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# Budgetary Traffic Lights

## Early warning indicator for risks to target balance of the general government budget

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Discussion Paper No. 2/2018

www.rozpoctovarada.sk

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## Early warning indicator for risks to target balance of the general government budget

*Matúš Kubík[2], Pavol Majher[3]*

## Abstract

In this paper, we develop a framework to assess and communicate short-term risks to the general government budget. The project is motivated by the need to keep budgetary developments under constant surveillance and to timely identify sources of fiscal stress, such that the government can mitigate or even eliminate these by taking appropriate measures. We consider a concept of fiscal risk defined in terms of the expected deviation of the budget balance from its fiscal target. Our framework consists of three parts. First, we collect data input from various sources and identify potential one-off effects. Second, we forecast end-of-year values for revenue and expenditure items of the budget. We design a forecasting method that combines a simple heuristic method of time series forecasting with expert assessments. Third, we use the forecasted output to evaluate and communicate the fiscal risk level for a current fiscal year. Specifically, we use a concept of traffic light colors to report expected deviations of fiscal outcomes from their budgeted targets.

Keywords: government budget balance, fiscal risk, budget forecast
JEL classification: C33, C53, H60, H68

[1] First and foremost, we would like to thank Ľudovít Ódor, a former member of the Council for Budget Responsibility, who initiated this project and provided important guidance throughout its development. We also gratefully acknowledge comments and suggestions from members of the Council for Budget Responsibility (CBR), members of the CBR Advisory Panel and from our colleagues at the Secretariat of the Council, most notably Juraj Kotian, Kevin Page, Jeromin Zettelmeyer, Erik Bugyi and Viktor Novysedlák. All remaining errors are our own.
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# Content

# 1 Introduction

Management of public finances, early identification of fiscal risks and implementation of measures by the government are all challenging tasks. This is true especially given the fact that life is rarely going as planned. Understandably, the longer the time horizon, the greater the risks of deviations from the planned development of budget balance of the general government. Therefore, it is important to keep budgetary trends under constant surveillance. Fiscal risks need to be identified swiftly and, if possible, the government should possess tools to mitigate or even eliminate them. This paper presents a framework used by the Council for Budget Responsibility (CBR) to measure and communicate fiscal stress over the short-term horizon (in a current fiscal year) that can be helpful in achieving budgetary targets.[4]

Finance Ministers, as well as independent fiscal institutions, face the following key questions: Does everything go as planned? Are we on track to meet the budgetary target? Or should some adjustments, either legislative or non-legislative, be made? To answer these questions, it is necessary to continuously monitor all relevant items in the general government budget. General principles for assessment of fiscal risks by the CBR were outlined in Ódor (2014). Within this setup, the CBR possesses two complementary tools for monitoring budgetary trends. The Budgetary Traffic Lights framework focuses on the short-term horizon (potentially also on the medium-term horizon), while the Fiscal Space Review aims to monitor fiscal risks over the medium- to long-term horizon. This paper introduces the former, while the latter will be presented in the foreseeable future.

The Budgetary Traffic Lights (BTL) is a framework that evaluates and communicates fiscal stress in the short-term using simple and pragmatic concept of colors of the traffic light. It works with a definition of short-term fiscal stress as a deviation of the current forecast of the general government budget balance from the budgetary target. In other words, the BTL considers a projected value of the public finance balance, which would most likely be achieved if no additional measures are taken by the government (neither legislative nor operational) on the horizon of the forecast. Intuitively, the greater the negative deviation from the target, the higher the fiscal stress. As its name indicates, our framework expresses these deviations using colors of the traffic lights. Green shows that the finance minister can still sleep peacefully, yellow indicates the need for closer monitoring of the situation, and red indicates a serious deviation if no additional measures are taken. See figure 1 for a simple representation of the BTL.

It is important to emphasize that in the current version of the BTL we use color scheme of the traffic light to communicate the fiscal risk, which is defined as expected deviations from the

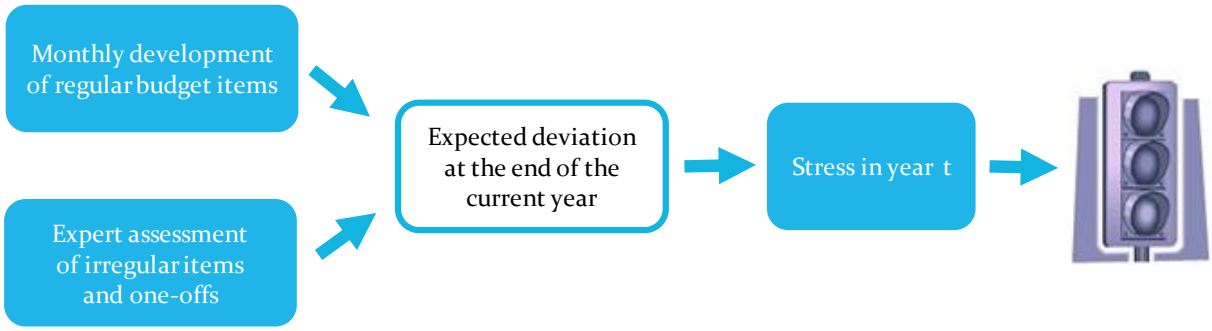
[4] Taylor and Sutton (2018) have recently published their approach to carry out in-year forecasting and monitoring of the public finances used by the Office for Budget Responsibility, an independent fiscal authority in the United Kingdom.

fiscal target. In turn, the fiscal target is given by a budgeted value of the government balance. This approach may be overly simplistic in two respects:

- Firstly, the budgeted balance may not be the main fiscal target. The government could aim for targeted values of some other fiscal variables, such as the level of gross debt or the growth rate of primary expenditures. In such cases, the balance itself serves as an intermediate target and is adjusted by the government to align with its main objectives.
- Secondly, deviations from fiscal targets proposed in the budget may be desirable on some occasions. For instance, an economic downturn would require a counter-cyclical fiscal policy response from the government. This response would, in turn, yield a deterioration of the balance.

In those situations, expected deviations from the budgeted balance per se may not be a source of concern to the government. As a result, it may be detrimental for CBR credibility to communicate a high-deviation forecast by emphasizing a need to carry out budget-improving adjustments by the government. We propose to keep communication of the fiscal risk levels at the technical basis, while using complementary parts of a published report to further comment on broader perspective of expected fiscal outcomes.

*Figure 1: Budgetary Traffic Lights – the basic concept*




The BTL framework consists of three steps. In the first step, data inputs are collected from various sources. At the same time, we identify and subtract any possible one-off effects that could bias our forecasting approach. In the second step, the end-of-year values are forecasted for the individual revenue and expenditure items of the government budget. We identify elements in the budget that have a relatively stable pattern throughout the year. In other words, they are relatively well predictable[5]. These items are forecasted by a simple time-series approach based on the monthly developments in previous years. For non-stable revenue and expenditure items, e.g. capital expenditures or projects funded from the EU budget, the end-of-year values are forecasted by various expert assessments. In the third step, the projected output is adjusted to comply with the accounting standards ESA 2010.

[5] Examples are energy consumption, wages or pensions.

Our framework employs the forecasting procedure that combines a simple heuristic method of time series forecasting with expert knowledge. Economic literature shows that, in the short term, it is very difficult to have better prognostic tools than simple ARIMA processes. However, fiscal forecasts are often much more demanding, as many budget items are of the one-off nature or exhibit abrupt changes over short periods of time (e.g. capital expenditures or projects financed from the EU budget). The methodology used within the BTL attempts to identify items that are "predictable" (or "regular") based on historical trends and those that clearly require an input of expert opinion.

Once the forecast of fiscal variables is calculated, we use it to assess and communicate the short-term fiscal stress for a current year. In the current framework, we use the values of 0.1% of GDP and 0.5% of GDP as thresholds for the expected deviation from targets that separate situations of low, medium and high level of fiscal risks. Subsequently, we assign a level of fiscal risk to a corresponding color of the traffic light. Results of the assessment are reported monthly together with a detailed analysis of the underlying factors and a commentary providing broader perspective for the projections (such as the role of economic cycle, etc.). On top of that, we publish decompositions of the expected balance deviation to provide more substantive information regarding current fiscal developments. For the sake of transparency, it is important to comment on month-to-month changes in reported outcomes, especially in a case of switch in traffic light colors.

The paper is organized as follows. Section 2 describes the short outline of used methodology. Section 3 provides the detailed description of preliminary steps in our framework. Section 4 deals with the forecasting method itself, while Section 5 discusses communicating forecasted output using colors of the traffic lights. Section 6 concludes.

## 2 Outline of methodology

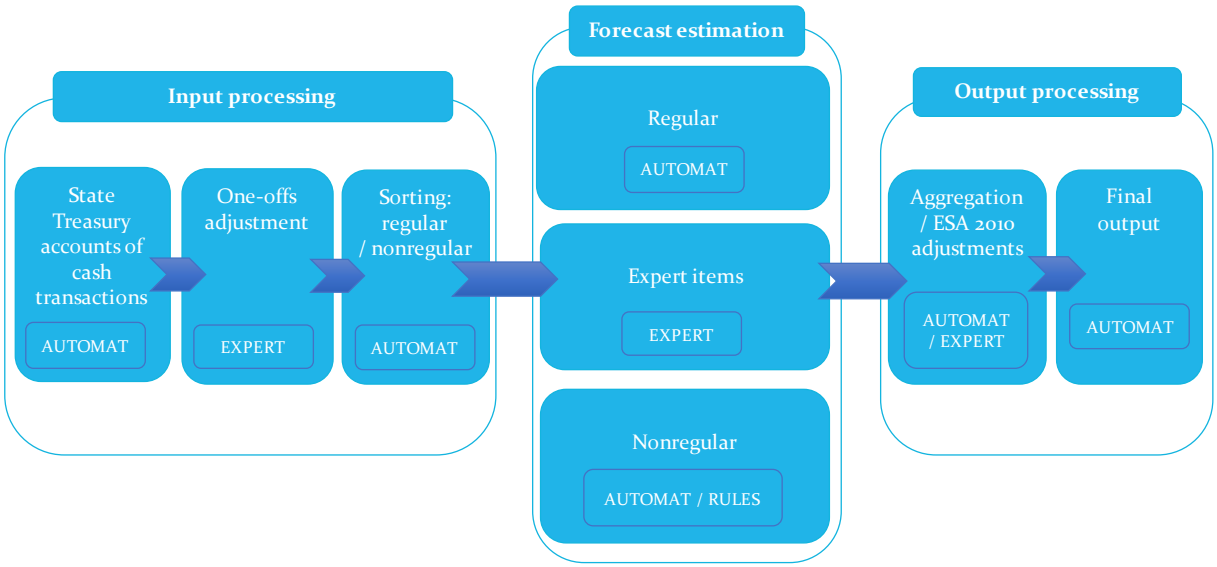
**A methodology of the Budgetary Traffic Lights framework has been designed with the aim to monitor budgetary trends in the short-run.** We want to identify and explain deviations of revenue and expenditure budgetary items from their respective fiscal targets. Subsequently, we report and comment on these outcomes monthly to inform the public and the government about relevant budgetary risks and a possible need to adopt balance-improving measures. To this end, we present the framework capable of forecasting the end-of-year balance of the general government budget in a structural way. The method uses variety of data sources and deals with different issues inherent in assessments of the public sector.

It is important to remark that the framework in its current form has not been designed as a single bloc. Instead, the structure has been developed in many incremental steps that responded to new information or treated individual issues as they arose. Therefore, **forecasted values of**

**variables are calculated by a heuristic statistical method** rather than by more rigorous econometric approaches. We view this set-up as a suitable starting point and plan to expand it gradually to incorporate more advanced statistical methods.

**Our forecasting methodology consists of three main parts: processing of inputs, calculating projections, and transforming outputs.** The scheme is presented in figure 2.

