



## THE AWM DATABASE<sup>1</sup>

This note documents the 17<sup>th</sup> update of the Area-wide Model (AWM) database<sup>2</sup>. This update, compared to the previous one carried out in 2016, extends the database to 2016Q4. As in previous versions, it has been constructed using both euro area data reported by the ECB or Eurostat, where available. It has then been backdated using the numbers of the previous version of the database (in general history pre-1996 has been frozen since the 5<sup>th</sup> update).

The coverage of fiscal variables is relatively limited<sup>3</sup>. Users interested in fiscal issues, should refer to the euro area fiscal database<sup>4</sup>, which provides a very rich and more consistent framework for the fiscal series.

The AWM database covers a wide range of quarterly euro area macroeconomic time-series. The updated database starts for most variables in 1970Q1 and is now available until 2016Q4. This note elaborates on the methodology and procedures used to update the Area-wide Model database. The first section draws on previous versions of the documentation and briefly explains the sources and methodology to build the historical data. The second section explains how the data for earlier periods are re-scaled to bring the figures in line with recent euro area aggregate data. The subsequent sections list the units and seasonal adjustment of the series, elaborates on the main changes with respect to the previous version of the database and gives a tentative timetable for the next update. The document closes with a summary and an appendix with the codification of the database.

### 1 HISTORICAL DATA: SOURCES AND METHODOLOGY<sup>5</sup>

As in the previous version of the database, the historical data have been frozen and rescaled to the new levels given by the recent history.

The historical data are based on the aggregation of available country information when the original AWM database was compiled<sup>6</sup>. The main source for the country information is Eurostat, complemented by the OECD National Accounts, the OECD Main economic indicators, the BIS and the AMECO databases.

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<sup>1</sup> For questions on the construction of the database please email: [AWMdatabase@ecb.europa.eu](mailto:AWMdatabase@ecb.europa.eu). Users should be aware that this is an update of the database provided with the ECB working paper No. 42, undertaken by ECB staff and does not represent in any way an official ECB data source. In this sense it should be viewed as an effort to gather and process all the available information in order to cover the gaps in the specific statistical needs to model the euro area.

The cut-off date for this update is 28 July 2017.

<sup>2</sup> For a description of the model see ECB working paper No. 42: 'An Area-wide Model (AWM) for the euro area' by Gabriel Fagan, Jérôme Henry and Ricardo Mestre (January 2001).

<sup>3</sup> The only fiscal variables available are real government consumption (GCR), government consumption deflator (GCD) and indirect taxes net of subsidies (TIN), the data after 1995Q1 reflects the figures from the ESA2010 database while the numbers before 1995Q1 are related to the frozen information from the 5<sup>th</sup> update of the AWM database. These series have been kept in the AWM database dataset for consistency reasons (in terms of methodology) with the rest of the series.

<sup>4</sup> Fiscal dataset constructed following: Joan Paredes, Diego J. Pedregal, Javier J. Pérez, Fiscal policy analysis in the euro area: Expanding the toolkit, *Journal of Policy Modeling*, Available online 28 July 2014, ISSN 0161-8938, <http://dx.doi.org/10.1016/j.jpolmod.2014.07.003>. For questions on the fiscal database please email: [euro\\_area.fiscal\\_database@ecb.europa.eu](mailto:euro_area.fiscal_database@ecb.europa.eu)

<sup>5</sup> For a more detailed description of the compilation of the historical data, please refer to the previous version of the documentation.

The method of aggregation used for most variables is the so called “Index method”<sup>7</sup>. The log-level index for any series X is defined as follows:

$$\ln X_z = \sum_z w_i \ln X_i$$

where  $w_i$  is the weight of  $X_i$  in the aggregate  $X_z$ . This method is used for both the nominal and real national accounts variables. The deflators are subsequently derived. This method is also used for GDP income variables (e.g. compensation of employees and disposable income) as well as for HICP and components.

For some other variables, for example ratios, the aggregate is simply calculated as a weighted sum of the variables (without expressing them in logarithms). Finally, there are some series that are just summed, e.g. employment and unemployment.

The weights used in aggregating most of the individual country series are constant GDP at market prices (PPP) for the euro area for 1995. If not all countries are available then the weights are re-scaled from the original weights. For HICP variables, 1995 HICP weights are used.

