e.g. during crises). Therefore the performance of the elasticities needs to be evaluated and updated frequently and any systematic forecast errors should be taken into account and corrected for.

  An example of good practice, as done for instance in the Slovak Republic, is the establishment of a tax projections committee, comprised of economists from the main public institutions of the country (ministry of finance, fiscal council, central bank, statistical office), plus economists from the main commercial banks or other relevant research institutes. The committee meets every time the ministry of finance updates its tax projections and the aim of the committee is to assess whether the tax projections (and/or the assumptions they are based on) of the ministry are realistic/too optimistic or pessimistic. It provides ground for discussion on tax projections. A similar committee is also established for macroeconomic forecasts.

  In order for the CFA's sustainability analysis to be truly independent, it is important that it has an independent view on the official fiscal projections, including tax revenue projections, ideally via its own forecasts or, if this is not possible over the short term, e.g. via scenario analyses.

- **Access to information, including on contingent liabilities and other capital requirements:** very detailed, including forward looking information is needed so that the CFA is in the best possible position to deliver informed analysis and opinion. Contingent liabilities and other capital requirement information should be provided timely by the Budget Office, the Ministry of Finance, the Financial Market Commission (*Comisión para el Mercado Financiero*, CMF) and the Central Bank. The CFA could seek to develop agreements on access of information with the mentioned institutions through formal protocols or memoranda of understanding (MoU). The MoU could establish what information CFA needs to fulfil its mandate and mutually agreeable and collaborative processes for information requests, including real-time access to existing dataset and information systems, indicative and realistic timeframes for responses to data requests, steps to take when requests are not or cannot be complied with, and provisions regarding the treatment of confidential data. There are many examples of OECD IFIs having signed MoUs to access data and information. For example, in 2012, the Australian Parliamentary Budget Office (PBO) signed a MoU with the Heads of Treasury, Finance and over 20 other government agencies. The MoU describes the roles and responsibilities of the parties, the process for requesting and providing information, avenues of communication and dispute resolution. The impact of the MoU has been positively assessed in two independent evaluations of the PBO. In Portugal, the CFP has an Institutional Cooperation MoU in the field of General Government Statistics with the Bank of Portugal, Statistics

Portugal, the Directorate General for Treasury and Finance. The MoU aims to promote co-operation among the signatories in the field of General Government Statistics (CFP, 2017[63]). The strategy of giving the IFI advance access to data on a confidential basis has been used successfully by other OECD IFIs and their government counterparts and would have the potential benefit of strengthening CFA analysis and the usefulness and timeliness of its work.

- **Integration of climate change spending pressures:** As highlighted above, this is a field under development. One of the few IFIs that has started to include this topic in the report of fiscal risks is the UK OBR. It could serve the CFA as an example and basis for analysis in the long term. The UK OBR uses the framework developed by the Central Bank of England to set different scenarios and discuss fiscal risks stemming from them. The Chilean Ministry of Finance is developing an analytical framework through a technical cooperation with the United Nations. The work will include the measurement of the required, direct and indirect, public and private spending to deal with climate change. This work could be the basis to start analysis on fiscal risks and public spending pressures. The CFA could also make a partnership with the Central Bank of Chile to start developing a framework for building scenarios on the macroeconomic and fiscal impact of the damage due to climate change and of mitigating measures.

5. Macroeconomic forecasts and potential output estimations

PREPARING MACROECONOMIC FORECASTS

Up-to-date macroeconomic information and accurate forecasts are crucial for fiscal planning. Unrealistic, biased or outdated macroeconomic forecasts can seriously hamper assessments of the budgetary situation many IFIs are mandated to perform.

Preparing official forecasts is a key element of the mandate of some of the OECD IFIs, including IFIs of the Netherlands, the United Kingdom and Slovenia. Indeed, many IFIs in the European Union have a mandate that stems from the law to provide a thorough review of the government's official projections on which budgets are based. Should the IFI not endorse the figures put forward by the government, the authorities are expected to revise their forecasts.
Some IFIs have only the mandate to endorse official forecasts, as is the case of the Spanish AIReF. To accomplish this task the AIReF has developed a suite of models. The Spanish AIReF uses dynamic factor modelling for nowcasting (AIReF, 2015[64]) (most suitable for current-period forecasts or one to two periods ahead using high-frequency monitoring data), VAR models for short-term forecasting (most suitable for forecasts up to eight quarters), and reduced-form macroeconometric models based on potential output and output gap relationships for the longer run outlook (where strong assumptions about economic relationships and equilibrium concepts may prove advantageous) (OECD, 2019[16]). All results are linked within the national accounts framework and by a suite of satellite models, including Markov-switching recession probability assessments. AIReF also challenges the results using extensive sensitivity and uncertainty analysis, and tests an array of alternative scenarios.

The Portuguese CFP has a formal role in assessing official government forecasts and also presents its own fiscal and macroeconomic forecast. The CFP prepares macroeconomic forecasts for the next four years, which are initially presented in March and updated in September each year. The CFP projects the evolution of GDP, its components and the unemployment rate as well as the evolution of the external sector and of business cycle indicators (OECD, 2019[11]). The CFP uses a set of VAR models for short-term forecasting of GDP and its components, a collection of bridge and mixed-data sampling (MIDAS) models, combined with bootstrapping simulations for the very short-term forecasting of GDP, as well as a collection of VARs to forecast inflation in the short run. This is complemented with a macroeconometric model with error-correction equations for economic and fiscal forecasts.

In case of some IFIs who neither produce nor officially endorse government projections in their mandate, macroeconomic forecasting is used as a part of a broader analytical toolkit to assess and predict the state of public finances in their country. This is the case of the Slovak CBR. The CBR does not endorse the Ministry of Finance macroeconomic medium-term forecasts. Instead, this is done by the Macroeconomic Forecasting Committee, formed by independent institutions from the private and public sector, such as the Central Bank, commercial banks and academics, in which the CBR is a member with no voting rights. The Committee discusses preliminary forecasts delivered by the Ministry of Finance, whose predictions can be subsequently modified respecting the prevailing opinion of the Committee. Tax revenue forecasts used in the government budget are also subject to expert scrutiny by the Tax Revenue Forecasting Committee comprised of independent domestic experts from the public and private sectors. The CBR directly uses these assumptions to construct the baseline scenario for the forecasts. For the long-term projections, the European Commission's forecasts are taken as a benchmark and are complemented by calculations based on the CBR's own models.

Notwithstanding, the CBR has developed several macroeconomic forecasting models, which are the basis for risk sensitivity analysis. The CBR has a standard macro econometric model with a neoclassical supply block and error correction equations for the components of aggregate demand. The model has a detailed fiscal block that allows analysis of interactions between fiscal variables and the real economy. The model is used for: macro forecasting; estimating

fiscal multipliers; and measuring economic impacts of fiscal measures. The CBR also has a nowcasting model used for short-term forecasting of macroeconomic indicators for up to two quarters. The main role of nowcasting in CBR is to track the actual positive and negative macroeconomic risks of the Slovak economy in relation to the latest official national macroeconomic forecast by the Macroeconomic Forecasting Committee. Additionally, the nowcast models help to improve precision of estimates of initial conditions of the economy by bridging the short-term forecast and mid-term forecast. Given the sophistication achieved by the macro-modelling tools, the CBR plans to start publishing its forecasts periodically.

Other OECD IFIs that have invested considerable resources into forecasting tend to rely on several models centred on a main and usually large macroeconometric model. To evaluate events with a significant impact on the domestic economy, such as those that originate in a sector not captured in detail in the main model, supplementary models are used, e.g. modelling of specific sectors such as housing. Predictions from such sub-models are then fed into the main macroeconomic model as external assumptions or shocks.

For the medium-term macroeconomic outlook, Canada's and the UK's IFIs use a reduced form Keynesian model of aggregate demand for demand-side GDP, and a simple production function for supply side GDP. Medium-run factor incomes are often prepared by holding labour and capital shares constant or using simple trend projections. In the Netherlands, the IFI uses a simple production function for the supply side in combination with a detailed satellite model for the structural unemployment and a structural econometric model for aggregate demand. The US IFI employs a broad range of macro models, including standard general-equilibrium models that reflect Keynesian responses to governmental stimulus and contractionary fiscal policy, as well as a set of micro or sector models for interactions between key economic factors such as labour supply, productivity, cost of labour, housing market starts, prices of key goods such as health care, food, and energy. These macro-based and micro-based models are coordinated through a semi-annual update of the economic forecast, informed by expert judgment from a panel of economic advisors.

The Brazilian IFI produces its own macroeconomic forecasts as a basis for its baseline fiscal scenario (Brazil IFI, forthcoming$_{[65]}$). In the very short term, the aggregate real GDP projection is determined using nowcasting models (MIDAS: mixed data sampling models). For the short and medium term, forecasts of real GDP is obtained by the forecasts of the components of aggregate demand through error-correction models (private consumption, government consumption, investment and net exports). The consumer price index is modelled using a Phillips curve equation; while the forecast for the implicit deflator for GDP is consistent with its historical relationship with consumer price index. The exchange rate forecast evolves according to the uncovered interest parity condition; and the nominal interest rate is expressed via a Taylor rule that relates the policy rate to inflation expectations, deviations from target and the output gap.

Forecasting or even proper evaluation of forecasts is a costly exercise. Given the diversity of the resource base among IFIs, not all institutions can afford to engage in such modelling work. Some institutions therefore rely on other institutions' forecasts when conducting their assessment. For example, the Australian Parliamentarian Budget Office must rely on the fiscal and economic forecasts contained in the most recent reports released by the government.

Risks surrounding macroeconomic forecasts are usually included in the reporting of IFIs. Some institutions apply more or less sophisticated statistical techniques to evaluate the uncertainty surrounding macroeconomic and fiscal developments, expressed as a range of estimates. Then they locate the position of the central estimate of the government relative to the range of uncertainty. In Portugal, for example, the CFP uses time-weighting of other institutions' forecasts when producing forecast distributions with more recent forecasts receiving a higher weight. They also produce asymmetric fan charts using different vintages of the government's forecasts from the last 22 years. The Italian and Greek IFIs use their own forecast as a benchmark and other institutions' forecasts to set upper and lower bounds for the endorsable range. In turn, the Lithuanian IFI defines its endorsable range using the central bank's forecast and standard errors from previous periods. The endorsable range is constructed for a set of macroeconomic variables most relevant from the perspective of fiscal planning, and the macroeconomic forecast is not endorsed if the government's projection falls outside the endorsable range for one of the variables.

