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CORE INFLATION MEASUREMENT – CZECH EXPERIENCE*

Submitted by Czech Statistical Office

The meeting is organised jointly with the International Labour Office (ILO)

I. INTRODUCTION

1. Core inflation can be interpreted as an alternative measure of inflation where only price changes of permanent and persistent nature are captured. This characteristic predestinates core inflation for specific analytical and forecasting use. Its analytical function is to enable the distinction between temporary price shocks and long-term inflation or deflation pressure. Core inflation can also be used as a good starting point for forecasting inflation.

2. In the Czech Republic the core inflation measurement got into the focus of attention in the beginning of 90's, when inflation rates become much more significant than in the previous decade and were strongly influenced by administrative interventions like stepwise price

* This paper has been prepared by Mr. Jiří Mrázek, Czech Statistical Office, at the invitation of the Secretariat.

liberalization of the market. Current way of measurement and publication of core inflation in the Czech Republic started in January 1997 as a result of previous discussions between the Czech Statistical Office (CzSO), the Czech National Bank and the Czech Ministry of Finance.

3. However, there has never been a consensus of opinions about the definition used and from time to time an alternative approach was discussed and tried. At the end of the year 2003 the CzSO proposed several alternatives and proposed the results to users. But after taking into account various characteristics and attributes of the new proposals, the former definition was preserved.

4. The aim of this short paper is to present the current core inflation and related CPI statistics in the Czech Republic, the alternative proposals of the CzSO, their characteristics based on empirical results, and the reasons for the decision leading to actual state. An attempt is made to generalize the experiences from the empirical calculations done by the CzSO, in spite of the fact that time series were not long and the results only describe the inflation in a relative stable period without any extraordinary price shocks.

II. CURRENT DEFINITION OF CORE INFLATION

5. Current method used is very simple and is demonstrated in the following table 1. The monthly CPI rate is broken down into 2 additive parts. One of them is the effect of changes in regulated prices, of tax adjustments and administrative measures. The rest, expressed in percentage points, is considered to be the monthly rate of core inflation (CORE). In the following step, in the time series of CORE, a seasonal pattern (SEASON) is found by one of the ARIMA models. After separating this from CORE a monthly rate of seasonally adjusted core inflation is obtained (ADJCORE). This is again expressed in percentage points. The resulting rates of core inflation (CORE) and seasonally adjusted core inflation (ADJCORE) are no more chained to create any basic series. Results in the form of table 1 are presented at each First Release of CPI every month.

Table 1. Core inflation

Breakdown of consumer price index - 2/2006 (in % points)	
Monthly rate of CPI	+ 0,085
Including:	
the effect of changes in regulated prices, of tax adjustments and administrative measures	+ 0,009
core inflation before seasonal adjustment	+ 0,076
including :	
seasonal effect	+ 0,047
core inflation after seasonal adjustment	+ 0,029

6. Graphs 1.1 to 1.4 in the Annex show the typical behavior of so defined statistic within the period of December 1999 to July 2003.

7. The Graph 1.1 shows CORE part in total CPI. In the graph 1.2 a seasonal part of CORE is detected. After subtraction of this seasonal part from CORE, seasonally adjusted ADJCORE remains. This is shown in the graph 1.3. Finally, in the graph 1.4 this resulting ADJCORE is shown with the starting total CPI as background.

8. Results are generally acceptable with some exceptions. It may happen that seasonal part do not fit well and the results are rather distorted. This can be seen for example in June 2002 in the graphs 1.2. to 1.4. The cause for the change of the typical seasonal pattern was due to an irregular shift of season for fresh fruit and vegetables, namely potatoes.

9. The smoothing effect can be seen from the decreasing value of standard deviation of monthly rates for each of the presented series. While the average standard deviation for the former CPI was 0.54 percentage points, this sank to 0.33 and to 0.27 percentage points for CORE and ADJCORE respectively.

10. One of the problems behind this method is that the “administrative inflation” part is removed and neglected. More precisely, constant zero monthly rate is imputed to this part of the basket. This could be best seen, when monthly rates of CORE and ADJCORE inflation are chained in order to make basic index time series. The results are shown in the graph 1.5.

11. CPI series thus obtained is equal to the original CPI basic series. The increasing gap between CPI and both core inflation series can be interpreted as the inflation caused by “regulated” prices. But the goal to find core inflation unbiased over long-term period has not been achieved. That explains the reason that no basic series for core inflation are calculated and only results in the form of table 1 are published and interpreted as a simple breakdown of the current monthly CPI rate.

12. As a reaction to increasing need to have another form of inflation measure that would eliminate the particular item groups of the consumer basket, another table in the regular publications was introduced. Example can be seen in the table 3 of the Annex. This one has been published since 2001 and due to increasing interest of analysts its publication was moved to the First Release starting with January 2006.