*Figure 2: Forecasting procedure within the Budgetary Traffic Light framework*




Input processing is the first stage of our approach. We **gather relevant information concerning economic performance of the general government** from all available data sources. While doing this, we are mindful of the **underlying structure of data** based on a network of individual entities of the public sector and the classification system of economic transactions. The core element of our inputs are the cash-recorded revenue and expenditure items that need to be adjusted to **eliminate possible irregularities** in observations. Adjusted data is processed by **a sorting algorithm** to determine whether developments in outcomes reported at the individual level are comparable across years in the sample.

The second stage deals with **a calculation of forecasted values**. The point of departure is grouping of revenue and expenditure items based on the sorting algorithm. **Different rules for forecasting are used** based on regularity or non-regularity of individual time series. At the same time, **expert assessments** are used for selected parts of the general government, where projections require usage of additional information.

The last stage concerns **processing and reporting of projected outputs**. We aggregate the projections for all revenue and expenditure items and public subjects. The cash variables are adjusted to align with the accrual notation according to the ESA 2010 standards. Finally, we relate results to the traffic light indicator and construct relevant tables and graphs.

In the following sections we provide a detailed description of the individual parts of our methodology. Now let us define the terminology used throughout the paper:

- A term **current year** is used to denote a fiscal year that is subject to forecasting. Our task is typically to project levels of revenue or expenditure items at the end of a current fiscal year.
- **Profile** is a sequence of reported executions for a given revenue or expenditure item over an individual fiscal year. It can consist respectively of twelve or four observations for monthly or quarterly frequency of reporting. Realized amounts in the profile can be expressed either in absolute values or in values relative to the end-of-year level. It is also possible to report these values cumulatively.
- We refer to a budgetary item as **regular**, if underlying profiles of realization values relative to end-of-year totals are similar across years. Realizations of the regular time series can be projected by our **baseline forecasting method**. On the other hand, a profile is **non-regular**, if sizeable differences in historical profiles are observed between any pair of years.

# 3 Preliminary steps

The first stage in our analysis concerns processing of data inputs. We want to incorporate into the forecasting algorithm all relevant information on economic transactions realized by the general government entities. Therefore, it is crucial to get understanding of a universe of economic data collected and reported for the public sector in Slovakia. We need to know variety of data sources and different types of data classifications, or, in other words, **where and how information is recorded**. Moreover, our task is to **identify and remove irregularities**, which often occur in time series and distort properties of the forecasting algorithm. The topics related to obtaining and adjusting data inputs are discussed in this section.

## 3.1 Data inputs

Our method calculates projections for budget realizations of the general government based on information on economic transactions of entities belonging to the public sector. In the following we characterize classification types of items in the budget, describe the most important sources of data, and discuss how timing of data releases across data sets affects publication timing of our report.

### 3.1.1 Classification of data

There are several types of classification within the public-sector accounts in Slovakia used to sort recorded transactions. We focus in detail on two types that are the most relevant for our forecasting algorithm: The **Economic Classification of Budget Classification (ECBC)** and

**the classification by a source of financing**. Afterwards we briefly survey selected additional types of classifications.

**Economic Classification of Budget Classification**

This type of data classification sorts economic transactions into **detailed structure of revenues, expenditures and financial operations** based their underlying nature. The structure of ECBC is defined by the Ministry of Finance of the Slovak Republic (MoF) and published at the website of the Ministry of Finance (2018a). ECBC classifies each transaction within a hierarchical system consisting of four layers: main categories, categories, items and sub-items. The first three layers are labeled by three-digit number codes, while sub-items are denoted by six-digit codes.

The first tier of **main category** sorts entries of the public accounts into broad groups providing elementary information about nature of transactions. The structure is as follows:

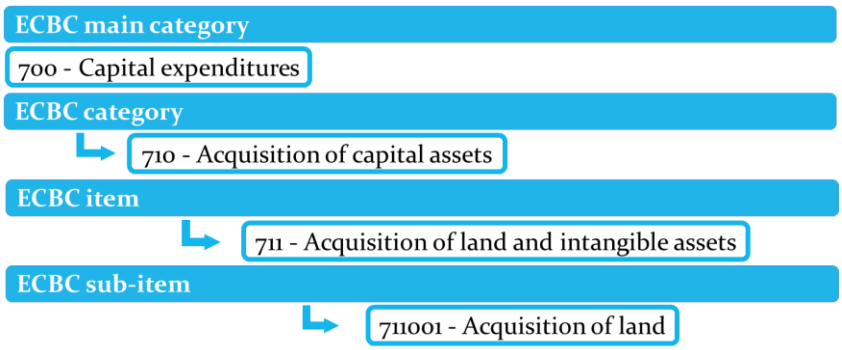
- The revenue side contains main categories of tax revenues, non-tax revenues, and grants and transfers received.
- Transactions on the side of expenditures can be sorted either as current expenditure or capital expenditure.
- The class of financial operations (FOs) consist of three main categories: revenue FOs, received credit, loans and returnable financial aid, and expenditure FOs.

The second and third tier in ECBC are **category** and **item**, which provide a higher detail of information compared to main categories. Each 3-digit code for these levels of classification is constructed based on the code of a corresponding higher-rank tier. For illustration, the main category of current expenditures (ECBC code 600) is split into five categories: expenditures on wages (610), social contributions payable (620), goods and services (630), transfers payable (640), and interest payments (650). Subsequently, the category of wages (610) consists of six items: standard wages (611), overtime premiums (612), emergency service reimbursements (613), bonuses (614), other personal compensations (615), and supplementary payments (616).

Finally, the fourth tier in ECBC is **sub-item,** which is the most detailed level of disaggregation. A sub-item is denoted by a 6-digit code, which is based on a 3-digit code of a corresponding higher-level item. However, some of the items do not feature more detailed disaggregation (e.g. standard wages (611)) and in such cases the sub-item level is not defined.

We illustrate the structure of ECBC by an example in figure 3. The scheme shows a sequence of ECBC tiers for transactions sorted under the ECBC sub-item “acquisition of land”.

*Figure 3: Example of structuring of the ECBC*




The ECBC classification, as presented above, forms the basis for structuring forecast calculations within our algorithm. The projections are estimated for time-series disaggregated mostly at the tier of ECBC item. We have selected this level of disaggregation, as the corresponding structure of budgetary items is sufficiently detailed. At the same time, values reported at the tier of ECBC item are immune to misreported ECBC sub-item codes frequently observed for some public entities. Finally, this level of disaggregation facilitates use of our baseline forecasting method.[6] In 2018, almost 93% of the (cash) budget processed at the tier of ECBC item has been assessed as having similar in-year developments over years, as opposed to less than 90% for the tier of ECBC sub-item.[7]

However, for some variables we find it more convenient to work at the level of ECBC sub-item, which is the most detailed level of the ECBC classification. This holds true for many expenditure items of the state budget (e.g. investment, intermediate consumption, transfers to other public entities), where the issue of misreporting is virtually absent, and the regularity within our baseline forecasting method is preserved. To sum up, we govern the choice of a suitable disaggregation level by characteristics of considered transactions or by underlying statistical properties (e.g. noisy reporting by municipalities at the level of sub-items is smoothed at the level of items or even categories).

**Source classification**

The second type of classification sorts data based on a source of financing for a corresponding budgetary item. MoF maintains a list of source codes, which are assigned to every economic transaction recorded in accounts of the State Treasury. For instance, a transaction can be sorted as "budgeted resources", which denotes financing from the current budget, or as "budgeted

[6] For a detailed description of this method see chapter 4.
[7] There is a sizable difference between regularity of revenue and expenditure budgetary items. At the tier of ECBC item, the regularity is evaluated for almost 94% of the cash budget for revenues is regular (93% at the tier of ECBC sub-item), while in case of the cash budget for expenditures this value is less than 92% (87% at the ECBC sub-item tier).

resources from previous years", which labels values budgeted in previous years and transferred into a current year (e.g. for capital expenditures). Some of source codes classify different funds and programming periods of the EU budget, while other codes are associated with expenditures associated with co-financing to EU funds or various international grant programs.

The aspect of the source classification, which is essential for our approach, is that is allows to consider independently transactions financed from **national resources** and those related to other sources, most notably the **EU funds** and **co-financing**. We make this distinction to treat individually the data inputs for these blocs of the budget. As a result, we can select suitable methods when assessing respective groups. Specifically, a part of budget financed from national resources is assessed using the baseline method (Section 4.2), while forecast calculation that concerns EU funds and co-financing is treated alternatively based on an expert judgement.[8]

The broad differentiation of data inputs into national resources and other sources represents the most important application of the source classification within our approach. Yet, we can make use of this sorting system for various individual treatments within the process of forecasting. For example, useful information is provided by the source code labeling capital expenditure resources budgeted in previous years and transferred into a current year. We can improve our forecasts of realized volumes of investment by keeping track of these transferred amounts.

**Other classifications**

There are several other classification systems that sort data in the public-sector accounts. In what follows we present two of these additional categorizations. Although we do not use them in the baseline forecasting method, some pieces of supplementary information are useful either during input processing or in the forecast calculation.

**Classification of the Functions of Government (COFOG)** is a classification system that sorts expenditures of the public sector based on their purpose. The system was developed by the OECD and is maintained by the United Nations Statistics Department[9]. In our analysis, this classification is useful for identification of one-offs in the preliminary stage, e.g. for filtering out irrelevant transactions in case of transfers from the state budget to other entities of the general government.

**Budget Program or Sub-program** is a categorization that groups expenditures of the state budget and budgets of the local governments based on pre-defined public-sector activities. This framework is maintained by MoF on its website.

[8] Subsection 4.4.4 contains more details on this selection.
[9] Detailed structure and explanatory notes can be found on the website of the United Nations Statistics Division at https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4 .

### 3.1.2 Data sources

In this section, we review sources of data used for our forecast calculation. Unless stated otherwise, information is not available publicly and is provided to CBR by respective institutions upon request. The summary of data sources of is presented in tab 1.

The fundamental source of data for our analysis are **accounts of the State Treasury (ST)**. ST collects and reports information about economic transactions realized by subjects of the general government in a designated information system. At each point of reporting time (i.e. daily, monthly or quarterly) the transactions are aggregated into entries, which are characterized by an underlying entity of the public sector, an ECBC code (at the ECBC sub-item level), a COFOG code, a source code and a budget program code (where applicable). For each entry, the ST accounts contain values of approved budget, adjusted budget, and current execution. Data is available at quarterly frequency starting in 2008 and at monthly frequency from 2013 (except for local governments, where frequency of reporting has remained quarterly after 2013). Moreover, for the state budget it is possible to observe realizations daily, although some minor inaccuracies can be noted in comparison to monthly data, which is controlled thoroughly and validated.

Next to ST, **the Budget Information System** kept by MoF contains values of the approved budget and budget adjustments aggregated monthly for the state budget and organizations partly funded from the state budget in a detailed entry-level structure analogous to that of the ST data set. For the state budget, the budget adjustments can be identified even at the level of individual budgetary chapter (e.g. ministry) through so-called budgetary measures, which are published on the website[10] maintained by MoF.

An important piece of evidence for our forecast can be found in projections of budget execution prepared biannually by MoF and published within the scope of the Stability Programme and the Draft Budgetary Plan. These estimates often include measures, which are planned by the government in the current year but cannot be identified yet from the actual data on budget realizations. The estimates are published in the documents at the broad level of ESA 2010 codes, however MoF provides CBR with a more detailed structure upon request.

There are **various sources outside of MoF that provide information on different areas of public budget realization**. The Debt and Liquidity Management Agency (DaLMA) publishes information on various debt instruments used currently by the state budget and summarizes monthly volumes of issued and purchased debt instruments. Moreover, DaLMA prepares a plan of new issuances of government debt instruments. This information is useful for predicting government's interest payments (and receipts, in case of premium bonds). Next, the Ministry of Health (MoH) reports monthly amounts spent on public healthcare expenditures based on

[10] The budget adjustments are available at http://rozpocet.sk/web/#/rozpocet/rozpoctove-opatrenia (only in Slovak).

information from health insurance companies. At the same time, MoH collects and reports levels of public hospitals' liabilities, which we use for estimating their financial performance. The Social Insurance Agency provides information of social security contributions paid by employers and employees. At the same time, we have access to detailed data on old-age and inability pensions. The Financial Administration (FA) assembles information gained from tax returns by employees and firms. Last, useful evidence can be often found in media news, e.g. concerning details of large investment projects or consolidation measures.