When only annual data were available with partly missing quarterly data, the annual figures were interpolated into quarterly observations using the available quarterly data as an indicator, following the Chow-Lin procedure, implemented as a Kalman filter. When no indicator was available the data were interpolated using a cubic spline.

## 2 RE-SCALING OF AREA-WIDE DATA TO OFFICIAL SOURCES DATA

As a general principle, the euro area data used are consistent with those reported in the ECB Statistical Data Warehouse (SDW)<sup>8</sup> and/or those produced by Eurostat<sup>9</sup>. This was achieved by either completely replacing the original country aggregation by the available official euro area series or by linking the data contained in the original AWM database to the official euro area data where necessary, in order to maximise the length of the series<sup>10</sup>. This linking procedure takes, as a general rule, the available euro area data from the SDW or Eurostat as far back as possible.

The variables are re-scaled as follows.

- Real GDP and demand components are taken from Eurostat, the original source of the corresponding SDW data; then they are re-scaled to the ECU-euro corrected level of 1995 and then backdated with rates of growth of the AWM’s original series.

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<sup>6</sup> It should be stressed that currently much more information is available, but no additional work has been undertaken to take it on board.

<sup>7</sup> A full explanation of this method can be found in Fagan and Henry’s paper “Long run money demand in the EU: Evidence for area-wide aggregates”, *Empirical Economics* (1998) 23:483-506.

<sup>8</sup> See <http://sdw.ecb.europa.eu/>

<sup>9</sup> For a detail description of the ECB and Eurostat data please refer to <http://www.ecb.europa.eu> and <http://epp.eurostat.ec.eu.int> respectively.

<sup>10</sup> Obviously the non-official data from the original AWM database is bound to be of lower quality compared to the data from official sources.

- Deflators of GDP and its components are calculated as the ratio of the nominal and real series for each variable.
- The unemployment rate is taken from Eurostat, the same series as reported in the SDW. Backdating is undertaken following the same approach.
- Total employment/employees, total compensation of employees and gross operating surplus are taken from the SDW and backdated in rates of growth.
- HICP and components are consistent with the SDW series in terms of growth rates, but have 1996 as their base year (compared to 2015, that serves as the base year of the official series), and are backdated in rates of growth. Note that, contrary to other conventions, they follow a fixed euro area composition approach.
- Short term interest rate data are taken from the SDW. They are backdated with the corresponding series contained in the original database (source: BIS and AMECO). The long term interest rate is taken fully from the SDW.
- The information on household disposable income is based on the seasonally adjusted savings ratio series published by Eurostat. This ratio has been extended back using the old disposable income and private consumption series.
- Data on the nominal effective exchange rate represent the NEER-38 series from 1993Q1 onwards and the NEER-12 one over 1981Q1-1992Q4<sup>11</sup>. Values from the –now frozen- 5<sup>th</sup> update of the database are used over the rest of the history.

In the AWM (as in the Eurostat national accounts data), exports and imports of goods and services are based on the gross concept (i.e. they do include intra-area trade flows). While, in principle, this does not affect developments in net trade and other ‘balance’ items of the current account, it does mean that both export and import figures overstate significantly the true trade of the area (since intra-area trade accounts for about half of gross exports).

### 3 UNITS AND SEASONAL ADJUSTMENT OF THE SERIES

The units of the series generally follow Eurostat or ECB conventions:

- Real GDP and its components are in millions of ECU/euro corrected with reference year 1995<sup>12</sup>.
- Nominal series are typically in millions of euros, including compensation to employees, and gross operating surplus.
- Deflators are generally set to 1 in 1995 (with the exception of YFD).
- HICP and its components are indices with base year 1996=100<sup>13</sup> except for the seasonally and working day adjusted series that have as base year 2015.

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<sup>11</sup> Notice that, for the period shared by the two series, they are relatively different and therefore the use of the linked series should be done with caution.

<sup>12</sup> The official National accounts figures published by Eurostat currently have 2010 as a reference year.

<sup>13</sup> The official HICP figures published by Eurostat are scaled to the year 2015=100.