III. LOOKING FOR NEW SOLUTIONS

13. Increasing demand of the Czech National Bank lead to investigation of new ways to calculate core inflation measures. The simplest approach is perhaps to exclude volatile components such as food and energy. The results for the period December 1999 to July 2003 are shown in the graph 2.1 of the Annex. Irregularity does not disappear; volatility is a little bit lower.

14. Next considerations were to divide the basket to about 90 components (mostly 4-digit COICOP levels) and to look for exclusions in this level of breakdown. First idea was to define volatile components based on their standard deviations of monthly rates over the whole period.

Graph 2.2 shows the results when components whose standard deviation exceeds 5 or 3 percentage points respectively are excluded from CPI.

15. More sophisticated methods do not exclude specific components giving them weights 0 and retaining the weights of non-excluded components, but use a finer method to modify weights. No component is excluded totally, but the weights are modified by the inverse value of the relevant standard deviation of monthly rates over the whole period. The result is shown in the graph 2.3. It is interesting to notice that this approach gives very similar results as the previous method of exclusion of components with std > 3, even if this time all components are used.

16. All previous procedures were characteristic by looking at each of the components only once for the whole period considered and this way determining its fixed weight for the calculation of some core inflation measure. In practical exercise it will not be clear which time period should be considered as decisive to calculate whatever volatility statistics for each of the component with the aim to exclude or partially exclude this component. So the next consideration was to come to a “run-time decision” about each component’s exclusion or inclusion.

17. The procedure is following. Every month all components are sorted according to their monthly rate and n % (weighted) with highest increase and decrease are excluded. The monthly inflation rate is then calculated using the remaining components only. The resulting inflation monthly rates are chained. In this way, the composition of consequent chains is not constant. Results for n = 5, 15, 25, 35 and 45% are shown in graph 2.4 with increasing downward bias for n increasing.

18. It became clear that more intensive smoothing of volatility within CPI basket leads inevitably to downward bias. The reason is intuitively clear. In real economy the upward shock of price is more possible than the downward one in terms of probability and intensity. Removing abrupt movements would therefore distort the overall picture downwards. Skewness of the distribution of price changes is obvious. As a result a symmetric treatment is not possible. This could be demonstrated even better when the latter method is used for n = 50%. The trimming becomes now absolute and the resulting method equals to the calculation of the chained index of weighted medians.

19. Weighted median is in other words the same as weighted 50-percentile. To demonstrate the effect of skewness, methods using the chained m-percentile for several m > 50 were tried. The surprise was that only for m so big as m = 67 the former level of CPI was reached. Results for m = 50, 57, 67 are shown in the graph 2.5. Next steps to continue with the construction of suitable core inflation measures would have been to use asymmetric means or more sophisticated methods. In this point the research ended because it became obvious that methods used would have hardly been transparent for users. It was decided to stop next development and to continue with the current methods used till then.

20. The following table shows some statistics for all the abovementioned methods used:

Table 2

Type of core inflation	Remaining weight in the index construction	Index for the end period (2003-07) with base 12-99=100	Average standard deviation of monthly rates
	‰	%	% point
CPI	1000	109.1	0.509
std < 5	944	108.1	0.404
ex food energy	841	107.0	0.386
trim 5%	891	105.5	0.256
std < 3	840	105.5	0.237
Modif. weights	1000	105.7	0.233
67%-perc		109.2	0.206
trim 15%	692	104.1	0.153
57%-perc		104.5	0.117
trim 25%	487	103.5	0.110
trim 35%	294	102.8	0.091
trim 45%	101	102.5	0.082
median		102.4	0.082

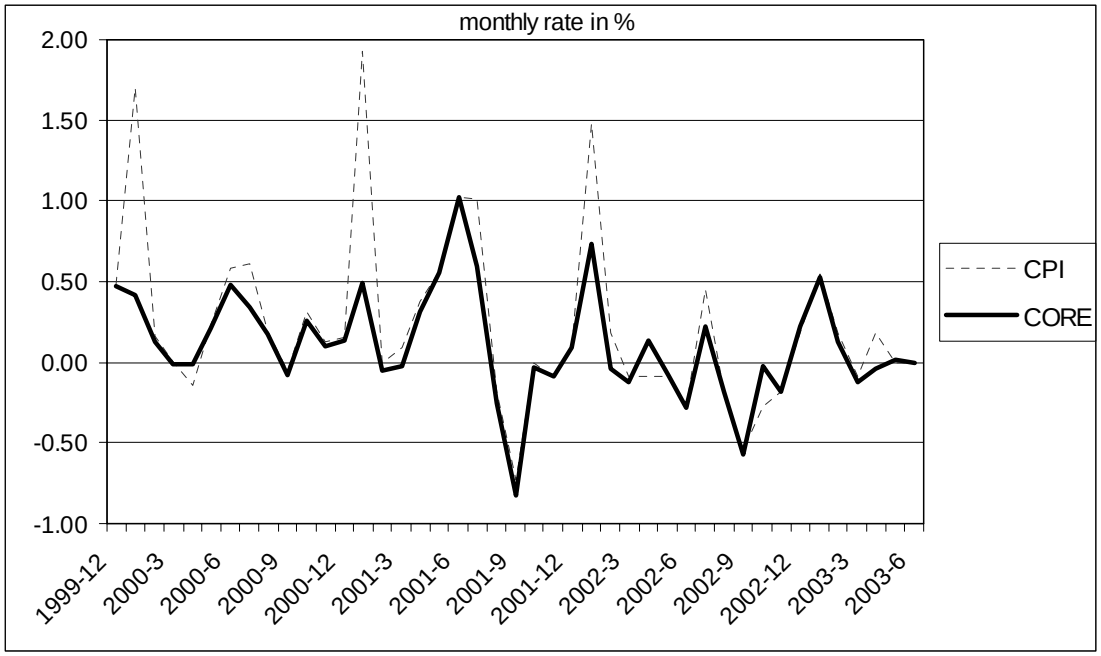
21. Individual methods are sorted descending by the average standard deviation of monthly rates. Generally, the smoothness goes hand in hand with downward bias, the m-percentile measures being exceptions.

