Appendix 5 Details of seasonal adjustment with X-12-ARIMA

1 Specification file

The specification file (at conduct of 2015-base revision), set in X-12-ARIMA for calculating the seasonally adjusted indices of the 2015-base CPI, is shown below.

series{start=2010.01	Start of data: January 2010
span=(2010.1,2015.12)	Period of data: January 2010 to December 2015 (Note 1)
period=12	Type of data: Monthly data
decimals=3}	(Note 2)
transform{function=log}	Log transformation of data
regression{variables=(ls2014.4)}	Prior adjustment of outliers (see the next page for details)
x11{	(X-11 part)
sigmalim=(2 3)	Singular term management limit : 2σ to 3σ
seasonalma=X11default	X-11 default used for moving average
appendfcst=yes	Output of prediction period of Reg-ARIMA model
save=(d10 d11)}	Storage of seasonal and seasonally adjusted indices in the file
arima{ model=(0 1 1)(1 0 1)}	ARIMA model setting (see the next page for details)
estimate{ }	Default estimation of Reg-ARIMA model

(Note 1) The seasonally adjusted indices are revised every year when the December result for Japan is compiled. For example, when the December 2016 result for Japan is created, the seasonal indices from January 2010 to December 2016 will be calculated with "span = (2010.1, 2016.12)," as well as the estimated seasonal indices from January to December 2017. Based on the seasonal indices calculated here, the seasonally adjusted indices from January 2010 to December 2016 will be recalculated. The seasonally adjusted indices from January to November 2017 (to preliminary figure in December for the Ku-area of Tokyo) given by the estimated seasonal indices calculated here are the first published figures.

(Note 2) "decimals=3" is specified here, but regardless of this specification, (estimated) seasonal indices output includes fractions. Note that the number of digits of the seasonally adjusted indices, output from "the X-12-ARIMA program," is subject to control, but the output value itself is not used for calculating the index. The "original series before rounding off the fraction" is divided by the "(estimated) seasonal index before rounding the fraction" to calculate the seasonally adjusted indices for the 2015-base CPIs.

2 ARIMA model setting and prior adjustment of outliers

The table below shows the ARIMA model and prior adjustment of outliers for each grouping.

(1) Japan

Group	ARIMA model	Outlier setting
All items All items, less fresh food All items, less imputed rent All items, less imputed rent and fresh food	(0 1 1)(1 0 1)	LS2014.4
All items, less food (less alcoholic beverages) and energy	(2 1 2)(2 0 2)	
Goods	(1 1 0)(1 1 1)	
Goods, less fresh food	(0 1 1)(0 1 1)	
Semi-durable goods	(0 1 0)(1 1 0)	LS2014.4 LS2015.1

(2) Ku-area of Tokyo

Group	ARIMA model	Outlier setting
All items All items, less imputed rent Goods	(0 1 0)(0 1 1)	LS2014.4
All items, less fresh food All items, less imputed rent and fresh food Goods, less fresh food	(2 1 2)(0 1 1)	
All items, less food (less alcoholic beverages) and energy	(2 1 1)(0 1 2)	
Semi-durable goods	(0 1 2)(0 1 1)	LS2014.4 LS2015.1

[Reference] Overview of discussions on model settings

The ARIMA model, which is considered most appropriate, was selected for each grouping after the verification of statistical significance with the AIC values, etc. The seasonality of each grouping depends on the degree of effect of fresh food, whose price is considered to be affected by season and weather, clothes (semi-durable goods) whose price tends to drop as the change of season comes closer, and energy which is considered to be easily affected by the factors abroad, and the most appropriate model may also vary depending on the grouping.

For prior adjusting outliers, statistical significance was verified for each grouping in terms of the effect of changes in the index level due to the consumption tax rate revised in April 2014, and changes in the index level due to linking of the old and new indices, each having different weights, in January 2015. The former was significant in all groupings, and the latter was significant only in semi-durable goods.