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ANALYSIS OF INFLATION PERSISTENCE IN SERBIA[41]

Mirjana Miletić[42]
Narodna banka Srbije
Siniša Miletić[43]
Visoka škola za poslovnu ekonomiju i preduzetništvo

Abstract

In this paper, we analyzed inflation persistence in Serbia, both at the aggregate level as well as for the different components of the consumer price index. The analysis was done for the series of prices given on the quarterly basis for the period from 2002q1 to 2013q2. We applied univariate autoregression model (AR) of order p, whereby sum of autoregression coefficients was used as a measure of inflation persistence. In addition, special attention was paid to the problem of structural breaks in the series of inflation as it may overestimate the level of inflation persistence and could give misleading signals. The importance of appropriate assessment of the inflation persistence stems from the fact that the impossibility of faster return of inflation to the long-run equilibrium level, after external or domestic shock, has implications on the conducting of monetary policy and represents a major challenge for its effectiveness, especially in emerging countries like Serbia. If the persistence of inflation is higher, monetary policy reaction should be stronger and proactive. If the estimated level and persistence of inflation is lower in comparison with previous empirical analysis, this could suggest that inflation expectations are now better anchored, which is particularly important for countries with inflation targeting regime. Results of the analysis indicate that the inflation persistence in the Serbia is modest and that is higher at the aggregate level compared to the simple average of the components of the consumer price index. This is probably consequence of so-called aggregation effect, since the highest persistency have the prices of those products with the largest share in the consumer basket. In the case of Serbia, food prices have the highest degree of persistence and the largest share in the consumer basket.

Keywords: monetary policy; inflation; persistence of inflation; autoregression model; structural break.

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[42] Kralja Petra 12, Telefon: +381648608162; Fax: +381113027359; E-mail: mirjana.miletic@nbs.rs

[43] Mitropolita Petra 8, Telefon: + 381631023794; E-mail: sinisamiletic72.bgd@gmail.com

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1 Introduction

As inflation is often exposed to numerous macroeconomic shocks which cause its deviation from the long run trend (inflation target), inflation persistence could be defined as speed with which inflation converges to equilibrium after a shock. The sources of inflation persistence are in principle twofold. First, the inflation persistence could be result of driving process, which inflation must inherit. This is in literature explained by New Keynesian Phillips curve.

Backward-looking or indexing behavior of prices causes intrinsic inflation persistence. The importance of appropriate assessment of the inflation persistence stems from the fact that the impossibility of faster return of inflation to the long-run equilibrium level, after external or domestic shock, has implications on the conducting of monetary policy and represents a major challenge for its effectiveness, especially in emerging countries like Serbia. For CEE countries it also has implications for future membership in the euro area. Most theories of inflation dynamics point out a significant role to inflation expectations in the determination of inflation. Under the assumption of rational expectations, inflation expectations by themselves will not contribute to the persistence of the inflation process [see Moreno and Villar (2010)]. However, relatively small deviations from the assumption of perfect information can change this result dramatically. First, imperfect information about nature of the shocks (temporary versus permanent) are affecting the economy and may lead to more persistent and gradual responses of inflation to shocks. Also, change in the monetary policy reaction function and change in the way the economy responds to shocks or monetary policy actions could affect inflation persistence. In principle, inflation persistence tends to be higher in period of high inflation.

Inflation persistence has been studied by various models, ranging from simple AR to DSGE models. In studying univariate AR models, many authors found very high persistence for sample over 50 years starting from the post-second world war era, both in the United States and in the euro area. More recent studies have found that inflation series have several structural breaks. When studying the properties of the estimated AR models for subperiods identified by the break points, persistence turned out to be significantly smaller, particularly in the more recent periods, which shows that inflation persistence changed over time [for details see Darvas and Varga (2007)]. The persistence properties of inflation and their response to the adoption of an inflation targeting regime are the subject of a large literature. Empirical evidence seems to be inconclusive in providing answers to the question whether inflation targeting regime plays an important role and leads to a reduction in inflation persistence (Siklos (2008), Filardo and Genberg (2009), Gerlach et. all (2010), etc).