IV. RESUME

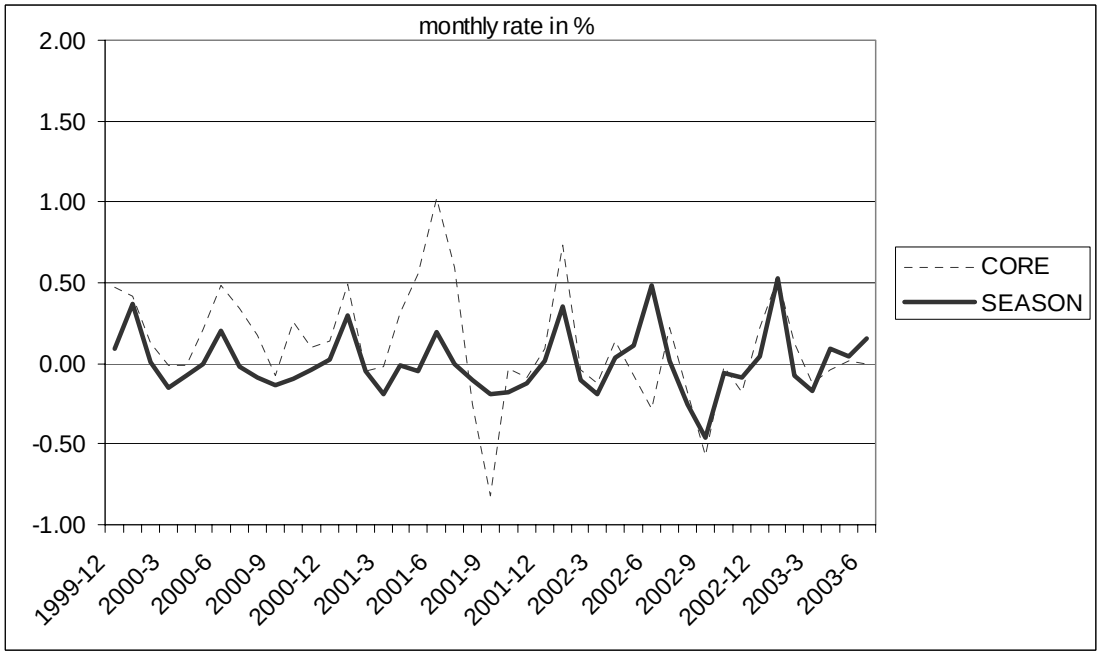
22. This work tried to explain natural development in looking for some suitable measure of core inflation in the Czech Republic. As the period to which the data concerned was short, no definitive statements were possible about characteristics of the different inflation measures. But the basic information was obtained. The results were generally not surprising, as all the facts about the core inflation measures used are theoretically known. But it proved necessary to have these empirical results and their illustrations in graphs to make the theoretical statements more concrete for the final decision. Given the skewness of the distribution of price changes, which cannot be expected stable with time and the same in different countries, it would not be practical to develop sophisticated methods, which would not be understandable for even relatively educated users and which would need permanent adjustment of parameters.

