Monday, Jun 11, 2007

2000 Base Corporate Goods Price Index
Hedonic Regression Model for Quality Adjustment[1]
– Servers –

The Bank of Japan compiles the index of "General purpose computers & servers" in the 2000 base Corporate Goods Price Index (CGPI). When the sample prices of "servers" surveyed for the compilation of the index are replaced, the quality difference between the old and new sample prices are adjusted by the hedonic regression method.[2, 3] The bank updated the hedonic regression model. The details of the estimation are as follows.

1. The Data Source
The data we used for the analysis are as follows.

I.   The price data for servers are taken from "Japan Server Quarterly Model Analysis", the data base of IDC Japan.

II.   Spec. data for each product are taken from the "Japan Server Quarterly Model Analysis" and brochures of the products.

III.   The sample range for analysis is the last two years, and the number of the observations is 50 for high class PC servers and 268 for standard ones respectively.[4] The data from 2005/Q1 to 2006/Q4 are used to estimate the hedonic regression model, which is adopted from May 2007 for the CGPI. When the data include the same information of the products as shipped in consecutive periods, only the data of the products shipped in the first period are selected as sample data.[5]

---

[1] For more detail, see the "Explanation of Corporate Goods Price Index (CGPI)" on the Bank of Japan (BOJ) website, http://www.boj.or.jp/en/theme/research/stat/pi/cgpi/index.htm.

[2] The hedonic regression method is one of the quality adjustment methods. This method is used to calculate the part of the price changes that correspond to the change in quality accompanying the shift to the new sample prices.

[3] The Bank adopts two hedonic regression models, one for high class PC servers, whose maximum supported quantity of processors are four or more, and one for standard ones, whose max supported quantity of processors are two or less. The regression model of high grade PC servers substitutes that of UNIX servers.

[4] As we discussed above, the observations for regression are categorized into two classes, the high grade class, and the standard class, by means of the number of processors as the criterion.

[5] The sample price of CGPI is usually replaced by the price of corresponding new product soon after its release. Therefore, use of the first observation to estimate may be the best corresponding to quality adjustment of the sample price.

Estimation Result for High Class Models

	2005/1Q-2006/4Q	(Ref.) 2004/1Q-2005/4Q
Box-Cox Prameter	--	-0.469
Estimsated Model	Log-Linear Model	Box-Cox Model
Intercept	4.735 *	-197.915 **
Clock Frequency (MHz)	1.197 ***	2.187E-06 ***
Box-Cox Prameter	--	0.754
Max. Supported Memory Capacity (GB)	--	0.004 ***
Box-Cox Prameter	--	-0.772
Cache Memory (KB)	--	406.449 **
Box-Cox Prameter	--	-2.032
Processors/Quantity	--	0.001 ***
Box-Cox Prameter	--	-1.991
Processor Type		
Xeon7000series × Number of Processors	0.136 *	
SCSI Hard Disk Drives	0.288 **	--
Dummy for Producer		--
Producer A	0.461 ***	--
Producer B	0.224 *	--
Producer C	0.345 ***	0.001 ***
Dummy for Period		
2006/4Q	-0.226 **	
(Ref.) Processor Type (Previous estimation)		
Xeon MP		2.957E-04 *
(Ref.) Dummy for Period (Previous estimation)		
2005/2S		-5.107E-04 ***
Adjusted R^2	0.576	0.680
Standard Error of Regression	0.244	2.805E-04
Mean of Dependent Variable	14.574	2.132
Number of Observations	50	50

Notes:

1. *, ** , *** denotes significance at the 10%, 5%, 1% level respectively.

2. The estimated results above are White heteroscedasticity consistent estimator.

3. To avoid a perfect multicollinearity, we drop the dummy variable for the 2005/1Q, and also, dummy variables whose parameters are not estimated significantly are dropped from the estimation.

4. In the column of the Dummy for Period above, "Q" denotes quarter and "S" denotes semester.

(Appendix 2)

Estimation Result for Standard Models

	2005/1Q-2006/4Q	(Ref.) 2004/1Q-2005/4Q
Box-Cox Prameter	0.411	-0.257
Estimsated Model	Box-Cox Model	Box-Cox Model
Intercept	261.347 ***	-4,804.390 ***
Max. Supported Memory Capacity (MB)	3.223 ***	--
Box-Cox Prameter	0.257	--
Cache Memory (KB)	--	11,815.600 ***
Box-Cox Prameter	--	-2.457
Processor Cores/Max. Supported Quantity	18.474 ***	--
Processor Type <See the Notes below>		
Processor Type Dummy × Number of Processors	44.938 ***	
Hot-Plug Capability	52.383 ***	0.005 **
RAID Controller	28.901 ***	--
Cabinet/Form factor		--
Blade	40.052 ***	--
Dummy for Producer		
Producer A	78.125 ***	0.008 ***
Producer B	22.857 **	--
Producer C	32.918 ***	--
Producer D	104.613 ***	0.017 ***
Producer E	--	-0.007 ***
Dummy for Period		
2006/1S	-38.296 ***	--
2006/2S	-89.539 ***	--
(Ref.) Processor Type (Previous estimation)		
Pentium 4		-0.015 ***
Xeon		0.014 ***
Xeon MP		0.049 ***
Opteron 275		0.020 ***
Adjusted R^2	0.644	0.602
Standard Error of Regression	61.897	0.013
Mean of Dependent Variable	497.515	3.751
Number of Observations	268	306

Notes:

1. *, ** , *** denotes significance at the 10%, 5%, 1% level respectively.

2. The estimated results above are White heteroscedasticity consistent estimator.

3. To avoid a perfect multicollinearity, we drop the dummy variable for the 2005/1S, and also, dummy variables whose parameters are not estimated significantly are dropped from the estimation.

4. In the column of the Dummy for Period above, "S" denotes semester.

5. Processors used for "Processor Type Dummy" above include the Xeon series processors and the Opteron series processors.