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October 2018

Reestimation Result of Hedonic Regression Model in the Corporate Goods Price Index and the Services Producer Price Index

— Tablet Computers —

The Bank of Japan reestimates the hedonic regression model of quality adjustment, applied to tablet computers[1]. The reestimation result as of September 2018 is shown in the Table.

The details of data for the estimation are as follows:

Scope of application[2]	・Tablet computers classified in "Notebook computers" (Producer Price Index, Export Price Index, Import Price Index) ・Rental tablet computers classified in "Computer rental" (Services Producer Price Index)
Dataset[3]	Source: ・The retail price (quarterly average price) and specification data are provided with the *BCN Ranking* by the BCN Inc. Other important specifications unlisted in the database are taken from the specification sheet of each tablet computer. Number of observations (release period): ・141 (from 3rd quarter 2016 to 2nd quarter 2018) [4]
Model selection[5]	・Based on the results of likelihood ratio tests, the Log-Linear model is selected.
Suggested period of application	・From September 2018 onward
Frequency of estimation	・Every March and September

[1] Other hedonic regression models are estimated for desktop and notebook computers separately.

[2] The same model is applied to domestic good, exported goods, and imported goods.

[3] The model is estimated by mixing up price data of both domestic goods and imported goods.

[4] In order to maintain the stability of the estimation, the sample release period has been extended from four quarters to eight quarters.

[5] 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 λ is the Box-Cox transformation parameter.

When λ =0, function is logarithmic; When λ=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 λ_i=1), Log-Linear Model (when λ_0=λ_i=0), Semi Log-Linear Model (when λ_0=0, λ_i=1), and Linear Model (when λ_0=λ_i=1).

(Table)

Estimation Result for Tablet Computers

Suggested period of application	This Time Estimation September 2018-	Last Time Estimation March 2018-August 2018
Estimated Model	Log-Linear Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable		0.333
Intercept	2.910 ***	17.850 **
CPU Frequency (MHz)	0.220 **	2.474E-04 ***
Box-Cox Parameter		1.477
Main Memory (MHz)	0.160 **	0.028 *
Box-Cox Parameter		0.623
Storage (GB)	0.357 ***	5.999 ***
Box-Cox Parameter		0.109
Monitor Size (inch)	1.384 ***	--
Box-Cox Parameter		
Display Resolution (pixels)	--	0.001 **
Box-Cox Parameter		0.569
Battery Life (hours)	0.177 ***	13.252 ***
Box-Cox Parameter		-0.266
Dummy Variables		
CPU L3 Cache		
3MB or more	--	9.983 ***
Durability		
High Impact Resistance	0.386 ***	36.010 ***
Pre-installed Application		
Microsoft Office Home and Business Premium with an Annual License of Office 365	--	11.523 ***
Standard Accessory		
Keyboard	0.097 *	12.384 ***
Manufacturer		
Manufacturer A	--	8.992 **
Manufacturer B	-0.119 **	-5.252 **
Manufacturer C	0.439 ***	--
Manufacturer D	0.549 ***	--
Manufacturer E	-0.244 **	--
Release Period		
4th quarter 2016	0.047	--
1st quarter 2017	-0.094	--
2nd quarter 2017	-0.257 ***	-0.883
3rd quarter 2017	-0.154 **	3.229
4th quarter 2017	-0.273 ***	-0.844
1st quarter 2018	-0.296 ***	--
2nd quarter 2018	-0.219 **	--
R-squared	0.951	0.982
Adjusted R-squared	0.943	0.978
Standard Error of Regression	0.225	5.946
Mean of Dependent Variable	11.043	126.230
Number of Observations	141	71
(release period)	(from 3Q 2016 to 2Q 2018)	(from 1Q 2017 to 4Q 2017)
Tests for Double Box-Cox Model		
(H_1: Double Box-Cox)		
H_0: Semi Box-Cox (λ_i=1)	57.601 ***	17.031 ***
H_0: Log-Linear (λ_0=λ_i=0)	8.020	19.799 ***
H_0: Semi Log-Linear (λ_0=0,λ_i=1)	62.498 ***	62.922 ***
H_0: Linear (λ_0=λ_i=1)	174.875 ***	67.089 ***

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

2. The specifications of Log-Linear/Double Box-Cox Models are 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. "High Impact Resistance" dummy is applied if a device is able to withstand drop and pressure testing, or is made of high durability materials.