ANNEX

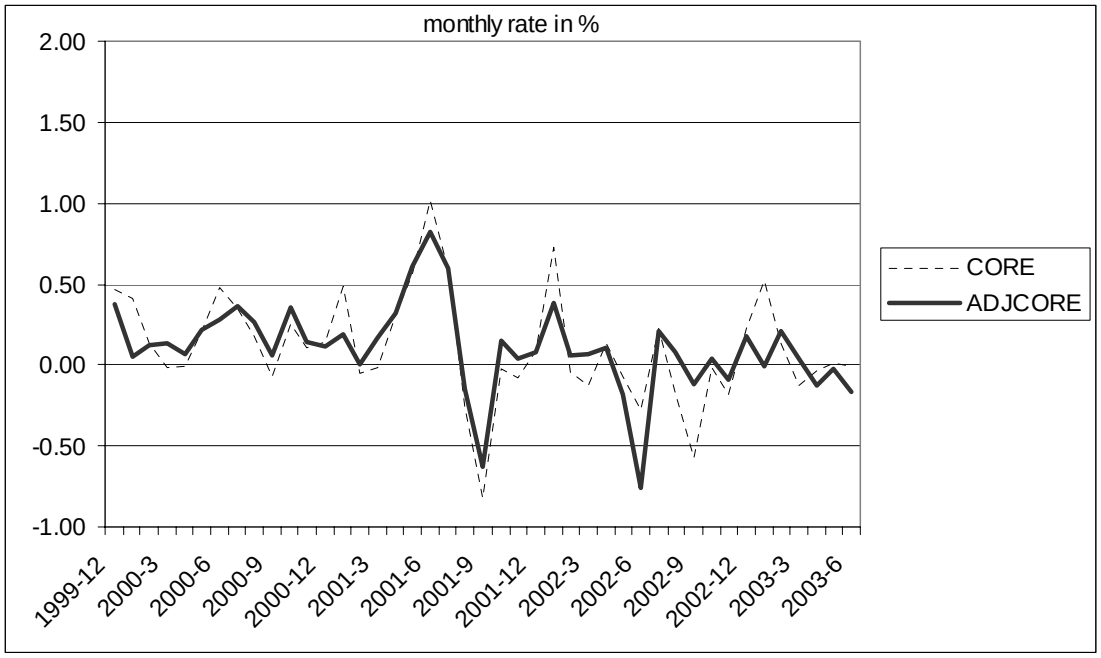
Graph 1.1



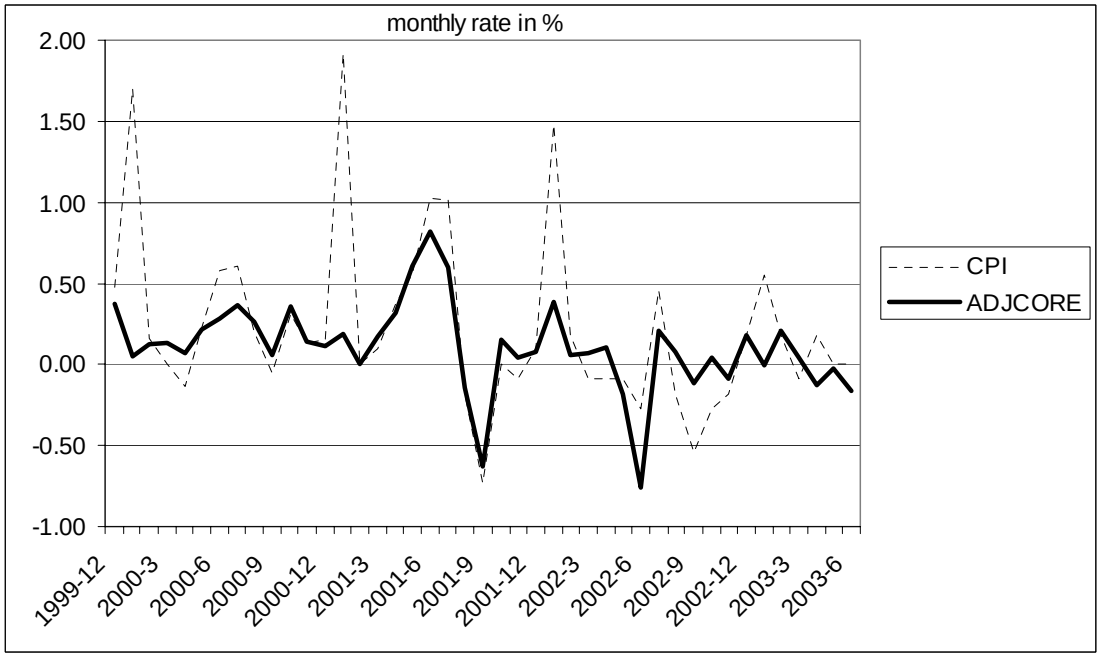
Graph 1.2



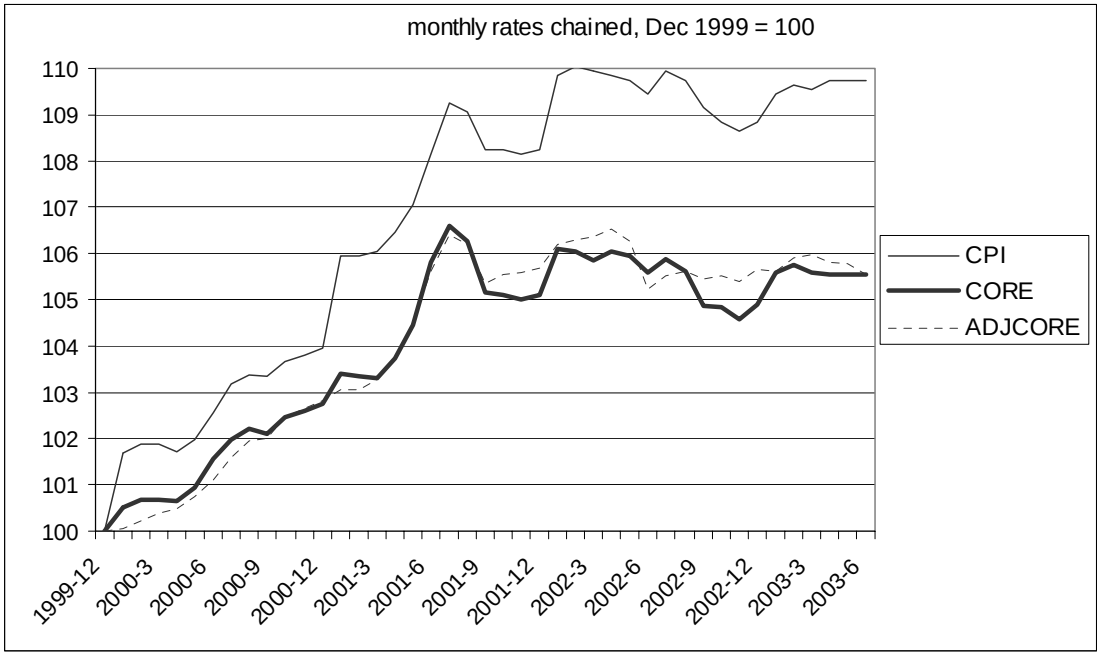
