# 20. MEASURING CORE INFLATION IN ROMANIA USING THE DOBRESCU METHOD – A COMPARATIVE APPROACH

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## Abstract

*The paper focuses on the persistent and non-persistent changes in relative prices and their relation with the volatility of the aggregated price index. From the methodological perspective, the paper analyzes the implications of the hypotheses of five main methods for calculating core inflation with respect to the persistent and non-persistent changes in relative prices. From the empirical perspective, the paper ranks the methods based on volatility and discusses the relation between volatility and the persistent and non-persistent changes in relative prices, focusing on the relation between the changes in the components of the CPI that tend to be irreversible and the CPI. In the context of the analysis, the main conclusion of the paper indicates that there is a long-term tendency of the CPI, which is reflected by the irreversible changes in relative prices.*

**Keywords:** core inflation, relative prices, prices volatility, reversibility

**Jel Classification**: E31, E37, C53, P22

The mechanisms which describe the formation of core inflation have deep implications on the methods used and on the output obtained. To take only one example: if we accept the view of Bryan and Cecchetti (1994), Cecchetti (1997) ,Wynne (1997, 1999), who see core inflation as underlining the common variations in prices, then the best method for the calculation of core inflation is the weighted median. This is a clear case in which the theoretical understanding of core inflation proves to be fundamental for the choice of appropriate method. This shows us that simply obtaining sensible empirical data for core inflation is not enough. Even if for some periods the large majority of methods offer the same results, there are periods with different values for core inflation; these values being explainable by the particularities of each methodology.

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Having this in mind, the paper is organized as shown below. In the first chapter we present synthetically the models used in the analysis and make a short description of the data. This is done based on the following reasons: a) the paper focuses on the Dobrescu method, and thus an ample space will be given to this model; b) the models are largely known and an ample presentation would be superfluous.

In the second chapter we present the specific features of the Dobrescu method and the algorithm for the calculation of core inflation.

In the third chapter we present the hypotheses of the models. The chapter focuses on one of the objectives, namely to analyze the implications of the hypotheses of the methods for calculating core inflation in relation to the persistent and non-persistent changes in relative prices.

In the fourth chapter we present the empirical results focusing on two of the three objectives of the paper: a) to rank the models based on volatility; and b) to analyze the relation between the changes in the components of the aggregated consumer price index that tend to be irreversible and the CPI.

In the conclusions of the paper, we are synthetically presenting the way the paper achieved its objectives.

## 1. Description of the models and the data used in the analysis

In order to understand the more specific comments in chapters 3 and 4, it is relevant to briefly present the methods used in the empirical analysis. The Dobrescu method will be presented in a separate chapter.

The exclusion-based method is based on the idea that there are some components of the price index that are vulnerable to the shocks in the economy, generate a higher volatility of the index and do not offer useful information for the underling trend of inflation. Thus, the method suggests eliminating these components in calculating the core inflation (see Roger 1998, Cutler 2001, Pelinescu and Dospinescu, 2008, for more details).

The trimmed symmetric means method is based on the idea that for each time period of the analysis there are components of the price index which are more volatile and they should be eliminated from the calculation of core inflation. The method is based on removing a specified upper and lower tail of the distribution of prices (see Bryan, Cecchetti and Wiggins 1997, Kearns 1998, Cutler, 2001, for more details).

Trend estimates are based on identifying the tendencies of a series. The method works with the aggregate price index. The trend is estimated using different methods, such as moving average (see Gujarati, 2004), HP filter (see Hodrick and Prescott, 1980), Kalman filter (Maybeck, 1976, Welch and Bishop, 2001).

The method based on volatility weights ranks the information based on the volatility of prices, which means that the components with less volatility have a higher weight in the aggregate price index (see Diewer, 1995, Marques and others, 2000, for more details).

