NOTES ON SEASONAL AND CALENDAR ADJUSTMENT (updated on 22/07/2021)

Quarterly government finance statistics are reported to Eurostat in the form of non-seasonally adjusted (raw) figures. However, a certain number of the reported series contain seasonal patterns (partly explained by the link with the seasonality of economic activity and by the budgetary planning and accounting practices of national governments), which make it difficult to carry out a direct meaningful cross-country and time series analysis. The same is true for GDP, which reflects the seasonal pattern of all economic activities in the economy.

To overcome this difficulty and thus to gain a better understanding of trends in addition to the non-seasonally adjusted data, seasonally adjusted data is presented for the EU and EA and selected countries. The seasonal adjustment for total revenue and total expenditure is done using an indirect procedure (at country level using Tramo-Seats on JDemetra).

Where available, National Statistical Institutes own estimates are used as input for the aggregates, which are supplied to Eurostat on a gentlemen's agreement basis. Some country level estimates as well as data for the EU aggregates are published on Eurobase. These estimates are supplemented by Eurostat's own estimates for those countries, which do not yet supply their own estimate. This data is labelled confidential and not published.

Net lending (+)/ net borrowing (-) is derived indirectly from the accounting identity:

Net lending (+)/ net borrowing (-) = total revenue - total expenditure.

As concerns GDP, no independent estimate is derived.

EU AGGREGATES:

Estimated indirectly at Eurostat on the basis of Member States' data a far as this is supplied nationally and complemented by Eurostat's own estimates, where no nationally supplied data is available. Tramo-Seats run on Demetra+ is used in all cases.

For the following countries, the estimates are produced by the respective National Statistical Institute, which all follow the "ESS guidelines on seasonal adjustment":

Belgium: The seasonally adjusted series are computed following an indirect approach. The components of the revenue and of the expenditure of the General Government are seasonally adjusted by means of "Tramo-Seats", taking into account the presence of possible outliers and calendar effects. The model of each component (>20) has been individually validated (no automatic modelling). The absence of residual seasonality after aggregation has been checked. The data are benchmarked on annual totals of the non-adjusted series. The annual benchmarking is computed on each component by means of a multiplicative Denton procedure.

Bulgaria: Tramo-Seats on Demetra +. Total expenditure: no trading days effects, no Easter effect, log-transformation, ARIMA model [(0,0,1)(1,1,1)], outliers: AO[2007-IV], TC[2008-IV], AO[2014-IV], LS[2016-I]. Total revenue: no trading days effects, no Easter effect, log-transformation, ARIMA model [(3,0,0)(0,0,0)], outliers LS[I-2007], LS[II-2009], AO[II-2001].

Czechia: Tramo-Seats on Demetra +. Total expenditure: No trading days effects, no Easter effect, ARIMA model [(0,1,1)(0,1,1)], outliers: AO[2003-I], AO[2003-III], AO[2012-IV], TC[2001-IV], LS [2016-I]. Total revenue: No trading days effects, no Easter effect, ARIMA model [(0,1,1)(0,1,1)], outliers: AO[2003-I].

Denmark: X12-ARIMA. Total expenditure: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(1,1,0)(1,0,0)], outliers: AO[2005-IV], TC[2011-I]. Total revenue: Log-transformation, trading days effects, no Easter effect, ARIMA model [(0,1,0)(0,1,1)], outliers: TC[2009-II], AO[2008-II], TC[2009-II], LS[2015-I], [2004-I].

Germany: X13-ARIMA. Total expenditure: Log-transformation, no trading day effects, ARIMA model [(0,1,1) (0,1,1)], outliers AO [1995-I, 1995-III, 2010-III]. Total revenue: Log-transformation, no trading day effects, ARIMA model [(0,1,0) (0,1,1)], no outliers.

Estonia: Tramo-Seats on Demetra +. The seasonal adjustment of all time series is done with TRAMO/SEATS using JDemetra+ software. For TE and TR no calendar adjustment has been added as it does not have a notable impact on the results. According to ESS guidelines there is also no temporal consistency forced on the time series in order to provide a more purely seasonally adjusted time series for users.

Ireland: JDemetra+ X13 RSA 4c method. Ireland specific calendar. Total revenue: Log-transformation, ARIMA Model (2,1,0)(0,1,0), Outlier AO (III-2002), Total expenditure: Log-transformation, ARIMA Model (0,1,1)(0,1,1), Outliers detected LS (I-2011), AO (III-2011), AO (I-2010), LS (III-2010), LS (II-2020), TC (IV-2009). General Government Surplus/Deficit using indirect approach.

Spain: For P3, OTE, OTR and B9, the seasonally adjusted series are computed following an indirect approach. The components are seasonally adjusted using Tramo-Seats on JDemetra+ 2.2.2, taking into account the presence of possible outliers and calendar effects. The model of each component has been individually validated (no automatic modelling). The absence of residual seasonality after aggregation has been checked. The data are benchmarked on annual totals of the non-adjusted series. For P51g:

series has been log-transformed, no mean effects, ARIMA model [(0,1,0)(0,1,1)], no calendar effects, 6 pre-specified outliers: LS (I-2016),LS (III-2012),LS (IV-2014),AO (III-2015),AO (IV-2007),AO (I-2020).