- Total employment, employees, total labour force and the number of unemployed are expressed in thousands of persons.
- The unemployment rate is expressed as ratio to the civilian workforce (ILO definition).
- Balance of payments-related series (i.e. current account balance and net factor income from abroad) are represented as a percentage of GDP.
- Commodity prices are expressed in US dollars, while “world” GDP is in millions of US dollars.

The series that are typically seasonal, like GDP and its components or employment are provided seasonally and working day adjusted except the case of the HICP series where both seasonal and seasonally and working day adjusted data are available in the database.

#### 4 **COMPARISON WITH THE PREVIOUS AWM DATABASE UPDATE AND FUTURE UPDATES**

- All the series are available up to 2016Q4.
- Seasonally adjusted HICP and HICP excluding energy series have been dropped and substituted by the corresponding seasonally and working day adjusted series, additionally HICP energy seasonally and working day adjusted has been included in the dataset.
- The next update of the database is scheduled to be circulated in September/October 2018. It will extend the database up to 2017Q4.

#### 5 **SUMMARY**

This note presents the 17<sup>th</sup> update of the AWM database. This database takes publicly available data, such as the one compiled by Eurostat and/or reported in the ECB SDW, and supplements it by aggregating available country data. In general Data prior to 1996 are drawn from the, now frozen, previous version of the AWM database, and are bound to be of lower quality than more recent data. This version of the database extends the series to 2016Q4 with a fixed composition of the Euro area with 19 members.