In our analysis, we used the monthly consumer price index detailed for 101 groups of goods and services, for the period January 1994 to December 2009. The data can be found in the Monthly Statistical Bulletin of Prices (the bulletins are available on the web page of the National Institute for Statistics at www.insse.ro).

## 2. The specific features of the Dobrescu method. The algorithm for the calculation of core inflation

Some changes in relative prices reflect temporal imbalances between demand and supply. For example, a dry summer leads to an increase in the prices of corn. These shocks, such as the one mentioned above, lead to increases in some prices, which are only temporal.

Given an economic environment (characterized by specific production functions, preferences, and technologies) the persistent modifications of relative prices should be zero. Once the effects of the shocks die out, the relative prices should return to their initial values. Unfortunately, this is not the case, because the downward rigidities of wages negatively influence the adjustment process, leading to some permanent modifications in the relative prices.

Before we present the Dobrescu method, a terminological comment is required. In the paper, we are using the persistent and non-persistent changes in relative prices, as well as the reversible and irreversible changes in relative prices. The terms are synonymous and depending on the context we feel that the use of one or the other term helps to grasp the meanings.

The Dobrescu method identifies the changes in relative prices which tend to be irreversible. The method is based on three assumptions. First, there is a strong correlation between the variation in relative prices and the rate of inflation and deflation. In this respect, higher rates correspond to higher variations (see Dobrescu, 1999, p. 2).

Second, "some changes in the relative prices reflect durable tendencies of the equilibrium conditions, whilst others reveal only temporary mismatch between demand and supply in different markets. Consequently, the first category of changes is more persistent than the second ones" (see Dobrescu, 1999, p. 4).

Third, "the real economy is significantly more inertial than its nominal *alter ego*. Consequently, persistent changes in relative prices happen at a slower pace than temporary ones" (see Dobrescu, 1999, p.5).

Taking into account the first assumption, the Dobrescu method calculates a coefficient of relative prices modifications, denoted by SSTD. It is calculated by the following formulas:

$$SD(i,t) = \left| \frac{PI(i,t) - PI(t)}{PI(t)} \right| \quad (1)$$

$$SSTD(t) = \sum_{i=1}^{n} SD(i,t) \cdot w(i) \quad (2)$$

where: PI(i,t) represents the relative price index of the component i from the aggregate price index and is calculated as PI(i,t) = ($p_{i,t}/p_{i,t-1}$), $p_{i,t}$ represents the individual price of goods and services included in the basket of aggregate price index, PI(t) represents the aggregate price index, w(i) – represents the weight of the group i, where

$$\sum_{i=1}^{n} w(i) = 1$$

One may see that for each group of the consumer price index the method calculates a measurement of volatility of that group of prices, denoted by SD. The coefficient of relative prices modifications is a weighted sum of the SDs calculated for each group.
When the variation in relative prices is high, the SSTD is high. Taking these facts into consideration, there is an issue of identifying the value of SSTD, which reflects the modifications in relative prices that tend to be persistent in the long run. The cause of this persistency is explained by the second assumption of the Dobrescu model: "Some changes in the relative prices reflect durable tendencies of the equilibrium conditions" (see Dobrescu, 1999, p. 4). These are relative prices modifications that we want to keep in the core inflation indicator. Other relative price modifications reveal only temporary mismatch between demand and supply in different markets. These are the modifications that we want to eliminate from the core inflation indicator. Having this assumption in mind, the Dobrescu model calculates the coefficient of persistent relative price changes SSTD*(t). This coefficient becomes the key element that enable us to identify the difference between persistent changes and non-persistent changes in relative prices. SSTD*(t) is calculated using the following algorithm:

