JDEMETRA+ 3.0

<u>RELEASE NOTES</u>

0. **System requirements**

JDemetra+ 3.0 uses many recent improvements of the Java language. It needs Java 17 or higher.

1. **Complete re-design of the Java libraries**

The Java API and the organization of the packages have been deeply redesigned.
The java libraries are now split according to two axes:

- Statistical concepts

Module	Description
Demetra-toolkit	Basic math/stat/time series concepts
Demetra-sa	Generic seasonal adjustment routines
Demetra-tramoseats	Auto-modelling (tramo) + canonical decomposition
Demetra-x13	Auto-modelling (x13) + X11
Demetra-sts	Structural time series (uni/multivariate)
Demetra-stl	STL (seasonal adjustment)
Demetra-highfreq	Modelling/seasonal adjustment of High-frequency series
Demetra-benchmarking	Benchmarking + temporal disaggregation + calendarization
Demetra-revisions	Revision analysis
Demetra-calendar	Specific calendars
Demetra-sa-experimental	Experimental solutions for seasonal adjustment (filters…)
Demetra-tsp	Time series providers

- Types of functionalities

Module	Description
API	Main concepts, main algorithms (I/O description)
Core	Actual algorithms
IO	xml, html, protobuf, informationset
R	Connection with R packages
GUI	Netbeans plug-ins

Following the topic, some modules can be missing.

Modules	API	Core	IO	R	GUI
Toolkit					
Tramo-Seats					
X12-Arima	x	x	x	x	x
...					
Benchmarking					
High-frequency	x	x		X	
	Concepts, definitions	Implementation	Xml...	R connection	Netbeans plug-in

The current structure contains about 150 modules.

See https://github.com/jdemetra/jdemetra-core/tree/v3.0.0 and https://github.com/jdemetra/jdemetra-app/tree/v3.0.0 for more details.

The new API rests as often as possible on immutable objects. The use of the builder pattern, especially through "Lombok" annotations is widespread in the different modules. This leads to more robust code and to more uniform interfaces.

2. Algorithms

Most of the algorithms on time series have been adapted to deal with any periodicity. That's especially the case of (Reg)Arima estimation, canonical decomposition, benchmarking, temporal disaggregation, and state space modelling.

Though most routines have been rewritten, the new implementations of Tramo-Seats and X13 should provide very similar results in comparison with the JD+ 2.2.3 versions. The main differences are:

- New options to deal with calendar effects (TD3= weeks, Saturdays, Sundays; TD3c = weeks, Fridays+Saturdays, Sundays; TD4 = weeks, Fridays, Saturdays, Sundays)
- Corrections of several bugs
    o Handling of series with mean correction and missing values
    o Join use of automatic trading days and holidays in Tramo-Seats
- Systematic use of the Kalman filter in X13 (instead of a modified Ljung-Box filter), which can have an impact for the detection of some limit outliers

On occasion (unstable models), the small changes in the algorithms could lead to more significant differences in the results (< 5% of the series).

3. Time series providers

The time series providers available in version 2 have been upgraded to version 3. Text, Excel and SDMX providers can deal now with weekly/daily time series.

4. Interface with R

The connection with R is made – as for JDemetra+ 2.x – through the package Rjava. However, for performance reasons, complex structures like seasonal adjustment IO are now transferred between Java and R by means of Google's "protocol buffers" (Rprotobuf). See https://developers.google.com/protocol-buffers for details. That solution improves in a dramatic way the performances of R packages based on JDemetra+.

5. <u>Cruncher</u>

The Command line tool for batch processing of Tramo-Seats and X13 offers the same functionalities as in JD+ 2.x. To be noted that the new cruncher is compatible with JDemetra 2.x and JDemetra 3.0

Slightly modified output dictionaries are available on github.

6. <u>Graphical user interface</u>

The appearance of the new graphical interface doesn't differ much from the previous one, which should simplify the transition and the documentation

A new "look and feel" – more modern – has been selected by default and the components has slightly modified been to work correctly with it.

The first release of the graphical interface will offer Tramo-Seats and X13 (single and multi-processing) with a preliminary version of the fractional airline model (handling of high-frequency series) for exploratory purposes