CBR
COUNCIL FOR BUDGET RESPONSIBILITY

How to evaluate the long-term sustainability of public finances?

Background material for the meeting of the Advisory Panel

October 4, 2013

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Abstract

The sustainability of public finances is a complex concept that needs to be analyzed through different angles. The Council for Budget Responsibility has decided to analyze long-term trends from four aspects: (1) solvency, (2) intergenerational equity (fairness), (3) growth, and (4) stability. In its reports, the CBR will present its views on both stock values and flow values. The 'net worth' features prominently among stock values in that it captures both the past and future effects. At the same time, it serves as a benchmark for public finance transparency. The summary long-term sustainability indicator will quantify the permanent changes in taxes or expenditures that are necessary to keep the public debt in the next 50 years below the upper limit set by the law. The indicator will be quantified based on the baseline scenario which simulates long-term trends without changes in the existing policies. The other useful analyses include, in particular, generational accounts, models of the links between fiscal and macroeconomic performance, and sensitivity analyses. A comprehensive picture of the condition of public finances can also be derived from various models of convergence of the Slovak economy, the cost-of-delay indicators, or more detailed analyses of contingent liabilities. CBR's long-term sustainability reports should bring useful information to both the expert community and public at large, and become a default basis for decisions on areas such as the budget, pension system and healthcare.

Content

Introduction

The Council for Budget Responsibility (CBR) was formed in 2012 through constitutional Act No. 493/2011 (the "Fiscal Responsibility Act") as an independent body set up to monitor and evaluate the fiscal performance of the Slovak Republic. One of the key CBR's tasks is to prepare and publish reports on the long-term sustainability of public finances.

The objective of this background note is to outline possible approaches to assessing the long-term sustainability of public finances and present the methodology and assumptions used in long-term sustainability reports. The report should apply standard analytical tools and procedures based on the best practices used by similar institutions worldwide.

The first part of the note defines the sustainability concept and possible approaches towards it. The second part describes the approaches used by other independent fiscal institutions. The third part defines the initial CBR methodology (used in the very first long-term sustainability report). The fourth part suggests a number of possible methodological improvements which will, however, require that the underlying analytical approaches be deepened and the quality of the input data improved.

1. The concept of long-term sustainability in public finances

Past decades broadened the horizons of public-finance risk analyses, mainly due to population ageing in the developed economies. Increasing life expectancy and falling fertility rate increases the share of post-productive population which will inevitably put additional pressure on the healthcare, pension and long-term care systems.

Prior to embarking on the path of long-term sustainability analyses, many developed countries would apply medium-term budgeting. Since most expenditure programmes stretch over several years, it was necessary to consider longer-term consequences when launching new projects. Such analyses are oftentimes used, for example, to identify the margins for discretionary measures in the budget. The share of mandatory expenditures in many countries is high, which narrows their real room for manoeuvre and impairs their ability to take decisions within a single-year horizon. Medium-term frameworks are indispensable also in situations when a country enacts certain fiscal rules (for example, expenditure ceilings).

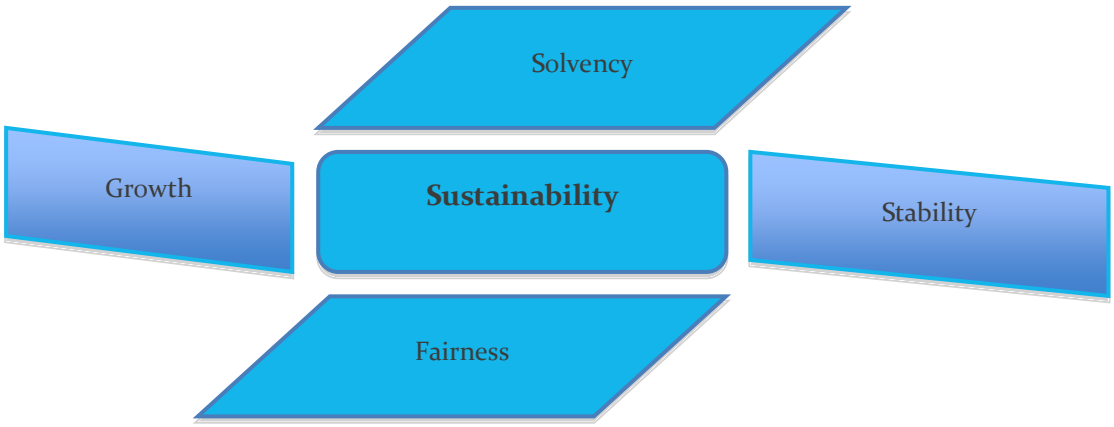
In the less-developed economies, medium-term risks are analysed for somewhat different reasons. Their tax bases are often fragile and various macroeconomic shocks (cyclical fluctuations, financial contagion, etc.) are thus capable of changing the country's fiscal position quite considerably. For example, a sudden stop in the influx of foreign capital may undermine the country's ability to refinance its public debt. In many countries, the International Monetary Fund performs routine analyses of sensitivity to various macroeconomic shocks in order to identify their overall fiscal stability in the medium-term horizon.