$$SD^*(i,t) = \left| \frac{PI^*(i,t) - PI^*(t)}{PI^*(t)} \right| \tag{3}$$

$$SSTD^*(t) = \sum_{i=1}^{n} SD^*(i,t) * w(i) \tag{4}$$

where: PI*(t) represents the average aggregated index in the period from starting point to t of the aggregate price index, namely $PI^*(t) = [\prod_{k=1}^{t} PI(k)]^{1/t}$ if we use the geometric mean or $PI^*(t) = \frac{\sum_{k=1}^{t} PI(k)}{t}$ if we use the arithmetic mean, and PI*(i,t) represents the average individual price index of group i from the starting point to t of the aggregate price index, namely $PI^*(i,t) = [\prod_{k=1}^{t} PI(i,k)]^{1/t}$ if we use the geometric mean or $PI^*(i,t) = \frac{\sum_{k=1}^{t} PI(i,k)}{t}$ if we use the arithmetic mean.

The third assumption states that "the real economy is significantly more inertial than its nominal *alter ego*. Consequently, persistent changes in relative prices happen at a slower pace than temporary ones" (see Dobrescu, 1999, p. 5). In this context, for an environment characterized by a set of conditions (dominant preference function for households, technologies, expectations) we can assume that the number of relative price changes that tend to be persistent is low and "the coefficient of persistent relative price changes tends towards a minimum located above zero" (see Dobrescu, 1999, p. 6)

An acceptable approximation of this coefficient is its value determined for the average indices. SSTD*(t) was calculated by Dobrescu (1999) for moving intervals of three months (SSTD*3), four months (SSTD*4), five months (SSTD*5) and so on up to 25 months (SSTD*25). The method assumes that the coefficient of persistent relative price changes has a quantifiable level, which is denoted by NSSTD. Dobrescu uses the formula:

$$SSTD^*(t) = C(g) \times SSTD^*(\tilde{t}\,1) \qquad (5)$$

The calculus indicates that starting with 12 months the coefficient C(g) tends to unit. This suggests that a moving average of 12 months or over 12 months would be a good proxy for the NSSTD (Dobrescu, 1999, p. 9).

Synthetically, the algorithm suggested by Dobrescu (1999) is based on a sequence of four steps. At each step we are making some comments in order to understand better what the role of each step in the algorithm is.

The first step is to calculate the coefficient of relative prices modifications, SSTD(t), for the initial statistical series and the coefficient of persistent modifications of relative prices, NSSTD(t). We have at this point an imagine of the volatility of the components of the aggregate price index, namely the SSTD(t). We also have the NSSTD(t), which reflects the value of SSTD(t) for which all the modifications in relative prices are persistent in the long run.

The second step is to compare the value of SSTD(t) with NSSTD(t). If the value of SSTD(t) is lower or equal to NSSTD(t), then we identified the value corresponding to the core inflation. If this is not the case, then it means that in the structure of the aggregate price index there are relative price modifications which are reversible, and which were not eliminated.

The third step is to identify the component of the aggregate price index that has the highest value of SD and eliminate it. At this point, we recalculate SSTD(t) correcting for the weight of the component which was eliminated. If we obtain a value for SSTD(t) which is still higher than NSSTD(t), it means that we have to restart with the third step, that is eliminating another component that has the highest value of SD. The procedure continues as long as the value of SSTD(t) is higher than NSSTD(t).

The fourth step, after we identified the first value of SSTD(t), which is lower than NSSTD(t), we are keeping the values of the last components eliminated from the aggregate price index with a fractional value.

In order to understand the logic of the approach of the Dobrescu model and also to understand relation (5), which is critical in evaluating the efficiency of the model, we are considering an example. Let us take the example of bread, which is one component of the consumer price index and use the notation $P(i_b,t)$ to indicate the

changes in the price of bread from period t-1 to period t. Furthermore, let us use the denotation $SD_{ib,t}$ to indicate the measure of volatility of the change in the price of bread. The key question is how do we know if a change in the price of bread is persistent or not?