The approaches that the IFIs have to check if the budgetary figures are plausible vary widely, largely depending on mandate and capacities. Most IFIs conduct aggregate analyses: simple spreadsheet-based forecasting of main tax bases and effective rates, and applying some empirically identified elasticities. In Italy, the macroeconometric model incorporates a detailed fiscal block which allows an automatic consistency check between the macro and fiscal forecasts. The Austrian, the Slovak and the Spanish IFIs monitor the expenditure side of the budget at a high degree of disaggregation, particularly geographical, and work with individual-level data to evaluate policy measures, particularly in the area of taxes and benefits.

ESTIMATIONS OF POTENTIAL OUTPUT AND THE OUTPUT GAP

Estimations of the output gap are an essential element of monitoring the compliance with fiscal rules. This is the case for all independent fiscal institutions tasked with assessing cyclically adjusted fiscal indicators, such as the case of the Chile CFA. Very volatile estimates of output gap with weak information content can quickly undermine the credibility of a fiscal framework and the IFIs, which aim to assess the performance against cyclically adjusted indicators. Furthermore, long-term forecasts of potential output growth are an essential input into public debt sustainability analysis. In designing a suite of models, a practitioner must be aware of both goals of the output gap and potential output. This generally calls for a consideration of structural and statistical methods as complementary tools.

The central problem is the inherent difficulty of estimating potential output in real time due to its non-observability, unknown structural breaks, and the non-computability of such a complex variable. Policymakers face an important trade-off between putting too much weight on recent developments, leading to them to follow the cycle, and too little weight on current observations, risking missing structural shifts in the economy.

Most EU IFIs produce their own independent estimates of potential output and output gaps, typically twice per year (EU IFIs, 2019[66]). There are two conventional methods to estimate the potential output: Hodrick-Prescott (HP) filter and a production function approach. Some well-established fiscal councils also cover univariate or multivariate unobserved components models and principal components analysis.

Generally, leading OECD IFIs use several models to estimate the output gap. Although costly from a computational perspective, due to the number of procedures involved, mid-ranges or averages of a suite of model estimates can reduce the likelihood of output gap estimates being misspecified due to the properties of model averaging (Casey, 2018[67]).

For example, the Slovak CBR uses a suite of models for the estimation of potential output and the output gap as an input into the estimation of the general government structural balance and the assessment of long-term fiscal sustainability. Among the models used by the CBR are HP-filter model to estimate trend GDP and output gap. A principal component model estimates the output gap directly, using several soft indicators of the cyclical components of GDP. A state-space output gap is estimated by a multivariate Kalman filter technique for estimating potential output and the output gap.

The UK OBR bases the estimates of potential output and the output gap on national output excluding the small and volatile oil and gas sector. The forecast for oil and gas production is then added to complete the GDP forecast. The OBR uses nine different techniques to estimate the output gap, including statistical filters, cyclical indicators and production functions. The techniques used to construct these estimates are refined from forecast to forecast, so the precise variables and parameters may vary over time.

The EU network for independent fiscal councils has produced a practitioner guide providing a comprehensive literature review of potential output and output gap estimates for IFIs (EU IFIs, 2019[66]). Different EU IFIs seems to converge on the view that it is best to use many alternative methodologies jointly for comparison and assessment. This leads to the use of a suite of models approach.

RECOMMENDATIONS FOR CHILE'S AUTONOMOUS FISCAL COUNCIL

Macroeconomic forecasting

The Chilean fiscal framework would benefit from the CFA taking a more active role in the area of macroeconomic forecasting, by participating in public debate with its own forecasts or own assessment of forecasts. Analysis conducted by IFIs aim to create a framework for debate and to assess the reasonableness of the government's forecasts and estimates. Indeed, experience and empirical evidence suggest that macroeconomic forecasting of an IFI can indeed reduce forecasting bias in the budget (Hagemann, 2011[68]).

At present, the CFA uses macroeconomic forecasts for a 50-year horizon for studying the sustainability of public finances. Variables forecasted include economic growth, inflation, exchange rate, external inflation, interest rates, and the copper price. Three different scenarios for these variables are built: the CFA scenario, fiscal authority scenario (DIPRES which is under the Ministry of Finance and builds the official forecasts), and an alternative scenario (also chosen by the CFA). The CFA scenario is based on the CFA Board judgment based on information collected from the Central Bank, the fiscal authority, market surveys, and international and local institutions. For long-term interest rate, forecasts are based on a composed interest rate from the Central Bank policy rate and a market premium. Long-run projections of these variables assume a gradual convergence to developed world figures.

The CFA scenario puts high weigh on the Central Bank forecasts as a benchmark. The Chile Central Bank has a very solid reputation on independent macroeconomic forecasting done by a well-established and numerous staff, having developed sound and up-to-date econometric tools. While it is a good thing to rely on the Central Bank macroeconomic forecasts in the short term, especially as the CFA has not the staff nor the resources to dedicate to this task and is not part of its mandate, relying on the Central Bank forecasts ties CFA activities to the calendar of the Central Bank policy meetings, moment when forecasts are updated. In this sense, it be would valuable for the CFA to have a more official, pre-determined and agreed, relationship with the Central Bank to discuss the macroeconomic forecasts. The CFA could organise frequent meetings and discussions around the forecasts with the Central Bank, so that the CFA has beforehand the real time situation of the Chilean economy.

The CFA could also consider setting up a working group, or hold annual workshops, to serve as platforms for analytical discussions on projections and forecasting in Chile. An example of a working group of economic forecasters is the one set up by Spain's IFI, formed by regional experts. Another option could be to set up an annual workshop where such macro and fiscal issues could be discussed, with presentations from the CFA on current work, other (national and international) institutions, and academia. Maintaining a concerted effort to interact with other institutions within the country that provide analysis on fiscal policy issues is also warranted.

In the medium- to long-term, and given the importance of macroeconomic forecasts to assess the sustainability and risks of public finances, the CFA could consider developing in-house tools for macroeconomic forecasting. This would require an increase of analytical and experienced staff dedicated to this, as much of IFIs making macroeconomic forecasts usually have more staff than currently the CFA does. The Spanish AIReF experience indicates that is worth hiring field experts as they come usually with a solid background and experience on developing models, being able to put their tools to work rapidly.

Most OECD IFIs preparing macroeconomic forecasts use several different approaches (suite modelling) providing a check on different forecasts and leveraging each model's strength for different time horizons and circumstances. It should be highlighted that the models developed by the CFA should strike a good balance between the complexity and transparency, clarity and the capacity to achieve business continuity with any new analyst or outsiders being able to run the models. The Slovak CBR has only one macroeconomist to run and maintain the macroeconomic forecasts exclusively, but they are evaluating the idea to increase the staff dedicated to this in order to be able to develop other tools. The Portuguese IFI has two to three expert and skilled economists to maintain and run all the models developed by the IFI to fulfil the mandate (OECD, 2019[11]).

The CFA could consider in the medium-term simple approaches. Some examples could be VAR models for short-term forecasting and other macroeconomic models based on reduced-form and theoretical relationships for the long-term. A bottom-up approach of national accounts GDP components would be advisable. Developing nowcasting models for GDP and fiscal revenues should be also considered in the medium-to-long term, as they would help to obtain real time estimates of the macroeconomic situation, helping the CFA to monitor and assess public finances in real-time. Uncertainties surrounding forecasts could be elaborated using fan charts modelling the probability of downturns (Turner, Chalaux and Morgavi, 2018[62]), or as the Canadian PBO or UK OBR do, fan charts for the economic outlook based on past forecasting errors.

The selection of models should be based on rigorous performance evaluation. Methodological approaches need a firm theoretical justification in the economic and forecasting literature and should hold up to academic peer review. Models should also be supported by well-developed working papers that detail extensive supporting literature and provide a strong evidence base for use. For this reason, elaborating macroeconomic forecasts could take some time, because more staff is required and developing models that work requires also testing and evaluating.

The CFA should publish all documentation, databases, working papers, models and past analysis and forecasts on the website to be fully transparent around its economic modelling and forecast errors. Doing so would allow experts to suggest improvements and find coding errors and identify other issues that the analysts who maintain and use the models may have overlooked. This would reinforce its reputation as an independent and non-partisan institution, helping to build a strong opinion and participate in public debate. Good experiences are the UK OBR (https://obr.uk/forecasts-in-depth/the-economy-forecast/) or the Spanish AIReF (https://www.airef.es/es/estimaciones-macroeconomicas/).

Estimations of potential output and the output gap

The CFA methodology to calculate potential output is the same as the official methodology. One of the CFA's role is to review the official calculations of potential output and express its opinion on them. The methodology of calculation has advantages as it is based on expert committee opinions. Calculations of the potential output are based on a Cobb Douglas production function, where the inputs (growth of total factor productivity, labour force and gross fixed capital formation) come from an experts' committee that meets every year before the draft of the budget law. However, as highlighted already by the CFA (Arend and Sanchez, 2020[5]) potential output has been persistently overestimated, which means an output gap with a negative bias. This causes cyclical adjustments in non-mining tax revenues to be persistently negative, resulting in an upward bias in structural revenues and fiscal spending.

IFIs can play a useful role in developing and validating measures of potential output that more accurately reflect country circumstances, including through work on medium-term forecasts and on ways of estimating underlying potential. On top of reviewing calculations based on the official methodology and making recommendations for changing the methodology when needed, the CFA could plan to develop in the medium-to-long term alternative measures of potential output and output gap. This would help the CFA to have a deeper understanding of the dynamics of the output gap and reveal more accurately its true size, as the output gap determines the current budgetary stance and its sustainability. Developing alternative measures of the output gap can also provide a deeper and more complete medium-term view of economic growth projections in the context of expenditure planning and debt sustainability assessments.

In the medium- to long-term, developing alternative measures would require a suite of models and approaches (including structural and statistical methods as complementary tools), as well as the use of judgement, including in trying to identify temporary and permanent shocks. Forecasts for potential output could be published on a regular basis to help the evaluation of forecasts and improve performance. The most appropriate model and how much weight to put on the most recent observations is likely to vary over time, suggesting that judgement may be important. This should also be transmitted to the public.

