PRB | Performance review body of the single european sky

Annex II
Guidelines for calculating the baseline values

Guidelines document for the estimation of the baseline values for RP3 Performance Plan preparation

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1. Introduction

1 The baseline values at charging zone level are defined in in Article 10(2) of the Commission Implementing Regulation (EU) 2019/317 of 11 February 2019 (below referred to as "new Implementing Regulation") as follows:

"The performance plans shall be drawn up in accordance with the template set out in Annex II and shall include:

(a) binding national performance targets or binding FAB performance targets, set on the basis of the key performance indicators referred to in Article 8(2), including a 'baseline value for determined costs' and a 'baseline value for the determined unit cost' for each charging zone, for the purpose of setting targets in the key performance area of cost-efficiency. Those baseline values shall be calculated in respect to the year preceding the start of the reference period.

The baseline value for determined costs shall be estimated by using the actual costs available for the preceding reference period and shall be adjusted to take account of latest available cost estimates, traffic variations and their relation to costs.

The baseline value for the determined unit costs shall be derived by dividing the baseline value for the determined costs with the latest available traffic forecast expressed in service units for the year preceding the start of the reference period."

2 The new Implementing Regulation specifies that baseline values need i) to be derived from the actual costs available for the **preceding reference period** and ii) to be adjusted **to take into account traffic variation and their relation to costs**.

3 This document presents technical guidelines for Member States to estimate their respective RP3 cost efficiency baseline values at local level.

4 The application of the methodology proposed in this guidelines document **is without prejudice to the approval of a Performance Plan by the European Commission**.

5 Furthermore, it is important to note that this document only provides guidelines for **short-term forecasts** (i.e. the baseline value for determined costs).

6 Section 2 describes the input data required for the calculations. The data can be used as an input for the methodology described in Section 3.

7 Section 4 presents a mathematical representation of the methodology proposed.

2. Input data

8 The forecasting technique described in the next section makes use of historical cost data from RP2 to predict cost evolutions until the end of 2019 (i.e. the baseline value as defined in the new Implementing Regulation).

9 Actual cost data, as reported in the Reporting Tables, need to be used. This approach would limit the forecasting error and avoid any unjustified baseline estimation.

10 Cost data must be expressed in **€$_{2017}$**. According to the new Implementing Regulation, depreciation costs, cost of capital and costs incurred for competent authorities according to Article 22(1) should not be subject to inflation adjustments over the duration of RP3.

11 Only ***en route* cost data at charging zone level** need to be used.

12 The baseline value for *en route* total cost is determined as the sum of individual predictions of cost items per charging zone.

13 Cost items are defined in the new Implementing Regulation as **staff costs**, **non-staff operating costs**, **depreciation costs**, **cost of capital**, and **exceptional items**. Costs of exempted Visual Flight Rules (VFR) flights need to be subtracted from the abovementioned categories.

14 The **PRB recommends excluding the exceptional items** from the forecast. Due to the high volatility of this cost item, the predictions may result biased. In addition, exceptional items are normally costs, which have been incurred but which are not planned.

15 The granularity of the cost data provided for the Reporting Tables is sufficient to successfully perform the suggested calculations.

16 The **air traffic data** used for these forecasts are the number of ***en route* service units** as outlined in the STATFOR forecast. **The PRB recommends the use of the latest available STATFOR forecast base scenario**.

3. Forecasting methodology

17 In order to forecast the baseline value for total costs, several techniques are available: moving average, linear approximation and linear regression.

18 As required by the new Implementing Regulation, **all RP2 actual data to-date** need to be used in the estimation method.

19 Generally, forecasting can be performed for each actual cost item or on the overall actual costs.

20 The **PRB recommends the individual estimation of each cost item**. This approach allows for the analysis of the trends for specific cost items.

3.1 Moving average

21 Moving average estimation is typically applied for short-term quantitative time series analyses. This approach smooths short-term fluctuations while capturing longer term evolutions.

22 The **main advantage** of this approach is the easy implementation/calculation.

23 The **main disadvantage** is that this approach is univariate. In other words, the moving average does not directly consider traffic (or any other variable) while estimating cost evolutions.