The Dobrescu model assumes that "the real economy is significantly more inertial than its nominal alter ego. Consequently, persistent changes in relative prices happen at a slower pace than temporary ones" (see Dobrescu ,1999, p.5). This suggest that if the change in the price of bread is persistent then its variation should be smaller than the case in which the change is not persistent. This can be written as P(ibp,t)<P(ibnp,t) where :P(ibp,t) indicates the case when the price of bread is persistent and P(ibnp,t)the case when it is not persistent. Consequently ,SDibp,t<SDibnp, where the notations are similar with the one above.

Moreover, the Dobrescu model assumes that "some changes in the relative prices reflect durable tendencies of the equilibrium conditions, whilst others reveal only temporary mismatch between demand and supply in different markets. Consequently, the first category of changes is more persistent than the second ones" (see Dobrescu, 1999, p. 4). This suggests that if the change in the price of bread is persistent it should be observed for a larger number of periods. This is the critical point in making the distinction between persistent and non-persistent modifications. If the aggregated price index contains only persistent modifications in the individual price index, then the coefficient C(g) in relation (5) equals to 1. Dobrescu (1999) identifies that in the cases of SSTD*(t) calculated for intervals of 12 months or longer, the C(g) tends to unit (see Dobrescu, 1999, p. 9). Consequently, the value of C(g) in relation (5) demonstrates that we have a basis to use SSTD*(12) to identify and eliminate persistent price changes.

## 3. Hypothesis of the models used in the empirical analysis

There is a tension between the hypothesis of the models and their implications on reversible and irreversible modification in relative prices. This tension has important theoretical and practical implications that we are going to underline.

The first hypothesis is to consider that the reversible modifications in the relative prices are characteristic only of some components of the aggregate price index, for example, the components that are affected by seasonality or vulnerable to economic shocks. This is specific to the exclusion-based method. One may see that this hypothesis puts forward a very strong assumption. It suggests that we know with certainty those components. *Moreover, it suggest that no modifications of those components are irreversible, which boils down to the fact that the products and services reflected by them are not affected by the downward rigidities of wages and prices, in general. This assumption is hardly plausible when confronted with the empirical facts.*

The second hypothesis is to consider that there is a relation between the variation in relative prices and inflation. This hypothesis implies removing a specified upper and lower tail of the distribution of prices. The method in this case is the trimmed

symmetric means method. *Even though this method makes no strong assumptions about the components of relative prices that exhibit reversible modifications, it assumes a constant proportion of prices in each period with reversible modifications. This translates into assuming that a constant number of products and services (reflected by the eliminated components) are not affected by the downward rigidities of wages and prices in general.*

The third hypothesis is to consider that all the modification in relative prices that fall outside the trend of the aggregate price index should be eliminated. This hypothesis is characteristic of the trend estimation method, which uses different techniques, such as the HP filter. *The comments made on the second hypothesis applies here, namely it assumes that for each period the downward rigidities of wages and prices, in general, do not affect a constant number of products and services (reflected by the components whose modifications fall outside the trend).*

The fourth hypothesis considers all components of the aggregate price index as given useful information. It ranks the information based on the volatility of prices, which means that the components with less volatility have a higher weight in the aggregate price index. The hypothesis is specific to the volatility weights method. *This hypothesis assumes that there are no irreversible modifications in relative prices and, consequently, that all components are not affected by the downward rigidities of wages and prices, in general.*

The fifth hypothesis assumes that there is a relation between the variation in relative prices and the rate of inflation and that it is not justifiable to set a prior percentage of the price distribution to be eliminated; this percentage should be variable and should result from the composition of the consumer price index. This hypothesis is specific to the Dobrescu method, and it assumes that the relative prices that exhibit an irreversible modification differ from period to period, thus *it assumes that for each period the downward rigidities of wages and prices, in general, affect a different number of products and services.*

## 4. Empirical results

We applied the five methods using the monthly consumer price index detailed for 101 groups of goods and services, for the period from January 1994 to December 2009.