*Tab 1: Overview of data sources*

| Source of data | Information | Frequency of reporting |
|---|---|---|
| State Treasury accounts | all economic transactions realized by subjects of the public sector | monthly, daily (state budget), quarterly (local governments) |
| Budget Information System | structured overview of approved budget values and budget adjustments | annually (approved budget), daily (budget adjustments) |
| MoF documents[11] | in-year forecasts of budget realization | biannually |
| Debt and Liquidity Management Agency | government debt portfolio, emission plan for bonds | biannually |
| Debt and Liquidity Management Agency | summary of issued and re-purchased debt instruments | monthly |
| Ministry of Health | healthcare expenditures, liabilities of public hospitals | monthly |
| Social Insurance Agency | social security contributions, pensions | monthly |
| Financial Administration | tax returns by employees, firms | monthly |
| EEX market platform | prices of $CO_2$ allowances | daily |
| Media | cost of investment projects, measures of consolidation, etc. | various |

Publication dates of our forecasts reflect the frequency of data reporting. The ST accounts is the most important source of information, as they serve as an input for our baseline forecasting algorithm. Following the corresponding release frequency, **our budget realization forecast is published at the monthly frequency**. In case of values that are reported less frequently (most notably for the local governments), we keep the projections at levels from their last update.

[11] We have in mind the Stability Programme and the Draft Budgetary Plan published respectively in April and October.

### 3.1.3 Time delay of data release

An important aspect that affects our usage of collected data in forecast calculation is timing of releases of individual data series. Above we have discussed differences in frequency of reporting, as data is can be released daily, monthly, biannually or annually. On top of this, the data sources differ in time periods between a point of time that is covered and an actual release of information. This release lag affects crucially timing of our publication of individual forecast vintages.

We illustrate this issue with the reporting process of the ST financial accounts, which is the fundamental data source for our analysis. All subjects of the public sector are obliged to submit in 25 days after the end of a month (or a quarter, for local governments) a report of their economic transactions together with relevant underlying information (ECBC, COFOG, etc.). Subsequently, ST collects these data inputs and verifies reported values. Finally, processed data in the table form is inserted into the information system, where it becomes accessible by registered institutions including the CBR. We can access the completed tables typically 40-45 days after the end of a period, or 50-60 days in case of municipalities. These release lags tend to be longer at the end of the year (up to 70 days for municipalities), when data is reviewed more thoroughly.

A similar issue can be observed also for complementary data sources, although the length of a time lag differs from case to case. Our goal is to incorporate newly reported data into our analysis as soon as possible to make our estimates up-to-date and relevant for the public. Since the main source of input data for our projections is the ST accounts, **we start to produce and publish our forecasts for a current year in March, when information covering transactions in January is available**. Subsequently, **we continue with reporting on the monthly basis until March of next year, when complete information for cash transactions in a given year is available**. Note that this last estimate can differ from the final outturn of the budget, since the latter value includes accounting adjustments realized by the Statistical Office shortly before the submission to the Eurostat.

Within the forecasting March-to-March window, **we communicate our forecast preferably at the end of each month**. This choice is guided by time necessary to process newly published information from the ST accounts. Minor delays may occur in the months following the reporting dates of municipalities, as their release lags tend to be longer.

## 3.2 Controlling for data irregularities

The last step in the preliminary stage is identifying and adjusting potential irregularities in the data inputs. We describe our treatment of two types of irregularities frequently present in the underlying data: **one-off transactions** and **sample coverage issues**. Our objective is to

increase the share of budgetary items sorted as regular, thus increasing sample coverage of the baseline forecasting method. The treatment concerns data from the ST accounts that serve as the main input into the projection algorithm. However, other data sources can provide information on needed adjustments.

### 3.2.1 One-off transactions

We define a one-off in our data as a transaction or a set of transactions that changes in-year development of a budgetary item such that it differs from patterns observed in previous and subsequent years. The necessary condition is that **the profile of a budgetary item is regular in periods excluding the year when the one-off occurred**. Therefore, eliminating one-offs from data allows to process a concerned budget entry as regular, so that the baseline forecasting method can be applied.

Note that the definition of one-offs used in our methodology differs from a concept of one-offs used when calculating values for the structural balance or the expenditure benchmark within the Stability and Growth Pact framework[12]. The key principle in our approach *is the impact on a profile of in-year realizations* rather than on the end-of-year outturn only.

The one-off transactions can be observed on both the revenue and expenditure side of the government budget. The revenue one-offs are often associated with sales or administrative fees, which tend to exhibit balanced inflow of receipts. Subsequently, gains from exceptional transactions may disrupt the regular profile of in-year realizations. On the other hand, we have identified expenditure one-offs related to state government transfers to other subjects of the public sector or social security contributions on behalf of certain groups.

A fitting example is the auction of frequency spectrum bands for telecommunication networks in 2014. Licenses were sold to four largest network operators in Slovakia for a total value of 164 million Euro (0.22% of GDP), where the payments were made in eight installments (two per each operator) concentrated within four months of the year. In comparison, the total value of sales received by the state budget (where receipts from the frequency auction are recorded) was 56 million Euro (0.80% of GDP) in 2013 and 66 million Euro (0.84% of GDP) in 2015. As a result, receipts from the sale of licenses weighed disproportionately on the total value of sales and distorted the corresponding profile (see Figure 4). Once we eliminate this transaction, the series is regular and well suited to be assessed by the baseline forecasting method (Figure 5).

[12] Five guiding principles for identifying transactions as one-offs can be found in European Commission (2018, p. 28).

*Figure 4: Revenue from sales*
*(cumulatively, million Euro)*

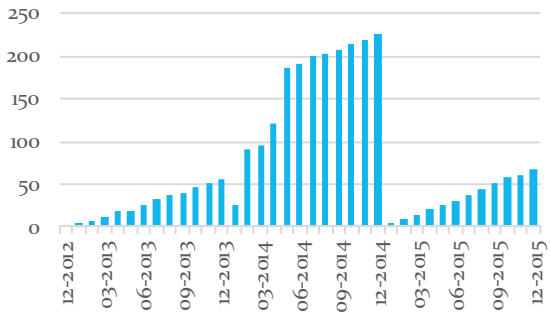
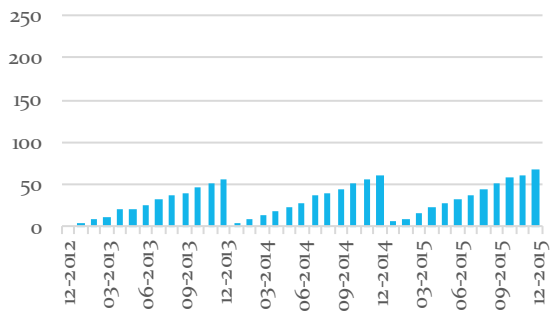



*Figure 5: Revenue from sales without telecommunication licenses*
*(cumulatively, million Euro)*




*Notes: The figures represent total revenue from non-industrial and incidental sales received by the state budget in 2013, 2014 and 2015. The monthly values are reported cumulatively. The figure on the LHS display total amounts as reported in the ST accounts and the figure on the RHS excludes receipts for newly auctioned telecommunication frequency bands. The sources of data are ST and the Regulatory Office.*

### 3.2.2 Sample coverage issues

The second type of irregularity present in our input data is connected to variations in sample coverage over time. Since the introduction of the new accounting standard ESA 2010, several subjects have been added to the general government, including the National Highway Company or the Slovak Railway Company. However, **the ST accounts started to contain information reported by these subjects at various time points and not necessarily when the reclassification happened** (see figure 6 and figure 7**Error! Reference source not found.**). A similar consideration holds true for newly established subjects of the public sector.

*Figure 6: Current transfers to the Railways of Slovak republic*
*(cumulatively, million Euro)*

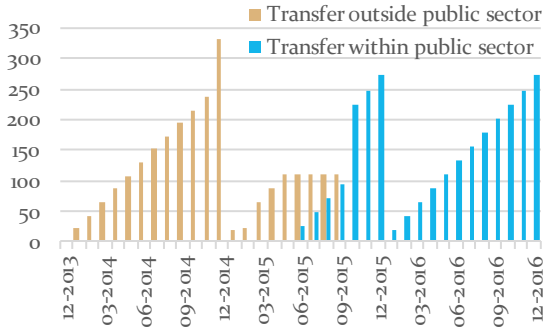
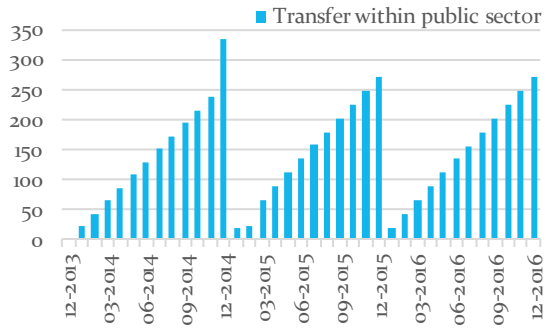



*Figure 7: Adjusted current transfers to the Railways of Slovak republic*
*(cumulatively, million Euro)*




*Notes: The figures represent total expenditure on the current transfer to the Railways of Slovak republic by the state budget in 2014, 2015 and 2016. The monthly values are reported cumulatively. The figure on the LHS displays the total amounts as reported in the ST accounts, where transactions until mid-2015 were reported as paid outside of the public sector. The figure on the RHS shows adjusted data series with transactions classified as transfers within the public sector. The source of data is the ST accounts.*

To account for these changes, a composition of the general government needs to be updated regularly by the list of subjects of the public sector published by the Statistical Office. At the same time, we need to estimate the revenue and expenditure levels of these new entities. In this task, MoF forecasts published as a part of the Stability Programme and the Draft Budgetary Plan can be especially helpful. Finally, the same issue is observed for transactions, which are reported by other subjects of the public sector and concern re-classified entities.

# 4 Forecasting procedure

In this section, we present our method to forecast outturn of the general government budget. Our projections are made for a current year $t_C$ based on information recorded in previous months of this year and time-series reported for the previous years. First, we show a process of data sorting based on regularity. Second, we present projection methods for regular and non-regular time-series. Note that this part of our forecasting procedure concerns budget realizations only *on the cash basis*. Subsequently, we discuss expert forecasts prepared for selected components of the budget (e.g. tax revenue or healthcare expenditures). Finally, we discuss steps taken in processing of the projected outputs for reporting purposes, such as accrual adjustment, aggregation and consolidation.

Let us first define a system of **notation** that will be used throughout characterization of the method. There are three indicators used for indexation of variables:

- **Time**: index $t$ denotes a year, $q$ labels a quarter and $m$ denotes a month.
- **Subject**: index $i$ denotes a subject of the public sector that receives or pays a corresponding transaction.
- **ECBC**: index $e$ denotes the ECBC code of a considered variable.

Note that we do not index inputs by codes of the source classification, since our baseline method is applied only to time-series financed from the national resources.

Next, we discuss notation used for variables used in the method. The two basic elements are:

- **Budget realization**, denoted by $y$, equals a total value received or paid within a given budgetary item in a month of a given year. An example of notation is as follows: $y_{t,m}^{i,e}$ – total amount of transactions realized by subject $i$ and sorted on ECBC code $e$ in month $m$ of year $t$. Consequently, we denote by $\mathbb{y}$ a value of **cumulative budget realization**, which equals cumulative sum of budget realizations calculated for a given number of months. In terms of notation, $\mathbb{y}_{t,m}^{i,e} = \sum_{k=1}^{m} y_{t,k}^{i,e}$.

- **Relative budget realization,** represented by $x$, is defined as a ratio of the budget realization in a month to the total budget realization in a corresponding year. A value of this indicator is calculated from the corresponding budget realization: $x_{t,m}^{i,e} = y_{t,m}^{i,e} / \mathbb{y}_{t,12}^{i,e}$.

