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ESTIMATING HEDONIC PRICE INDEXES FOR PERSONAL COMPUTERS IN RUSSIA

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Abstract

Economists have been noting for decades that Consumer Price Index (CPI) in the developed countries is overstating inflation by 0,5–2,0% per year. A significant part of the bias is due to the presence of technology products and differentiated products in the CPI basket. An increase share of these products in the Russian CPI may also lead to a substantial upward bias. Nowadays hedonic indices are believed to be the most efficient way to reduce this bias. They can be used in two ways: to estimate the bias in CPI and to elaborate alternative official price indices for information and communication technology (ICT) products. We estimate a 25% fall in the price of personal computers for 20 months (03.04-11.05) using this method. A 25–44% upward bias in price index for PC in Russia was also calculated. We have found that the Russian CPI could be upward biased by 0,18-0,32% per year due to new goods and quality change effects for PC (given 1% expenditure share).

Key words: CPI, price index, hedonic price index, CPI bias

JEL Classification: C43, E31

1. INTRODUCTION

In the last two decades considerable attention has been drawn to the methods of computing price indexes for Information and Communication Technology (ITC) products: the discussion started in the USA and then has been continued throughout the entire world. Report prepared by Boskin Commission (1996) raised the problem of biases in the price indexes for ITC products: it showed that traditional matched models indexes can substantially overestimate inflation, because they are not able to measure the peculiarities of ITC industries (i.e. fast rotation of goods, huge quality differences among products on the market, short product life cycle, etc.).

Despite the fact that price indexes are the main measures of inflation and are used to calculate real (deflated) values of macroeconomic indicators, little attention is paid to them in Russia and other former USSR countries (CIS). The productivity paradox in the developed countries revealed that there is correspondence between productivity measures and quality adjustments method, which is crucial for price indexes for ITC products. So the inability of Russian statisticians to eliminate biases in price indexes used will lead to biased measures of inflation (deflators) and economic growth. Given that Russian Government is stimulating the development of ITC industries, the inability to eliminate biases for these products would lead to inefficient policy decisions, because the price indexes for ITC products would be biased up, while productivity growth, investments, consumption would be underestimated.

Rapid development in the technology of ITC products, described by Moore Law, forms special properties of the ITC industries, which were summarized by Hausman (1997) as a “law of invisible hand for imperfect competition”: firms can make economic profit only with introduction of new goods that are unique and have a market power to be priced higher than marginal costs. This law in case of fast technological development leads to a very short product life cycle, fast quality growth and stable or falling nominal prices. Recent papers by Greenstein and Barth (2006) and Greenstein and Wade (1998) show that ability of competitors to cannibalize and vintage are crucial determinants of the product life cycle. Figueiredo and Kyle (2003) show that innovative companies always have an incentive for high frequency of entrance.

Recent studies of hedonic price indexes for PC show that quality adjusted prices decline by 25–35 % per year in the USA — (Pakes,2002), (Berndt, Ernst R. and Neal J. Rappaport,2001), (Berndt, Ernst R., Zvi Griliches and Neal Rappaport, 1995), 34% in Germany — (Moch,1997), 33–36% in France — (Bourot, 1997)), 28–34% in Taiwan — (Jang et al.,1996).

There is no evidence about quality-adjusted price indexes for PC in Russia: Russian statistical agency (Rosstat) computes a price index for PC in the CPI, but it is not publicly published.¹ Investment deflators in ITC are not developed as well.

¹ Problems with methodology for such goods like PC might be the main reason why Russian statistical agency does not publish these indexes.

Nowadays there is no evidence on quality-adjusted prices for PC in Russia or CIS countries, so this study aims to answer two main questions: firstly, we estimate the quality-adjusted price change in Russia. Comparing these estimates to the evidence from developed countries one can make conclusions about the extent to which PC markets are integrated and competitive. Secondly, we are able to assess the potential bias in the corresponding price index, which would help us to prepare recommendation for Rosstat in the future.