Quite paradoxically, long-term analyses appeared for the first time in countries with relatively good fiscal positions (Australia, New Zealand and Scandinavia). Also international institutions, such as the OECD (2001) and the European Commission (EC, 2006, 2009) have contributed towards the spread of long-term projections in the domain of public finances. All EU member states publish annual convergence and stability programmes containing long-term perspective on their budgets; these programmes are subsequently evaluated by the European Commission.

Given the complexity of the issue and the overly optimistic projections in many countries, the demand for independent analyses in this area is on the rise. The most renowned institutions producing long-term analyses of the public finance sustainability include, for example, the Congressional Budget Office (CBO) in the United States, the Parliamentary Budget Officer (PBO) in Canada, and the Office for Budget Responsibility (OBR) in the United Kingdom.

Despite the undisputable progress achieved in the recent past, the concept of long-term sustainability has not yet been clearly defined. In its analyses, the Council for Budget Responsibility (CBR) will base itself on the four dimensions of sustainability as defined in the study of Schick (2005). Obviously, all four aspects are mutually intertwined and should therefore be evaluated comprehensively.

Chart 1: Four dimensions of sustainability (based on Schick, 2005)



The first dimension is **solvency**. Put simply, solvency is the ability to pay financial obligations. This is the spirit in which the Fiscal Responsibility Act in Slovakia defines the concept of long-term sustainability:

"...long-term sustainability means such a fiscal performance of the Slovak Republic under which the general government balance and general government debt are at levels which ensure that changes in the general government revenues/expenditures under the baseline scenario, will not bring the general government debt above the upper limit in the nearest 50 years..."

In other words, public finances remain sustainable in the long run if the present fiscal-policy setup reins the future public debt within the 50% GDP limit over 50 years horizon. Problems may occur either because the actual size of the deficit or debt is too high, or because the expenditures sensitive to population ageing will surge on a massive scale in the future. Under both scenarios, the rise in interest costs and, subsequently, the debt growth, spins out of control (the "snowball effect"). In general, other time horizons can also be considered, including the indefinite one, and the target debt levels can be adjusted accordingly[1]. At the same time, solvency can also be viewed through stock values (net worth) or flow values (long-term forecasts of revenues and expenditures).

The concept of **stability** is closely linked with solvency. Some countries explicitly emphasise the importance of a stable tax burden as part of their fiscal policy objectives (Australia). Sustainability is not a problem as long as the government collects more taxes in the future to cover additional public expenditures. However, this could lead to excessive fluctuations in the living standard of individuals during their lives, or between generations[2]. Hence a mismatch

[1] The main theoretical basis here is the intertemporal budget constraint which assumes that the entire debt will be repaid on the infinite horizon through primary surpluses. The time horizon is usually set depending on the anticipated culmination of demographic processes, and ceilings are set according to the fiscal rules applicable in a given country or monetary union.

[2] The criterion is in compliance with the literature covering optimum spread of taxes in time based on the pioneer work of Barro (1979).

may occur with the remaining two dimensions of sustainability – growth and intergenerational fairness. However, the concept of stability should not be mistaken for the underlying assumption of most "no-policy-change" scenarios, which model the "public expenditure to GDP ratio" as a constant value. In our view, the stability concept should also encompass the analysis of how robust individual scenarios are. Since long-term projections carry a significant degree of uncertainty, it is also essential to analyse how sensitive their outcomes are to changes in various input parameters (interest rate, fertility rate or, for example, increased labour productivity).

Economic **growth** represents the third dimension of sustainability. Various fiscal scenarios, rising deficit, debt or taxes, cannot be isolated from the macroeconomic environment. If the government consumes most savings in the economy to finance its debt, it may "crowd out" private investment and thereby limit the long-term potential economic growth. An increase in debt may also have other negative repercussions, such as higher risk premiums or impaired ability to handle financial crises. If radical tax increases are used as a means to ensuring long-term sustainability, marginal tax rates go up and, consequently, the supply of labour and volume of investments in the economy shrink.

Intergenerational fairness represents the fourth dimension. Also the recital in the Fiscal Responsibility Act emphasises economic and social fairness between generations. It is essential to ensure that present generations refrain from encumbering future generations with inadequate fiscal burdens. However, since the definition of intergenerational fairness is problematic, the CBR's analyses will aim to quantify the consequences of individual scenarios on individual generations without taking any normative stance on the aspect of fairness.

2. Analyses of long-term sustainability in other countries

Before introducing the main elements of the methodology employed by the Council for Budget Responsibility, it is useful to look at ways in which long-term sustainability is analysed in other countries. We will briefly describe the outputs of the European Commission, OBR, PBO and CBO.

The **European Commissions'** "Fiscal Sustainability Report" and „The Ageing report" are the best known analyses of long-term sustainability in Slovakia. Once every three years the Commission publishes these reports prepared jointly by the European Commission (DG ECFIN) and the Economic Policy Committee Working Group on Ageing Populations (AWG). The analysis focuses primarily on the concept of solvency and on the modelling of expenditures sensitive to population ageing. The results are presented in the form of flow values and through sustainability indicators.