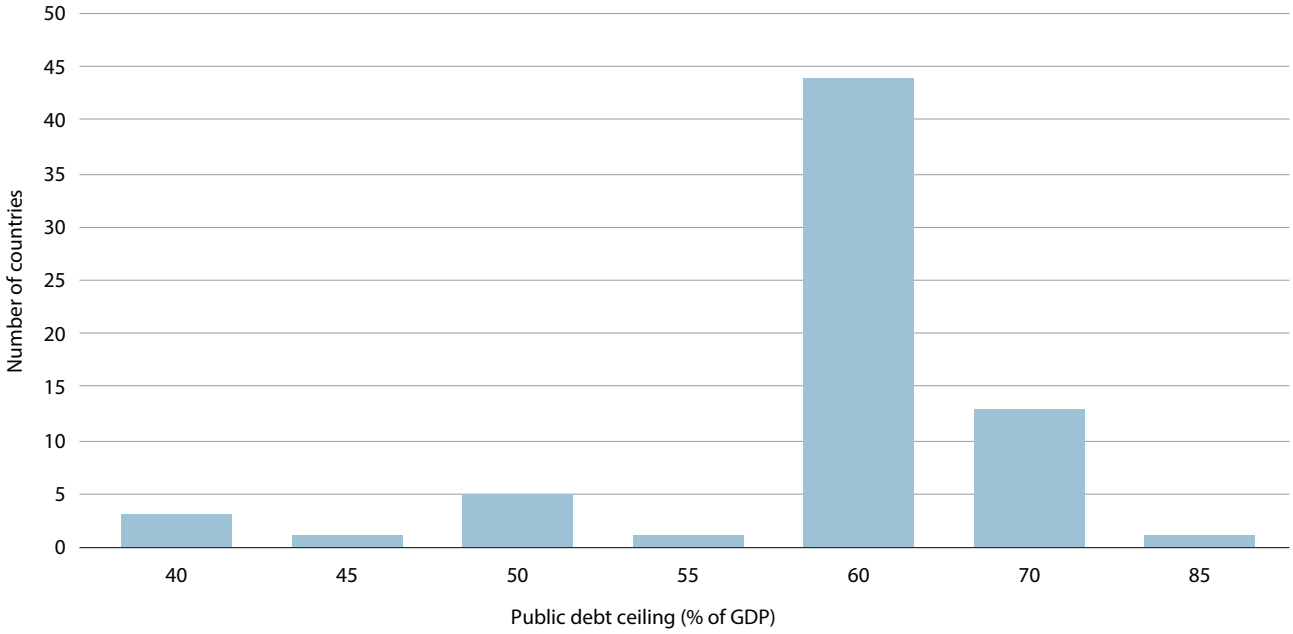
6. Estimating a debt ceiling, limit or threshold

HOW DO COUNTRIES SET A DEBT BRAKE?

As of 2015, about 70 countries worldwide had an explicit debt ceiling in place, mostly defined in terms of gross debt, as not all countries have the statistical capacity to produce balance sheet data necessary to maintain a measure of net debt. The majority of debt ceilings was clustered around 60-70% of GDP, including most EU countries (Figure 7; (Eyraud et al., 2018[6])). According to the IMF (Eyraud et al., 2018[8]), while debt rule calibration should be grounded in serious economic analysis, ad hoc tinkering seems to have been the norm in practice. Calibration should be updated regularly but not too frequently, being binding for at least three years (Eyraud et al., 2018[6]), as the aim of the rule is to anchor medium-term expectations about fiscal policy.

For example, the debt ceiling of the EU's Stability and Growth Pact (originating in the Maastricht Treaty) was set up based on political considerations rather than on analytical or theoretical ones, even though *ex post* it could be argued that over the long run, a 60% of GDP debt ratio (approximately the average level of debt of the member countries around the time of the Maastricht Treaty adoption in 1992) would be consistent with 3% of GDP headline deficit if long-run nominal growth was at 5%, taking into account the European Central Bank's inflation target of 2%. However, these assumptions appear rather unrealistic today (Eyraud et al., 2018[8]). At the same time, the structural budget balance rules operationalising the debt rule, if adhered to, are consistent with debt levels closer to zero than 60% of GDP (Barnes et al., 2016[69]; Darvas, Marin and Ragot, 2018[70]; De Grauwe, 2003[71]). Though the EU fiscal rules framework has undergone several amendments since its first establishment, the debt and deficit ceiling values themselves are very difficult to change, as they are embedded in the EU Treaty, hence any change would require ratification by all the EU Member States.

FIGURE 7. **Distribution of public debt ceilings**



Note: As of 2015. The majority of debt ceilings are defined in gross terms.

Source: (Eyraud et al., 2018[8])

CRITERIA FOR DETERMINING A LONG-TERM DEBT ANCHOR BASED ON A DEBT CEILING

Numerical fiscal rules are widespread and come in a large variety of forms that can be systematized in few categories: debt rules, budget balance rules, structural budget balance rules, expenditure rules or revenue rules. Since the different types of rules have pros and cons there has been a tendency to combine two or more of them in later generations of fiscal rules. Thus, they have become more complex to understand and enforce (Eyraud et al., 2018[6]). This is why the call for simple fiscal rules structured around a fiscal anchor, usually in terms of a debt threshold, and one or two operational targets is becoming strong (Eyraud et al., 2018[8]).

There is currently no consensus on an optimal level of public debt. A safe debt limit may be different between countries and may vary within a given country over time. It depends on the country's development and openness, debt structure and monetary policy settings. There are various methodological approaches how to derive debt ratios associated with a high probability of fiscal distress, potentially leading to a loss of market access, or of macroeconomic instability (fiscal limits). Each of these approaches uses a different set of assumptions and has its own limitations, hence it is advisable not to rely on only one of them. In any case, irrespective of how the debt limit has been derived, the debt anchor should not be set at this limit. The debt anchor should provide a buffer to account for negative macroeconomic and fiscal shocks (Eyraud et al., 2018[6]) and act as a safety buffer defined for self-insurance purposes. Those buffers should reflect the distribution of risks around the predicted debt trajectory (Fournier and Fall, 2015[72]; Debrun et al., 2019[23]). For example, (Fournier and Fall, 2015[72]) suggest setting prudent debt targets below a debt threshold, which they define as a debt ratio at which debt starts to have adverse effects on the economy. These, in turn, are lower than debt limits, at which there is a high probability of default. They also advise the main target variables of a fiscal rule to be defined via a band or a confidence interval, also to accommodate for possible macroeconomic or fiscal fluctuations (Figure 8).

For instance in the case of the Slovak Republic, the debt rule not only provides a maximum ceiling value (temporarily at 60% of GDP) at which government has to face a confidence vote, but starting at 10 percentage points below the ceiling, five sanctioning mechanisms dependent on the distance to the maximum ceiling, start to kick in. The mildest one (currently at debt ratios of 50-53) requires the ministry of finance to provide a written explanation of why debt has reached this level and a list of measures to bring it back down. The aim of this band of sanctioning measures is to prevent debt from actually reaching the cap and hence limit the need for an abrupt and strong corrective (potentially countercyclical) reaction from fiscal policy.

The initial debt limit of 60% of GDP (as in the EU's Stability and Growth Pact) stems from a high uncertainty related to the medium-term economic outlook in the Eurozone at the time of adopting the limit. Given the Slovak Republic's specificities, authorities considered that from year 2018 to 2027 the limits decrease by 1 percentage point yearly, until they reach 50 % of GDP.

FIGURE 8. **Prudent debt targets design**

Source: based on (Fournier and Fall, 2015[72])

The Slovak Republic has well defined exceptions and escape clauses. The obligation to invoke the sanctions shall not apply to the period from the declaration of war or a state of war until the end of war or a state of war. Besides that, there are other exceptions, which apply in cases defined below, however only under the condition that the third debt brake was exceeded (actual debt is equal or exceeds 55 % GDP). In case the debt overruns the third sanction band, the obligation to invoke the sanctions shall not apply, if one of the condition listed below is fulfilled: to the period of 24 months after the government's Manifesto was approved and the government got the vote of confidence; to the period of 36 calendar months when the year-on-year percentage change of gross domestic product declined by at least 12 percentage points; to the period of 36 calendar months, when public expenditures incurred to restore the proper functioning of the banking sector affected by the financial crisis, public expenditures incurred to remedy the consequences of natural disasters and catastrophes and public expenditures incurred in connection with commitments arising from international treaties have, in aggregate, exceeded 3% of gross domestic product.

METHODOLOGIES TO ESTIMATE A DEBT CEILING/THRESHOLD

The concept of debt limit is promising to complement debt sustainability analysis (DSA) exercises and give a better sense of fiscal sustainability. The debt limit could be used as a starting point for determining the level at which would be desirable to stabilize debt. A debt limit can be embedded in the standard DSA arithmetic and its definition lends itself to model-based approaches capturing key relationships among relevant variables (Gosh et al., 2013[73]; Bi, 2012[74]).

Very few if any IFIs calculate debt limits or thresholds to fulfil the mandate on the assessment of fiscal sustainability. One example is the Slovak CBR that within its mandate of evaluating the long-term sustainability of public finances analyses the relationship between the fiscal policy and default risk as part of the risk assessment building block in the CBR's toolkit. The CBR has developed a number of technical papers on how to estimate debt limits to feed public debt discussion on the optimal or right level of public debt.

The Spanish AIReF has recently proposed an improved framework for fiscal policy, including a debt-to-GDP ratio as long-term anchor. This anchor with the actual ceiling no higher than 60% of GDP to fulfil the requirements of the Stability and Growth Pact. However, the debt limit could be lower if additional buffers are deemed necessary. Within this framework in mind, the AIReF is planning to develop a framework to determine appropriate debt ceilings and periods to attain the ceiling.

In the literature there is a relatively wide diversity of concepts and methods to estimate debt ceilings/thresholds. The literature on prudent/optimal/sustainable debt levels and how to estimate debt thresholds has evolved in recent years and comprises several different models and methodologies. Main methodologies are comprised in the following toolkit:

- A fiscal space analysis using the fiscal reaction function and "fiscal fatigue" (concept of (Ostry et al., 2010[75]) and (Gosh et al., 2013[73]));
- Cross-country empirical debt limit model based on estimated probability of default;
- A fiscal limit (concept of (Bi, 2012[74])) for advanced and for emerging countries;
- Growth-maximizing debt levels (Checherita-Westphal, Hughes Hallett and Rother, 2014[76]).