There is a broad acceptance that the elimination of volatility is an important criterion in analyzing the efficiency of the core index (see Wynne, 1999, Clark, 2001). The elimination of the volatility from the price index was calculated by the ratio of the standard deviation of the core inflation index to the standard deviation of the CPI. The standard deviation was calculated using a period of 12 months for the aggregated consumer price index and for the six core indexes. We did this for 16 years, resulting in 16 standard deviations for each index. The results are presented in Tables 1.1 and 1.2 in Appendix. They illustrate the capacity of the core indexes to eliminate the volatility of the consumer price index.

If we are interested in the capacity of the index to eliminate as much volatility as possible, then the most efficient indicators are the HP filter, followed by the median and the trimmed symmetric means 25%. This assertion is based on the arithmetic

mean of the ratios of the standard deviation of the core inflation index to the standard deviation of the CPI. The results show that the methods that are less sensitive to the distribution of prices have a better track record in eliminating the volatility of the aggregated consumer price index. The HP filter does not even use the distribution of prices; it uses only the aggregate price index. The median does not use, as other methods do, an aggregation of a percentage of the distribution of prices, it only takes one value into consideration. If we want to focus not only on the elimination of volatility, but also on the information kept in the core indicator, *then we should look at the consistency of the relation between the value of the CPI and the volatility induced by the persistent changes in relative prices.*

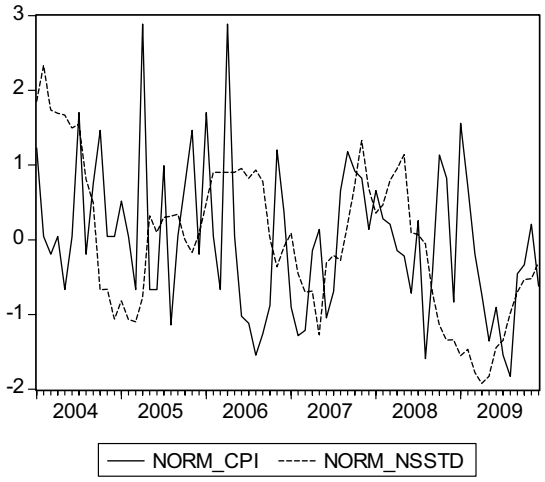
To illustrate this, we turn to the application of the Dobrescu method and analyze the values of the NSSTD. The consumer price index (rate of inflation and deflation) and the coefficient of relative price modifications, namely the SSTD, are positively correlated (see Dobrescu, 1999, p. 3). As Dobrescu suggested, this means that there is a strong correlation between the variation in relative prices and the rate of inflation and deflation. In this respect, higher rates correspond to higher variations.

There also are changes in the components of the aggregated price index, which tend to be irreversible. This is reflected in the NSSTD.

To see a picture of the relation between CPI and NSSTD, we plotted the relation between the normalized series of CPI and of NSSTD.

**Figure 1**

**The relation between the NORM_CPI and NORM_NSSTD**




We identify (see Figure 1 above) four situations:

1) There are periods with a high level of inflation and a high level of NSSTD;
2) There are periods with a high level of inflation and a low level of NSSTD;
3) There are periods with a low level of inflation and a high level of NSSTD;
4) There are periods with different levels of inflation and medium level of NSSTD.

The analysis of the levels of NSSTD will provide some insights on the efficiency of the Dobrescu method.

The first case is that of high values of NORM_NSSTD. These values are explained by the presence of shocks in the economy. These shocks induce high values to the component of the aggregated price index affected. This, in turn, makes the difference between the changes in those components and the aggregated price index higher than in the case where the relative prices are not affected by shocks. This explains the high positives values obtained for NORM_NSSTD.

The second case is that of low values of NORM_NSSTD. These values are explained by the absence of shocks in the economy and small variation in the changes in relative prices.