3.2 Linear approximation

24 The linear approximation approach describes the change of a variable in response to a change of another variable.

25 Therefore, it is possible to express the change in costs relative to a change in traffic.

26 In this approach, the linear approximation is determined based on the time horizon. The factor reflects the evolution of a cost item between the start and end point of the timeframe, given the air traffic evolution (expressed in service units) during the same timeframe.

27 The **main advantage** of this approach is the possibility of relating the evolutions of costs with respect to the evolution of traffic.

28 The **main disadvantage** of this approach is the computation. The relation between costs and traffic is computed only using the starting and the ending value of the timeframe selected (e.g. the first and the last year of RP2). Therefore, the linear approximation does not consider any intermediate evolution. Moreover, the forecasts are not robust to a change in the starting and/or ending values and the short timeframe provided by the new Implementing Regulation might hinder accuracy.

3.3 Linear regression

29 The linear regression approach estimates a function describing the relation between two (or more) variables.

30 A linear function represents the relation between a dependent variable (Y) and an explanatory variable (X). The relation is then described by two model parameters A ("the slope") and B ("the intercept"): **Y = A X + B**.

31 In this context, the actual cost is the dependent variable while the air traffic (expressed in service units) is the explanatory variable.

32 The **main advantage** of this approach is the possibility to account for the detailed (i.e. yearly) evolution of costs with respect to the evolution of air traffic considering all years of the timeframe selected. More advanced models may include several explanatory variables to improve the forecasting power.

33 The **main disadvantage** of this approach is the relative computational complexity. Another shortcoming is the possible validity of the estimations. Usually, linear regression needs a large number of observations to increase the prediction accuracy. However, given the short-term forecasting needed for this exercise, the linear regression approach may be considered as a reliable approach.

34 The most straightforward way to implement this technique is to use commercial software. For example, Microsoft's Excel has built-in functions to easily determine the parameters of the function (i.e. the slope A and the intercept B).

35 A numerical example and the relative Excel functions are provided in Section 4.

3.4 *Comparing the three methodologies*

36 In the moving average approach sudden variations from the past are smoothed. However, if future traffic diverges from past trends, the costs estimated by this methodology will not follow the air traffic evolution.

37 Linear approximation and regression account for the traffic evolution and its link with costs. These two methodologies can forecast changes in costs due to future traffic evolutions.

38 The difference between the linear approximation and the standard linear regression is that the linear approximation only looks at the start and end point of the timeframe, while the standard linear regression also considers intermediate data points. Therefore, the latter approach accounts for more information, while the former does not consider them.

39 **The PRB recommends the estimation of the baseline value using a standard linear regression approach**.

4. Numerical forecasting examples

40 In this section, the standard linear regression approach is illustrated by a numerical example.

41 For illustrative purpose, we assume that a hypothetical charging zone is showing historical actual costs, historical service units, and forecasted service units as in Table 1.

2015	2016	2017	2018	2019
Historical actual costs [M €2017]			To be forecasted	
112	130	125	?	?
Historical air traffic [M SU]			Traffic forecast applied	
11	12	13.5	14	15

Table 1: Historical data and traffic forecasts for a hypothetical charging zone (numerical example)

42 For the sake of simplicity, in the numerical example we forecast the 2019 total costs using the actual total costs (i.e. the aggregation of all cost items of the new Implementing Regulation). However, it is important to remark that this exercise should be done per cost item. Forecasting each cost item would provide more information on specific cost item trends.

43 In order to estimate a linear regression, it is possible to make use of the Excel functions “SLOPE” and “INTERCEPT”.

44 For a three-year time horizon, the linear regression will be based upon 2017, 2016 and 2015 historical costs and traffic data, as well as the 2019 traffic forecast.

45 The PRB first computes the slope and the intercept of the function:

$$\text{Slope (A)} = SLOPE(\{112{,}130{,}125\};\{11{,}12{,}13.5\}) = 4.5$$
$$\text{Intercept (B)} = INTERCEPT(\{112{,}130{,}125\};\{11{,}12{,}13.5\}) = 67.3$$

46 The estimated function can be now used to forecast the 2019 costs:

$$Estimated\ 2019\ costs\ = A * 2019\ traffic + B = 4.5 * 15 + 67.3 = \mathbf{135.2\ M€2017}$$