These models and methodologies are briefly described below, with indicatives results estimated for Chile in the literature. These estimations are for illustration only and show the different "optimal debt limits" that the different models can produce. The last section provides some guidance on the design of operational fiscal rules that should complement any debt anchor.

Cross-country empirical debt limit models using the concept of fiscal reaction function and "fiscal fatigue"

This method was primarily developed for and applied to advanced economies (Gosh et al., 2013[73]; Fournier and Fall, 2015[72]). However, it was also used for emerging market economies, including Chile in an analysis by the Fiscal Council of Peru (Ganiko et al., 2016[77]). The approach is based on the notion that governments in these countries usually react to rising debt by raising their primary balances to stabilise the debt-to-GDP ratio. However, the primary balance cannot increase indefinitely - there is a point when "fiscal fatigue" kicks in and the change in primary balance is not sufficient to offset rising interest costs associated with higher debt. As a result, there is a debt ratio, a debt limit, above which the debt dynamics become explosive and the government has to either undertake fiscal adjustment of an extraordinary size, or default on its debt (Debrun et al., 2019[23]). Contrary to the strand of literature on sovereign default (e.g. (Arellano, 2008[78]), default in this setting is not a strategic decision, it is the direct result of the government's inability to roll over debt.

The method consists of two steps, first estimating a fiscal reaction function, and second derivation of the debt limit based on the intercepts of the fiscal reaction function and the debt interest cost schedule.

1. Estimation of a fiscal reaction function

In general, a fiscal reaction function (FRF) is a reduced-form relationship between the primary balance and (lagged) public debt and possibly a set of control variables, e.g. output gap, a measure of deviation of public expenditure from its trend (expenditure gap), inflation or trade openness. A quite extensive body of literature on the response of primary balance to debt changes dates back to a seminal paper by Bohn (1998[79]), who finds that the US primary balance reacts positively to increases in debt over 1916-1995, and even more so at higher levels of debt. Mendoza and Ostry (2008[80]) also find a generally positive reaction of primary balance to changes in debt over 1990-2005, respectively in a panel of advanced economies, a panel of emerging market economies, as well as in a mixed pool of these countries. However, they find the response is weaker at higher levels of debt in the three cases.

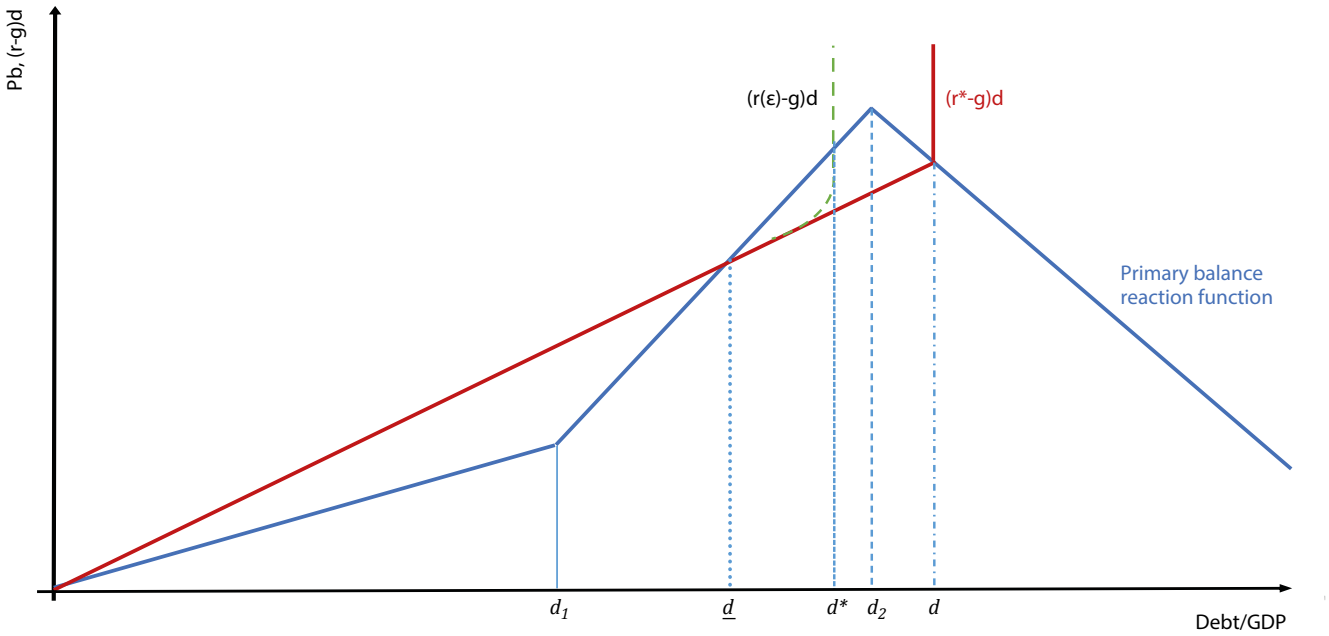
To determine whether fiscal fatigue is present, or more generally whether primary surplus reacts differently at different debt ratios, debt enters the fiscal reaction function in a non-linear form, e.g. as a piece-wise linear specification (Fournier and Fall, 2015[72]; Mendoza and Ostry, 2008[80]); or as a polynomial (quadratic or cubic; (Gosh et al., 2013[73]; Bohn, 1998[79]; Ganiko et al., 2016[77]). In the piece-wise linear form, debt thresholds can either be set exogenously, or they can be found via grid search, minimising the sum of squared errors of the equation (Fournier and Fall, 2015[72]; Mendoza and Ostry, 2008[80]).

Country fixed effects are usually included to provide country heterogeneity and to help control for possible endogeneity issues between government balance and debt (countries able to generate higher primary balances would tend to have lower public debt). Since persistence in the error term of the FRF may also be a source of endogeneity, this is usually addressed by modelling the error term as an AR(1) process (Gosh et al., 2013[73]; Fournier and Fall, 2015[72]). Despite the inclusion of country fixed effects (which can be interpreted as country-specific average deviation from the sample average primary balance), an important assumption of the panel estimation is that the response of primary balance to changes in debt is the same among the sample of the countries, along the entire cross-country range of debt ratios. Hence, it is advisable to work with a relatively homogeneous group of countries, which share similar characteristics (Gosh et al., 2013[73]).

2. Derivation of the debt limit based on the intercepts of the fiscal reaction function and the debt interest cost schedule

In a second step, the estimated fiscal reaction function is linked with the governments' debt interest payments schedule, via the standard debt-accumulation dynamics relationship. The debt limit is found on the second intersection of these two schedules (Figure 9). The first intersection, when the interest payments exactly offset the primary balance, there will be a conditionally stable equilibrium level of debt, $\underline{d}$. Around this debt level, if there is a shock to debt such that debt does not raise beyond the debt limit, the primary balance will over time more than compensate for this increase so that the debt ratio will return to the equilibrium level.

FIGURE 9. **Determination of the debt limit**



Note: g is the growth rate, r is the interest rate, r* is the risk-free interest rate, *r* (ε) is the interest rate with a risk premium, pb is the primary balance, $\underline{d}$ is the debt-to-GDP ratio, d* is the stochastic debt limit depending on the probability of default and $\bar{d}$ is the deterministic debt limit corresponding to the intersection between risk-free interest payment and the fiscal reaction function. d_1 and d_2 are two estimated thresholds signalling changes in the reaction function to increasing debt,

Source: (Fall and Fournier, 2015[81])

In a deterministic case, i.e. without any macroeconomic shocks, markets will lend to the government at the risk-free interest rate (the red line in Figure 9), until the debt reaches its limit, at which point the interest rate on debt is going to explode and the government will cease to repay its obligations ($\bar{d}$ in Figure 9).

In a stochastic case, shocks to the primary balance materialise and a finite interest rate exists which compensates risk-neutral lenders of the endogenous risk of default via a risk premium. The probability of default in the next period is the probability that debt goes beyond its maximum level. The model can be solved for a value of debt (d* in Figure 9), the stochastic debt limit at which the interest rate on government debt goes towards infinity and the government loses market access. The government is going to face spiralling interest rates as it approaches this debt limit.

In addition to explicitly modelling the probability of default, it is possible to use the latest or historical market interest rates as in (Gosh et al., 2013[73]) or (Fournier and Fall, 2015[72]). Another possibility is to estimate the market risk premium in a similar vein as fiscal reaction function (FRF), as a function of debt and controls, and also to take exchange range depreciation into account. This is especially relevant for emerging market economies, due to the inability to borrow abroad in their own currency ("original sin"). With a version of the "fiscal fatigue" approach, using bootstrapping to derive stochastic debt limits, (Ganiko et al., 2016[77]) derive the debt limit for a set of emerging market economies..

Cross-country empirical debt limit model based on estimated probability of default

This model (Fournier and Bétin, 2018[82]) builds on the determinants of sovereign defaults literature (see e.g. (Fournier and Bétin, 2018[83]) for a brief overview). It is applied to middle-income countries, because unlike for advanced economies, there is enough data available on government defaults on both external and internal debt.

