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# **Apples and oranges: relative growth rate of consumer price indices**

Ivan O. Kitov, Oleg I. Kitov

## **Abstract**

Headline CPI, core CPI, and indices for various small expenditure categories were analyzed. Sustainable long-term linear trends have been found in the difference between the headline CPI and these indices. Overall, the results completely support our previous findings for such principal categories as energy, food, housing, etc. One should return to relative price of apples and oranges in order to explain these linear trends in terms of the mainstream economics.

Key words: CPI, core CPI, expenditure categories, price index

JEL Classification: E31, E37, G12

## **Introduction**

In our previous article (Kitov and Kitov, 2008), we have found that major individual categories of consumer price index (CPI) such as energy, food, housing, transportation, medical care, and education plus communication are characterized by the presence of linear trends relative to headline and core CPI. In other words, the deviation between the headline CPI and the price index, for example, for food is a piece-wise linear function of time with possible turning point from negative to positive slope, and vice versa. As a result, one obtains a unique opportunity to predict relative behavior of individual prices in relative terms. In 2007, we predicted a short period of high volatility associated with the index for energy, which should inevitably end by a relative decrease in the prices for energy, and thus, for oil. This was a successful prediction, which currently points at a continuation of the oil price decrease relative to the headline CPI.

The presence of robust linear trends in the differences between the headline (or core) CPI and the indices for various expenditure categories also has a fundamental theoretical importance. The orthodox economics considers price inflation as a stochastic process with high volatility induced by strong variation in individual price setting procedures. Overall, the observed variation in inflation is a consequence of the underlying variation in the evolution of individual prices. Our previous paper revealed that this is not the case, however, at least at the level of the major categories.

In this paper, we analyze the evolution of prices for some low-level categories of expenditures relative to the headline CPI and core CPI in the USA during the period between 1960 and 2008. The main objective is to reveal the presence of reliable linear trends in corresponding differences in support to our previous findings. The existence of such trends would also represent a challenge for conventional economics elaborating the hypothesis of price inflation to be a stochastic process. For the analysis, we use the previously elaborated procedure. Accordingly, we skip the description of CPI and linear trends in the differences with its major components, and focus only on quantitative results.

## **Linear trends and turns**

Following the approach developed in (Kitov and Kitov, 2008) we start our analysis with apples and oranges. The difference between the price indices related to these commodities and the core CPI, as reported by the U.S. Bureau of Labor Statistics (<http://www.bls.gov/data/>), is shown in

the left panel of Figure 1. The comparison of apples and oranges is a textbook case. The choice of the core CPI is a natural one because this index does not contain food as a category. (Here and below we use only the season adjusted indices.) One can observe that corresponding differences demonstrate slightly varying behavior. The indices for apples and oranges are similar in shape, but the latter has been growing at a higher rate than the former since 1990 and both have been growing faster than the core CPI. Both commodities demonstrate slightly accelerating nonlinear trends after 2000, as Figure 1 (right panel) displays for the index for oranges. The index for bananas has been decreasing relative to the core CPI, but caught up during several months in the end of 2008. Between 1995 and 2005, the index was growing approximately linearly over time.

Therefore, these three commodities with very small weight in the overall CPI demonstrate the presence of reliable linear trends: their prices do not grow stochastically relative to other prices. Another crucial feature of the evolution we would like to find is the presence of robust turns in long-term linear trends. The differences in Figure 1 do not provide such examples.