The intertemporal budget constraint, which is the cornerstone of the Commission's indicators, says that the current debt in the future must be paid through primary surpluses. The Commission bases itself on the gross debt concept and examines sustainability over two different time horizons. The S1 indicator expresses the need for permanent improvement in

structural primary balance for the gross debt to achieve, by a certain year (2030), a certain target value (60% of GDP). The S2 indicator expresses a need for permanent consolidation necessary to prevent the debt from exploding on infinite horizon.

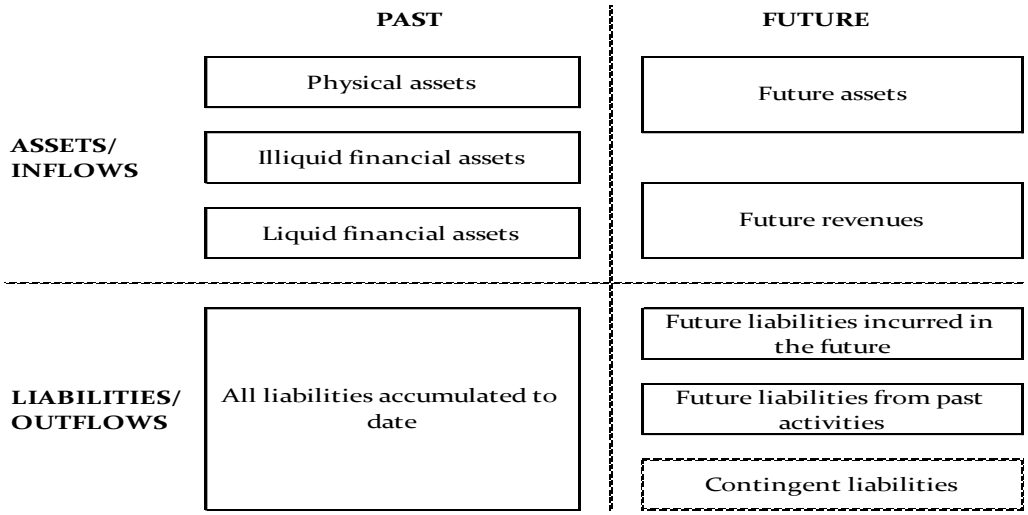
The size of the S1 and S2 indicators is influenced, in particular, by the actual budgetary situation (debt and structural balance) and the anticipated increased cost of ageing in the long-term horizon (revenues are, in most cases, modelled as a constant share in GDP). Based on these indicators, the Commission puts EU member states into three groups: with low, medium and high risk.

Compared to the Commission's report, the analysis prepared by the **Office for Budget Responsibility (OBR)** has one additional dimension. Apart from flow values, it also analyses stock values and divides the government's activities into past and future activities (Figure 2).

Individual parts of this matrix can be quantified with differing degree of exactness. The degree of uncertainty rises as we move from past activities to future activities. The analysis begins in the left bottom corner, which is in fact explicitly quantified gross debt. By deducting liquid financial assets we get the net government's debt. The gross and net debt indicators and their projections have the advantage of providing relatively good cross-country comparisons and their values can be quantified without significant uncertainties. Their disadvantage is that they ignore many other activities of the government and public sector. If we also include other financial and non-financial assets into the analysis, we get a picture of a narrowly defined net worth. However, the uncertainty around this indicator is higher since certain public sector assets are difficult to value (infrastructure, buildings, proprietary software, etc.). But we are still in the past.

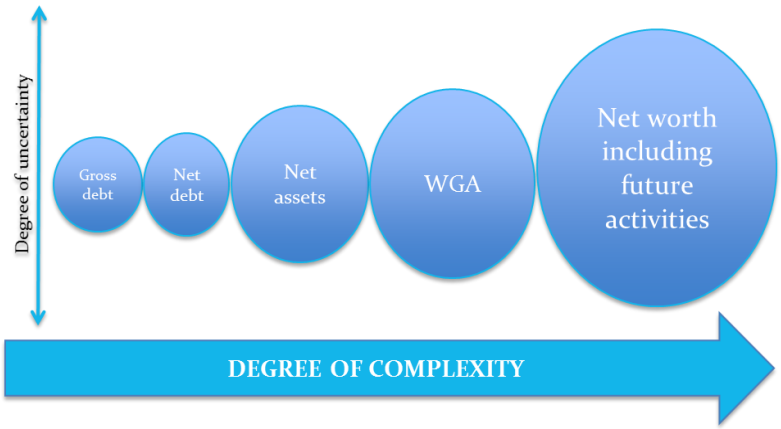
There are also liabilities which will incur, with a lower or higher degree of probability, but they are not yet a part of the official debt: implicit and contingent liabilities. These include, for example, future pensions of the current pensioners, PPPs, or government guarantees. Their net value can be included into the government's balance. In the United Kingdom, this is done through audited WGA (Whole of Government Accounts) based on international accounting standards. Here, the uncertainty is higher because the events are only likely to occur; on the other hand, the choice of the discount rate may influence the results quite significantly.

Figure 2 – Sustainability concept by the OBR (adapted from the OBR's 2011 report)



The last facet of the analysis includes future outflows and inflows from future activities to project the tax and other revenues and quantify the impacts of population ageing. The nature of this analysis implies that calculations carry the highest degree of uncertainty (Figure 3).