Graph 1.3



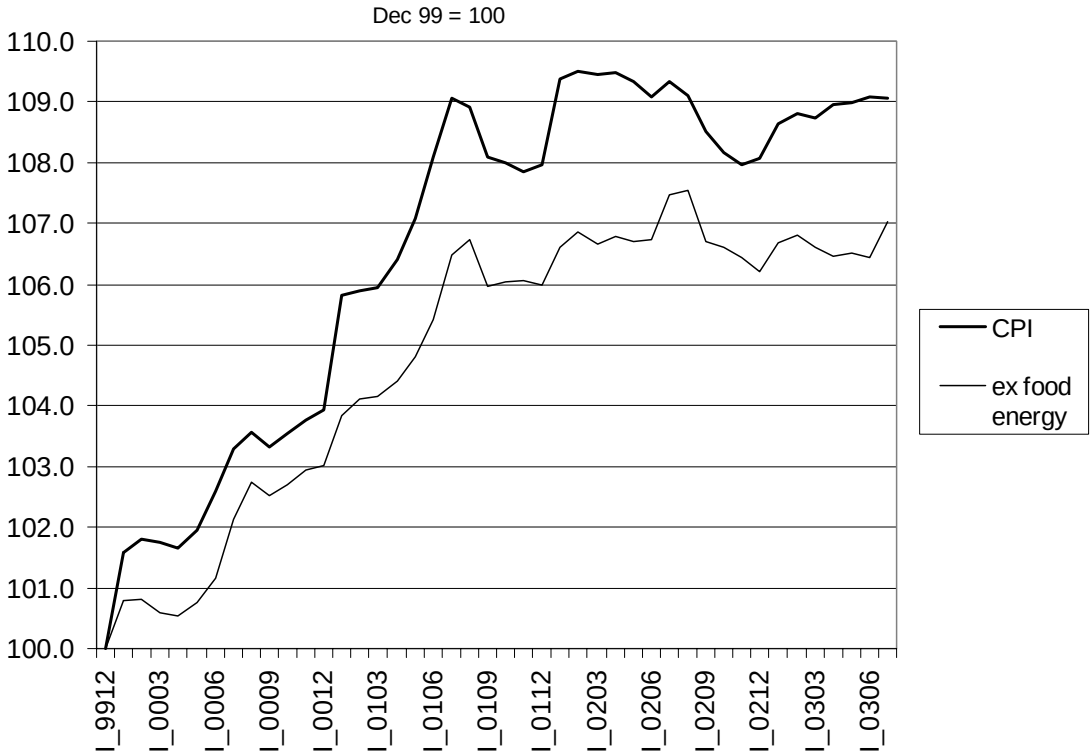
Graph 1.4



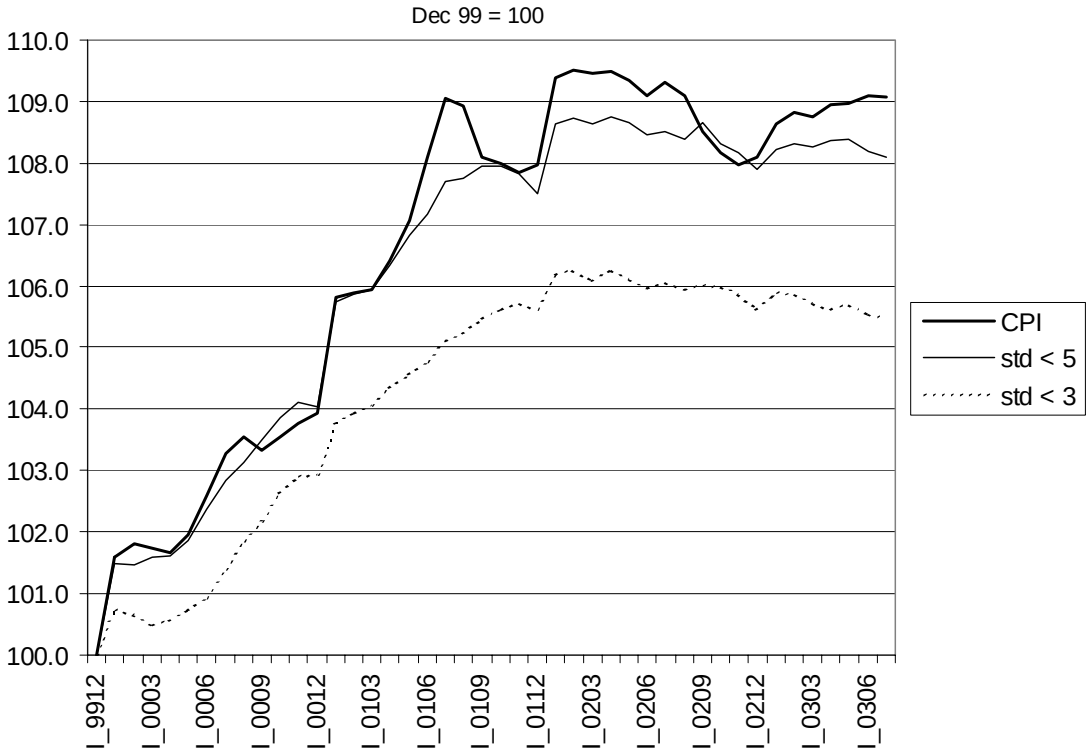
Graph 1.5


monthly rates chained, Dec 1999 = 100
110
109
108
107
106
105
104
103
102
101
100
1999-12
2000-3
2000-6
2000-9
2000-12
2001-3
2001-6
2001-9
2001-12
2002-3
2002-6
2002-9
2002-12
2003-3
2003-6
CPI
CORE
ADJCORE