At the same time, **relative cumulative budget realization** $\mathbb{x}$ is derived as cumulative sum of budget realizations over a given period divided by the total annual realization. This can be expressed as $\mathbb{x}_{t,m}^{i,e} = \sum_{k=1}^{m} x_{t,k}^{i,e} = \sum_{k=1}^{m} y_{t,k}^{i,e} / \mathbb{y}_{t,12}^{i,e}$.

Let us use a simple example to illustrate these concepts. Consider a transfer from the state budget to a subject of the public sector that pays the amount of 50 million Euro monthly. We assume that payments are balanced over year, therefore the total annual amount is 600 million Euro. Using the notation introduced above, we obtain the following values:

$$y_{t,1} = 50, y_{t,2} = 50, \dots, y_{t,12} = 50$$

$$\mathbb{y}_{t,1} = 50, \mathbb{y}_{t,2} = 100, \mathbb{y}_{t,3} = 150, \dots, \mathbb{y}_{t,12} = 600$$

$$x_{t,1} = \frac{50}{600} = \frac{1}{12}, x_{t,2} = \frac{1}{12}, \dots, x_{t,12} = \frac{1}{12}$$

$$\mathbb{x}_{t,1} = \frac{1}{12}, \mathbb{x}_{t,2} = \frac{2}{12}, \mathbb{x}_{t,3} = \frac{3}{12}, \dots, \mathbb{x}_{t,12} = \frac{12}{12} = 1$$

This notation will be used in the description of the algorithm and is valid for any time-series in consideration regardless of underlying subject and ECBC code. Therefore, for ease of notation, we omit indices *i* and *e* unless they are needed for clarity.

Let us introduce some additional notational concepts, which are derived from the notions of budget realizations and relative budget realizations.

- We denote $\mathbb{y}_t$ the end-of-year value of budget realizations in year $t$, $\mathbb{y}_t := \mathbb{y}_{t,12}$.
- Next, $\bar{y}_t$ represents a profile of budget realizations in year $t$, i.e. $\bar{y}_t := \{y_{t,m}\}_{m=1}^{12}$. Analogously, we use notations $\bar{\mathbb{y}}_t := \{\mathbb{y}_{t,m}\}_{m=1}^{12}$, $\bar{x}_t := \{x_{t,m}\}_{m=1}^{12}$ and $\bar{\mathbb{x}}_t := \{\mathbb{x}_{t,m}\}_{m=1}^{12}$.

## 4.1 Sorting based on regularity

In this step, our objective is to decide for each government budget item, which enters the forecasting procedure, whether the baseline method or the alternative approaches are more suitable for projection calculation. In this assessment we focus on properties of the historical time-series for a given entry. We denote $\mathbb{T}$ a set of all year-indices before the current year $t_C$, i.e. $\mathbb{T} = \{t_C - 1, t_C - 2, \dots, t_0\}$. Our sorting algorithm consists of the following steps:

1. Calculate a "representative" profile based on a sample of historical data profiles.
2. Identify deviations of data profiles from the representative profile.
3. The entry is REGULAR, if deviations are sufficiently small and the sample $\mathbb{T}$ contains two most recent years (i.e. $t_C - 1$ and $t_C - 2$).
4. If deviations are large, eliminate a year with the largest discrepancy from the sample and start again from step 1.
5. The entry is NON-REGULAR, if the historical data sample after elimination does not include two most recent years.

Now let us describe these steps in more detail.

**The representative profile**

Designing a formula for the representative profile deserves special attention, as it constitutes an essential element of our analysis. Besides having a crucial role in our assessment of regularity, this concept is used also in the subsequent calculation of forecasted values for regular entries (see Section 4.2). We guide our design of the formula for the representative profile by the following principles:

A. Information from all historical time-series is used for estimation except those with extremely deviating profiles.
B. Data from two most recent years needs to be included in the sample.
C. Patterns recorded more recently carry a higher weight in the calculation compared to the older-dated evidence.
D. The coefficients used in the formula to weigh observations for respective months are equal in a given year.

Departing from these points, we set up a formula for the representative profile as the weighted average of corresponding historical profiles. The weight levels are assumed to decay exponentially over years. Furthermore, the largest weight level is assigned to year $t_C - 1$ and the rate of decay equals to $1/\sqrt{2}$. We have selected this value because it is the largest rate of decay ensuring that the weight of observations from two most recent years exceeds the weight of observations from all other years in the sample.

Let us formalize these statements. We define the representative profile $\bar{x}^*$ as

$$\bar{x}^* := \{x_m^*\}_{m=1}^{12}, \tag{1}$$

where representative monthly budget realizations $x_m^*$ are calculated as

$$x_m^* := \sum_{t \in \mathbb{T}} w_t \, x_{t,m}. \tag{2}$$

Weights used in equation (2) are given by the following formula

$$w_t = \frac{(\sqrt{2})^{(t-t_0+1)}}{\sum_{\tau \in \mathbb{T}} (\sqrt{2})^{(\tau-t_0+1)}}, \forall t \in \mathbb{T} \tag{3}$$

which is consistent with assumed properties $w_t = w_{t-1}\sqrt{2}$ and $\sum_{t \in \mathbb{T}} w_t = 1$.

For example, in a data sample that we use to calculate projection for year $t_C = 2017$ (i.e. $\mathbb{T} = \{2013, \ldots, 2016\}$), we obtain the following weight values:

$$w_{2013} = \frac{\sqrt{2}}{\sqrt{2}+2+2\sqrt{2}+4} \approx 0.138, \qquad w_{2014} = \frac{2}{\sqrt{2}+2+2\sqrt{2}+4} \approx 0.195,$$

$$w_{2015} = \frac{2\sqrt{2}}{\sqrt{2}+2+2\sqrt{2}+4} \approx 0.276, \qquad w_{2016} = \frac{4}{\sqrt{2}+2+2\sqrt{2}+4} \approx 0.391.$$

It is important to note that the weighting values are dependent on years included in the sample, i.e. elements of the set $\mathbb{T}$. In principle, it may happen that some of years are excluded from the sample and denominators used for normalization of weights are adjusted accordingly. For example, if $t_0 = 2013$, $t_C = 2017$ and $\mathbb{T} = \{2016, 2015\}$, then

$$w_{2015} = \frac{2\sqrt{2}}{2\sqrt{2}+4} = \frac{1}{1+\sqrt{2}} \approx 0.414, \qquad w_{2016} = \frac{4}{2\sqrt{2}+4} = \frac{\sqrt{2}}{1+\sqrt{2}} \approx 0.586.$$

**Comparing the representative profile with data**

Once the representative profile $\bar{x}^*$ is calculated following equation (1), we use it to assess regularity of the concerned entry. Our aim is to evaluate whether the corresponding profiles $\bar{x}_t$ reported for all years $t$ in sample $\mathbb{T}$ do not deviate substantially from the representative profile. As a measure of deviation, we calculate absolute differences between values of relative budget realizations in a representative profile and in historical profiles. The differences are denoted by $\Delta_{t,m}$ and are calculated as follows

$$\Delta_{t,m} = \left| x^*_m - x_{t,m} \right|. \tag{4}$$

**Assessment of regularity**

In the regularity assessment of a time series considered, we compare corresponding differences $\Delta_{t,m}$ with suitable thresholds. Levels of these thresholds $\widetilde{\Delta}_m$ are month-specific and defined as the standard deviation of corresponding relative budget realizations. We assume common upper and lower bound, $\widetilde{\Delta}_{max}$ and $\widetilde{\Delta}_{min}$ respectively, for the thresholds. Formally, these rules can be written down as follows

$$\widetilde{\Delta}_m = max\left\{\widetilde{\Delta}_{min}, min\left\{\widetilde{\Delta}_{max}, \sqrt{\frac{1}{|\mathbb{T}|-1}\sum_{t\in\mathbb{T}}\left(x_{t,m} - \frac{1}{|\mathbb{T}|}\sum_{\tau\in\mathbb{T}} x_{\tau,m}\right)^2}\right\}\right\}, \tag{5}$$

where $|\mathbb{T}|$ denotes the cardinality (the number of elements) of the set of sample years $\mathbb{T}$.

Let us discuss reasons for constraining threshold values by the upper and lower bound. The upper limit ensures that conditions for regularity are never too weak in a sense of accepting time-series that exhibit substantial degree of cross-year volatility. On the other hand, the lower limit prevents the sorting algorithm from becoming too strict. For example, a slight deviation in year $t_C - 2$ in a time-series with otherwise high cross-year similarity of profiles may lead to unnecessary rejection of regularity based on principle B. We set levels of these thresholds to values $\widetilde{\Delta}_{max} = 10$ and $\widetilde{\Delta}_{min} = 2$ based on our experience with applying the method. Once the length of data sample is sufficient, we will do robustness checks on these values and adjust them based on results.

We depart from differences between a representative profile and historical profiles defined in equation (4) and threshold levels given by expression (5). **We evaluate a budgetary item to be regular**, if the following condition holds:

$$\forall t \in \mathbb{T}, \forall m: \Delta_{t,m} \leq \widetilde{\Delta}_m, \tag{6}$$

i.e. the values of differences are less than or equal to the threshold levels across the sample.

**Eliminating deviating years from the sample**

If condition (6) is not met, our next step is to assess whether non-regularity can be attributed solely to some of the sample years. Specifically, we eliminate a year $\tilde{t}$, whose profile exhibits the largest difference from the representative profile in one of its months. The identification problem of the year $\tilde{t}$ can be written in mathematical notation as follows

$$\tilde{t} = \arg\max_t \left\{ \max_m \{\Delta_{t,m} - \widetilde{\Delta}_m\} \right\}. \tag{7}$$

After solving this problem, we update the set of years $\mathbb{T}^{new}$ such that $\mathbb{T}^{new} = \mathbb{T} - \{\tilde{t}\}$ and repeat the procedure starting with calculation of a representative profile for $\mathbb{T}^{new}$. Note that this updating through elimination can be performed multiple times as long as there is a sufficient number of annual profiles in the sample.

**Non-regular time series**

Principle B yields that any of solutions $\tilde{t} = t_C - 1$ or $\tilde{t} = t_C - 2$ to problem (7) leads automatically to rejection of regularity. In other words, once any of two years preceding the current year is eliminated as the most deviating from the representative profile, **we evaluate the time-series as non-regular**. Subsequently, the baseline forecasting method cannot be applied to forecast non-regular time series as there is no representative profile.

**Regularity in general government data**

We conclude characterization of the concept of regularity used in our forecasting procedure by reviewing corresponding properties of Slovak general government data. In particular, **we quantify shares of the budgetary items recorded in the ST accounts that are evaluated as regular and non-regular**. In 2018, regularity has been assessed for almost 93% of the cash budget without EU funds and co-financing at the level of ECBC item. Corresponding percentages for the revenue and expenditure sides of the budget are 94% and 92% respectively.

The reported values are very high, which could indicate that overwhelming majority of the budgetary items, albeit on the cash basis, do not change patterns of in-year realizations much between years. However, these shares are calculated for the entire budget including sections of the general government subject to expert forecasts.[13] Once we exclude areas of the budget that are subject to expert assessments described in section 4.4, share of regular items in the total cash

[13] Sections of the budget subject to expert forecasts are: tax revenues, economic performance of municipalities and self-governing regions, social transfers including old-age and disability pensions, expenditures of the healthcare sector, interest expenditures of public debt, and capital expenditures by the state budget.

budget drops to 78%, and corresponding shares for revenue and expenditure items stand at 71% and 81% respectively.

The share of the budget attributed to regular time series has increased from 92% observed in 2017. This increase is due to addition of one year of observations to the underlying data, which has made some of budgetary items introduced in recent years "eligible" for regularity given the principle B of designing the representative profile (minimal requirement of two years for the length of a sample). On the other hand, new budgetary items were introduced in the budget for 2018, thus automatically increasing share of non-regular time series. As a result, the year-to-year increase in the share of regular time series has been only modest.

## 4.2 Regular time series forecasting – the baseline forecasting method

Let us consider a regular time series with the representative profile $\bar{x}^*$. Assume that we observe values of budget realizations corresponding to the time series over first M months of the current year $t_C$. Our objective is to forecast the end-of-year value of cumulative budget realization $\mathbb{y}_{t_C}$. We refer to the approach described below as **the baseline forecasting method**.

