Technical notes

Euro area overview

Calculation of growth rates for monetary developments

The average growth rate for the quarter ending in month t is calculated as:

(1.1) $$\left(\frac{0.5I_t + \sum_{i=1}^{2} I_{t-i} + 0.5I_{t-3}}{0.5I_{t-12} + \sum_{i=1}^{2} I_{t-i-12} + 0.5I_{t-15}} - 1 \right) \times 100$$

where I_t is the index of adjusted outstanding amounts as at month t (see also below). Likewise, for the year ending in month t, the average growth rate is calculated as:

(1.2) $$\left(\frac{0.5I_t + \sum_{i=1}^{11} I_{t-i} + 0.5I_{t-12}}{0.5I_{t-12} + \sum_{i=1}^{11} I_{t-i-12} + 0.5I_{t-24}} - 1 \right) \times 100$$

Section 1.3

Calculation of interest rates on indexed longer-term refinancing operations

The interest rate on an indexed longer-term refinancing operation (LTRO) is equal to the average of the minimum bid rates on the main refinancing operations (MROs) over the life of that LTRO. According to this definition, if an LTRO is outstanding for D number of days and the minimum bid rates prevailing in MROs are $R_{1,MRO}$ (over D_1 days), $R_{2,MRO}$ (over D_2 days), etc., until $R_{n,MRO}$ (over D_n days) the applicable annualised rate (R_{LTRO}) is calculated as:

(1.3) $$R_{LTRO} = \frac{\sum_{i}^{n} D_i R_{i,MRO}}{\sum_{i}^{n} D_i}$$

Sections 2.1 to 2.6

Calculation of transactions

Monthly transactions are calculated from monthly differences in outstanding amounts adjusted for reclassifications, other revaluations, exchange rate variations and any other changes which do not arise from transactions.

If L_t represents the outstanding amount at the end of month t, C_t^M the reclassification adjustment in month t, E_t^M the exchange rate adjustment and V_t^M the other revaluation adjustments, the transactions F_t^M in month t are defined as:

(1.4) $F_t^M = (L_t - L_{t-1}) - C_t^M - E_t^M - V_t^M$

Similarly, the quarterly transactions F_t^Q for the quarter ending in month t are defined as:

(1.5) $F_t^Q = (L_t - L_{t-3}) - C_t^Q - E_t^Q - V_t^Q$

where L_{t-3} is the amount outstanding at the end of month $t-3$ (the end of the previous quarter) and, for example, C_t^Q is the reclassification adjustment in the quarter ending in month t.

For those quarterly series for which monthly observations are now available (see below), the quarterly transactions can be derived as the sum of the three monthly transaction figures in the quarter.

Calculation of growth rates for monthly series

Growth rates can be calculated from transactions or from the index of adjusted outstanding amounts. If F_t^M and L_t are defined as above, the index I_t of adjusted outstanding amounts in month t is defined as:

(1.6) $I_t = I_{t-1} \times \left(1 + \frac{F_t^M}{L_{t-1}}\right)$

The base of the index (for the non-seasonally adjusted series) is currently set as December 2010 = 100. Time series for the index of adjusted outstanding amounts are available on the ECB's website (http://www.ecb.europa.eu/stats/money/aggregates/aggr/html/index.en.html).

The annual growth rate a_t for month t – i.e. the change in the 12 months ending in month t – can be calculated using either of the following two formulae:

(1.7) $a_t = \left(\prod_{i=0}^{11}\left(1 + \frac{F_{t-i}^M}{L_{t-1-i}}\right) - 1\right) \times 100$

(1.8) $a_t = \left(\frac{I_t}{I_{t-12}} - 1\right) \times 100$

Unless otherwise indicated, the annual growth rates refer to the end of the indicated period. For example, the annual percentage change for the year 2002 is calculated in formula (1.8) by dividing the index for December 2002 by the index for December 2001.

Growth rates for intra-annual periods can be derived by adapting formula (1.8). For example, the month-on-month growth rate a_t^M can be calculated as:

(1.9) $$a_t^M = \left(\frac{I_t}{I_{t-1}} - 1 \right) \times 100$$

Finally, the three-month moving average (centred) for the annual growth rate of M3 is obtained as $(a_{t+1} + a_t + a_{t-1})/3$, where a_t is defined as in formula (1.7) or (1.8) above.

Calculation of growth rates for quarterly series

If F_t^Q and L_{t-3} are defined in formula (1.5), the index I_t of adjusted outstanding amounts for the quarter ending in month t is defined as:

(1.10) $$I_t = I_{t-3} \times \left(1 + \frac{F_t^Q}{L_{t-3}} \right)$$

The annual growth rate in the four quarters ending in month t (i.e. a_t) can be calculated using formula (1.8).

Seasonal adjustment of the euro area monetary statistics[1]

The approach used for seasonal adjustment of the euro area monetary statistics is based on multiplicative decomposition using X-12-ARIMA[2]. The seasonal adjustment may include a day-of-the-week adjustment, and for some series it is carried out indirectly by means of a linear combination of components. This is the case for M3, which is derived by aggregating the seasonally adjusted series for M1, M2 less M1, and M3 less M2.