2. HEDONIC PRICE INDEXES ESTIMATES FOR PC MARKET (YEKATERINBURG, RUSSIA)

2.1. Model

Hedonic price index is any price index, which uses information from hedonic regression. Hedonic regression describes how product price (P_i) could be explained by different product characteristics. For example, assume that we have n goods, which could be described by a vector of k characteristics $\mathbf{z}_i = (z_{i1}, \dots, z_{ki})^T$. Thus the hedonic regression is:

$$P_i(z_i) = c_0 + \sum_{j=1}^k c_j z_{ji} + \varepsilon_i \quad \forall i \in [1, \dots, n] \quad ,$$

where ε_i *i.i.e.* $N(0; \sigma^2)$. Then corresponding chained² hedonic price index would look like:

$$PI[0; T] = \prod_{t=0}^T \frac{\hat{P}_{t+1}(\mathbf{z}^t)}{\hat{P}_t(\mathbf{z}^t)} \quad ,$$

Where $PI[0; T]$ — price index for period from 0 to T , $\hat{P}_{t+1}(\mathbf{z}^t)$ — estimate of hedonic regression at period $t+1$ with mean characteristics of period t — \mathbf{z}^t . A detailed taxonomy of hedonic price indexes are presented in Table 1 (Appendix 1).

2.2 Data

² In the study we also calculate base indexes, which are defined as a relative of price of T period for the good with mean characteristic and price of 0 period for the good with the same characteristics. See detailed description in table 1.

The usage of hedonic regressions to construct price indexes requires detailed information on prices and product characteristics. To study the relationship between quality and product price we use a data set on PCs for the period from 03.2004 to 11.2005 in the electronic database of advertisements for one of the largest Russian cities — Yekaterinburg.

Our sample (See Table 2 in App.2 for a descriptive statistics) consists of about 200 monthly observations, the main characteristics of a PC are processor speed (MHz), PC memory (in Mb), Video Memory (in Mb), Hard Disk Capacity (in Hb), Type of Optical Disk Drive (CD-ROM, CD-RW, CD-RW/DVD-ROM, DVD-R) and type of processor (either Pentium 4 or other).

It should be noted that as in developed countries, Yekaterinburg PC market experiences a high quality growth — for the 20 month Video Memory grew by 87%, Hard Disk Capacity by 73%, PC memory by 47% and Speed by 27% (table 2), while average prices grew by 18% that is a little bit lower than the rate of inflation in Russia (measured by CPI).

2.3 Hedonic price indexes estimates

In this study we find a substantial decline in quality-adjusted prices in Russia: from 24–40% for the 20 month period (Figure 1 and Table 6 in Appendix 6). These estimates suggest that PCs market in Russia has very similar properties to those of western markets (USA, EU and Australia) — fast quality growth, high speed of new goods introduction and goods exit and a rapid decline in quality-adjusted price. Obviously, we should expect the same biases in elementary price indexes for ITC products, biased ITC deflators and productivity paradox.