In the first step, we calculate a representative relative cumulative profile $\bar{\mathbb{x}}^*$ based on the values of $\bar{x}^*$. This modification allows us to deal with the forecasting problem from the perspective of cumulative realizations. We choose this approach rather than treating directly month-specific realizations, as the former is more straightforward in terms of calculation as well as exposition. Moreover, cumulative profiles are less sensitive to changes due to parts of realized transactions being shifted between months. The profile $\bar{\mathbb{x}}^*$ consist of monthly values $\mathbb{x}^*_m$, which can be calculated as $\mathbb{x}^*_m = \sum_{\mu=1}^{m} x^*_\mu$. Observe that this definition yields the following identity

$$\mathbb{x}^*_m = \sum_{\mu=1}^{m} \sum_{t \in \mathbb{T}} w_t x_{t,\mu} = \sum_{t \in \mathbb{T}} w_t \sum_{\mu=1}^{m} x_{t,\mu} = \sum_{t \in \mathbb{T}} w_t \mathbb{x}_{t,m}\,, m = 1, \dots, 12.$$

In other words, for each month a representative relative cumulative realization can be expressed as the weighted average of relative cumulative realizations over sample years.

Secondly, we use the profile $\bar{\mathbb{x}}^*$ to estimate the value of $\mathbb{y}_{t_C}$. Recall that the value of relative cumulative realization can be interpreted as the share of end-of-year amount realized up to a given month. Consequently, the forecasted value $\hat{\mathbb{y}}^R_{t_{C,M}}$ can be calculated as follows:

$$\hat{\mathbb{y}}^R_{t_{C,M}} = \frac{\mathbb{y}_{t_C,M}}{\mathbb{x}^*_M}. \tag{8}$$

We refer to this indicator by the term **regular forecast**. The interpretation of this expression is straightforward: we forecast the end-of-year value of realization $\hat{\mathbb{y}}^R_{t_{C,M}}$ as being consistent with the value realized already in previous months of the year (captured by the numerator $\mathbb{y}_{t_C,M}$) and the expected growth rate in upcoming months given by the (representative) historical pattern (expressed by the denominator $\mathbb{x}^*_M$).

The formula in equation (8) constitutes the elementary building block of our baseline forecasting method. However, our experience with its application shows that excess volatility of projections is often observed during a year. Specifically, for some budgetary entries the projected end-of-year values are very sensitive to developments in monthly realizations. This issue is particularly relevant for time-series with back-loaded representative profiles, i.e. series, where a major share of realized amounts is reported in months towards the end of a year. Technically, this excess sensitivity arises from very small values of a representative cumulative relative profile $\mathbb{x}^*_m$ in early months of a year.

We deal with this issue by **adjusting forecast in a way that smooths month-to-month developments of projected values**. Our approach is to anchor the values projected based on realizations by information from the budgetary framework of the government in the current year. This is implemented through complementing the regular forecast by corresponding budgeted amounts presented in the Budgetary Information System, using either an approved budget or budget adjustments.

We use the term **budget-smoothed forecast** for an estimate that uses information from the approved budget in the calculation. The budget-smoothed forecast $\hat{\mathbb{y}}^B_{t_C,M}$ is given as follows

$$\hat{\mathbb{y}}^B_{t_C,M} = \omega_M \, \hat{\mathbb{y}}^R_{t_C,M} + (1 - \omega_M) \, \mathbb{y}^B_{t_C}. \tag{9}$$

In equation (9), $\mathbb{y}^B_{t_C}$ represents the budgeted value for time series in the current year and $\omega_M$ stands for a month-specific weighting coefficient, which reflects properties of the corresponding representative profile and is described in detail below.

By the similar logic, the term **adjustment-smoothed forecast** is introduced to denote an estimate incorporating the budget adjustments in the calculation. We denote this indicator by $\hat{\mathbb{y}}^A_{t_C,M}$ and calculate its value by the following equation:

$$\hat{\mathbb{y}}^A_{t_C,M} = \omega_M \, \hat{\mathbb{y}}^R_{t_C,M} + (1 - \omega_M) \, \mathbb{y}^A_{t_C,M}. \tag{10}$$

The term $\mathbb{y}^A_{t_C,M}$ stands for a corresponding value of the adjusted budget.

At this point we discuss our approach to parametrize the value of weight coefficient $\omega_M$. As the aim is **to moderate the sensitivity of monthly projections to changes in the level of budget execution**, the weight should be constructed such that it accounts for a degree of profile asymmetry. We assess whether the relative cumulative realization is low by comparing it with the corresponding value for a profile distributed uniformly over year. Consequently, the weighting coefficient is given as follows:

$$\omega_M = \frac{\mathbb{x}^*_M}{M/12} \text{ for } \mathbb{x}^*_M \leq \frac{M}{12}. \tag{11}$$

The interpretation is straightforward. The lower is the *relative* cumulative realization in the representative profile for a given month, the higher weight should be given to the "anchoring" term in the forecast calculation formula, i.e. to the budget value or the adjusted budget value.

In the following example we illustrate the weighting concept introduced above. Consider a time-series with the representative profile with monthly budget realizations given in millions as $y_m^* = 1$ for $m = 1, \dots, 11$ and $y_{12}^* = 19$. This implies that the relative realizations are given as $x_m^* = \frac{1}{30}$ for $m = 1, \dots, 11$, $x_{12}^* = \frac{19}{30}$, and subsequently the cumulative relative realizations follow $\mathbb{x}_m^* = \frac{m}{30}$ for $m = 1, \dots, 11$. Assume that in the current year $t_C$ the budgeted amount for this time series equals $\mathbb{y}_{t_C}^B = 32$. We observe realizations for first six months with values $y_{t_C,m} = 1$ for $m = 1, \dots, 5$ and $y_{t_C,6} = 3$, i.e. the outturn in the sixth month is higher by 2 million relative to the representative profile.

Since $\mathbb{y}_{t_C,6} = 8$ and $\mathbb{x}_6^* = \frac{6}{30} = \frac{1}{5}$, the regular forecast value calculated following expression (8) equals $\hat{\mathbb{y}}_{t_{C,6}}^R = 40$. Apparently, this estimate is substantially elevated relative to a value consistent with the representative profile (by 33 %) or from the budgeted amount (by 25 %). Now we compare this outcome with the budget-smoothed forecast. Equation (11) yields the weighting coefficient $\omega_6 = \frac{2}{5}$. Subsequently, the forecasted value $\hat{\mathbb{y}}_{t_C,6}^B$ as defined in equation (9) is $\hat{\mathbb{y}}_{t_C,6}^B = \frac{2}{5} \times 40 + \frac{3}{5} \times 32 = 35.2$. This estimated value is more conservative relative to the regular forecast.

Our experience shows that, in general, **the adjustment-smoothed forecast is the most appropriate forecasting formula from our toolbox for application on our data inputs**. The end-of-year estimates calculated by the smoothed-forecast formula are by construction less sensitive to month-to-month changes in budget realizations relative to the regular forecast. Moreover, the budget-smoothed forecast lacks information often disclosed during the year in the reported budget adjustments. Nevertheless, there may be circumstances when the budget-smoothed forecast or even the regular forecast are preferable.

First, in-year budget adjustments reported by some subjects of the public sector can be exaggerated in both directions (i.e. over- or understated), which distorts the forecasted value. For example, the budget adjustment levels of municipalities are often not tightly linked to developments of an underlying time-series. In such cases, the budget-smoothed forecast is a preferable choice of the projection type.

Second, there are time series where information in both the approved budget and budget adjustments is under- or overstated. This holds, for instance, for bonuses as a part of wage expenditures, as the final realization always exceeds corresponding amounts published in the budget or in budget adjustments. The discrepancy occurs partially because, in some years, bonuses are used by the government to pay out a share of newly-negotiated annual growth of the wage bill. In such cases, we find it more appropriate to use the regular forecast to estimate a projected value.

To sum up, our forecast method for regular time-series comprises three types of projection formulas, namely the regular forecast, the budget-smoothed forecast and the adjustment-

smoothed forecast, which are defined in expressions (8), (9) and (10) respectively. Given its advantages described above, **the adjustment-smoothed forecast $\hat{y}^{A}_{t_C,M}$ is our primary choice of the projection formula within the baseline forecasting method**, although justified exceptions from this rule can occur. In any case, ex-post validation of these forecasting methods is an important part of our assessment.

## 4.3 Non-regular time series forecasting

In this part we discuss our forecasting approach for time-series that are evaluated as non-regular by the sorting algorithm. Recall from the definition of regularity that these series exhibit high degree of variation across patterns of individual annual profiles. This variation is materialized by the representative profile being different from actual underlying profiles. A leading example of non-regular time-series are capital expenditures, where large payments are realized in non-frequent manner given the nature of underlying investment projects. Note, however, that a share of non-regular variables is decreasing over time, as some of these series lack a sufficient length of the data sample.

Many of non-regular components are forecasted by expert judgements, which are discussed below in Section 4.4. However, the sorting algorithm assesses regularity for all revenue and expenditure items across the general government. Given the large number of general government entities, if not the vast population of individual time-series, it is not feasible to calculate expert forecasts for all non-regular items. Therefore, **we design a general rule that sets projected values for non-regular time series not covered by the expert estimates**. Since in such cases historical data do not provide useful information, we depart from evidence reported during the current year in a form of budget adjustments and define **non-regular forecast** $\hat{y}^{NR}_{t_C,M}$ as equal to the corresponding level of adjusted budget:

$$\hat{y}^{NR}_{t_C,M} = y^{A}_{t_C,M}.$$

We are aware of drawbacks that are associated with the usage of this indicator, namely a noisy nature of its reporting for some of the subjects of the public sector. For each calculated forecast, we assess its deviation from the budget. Subsequently, non-regular projections with significant deviation are subject to a further inquiry. The framework produces an output file that contains information on observed excess magnitudes in month-to-month changes in projected values.

## 4.4 Expert estimates

In the previous sections, we have described the forecasting algorithm that calculates projections based on data reported in the ST accounts and in the Budgetary Information System. Yet, there are several additional data sources that may provide information valuable for the forecast calculation (see the overview in Section 3.1.2). Moreover, some groups of general government transactions have characteristics indicating that forecasting approach other than the baseline

method may be more suitable. These two aspects, complexity of inputs and data patterns, stimulate the development of expert assessments and their usage on selected blocks of the budget. We review these in the following part.

### 4.4.1 Tax revenues

Receipts from collected taxes and social contributions constitute the major part of the budget revenues. There are **more than 20 types of taxes that are accrued to several subjects of the general government**. The highest share of tax revenue, including receipts from the corporate income tax or the value added tax, is accrued to the state budget. The Social Insurance Agency collects social contributions except for health insurance contributions, which are accrued to health insurance companies. Municipalities receive revenue from the personal income tax and additionally from associated local taxes (e.g. the real estate tax or the tax from dog-ownership). Finally, some of the taxes are accrued to the State financial assets and the national broadcaster.

Tax revenues forecasting has been an important activity of the CBR since its establishment. This focus arises from the way in which the formation of tax projections is incorporated into the Slovak fiscal framework. The CBR is a member of the Tax Revenue Forecast Committee, which is, by the constitutional law, an advisory body to the Minister of Finance. This committee prepares, at least twice a year, forecasts of revenues from taxes and social contributions. At the same time, effects of proposed legislative changes are quantified by the committee. These forecasts are used within the budget drafting process and are included in annual versions of the Stability Programme and the Draft Budgetary Plan.

Given these considerations, **the CBR conducts tax forecasting in a distinct regime**. Revenues from taxes and social contributions are forecasted at the monthly frequency over the medium-term time-horizon to be consistent with the fiscal framework. Receipts for each tax are projected individually while accounting for linkages between the taxes (e.g. between the personal income tax and the corporate income tax). Complementary data sources are used on top of the ST accounts, such as information from the Financial Administration (including individual tax declaration of companies), statistics from the Statistical Office (e.g. firm profitability), various labor market indicators or evidence on consumption of specific goods (gasoline and diesel, tobacco, etc.).

