



EUROPEAN CENTRAL BANK

EUROSYSTEM

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# **JDemetra+ as an innovative tool for seasonal adjustment**

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Stakeholders*

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# Content

- Seasonal adjustment methods and software
- Software development
- JDemetra+
  - Structure
  - Characteristics
  - Differences to the original programs
  - Future product development

## Leading seasonal adjustment methods

- The main seasonal adjustment (SA) programs are:
  - TSW – the Windows application, developed by the Banco de España, that integrates the TRAMO and the SEATS programs;
  - X-13ARIMA-SEATS – produced by the U.S. Census Bureau, include enhanced X-12-ARIMA method and is capable to generate ARIMA model-based SA.
- Both algorithms are written in FORTRAN; they are not designed for reusability
- In case of introduction of the new functionality, the actual programs are modified
- Uncertain future of the FORTRAN language
  - Lack of developers
  - Not an object-oriented language

# The development of software for seasonal adjustment in the European Union

2002  
Demetra

- Program to compare X-12-ARIMA and TRAMO/SEATS (1997/98)
- Integration of original software in a user-friendly application
- Lack of sufficient product development and handling of errors as a result of a loss of technical knowledge about software

2010  
Demetra+

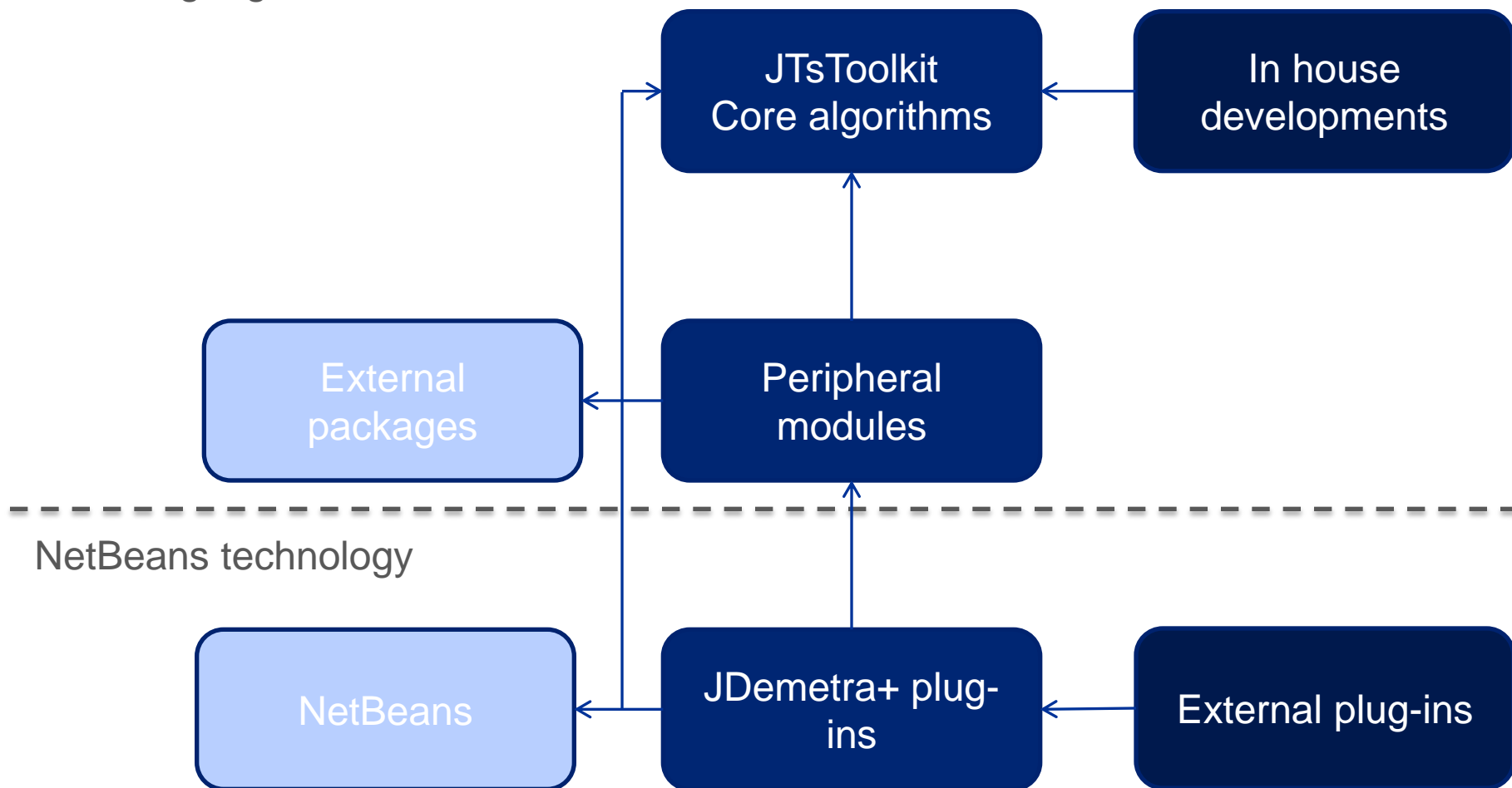
- Developed in cooperation between Eurostat and the National Bank of Belgium
- Enables the implementation of the ESS Guidelines on SA
- Provides graphical interface and common input/output diagnostics for TRAMO/SEATS and X-12-ARIMA
- Includes complex technical solutions. Uses .NET technology and can be used only under Windows