Figure 3 – Relationship between complexity and uncertainty



The OBR also summarises its results using sustainability indicators, placing higher emphasis on the indicator similar to Commission's S1 indicator, and calculates the sensitivity analysis against various input parameters. An interesting feature of OBR reports is that not all tax revenues are factored in at a fixed ratio to GDP. The OBR, for example, is anticipating a decline in revenues due to the depletion of oil reserves and due to increased globalisation.

The fiscal sustainability reports prepared by the U.S. **Congressional Budget Office (CBO)** place the main emphasis on the long-term forecasts of revenues and expenditures. Their projections are divided a relatively detailed manner by sectors and taxes. The analyses serve as a basis for calculating debt scenarios. One scenario is 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 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., focuses 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.

3. Initial methodology of the CBR

This part describes the basic methodology used by the Council for Budget Responsibility. The next part features the analyses which the CBR plans to do in the future once it has developed its own models and database. Both chapters should comprehensively cover all four aspects of sustainability presented in the first part of this paper.

The initial methodology most resembles the approach used by the Commission and the PBO, and contains the projections of the main revenue and expenditure categories, including the quantification of the long-term sustainability indicator. The indicator will be quantified based on the calculation of the baseline scenario which simulates long-term trends without changes in the existing policies.

The **long-term sustainability indicator** is defined in the Fiscal Responsibility Act as:

"...a difference between the actual and long-term sustainable value of the structural primary balance expressed as a percentage of GDP."

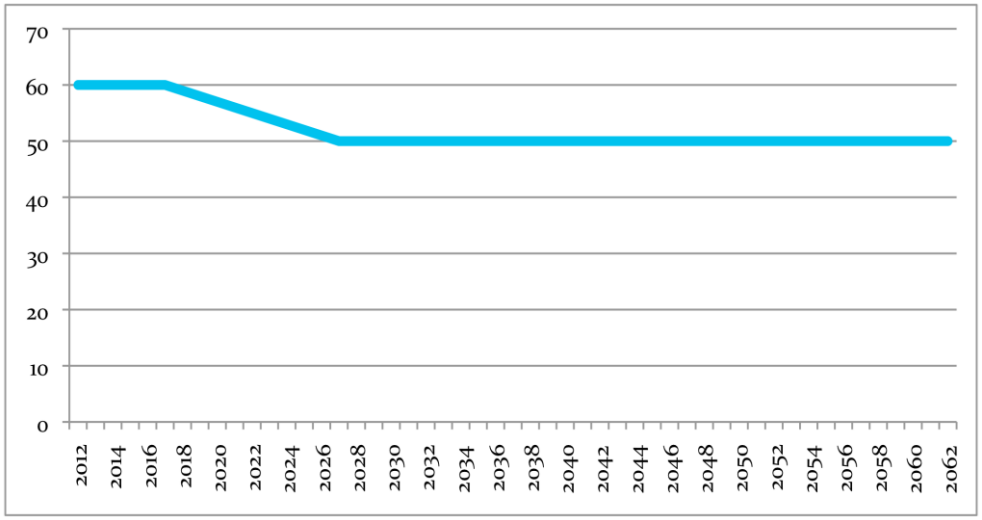
Given the fact that the **definition of sustainability is on a 50-year horizon and is linked to the upper debt limit** (Figure 4), the long-term sustainability indicator resembles Commission's S1 indicator.

The Fiscal Responsibility Act also defines inputs that the CBR must take into account in quantifying the indicator:

a) value of the structural primary balance
b) demographic projections published by Eurostat,
c) macroeconomic forecasts of the Macroeconomic Forecasting Committee and long-term macroeconomic projections by the European Commission,
d) long-term projections of the expenditures sensitive to population ageing, calculated by the European Commission,

e) long-term projections of property income, calculated by the European Commission,
f) implicit liabilities and contingent liabilities.
g) other indicators affecting long-term sustainability.

Figure 4 – Upper general government debt limit (% of GDP)



The starting point of the analysis is to determine the **structural primary balance**[3] which assesses the condition of public finances, adjusted for the impact of the economic cycle, one-off or temporary measures and debt interest payments. Compared to the Commission's approach, CBR uses **broader definition of structural balance** as it also includes the fiscal performance of state corporations, municipalities and self-governing regions, as well as of the National Bank of Slovakia. Moreover, differences may occur in the **quantification of cyclical impacts, sale of assets, or one-off factors**. In the future, the CBR will present an analysis of alternative approaches towards measuring the cyclically adjusted balance.

This will be followed by the projections of individual budgetary values over the next 50 years using macroeconomic and demographic assumptions. CBR divides the projection horizon into the medium- and long-term.

In the **medium-term horizon,** the calculation of revenues and expenditures is more detailed because more information is available through the official government medium-term budget. Macroeconomic forecasts and tax revenue forecasts used in the government budget are subject to expert scrutiny by Macroeconomic Forecasts Committee and Tax Revenue Forecasting Committee comprised of independent domestic experts from the public and private sectors. CBR therefore directly uses these assumptions and does not produce its own assumptions for this purpose.

[3] General government balance and debt data used in the calculations are based on the European system of accounts (accrual principle).