## Appendix: Area-Wide Model Variables

Variable	Description
CAN_YEN	Current Account Balance as a Share of GDP. Calculated as the ratio of the sum of balance of trade (exports minus imports) and net factor income from abroad, and nominal GDP [CAN_YEN = (Balance of Trade + NFN_YEN * YEN) / YEN].
COMPR	Commodity Prices, US dollars. Calculated as the weighted sum of oil prices and non-oil commodity prices.
EEN	Nominal Effective Exchange Rate (NEER), Euro Euro area-19 countries vis-a-vis the NEER-38 group of main trading partners, Base year 1999 (1999Q1 = 1).
EXR	Euro-per-USD Exchange Rate.
GCD	General Government Final Consumption Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real general government consumption expenditure.
GCR	General Government Final Consumption Expenditure, Millions of euros, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995.
GON	Gross Operating Surplus. Calculated as the residual term of the difference between nominal GDP and the sum of compensation of employees and taxes on production and imports net of subsidies (GON = YEN - WIN - TIN).
HEG	HICP Energy, Index, Neither seasonally nor working day adjusted data, Index base year 1996 (1996 = 100).
HEGSYA	HICP Energy, Index, seasonally and working day adjusted data, Index base year 2015 (2015 = 100).
HEGWEI	Weight of the HICP Energy on Overall HICP, Parts per 1000, HICP total = 1000.
HEX	HICP - All Items Excluding Energy, Index, Neither seasonally nor working day adjusted data, Index base year 1996 (1996 = 100).
HEXSYSY	HICP - All Items Excluding Energy, Index, Working day and seasonally adjusted data, Index base year 2015 (2015 = 100).
HICP	HICP - Overall Index, Index, Neither seasonally nor working day adjusted data, Index base year 1996 (1996 = 100).
HICPSYA	HICP - Overall Index, Index, Working day and seasonally adjusted data, Index base year 2015 (2015 = 100).
ITD	Gross Fixed Capital Formation Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real gross fixed capital formation.
ITR	Gross Fixed Capital Formation, Millions of euros, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995.
LEN	Employees, Thousands of persons, Calendar and seasonally adjusted data.
LFN	Labour Force, Thousands of persons. Implied from total employment and the employment rate [LFN = LNN / (1 - URX)].
LNN	Total Employment, Thousands of persons, Calendar and seasonally adjusted data.
LPROD	Labour Productivity. Calculated as the ratio of real GDP, and total employment (LPROD = YER / LNN).
LTN	Nominal Long-Term Interest Rate, Euro area 10-year Government Benchmark bond yield, Percent per annum.
MTD	Imports of Goods and Services Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real imports of goods and services. Based on the gross concept, i.e. both extra- and intra- area trade flows are accounted for.
MTR	Imports of Goods and Services, Millions of euros, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995. Based on the gross concept, i.e. both extra- and intra- area trade flows are accounted for.
NFN_YEN	Net Factor Income from Abroad as a Share of GDP. Calculated as the ratio of the sum of primary-income balance (Balance of Payments and International Investment Position), secondary-income balance (Balance of Payments and International Investment Position) and the capital-account balance, and nominal GDP [NFN_YEN = (Primary-income Balance + Secondary-income Balance + Capital-account Balance) / YEN].
PCD	Individual Consumption Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real individual consumption expenditure.
PCOMU	Non-oil Commodity Prices, ECB commodity price index US dollar denominated, Import weighted, Total non-energy commodity, Neither seasonally nor working day adjusted data.
PCR	Individual Consumption Expenditure, Millions of euros, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995.
POILU	Oil Prices, United Kingdom, Petroleum: UK Brent, US dollars per barrel.
SAX	Gross Household Saving Rate, Percentage, Calendar and seasonally adjusted data. Defined as the ratio (multiplied by 100) of gross saving, and gross disposable income adjusted for the change in the net equity of households in pension funds reserves [SAX = (Gross Saving / (Gross Disposable Income + Net Equity of Households in Pension Funds Reserves)) * 100].
STN	Nominal Short-Term Interest Rate, Euribor 3-month, Percent per annum, Last trade price.
TIN	Taxes on Production and Imports Less Subsidies, Millions of euros, Current prices, Calendar and seasonally adjusted data.
ULC	Unit Labour Costs. Calculated as the ratio of compensation of employees, and real GDP (ULC = WIN / YER).
UNN	Number of Unemployed, Thousands of persons, Total (all ages), Total (male and female), Seasonally adjusted but not working day adjusted data.
URX	Unemployment Rate, Percentage of civilian workforce, Total (all ages), Total (male and female), Seasonally adjusted, but not working day adjusted data.
WIN	Compensation of Employees, Millions of euros, Current prices, Calendar and seasonally adjusted data.
WRN	Wage per Head. Calculated as the ratio of compensation of employees, and total employment (WRN = WIN / LNN).
XTD	Exports of Goods and Services Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real exports of goods and services. Based on the gross concept, i.e. both extra- and intra- area trade flows are accounted for.
XTR	Exports of Goods and Services, Millions of euros, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995. Based on the gross concept, i.e. both extra- and intra- area trade flows are accounted for.
YED	GDP Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real gross domestic product (GDP).
YER	Gross Domestic Product (GDP) at market prices, Million Euro, Chain linked volume, Calendar and seasonally adjusted data, Reference year 1995.
YFD	GDP at Factor Costs Deflator, Index. Defined as the ratio of nominal, and real GDP at factor costs.
YFN	GDP at Factor Costs. Calculated as the sum of compensation to employees and gross operating surplus (YFN = WIN + GON).
YIN	GDP, Income Side. Calculated as the sum of GDP at factor costs and taxes on production and imports less subsidies (YIN = YFN + TIN).
YWD	"World" GDP Deflator, Index, Index base year 1995 (1995 = 1). Defined as the ratio of nominal, and real "world" GDP.
YWDX	"World" Demand Deflator, Composite Indicator. Calculated as the weighted sum of "world" GDP deflator expressed in euros and the euro area export deflator [ $\log(YWDX) = w(YWD * EEN) * \log(YWD * EEN) + w(XTD) * \log(XTD)$ ].
YWR	"World" GDP, Millions of US dollars. Calculated as the weighted sum of the GDP of the main trading partners of the Euro Area at the time of the creation of the model. These countries are the US, the UK, Japan and Switzerland [ $\log(YWR) = w(US) * \log(GDP(US)) + w(UK) * \log(GDP(UK)) + w(JP) * \log(GDP(JP)) + w(CH) * \log(GDP(CH))$ ], where $w(US) + w(UK) + w(JP) + w(CH) = 1$ .
YWRX	"World" Demand, Composite Indicator. Calculated as the weighted sum of "world" GDP and domestic demand net of exports for the euro area [ $\log(YWRX) = w(YWR) * \log(YWR) + w(FDD-XTR) * \log(FDD-XTR)$ ], where $w(YWR) + w(FDD-XTR) = 1$ .