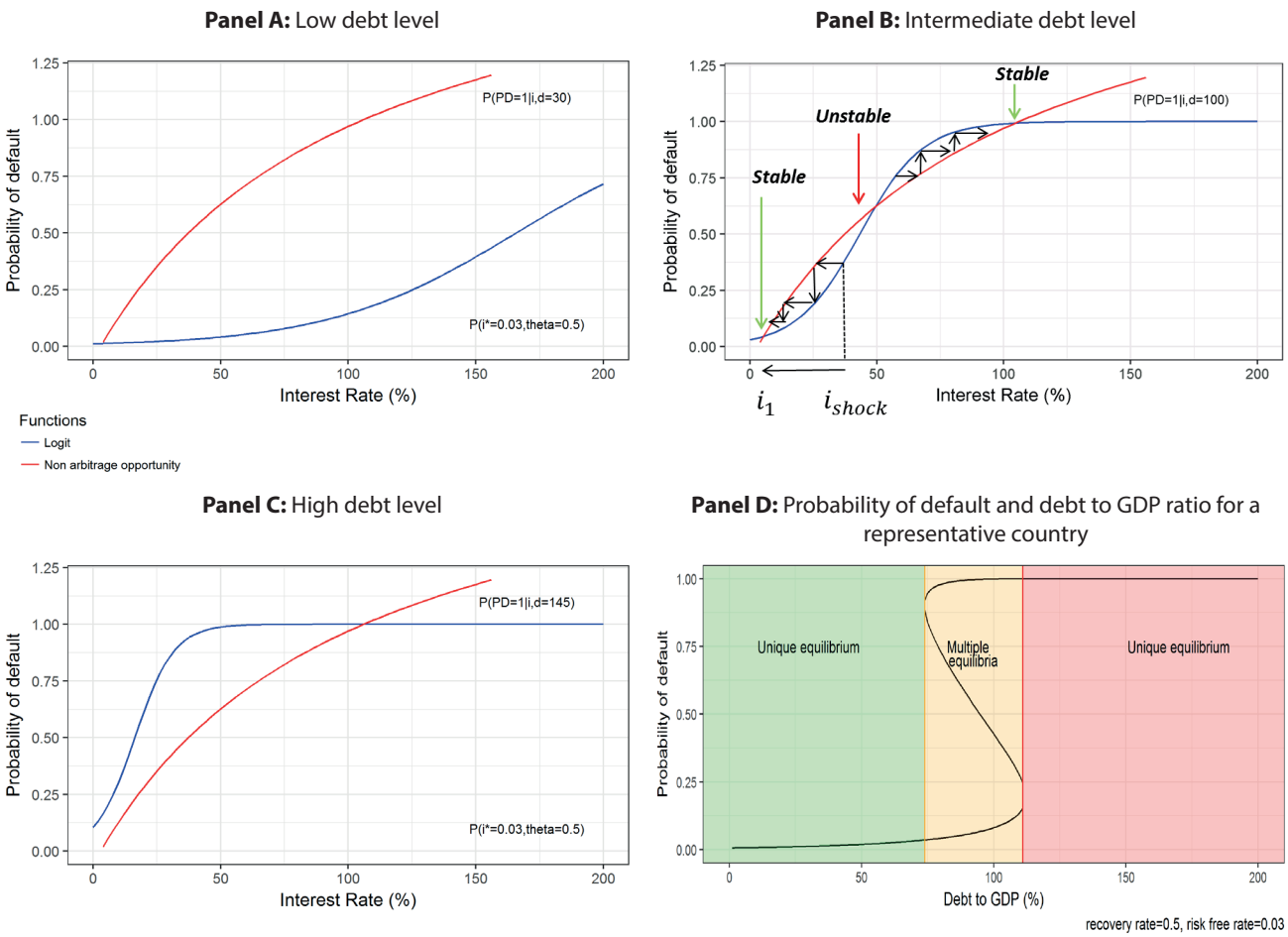
The first step is to estimate a logit model in which the risk of default is increasing with the lagged debt-to-GDP ratio, lagged government interest payments relative to exports and a set of lagged control variables. These notably include: real GDP growth, as an important driver of debt dynamics and an indicator of the business cycle, as more defaults tend to happen during economic downturns; oil and mining exports relative to GDP, as dependency on commodity exports

may raise the probability of default; government effectiveness, as it can increase long-term growth prospects, reliance on equity-like liabilities and the capacity to raise taxes; real GDP volatility.

In a similar vein to the "fiscal fatigue" approach, where debt limits arise at the intersection of the primary balance and interest payment schedules, debt limits in this model are derived by linking the estimated default probability as a function of the interest rate and other structural determinants with an absence-of-arbitrage equation, which relates the effective interest rate on government debt to the risk-free interest rate, the risk of default in the next period, the assumed recovery rate and the investors' degree of relative risk aversion. This relationship reflects the fact that the market risk premium offsets the default risk from the investors' side.

Three possible cases can arise as a solution to the system: at low levels of debt, the logit curve is almost flat, the equilibrium interest rate is low as the probability of default is close to zero (Figure 10, panel A). At high levels of debt, there is a single solution to the model associated with high level of default risk (Figure 10, Panel C). In an intermediate case, multiple equilibria can arise (Figure 10, Panel B). In between two stable equilibria, there is an intermediate, unstable one, which reveals the risk of a self-fulfilling crisis and interest rate volatility. In this case, the debt limit is computed as corresponding to the stable solution with the lowest probability of default, for a country with a credible lender of last resort. For a given country, the probability of default can then be represented as a function of debt, taking into account the effect of debt on the interest rate and holding other structural characteristics constant (Figure 10, Panel D).

FIGURE 10. **Equilibrium interest rate, probability of default and debt level**



Source: (Fournier and Bétin, 2018[82])

Structural fiscal limit models using the Laffer curve

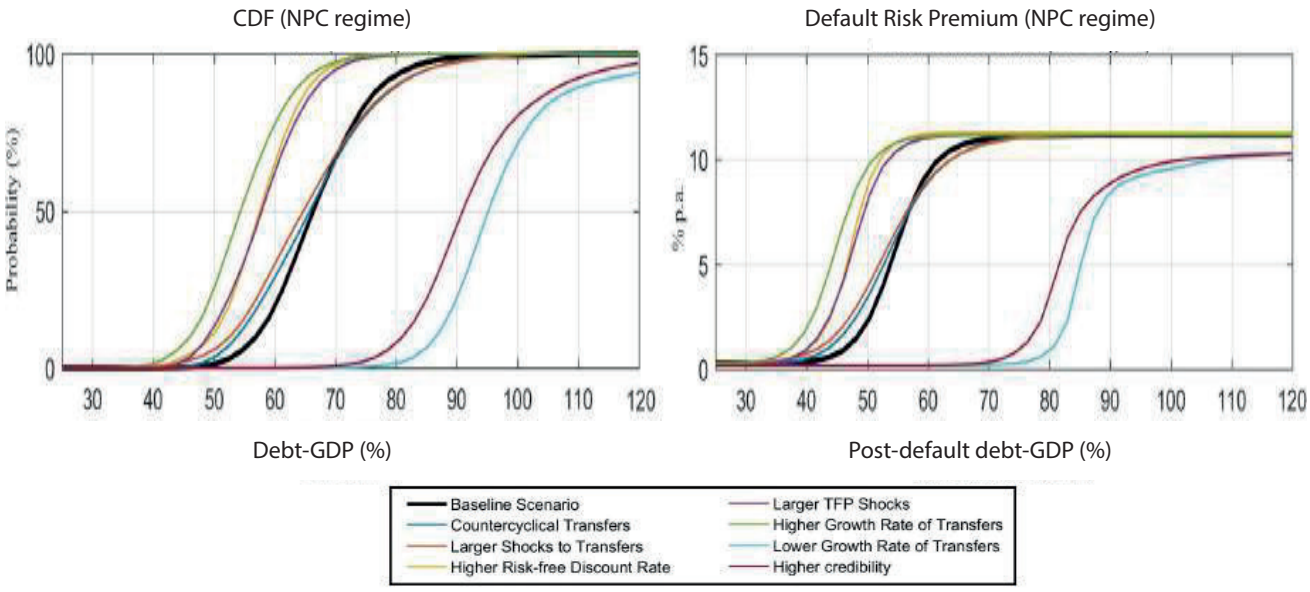
In this literature (e.g. (Bi, 2012[74]; Bi and Leeper, 2013[84])), recently updated and applied by the Slovak CBR (Múčka, 2015[85]; Múčka, 2019[86]), fiscal limit arises endogenously from the peak of the Laffer curve, distribution of economic shocks and expectations about future policies, in a structural model based on a dynamic general equilibrium framework with a fully specified fiscal sector. The Slovak CBR uses it as the first step in the process of the safe debt level analysis. Mapping economic environment, especially fiscal policy regimes, into fiscal limit distributions and sovereign bond prices is a useful tool to examine the efficacy of fiscal reforms pursued by countries that are under sovereign risk pressures.

In a real business cycle model of closed economy, the government finances its exogenous level of purchases and lump-sum transfers to homogeneous households by collecting distorting taxes on labour and issuing non-state-contingent debt. The tax rate is raised when debt increases. Laffer curves arise endogenously from the distorting taxes. If the tax rate is too high and hence on the "slippery" side of the Laffer curve, the government is unable to raise more taxes by increasing the tax rate. The lump-sum transfers to households follow a Markov regime-switching process with one regime being stationary and the other explosive. If the government stays too long in the explosive regime, public debt may reach such a level that the tax rate hits the peak of the Laffer curve and the government is unable to repay its debt in full. Since households are forward-looking, even if the peak of the Laffer curve has not been reached yet, a positive probability of this event can prompt households to demand a higher default risk premium on sovereign debt today.

The fiscal limit in this framework is hence the maximum level of debt that the government is able to service, defined as the sum of the discounted maximum fiscal surpluses in all future periods. At this point, it can no longer adjust taxes or spending to stabilise debt. Given the persistence of exogenous disturbances, the fiscal limit depends on the current state of the economy (level of productivity, regime of transfers and level of government purchases) and on random shocks hitting the economy in the future. Consequently, the fiscal limit is state-dependent and has a stochastic distribution.

To estimate the country default risk premium, one must solve the nonlinear model which uses the already calculated distribution of the fiscal limit. At each period, an effective fiscal limit is drawn from the state-dependent fiscal limit distribution. If the actual level of government debt surpasses the effective fiscal limit, then the government reneges on a fraction of its debt with the realised default rate following an empirical distribution from historical data. Otherwise,

FIGURE 11. **Fiscal limit distribution and risk premium for the Slovak Republic under different scenarios**



Source: (Múčka, 2019[86])

the debt is repaid in full. Using the state-dependent distributions of fiscal limits and the empirical distribution of default rates, households can decide the quantity of government debt that they are willing to purchase and the price at which they are willing to do so. To be able to obtain a consistent, jointly determined default rate and fiscal limits distribution, the model is solved iteratively until convergence of both is achieved (Múčka, 2019[86]).

An illustrative distribution of fiscal limits and the corresponding default risk premium for the Slovak Republic, estimated for various scenarios and initial conditions is shown in Figure 11. Since the default probability in the baseline scenario at the Maastricht debt level of 60% of GDP is around 35%, this debt limit is considered to be too high for the Slovak Republic (Múčka, 2015[85]; Múčka, 2019[86]).