The third case is that of medium values of NORM_NSSTD. These values are explained by the absence of shocks in the economy and medium variation in the changes in relative prices. The values of NSSTD are sensitive to the gap between the components of the aggregated price index and the aggregated price index; that is why even a medium variation can lead to medium values of NORM_NSSTD.

The presence of shocks explains the values of NORM_CPI. The high values are values where we have shocks. The medium values are the periods without shocks to the economy. The difference in comparison to NORM_NSSTD is that CPI is a chain index; consequently, if a shock to a price dies out quickly we are going to see a sudden drop in the NORM_CPI, as one may see in Figure 1. In this case, we have low values of NORM_CPI.

We can see that the NORM_NSSTD varies much less then the NORM_CPI. Moreover, due to the construction of NSSTD as moving intervals of 12 months of SSTD, the shocks in relative prices induce a variation in NSSTD of lower amplitude than the one induced to CPI. The shocks tend to be absorbed over a longer period of time in the case of NSSTD in comparison with the case of CPI. *The results indicate that the presence of shocks in the economy makes the gap between the core inflation indicator and the aggregate price indicator broader.*

We are also interested to see if the volatility induced by the permanent changes in the relative prices is positively correlated with the consumer price index.

When calculating the core inflation indicator, we wanted to identify the long-term tendency of the consumer price index. This suggests that the variation in the persistent component of the CPI should not be correlated with the period-to-period variation in the aggregated price level (CPI is calculated as a chain index). This would, in turn, suggest that the coefficient of correlation between the CPI and the NSSTD should tend to 0.

**Table 1**

**The correlation between the NORM_IPC and NORM_NSSTD over the period January 2004–December 2009**

| | NORM_CPI | NORM_NSSTD |
|---|---|---|
| NORM_CPI | 1.000000 | 0.109457 |
| NORM_NSSTD | 0.109457 | 1.000000 |

We calculated the Pearson correlation coefficient between NORM_IPC and NORM_NSSTD for the period January 2004–December 2009, thus for a number of 72 periods (see Table 1). The time is relevant, comprising periods with high and low levels of inflation. The results indicate that the coefficient of correlation is slightly positive, and what is relevant is that we do not have a strong correlation like in the case of the correlation between the variation in relative prices and the rate of inflation and deflation. The result suggests that there is a long term tendency of the aggregate price index reflected by the irreversible changes in the relative prices.

## 5. Conclusions

Analyzing the core inflation indicators based on the frame of reference indicated by the Dobrescu method allowed for pinpointing some "silent" limitations of the methods for calculating core inflation and the efficiency of the results. The paper had three main objectives: to identify the implications of the hypothesis of the methods for calculating core inflation on persistent and non-persistent changes in the relative prices; to rank the models based on volatility; and to analyze the relation between the changes in the components of the aggregated consumer price index that tend to be irreversible and the CPI.

From the perspective of the first objective:

1) The methods for calculating core inflation assume that some (variable from method to method) components of the aggregate price index are not affected by the downward rigidities of wages and prices, in general. This assumption is hardly plausible when confronted with the empirical facts. This translates into the incapacity of the method: a) to pinpoint what relative prices should be eliminated and, related to this; b) to identify the optimum level of volatility to be eliminated.

From the perspective of the second objective:

1) The least efficient method is the exclusion-based method. This shows that *a priori* elimination of some components of the aggregate price index not taking into account the statistical and economic characteristics of each period of analysis is, on average, the least efficient approach.
2) On the basis of the volatility criterion, the HP filter is the most efficient on the average. Nonetheless, we do not have a clear criterion to ensure sure that the volatility eliminated is not specific to the core inflation indicator.

From the perspective of the third objective:

1) The results indicate that the presence of shocks in the economy makes the gap between the core inflation indicator and the aggregated prices indicator broader.
2) There is a long term tendency of the aggregated price index, which is reflected by the irreversible changes in relative prices.