The analysis of inflation persistence is particularly relevant in an economy characterized by relatively high and volatile inflation and inflation expectations above the medium inflation target, which is feature of the Serbian economy. This motives us to analyze the impact of inflation targeting on the evolution of inflation persistence and the effects of aggregation across different categories of prices, particularly having in mind that the persistence properties of inflation at a disaggregate level are also a valuable input for monetary policy and the lack of empirical research in this field in the case of Serbia. For this purpose we use disaggregate quarterly data of the Serbian CPI. We compare persistence in a sample covering period before the formal adoption of inflation targeting regime (between 2002q1 and 2008q4) with persistence for the whole period of analysis.

The paper is organized as follows. Section two briefly provide some literature review on the results of inflation persistence in developed and emerging market economies, particularly in those with inflation targeting monetary policy regime. Section three presents some methodological issues relating to estimation of inflation persistence, while section four describes stylized facts of Serbian inflation. Section five discusses results of empirical analysis on both aggregate and component level. Finally, section six offers some concluding remarks.

2 Literature review

Inflation persistence is a crucial aspect of overall inflation dynamics. Inflation persistence measures are usually based on univariate models (e.g. the sum of autoregressive coefficients, the largest autoregressive root, half-life and spectral density at frequency zero – see Marques (2004) for a summary). Marques (2004) stresses that it is more natural to assume a time-varying mean of inflation than to assume a constant mean or to search for breaks in the mean of inflation. In his analysis of US and euro area inflation, Marques considers several treatments for the mean of inflation, including the application of an HP filter and a moving average. In general, his results confirm that more flexibility assumed for the mean of inflation delivers lower estimates of persistence. Similar results for the US and the euro area are provided by Dossche and Everaert (2005), who model the time-varying mean as an AR(2) process. Benati (2006), in the framework of AR(p) representation of inflation series for 21 countries, allows for random-walk time-varying parameters.

Most of the available research on inflation persistence in the CEEC countries is based on micro data. Micro analysis is available for the Czech Republic, Poland, Slovakia and Macedonia [see Babetski, Coricelli, and Horváth (2006), Konieczny and Skrzypacz (2005), Coricelli, and Horváth (2006) and Petrovska and Ramadani (2010), respectively]. Some of the results signal that high inflation persistence can indeed be a problem for some CEEC countries. The magnitude of inflation persistence in Hungary was estimated by the univariate time series method for the period ending in 2005 and by the structural time series method for the period ending in mid-2006 (Darvas and Varga 2007; Menyhert 2008). It is found that during the study period, inflation persistence in Hungary was higher than that in the US and euro area and that inflation dynamics was determined as much by past inflation as by forward-looking expectations.

Babetski, Coricelli, and Horvath (2008) analyzed inflation persistence in an inflation targeting country (Czech Republic) using 412 detailed product-level consumer price indices underlying the consumer basket over the period from 1994:M1 to 2005:M12. Authors suggest that raw goods and non-durables, followed by services, display smaller inflation persistence than durables and processed goods.

Authors conclude that inflation seems to be somewhat less persistent after the adoption of inflation targeting in 1998 and that there is evidence for aggregation bias. Aggregate inflation is found to be more persistent than the underlying detailed components. In addition, price dispersion, as a proxy for the degree of competition, is found to be negatively related to inflation persistence, suggesting that competition is not conducive to reducing persistence.

Coricelli and Horvath (2006) analyzed price setting behavior in Slovakia, using large micro-level dataset covering about 57% of Slovak CPI for the period 1997-2001. Similarly to results on advanced market economies, authors found that price changes are infrequent and sizeable. Authors found that market structure is an important determinant of pricing behavior. The dispersion of prices is higher while persistence is lower in the non-tradable sectors, suggesting that higher competition in goods markets is not conducive to lower persistence. An important implication of authors research is that increasing market competition brought about by entry in the EU will not necessarily lead to lower persistence. By contrast, the increasing share of services in consumption will reduce persistence.

Konieczny and Skrzypacz (2005) analyzed the behavior of price setters in Poland during the transition from a planned to a market economy, using a large disaggregated data set. Authors found that the size and frequency of price changes, as well as relative price variability, all increase as inflation rises. Authors conclude that the effect of expected inflation on relative price variability is much stronger than the effect of unexpected inflation.