France: Seasonally adjusted data is transmitted. Working day adjustment is also done when relevant. An indirect method is used. Seasonal adjustment is done using X-12-ARIMA. For more information, you can read INSEE's methodology (starting on page 21) at the following link (the document is available in English and French): https://www.insee.fr/en/information/2579410.

Latvia: Tramo-Seats on JDemetra+ (version 2.0.0). No trading day effect, national calendar adjusted. Total expenditure: Log-transformation, ARIMA model [(0,1,1)(0,1,1)], 2 pre-specified outliers: AO[2006-IV], AO[2020-II]. Total revenue: Log-transformation, ARIMA model [(0,1,1)(0,1,1)], pre-specified outlier: AO[2020-II].

Lithuania: Tramo-Seats on Demetra+. Total expenditure: Log-transformation, no Easter effect, ARIMA[(0,1,1)(0,1,1)], outlier AO[2011-IV]. Total revenue: Log-transpormation, no Easter effect, ARIMA[(0,1,1)(0,1,1)], no outliers.

Luxembourg: All series are seasonally and calendar adjusted with automatic outlier detection and correction. No benchmarking or other adjustments are made. The method used is non-parametric X13 RSA5c with the Luxembourgish calendar. The software used is JDemetra+ (v2.2.2).

Hungary: JDemetra+ TramoSeats method. Hungarian specific calendar is used. Working day, Easter and leap year effects are tested. Total revenue: Log-transformation, no trading day effects, no Easter effect, ARIMA model [(1,1,0)(0,1,1)], 1 predefined outlier: AO (2015-IV). Total expenditure: Log-transformation, no trading day effects, no Easter effect, ARIMA model [(2,1,0)(1,0,0)].

Malta: Total revenue: Tramo-Seats on JDemetra+ 2.2.2, Series has been log-transformed, No trading days effects, No Easter effects, ARIMA model [(0,1,1)(0,1,0)], 3 pre-specified outliers: AO(III-2000), AO(IV-2000), TC (I-2020). Total expenditure: Tramo-Seats on JDemetra+ 2.2.2, Series has been log-transformed, No trading days effects, No Easter effects, ARIMA model [(0,1,1)(0,1,0)], 2 pre-specified outliers: AO(IV-2003), TC (I-2008).

The Netherlands: X13-ARIMA on JDemetra+. Total revenue: Log-transformation, no trading day effects, no Easter effect, ARIMA model [(1,0,1)(1,1,0)], outlier: LS [2009-I], LS [2020-I], LS [2020-II]. Total expenditure: Log-transformation, no trading day effects, no Easter effect, ARIMA model [(0,1,0)(0,1,1)], outlier: AO [2009-II], AO [2020-I], AO [2020-II].

Austria: Tramo-Seats on Demetra +. Total expenditure: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(0,0,0)(0,1,1)], 10 pre-specified outliers: [2004-II], [2004-IV], [2009-IV], [2014-IV], [2015-III], [2020-I], [2020-II], [2020-III], [2020-IV], [2021-I]. Total revenue: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(0,0,0)(0,1,1)], 5 pre-specified outliers: LS[2009-II], LS[2016-I], AO[2020-II], AO[2020-III], AO[2020-IV], AO[2021-I].

Poland: Tramo-Seats on JDemetra +. Direct method used. Concurrent adjustment for Q1 each year, current adjustment Q2, Q3, Q4 (model revised once a year). Calendar effects adjustment used. Working days with leap year effect (2 regressors) and Easter effect tested for each series - only significant effects used in final specification. Automatic model selection with additional non-automatic verification of problematic cases. Total expenditure: P.2 - log transformation; no calendar effect, ARIMA model [(0,0,0)(1,1,0)], AO(2010-III); P.5 - log transformation; no calendar effect, ARIMA model [(0,1,1)(0,1,1)], outliers: AO(2000-IV), LS (2001-I), TC (2016-I); D.1 - log transformation; no calendar effect, ARIMA model [(1,0,0)(0,1,0)], outliers: AO(2007-I), AO(2009-II), AO(2013-IV); D.6M - log transformation; no calendar effect, ARIMA model [(0,1,1)(0,1,1)], outliers: AO(2007-IV), LS(2004-IV), AO(2020-II); D.4 - log transformation; no calendar effect, ARIMA model [(0,0,0)(0,1,1)], outliers: LS(2013-III), LS(2008-IV); P.29+D.3+… - log transformation, no calendar effect, ARIMA model [(0,1,1), (0,1,0)], outlier: TC[2004-I], AO(2020-II), AO(2020-III), AO(2020-IV); Total revenue: D.2 - log transformation; no calendar effect, ARIMA model [(0,1,1)(0,1,0)], outliers: AO(2004-II), TC(2009-I), AO(2020-I); D.4 – no-log transformation; no calendar effect, ARIMA model [(0,0,0)(1,0,0)], outlier: TC(2012-II), AO(2020-II); D.5 - log transformation; no calendar effect, ARIMA model [(1,0,0)(0,1,0)], outlier: AO(2020-I), AO(2020-II); D.61 - log transformation; no calendar effect, ARIMA model [(0,1,1)(0,1,1)], outliers: TC(2008-IV), AO(2007-IV), AO(2011-III); P.1+D.7+D9 - log transformation; no calendar effect, ARIMA model [(0,1,1)(0,1,1)], outliers: AO(2013-IV), AO(2009-IV), AO(2012-IV).