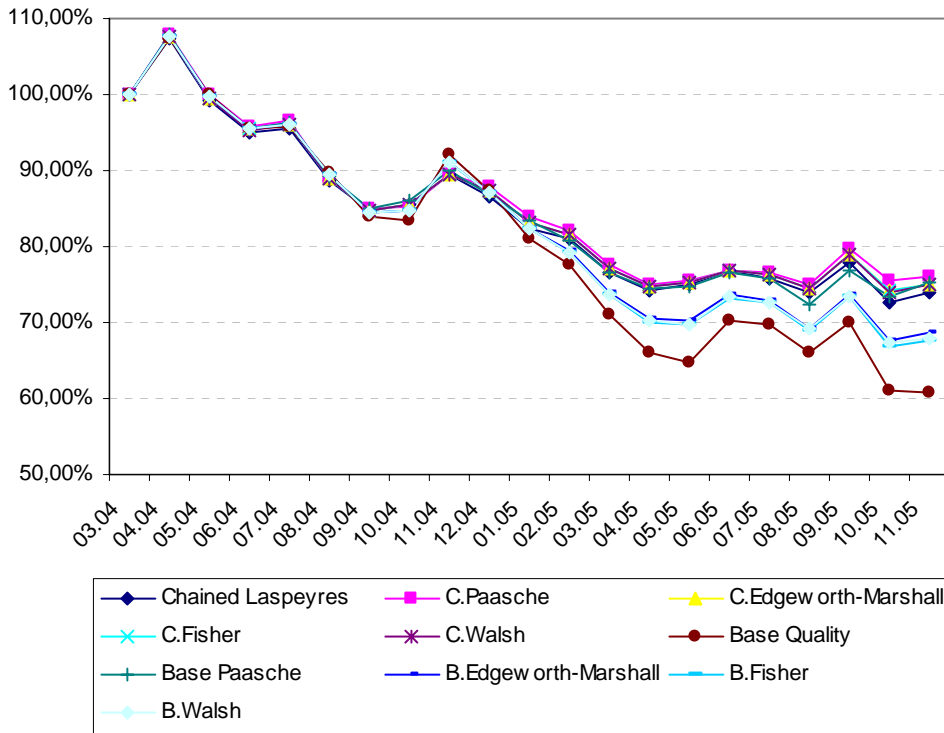
We also find that there is a systematic difference between chained and base indexes. The former are tending to overestimate price decline: they are more describing PCs that are much more close to exit and are older than the average PCs on the market. Faster price decline of base indexes may be due to the properties of the life cycle of exiting/old PCs, which is not studied in hedonic literature: at the end of life or when new PCs enter the market exiting/older PCs experience higher price decline than entering and average-age PCs.

Also we find that “superlative” indexes (Fisher, Edgeworth-Marshall and Walsh) are showing a more consistence and stable dynamics over time as they are using information about characteristics of PCs for both periods. This is why we treat chained “superlative” hedonic indexes as the most precise.

As for statistical properties of hedonic regression estimates, we would like to admit two points. First of all, all independent variables are significant at the 5–10% confidence levels almost in all regressions. Mean R^2 is about 80%. (Table 4–5 in App. 4–5). Secondly, estimates of coefficients are not very stable over time due to omission of important variables — this is the main reason for not implementing methods like “option cost” that was for PCs in UK, because coefficients might be substantially biased.

However, fitted price calculated near the mean characteristics tends to be very stable, independent of omitted variables, because of the OLS properties.³

Figure-1: Hedonic Price Indexes for PC in Russia (Yekaterinburg market) cumulative indexes from 03.2004-11.2005⁴



2.4 Price index and CPI biases

To estimate price index for PC bias we need to get a matched model index that is currently used by Rosstat. Unfortunately, Rosstat doesn't publish official PC indexes. So, to estimate bias we use the following scheme: we assume that official price index would be at least 100% (i.e., show no price change)⁵ — we get a lower bound. Upper bound is derived on the assumption that official price index would not exceed the average price growth.

³ OLS estimation guarantees that regression is always crossing its mean.

⁴ Index with label "B." and "C." stands for chained or base. For example, B.Walsh is a base Walsh hedonic price index.

⁵ The validity of this assumption could be tested through the inspection of the CPI elementary price indexes — you can hardly find a price index showing a decline in prices - at most 100%.

Based on this assumption an upward bias in price index for PC is lying within the interval from 25% to 44%⁶ for 20 months or from 16% to 29% in 12 month scale. Personal computers have a 1,13% in the Russian CPI, so given this, an upward bias in the CPI due to the bias in the price index for PC could be from 0,18 to 0,32 % per year (12 month scale).

3. CONCLUSION

Nowadays hedonic indices are believed to be the most efficient way to reduce this bias. They can be used in two ways: to estimate the bias in CPI and to elaborate alternative official price indices for ITC-products. We estimate a 25% fall in the price of personal computers for 20 months (03.04-11.05) using this method. A 25–44% upward bias in price index for PC in Russia was also calculated. We have found that the Russian CPI could be upward biased by 0,18-0,32% per year due to new goods and quality change effects for PC (given 1% expenditure share).