Petrovska and Ramadani (2010) applied classical econometric method to characterize the dynamic behavior of the quarter-on-quarter inflation over the period 1997q1-2010q1 in Macedonia. In particular, authors estimated univariate autoregressive (AR) models for the aggregate consumer price inflation series and as well as for the consumer price inflation at representative product groups level, taking into account the influence of structural breaks in the mean of inflation on the level of persistence. Authors found strong evidence for a break in the mean for the housing, transport and communication services and culture and leisure inflation. Allowing for a break in the mean of inflation, the inflation measures generally exhibit relatively lower inflation persistence.

3 Methodological issues

The most common approach used in empirical analysis of inflation persistence is based on the sum of autoregressive coefficients in a univariate process of inflation, following Andrews and Chen (1994):

$$\pi_t = \alpha + \sum_{i=1}^{q} \beta_i \pi_{t-i} + \varepsilon_t , \qquad (1)$$

where the sum of autoregressive coefficients is $\rho = \sum_{i=1}^{q} \beta_i$.

Previous equation can be rewritten in the following way:

$$\pi_t = \alpha + \rho\pi_{t-1} + \sum_{i=1}^{q-1}\gamma_i\Delta\pi_{t-i} + \varepsilon_t \qquad (2)$$

If ρ = 1, inflation process has unit root, which means that possibility to control inflation is low and that the variance of the permanent shock is much greater than variance of transitory shock. If $|\rho| < 1$, the inflation process is stationary.

Another alternative way to measure inflation persistence that has also been employed in some empirical studies is non-parametric and relies on the idea that there is a close relationship between persistence and mean reversion. The estimator for the unconditional probability of a process not to cross its mean in period *t* is given by:

$$\hat{\gamma} = 1 - n/T$$

where *n* stands for the number of times the series crosses its mean during a time interval with *T+1* observation. Presence of structural breaks in the mean of inflation could yield spuriously high estimates of the degree of persistence (Perron, 1989). Although, a lot of papers find evidence for a break in the mean of inflation, the reasons for the occurrence of such breaks is not clear in many cases. If monetary policy was the driving force, we would expect to see the break occurring in a similar fashion for most sectoral inflation series. However, break dates are sometimes distributed widely in sectoral inflation series. For instance, a methodological change in the measurement of prices, can affect the stability of the estimated model. To account effect of such bias, dummy variable should be included in the regression model presented in equation (2):

$$\pi_t = \alpha + \rho\pi_{t-1} + \sum_{i=1}^{q-1}\gamma_i\Delta\pi_{t-i} + \delta d_t + \varepsilon_t, \qquad (3)$$

Where $d_t = \begin{cases} 1, & t \geq s \\ 0, & otherwise \end{cases}$ *s* is the break date.

Starting from the linear regression model:

$$y_t = x_i'\beta_i + u_i, \qquad (4)$$

where xi accounts for a p×1 vector of regressors and β_i is the p×1 vector of regression coefficients, which can vary over time, presence of structural break point can be tested by the hypothesis that all regression coefficients remain constant (H_0: $\beta_i = \beta_0$) against the alternative that at least one varies over time. Thus, under the alternative hypothesis, model described by (4) can be rewritten as:

$$y_t = x_i'\beta_j + u_i, \qquad i = i_{j-1}+1,\dots,i_j, \qquad j = 1,\dots,m+1,\ i_0 = 0,\ i_{m+1} = n \qquad (5)$$

where *j* is the segment index and i1,..., im denotes the set of breakpoints [see Zeileis et al. (2003)].

The classical test for structural change is typically attributed to Chow (1960). His testing procedure splits the sample into two subperiods, estimates the parameters for each subperiod, and then tests the equality of the two sets of parameters using a classic F statistic. If the breakdate is known a priori, then the chi-square distribution can be used to assess statistical significance. However, if the breakdate is unknown a priori, then the chi-square critical values are inappropriate. Andrews (1993) and Andrews and Ploberger (1994) provide tables of critical values that are appropriate in this case and Hansen gives an algorithm for computing approximate asymptotic p values of these tests [for details see Hansen (2001)].

