Seasonal Adjustment for Currency in Circulation Data

February 7, 2023

Bank of Japan

Currency Issue Department

The Bank of Japan has revised the seasonally adjusted Banknotes in Circulation Data, both of the average amounts outstanding and the amounts outstanding at end of period, which is released as a part of the Currency in Circulation Data.

Having obtained the final figures for the whole year 2022, we have selected the most suitable ARIMA models applied for individual series.

Details of the seasonal adjustment method are shown below:

1. The Bureau of Census X-12-ARIMA method, version 0.3 is used.
2. As for the seasonally adjusted figures after 1967, a multiplicative model and a logarithmic transformation are adopted for each series. The critical values for *additive outliers* and *temporary changes* follow the default settings in X-12-ARIMA [version 0.3]. The period of the time-series data used for seasonal adjustment is the last 56 years, from January 1967 to December 2022. Thereafter, seasonally adjusted figures are calculated by applying the predicted seasonal factors.

   -- Starting with the 2012 revision, data for the last 56 years are used instead of data from the beginning of the series (January 1955) to the most recent December. This is because the number of data from the beginning of the series has reached the program limit with the X-12-ARIMA model. [*]
3. For the trading-day adjustment, user-defined, day-of-the-week variables are used.

Models Used for the Seasonal Adjustment

Indicator	ARIMA model	Level shift and ramp	Trading-day adjustment	Length of the series
Banknotes in circulation (average amounts outstanding)	(010)(011)	February 1989 From February to April 2002 From February to April 2005	None	From January 1967 to December 2022
Banknotes in circulation	(212)(011)	March 2002 March 2005	Yes	From January 1967 to December 2022

(amounts outstanding at end of period)				

Note: The X-12-ARIMA program can handle up to 720 observations, among which 48 observations are used for the projection of seasonal factors and 672 observations (56 years for monthly data) are used for seasonal adjustment.

Inquiries

Operations Control Group, Operations Control Division, Currency Issue Department

E-mail : post.cid6@boj.or.jp