

## Reestimation Result of Hedonic Regression Model in the Corporate Goods Price Index and the Services Producer Price Index — LCD Televisions —

The Bank of Japan reestimates the hedonic regression model of quality adjustment, applied to LCD televisions. The reestimation result as of April 2018 is shown in Appendix.

The details of data for the estimation are as follows:

Scope of application <sup>1</sup>	<ul style="list-style-type: none"> <li>• LCD televisions classified in “Television receivers” (Producer Price Index, Import Price Index)</li> <li>• Rental LCD televisions classified in “Communications &amp; office equipment rental and machinery &amp; equipment rental for service industries” (Services Producer Price Index)</li> </ul>
Dataset <sup>2</sup>	<p>Source:</p> <ul style="list-style-type: none"> <li>• The retail price (quarterly average price) and specification data are provided with the <i>BCN Ranking</i> by the BCN Inc. Other important specifications unlisted in the database are taken from the specification sheet of each LCD television.</li> </ul> <p>Number of observations (launch period):</p> <ul style="list-style-type: none"> <li>• 116 (from 1st quarter 2017 to 4th quarter 2017)</li> </ul>
Model selection <sup>3</sup>	<ul style="list-style-type: none"> <li>• Based on the results of likelihood ratio tests, the double Box-Cox model is selected.</li> </ul>
Suggested period of application	<ul style="list-style-type: none"> <li>• From April 2018 onward</li> </ul>
Frequency of estimation	<ul style="list-style-type: none"> <li>• Every April</li> </ul>

<sup>1</sup> The same model is applied to domestic goods, and imported goods.

<sup>2</sup> The model is estimated by mixing up price data of both domestic goods and imported goods.

<sup>3</sup> Hedonic regression model is assumed to be the general function form expressed as follows:

$$\frac{y^{\lambda_0} - 1}{\lambda_0} = \beta_0 + \sum_{i=1}^n \beta_i \frac{x_i^{\lambda_i} - 1}{\lambda_i} + u$$

where  $\lambda$  is the Box-Cox transformation parameter.

When  $\lambda = 0$ , function is logarithmic; When  $\lambda = 1$ , function is linear. The functional form is determined by Box-Cox test (likelihood ratio test) under constraints of each parameter settings, such as in the Double Box-Cox Model, Semi Box-Cox Model (when  $\lambda_1 = 1$ ), Log-Linear Model (when  $\lambda_0 = \lambda_1 = 0$ ), Semi Log-Linear Model (when  $\lambda_0 = 0, \lambda_1 = 1$ ), and Linear Model (when  $\lambda_0 = \lambda_1 = 1$ ).

## Estimation Result for LCD Televisions

Suggested Period of Application	This Time Estimation April 2018-	Last Time Estimation April 2017-March 2018
Estimated Model	Double Box-Cox Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable	-0.115	0.096
Intercept	5.908 ***	16.891 ***
Screen Size (inch)	2.962E-03 ***	8.637E-04 ***
Box-Cox Parameter	1.284	2.302
Built-in Tuners	5.205E-05 ***	--
Box-Cox Parameter	3.590	--
Built-in Tuners (for terrestrial digital only)	--	0.477 *
Box-Cox Parameter	--	-0.745
Built-in Speakers	0.018 ***	1.162 ***
Box-Cox Parameter	0.519	-0.627
Dummy Variables		
Display Resolution		
Full HD	0.054 ***	--
4K	0.151 ***	1.312 ***
Motion Enhancer		
120 Hz or 240 Hz	0.025 **	0.784 ***
Built-in Recorders		
HDD only	0.174 ***	--
Blu-ray and HDD	--	2.225 ***
Integrated Features		
Video On Demand	0.035 ***	--
Smart TV	--	0.469 **
Portable	0.067 ***	--
Manufacturer		
Manufacturer A	0.037 ***	--
Manufacturer B	-0.089 ***	-1.093 ***
Manufacturer C	0.061 ***	--
Manufacturer D	-0.039 **	--
Manufacturer E	-0.260 ***	--
Manufacturer F	-0.166 ***	--
Manufacturer G	-0.091 **	-0.877 **
Manufacturer H	-0.191 ***	--
Period		
1st quarter 2016	--	--
2nd quarter 2016	--	-0.255
3rd quarter 2016	--	0.054
4th quarter 2016	--	-0.046
1st quarter 2017	--	--
2nd quarter 2017	-0.016	--
3rd quarter 2017	0.016	--
4th quarter 2017	0.012	--
R-squared	0.982	0.965
Adjusted R-squared	0.978	0.960
Standard Error of Regression	0.035	0.548
Mean of Dependent Variable	6.347	21.655
Number of Observations	116	102
(release dates)	(from 1Q 2017 to 4Q 2017)	(from 1Q 2016 to 4Q 2016)
Tests for Double Box-Cox Model ( $H_1$ : Double Box-Cox)		
$H_0$ : Semi Box-Cox ( $\lambda_1=1$ )	9.236 **	16.023 ***
$H_0$ : Log-Linear ( $\lambda_0=\lambda_1=0$ )	98.365 ***	54.496 ***
$H_0$ : Semi Log-Linear ( $\lambda_0=0, \lambda_1=1$ )	25.118 ***	18.918 ***
$H_0$ : Linear ( $\lambda_0=\lambda_1=1$ )	278.350 ***	278.465 ***

Notes: 1. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

2. The specification of Double Box-Cox Model is determined based on the result of likelihood ratio test.

The likelihood ratio statistics is distributed as chi-squared with degrees of freedom equal to the number of restraints.

3. "Built-in Tuners" includes tuners for terrestrial digital and BS-CS 110 digital broadcasting.