Tests against alternative of unknown timing with m = 1 are usually based on a sequence of *F* statistics for a change at time *i*:

$$F_i = \frac{\hat{u}_i' \hat{u}_i - \hat{u}_i'(i)\hat{u}_i(i)}{\hat{u}_i'(i)\hat{u}_i(i)/(n-2p)}, \qquad (6)$$

where $\hat{u}_i(i)$ are residuals from a segment regression with nreakpoint *i* and $\hat{u}_i$ are residulas from the unsegmented model. F statistics are computed for $i = n_h, \ldots .\ n - n_h$, where $n_h = [nh]$ and *h* is the trimming parameter that determines the maximum time span between two possible breaks, $h = 0{,}1$ or $h = 0{,}15$.

Structural break could be tested by OLS-based CUSUM test introduced by Ploberger and Kramer (1992), which is based on cumulated sums of standard OLS residuals:

$$W_n^0(t) = \frac{1}{\hat{\sigma}\sqrt{n}} \sum_{i=1}^{\lfloor nt \rfloor} \hat{u}_i, \qquad (7)$$

where the limiting process for $W_n^0(t)$ is the standard Brownian bridge $W_0(t) = W(t) - tW(1)$ and $W(\cdot)$ denotes standard Brownian motion. Under a single-shift alternative, the process should have a peak around the breakpoint.

Bai and Perron (1998) develop tests for multiple structural changes. Their method is sequential, starting by testing for a single structural break. If the test rejects the null hypothesis that there is no structural break, the sample is split in two and the test is reapplied to each subsample. This sequence continues until each subsample test fails to find evidence of a break.

Given an m-partition *i*1,....*im* and obtained the least squares estimates for the β_j, the

resulting minimal residual sum of squares is given by:

$$RSS(i_1, \ldots, i_m) = \sum_{j=1}^{m+1} rss(i_{j-1}+1, i_j), \qquad (8)$$

where $rss(i_{j-1}+1, i_j)$ is the minimal residual sum of squares in the jth segment. The problem of dating structural changes is to find the breakpoints $\hat{\imath}_1$, ... , $\hat{\imath}_m$ that minimize the objective function:

$$\left(\hat{i}_1,\ldots,\hat{i}_m\right) = \arg\min_{(i_i,\ldots,i_m)} RSS(i_i,\ldots,i_m) \quad , \qquad (9)$$

over all partitions i_1 , ... , i_m with $i_j - i_{j-1} \geq n_h$.

4 The stylized facts of Serbian inflation

Table 1 depicts price dynamics of different groups of products and services over the period January 2007 to July 2013 in Serbia. As it can be observed price increases happen much frequently than price decreases. Also, average size of price increase is larger than average size of price decrease. This asymmetrical reaction of prices - stronger reaction to positive than to negative shocks - has implication on the monetary policy reaction. Prices of tradable on average have stronger reaction to negative shock compared to nontradables. Strongest reaction in both directions is observed for food and beverages prices. This suggests that monetary policy in the case of supply side shocks should react to prevent second round effects, not to offset shock, because the reaction to the shock alone could lead to unnecessary restrictions on economic activity, while prices of products directly exposed to cost pressures will fall down when the shock disappears.

TABLE 1. THE STYLIZED FACTS OF CONSUMER PRICE CHANGES

	Share of goods with increased prices (in %)	Share of goods with decreased prices (in %)	Average size of price increases (in %)	Average size of price decreases (in %)
CPI	75.6	19.2	1.1	0.4
Food and beverages	66.7	30.8	1.9	1.3
Alcoholic products and tobacco	77.2	16.7	1.7	0.4
Clothing and footwear	70.5	21.8	0.6	0.5
Housing	85.9	9.0	0.9	0.2
Housing equipment	79.5	15.4	0.8	0.3
Health	80.8	10.4	0.8	0.8
Transport services	71.8	25.6	1.4	1.1
Communication services	34.6	26.9	1.1	0.3
Culture and leisure	74.4	17.9	1.1	1.0
Education services	64.1	12.8	0.7	0.2
Restaurants and hotels	89.7	6.4	0.6	0.3
Miscellaneous	97.4	2.6	0.6	0.2