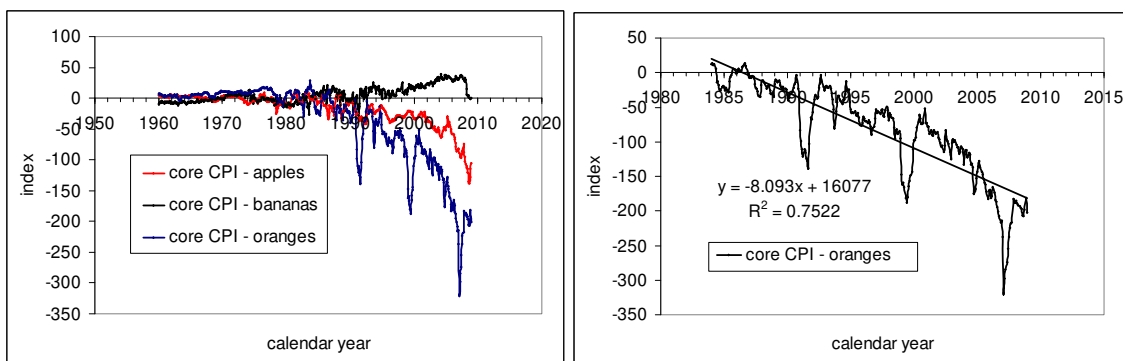


Figure 1. Left panel: the difference between the core CPI and the indices for apples, oranges, and bananas between 1960 and 2009. Right panel: linear trend in the difference between the core CPI and the index for oranges.

Some components of the food category do provide the turning points. Figure 2 (left panel) depicts corresponding differences for meat and fish. There was a clear turn from a positive slope to the negative one for the index for meat. Right panel of Figure 2 demonstrates relevant regression lines and equations. The price index for meat has been catching up the core CPI and will likely intercept the zero line near 2014. One should expect that the price for meat

and related products will not stop the leading growth. The same statement is valid for the price of fish – the linear trend in the difference is currently a negative one.

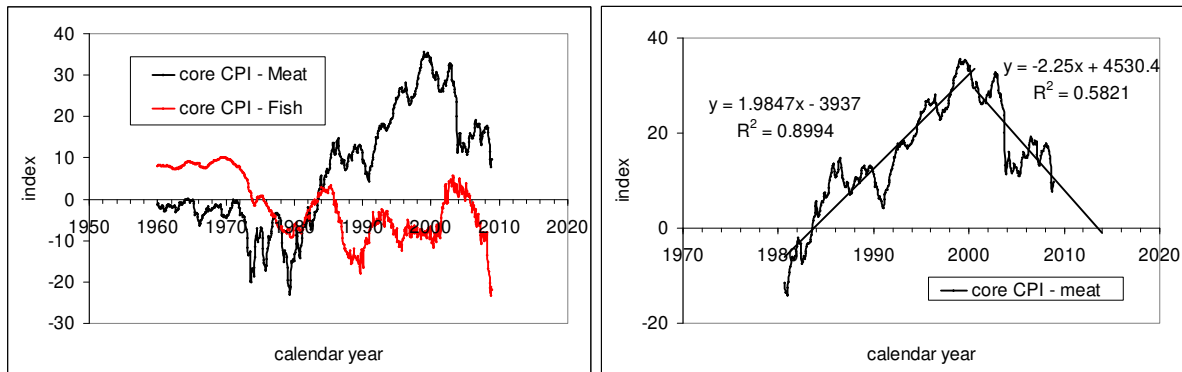


Figure 2. Left panel: the difference between the core CPI and the indices for meat and fish between 1960 and 2007. Right panel: linear trends and turning point the difference between the core CPI and the index for meat.

The indices for nonalcoholic beverages and specifically for carbonated drinks demonstrated an outstanding linear trend between 1980 and 2004, as shown in Figure 3 (left panel). In 2005, the growth started to decelerate and in the middle of 2008 the trend changed to a negative one. The price for carbonated drinks has a long way to catch up the core CPI – more than 60 units of price index. Currently, the process of a new trend formation is underway. If the negative slope will be the same as for the positive trend, one will observe a 25-year period of a leading growth in the price of beverages.