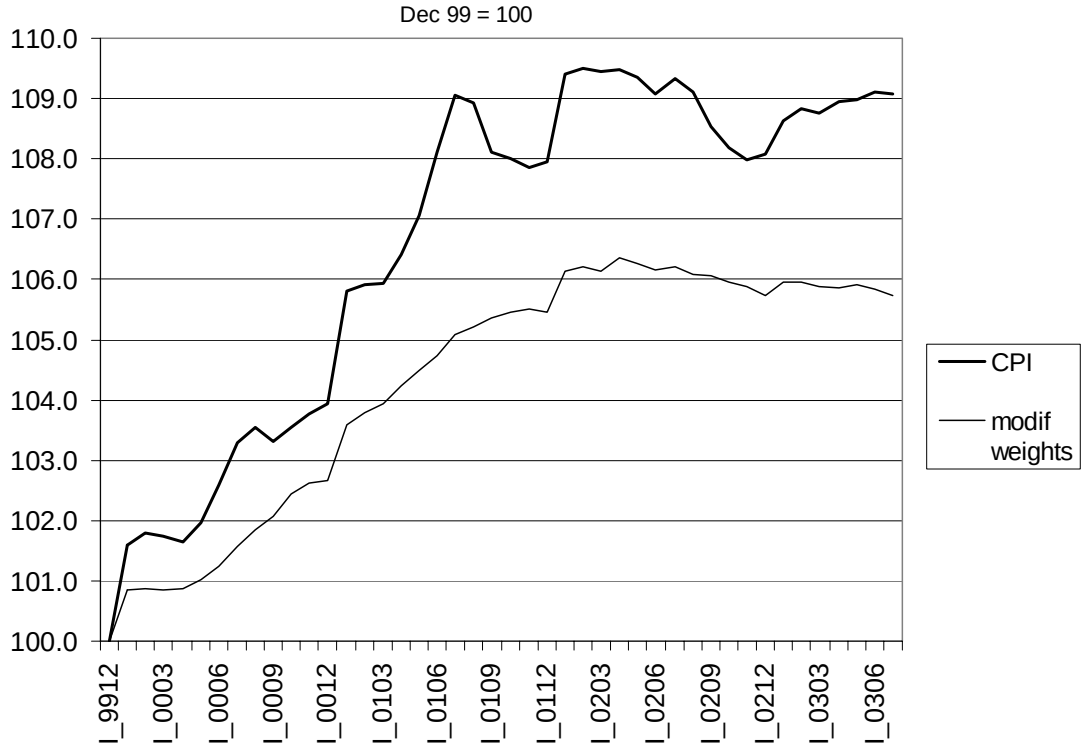
Graph 2.1



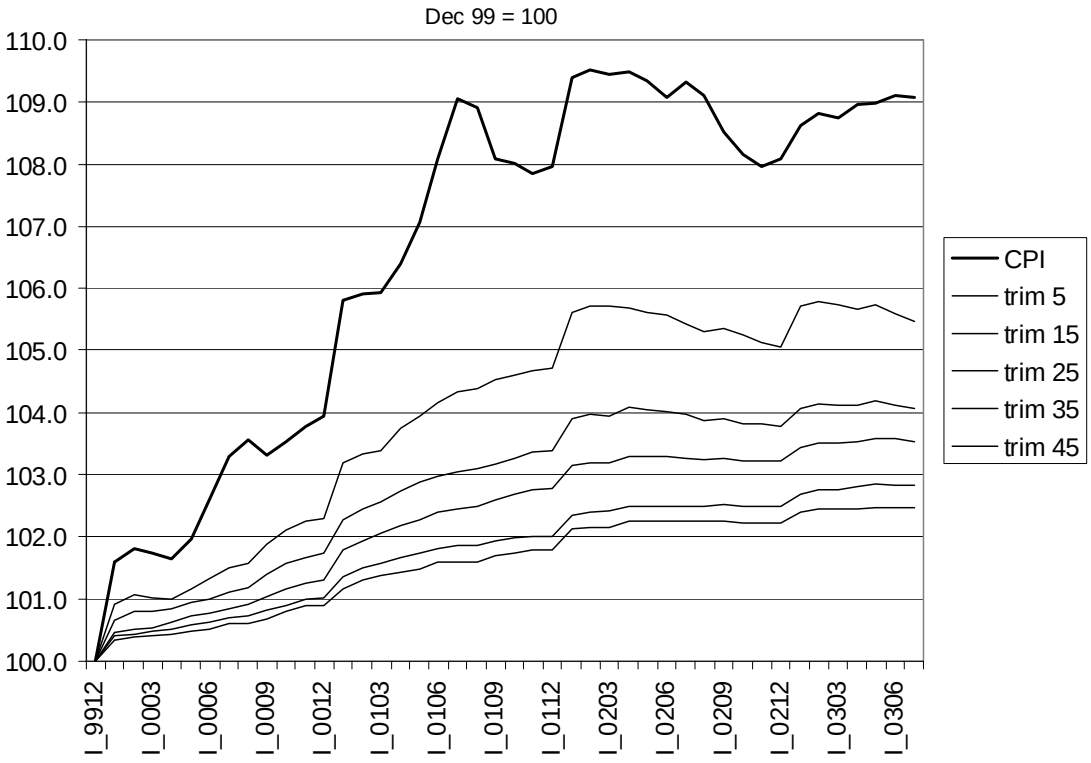
Graph 2.2



Graph 2.3



Graph 2.4



Graph 2.5

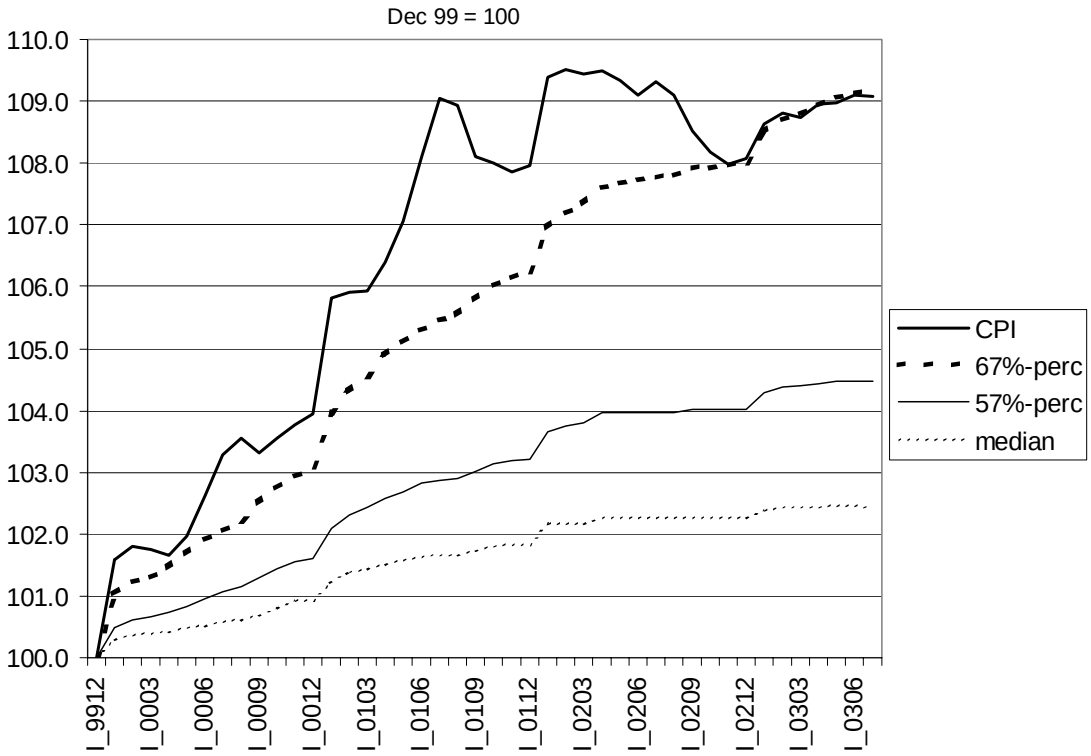

Dec 99 = 100
110.0
109.0
108.0
107.0
106.0
105.0
104.0
103.0
102.0
101.0
100.0
I_9912
I_0003
I_0006
I_0009
I_0012
I_0103
I_0106
I_0109
I_0112
I_0203
I_0206
I_0209
I_0212
I_0303
I_0306
CPI
67%-perc
57%-perc
median

Table 3

Consumer price index - seasonal goods, administrative prices, heating oils, automotive fuels and lubricants, package holidays, food and non-alcoholic beverages

Year/month		Total	Total excl. seasonal goods	Seasonal goods *)	Total excl. goods with administrative prices	Goods with administrative prices	Total excl. domestic heating and lighting oils, automotive fuel	Domestic heating and lighting oils, automotive fuel	Total excl. package holidays	Package holidays	Total excl. food and non-alcoholic beverages	Food and non-alcoholic beverages
Weights (‰)		1000.0	969.0	31.0	794.5	205.5	968.9	31.1	973.2	26.8	802.4	197.6
Previous month = 100												
2005	February	100.2	100.2	100.5	100.2	100.1	100.2	99.2	100.1	103.6	100.3	100.0
	March	99.9	99.8	101.1	99.9	100.1	99.9	102.3	100.0	96.9	99.9	99.9
	April	100.1	100.2	99.1	100.2	99.8	99.8	108.1	100.2	98.0	100.2	99.8
	May	100.2	100.0	105.4	100.2	100.1	100.2	100.7	100.1	101.8	100.0	100.7
	June	100.6	100.5	101.6	100.3	101.6	100.5	101.8	100.5	102.6	100.7	100.2
	July	100.3	100.7	89.3	100.2	101.2	100.2	104.0	99.8	116.5	100.8	98.2