Growth-maximizing debt targets

Checherita-Westphal et al. (2014[76]) argue that instead of focusing on debt levels at which governments default, countries should target levels of debt which are growth-maximising. This concept is based on Aschauer's (2000[87]) model where growth-optimising policy is expressed in terms of public-to-private capital ratios. Under a golden rule (government borrowing may only be used to finance investment, current public spending has to be financed by current revenues), the optimal level of debt follows from the ratio of public to private capital that maximises the growth rate of output per capita at existing employment levels. This depends on the output elasticity with respect to public capital stock. This elasticity can be obtained via a regression of the production function including public capital in a cross-country panel regression (as public capital stock data for a single country may not be long enough). With an elasticity of about 0.23 for 11 euro-area countries and of 0.25-0.28 for 22 OECD countries, growth-maximising debt ratios of around 50% and 55-65% of GDP, respectively have been derived for these groups of countries.

CALIBRATING A LONG-TERM DEBT CEILING/ANCHOR

The IMF has formulated simple basic rules for calibrating a debt anchor (Eyraud et al., 2018[6]), the following section is mostly based on this advice. The authors of the IMF note can provide the related excel and Eviews programs upon request. A similar procedure, based on reduced-form equations rather than on a VAR system, is used in (Fournier and Fall, 2015[72]). The main steps are as follows:

1. Identifying a maximum debt limit (maximum sustainable level of debt)
2. Calibrating macroeconomic shocks, via a VAR or based on a historical joint distribution
3. Using a simultaneous set of a fiscal reaction function and debt-accumulation equation, subject to the macroeconomic and fiscal shocks, simulate a set of many debt trajectories to get a debt fan chart
4. Deriving the debt ceiling as the starting debt level of the fan chart which satisfies the conditions of not breaching the maximum debt level with an acceptable probability.
5. If the starting level of debt does not satisfy (4), iterate with a higher or lower starting level of debt and repeat until the condition is met.

The first step is to derive a debt limit. A country's initial debt limit can arise from analysis based on methods summarized above. In an ideal case, given that all methods have caveats and take into account different aspects of debt sustainability, it is advisable to carry out sensitivity analysis deriving alternative debt limit estimates based on more than just one method and/or various assumptions.

In a second step, an unrestricted VAR is estimated with quarterly macroeconomic variables needed to project public debt (GDP growth, interest rates on government debt, exchange rate). The estimated variance-covariance matrix of the VAR is then used to generate a large number, N, of macroeconomic shocks (1000 or more) over the medium-term projection horizon. The VAR model is then used to project all the macroeconomic variables using these shocks as error terms and generating N sets of macroeconomic variables' projections over the forecast horizon. Another alternative to derive the N sets of macroeconomic projections is to draw from the historical joint multivariate normal or Student's t distribution of these variables, using their historical means, variances and covariances.

In the third step, a fiscal reaction function (FRF) and the debt accumulation identity equation are used to derive N debt path simulations. In the FRF, the primary balance reacts to past levels of itself and debt, as well as the positive and negative output gap (to allow for asymmetric reactions to the business cycle). This FRF can be estimated using a panel of countries, or for an individual country if there is enough data. In the simulation, a shock is added onto the FRF based on the estimated residuals of the FRF. This helps to capture shocks which are not part of the fiscal reaction function, such as below-the-line realization of contingent liabilities. The FRF, in particular the debt-reaction coefficient, can also be calibrated so as to stabilize debt at a pre-defined long-term level:

$$\rho = (1 - \beta)\frac{(r - g)}{(1 + g)} - \frac{\alpha}{d^*} \quad (1)$$

where β is the autoregressive coefficient on primary balance from the FRF, r and g are the long-term steady-state real interest rate and real growth rate, respectively, α is the FRF intercept and d^* is the pre-defined long-term level of debt. For instance, 60% of GDP can serve as a starting point for advanced and emerging market economies, or another, politically acceptable value in the respective country-specific context can be used. Yet another alternative is to use a pre-defined primary balance path, with fiscal shocks, calibrated based on historical distribution, added on top, to account for possible uncertainties. This path should not, however, take current government plans for granted.

It may also make sense to constrain the annual changes in the primary balance, either implied by the FRF or the pre-determined path, as fiscal responses beyond certain size, especially during consolidations, may not be realistic from a political economy point of view. For example, in the preventive arm of the EU fiscal framework, the maximum annual structural adjustment required by the rules in "good times" (i.e. when the output gap >= 1.5% of GDP and actual GDP growth > potential growth) is bounded at 1% of GDP.

Lastly, the result of *N* simulations of the simultaneous system of the fiscal reaction function and the debt-accumulation equation from the previous step, *N* debt paths arise. These can be summarized in the form of a fan chart. If the probability of hitting the debt limit from step one falls within the chosen risk limit the government is willing to accept (e.g. 10% as a baseline, so that the debt remains below the debt limit in 90% of all cases; (Fall and Fournier, 2015[81]) use 25% and 75%, respectively) for the whole simulation period, then the starting debt level of the simulation can be taken to be the debt ceiling (Fall and Fournier, 2015[81]) set the debt limit at median at the end of the time horizon). If the given percentile (90th) of debt exceeds (is significantly lower than) than the maximum debt limit in at least one period of the simulation, the starting value of debt is adjusted downwards (upwards) in an iterative procedure, e.g. by steps of 0.3% of GDP, and the whole simulation procedure (steps 2-5) is repeated until the required percentile of debt is below the maximum debt limit, with a small tolerance amount (e.g. 0.4% of GDP) each year of the simulation period. The safety margin, or buffer then is the difference between the theoretical maximum debt limit and the computed debt ceiling.

The time horizon used for the simulation should be medium-term and not too long, i.e. around six years. The calibration procedure is based on the assumption that debt should remain under its maximum limit with a reasonable probability even if negative shocks materialize over the whole projection period. Assuming the series of negative shocks would last over a long term may be not only unrealistic, but also lead to near-zero values of the debt ceiling, i.e. the longer the simulation horizon, the lower the implied debt anchor value.

Another way to calibrate the debt rule anchor when the maximum debt limit from step one above is not known, is via a similar procedure that is based on the maximum primary balance that the government is able to maintain (i.e. not just attain) over the medium term, given macroeconomic shocks. In this case, the procedure mimics the steps above (save for the first one), except the assessment of risks of acceptable probabilities is made around the primary balance as a result of a fiscal reaction function. Hence, the value of the debt ceiling in this case is the level of debt compatible with the level of primary balance not exceeding a certain level with a certain probability, conditional on macroeconomic shocks and allowing for the debt feedback via the FRF (for more details, see (Eyraud et al., 2018[6]) or (Fall and Fournier, 2015[81])).

The above framework applies to advanced and emerging market economies and uses the concept of gross debt. However, for commodity exporters, focusing on net debt may make more sense, as these countries tend to have large

financial assets. For calibrating the optimal level of net debt, permanent income hypothesis (PIH) approach may be used for long-term sustainability considerations, which stabilises net wealth of the country at its initial level to ensure intergenerational equity. A modified PIH approach may be warranted to enable front-loading of spending if there are investment gaps to be addressed (Tiwari et al., 2012[88]). Other possible models are risk-based models, such as value-at-risk approach (Eyraud et al., 2018[6]; Eyraud et al., 2018[8]). So far, no commodity exported explicitly calibrates its net wealth target based on this approach (Eyraud et al., 2018[8]). Structural balance based on price-smoothing and natural resource funds, such as those already in place in Chile, the former possibly accompanied by an expenditure rule to help limit procyclicality, are important parts of fiscal frameworks of resource-rich countries with a long resource horizon (for more details see (Tiwari et al., 2012[88])).

MEDIUM-TERM OPERATIONAL OBJECTIVES

Well-designed fiscal frameworks are generally structured around two pillars (Lledo et al., 2018[89]):

1. fiscal anchor linked to the final objective of fiscal policy, and
2. one or more operational rules on fiscal aggregates.

A natural fiscal anchor is the debt-to-GDP ratio, which provides a guide for medium-term fiscal expectations and creates an upper limit for repeated fiscal slippages. This threshold can be calibrated to ensure the long-term fiscal sustainability.

However, the debt ratio does not offer operational guidance in the short term. According to the IMF (Lledo et al., 2018[89]), the fiscal framework should also incorporate shorter-term operational rules that are under the direct control of the government and that have a close and predictable link to debt dynamics; for example an expenditure rule or a budget balance rule. There is no optimal number of operational rules, but caution is required with multiple rules because of the risks of redundancy and inconsistency.

The IMF (Lledo et al., 2018[89]; Eyraud et al., 2018[8]) sets out several rules for the design of operational fiscal rules:

1. *they should not be a substitute for good policies*. The aim of the rules is to mitigate policy biases (e.g. the deficit bias, common pool problem, political business cycle, etc.) and hence to prevent governments from misusing policy discretion. However, this does not mean fiscal rules should lead to optimal fiscal policy in each and every period. Multiple operational objectives will not mean that fiscal policy will be closer to optimum.

2. *the fiscal rules system should not be over-determined*. Too many constraints on government policy may even mean impairing its full conduct. There is also risk of creating inconsistencies between the individual rules, which may not always be apparent (e.g. when rules constrain one part of the budget but the other part is composed of items which cannot be changed easily).

3. *overlap between targets should be minimised*. Overlap happens when two or more rules affect the same fiscal aggregate, but to a differing degree. An example is simultaneous working of a headline balance and structural budget balance rule, which may run into conflict e.g. in case of exceptionally big macroeconomic shocks. Though some overlaps are more obvious than others, and perhaps not fully avoidable, they may create political economy problems and issues with the rules' credibility.

4. *the whole framework should be easy to communicate to the public*. Confusion means running the risk of unanchoring fiscal expectations.

There are six main types of operational rules and each of them has their own pros and cons (Table 8).

