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The 2005 Base Corporate Goods Price Index
Hedonic Regression Model for Quality Adjustment[1]
– Copying Machines –

The Bank of Japan (BOJ) compiles the Corporate Goods Price Index (CGPI) which focuses on the prices of goods traded among corporations. BOJ surveys the prices of the representative products in each commodity category and when they lose their representativeness in the market, they are replaced accordingly. To account for price changes with the quality being constant, quality adjustments between old and new products need to be done. BOJ employs various quality adjustment methods and hedonic regression method is one of them. BOJ updated the regression models[2] for "copying machines." See the appendix 1 and 2 for the results.

The details of samples for the estimation are as follows.

I. The price data for copying machines are taken from the Gartner Japan, Ltd. database.
II. Specifications for each product are taken from the Gartner Japan, Ltd. database and brochures of the products.
III. The numbers of the observations for monochrome copying machines and color copying machines are 127 and 146 respectively. The data from 2009/Q2 to 2011/Q1 are used to estimate the hedonic regression models, which are adopted from August 2011 for the quality adjustment. When the observations include the data of the same products as shipped in several quarters, the first data are used for the estimation[3].

[1] For more details, see the Outline of "Corporate Goods Price Index (CGPI, 2005 base)" on BOJ website.

[2] The Bank adopts two hedonic regression models, one for monochrome copying machines and one for color copying machines.

[3] Sample prices of CGPI are usually replaced by the prices of corresponding new products soon after the release. Therefore, the use of the first observation to estimate may be the best corresponding to quality adjustment of sample prices.

(Appendix 1)

Estimation Result for Monochrome Copying Machines

	2009/Q2~2011/Q1	(Ref.)2008/Q2~2010/Q1
Estimated Model	Semi Box-Cox Model	Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.480	0.770
Intercept	645.886 ***	10,330.716 ***
Multi Copy Speed (ppm)	12.746 ***	34.723 ***
Box-Cox Parameter	--	1.753
First Copy Time (seconds)	-29.591 ***	--
Hard Drive (GB)	--	12.934 **
Box-Cox Parameter	--	1.123
Input Paper Capacity (sheets)	0.043 ***	1.774 ***
Automatic Document Feeder, Input Paper Capacity (sheets)	0.402 *	--
Dummy Variables		
Duplex Printing	--	3,514.051 **
Printer	--	5,771.483 ***
Scanner	56.432 ***	--
Fax	49.939 ***	3,344.564 ***
Automatic Document Feeder	--	2,450.328 **
Color Control Panel	90.633 ***	--
Producer		
Producer A	118.741 **	--
Producer B	463.578 ***	--
Producer C	100.150 ***	--
Producer D	72.647 **	--
Producer E	277.890 ***	--
Producer F	--	10,131.394 ***
Period		
2008/Q3	--	1,579.016
2008/Q4	--	130.516
2009/Q1	--	-3,885.885 **
2009/Q2	--	2,667.115 **
2009/Q3	-50.904	-1,620.319
2009/Q4	-15.367	3,825.386 **
2010/Q1	38.194	-718.406
2010/Q2	-39.474	--
2010/Q3	-208.691 ***	--
2010/Q4	-190.482 ***	--
2011/Q1	-110.563 **	--
R^2	0.947	0.938
Adjusted R^2	0.938	0.932
Standard Error of Regression	90.612	5,109.236
Mean of Dependent Variable	1,334.728	45,441.565
Number of Observations	127	167

Notes:
1. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.
2. The coefficients above are estimated using White heterosckedasticity consistent estimator.

(Appendix 2)

Estimation Result for Color Copying Machines

	2009/Q2～2011/Q1	(Ref.)2008/Q2～2010/Q1
Estimated Model	Box-Cox Model	Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.076	-0.019
Intercept	-600.201 ***	-5,263.208 ***
Multi Copy Speed (Color, ppm)	0.001 ***	0.001 ***
Box-Cox Parameter	2.010	1.854
Input Paper Capacity (sheets)	591.615 ***	8,967.165 ***
Box-Cox Parameter	-0.950	-1.700
Automatic Document Feeder, Input Paper Capacity (sheets)	0.016 ***	0.003 ***
Box-Cox Parameter	0.540	0.701
First Copy Time (Color, seconds)	-0.460 **	-1.118E-05 ***
Box-Cox Parameter	0.184	3.552
Hard Drive (GB)	1.621 **	--
Box-Cox Parameter	-3.213	--
Dummy Variables		
Type, Console	--	0.148 ***
Paper Size,A3	0.993 ***	0.334 ***
PostScript	--	0.056 **
Scanner	--	0.102 ***
Fax	--	0.054 ***
Scanner & Fax	0.313 ***	--
Internet Fax	--	0.042 *
Producer		
Producer A	-0.258 **	--
Producer B	0.710 ***	--
Producer C	2.099 ***	--
Producer D	-2.121 ***	--
Producer E	--	0.058 *
Period		
2008/Q3	--	0.047 *
2008/Q4	--	2.936E-04
2009/Q1	--	0.014
2009/Q2	--	-0.187 ***
2009/Q3	0.208	-0.078 ***
2009/Q4	0.159	-0.109 ***
2010/Q1	0.318	-0.134 ***
2010/Q2	1.746 ***	--
2010/Q3	-0.099	--
2010/Q4	0.832 ***	--
2011/Q1	0.757 ***	--
R^2	0.935	0.926
Adjusted R^2	0.925	0.917
Standard Error of Regression	0.483	0.106
Mean of Dependent Variable	23.855	11.930
Number of Observations	146	170

Notes:
1. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.
2. The coefficients above are estimated using White heterosckedasticity consistent estimator.