Portugal: X13-ARIMA on Demetra+. A manual pre-treatment is performed by identifying and deducting one-off measures. Additional pre-treatment is applied for outlier detection and correction. The seasonal adjustment is applied to total revenue, expenditure except compensation of employees and compensation of employees. Net lending (+)/net borrowing (-) is presented as a result of the difference between the series seasonal adjusted of total revenue and total expenditure. Total expenditure results of the sum of seasonal adjustment series of total expenditure (except compensation of employees) with compensation of employees. Total Expenditure (except compensation of employees): X-13-ARIMA; log-transformation; no trading days effects; no Easter effect; ARIMA Model [(0,1,1)(0,1,1)]; Outliers: AO (IV-2002), TC (III-2002) and SO IV [2012-2020] (user defined variable); Compensation of employees: TRAMO-SEATS; log-transformation; no trading days effects; no Easter effect; ARIMA Model [(0,1,1)(0,1,1)]; Outliers: TC (III-2005), TC (I-2013), LS (I-2011), LS (I-2012), AO (I-2001), AO (III-2014), SO II [2012-2013](user defined variable) and SO IV [2012 -2017](user defined variable);Total Revenue: X-13-ARIMA; log-transformation; no trading days effects; no Easter effect; ARIMA Model [(1,0,1)(1,1,0)]; Outliers: AO (II-2020), AO (II-2009) and SO III [1999-2008] (user defined variable).

Romania: Tramo-Seats on Demetra+. P.51g series was not log-transformed and the model used was automatic Arima model. Total expenditure was log transformed and the model used was automatic Arima model. Total revenues was log transformed and

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the model used was automatic Arima model. B.9 is derived indirectly by the difference between seasonally adjusted series of total revenue and total expenditure.

Slovenia: Total revenue: Log transformation, no trading days effects, no Easter effect; 3 pre-specified outliers: LS Q1/2009, LS Q1/2020, AO Q1/2012; ARIMA (0,1,1)(0,1,1). Total expenditure: Log transformation, no trading days effects, no Easter effect; 7 pre-specified outliers: AO Q2/2020, AO Q2/2012, AO Q4/2014, AO Q1/2013, AO Q4/2013, AO Q1/2001, TC Q1/2011; 1 detected outlier: LS Q4/2020; ARIMA (0,2,1)(0,1,1). Gross fixed capital formation: Log transformation, trading days effects (1 variable), no Easter effect; 5 pre-specified outliers: LS Q1/2016, LS Q1/2015, AO Q4/2019, LS Q1/2011, TC Q1/2017; ARIMA (0,1,1)(0,1,1). Final consumption expenditure (P3): Log transformation, no trading days effects, no Easter effect; 2 pre-specified outliers: TC (IV-2008), TC (I-2007) ARIMA (0,1,0) (0,1,1).

Slovakia: Tramo-Seats on JDemetra +. Total expenditure: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(0,1,1)(0,1,1)], 3 pre-specified outliers: LS[2000-IV], AO[2002-IV], AO[2015-IV]. Total revenue: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(0,1,1)(0,1,1)], 5 pre-specified outliers: LS[2001-III], AO[2015-IV], AO[2020-II], AO[2020-III], AO[2020-IV].

Finland: The seasonally adjusted series are computed following an indirect approach. The components of the revenue and of the expenditure of the General Government are seasonally adjusted by Tramo-Seats / JDemetra+ 2.0.0, taking into account the presence of possible outliers and calendar effects. The data are benchmarked on annual totals of the non-adjusted series. The annual benchmarking is computed on each component by Denton procedure. After accrual corrections, outliers were detected in subsidies (D3), D62, D7.

Sweden: Tramo-Seats on JDemetra. Total expenditure: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(0,1,2)(0,1,1)], 2 pre-specified outliers: AO[1998-III], AO[2010-IV]. Total revenue: Log-transformation, no trading days effects, no Easter effect, ARIMA model [(1,0,0)(0,1,0)], 2 pre-specified outliers: AO[2014-IV], AO[2020-II], one detected outlier TC[II-2020].

Switzerland: The data reported is trend-cycle data. A Denton-Cholette method is used to temporally disaggregate annual data. The quarterly data is extrapolated using smoothed indicators.