The seasonal adjustment procedures are first applied to the index of adjusted outstanding amounts.[3] The resulting estimates of seasonal factors are then applied to the levels and to the adjustments arising from reclassifications and revaluations, in turn yielding seasonally adjusted transactions. Seasonal (and trading day) factors are revised at annual intervals or as required.

1 For details, see “Seasonal adjustment of monetary aggregates and HICP for the euro area”, ECB, August 2000 and the "Monetary and financial statistics" sub-section of the “Statistics” section of the ECB’s website (http://www.ecb.europa.eu/stats/money/aggregates/aggr/html/index.en.html).

2 For details, see Findley, D., Monsell, B., Bell, W., Otto, M. and Chen, B. C., "New Capabilities and Methods of the X-12-ARIMA Seasonal Adjustment Program", *Journal of Business and Economic Statistics*, 16, 2, 1998, pp.127-152, or "X-12-ARIMA Reference Manual", U.S. Census Bureau, Washington, D.C. For internal purposes, the model-based approach of TRAMO-SEATS is also used. For details of TRAMO-SEATS, see Gómez, V. and Maravall, A., "Programs TRAMO and SEATS: Instructions for the User", Banco de España, Working Paper No 9628, Madrid, 1996.

3 It follows that for the seasonally adjusted series, the level of the index for the base period (i.e. December 2008) generally differs from 100, reflecting the seasonality of that month.

Sections 3.1 to 3.5

Equality of uses and resources

In Section 3.1 the data conform to a basic accounting identity. For non-financial transactions, total uses equal total resources for each transaction category. This accounting identity is also reflected in the financial account i.e. for each financial instrument category, total transactions in financial assets equal total transactions in liabilities. In the other changes in assets account and the financial balance sheets, total assets equal total liabilities for each financial instrument category, with the exception of monetary gold and special drawing rights, which are by definition not a liability of any sector.

Calculation of balancing items

The balancing items at the end of each account in Sections 3.1, 3.2 and 3.3 are computed as follows.

The trade balance equals euro area imports minus exports vis-à-vis the rest of the world for goods and services.

Net operating surplus and mixed income is defined for resident sectors only and is calculated as gross value added (gross domestic product at market prices for the euro area) minus compensation of employees (uses) minus other taxes less subsidies on production (uses) minus consumption of fixed capital (uses).

Net national income is defined for resident sectors only and is computed as net operating surplus and mixed income plus compensation of employees (resources) plus taxes less subsidies on production (resources) plus net property income (resources minus uses).

Net disposable income is also defined only for resident sectors and equals net national income plus net current taxes on income and wealth (resources minus uses) plus net social contributions (resources minus uses) plus net social benefits other than social transfers in kind (resources minus uses) plus net other current transfers (resources minus uses).

Net saving is defined for resident sectors and is calculated as net disposable income plus the net adjustment for the change in the net equity of households in pension fund reserves (resources minus uses) minus final consumption expenditure (uses). For the rest of the world, the current external account is compiled as the trade balance plus all net income (resources minus uses).

Net lending/net borrowing is computed from the capital account as net saving plus net capital transfers (resources minus uses) minus gross capital formation (uses) minus acquisitions less disposals of non-produced non-financial assets (uses) plus consumption of fixed capital (resources). It can also be calculated in the financial account as total transactions in financial assets minus total transactions in financial liabilities (also known as changes in net financial worth (wealth) due to transactions).

For the household and non-financial corporation sectors, there is a statistical discrepancy between the balancing items computed from the capital account and the financial account.

Changes in net financial worth (wealth) due to transactions are computed as total transactions in financial assets minus total transactions in financial liabilities, whereas other changes in net financial worth (wealth) are calculated as (total) other changes in financial assets minus (total) other changes in financial liabilities.

Net financial worth (wealth) is calculated as total financial assets minus total financial liabilities, whereas changes in net financial worth (wealth) are equal to the sum of changes in net financial worth (wealth) due to transactions (lending/net borrowing from the financial account) and other changes in net financial worth (wealth).

Changes in net worth (wealth) are calculated as changes in net worth (wealth) due to savings and capital transfers plus other changes in net financial worth (wealth) and other changes in non-financial assets.

The net worth (wealth) of households is calculated as the sum of the non-financial assets and net financial worth (wealth) of households.

Annual growth rates for financial transactions

The annual growth rate $g(f_t)$ for financial transactions is calculated as:

(1.11) $$g(f_t) = \left(\frac{\sum_{i=0}^{3} f_{t-i}}{F_{t-4}} \right) \times 100$$

where f_t stands for the transactions in quarter t, and F_{t-4} for the end-of-quarter stock value four quarters earlier.