TABLE 8. **The pros and cons of operational fiscal rules**

Budget Balance Rules	
Overall Balance + Easy to communicate/monitor + Clear operational guidance – Can lead to procyclicality – Could lead to changes in composition	**Golden** + Protects public investment + Intergenerational equity – Weak link to debt sustainability – Creative accounting
Cyclically Adjusted/Structural + Fosters economic stabilisation + Good operational guidance – Difficult to compute and monitor	**Over the Cycle** + Good stabilisation properties – May entail too loose/tight stance – Difficult to monitor and enforce
Expenditure Rules + Easy to communicate and monitor + Allow macroeconomic stabilisation + Clear operational guidance – Could lead to changes in composition – May reduce incentive to mobilise revenues	**Revenue Rules** + Raise revenues or limit tax burden – No direct link to debt sustainability – Can lead to procyclicality

Source: (Lledo et al., 2018[89])

Nominal budget balance rules (e.g. overall balance rule, primary balance rule, golden rule) impose limits on the nominal headline fiscal balance and are generally expressed in percent of GDP. They are easy to communicate and effective in preserving debt sustainability, since they are closely linked to debt dynamics. Since they are not corrected for the business cycle, they may hamper the effect of the automatic stabilisers, which may lead to pro-cyclicality. They may also affect the quality of budget composition, as they may lead to budget cuts in undesirable areas which are, however, easy to make (e.g. in public investment, or generally in areas where the country may have a spending deficit, for instance education, health care, etc.). The golden rule partly addresses this weakness in that it only targets the current budget balance, excluding capital expenditure. It is deemed to be more growth-friendly, since public investment usually has a high growth multiplier. However, the rule has other shortcomings, e.g. it may lead to "creative accounting" practices ultimately leading to deterioration of quality of public investment projects. Another shortcoming is that, on the other hand, growth-enhancing measures, such as investment in human capital, may not be classified as capital expenditure. Furthermore, the link between the golden rule and debt dynamics is not so straightforward, so it may even create risks to public debt sustainability.

Balance rules that correct for the cycle (cyclically-adjusted or structural budget balance rules, over-the-cycle rules) also impose limits on the overall or primary balance, but they correct for the effects of the business cycle and hence make it possible the automatic stabilisers to operate fully, to help stabilise macroeconomic fluctuations to a certain extent. This feature is also their main drawback: it requires the budget balance to be stripped off the effect of the cycle, usually by using the potential output and output gap measures. These, however are relatively difficult to compute in a timely and reliable manner (prone to measurement errors and revisions) and consequently difficult to monitor and communicate. If they are defined in structural terms, they entail an additional difficulty of determining which revenues and expenditures are one-off in nature. Moreover, determining whether changes in commodity prices are temporary or structural can be a difficult call and create numerous technical complications.

Expenditure rules limit the total, primary or current spending, in real or nominal terms and are set either in levels, growth rates or, occasionally, in percent of GDP. They are easy to understand, monitor and enforce. They support macroeconomic stabilisation if they are set in levels or growth rates, and even more so, if they exclude cyclically sensitive items, such as unemployment benefits. This is due to the fact that they allow automatic stabilisers on the revenue side (and expenditure side, if they exclude cyclical items) to operate, while setting constraining spending in times of booms. On the other hand, they may be procyclical if they are set in percent of GDP, as that means growth of spending in good times. This may be alleviated by defining the expenditure rule in terms of potential GDP, but this, in turn, raises difficulty in computing and monitoring the rule, similar to the balance rules that correct for the

cycle. This difficulty may not, however, be as big as with the structural balance rule, as e.g. long-term averages may be used. The macroeconomic stabilisation properties (anti-cyclicality) may be enhanced if the rule is set in nominal terms, as this means that any adjustment to spending also has to take inflation developments into account. Their debt-sustainability enhancing properties depend on their specific design, e.g. if above-limit spending can be offset by discretionary measures on the revenue side (this is the case for the expenditure rule in the EU), otherwise they can discourage revenue-mobilisation, especially in countries with low revenue-to-GDP ratios.

Revenue rules set floors or ceilings on government income. They are relatively rare compared to other types of rules. Revenue floors aim to boost revenue collection (they are e.g. imposed on members of the West African Economic and Monetary Union). Revenue ceilings seek to prevent an excessive tax burden (e.g. in Australia between 1985 and 1988 or Denmark in 2001-2011). They may complicate macroeconomic stabilisation and since they do not constrain spending, they do not ensure fiscal sustainability, unless windfall revenues are earmarked to reduce debt.

The above-mentioned rules are recommended to be adapted by further considerations for developing and/or commodity-exporting countries. They need to address the volatility of commodity prices, as well as possible depletion of natural resources, where relevant. The expenditure rule and structural rule, which takes into account the commodity gap (denoting deviation of commodity prices from their structural level), both help address price volatility. In addition to them, it is also possible to use *revenue split rules*, which set aside a certain percentage of revenues using an ad-hoc criterion. *Price smoothing rules* are similar, but more complex, as they involve calculation of a reference price. The difference between the reference and the actual price is saved and can be used in periods of shortfalls.

In developing countries, that have development needs which have to be addressed, the operational objectives should be supplemented by the broader institutional framework. For instance, a well-designed *medium-term budgetary framework* and a strong *public investment framework* can help minimise the possible effect of fiscal rules on public investment (including e.g. human capital investment).

Countries generally do not publish the analysis which lead to their particular fiscal rules framework selection, as often other considerations may be involved, including political economy ones. However, the IMF (Lledo et al., 2018[89]) distinguishes between four approaches to aid selection of operational fiscal rules: i) counterfactual analysis, ii) scenario analysis, iii) stochastic simulations, and iv) model-based selection.

CALIBRATING OPERATIONAL FISCAL RULES BASED ON A DEBT ANCHOR

The IMF has formulated simple basic rules for calibrating the main operational rules based on a debt anchor (Eyraud et al., 2018[6]), the following section is mostly based on this advice. The authors of the IMF note can provide the related excel and Eviews programs upon request.

It is advisable to complement the debt anchor with an operational rule, such as a structural balance or expenditure ceiling one (Eyraud et al., 2018[8]). The debt anchor is a longer-term target which by definition is not fully under the immediate and direct control of the policymakers. Depending on the circumstances and the extent of deviation of debt from target, it may not be economically desirable to eliminate deviations from the target over a very short period of time. The main aim of the debt target is to anchor expectations on fiscal policy. On the other hand, it can be relatively easily linked to a comparatively more operational budget balance target (nominal or cyclically adjusted) or an expenditure target, via the stock-flow relationship between these measures.

It is important that whatever set of rules the framework consists of, they are consistent with each other. For example, if the debt anchor is set for the general government, the operational budget balance target should also encompass the general government. The operational rule(s) should be derived from and linked with the main anchor. In addition, there should not be too many rules creating too complex a framework, otherwise it may be counterproductive, leading to inconsistencies, intransparent behavior and may lead to undesirable policies, e.g. cuts in productive investment (Eyraud et al., 2018[8]), (Andrle et al., 2015[90])).

The constant structural balance that leads to the convergence to the debt ceiling over the long term can be derived via the debt dynamics relationship as:

$$b^* = \lambda \cdot d^* = \frac{-g}{(1+g)}\, d^* \quad (2)$$

for headline balance, and

$$pb^* = \lambda \cdot d^* = \frac{(i-g)}{(1+g)}\, d^* \quad (3)$$

for primary balance.

Where g is the long-term nominal GDP growth and i is the long-term average interest rate on government debt, d^* is the debt target and b^* is the balance target.

The constant primary balance, however, can only lead to convergence of debt to target (unless the two are already identical) if GDP growth is bigger than the interest rate on government debt, whereas the headline balance will lead to convergence if GDP growth is positive.

The target balance can further be derived so as to ensure convergence to the debt target by a given date and enable up-front building of buffers to accommodate any future known incremental increases of fiscal costs (e.g. those related to ageing). In that case, the operation balance path will not be constant over time: the balance will be equal to the target balance ensuring debt conversion in years in which additional incremental costs are zero; and ($b - \Delta A_t$) otherwise, where ΔA_t is the cumulative amount of the incremental costs from the starting period through year t.

The target balance will then be:

$$b^* = \frac{\lambda}{(1+\lambda)^N - 1}\, [d_0(1+\lambda)^N - d_N^* + S] \quad (4)$$

Where b^* is the target headline or primary balance, λ is defined as in (2) or (3) depending on the type of balance, d_0 is the starting level of debt, d_N^* is the target level of debt to be achieved in period N and S is the cumulative amount of future increases of additional ageing costs up through period N.

This kind of fiscal balance path will make it possible that buffers are built for a later period when additional fiscal costs kick in, so that the required balance will be higher in the initial periods than in the later periods.
Similarly, it is also possible to derive the structural balance path so that convergence to a given debt target is achieved by a given date and/or with a transition period in which the starting balance can converge to the target balance incrementally, to prevent too sharp fiscal adjustment, especially if the initial balance is very different from the target one. This concept is also embedded in the fiscal framework of the EU, so that countries which are not at their medium-term structural balance objective, can converge to it gradually without being considered as in breach of the rules. The detailed derivation of these kind of structural balance rules, as well as of those mentioned above, is described in (Eyraud et al., 2018[6]).

The structural balance target can be turned into a nominal balance target, using fiscal elasticities of revenues and expenditures with respect to the output gap (e.g. (Price, Dang and Botev, 2015[91])) and the maximum (negative) output gap that can open up during a typical downturn. However, having both a structural and a nominal balance rule may lead to inconsistent overlaps and may contribute to making the framework undesirably complex (Eyraud et al., 2018[8]). Rules which make it possible for the automatic stabilisers to operate (such as the structural balance or expenditure rules) are preferable to more rigid ones, such as the nominal balance ceiling, which may more easily lead to procyclical policies (Eyraud et al., 2018[8]; Darvas, Marin and Ragot, 2018[70]).

Using the structural balance requires estimation of the output gap, which in itself is a complex procedure, often prone to revisions. Therefore, it may be advisable to establish an expenditure rule instead (Eyraud et al., 2018[8]; Barnes et al., 2016[69]; Andrle et al., 2015[90]). The expenditure rule can be derived from the structural balance target, using fiscal elasticities to derive structural revenue-to-potential GDP ratio and assuming initially that the realized and structural expenditures are identical (i.e. that there is no cyclical component of expenditure, such as e.g. unemployment benefits, or other benefits conditional on income):

$$e^* = r^* - sb^* \quad (5)$$

in levels, where e^* is the structural expenditures-to-GDP ratio, r^* is the structural revenue-to-GDP ratio and sb^* is the target structural balance. In growth rates, this gets:

$$\Delta e^* = \Delta r^* - \Delta sb^* \quad (6)$$

If the country's structural balance already is at its target, equation (6) implies that the rate of growth of structural expenditure should be equal to long-term (potential) growth rate of GDP.