2015  
JDemetra+

- Fortran codes re-written in JAVA
- Open source, platform independent
- Extensible graphical interface, based on the NetBeans platform (plugins)
- Developed by the National Bank of Belgium, supported by the Deutsche Bundesbank for the X-11 part
- Tested and promoted by the Seasonal Adjustment Centre of Excellence (SACE), launched by Eurostat
- As of as of February 2015, recommended by the Seasonal Adjustment Expert Group as software for conducting seasonal adjustment of official statistics in the European Union

## JDemetra+ structure

Java language



# JDemetra+ distinctive features

- **Flexibility**
  - Encompasses the leading SA algorithms
  - Could evolve independently when improvements or alternative methods appear
- **Versatility**
  - Can be used in a rich graphical interface (JDemetra+ itself)
  - Can be integrated in other (in-house) developments
- **Reusability of modules the other circumstances**
  - JEcotrim (for temporal disaggregation)
  - Usage of the libraries of JDemetra+ for outlier's detection
  - Estimation of missing values, forecasts, calendarization
- **Extensibility**
  - Additional plug-ins and modules do not change the core engines
- **Efficient process of large datasets**
  - JWSAcruncher, command line application that allows calling JDemetra+ from other applications
  - Web services
  - Direct call to Java libraries
- **Open source**
  - Contribute to the increase the transparency of statistical computation and a better sharing of the statistical knowledge
  - Possibility for different teams to progressively take over the software or to contribute to its evolution
  - Plug-ins developed by SA experts can be shared with the community members

## **The implementation of the original programs in JDemetra+**

- The structure of the Java code differs profoundly from the original codes
- JDemetra+ uses a common skeleton for the pre-processing steps of X12/X13 and for Tramo
  - For performances and/or design reasons, the used algorithms (estimation of Reg-Arima models, maximization of the likelihood...) will not always follow the original solutions
  - From a theoretical point of view, no impact on the results, from a practical point of view, impact usually marginal (due to different local solutions in optimization problems...)
- Perfect comparability for X11, punctual differences in SEATS
- JDemetra+ is faster and more robust to invalid adjustments than X12/X13

## Migration to JDemetra+

- Migration is relatively easy when seasonal adjustment software is used as a stand-alone application
- In case of an integrated data production environment:
  - Changes in the production scheme
  - Analysis of the JDemetra+ code
  - Need for additional functionalities (data providers, tailor-made reporting, check-in/check out facilities...)
  - Extensive tests
  - Documentation
  - Maintenance
- Support offered by the SACE
- Migration of specification files → differences in implementation



# Product development

- **Plugins** (\* indicates planned plugins)
  - Other statistical topics
    - Structural models and other advanced model-based seasonal adjustment methods
    - Chain-Linked Indices Aggregation and Disaggregation
    - Benchmarking, temporal disaggregation
    - Dynamic factor models (nowcasting)
    - Business cycle analysis\*
    - Bayesian VAR\*
    - Revision analysis
  - Seasonal adjustment tools
    - Enriched output
    - Parsers for translating X-12 spec files to JDemetra+
    - Enhanced direct/indirect SA and balancing tool\*
  - Others
    - Data providers for SDMX WEB services
    - Light scripting language (for batch processing)\*
- A common pre-processing module

## Links

JDemetra+ repository on Github: <https://github.com/jdemetra>

This presentation is available on:

<https://github.com/SylwiaGrudkowska/JDemetra/>

Support, documentation and more:

[https://ec.europa.eu/eurostat/cros/content/seasonal-adjustment\\_en](https://ec.europa.eu/eurostat/cros/content/seasonal-adjustment_en)