Sections 4.3 and 4.4

Calculation of growth rates for debt securities and listed shares

Growth rates are calculated on the basis of financial transactions and therefore exclude reclassifications, revaluations, exchange rate variations and any other changes which do not arise from transactions. They can be calculated from transactions or from an index of notional stocks. If N_t^M represents the transactions (net issues) in month t and L_t the level outstanding at the end of month t, the index I_t of notional stocks in month t is defined as:

(1.12) $$I_t = I_{t-1} \times \left(1 + \frac{N_t^M}{L_{t-1}} \right)$$

The base of the index is set equal to 100 in December 2008. The growth rate a_t for month t, corresponding to the change in the 12 months ending in month t, can be

calculated using either of the following two formulae:

$$(1.13)\quad a_t = \left(\prod_{i=0}^{11} \left(1 + \frac{N^M_{t-i}}{L_{t-1-i}} \right) - 1 \right) \times 100$$

$$(1.14)\quad a_t = \left(\frac{I_t}{I_{t-12}} - 1 \right) \times 100$$

The method used to calculate the growth rates for securities other than shares (Section 4.3) is the same as that used for the monetary aggregates, the only difference being that an “N” is used instead of an “F”. This is to show that the method used to obtain “net issues” for securities issues statistics differs from that used to calculate equivalent “transactions” for the monetary aggregates.

The average growth rate for the quarter ending in month t is calculated as:

$$(1.15)\quad \left(\frac{0.5I_t + \sum_{i=1}^{2} I_{t-i} + 0.5I_{t-3}}{0.5I_{t-12} + \sum_{i=1}^{2} I_{t-i-12} + 0.5I_{t-15}} - 1 \right) \times 100$$

where I_t is the index of notional stocks as at month t. Likewise, for the year ending in month t, the average growth rate is calculated as:

$$(1.16)\quad \left(\frac{0.5I_t + \sum_{i=1}^{11} I_{t-i} + 0.5I_{t-12}}{0.5I_{t-12} + \sum_{i=1}^{11} I_{t-i-12} + 0.5I_{t-24}} - 1 \right) \times 100$$

The calculation formula used for Section 4.3 is also used for Section 4.4. Section 4.4 is based on market values, and the calculations are based on financial transactions, which exclude reclassifications, revaluations and any other changes that do not arise from transactions. Exchange rate variations are not included, as all listed shares covered are denominated in euro.

Seasonal adjustment of securities issues statistics[4]

The approach used is based on multiplicative decomposition using X-12-ARIMA. The seasonal adjustment of total securities issues is carried out indirectly by means of a linear combination of sectors and maturity segments.

The seasonal adjustment procedures are applied to the index of notional stocks. The resulting estimates of seasonal factors are then applied to the outstanding amounts, from which seasonally adjusted net issues are derived. Seasonal factors are revised at annual intervals or as required.

[4] For details, see “Seasonal adjustment of monetary aggregates and HICP for the euro area”, ECB, August 2000 and the “Monetary and financial statistics” sub-section of the “Statistics” section of the ECB’s website (http://www.ecb.europa.eu/stats/money/aggregates/aggr/html/index.en.html).

As with formulae (1.13) and (1.14), the growth rate a_t for month t, corresponding to the change in the six months ending in month t, can be calculated using either of the following two formulae:

(1.17) $$a_t = \left(\prod_{i=0}^{5} \left(1 + \frac{N_{t-i}^{M}}{L_{t-1-i}} \right) - 1 \right) \times 100$$

(1.18) $$a_t = \left(\frac{I_t}{I_{t-6}} - 1 \right) \times 100$$

Section 5.1

Seasonal adjustment of the Harmonised Index of Consumer Prices (HICP)

The approach used is based on multiplicative decomposition using X-13 and JDemetra+. The seasonal adjustment of the overall HICP for the euro area is carried out indirectly by aggregating the seasonally adjusted euro area series for processed food, unprocessed food, industrial goods excluding energy, and services. Energy is added without adjustment, since there is no statistical evidence of seasonality. Where applicable and appropriate, euro area HICPs are also adjusted for calendar effects. For additional information, see the box entitled "Harmonised Index of Consumer Prices - Easter effects and improved seasonal adjustment", Economic Bulletin, Issue 3, ECB, 2016. Seasonal factors are revised at annual intervals or as required.

Section 7.2

Seasonal adjustment of the balance of payments current account

The approach used is based on multiplicative decomposition, using X-12-ARIMA or TRAMO-SEATS depending on the item. The raw data for goods, services, primary income and secondary income are pre-adjusted in order to take into account significant working day effects. The working day adjustment for goods and services takes account of national public holidays. The seasonal adjustment of these four items of the current account is carried out using these pre-adjusted series. The seasonal adjustment of the total current account is carried out by aggregating the seasonally adjusted euro area series for goods, services, primary income and secondary income. Seasonal (and trading day) factors are revised at biannual intervals or as required.

Section 7.3

Calculation of growth rates for the quarterly and annual series

The annual growth rate for quarter t is calculated on the basis of quarterly transactions (F) and positions (L) as follows:

(1.19) $$a_t = \left(\prod_{i=t-3}^{t} \left(1 + \frac{F_t}{L_{t-1}} \right) - 1 \right) \times 100$$

The growth rate for the annual series is equal to the growth rate in the last quarter of the year.