Box 1 – Medium-term scenario without changes in policies

In multiple-year budgets, the quantification of measures is done under the "no-policy-change" scenario, NPC). However, it is not always absolutely clear how individual revenue and expenditure items would develop if no changes in the laws occurred. More detailed methodology will be presented on the next meeting of the Advisory Panel. This is without complication when it comes to revenues from taxes and social contributions (if we ignore secondary effects). Present macroeconomic forecast and the existing legislative framework are used. For other revenues (except for larger items), the NPC is assumed to be identical with the budget. The situation is more complicated on the expenditure side. Some transfers are regulated by law (pensions or benefits), but for other categories it is necessary to determine what is considered an unchanged policy. In the case of wages, wage growth in the private sector is used as a benchmark. Consumer price index may be used for goods and services. In the case of transfers to railways and hospitals, a value preventing their further indebtedness is assumed. For capital expenditures, the NPC derives from the nominal GDP growth (with possible correction for the elasticity of the share of tax and social contribution revenues in GDP). Government debt service should be adjusted for changes in deficit after the NPC scenario quantification and on the basis of the actual government debt securities issues plan. The other items according to the budget or price indices. The NPC scenario will be an integral part of the general government budget and stability programmes.

The expenditure items, save for interest payments, are calculated under the baseline scenario using a simple indexation through price indices (for example, goods and services through CPI, or capital expenditures through nominal GDP growth). Debt interest payments are a result of budgeted items adjusted for changes in deficit.

Beyond the three year horizon, these calculations are linked to **long-term projections**. Under the law, calculations are based on the projections of Eurostat (demography) and the European Commission (macroeconomic development). It is assumed (in the current initial methodology), that revenues will remain constant in relation to GDP, except for contributions to the fully-funded pension pillar and property income[4], which are explicitly modelled. On the expenditure side, the expenditures are assumed to remain stable in relation to GDP, except for those that are sensitive to population ageing[5]. The Commission's forecasts are taken as a benchmark and, in the future, they will be complemented by calculations based on the CBR's own models. The transition between the three-year horizon will be gradual, as opposed to sudden.

A very important difference compared to the Commission's methodology is that the implicit and contingent liabilities are also taken into account. The CBR will gradually present a more detailed analysis of both types of these liabilities. At the outset, they will feature primarily PPP projects and the costs of nuclear decommissioning.

[4] It stems from the assumption of zero stock-flow adjustment i.e. that the debt development dynamics (as % of GDP) is, besides the influence of the interrelationship between the development of interest rate and economic growth, determined exclusively by the primary balance. It is implicitly assumed that nominal government assets will remain fixed over time and that the income from them as a GDP ratio will be falling.

[5] A standard assumption found in the literature is the unit elasticity of tax revenues and an increase of expenditures by nominal GDP growth also in quantifying fiscal impulse (Chand, 1993).

The resulting long-term overview of revenues and expenditures will have the structure presented in Table 1 below.

Table 1 – Long-term projection of public finances

	T	T+1	T+2	T+3	T+10	T+20	T+30	T+40	T+50
Revenues		Medium term horizon			Long-term horizon				
Tax revenues									
Social security contributions									
- Fully-funded pillar									
Other revenues									
- Revenues from assets									
Expenditures									
Fixed in the long term horizon (fixed as % of GDP)									
Sensitive to ageing									
Interest payments									
Balance									
State corporations and NBS*									
Structural balance									
Implicit liabilities									
Contingent liabilities									
Adjustments									
DEBT									

*National Bank of Slovakia

The long-term sustainability indicator is calculated as a permanent improvement in structural primary balance to the extent necessary to prevent public debt from exceeding the upper general government debt limit 50 years from now (presently 50% of GDP in 2053)[6].

The **baseline scenario** should show the consequences of current policies over the long-term horizon, taking due account of anticipated changes in the macroeconomic and demographic parameters. In many cases it is impossible to stick strictly to the current legislation because the results in the long-term could be heavily distorted[7]. Let us take social benefits as an example. If we indexed them each year by inflation only, they could slump below the minimum subsistence level. This is why long-term projections often use the assumption of indexation and wage development. Thus a constant ratio between social benefits and the average wage can be maintained. Similar problems may also occur in the tax system, for example as a consequence of changes in the tax allowance amount, or the maximum tax assessment base. Hence it is essential to consider each and every assumption also from the distribution point of view.

[6] A special consideration may be given to changes which will fully surface on a longer time horizon.
[7] This applies also in the case of those reforms that are deferred in time, but take account of improbable changes. For example, it is impossible to consider a change which would reduce pensions to 80% in 2030. It will also be necessary to discount those approved measures which will only enter into force after the lapse of the current election term.

4. Future improvements in methodology

In order for the CBR to be able to evaluate all four dimensions of long-term sustainability presented in the first chapter, the initial methodology will be gradually expanded to encompass also other aspects. Among them, net worth will play a key role[8].

4.1 Net worth

The net worth represents a very important part of the Fiscal Responsibility Act's philosophy. Horváth and Ódor (2009) and Ódor (2011) attach key importance to the net worth indicator from the public finance transparency point of view. This sub-chapter is largely inspired by their work.

