

**Hedonic Regression Models for Quality Adjustment
in the Corporate Goods Price Index and the Services Producer Price Index
- Computer Printers -**

To account for price changes with the quality being constant, quality adjustments between old and new sample prices need to be done. The Bank of Japan employs various quality adjustment methods and hedonic regression method is one of them¹.

The Bank has updated the hedonic regression models² for inkjet and laser printers³. See the appendix 1 and 2 for the results. These hedonic regression models are used for "Computer printers" (Producer Price Index, Export Price Index, and Import Price Index) and "Communications & office equipment rental and machinery & equipment rental for service industries" (Services Producer Price Index).

The details of samples for the estimation are as follows.

- I. The price data for inkjet and laser printers are taken from "BCN Ranking", the BCN Inc. database. The price data are retail prices at the large-size electrical appliance retailers.
- II. Specifications for inkjet and laser printers are taken from the "BCN Ranking" and the brochures.
- III. The numbers of the observations for inkjet and laser printers are 89 and 60 respectively. The data from 2013/Q3 to 2015/Q2 are used to estimate the hedonic regression models, which are adopted from October 2015 for the quality adjustment.

¹ For more details, see the [Outline of the Corporate Goods Price Index \(CGPI, 2010 base\)](#) and the [Outline of the Services Producer Price Index \(SPPI, 2010 base\)](#) on the Bank's website.

² The Bank adopts two hedonic regression models, one for inkjet printers and one for laser printers.

³ Laser printers include LED printers.

Estimation Result for Inkjet Printers

	2013/Q3-2015/Q2	(Ref.)2012/Q3-2014/Q2
Estimated Model	Double Box-Cox Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.157	0.302
Intercept	19.370 ***	50.801 ***
Input Paper Capacity (Standard and Options, sheets)	--	2.705E-06 ***
Box-Cox Parameter		2.499
Input Paper Capacity (Standard, sheets)	6.018E-06 ***	--
Box-Cox Parameter	2.030	
Input Paper Capacity (Options, sheets)	0.020 ***	--
Box-Cox Parameter	0.801	
Number of Ink	--	0.388 ***
Box-Cox Parameter		2.296
Fax Memory (pages)	0.086 ***	0.516 ***
Box-Cox Parameter	0.394	0.389
Number of Tray	--	1.628 ***
Box-Cox Parameter		1.551
Print Speed (Black, ppm)	0.102 ***	--
Box-Cox Parameter	1.098	
Dummy Variables		
Printing Function		
A3 Size	1.689 ***	5.364 ***
CD/DVD Label	1.596 ***	--
Standard Accessory		
2 Cordless Telephones	1.939 ***	--
Preview Display	1.738 ***	--
Period		
2012/Q4	--	4.673
2013/Q1	--	4.271
2013/Q2	--	--
2013/Q3	--	0.458
2013/Q4	-0.907	-2.665
2014/Q1	1.250 ***	6.470 ***
2014/Q2	0.224	1.288
2014/Q3	-0.288	--
2014/Q4	-0.768	--
2015/Q1	-1.463 ***	--
2015/Q2	-1.732 **	--
R ²	0.938	0.757
Adjusted R ²	0.926	0.727
Standard Error of Regression	1.024	6.556
Mean of Dependent Variable	25.379	67.383
Number of Observations	89	101

Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Estimation Result for Laser Printers

	2013/Q3-2015/Q2	(Ref.)2012/Q3-2014/Q2
Estimated Model	Double Box-Cox Model	Semi Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.125	0.262
Intercept	43.897 ***	32.045 ***
Print Speed (Black, ppm) Box-Cox Parameter	--	0.446 ***
Input Paper Capacity (Standard, sheets) Box-Cox Parameter	1.910 *** 0.045	0.015 ***
Standard Memory (MB) Box-Cox Parameter	3.E-04 *** 1.419	0.014 ***
Auto Document Feeder Capacity (sheets) Box-Cox Parameter	0.208 *** 0.288	0.157 ***
Running Cost (Black, yen per page) Box-Cox Parameter	-101.651 *** -2.788	--
Dummy Variables		
Printing Function		
Color Printing	1.414 **	11.461 ***
A3 Size	1.233 **	6.411 ***
Period		
2012/Q4	--	-1.056
2013/Q1	--	-2.060
2013/Q2	--	0.422
2013/Q3	--	-0.281
2013/Q4	-0.469	0.628
2014/Q1	-0.402	-3.358
2014/Q2	-0.253	-1.315
2014/Q3	-1.463 ***	--
2014/Q4	0.067	--
2015/Q1	-1.036	--
2015/Q2	-0.105	--
R ²	0.937	0.921
Adjusted R ²	0.919	0.902
Standard Error of Regression	1.016	5.358
Mean of Dependent Variable	23.093	65.500
Number of Observations	60	68

Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.