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Appendix

Appendix 1

Table-1 **Biases in CPI, % per year**

Source of bias	Canada ¹	France ²	U.S.A. ³	Japan ⁴	Germany ⁵	U.K. ⁶
Substitution effect: upper bound	0,10	—	0,15	0,00	0,10	0,05-0,10
Substitution effect: lower bound	0,00-0,10	0,05-0,10	0,25	0,10	—	—
Outlet substitution bias	0,07	0,05-0,15	0,10	0,10	0,05	0,10-0,25
Total	0,17-0,27	0,10-0,25	0,50	0,20	0,20	0,15-0,35
Quality change and new goods	0,30	—	0,6	0,70	0,60	0,20-0,45
Total	0,47-0,57	0,10-0,25	1,10	0,90	0,75	0,35-0,80

Source:¹(Crawford, 1998), ²(Lequiller, 1997), ³(Boskin et al., 1996), ⁴(Shiratsuka, 1999), ⁵(Hoffmann, 1998),
⁶(Cunningham, 1996)

Table-2 Hedonic index taxonomy within characteristic approach

Price Index	Chain	Base
Laspeyres	$\prod_{t=0}^T \frac{P_{t+1}(\mathbf{z}^t)}{P_t(\mathbf{z}^t)}$	—
Paasche	$\prod_{t=0}^T \frac{P_{t+1}(\mathbf{z}^{t+1})}{P_t(\mathbf{z}^{t+1})}$	$\frac{P_T(\mathbf{z}^T)}{P_0(\mathbf{z}^T)}$
Fisher	$\sqrt{\prod_{t=0}^T \left\{ \frac{P_{t+1}(\mathbf{z}^{t+1})}{P_t(\mathbf{z}^{t+1})} \frac{P_{t+1}(\mathbf{z}^t)}{P_t(\mathbf{z}^t)} \right\}}$	$\sqrt{\frac{P_T(\mathbf{z}^T) P_T(\mathbf{z}^0)}{P_0(\mathbf{z}^T) P_0(\mathbf{z}^0)}}$
Edgeworth-Marshall	$\prod_{t=0}^T \frac{P_{t+1}((\mathbf{z}^{t+1} + \mathbf{z}^t)/2)}{P_t((\mathbf{z}^{t+1} + \mathbf{z}^t)/2)}$	$\frac{P_T((\mathbf{z}^T + \mathbf{z}^0)/2)}{P_0((\mathbf{z}^T + \mathbf{z}^0)/2)}$
Walsh	$\prod_{t=0}^T \frac{P_{t+1}(\sqrt{\mathbf{z}^{t+1} \mathbf{z}^t})}{P_t(\sqrt{\mathbf{z}^{t+1} \mathbf{z}^t})}$	$\frac{P_T(\sqrt{\mathbf{z}^T \mathbf{z}^0})}{P_0(\sqrt{\mathbf{z}^T \mathbf{z}^0})}$
Base quality		$\frac{P_T(\mathbf{z}^0)}{P_0(\mathbf{z}^0)}$
$P_{t+1}(\mathbf{z}^t)$ — hedonic price at time $t+1$ with mean characteristics of the t^{th} time — \mathbf{z}^t .		