The analysis of firms in the private sector concentrates primarily on three types of statements: (1) balance sheet, (2) profit and loss account, and (3) cash-flow statement. CBR understands that the public sector cannot be assessed identically, but the missing government's balance sheet may, from the analytical viewpoint, obscure certain significant risks. Economic literature contains a number of recommendations on how to take account of the public sector's balance sheet. Buiter (1993) emphasises the importance of future cash-flows. The work of Koen and van den Noord (2005), which defines the practices of creative accounting through the net worth concept, is very much in tune with the underlying philosophy of the Fiscal Responsibility Act.

At this juncture, it should be pointed at two perspectives on the net worth concept. The first perspective is backward-looking and constitutes a standard part of financial statements in many countries (United Kingdom, Canada, Australia). However, as the work of Horváth and Ódor (2009) shows and the definition of the Fiscal Responsibility Act implies, a comprehensive net worth indicator – which also encompasses forward-looking flows in public finances – should be used as the cornerstone of Slovakia's budgetary framework (see Figure 5).

Figure 5. Public sector's balance sheet – net worth

ASSETS	LIABILITIES
A1 – Buildings, land, etc.	P1 – Explicit debt
A2 - Infrastructure	P2 - Implicit liabilities;
A3 – Net capital stock	P3 - Contingent liabilities;
A4 – Financial assets	P4 – Other liabilities
A5 – Net worth of the central bank	**Net worth**
A6 – Net worth of state corporations	
A7 – Natural resources	
A8 – Ecological wealth	
A9 – Other assets	

[8] The first estimate of the intertemporal net worth was presented in the second sustainability report published in April 2013.

There is an interesting parallel between the OBR's approach (described above) and the CBR's methodology. The main view on the balance sheet through the net worth concept is basically identical. The OBR (2011) departs from the net debt concept and, by gradually adding-on other important parts of the public sector's balance sheet, arrives at a broader definition of net worth. Categories A7 and A8 in Figure 5 will not be analysed in the near future due to the unavailability of data and reliable valuation methods. However, they may play a very important role in the future, for example in connection with climate change.

Figure 6 – Comparison of approaches of the OBR and CBR

OBR	CBR
Gross debt	P1
minus liquid financial assets	Part A4
Net debt	P1 – Part A4
Net assets – narrow definition of net worth	A1+A2+A3+A4+A6-P1
WGA	A1+A2+A3+A4+A6-P1+A5-Part P2-P3
WGA adjusted for future government activity	Net worth

Net worth can provide a more comprehensive picture of public finances and, if taken into consideration by economic policy makers, is capable of eliminating inappropriate motivations. Horváth and Ódor (2009) describe nine types of 'bad' motivations in situations where public finances are viewed solely through the prism of deficit, and not through the prism of net worth. They include, just to mention a few, the sale of assets below market price, too big of an emphasis on PPP projects, or expenditure cuts at the expense of state corporations.

Under the Fiscal Responsibility Act, the Ministry of Finance is required to include the net worth estimate (to be fine-tuned gradually) into the Summary Annual Report. As part of the annual evaluation of compliance with the budget transparency rules, the CBR also looks at the net worth calculation methodology. The description of individual categories of assets and liabilities will be an integral component of future reports on the long-term sustainability of public finances (as done by the OBR).

4.2. Intergenerational perspective

The sustainability indicators do not always illustrate accurately the differences between individual generations. The recital of the Fiscal Responsibility Act explicitly mentions social fairness between the present and future generations. This is particularly important when relatively large amounts are transferred through the pay-as-you-go pension pillar between individual age cohorts. The CBR intends to capture also this aspect of sustainability in its future analyses.

If a country has detailed data on how much individual age cohorts pay into and receive from public funds within the framework of redistribution, a simple summary indicator of net taxes by individual age cohorts can be calculated every year. In most cases, the youngest and oldest

age cohorts are the net recipients of transfers, whereas those in the productive age are the net payers to public coffers. This approach may be applied, subject to certain assumptions, also to long-term simulations in order to get a clearer picture of which generations are the winners and which are the losers in relation to public finance transfers.

In addition to detailed simulations, a more analytical approach can also be applied to generational accounts. Auerbach, Gokhale and Kotlikoff (1991, 1994), who pioneered this approach, took the intertemporal budget constraint as the basis and compared the burden of the new-born generation with future-born age cohorts. It all boils down to the fact that both the current and future government expenditures must be paid by someone. There are three options: through (1) accumulated assets, (2) taxes (minus transfers) from living persons, or (3) taxes from future-born generations (algebraically expressed in the equation below). Hence it is key to look at the present value of payments to the budget as the function of age.

N(t,t-s) denotes the present value of net payments from those born in year *t-s*. Let us assume age between zero and D. Value G(s) is government consumption in year *s* and W(t) represents net assets in year *t*. Thus:

$$\sum_{s=0}^{D} N_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} = \sum_{s=t}^{\infty} G_s (1+r)^{t-s} - W_t$$

The quantification of generational accounts is based on the first expression on the left side, which quantifies burden on the presently living generations. It is necessary to construct demographic projections and projections of taxes and transfers up to a date until the present age cohorts will live.

Then comes the projection of government consumption (first variable on the right side). A distinction must be made between the consumption which has a differing impact on various age groups (education) and the consumption which is a typical public goods and is therefore distributed evenly. A decision must be taken as to which discount rate is the most appropriate to use (r). According to Auerbach, Gokhale and Kotlikoff, future government revenues and expenditures are risky and the discount rate should thus be higher than the yield from government securities.

