

Hedonic Regression Models for Quality Adjustment in the Corporate Goods Price Index - Digital Cameras -

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 model² for compact digital cameras. See the appendix 1 for the result. Also, the results which were published in December 2015 are included in the appendix 2 and 3 for mirrorless interchangeable-lens reflex cameras and digital single-lens reflex cameras, respectively. These hedonic regression models are used for "Digital cameras" (Producer Price Index) and "Video cameras & digital cameras" (Export Price Index and Import Price Index).

The details of samples for the estimation are as follows.

- I. The price data for compact digital cameras, mirrorless interchangeable-lens reflex cameras, and digital single-lens reflex cameras 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 compact digital cameras, mirrorless interchangeable-lens reflex cameras, and digital single-lens reflex cameras are taken from the "BCN Ranking" and the brochures.
- III. The numbers of the observations for compact digital cameras, mirrorless interchangeable-lens reflex cameras, and digital single-lens reflex cameras are 90, 100, and 69 respectively. The data periods used to estimate the hedonic regression models are from 2014/Q4 to 2016/Q1 for compact digital cameras, and those for both mirrorless interchangeable-lens reflex cameras and digital single-lens reflex cameras are from 2013/Q4 to 2015/Q3. The model for compact digital cameras is adopted from May 2016 and the models for mirrorless interchangeable-lens reflex cameras and digital single-lens reflex cameras are adopted from November 2015 for the quality adjustment.

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

² The Bank adopts three hedonic regression models for compact digital cameras, mirrorless interchangeable-lens reflex cameras, and digital single-lens reflex cameras.

Estimation Result for Compact Digital Cameras

	2014/Q4-2016/Q1	(Ref.) 2014/Q4-2015/Q3
Estimated Model	Double Box-Cox Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.278	0.551
Intercept	-21,204.316 **	162.078 **
Optical Zoom (times)	2.283 ***	38.149 ***
Box-Cox Parameter	0.270	0.277
Shooting Capability (Battery Performance, shots)	39,531.120 **	2.906E-05 *
Box-Cox Parameter	-1.858	2.627
Maximum ISO Sensitivity (including Expanded Sensitivity)	8.611E-04 ***	0.006 ***
Box-Cox Parameter	0.898	1.029
F-Number (Wide-Angle)	-69.227 ***	-71.445 **
Box-Cox Parameter	-1.630	0.620
Maximum Number of Recording Pixels (Movie)	1.648E-07 ***	0.092 ***
Box-Cox Parameter	1.115	0.478
Dummy Variables		
Image Sensor Size		
not less than 1 inches and less than APS-C	7.067 ***	300.337 ***
APS-C	24.423 ***	453.042 ***
Full Frame	27.342 ***	828.858 ***
LCD Size		
not less than 3.2 inches	12.696 ***	--
Touch Screen Display	3.688 **	106.651 ***
Waterproof	9.939 ***	115.384 ***
Wireless Fidelity	5.471 ***	--
Electronic Viewfinder	2.751 *	--
Producer		
Producer A	32.971 ***	863.352 ***
Producer B	26.199 ***	1,085.110 ***
Producer C	18.399 ***	436.607 ***
Producer D	8.738 ***	--
Producer E	-5.618 ***	--
Period		
2015/Q1	-1.662	4.978
2015/Q2	-3.639 *	49.540
2015/Q3	0.603	39.135
2015/Q4	0.864	--
2016/Q1	-2.729	--
R ²	0.969	0.978
Adjusted R ²	0.959	0.970
Standard Error of Regression	3.935	71.870
Mean of Dependent Variable	66.268	714.430
Number of Observations	90	63

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

Estimation Result for Mirrorless Interchangeable-Lens Reflex Cameras

	2013/Q4-2015/Q3	(Ref.)2012/Q4-2014/Q3
Estimated Model	Semi Box-Cox Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable	-0.366	-0.316
Intercept	2.669 ***	3.060 ***
Image Sensor Size (mm ²)	3.160.E-05 ***	4.845E-06 ***
Box-Cox Parameter	--	1.285
Kit Lens 1 Zoom (times)	--	1.183E-03 ***
Box-Cox Parameter		0.809
Kit Lens 2 Zoom (times)	--	2.485E-05 ***
Box-Cox Parameter		-0.757
Optical Zoom of Kit Lens (max, times)	6.210.E-04 ***	--
AF Sensor Point (points)	2.990.E-05 ***	--
Dummy Variables		
Touch Screen Display	0.002 ***	0.010 ***
Electronic Viewfinder	0.005 ***	0.012 ***
Maximum Shutter Speed not more than 1/8,000 second	0.006 ***	0.010 ***
Including Two Kit Lens	0.003 ***	--
Producer		
Producer A	--	0.013 ***
Producer B	0.015 ***	0.032 ***
Producer C	-0.010 ***	--
Producer D	-0.005 ***	--
Period		
2013/Q1	--	-0.003
2013/Q2	--	-0.004 **
2013/Q3	--	-0.004
2013/Q4	--	-0.005 *
2014/Q1	0.004 ***	-0.002
2014/Q2	0.002	-0.003
2014/Q3	0.001	-0.005 **
2014/Q4	-0.003 **	--
2015/Q1	-0.004 ***	--
2015/Q2	-0.003 **	--
2015/Q3	0.001	--
R ²	0.856	0.762
Adjusted R ²	0.826	0.727
Standard Error of Regression	0.003	0.006
Mean of Dependent Variable	2.688	3.075
Number of Observations	100	116

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

Estimation Result for Digital Single-Lens Reflex Cameras

	2013/Q4-2015/Q3	(Ref.)2012/Q4-2014/Q3
Estimated Model	Double Box-Cox Model	Double Box-Cox Model
Box-Cox Parameter of Dependent Variable	0.156	-0.154
Intercept	21.864 ***	-0.828
AF Sensor Point (points)	0.021 ***	0.090 ***
Box-Cox Parameter	1.378	-0.222
Continuous Shooting Speed (shots/second)	--	21.106 ***
Box-Cox Parameter		-3.561
Shooting Capability (Battery Performance, shots)	6.720E-07 ***	1.772E-04 ***
Box-Cox Parameter	2.082	0.850
Maximum ISO Sensitivity (Except for Expanded Sensitivity)	0.643 **	--
Box-Cox Parameter	-0.065	
Optical Zoom of Kit Lens (max, times)	0.271 ***	--
Box-Cox Parameter	0.314	
Dummy Variables		
Full Frame Sensor	5.769 ***	0.105 ***
Maximum Shutter Speed not more than 1/8,000 second	1.773 ***	0.036 ***
Including Kit Lens	--	0.045 ***
Including Two Kit Lens	0.551 *	--
Continuous Shooting Speed not less than 5 shots/second	2.062 ***	--
Producer		
Producer A	2.704 ***	0.108 ***
Producer B	1.558 ***	0.040 ***
Period		
2013/Q1	--	-0.003
2013/Q2	--	-0.036 **
2013/Q3	--	-0.043 ***
2013/Q4	--	-0.006
2014/Q1	-0.044	-0.015
2014/Q2	0.148	-0.006
2014/Q3	-0.360	-0.013
2014/Q4	0.843	--
2015/Q1	0.215	--
2015/Q2	0.409	--
2015/Q3	--	--
R ²	0.959	0.966
Adjusted R ²	0.947	0.956
Standard Error of Regression	0.803	0.019
Mean of Dependent Variable	33.689	5.425
Number of Observations	69	68

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