Table-3 Descriptive statistics of Yekaterinburg city market for PC

Month	Pentium-IV Dummy	MHz	Memory, Mb	Hard Disk, Hb	Video memory, Mb	CD-ROM	CD-RW	CR-RW-DVD-ROM	DVD-RW	Mean Price, Ruble
03.2004	39,36%	2119,50	253,76	52,45	75,62	58,89%	9,91%	8,75%	0,87%	12638,38
04.2004	39,48%	2140,32	253,10	52,49	68,74	44,98%	10,68%	10,36%	0,32%	13171,16
05.2004	42,81%	2169,59	273,20	57,88	83,76	47,19%	20,63%	7,81%	1,88%	12655,87
06.2004	41,02%	2188,12	275,93	57,51	82,25	52,40%	12,57%	10,18%	0,60%	12965,10
07.2004	42,21%	2220,84	275,12	57,89	87,06	55,84%	13,96%	10,06%	0,97%	13433,98
08.2004	47,10%	2285,41	301,96	62,47	97,61	44,40%	18,92%	15,44%	4,25%	13604,48
09.2004	45,41%	2263,63	303,51	60,39	96,49	44,98%	6,11%	19,21%	3,49%	13486,31
10.2004	47,62%	2336,15	301,71	62,95	98,29	47,14%	27,14%	14,76%	4,76%	14215,24
11.2004	43,64%	2380,18	304,27	58,35	102,85	47,03%	24,15%	16,10%	3,39%	13656,82
12.2004	49,80%	2402,64	319,74	60,49	120,88	52,65%	21,22%	17,55%	3,67%	13758,77
01.2005	48,79%	2488,31	318,45	65,99	115,32	53,14%	10,63%	21,74%	7,25%	13742,91
02.2005	35,68%	2550,80	359,19	79,38	112,97	22,47%	38,33%	13,22%	9,69%	13981,04
03.2005	34,82%	2553,49	360,57	79,20	115,14	27,68%	36,16%	16,07%	8,93%	13668,07
04.2005	34,21%	2565,63	364,21	79,61	121,05	28,29%	30,92%	12,83%	12,17%	13835,54
05.2005	37,74%	2575,10	350,67	80,49	117,13	27,92%	12,45%	18,11%	15,09%	14282,16
06.2005	37,50%	2578,76	341,54	79,71	123,55	22,60%	9,62%	15,38%	7,69%	13379,99
07.2005	52,58%	2584,43	353,65	76,70	131,63	13,40%	10,31%	18,56%	9,28%	13945,28
08.2005	48,44%	2562,34	359,00	78,75	104,25	12,50%	6,25%	11,72%	11,72%	13241,38
09.2005	47,92%	2602,40	370,67	77,92	98,67	16,67%	5,21%	19,79%	14,58%	13679,58
10.2005	42,24%	2671,17	391,72	88,97	121,10	7,76%	5,17%	35,34%	10,34%	14590,80
11.2005	38,69%	2687,27	372,79	91,09	141,55	10,22%	2,19%	24,09%	17,52%	15015,71

Table-4 Estimates of hedonic regressions for Yekaterinburg market for PC

Month	Constant	Pentium -IV Dummy	MHz	Memory. Mb	Hard Disk, Hb	Video memory, Mb	CD- ROM	CD- ROM	CD-RW	CR- RW- DVD- ROM	DVD- RW	R ² - adjusted	F- statistics	No. of observati ons
03.2004	2577,492	2756,832	1,578	9,208	14,788	14,362	852,194	852,194	2567,557	5961,297	17655,386	80,35%	156,42	343
04.2004	433,578	2209,127	2,746	9,326	26,171	8,250	1324,931	1324,931	2431,992	7358,506	21645,262	72,42%	90,86	309
05.2004	3943,462	2546,807	1,271	10,289	2,864	17,781	711,144	711,144	1132,225	5779,356	18422,944	80,50%	147,29	320
06.2004	1446,208	2422,462	2,513	10,175	2,525	10,104	933,347	933,347	622,731	5500,407	19126,740	75,16%	112,98	334
07.2004	36,425	1968,418	3,256	10,354	0,241	11,257	1065,613	1065,613	775,562	6268,021	16277,795	65,40%	65,49	308
08.2004	1614,255	1776,872	2,461	6,221	20,822	2,075	849,980	849,980	1152,203	5776,364	15518,609	85,35%	168,05	259
09.2004	-459,433	2605,971	3,171	9,183	17,040	1,047	996,464	996,464	774,169	4269,933	10074,500	81,74%	114,38	229
10.2004	2340,920	2271,440	2,040	14,554	26,282	4,209	-924,382	-924,382	-2381,862	2889,042	5987,404	65,74%	45,99	212
11.2004	4389,910	1647,061	2,147	7,163	4,346	-2,337	-654,085	-654,085	608,705	5756,836	14116,167	75,72%	82,42	236
12.2004	2152,393	1951,696	1,715	5,656	23,706	9,665	412,702	412,702	1483,783	5535,731	16325,193	78,98%	102,88	245
01.2005	72,621	1655,040	2,640	4,892	20,292	10,857	174,280	174,280	2407,564	5181,727	9234,853	86,77%	151,06	207
02.2005	336,362	2429,160	2,172	6,115	9,370	21,354	1027,257	1027,257	377,556	4834,244	8986,832	87,96%	184,40	227
03.2005	-1935,516	2831,782	2,694	4,071	17,775	22,292	1867,839	1867,839	885,381	4048,559	9043,333	85,65%	148,88	224
04.2005	-2898,818	2708,786	2,833	8,632	22,506	14,527	1564,575	1564,575	680,794	2935,114	6694,799	84,16%	179,86	304
05.2005	-3441,562	1627,676	2,959	10,808	11,388	22,499	2590,836	2590,836	761,746	2245,770	6116,202	39,86%	20,44	265
06.2005	-1913,460	2412,073	2,892	6,440	31,059	6,995	1061,151	1061,151	1529,034	4109,553	4854,140	82,35%	108,28	208
07.2005	298,698	2187,562	1,739	5,373	19,540	23,650	2075,281	2075,281	1677,358	3417,243	4351,429	83,77%	56,04	97
08.2005	-541,898	1675,773	2,464	5,845	20,537	21,073	760,776	760,776	1592,097	2009,104	2696,909	78,02%	51,08	128
09.2005	-3531,834	2467,168	3,602	8,545	0,474	14,408	1711,655	1711,655	3407,598	4265,898	4947,470	86,98%	71,52	96
10.2005	-6001,258	2783,891	4,778	6,298	4,187	19,745	866,104	866,104	239,042	2321,040	5043,277	82,38%	60,73	116
11.2005	-5765,723	3849,195	4,046	9,063	23,343	12,141	1534,547	1534,547	1339,171	1635,547	3510,645	85,26%	88,39	137