The third step is to determine the net value of assets at time *t*. The value is negative in most cases and represents net debt. We will then get from the equation, as a residuum, the net present value of taxes which the future generations will have to pay (second variable on the left side). This value can be used to determine the average value of taxes which each and every future age cohort will have to pay, assuming that tax revenues will rise commensurately with productivity growth in the economy. The easiest comparison basis for a typical burden on future generations is the burden on the generation born in the present year.

Generational accounts enable a more comprehensive evaluation of various policies. If we look solely at deficit, we would not see any difference if we increased (in a fiscally neutral way) social security contributions and pensions; however, from the intergenerational perspective, such a move constitutes a significant redistribution, particularly to the benefit of the current

pensioners. Generational accounts also come in handy when analysing intergenerational fairness as a normative concept.

Understandably enough, apart from the advantages, generational accounts have also disadvantages. They do not capture changes in the behaviour of entities as a consequence of tax changes, are sensitive to the choice of the discount rate, and do not compare the currently living cohorts between themselves (past payments are not evaluated). Despite these drawbacks, they provide useful additional information to the existing solvency indicators and facilitate decisions on choices between various reform alternatives in the domain of pension systems[9].

4.3. Economic growth

Most long-term projections are calculated against based on a demographic and macroeconomic scenario, yet there is no feedback from the analysed scenario to the assumptions used for the projections. As a basic assumption, the absence of this feedback is all right, but if we want to be more realistic, it is only appropriate to prepare also scenarios where the growing deficit and debt, or changes in marginal tax rates, influence macroeconomic projections. The CBO's long-term budget outlook (2012) contains similar simulations.

An increase in debt influences economic development through various channels. Firstly, increased public debt draws money away from the private sector (crowding-out). Private investments decline, and so does the stock of capital, which impairs balanced economic growth. This effect is partly mitigated by the fact that a higher debt increases interest rates and thereby private domestic savings and foreign capital inflows (provided that financial markets do not view the situation as unsustainable).

The other negative effects of a rising government debt are more difficult to quantify. One of them is that the rising cost of government borrowing increases the need to adjust taxes upwards or public spending downwards, which may again enfeeble economic activity. A high public debt considerably narrows the government's room for manoeuvre should unexpected events occur (deep recession). This is one of the reasons why many countries opted for tax hikes rather than for incentivising measures. A high debt also increases the probability of financial crises through the channel of surging risk premiums on sovereign debt. This process is not linear and the investors' loss of confidence may be sudden and unexpected.

A rise **in marginal tax rates** has also negative repercussions for the prospects of the economy. The impact can be analysed most easily through traditional production functions, with labour and capital used as inputs. On the one hand, higher taxation of capital reduces the return on after-tax capital and thus reduces savings. On the other hand, lower return on savings incentivises people to save more in order to maintain their living standard in the future. Most economists concur that the first channel is stronger than the second one, and thus higher marginal taxation of capital impairs the growth potential of the economy. This is especially true for small and open economies where capital is very mobile. Similar rationale is valid for

[9] The INFORM Act proposal in the US goes exactly in this direction.

taxes on labour where higher marginal rates reduce the supply of labour – combined employment effect (extensive margin) and hours worked (intensive margin).

In the future, the CBR plans to make simulations concerning the effects of individual scenarios on the economic growth, as well as specific thematic studies on labour and capital supply elasticities.

4.4. Sensitivity analysis

Long-term projections should not be perceived as the most-probable-scenario predictions. Instead, they should be viewed as illustrative calculations pointing out various risks in public finances which may materialise if individual policies remain unchanged. Sensitivity analyses are necessary for economic policy makers to better understand how the outcome of projections changes if certain input parameters are modified. They will thus get an idea about the robustness of these outcomes, as well as a picture of which quantities are essential for achieving stability in the long run, which is one of the important dimensions of the sustainability concept.

The following table shows the indicators which are most frequently used in sensitivity analyses:

Table 1 – Variables used in sensitivity analyses

Area	Variable
Demographic indicators	Fertility rate
	Migration
	Life expectancy
Macroeconomic assumptions	Productivity growth
	Interest rate
	Unemployment rate
Sustainability indicators	Other time horizon
	Other target debt level

4.5. Other analyses and indicators

The long-term sustainability analysis should be expanded in the future to also include various analytical concepts and specialised annexes. It is impossible to specify them all at this point, but this sub-chapter mentions at least some of them.

Cost of delay – policy makers are not always in the position to implement changes leading to the long-term sustainability of public finances (whether for objective or subjective reasons). However, a delay in the adoption of the necessary measures comes with additional costs. Using standard assumptions, it is possible to calculate the cost incurred when the necessary changes are postponed to a later date.

More detailed tax revenue forecasts – most long-term projections use the standard assumption under which tax revenues grow commensurately with GDP nominal growth. In

other words, it is assumed that the long-term elasticity of the tax system is equal to one. But this does not have to be always the case. Some tax bases may have completely different dynamics than the economy itself. The OBR in its analysis mentions, for example, the impact of globalisation on corporate income tax and value added tax. Moreover, the analysis also looks at the potential development of certain excise taxes or the revenues from oil and natural gas. In our context, it will be necessary to scrutinise mainly taxes on consumption.