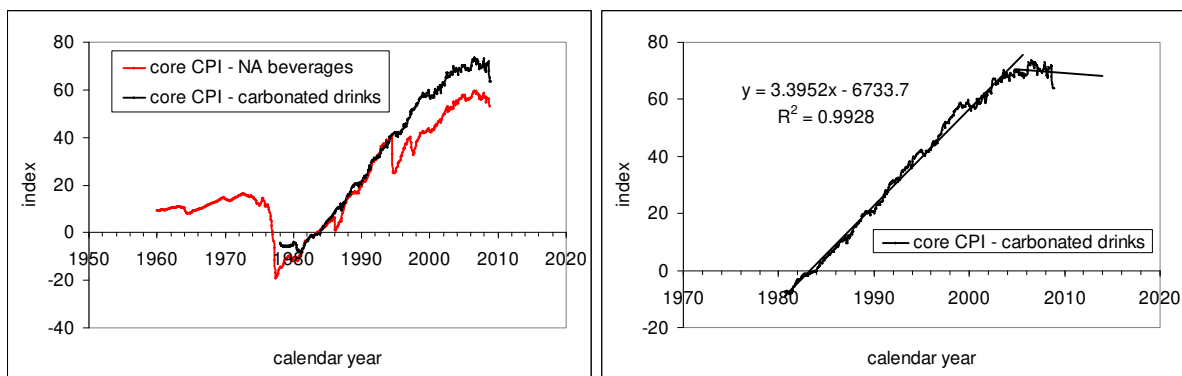


Figure 3. Left panel: the difference between the core CPI and the indices for nonalcoholic beverages and carbonated drinks between 1980 and 2008. Right panel: linear trends in the difference between the core CPI and the index for carbonated drinks.

Figure 4 depicts similar curves for two indices related to the index for housing: fuel oil and rent for primary residence. The former difference is very volatile and depends chiefly on oil

price. The index for housing has the largest weight (>40%) among all categories of the headline CPI. Therefore, the rent of primary residence is an important ingredient and its behavior is a defining one for the overall evolution of the CPI. The difference for the rent does not demonstrate a very robust long-term linear trend, but a number of short-term linear segments. The current trend is a negative one, i.e. the rent will be growing at an elevated rate relative to the overall CPI.

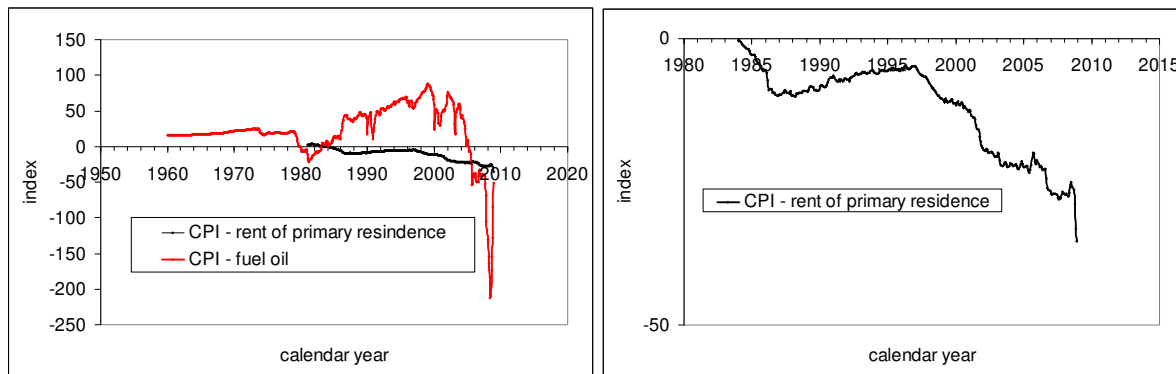


Figure 4. Left panel: the difference between the headline CPI and the indices rent of primary residence and for fuel oil (for housing) between 1960 and 2009. Right panel: linear trend in the former difference.

The price index for transportation includes numerous components. We have chosen the index for transportation services and the index for new cars. Figure 5 (left panel) shows corresponding differences. The index for transportation services has a long history of positive trend, which can be crudely divided into two segments – before and after 1995. The latter period is characterized by faster growth in the difference. The index for new cars has an opposite history - between 1985 and 2003 the difference was decreasing. After 2003, the difference shows slight signs of a possible turn, but the development of a new sustainable trend will need several years.