Table-5 **P-value**

Month	Constant	Pentium-IV Dummy	MHz	Memory. Mb	Hard Disk, Hb	Video memory, Mb	CD- ROM	CD- RW	CR- RW- DVD- ROM	DVD- RW
03.2004	0,02%	0,00%	0,00%	0,00%	1,73%	0,19%	0,56%	0,00%	0,00%	0,00%
04.2004	66,00%	0,00%	0,00%	0,00%	0,58%	16,75%	0,11%	0,04%	0,00%	0,00%
05.2004	0,00%	0,00%	0,54%	0,00%	62,69%	0,00%	4,02%	1,81%	0,00%	0,00%
06.2004	8,76%	0,00%	0,00%	0,00%	68,41%	0,01%	0,79%	23,90%	0,00%	0,00%
07.2004	97,49%	0,00%	0,00%	0,00%	97,65%	0,12%	3,93%	28,74%	0,00%	0,00%
08.2004	6,66%	0,00%	0,00%	0,00%	0,01%	36,37%	3,87%	3,29%	0,00%	0,00%
09.2004	62,72%	0,00%	0,00%	0,00%	2,61%	68,31%	1,52%	29,61%	0,00%	0,00%
10.2004	10,14%	0,00%	0,21%	0,00%	0,31%	53,52%	22,36%	1,23%	0,69%	0,21%
11.2004	0,01%	0,00%	0,00%	0,00%	57,16%	54,45%	28,62%	42,08%	0,00%	0,00%
12.2004	5,96%	0,00%	0,03%	0,00%	0,06%	0,01%	61,26%	10,11%	0,00%	0,00%
01.2005	94,71%	0,00%	0,00%	0,00%	1,06%	0,00%	76,92%	0,09%	0,00%	0,00%
02.2005	75,98%	0,00%	0,00%	0,00%	6,26%	0,00%	2,59%	43,06%	0,00%	0,00%
03.2005	12,59%	0,00%	0,00%	0,01%	0,07%	0,00%	0,04%	7,30%	0,00%	0,00%
04.2005	1,47%	0,00%	0,00%	0,00%	0,00%	0,00%	0,05%	12,34%	0,00%	0,00%
05.2005	30,03%	6,80%	5,18%	0,26%	50,58%	1,89%	2,78%	60,66%	9,64%	0,02%
06.2005	9,79%	0,00%	0,00%	0,00%	0,00%	0,01%	1,19%	0,82%	0,00%	0,00%
07.2005	86,18%	0,00%	2,95%	0,41%	3,36%	0,00%	0,82%	3,61%	0,00%	0,00%
08.2005	70,06%	0,02%	0,03%	0,02%	0,65%	0,00%	24,89%	6,76%	1,09%	0,13%
09.2005	1,70%	0,00%	0,00%	0,00%	95,52%	0,54%	0,79%	0,06%	0,00%	0,00%
10.2005	0,06%	0,00%	0,00%	0,03%	64,19%	0,00%	35,47%	83,43%	0,06%	0,00%
11.2005	0,03%	0,00%	0,00%	0,00%	0,09%	0,03%	4,61%	32,79%	0,23%	0,00%