Convergence models – advanced economies base their long-term projections on the average productivity growth for past decades. However, the less advanced and more open economies do not have sufficiently long time series to use and they have not reached the steady state equilibrium. This is why consideration should rather be given to convergence scenarios. Many studies have shown that while absolute convergence cannot be confirmed, relative convergence can be confirmed within a homogenous grouping of economies (see Acemoglu, 2008). Since the European Union is a natural benchmark for Slovakia, it will be necessary to analyse various convergence scenarios to a greater detail.

International comparisons – the best international practices, as well as unsuccessful attempts to ensure long-term sustainability, may be inspiring also for Slovakia's economic policy makers. In addition, the reader will get a better picture of how Slovakia performs in international comparisons. As mentioned above, the Commission categorises Member States into various risk groups from the sustainability point of view. The databases of Eurostat and the International Monetary Fund contain relatively well comparable data for gross and net debt.

Contingent liabilities – not all contingent liabilities are easy to quantify. Therefore, a more detailed analysis of potential risks must also have a qualitative dimension. The CBR has an ambition to analyse also such liabilities which are impossible to estimate from a short-term perspective, but which occur from time to time and which may have a considerable impact on public finances. Financial crises, which increase the debt and undermine the trust of financial markets, are a good example.

Non-demographic factors - demographic development represents the main motivation of public finance long term analyses. Population ageing and its impact on the pension and healthcare systems are at the core of every analysis. However, apart from demographic factors, there are also other long-term trends which may adversely affecting public finances. An example is the rising cost of healthcare provision, which may be due to various reasons: consumer preferences, different productivity growth compared with other sectors, or incorrect setup of the regulatory framework. The Council for Budget Responsibility will seek to identify and, where possible, also quantify the most important non-demographic factors.

5. Main questions to the Advisory Panel

To finalize our methodology we would be grateful to receive your suggestions, comments and answers to these 4 questions:

1. Do you consider the four aspects of sustainability sufficient to report about long-term fiscal trends?
2. What are your views on incorporating generational accounting and simple cohort statistics?
3. The Slovak framework put a lot of emphasis on the intertemporal net worth concept and the differences between the official deficit figures and the change in net worth. Is it useful or misleading because of uncertainty and valuation problems?
4. How to incorporate contingent liabilities in the calculations?
5. How to best communicate the results to politicians and the general public?

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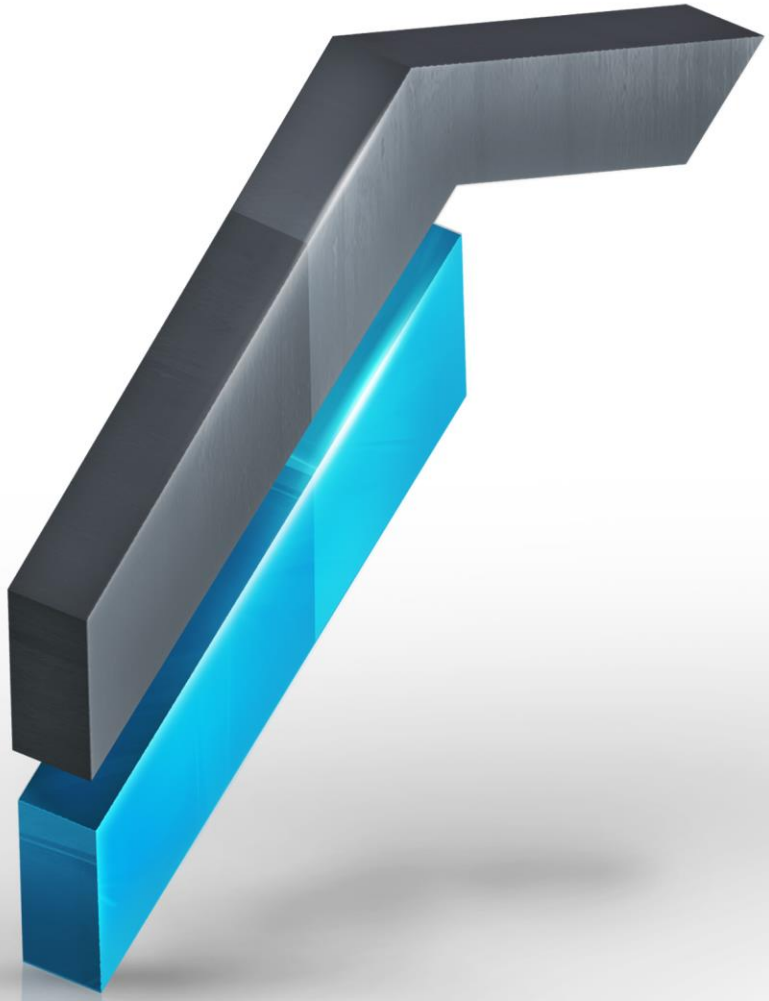

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COUNCIL FOR BUDGET RESPONSIBILITY

Council for Budget Responsibility

Imricha Karvaša 1
Bratislava 1
813 25
Slovakia