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## Appendix

**Table 1.1**

**The ratio between the standard deviation of the core inflation indexes and the standard deviation of CPI**

| | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02 |
|---|---|---|---|---|---|---|---|---|---|
| Dobrescu method | | 1.23 | 1.04 | 1.07 | 0.99 | 0.70 | 0.74 | 1.10 | 0.60 |
| HP filter | 0.02 | 0.21 | 0.13 | 0.02 | 0.17 | 0.16 | 0.20 | 0.25 | 0.22 |
| VC* | 1.02 | 0.95 | 0.99 | 1.04 | 0.99 | 0.85 | 0.73 | 0.89 | 0.56 |
| Median | 0.79 | 0.81 | 0.85 | 0.88 | 0.97 | 0.63 | 0.34 | 0.71 | 0.26 |
| Trimmed symmetric means 12.5% | 0.90 | 1.16 | 1.16 | 0.97 | 0.99 | 0.62 | 0.64 | 0.76 | 0.32 |
| Trimmed symmetric means 25% | 0.82 | 1.05 | 1.05 | 0.93 | 1.00 | 0.61 | 0.54 | 0.77 | 0.27 |
| Core 4 | 0.97 | 0.85 | 0.98 | 1.09 | 1.00 | 1.05 | 1.02 | 1.05 | 0.69 |
| Core 3 | 1.00 | 0.88 | 0.96 | 1.07 | 1.01 | 1.02 | 1.07 | 1.11 | 0.70 |
| Core 6 | 1.04 | 1.08 | 1.00 | 0.92 | 1.08 | 0.91 | 0.89 | 1.28 | 0.90 |

*Notes*

*VC = the method based on volatility weights.*

*Core4, Core3 and Core6 are measurements of core inflation obtained by applying the exclusion-based method.*

*Core 3 index was obtained by eliminating from the consumer price index both fuel price and prices of further goods: "seeds, beans and other leguminous", "potatoes", "other vegetables", "fresh fruits", "citric and other southern fruits" and "eggs".*

*Core 4 index was obtained by eliminating of further goods from the consumer price index. These goods are: "seeds beans and other leguminous", "potatoes", "other leguminous", "fresh fruits", "citric and other southern fruits" and "eggs".*

*Core 6 index was obtained by eliminating from the consumer price index the fuel price and the prices of electric power, gas and central heating.*

**Table 1.2**

**The ratio between the standard deviation of the core inflation indexes and the standard deviation of CPI**

| | 03 | 04 | 05 | 06 | 07 | 08 | 09 | Arithmetic mean 1994-2009 |
|---|---|---|---|---|---|---|---|---|
| Dobrescu method | 0.79 | 0.66 | 0.67 | 0.60 | 0.66 | 0.89 | 1.03 | 0.80 |
| HP filter | 0.24 | 0.22 | 0.08 | 0.03 | 0.02 | 0.03 | 0.03 | 0.13 |
| VC* | 0.65 | 0.54 | 0.52 | 0.51 | 0.77 | 0.60 | 0.82 | 0.78 |
| Median | 0.47 | 0.26 | 0.24 | 0.16 | 0.31 | 0.36 | 0.36 | 0.52 |
| Trimmed symmetric means 12.5% | 0.62 | 0.59 | 0.39 | 0.31 | 0.73 | 0.56 | 0.63 | 0.71 |
| Trimmed symmetric means 25% | 0.60 | 0.46 | 0.33 | 0.24 | 0.57 | 0.46 | 0.44 | 0.63 |
| Core 4 | 1.19 | 0.98 | 1.14 | 0.93 | 0.84 | 0.91 | 0.95 | 0.98 |
| Core 3 | 1.24 | 0.93 | 1.08 | 0.89 | 0.84 | 0.91 | 0.98 | 0.98 |
| Core 6 | 0.86 | 0.60 | 0.65 | 0.63 | 1.11 | 1.12 | 1.18 | 0.95 |