

DETAILED DESCRIPTION OF THE METHODOLOGY USED FOR THE SEASONAL ADJUSTMENT OF SECURITIES ISSUES STATISTICS

- 1 The standard procedure used at the ECB to seasonally adjust the securities issues statistics is to run X-12-ARIMA as follows:
 - Step 1. Run the program in default mode.
 - Step 2. Assess the adjustment and model obtained from Step 1 using available diagnostics and correct problems thereby detected.
 - Step 3. Decide which series should be indirectly adjusted in order to ensure additively.
- 2 Specifically, the steps involved can be detailed as follows:

Step 1. Run the program in default mode

X-12 ARIMA is run in default mode. By default mode we specifically refer to the following:

- sequentially test for outliers using the X-12 built-in detection procedures based in the sequential Chang-Tiao algorithms;
- automatically search for an ARIMA specification using X-12's AUTOMODL spec and obtain estimates by exact maximum likelihood in order to mitigate the effects of potential seasonal overdifferencing;
- test for possible trading day effects;
- run default X-11 using the automatic seasonal filter selection based on the X-11 ARIMA/88 moving seasonality ratio (MSR) criterion.

Step 2. Assess the adjustment and model obtained from Step 1 using available diagnostics and correct problems thereby detected

In certain instances, some of the automatically selected options in Step 1 has to be overridden when diagnostics show evidence of misspecification or of an inadequate framework to apply the standard X-11 filters. In particular:

- when no ARIMA model is selected by X-12 using the automatic selection criterion based on the within-sample forecast error test, the output of the IDENTIFY spec is analysed and based on this a range of models is considered, out of which the most parsimonious ARIMA model providing consistent estimates is selected;

- when an ARIMA model automatically selected by X-12 shows evidence of mis-specification, the same criterion as above in the selection of an alternative model is followed;
- in series with evidence of a largely stochastic seasonal pattern, the number of months used for forecasting and backcasting is reduced when this improves the suitability of the default X-11 filters.
- the seasonal filter selection based on the X-11 ARIMA/88 MSR criterion is on occasion overridden for series with evidence of a largely stochastic seasonal pattern;
- X-11's automatic selection of the Henderson filter for trend-cycle estimation is on occasion overridden for series with evidence of a largely stochastic trend;
- when lack of evidence of seasonality or trading day effects is found, the series is not adjusted. As for securities issues statistics, neither stock trading day effects in outstanding amounts nor flow trading day effects in net issues are sufficiently significant, no trading day adjustment is carried out. However, this issue will be regularly re-examined.

Step 3. Decide which series should be indirectly adjusted in order to ensure additivity.

The following rules summarise the procedures that have been followed in the selection of the series to be indirectly adjusted:

- the series with large seasonal patterns which at the same time are more amenable to adjustment using X-11-type filters are adjusted directly;
- for those series that produced ARIMA models with better results in terms of their in-sample forecast tests, preference is given to direct adjustment;
- in absence of any obvious choice when applying the two criteria above, preference is given to the indirect adjustment of series that are derived as aggregation of other components.