To summarize, forecasts of revenues from taxes and social contributions are calculated by the CBR in the distinct procedure to align with the requirements arising within the Slovak fiscal framework. This comprehensive approach is more thorough relative to the baseline method used to project realizations of the budget. Therefore, we use the outcome of this expert analysis in our final projection of the budget balance.[14]

[14] However, projections of tax revenues made by the baseline method provide a valuable input into the CBR tax forecasting framework, as cash receipts of taxes tend to exhibit stable in-year developments.

### 4.4.2 Municipalities and self-governing regions

Local governments constitute an important part of the public sector in Slovakia. The amount of their revenues and expenditures in recent years was around 7% of GDP and contributed 18% and 16% of the general government revenue and expenditure levels respectively. We recognize two tiers of local governance. First, there are more than 2900 municipalities in Slovakia. Second, we distinguish eight self-governing regions centered on the largest cities across the country.

Revenue of the local governments flows mainly from two sources. Tax receipts, namely the personal income tax together with some local taxes, is complemented by transfers from the state budget. On the expenditure side, the local governments provide a substantial share of public goods supplied by the government. For instance, the municipalities operate public elementary schools, provide selected social services and local transport services, or develop and maintain public spaces, such as streets or squares. The self-governing regions, on the other hand, operate public high schools and local hospitals, maintain regional road network, provide services for regional transportation, etc.

The local government report quarterly their respective flows of revenues and expenditures into the ST accounts. Therefore, we could in principle calculate projections of end-of-year realizations using our baseline forecasting method at the quarterly frequency. However, the quality of reporting is low at the individual level due to transactions being reported with time lags of different length. As a result, the sorting algorithm frequently evaluates the budgetary items as non-regular and information concerning historical profiles is neglected in projection calculations. Moreover, budget adjustments used for the non-regular forecasts contain even higher degree of imprecision with values being often exaggerated.

To avoid these problems, **we apply expert assessment to forecast a development of fiscal indicators related to the local governments**. Our approach is based on two pieces of information. Primarily, we use the patterns of profiles observed in previous years for the main categories and categories in the ECBC classification, i.e. at the broader level of aggregation. This broad perspective alleviates problems concerning in-year reclassification of transactions. The projections calculated at the aggregate level are subsequently divided into the more detailed structure depending by observed realizations reported for respective items and sub-items. This view is complemented by individual-level data on annual economic performance of municipalities. Although this information becomes available to the CBR with a significant time lag, it is useful in providing insights into observed historical patterns.

### 4.4.3 Old-age and disability pensions

The largest component of social transfers paid by the general government are old-age and disability pensions. The value of these pensions paid in recent years is Slovakia exceeded 8% of

GDP and accounted for almost 45% of the total value of social transfers. As an expenditure type that is paid regularly over year and the population of beneficiaries depending on slowly evolving demographic patterns, the pensions seem as an excellent candidate to be assessed by our baseline method.

However, there is **one technical issue that causes excess variation in historical profiles and subsequent variation in projected realizations**. The problem arises from the way in which pensions are paid out. Specifically, all pensioners are divided into twelve groups, which receive pensions each month in distinct dates fixed to given calendar days. If any of these fixed days falls on a weekend or a holiday, the payment is made on a previous working day. Rescheduling happening at the end of a month leads to a variation in payment days across months, with their count going from ten up to fourteen. Given the large value transferred by the payments, swings in budget realizations across months can be sizeable.

Our approach deals with the problem of rescheduling by **controlling for seasonality when forecasting time series of monthly realizations**. The seasonal component smooths cross-month variations in expenditure levels and allows for a stable end-of-year forecast.

Let us remark that the rescheduling occurring at the end of a year is corrected in the national accounts by modifying item inserted as a part of the adjustments from the cash basis to ESA 2010. Our estimate takes this adjustment into account in the final stage of the forecast calculation.

### 4.4.4 EU funds and co-financing

When introducing source classification in Section 3.1.1, we stated that revenue and expenditure items financed from EU funds or co-financing resources are not forecasted by the baseline method. This selection is motivated by a lumpy nature of these transactions. Incoming transfers received, or expenditures paid, are often reported within the ST accounts in large amounts. Furthermore, realization of expenditures over time is linked to the stage of a corresponding project within a current programming period rather than to a given month of a year.[15] This results in distorted patterns of corresponding profiles and, consequently, non-regularity of the series. Moreover, budget adjustments used for the non-regular forecast often do not reflect developments of underlying variables.

To circumvent these issues, we make use of the fact that, unlike at the micro level, the aggregate of EU expenditures (or revenues) exhibit profiles of development roughly similar across years. Using **the top-down approach, we forecast developments of the total amount of EU expenditures and subsequently split the estimated amounts into the lower-tier**

[15] A programming period lasts for seven years. Corresponding funds can be used also during three years after the period concludes.

**structure** in a way analogous to the local governments. The end-of-year realization of expenditures related to co-financing to the EU funds is estimated in the same way.

### 4.4.5 Interest expenditures

The level of the consolidated general government debt in Slovakia exceeds 50% of GDP.[16] As a result, the interest payments constitute a sizeable part of the total expenditures. Although the outgoing payments are reported within the ST accounts, the baseline method is not useful for estimating the total expense as historical profiles reflect underlying properties of the government bond contracts.

Our estimate reflects mainly data reported by the Debt and Liquidity Management Agency. We consider information concerning existing issuances of the government bonds as well as the bond-emission plan for a current year. At the same time, interest revenue arising from issuance of premium bonds is projected as well.

Note that the above characterization concerns only interest payments on the state budget debt, which constitutes around 90% of the general government debt. The rest is composed of debt stocks of municipalities and selected public entities (e.g. National Motorway Company or Slovak Railways) as well as contributions of the Slovak republic to the EFSF. The interest payments on this debt are estimated based on cash interest payments reported within the ST accounts (for municipalities and other public entities), or, alternatively, on expenditures related to the EFSF framework that were realized in previous years.

### 4.4.6 Healthcare sector

The government is involved heavily in the healthcare sector in Slovakia. There are three health insurance companies and the largest one is public. Concerning two private health insurance companies, their revenue and expenditure items related to the public social insurance system are also included in the national accounts as a part of the general government. The public sector also operates several large and small hospitals. Many of healthcare revenue and expenditure transactions that are realized by the government can be processed by the baseline forecasting method. Yet we apply alternative approaches on three large expenditure segments, whose properties require expert evaluation. Recall that the revenue level from health insurance contributions is forecasted within the bloc of tax revenues.

First and the most important element requiring the expert assessment is **expenditure on healthcare disbursed by the health insurance companies**. The main problem arises from the reporting practice, as the ST accounts contain only data on transactions of the public health

[16] Both the Slovak government in its Draft Budgetary Plan 2019 and the European Commission in its Autumn 2018 Economic Forecast expect the debt level to fall below 49% of GDP in 2018.

insurance company. We can review information concerning the private health companies in reports by the Ministry of Health, but the data format is different, and the reporting delay is longer relative to the ST accounts. We circumvent these issues by estimating the annual growth rate of healthcare expenditure based on the historical average. These projections are further amended by quantified effects of implemented measures as well as by realizations reported during a current year. Our experience shows that this simple approach generates estimates of reasonable precision.

Second part of the healthcare sector requiring alternative approach is **the financial performance of state-owned hospitals**. In this case, the expert evaluation does not use economic transactions reported within the ST accounts, but rather developments of a stock of liabilities on hospitals' balance sheets. Technically, we can view changes in liabilities as a part of the total level of healthcare expenditures, since an increase in hospitals' liabilities is effectively equivalent to a decrease in healthcare spending by insurers. Subsequently, our forecast is calculated jointly with the healthcare expenditure level based on the historical average of the y-o-y growth rates. On top of that, we use reports of hospitals' financial position assembled by the Ministry of Health, where we analyze month-to-month changes in the levels of relevant financial indicators.

Finally, third element subject to our expert judgement is **the payout of retained profits by private health insurance companies**. This transaction is recorded as a financial operation similarly to liabilities of the hospitals and as such does not enter the baseline forecasting method. We estimate the end-of-year level based on realizations recorded in previous years while taking into account the total amount of profit retained by insurance companies. The projected values for the change in hospitals liabilities and the profits payout is added to the budget forecast within adjustments from the cash basis to accrual notation.

### 4.4.7 Capital expenditure by the state budget

Next on our list of areas requiring expert forecast assessment is capital expenditures realized by the state budget. Payments for investment projects as well as capital transfers are lumpy by nature, and as such are typically not evaluated as regular by the sorting algorithm. Budget adjustments reported by the state budget are more realistic than those by other public subjects, therefore the non-regular forecast is a viable option. Yet, there is additional evidence available that can potentially improve precision of our projections.

The Slovak fiscal rules allow to **transfer resources allocated for capital expenditures across years** and to spend these funds even two years after the year of their budgeting. This feature has important consequences for the realized level of investment in a given year. On the one hand, some of currently budgeted expenditures can be postponed. On the other hand, investments financed from transferred resources can be realized on top of the current budget.

In our expert assessment, **we keep track of investment resources that were not realized in preceding years**. We estimate corresponding expenditure in a current year based on the historical average rate of usage of transferred investment financing. At the same time, **we expect a part of the currently budgeted resources to be transferred in the future**. Finally, information gained from media reports can be also useful in the capital expenditure forecast, as large investment projects typically receive extensive media coverage.

#### 4.4.8 Selected non-tax revenues

In the final part of the section discussing our projections made by expert judgements, we briefly review approaches used to forecast selected non-tax revenue items. First, expected revenues from **the dividend income** are estimated using published financial statements of relevant state-owned enterprises. Next, income from **the sale of $CO_2$ allowances** is projected based on the historical volumes traded and price developments observed at an online market platform provided by the European Energy Exchange. Lastly, we forecast **revenues from the fee for the management of emergency stocks of oil and oil products.** For projections of this revenue item, we consider the fee charged for the provision of services as it is published annually in the official price list.

### 4.5 Adjustment to ESA 2010

In this part we present steps that are undertaken to augment forecasted values of the budget in order to be consistent with the ESA 2010 standards of accounting. First, we show how cash-basis estimates of the general government balance are transformed into the accrual-basis representation. Second, we describe our approach to consolidate transactions within the public sector. Finally, we talk about other adjustments that are necessary to make our estimates compliant with the ESA 2010 standards.

#### 4.5.1 Adjustment to accrual basis

Recall that the accounts of ST, which are used as a fundamental input in our algorithm, contain values of budgetary items recorded on the cash basis. In other words, monthly transactions' values in the data set are constructed as a cumulation of cash flows realized during the month. Consequently, the baseline forecasting method yields an estimate of the end-of-year *cash* budget realization. However, **the general government balance should be represented on the accrual basis**, where transactions are recorded at the time-point when underlying economic activities take place. As a result, estimates of revenue and expenditure items need to be adjusted to account for this discrepancy.

For majority of the budgetary items, the accrual adjustment is not necessary, as the economic timing of transactions is identical to execution of cash payments. Differences between cash and

accrual notations requiring special treatment occur, most notably, for tax revenues, dividend income, interest expenditures and selected transactions with the EU budget. In what follows we review the basic principles of accrual notation for these variables. Detailed treatment is available in Part II of Eurostat (2016).

**The accrual forecast of tax revenues** is calculated jointly with the cash forecast within our tax revenue projection framework (see Section 4.4.1). The important concept used here is the "time-adjusted cash" method, where differences between the accrual time of tax receipts and the time of corresponding cash transfer are tax-specific and depend on average time difference between the effective tax cash receipts and underlying activities, transactions or other events. Note that the accrual adjustment does not concern all types of taxes. The real estate tax or the withholding tax are examples of taxes that have the accrual revenue levels equal to the levels of received cash payment.