The behavior of the index for prescription drugs is very similar to that demonstrated by the overall index for medical care – strong negative linear trend since 1980. This indicates that even small components of the med-care index have a large price setting potential relative to other component of the headline CPI. The trend suddenly stopped in the middle of 2008, however. Is it a turning point or just a small gap in the trend? One needs to wait for the future developments.

Figure 6 shows that the index for women’s footwear has been growing at a rate lower than that demonstrated by the headline CPI. In 2000, there was a kink in the slope of the

difference. The price index for furniture and bedding has a practically pure linear trend with several sharp falls – the most recent started in the end of 2008.

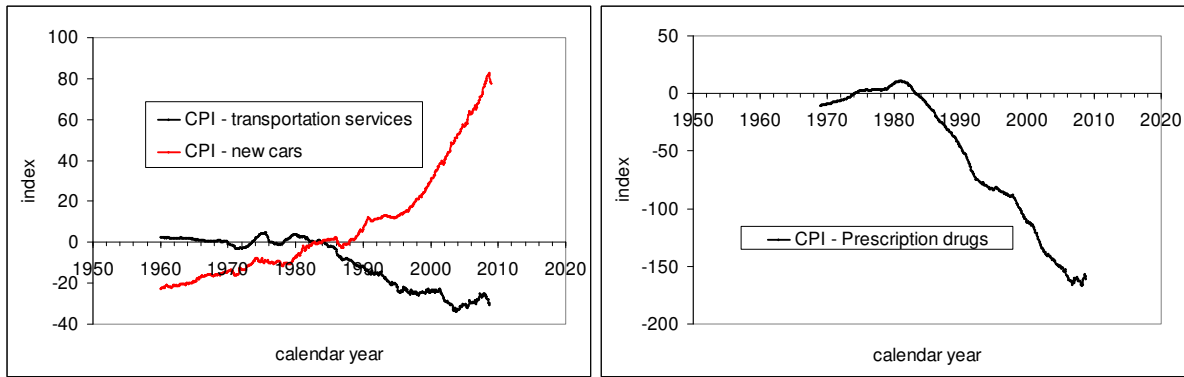


Figure 5. Left panel: the difference between the headline CPI and the indices for transportation services and new cars between 1960 and 2008. Right panel: The difference between the headline CPI and the index for prescription drugs has a solid linear trend since 1980. The trend suddenly stopped in the second half of 2008.

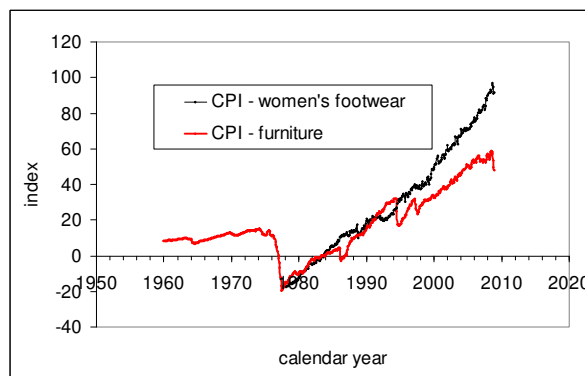


Figure 6. The women's footwear index was introduced in 1978 and since then has a solid positive (slightly non-) linear trend relative to the CPI. The index for furniture and bedding demonstrates practically pure linear trend with several sharp falls.

## Conclusion

We have studied a number of small components of the headline CPI. The principal finding consists in the presence of long-term linear trends in the difference between the CPI and the price indices for these components. These sustainable linear trends for very small categories of expenditures indicate that the underlying internal economic forces are not stochastic in relative terms. Obviously, if some random external shocks to supply and/or demand drive relative prices then such driving forces would result in random differences.

Overall, the results of this study completely support our previous findings. One should return to relative price of apples and oranges in order to explain the linear trends in terms of the mainstream economics.

### **References**

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