Similarly to the structural balance target, the basic expenditure rule can further be adapted based on needs. For instance, it can be adjusted to temporarily accommodate faster or slower rate of expenditure growth if the country is not yet at the structural balance target. In addition, in case there is change in structural revenue (e.g. in case of discretionary tax measures), the required rate of expenditure growth can be adjusted to account for these changes. Furthermore, if the country has a significant cyclical component of expenditure, like unemployment benefits, the expenditure rule can be adjusted for this as well. Lastly, it may be desirable to account for possible larger shifts in government investment. This can be also done by smoothing this component in the overall expenditure. All of these elements are also used in the expenditure rule of the EU fiscal framework (Box 8).

RECOMMENDATIONS FOR CHILE'S AUTONOMOUS FISCAL COUNCIL

If the CFA decides to estimate a debt ceiling as an analytical tool for its debt sustainability assessment, or as an input for improving the fiscal framework of Chile by including a debt anchor into it, it is advisable that the underlying analysis of Chile's debt limits is done in-depth. This means not relying only on one model and/or set of assumptions, so that the resulting debt limit is robust. Each methodology has different strengths and weaknesses and may help guide the discussion on an optimal debt anchor. The anchor should also strike a balance between being prudent enough to ensure fiscal sustainability, but also enabling addressing the country's structural needs (e.g. social needs, large investment and/or human capital gaps) and intergenerational equity. The analysis should be transparent, well-documented and public. Good communication can help with the buy-in of the rules, which is also important for their credibility and effectiveness.

It is also important that the set of fiscal rules are internally consistent. Ideally, a structural balance rule should be calibrated based on the debt anchor. For calibration of the debt anchor and the operational rule, the procedure as recommended by the IMF (described above) could be used. Some of the already existing analytical tools of the CFA (the semi-structural stochastic model) could be adapted and be used in this process. The CFA has started making efforts to estimate a debt threshold analytically, using the tools already developed in house. This is a welcome first move. Additional models could be also developed in collaboration with academics, or other peer IFIs, including, for example, a cross-country analysis using a common database.

BOX 8. CALIBRATION OF THE MAIN OBJECTIVES OF THE EU FISCAL FRAMEWORK

The debt ceiling first prescribed by the Maastricht Treaty for the EU countries was set at a level close to the values of debt to GDP prevailing in the member countries around the time when the Treaty was signed (1992), i.e. around 60% of GDP. This was complemented with a nominal balance objective of 3% of GDP. However, this was not a result of an in-depth analysis, but rather of political considerations, so that the debt and deficit rule are not linked (Kamps and Leiner-Killinger, 2019[92]). In principle, not taking the business cycle into account, a 3% of GDP nominal budget balance would stabilize debt at 60% over the long term if nominal GDP growth was around 5% (eq. 2 in the main text). However, this is quite higher than growth prevailing in the EU or the euro area in the recent decade or two.

These two basic debt and deficit anchors are embedded into the EU Treaty and hence changing them would be very complicated from a political point of view. Over time, they have been supplemented by a whole framework of fiscal rules and procedures (Stability and Growth Pact, SGP), which itself has undergone several reforms and has been supplemented by various elements and clarifying interpretations in the process, so that the framework has become complex, lacking transparency and consequently subject to critique and many proposals for further reform and simplification, mostly with a recommending conclusion to replace part of the complexity with a bigger reliance on the expenditure benchmark ((Barnes et al., 2016[69]) (Kamps and Leiner-Killinger, 2019[92]), (Darvas, Martin and Ragot, 2018[93]), (Bénassy-Quéré et al., 2018[94]), (Andrle et al., 2015[90]), to name just a few). For illustration, the manual document describing and explaining the framework, published and updated by the European Commission annually (European Commission, 2019[19]) has more than 100 pages, plus additional material of explanations and numerical examples. Determining if a country complies with the rules is not always straightforward, as there are often many elements and caveats to the computation that have to be taken into account. For example, determining whether the country complies with the debt rule if its debt is above the Maastricht debt limit of 60% requires a computation of three debt-based measures: a forward-looking, a backward-looking and a cyclically adjusted one.

Further stages of EU fiscal rules reform were more analytically based and have (more or less successfully) tried to reconcile the various operational objectives with each other and with the main two anchors. As long as countries comply with the main two anchors, they are subject to the so-called preventive arm of the SGP and they have to comply with the operational objectives defined in terms of a structural balance (the medium-term objective, MTO) and an expenditure rule (expenditure benchmark). Complying with them aims to prevent the breach of the two main anchors. If a country fails to comply with either the nominal deficit or debt rule, it becomes subject to the preventive arm of the SGP, which constitutes a correction mechanism meant to establish compliance with the anchors over a given period of time (which may vary from case to case). The preventive arm also has its own correction mechanism, as countries may also fail to comply with the operational objectives.

THE STRUCTURAL BALANCE RULE:

The procedure to calibrate the structural balance objectives – MTOs is as follows:

The member state can set its MTO each year, but is has to be in line with a floor of minimum MTO, which is recomputed every three years or on an ad hoc basis if significant structural reforms take place affecting the fiscal position of the country. The minimum MTO has three components:

1. Minimum benchmark (MB_i) ensuring a safety margin with respect to the 3% nominal balance objective, which is computed as:

$$MB_i = -3 + 1.2\frac{stdev(\varepsilon_i * OG_i) + stdev(\varepsilon_{EU} * OG_{EU})}{2}$$
$$\text{subject to } 0.7 \geq MB_i \geq -1. \quad (7.1)$$

Where $\varepsilon_i * OG_i$ is the country-specific cyclical component of the budget (semi-elasticity times the output gap) and $\varepsilon_{EU} * OG_{EU}$ is the EU-wide budgetary cyclical component. This calibration thus takes into account the fiscal component volatility of the country itself and of the EU as a whole since 1985. There is also a cap and a floor to prevent too strict or too lenient fiscal positions. The methodology for computing this benchmark is also subject to updates (less frequent than the minimum MTO itself).

2. Component ensuring sustainability or rapid progress towards it (MB^{ILD}):

$$MB^{ILD} = debt\ stabilising\ balance + 0.33 * ageing\ costs + debt\ reduction\ effort \quad (7.2)$$

Where the debt stabilizing balance is the balance that would stabilize the debt ratio at 60%, based on growth projections up to 2070 (for 2020); ageing costs is the present discounted value of the increase in costs of ageing calculated over an infinite horizon; and the debt-reduction effort represents a supplementary fiscal effort for countries whose debt is in excess of 60% of GDP and is computed as (0.024*$debt\text{-}to\text{-}GDP$ – 1.24), i.e. it is increasing in current debt.

3. A component ensuring compliance with the structural balance lower bound for euro area members and members-to-be (MTO^{EURO}). This is set at -1% of GDP.

The maximum of these three components then determines the minimum MTO a country can set (its actual MTO can be more ambitious, but it cannot be lower than minimum MTO):

$$MTO^{MIN} = max\ (MB_i, MB^{ILD}, MTO^{EURO}) \quad (7.3)$$

Effectively, the current countries' minimum MTOs range between -1.5 %to +0.5% of GDP. These fiscal positions, if maintained over a long term, generally imply much lower levels of debt than 60% of GDP, given the GDP growth rates prevailing in the last two decades. Most EU members put further constraints on themselves following the Global Financial Crisis with a treaty called the Fiscal Compact which sets even stricter requirements on their MTOs. The process of annual EU fiscal surveillance makes an assessment on whether the country's structural balance objective complies with the minimum MTO. In the second step, an assessment is then made if the country is at its MTO. If it is not, it is required to make annual adjustment towards it. The pre-set required structural adjustment depends on the size of the country's output gap and/or GDP growth and on whether the country's debt is at/below or above 60% of GDP. The resulting required structural adjustment, depending on these conditions, can then range between 0% to 1% of GDP.

THE EXPENDITURE RULE

Another operational element of the EU fiscal framework's preventive arm is the expenditure benchmark. The expenditure benchmark means general government primary expenditure total which is adjusted for cyclical (unemployment benefits) outlays and expenditure on EU programmes fully matched by the EU funds. The government investment included in this measure is an average over past four years, to smooth any swings. Lastly, it is corrected for any discretionary revenue measures. The growth rate of the resulting expenditure benchmark then has to be in line with medium-term potential growth (computed over five past years, the current year and a projection of four years ahead) if the country is at its MTO. If the country is not yet at its MTO, the rate of growth of the expenditure benchmark has to be below the medium-term potential growth by a given margin.

When assessing compliance with the rules, the European Commission takes into account the so-called pension reform, structural reform and investment clauses. I.e. under certain conditions specified by the rules, a country can deviate from the structural balance rule, if this deviation is due to costs of a pension or structural reform or public investment with positive effects on growth.

Source: (European Commission, 2019[19]) for the specific EU rules calibration.

The analysis of Chile's debt limits should be done in-depth, relying on more than one model and set of assumptions so that the resulting debt limit is robust.

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Independent fiscal institutions are key in supporting well-designed fiscal frameworks that ensure long-term sustainability while allowing for adequate fiscal space and counter-cyclical policy in the short run. The Autonomous Fiscal Council *(Consejo Fiscal Autónomo, CFA)* is Chile's independent fiscal institution tasked with contributing to the responsible management of the central government's fiscal policy through independent, non-partisan analysis and advice. While still relatively young as it started operating in June 2019, the CFA has already established itself as a respected institution relying on a wide range of analytical tools to assess the sustainability of public finances. In the current context, marked by a sharp increase of public debt, it is key to ensure that the models and tools used by the CFA remain "fit-for-purpose" and aligned with international best practices and standards.

This report builds on the extensive work conducted by the OECD on macroeconomic frameworks and independent fiscal institutions and presents advice on how the CFA can further strengthen its models and tools. The report highlights the quality of the tools already developed by the CFA and advises on refinements and further improvements with a particular attention for fiscal sustainability analysis and reporting, expenditure forecasts and communication on fiscal sustainability.

The report is the result of the work of an interdisciplinary OECD team bringing together expertise on country analysis, macroeconomic analysis and policy advice from across the Economics Department, with the support of the CFA.

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