The second revenue item that requires accrual adjustment is **the income received from dividends** paid by companies owned by the government. Based on the ESA 2010 principles, the revenue from dividend payments accrues to time at which a decision about dividend payout is made by the general assembly of a company. However, a corresponding cash transfer may be postponed and subsequently realized in a different fiscal year. Therefore, we use published minutes from general assemblies of relevant companies as well as additional information from the Ministry of Economy to obtain precise estimates of dividend revenue accruing to the current year.

On the expenditure side of the budget, an important item requiring accrual adjustments is **interest expenditures**. The rules of ESA 2010 require interest to be "recorded as accruing continuously over time on the amount of principal outstanding" (ESA 2010, 4.50). The adjustments correct for differences between the accrual valuation and the cash payments realized over time. We forecast these adjustments using detailed information on issued debt of the general government, which is published by the Debt and Liquidity Management Agency.

As a last example of the expenditure item subject to the accrual adjustment, we discuss **transfer to the EU budget**, which on the side of the EU general budget constitutes VAT and GNI-based source of financing. In recent years it has become a common practice to pay the last installment of this payment in January of the next year. Therefore, it is important to consider specifically these early-year payments when estimating the final accrual realization in the general government balance.

As a special case of accrual adjustment, **estimates for the output of research and development services need to be added to the budget**, since they are not forecasted by the cash-based benchmark method. Given a lack of information available on this matter during the year, we use values assumed in the approved budget and add them to relevant items of our budget forecast.

### 4.5.2 Consolidation

**Consolidation is a principle of accounting, which requires that all transactions and debtor-creditor relationships between units within a same sector are eliminated**. This rule allows us to obtain a more accurate view on a state and flows of the public sector relative to the economy. The accounting standard ESA 2010 requires that all transactions within the public sector are subtracted from respective revenue and expenditure items of the general government balance. A sole exception from this adjustment relates to social security contributions paid on behalf of certain groups from the state budget. This transaction is included both on the revenue side of the Social Insurance Agency and the health insurance companies and on the expenditure side of the state budget.

Cash transfers within the general government are recorded in the ST accounts, where they are sorted using designated sub-item codes of the ECBC classification system. There are individual codes used for subjects of the public sector that concern more sizeable transfers, such as municipalities or the National Highway Company. On the other hand, transactions related to subjects with smaller amounts are aggregated into a single ECBC code. **The detailed ECBC classification structure allows us to clearly identify transactions in underlying data that are realized within the general government and subtract them when calculating projections of the budget balance.** However, several issues have been observed relating to transferred amounts reported in the ST accounts, which, subsequently, make the consolidation process in our budget estimation less straightforward.

The first issue concerns **unequal amounts reported on the revenue and expenditure side of the budget for a single transfer**. Minor differences are commonplace due to reporting imprecisions and variation in a time of recording, yet for some of transfers this gap is very large. We consider reporting inaccuracies of transactions in the ST accounts as a main reason for this issue. Specifically, some of transactions are sorted incorrectly within the ECBC classification at sub-items not related to transfers within the public sector.

The second type of discrepancy occurs when **transferred amount is reported in the ST accounts using a ECBC code not corresponding to the relevant counterparty**. For example, a fraction of flows received from the state budget are sorted at the ECBC sub-item “transfers from other public subjects” instead of using the relevant ECBC code “transfers from the state budget”. This issue can be also attributed to inaccuracies in a process of data reporting to the ST accounts.

Finally, **transferred amounts may be reported with incorrect codes of the source classification**, indicating usage of the EU funds or co-financing instead of national resources and vice versa. This problem occurs typically on the side of subjects receiving payments related to the EU funds from the state budget, as they incorrectly consider such transfer to be financed from the national resources.

These discrepancies can be observed in the ST accounts for monthly observations as well as for the end-of-year values. Corrections for the needs of public sector reporting are realized ex-post by the Statistical Office in the process of compilation of the EDP notification data sets. Yet, within of our framework discrepancies present in the ST accounts affect forecasts calculated by the benchmark method, therefore **our estimates need to be adjusted contemporaneously for each forecast vintage during the year**.

We deal with issues described above by using **a systematic procedure to consolidate the public budget balance** within our forecast. Our approach consists of following steps:

1. We **identify all relevant transfers within the public sector**. A transfer is characterized by a pair of entities of the general government (a sender and a reciever) and corresponding codes of the ECBC classification and the source classification. The first list is formed based on transfers included in the approved budget and additional transactions are included when appearing in the monthly data.
2. We **set the projected values for outgoing and incoming transfers to be equal**. For each transfer, we select a value forecasted for either sending or receiving subject to determine a final estimate of transferred value. Subsequently, the estimated value for the non-selected subject is augmented to match with the final estimate. This step changes the revenue and expenditure sides of the budget in an asymmetric way, therefore the forecasted value of the budget balance may change.
3. We **consolidate transfers by subtracting them from both sides (revenue and expenditure) of the general government budget**. Since the values for outgoing and incoming transfers have been aligned in step 2, this subtraction does not affect the forecasted value of the budget balance.

### 4.5.3 Other ESA 2010 adjustments

We conclude this section by briefly discussing final steps that are realized in the process of forecast formation. These adjustments are used to fully align our projections with conventions arising from the ESA 2010 standards as well as to make an output of forecasting suitable for publication.

The most important adjustment is **a transformation of the forecasted budget into a structure corresponding to categories of ESA 2010**. Recall that our forecast is structured following classifications used in the ST accounts, namely by the ECBC system of main categories, categories, items and sub-items. Although there are some similarities between these two structures, as the level of categories in the ECBC classification is similar to the ESA 2010 categories, certain rearrangements are necessary for a correct fit. We use a conversion guide developed by the Statistical Office to obtain forecasted values of the ESA 2010 categories.

It is important to state that forecast transformation into the ESA 2010 structure requires more adjustments on top of the simple rearrangement described above. First, the principles of ESA 2010 require **subtracting EU funds for which the final beneficiary is a non-government unit**. This subtraction is realized symmetrically on the revenue and expenditure side of the budget. Second, **imputed social contributions paid by the government must be treated correctly**. This is done such that the estimated amounts of the expenditure item "Other social insurance benefits" (D.622) are imputed to the item "Employers' imputed social contribution" on both revenue and expenditure side of the budget (D.612REC and D.122PAY).

# 5 Communicating forecasted outcomes

In this section we present how **we utilize output from the forecasting framework** described above **to communicate fiscal risks to the public**. We use projected values for the general government balance to monitor short-run budgetary developments and to publicly report deviations of fiscal variables from the targets. In what follows, we describe our communication approach in more detail focusing on its two components. First, we introduce and describe **the concept of traffic light colors as an easily comprehensible way to communicate fiscal risks**. We complement this description by discussion of **end-of-year adjustments made by the government** and **their impact on our communication of projections**. Second, we describe **additional pieces of information characterizing the output of our forecast framework** that we use to complement the traffic lights indicator. In the meanwhile, we use specific outcomes for year 2018 to illustrate the above concepts.

## 5.1 Fiscal risk and traffic light colors

Recall that the outcome of our forecasting procedure is the forecast of the end-of-year budget outturn. **This estimate is typically different from a budget approved by the government.** Specifically, differences may be observed between forecasted and budgeted values for many revenue and expenditure items. **These discrepancies often result in deviation of a forecasted value of the budget balance from its fiscal target**. However, it may also be the case that deviations at the disaggregated level are in the opposite direction and therefore the projected balance is close to the target.

Once deviations from the targets are estimated, our objective is to communicate them publicly to signal whether current fiscal performance of the general government is on track to meet the objectives, or the **government will probably need to make adjustments** (including but not limited to legislative measures) **with possible welfare implications**.[17] This signal is

[17] In some situations, expected deviations from the budgeted balance per se may not be concerning for the government. This is the case when e.g. the government aims for targeted values of some other fiscal variables, or an unexpected economic downturn requires a counter-cyclical response of the fiscal policy.

represented by a color of the traffic light, where "**green**" represents **the low level of fiscal risk**, "**yellow**" stands for **the medium level of fiscal risk**, and "**red**" indicates **high risk** with the high likelihood of government needing to adopt consolidation measures. Using colors of the traffic lights to signal various levels of fiscal risk is a concept easily understandable to the public.

A crucial step when developing the concept of budgetary traffic lights is **to determine different levels of fiscal risk** (and thus colors of the traffic lights indicator) **based on magnitudes of deviations of our forecasts from the fiscal target**. This assignment needs to be straightforward and transparent, as we plan to communicate it monthly for every vintage of our projection. Unfortunately, **we cannot calculate the measure of forecast uncertainty given by standard econometric concepts**, such as confidence intervals, since we do not possess a time series of our forecasts of a sufficient length. Furthermore, our projections of budget outcomes are composed of a mixture of forecasts for distinct parts of the budget, where many of these estimates are calculated by heuristic or naïve methods without rigorous statistical properties.

Our approach within the scope of the budgetary traffic lights is **to attach levels of fiscal risk to magnitudes of forecasted deviations from the targets based on simple numerical thresholds**. These thresholds are expressed in percentages of GDP and are constant throughout a year. **We assign the value of 0.1% of GDP to the threshold for the medium level of fiscal risk and the value of 0.5% of GDP to the high-risk threshold** (simple characterization is presented in tab 2). If we forecast the budget balance at the level higher than or slightly below a fiscal target, then we communicate the low level of risk. The balance forecasted at a value below the target with a deviation less than 0.5% of GDP leads to an indication of the medium risk level. Finally, if the projected budget balance is less than the fiscal target and the difference is more than 0.5% of GDP, then we communicate the high level of risk.

*Tab 2: Determining colors of the traffic lights based on deviations of forecasts from the targets*

| Difference x between the forecasted budget balance and the target | Level of fiscal risk | Color of the budgetary traffic lights |
|---|---|---|
| x ≥ -0.1 % of GDP | low | GREEN |
| -0.1 % of GDP > x ≥ -0.5 % of GDP | medium | YELLOW |
| x < -0.5 % of GDP | high | RED |

The concept with fixed thresholds separating different levels of fiscal risk allows us to **easily communicate fiscal risk levels and link any month-to-month differences to changes in deviations of forecasted budget balances from the fiscal target**. On the other hand, the most important disadvantage is that fixed thresholds do not account for more information becoming available with new monthly data releases. We cannot quantify a robust link between

the number of months with reported data and degree of uncertainty of the forecast, since we are limited by short time horizons of our data.

Furthermore, **execution of the budget during the last months of a year is subject to substantial uncertainty due to adjustments realized by the government** in response to, among other factors, a state of the public finance in a current year as perceived by the government. These adjustments can be sizable and are determined by multitude of factors. We review some of them in the following section.

## 5.2 End-of-year fiscal adjustments

The government in Slovakia possesses various **tools to induce substantial changes to budget execution at the end of a year**, which are embedded within a legislative setup of the Slovak fiscal framework. These adjustments have an impact on the budget balance and therefore the government can use them to augment budget outturn. In what follows, we briefly describe two of such instruments in the Slovak public finance, namely postponement of investment and usage of budgetary reserves.

First, we describe how the government can impact the budget outturn through **postponement of investment**. Slovak budgetary rules allow ministries and other chapters of the state budget to transfer resources budgeted for capital expenditures across years. The investment projects can be put on hold in a year when they belong to an approved budget and realized later in any of two subsequent years.

This rule provides flexibility to realization of government investment projects and helps to avoid problems in case of tight deadlines and unexpected complications. However, it also impacts the budget, as **delayed investment decreases the expenditure level (and improves the budget balance) relative to fiscal target in a current year, while also having an opposite effect in a year of realization**. This phenomenon has been common in recent years, as transferred volumes of investment resources have been substantial (see figure 8).

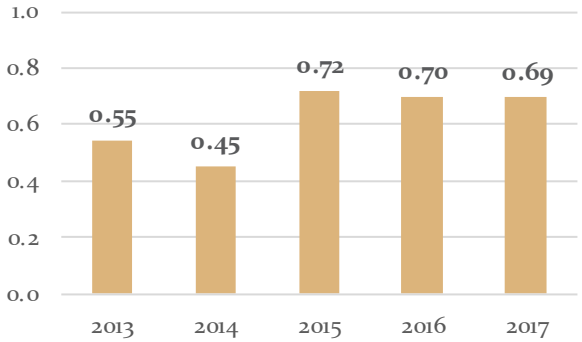
Decision of the government whether to postpone an investment project, or which part of a project to postpone, is project-specific and subject to information known only by the corresponding entities. Therefore, it is very difficult to incorporate these transfers into our forecasting framework. We form our projections based on historical patterns as well as information becoming available during a year. Yet we acknowledge that **the government space to maneuver during last two months of a year is large and therefore differences between our forecasts and the final outturn in this area can be significant**.