	August	100.0	100.2	93.5	100.0	100.0	100.0	100.5	99.7	106.0	100.3	99.1
	September	99.7	99.7	99.6	99.7	100.0	99.4	111.4	100.4	81.6	99.7	99.8
	October	100.9	100.9	100.3	100.0	103.1	100.9	98.0	101.0	97.4	100.8	100.6
	November	99.7	99.7	102.0	99.7	100.1	100.0	94.9	99.9	97.8	99.7	100.2
	December	99.9	99.7	105.3	99.8	100.0	100.1	93.9	99.8	99.3	99.7	100.4
2006	January	101.4	101.4	104.5	100.6	103.6	101.5	98.0	101.3	103.7	101.5	100.8
	February	100.1	100.1	100.4	100.1	100.1	100.1	100.5	100.0	104.0	100.2	99.8
The same period of the previous year=100												
2005	February	101.7	102.0	93.2	100.7	104.7	101.7	99.5	101.6	105.1	102.1	99.8
	March	101.5	101.8	93.5	100.6	104.7	101.6	98.8	101.4	104.7	101.9	99.6
	April	101.6	102.0	91.9	100.6	104.7	101.5	105.9	101.6	103.6	102.2	99.2
	May	101.3	101.5	97.7	100.6	103.6	101.3	101.0	101.2	105.2	101.6	100.2
	June	101.8	101.9	99.2	100.7	104.9	101.7	102.5	101.7	103.3	102.0	100.4
	July	101.7	101.8	96.2	100.5	106.0	101.5	108.0	101.7	102.5	102.2	99.3
	August	101.7	101.8	96.7	100.5	106.1	101.5	108.2	101.6	102.8	102.3	99.2
	September	102.2	102.2	102.0	101.3	106.0	101.7	121.0	102.1	104.2	102.8	99.7
	October	102.6	102.6	104.6	101.1	107.9	102.1	115.7	102.6	103.2	103.1	100.3
	November	102.4	102.4	105.1	100.8	108.0	102.1	111.1	102.5	102.9	103.0	100.4
	December	102.2	102.3	97.7	100.5	108.0	101.9	109.7	102.1	102.3	102.9	99.1
2006	January	102.9	103.0	100.9	100.8	110.0	102.6	112.1	102.9	101.5	103.7	99.5
	February	102.8	102.9	100.7	100.7	109.9	102.5	113.7	102.8	101.9	103.6	99.3

**) vegetables, potatoes, fruit, fish*