Table-6 Hedonic price indexes estimates on month-to-month basis

Month	Chained Indexes					Base Indexes				
	Laspeyres	Paasche	Edgeworth- Marshall	Fisher	Walsh	Base quality	Paasche	Edgeworth- Marshall	Fisher	Walsh
03.2004	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%
04.2004	107,40%	107,87%	107,63%	107,63%	107,64%	107,40%	107,87%	107,63%	107,63%	107,64%
05.2004	92,40%	92,61%	92,51%	92,51%	92,49%	93,00%	92,41%	92,70%	92,71%	92,70%
06.2004	95,70%	95,93%	95,82%	95,82%	95,82%	95,62%	95,91%	95,76%	95,76%	95,76%
07.2004	100,61%	100,80%	100,70%	100,70%	100,70%	100,29%	100,86%	100,58%	100,57%	100,58%
08.2004	92,94%	92,18%	92,55%	92,56%	92,56%	93,71%	92,53%	93,10%	93,12%	93,14%
09.2004	95,40%	95,36%	95,38%	95,38%	95,38%	93,64%	95,17%	94,43%	94,40%	94,41%
10.2004	100,97%	100,52%	100,75%	100,75%	100,75%	99,18%	101,38%	100,33%	100,27%	100,27%
11.2004	104,53%	104,92%	104,73%	104,73%	104,73%	110,58%	104,54%	107,39%	107,52%	107,55%
12.2004	96,78%	98,28%	97,53%	97,53%	97,50%	94,81%	96,41%	95,63%	95,61%	95,59%
01.2005	95,06%	95,49%	95,28%	95,28%	95,28%	89,94%	96,18%	94,56%	94,45%	94,46%
02.2005	98,58%	97,70%	98,13%	98,14%	98,14%	97,07%	96,95%	96,47%	96,41%	96,39%
03.2005	94,51%	94,52%	94,52%	94,52%	94,52%	91,33%	94,66%	93,15%	92,98%	93,02%
04.2005	96,90%	96,77%	96,83%	96,83%	96,83%	93,06%	97,26%	95,41%	95,14%	95,24%
05.2005	101,03%	100,56%	100,80%	100,80%	100,80%	98,15%	100,47%	99,44%	99,30%	99,36%
06.2005	102,44%	101,91%	102,17%	102,17%	102,18%	108,25%	102,23%	104,81%	105,20%	105,08%
07.2005	98,61%	99,61%	99,11%	99,11%	99,10%	99,41%	99,02%	99,21%	99,22%	99,02%
08.2005	97,47%	97,77%	97,61%	97,62%	97,63%	94,54%	95,41%	94,99%	94,98%	95,14%
09.2005	105,49%	106,41%	105,95%	105,95%	105,95%	106,27%	106,23%	106,25%	106,25%	106,34%
10.2005	93,18%	94,75%	93,99%	93,96%	93,96%	86,97%	95,68%	92,00%	91,22%	91,67%
11.2005	101,96%	100,73%	101,34%	101,34%	101,36%	99,60%	102,36%	101,27%	100,97%	100,96%
GAGR	-25,96%	-23,87%	-24,91%	-24,92%	-24,92%	-40,40%	-24,82%	-31,37%	-32,44%	-31,98%