The second tool that the government can use to change the budget outturn is **usage of budgetary reserves**. Each year, the budget contains several reserves, which can be used either

to cover costs arising from unexpected events or specific fiscal risks identified by the government. If these unexpected events do not materialize, **the budgetary rules allow the government to decide whether corresponding reserves remains intact or resources are used to finances other expenditures**.[18]

*Figure 8 Postponed capital expenditures planned for a given year in the state budget (in % of GDP)*


*Figure 9 Reserves in the budget excluding wages (in % of GDP)*




*Notes: The figure on the LHS displays levels of resources budgeted for capital expenditures by the state budget that were transferred into subsequent years. The figure on the RHS shows volumes of budgetary reserves within the state budget excluding a reserve for increase of public wages.*

The total level of budgetary reserves has been substantial in recent years (see figure 9). At the same time, the government has employed different approaches to tackle the issue of usage of these resources. Given this variability, **resources reallocated from reserves and spent at other expenditure items at the end of a current year can potentially shift final outturn of the budget balance relative to our forecasts**.

Our examples of the end-of-year fiscal adjustments show that **the forecast uncertainty remains sizable even at the year-end**. **Therefore, we view fixed thresholds as an appropriate way to differentiate levels of the fiscal risk**. Given a large number and idiosyncratic nature of these adjustments we are not able to incorporate them thoroughly into our projections. Our approach is to communicate our results at the highest level of transparency, such that any deviations of our forecasts from the official values are clearly quantified and explained both ex-ante and ex-post.

## 5.3 Complementary parts of communication

CBR communicates its assessment of a short-term fiscal risk monthly using the estimated budget outcome updated to include most recent information. **The main element** of published reports is **the risk level expressed as a deviation of the forecast from the target and represented by a color of the traffic light**. Each month we publish current values of expected deviations in

[18] In principle, the government can decide to use resources from any reserve to finance expenditures with other than the initial purpose.

revenues, expenditures and the balance, together with an overview of deviations estimated in previous months of the current year (see an example in **Error! Reference source not found.**).

*Figure 10 Deviations in CBR estimate of the GG balance in 2018 from the budget (in % of GDP)*

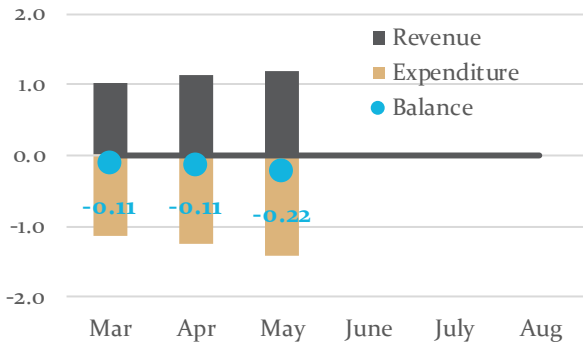
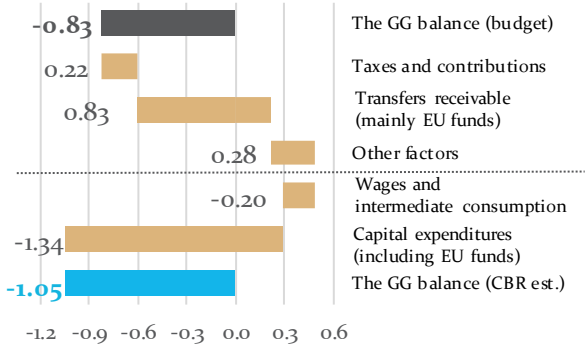



*Figure 11 Contributions of ESA 2010 categories to the forecasted deviation of the GG balance in 2018 (forecast May 2018, in % of GDP)*




*Notes: The figures represent the March 2018 version of the CBR's forecast of the 2018 GG balance. The figure on the LHS displays monthly projections for the budget revenue, expenditure and balance. The figure on the RHS shows a decomposition of the expected deviation from the target into broad ESA 2010 categories.*

Furthermore, we report a monthly time-pattern of these differences to provide a view on the short-term fiscal developments. This is complemented by **the estimated contributions of individual ESA 2010 categories to the total expected deviation** forecasted for a given months**.** For broad ESA 2010 categories we show a difference between our projection and the value from the approved budget (see **Error! Reference source not found.**).

The headline outcomes presented above are complemented with additional details characterizing our forecast. First, we present graphically **a decomposition of the expected deviation for the budget balance into factors representing distinct areas of the general government** (see an example in figure 12**Error! Reference source not found.**). A detailed structure of deviations of various revenue and expenditure items from their respective budgeted values enhances understanding of our target audience with respect to determinants playing role in the declared level of fiscal risk. Second, we decompose the total expected deviation into **contributions of individual entities of the general government and report ones with the most pronounced role** (see an example in figure 13**Error! Reference source not found.**).

Important part of our report is a **brief discussion of main factors contributing to a forecasted deviation**. We aim to highlight determinants of differences between our forecast and the fiscal target, yet we also discuss the most important factors driving month-to-month changes in our projections. Furthermore, in reports that are published following releases of the official government forecasts we focus on comparison of our values with those of the

government.[19] Ultimately, our aim is to provide **brief yet comprehensive perspective on current developments of the public finance in Slovakia**.

*Figure 12: Contributions of selected factors to the forecasted deviation of the GG balance in 2018 (forecast May 2018, in % of GDP)*

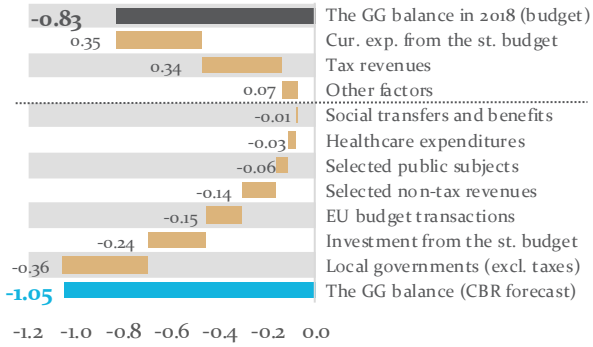



*Figure 13: Deviations for CBR estimate of the GG balance in 2018 from the budget (forecast May 2018, in million Euro)*

| Subject | Mar | Apr | May |
|---|---|---|---|
| State Budget | 21 | 25 | 74 |
| Social Insurance Company | 43 | -52 | -39 |
| Health Insurance Companies | 52 | 51 | 56 |
| Municipalities | -208 | -60 | -259 |
| Self-governing Regions | -14 | -42 | -61 |
| Emergency Oil Stock Agency | -13 | -18 | -19 |
| National Nuclear Fund | 8 | -13 | -22 |
| National Motorway Company | 51 | 12 | 17 |
| Environmental fund | -98 | -99 | -97 |
| Other subjects | 61 | 92 | 148 |
| **Total deviation** | **-96** | **-103** | **-202** |

*Notes: The figures represent the March 2018 version of the CBR's forecast of the 2018 GG balance. The figure on the LHS displays a decomposition of the expected deviation from the target into selected areas of the general government. The figure on the RHS shows contributions of selected public subjects in a tabular form.*

## 6 Conclusions and further work

In this paper, we presented the framework that the CBR uses to monitor budgetary trends in the short run. We described the methodology used to forecast developments in the general government balance in a current year using evidence from multiple data sources. Projected output was calculated using the baseline method and expert assessments for selected components of the public sector. Subsequently, we discussed how the output from the forecasting framework can be used to assess and communicate short-term fiscal risks with a help of simple signaling device represented by colors of the traffic lights.

We see the following three areas as natural next steps in our further work with the Budgetary Traffic Lights framework:

The first area concerns **adding more advanced forecasting methods into our methodology**. Recall that the main objective of our design of methodology was to construct a conceptual framework to treat the extensive structure of the general government's budget. Specifically, we focused on developing a complex procedure containing all the necessary steps rather than on selecting the optimal approach for every single treatment, especially for the forecasting method, where we used a simple heuristic approach. Therefore, we view as an important next step to

[19] Recall that the Ministry of Finance publishes its official forecast of budget execution in the Stability Programme and the Draft Budgetary Plan.

**introduce more rigorous forecasting techniques and to design a suitable selection mechanism to facilitate our estimates' precision**.

The second area deals with **the formalization of tools used in expert assessments**. The outcomes for several important components of the budget are forecasted by expert assessments. These estimations are calculated using various approaches, which currently lack a proper formalization. Transparency of the Budgetary Traffic Lights framework would benefit significantly from **distinct reports or working papers that describe methods used in expert assessment together with brief assessments of their historical performance**.

The third area for future work concerns **expanding a monitoring process for the public finances over the medium-term horizon**. The CBR currently uses the Budgetary Traffic Lights to monitor and evaluate trends in the public finances occurring in the short term (for a current year). However, it would be useful to provide such a thorough assessment for the medium-term horizon (for 2-3 subsequent years), especially given the time scope of published fiscal targets within the medium-term budgetary framework (in versions of the Stability Programme or the Draft Budgetary Plan). Therefore, we plan to soon expand our framework to **forecast developments in the government budget over three years time-horizon following the current year**.

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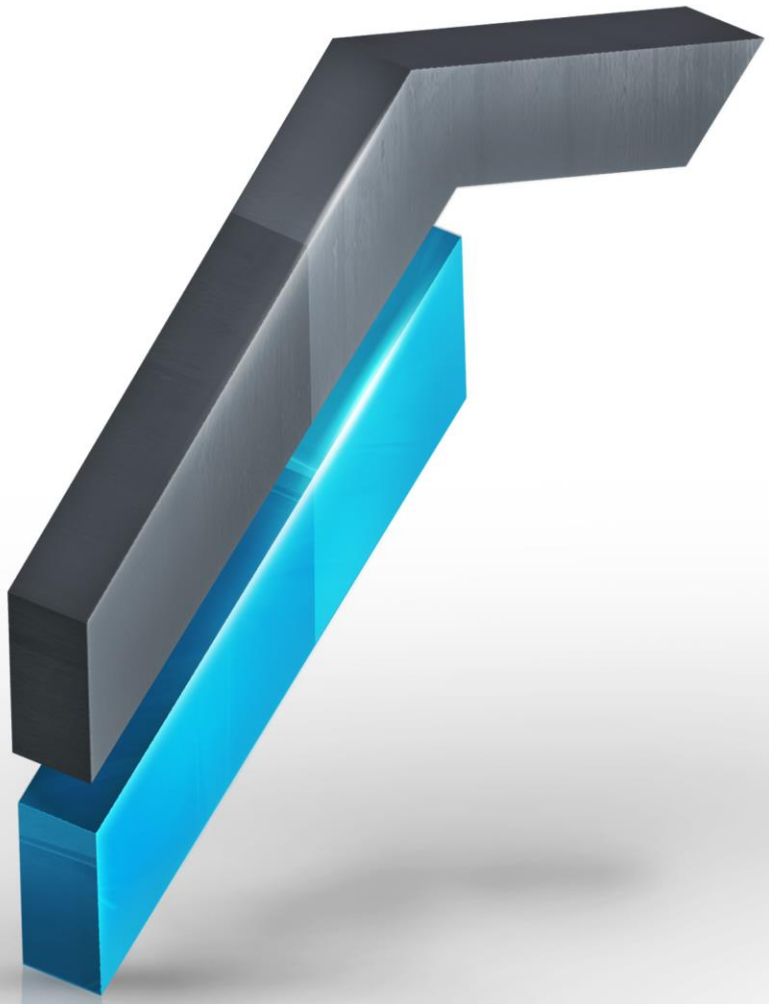

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