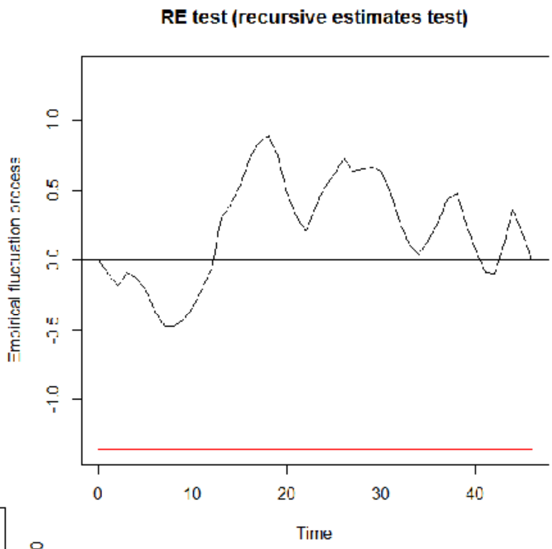
Source: Author's calculation

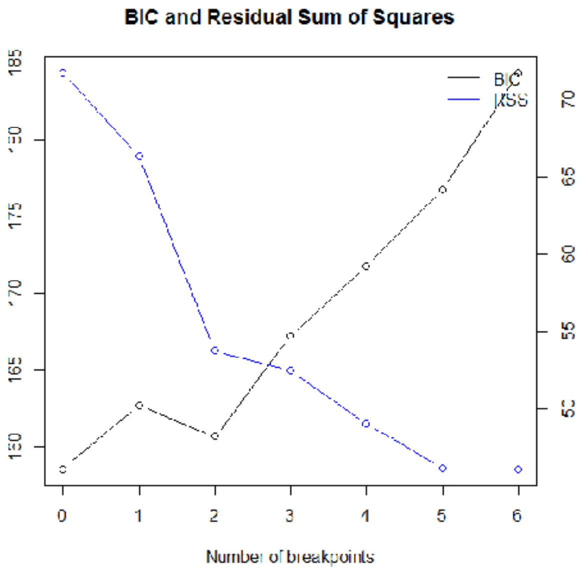
5 Empirical results

The analysis was done for the series of prices given on the quarterly basis for the period from 2002q1 to 2013q2. Due to the fact that series of monthly inflation are much more volatile and depend on the temporary factors which are, in principle, unrelated to the inflation trends, analysis was conducted on the quarterly basis. Beside the aggregate level, analysis was conducted for the different components of the consumer price index: core inflation measure or prices that are determined by the market (CORE), noncore inflation measure (XCORE), food prices in core inflation measure (COREFOOD), other prices in core inflation measure (CORENONFOOD), prices of fruits and vegetables (AGRICULTUR E), regulated prices (ADMINISTRATIVE) and prices of oil derivatives (DERIVATIVES). All series are seasonally adjusted by X-12 ARIMA method. Due to relatively small sample on quarterly basis for the different groups of products and services (since 2007), analysis was conducted for the components mentioned above and not on the sectorial basis that could provide more interesting results.

To see whether there has been a significant change in the persistence of our inflation series, we employ test based on F statistic, OLS-CUSUM test and test recommended by Bai and Perron (1993). We have chosen a trimming parameter for the total sample of 15%. Results of structural breaking point test are presented in Charts 1-8. We find strong evidence for a structural break in the case of core inflation, core food inflation measure, core excluding food inflation measure and regulated prices. In the case of core inflation measure Bai and Perron test suggests presence of two structural breaks (2003q3 and 2005q4), while OLS-CUSUM test and F statistic reject presence of structural break. In the case of core food inflation measure Bai and Perron and F statistic tests suggest presence of one structural break (2003q3). Bai and Perron test would chose a model with three breaks in the case of core non food inflation measure (2004q3, 2006q2, 2008q1) while OLSCUSUM test and F statistic suggest one break (2006q2). In the case of regulated prices Bai and Perron and F statistic tests suggest presence of one structural break (2003q3). Based on these findings in the case of core inflation measure we estimated model with two breaks, as Bai and Perron test suggest, while in the case of core non food measure we estimated model with one structural break, as F statistic and OLS-CUSUM test suggest.

CHART 1. STRUCTURAL BREAKING POINT TESTS FOR SERIES CPI





G POINT TESTS FOR SERIES

CORE

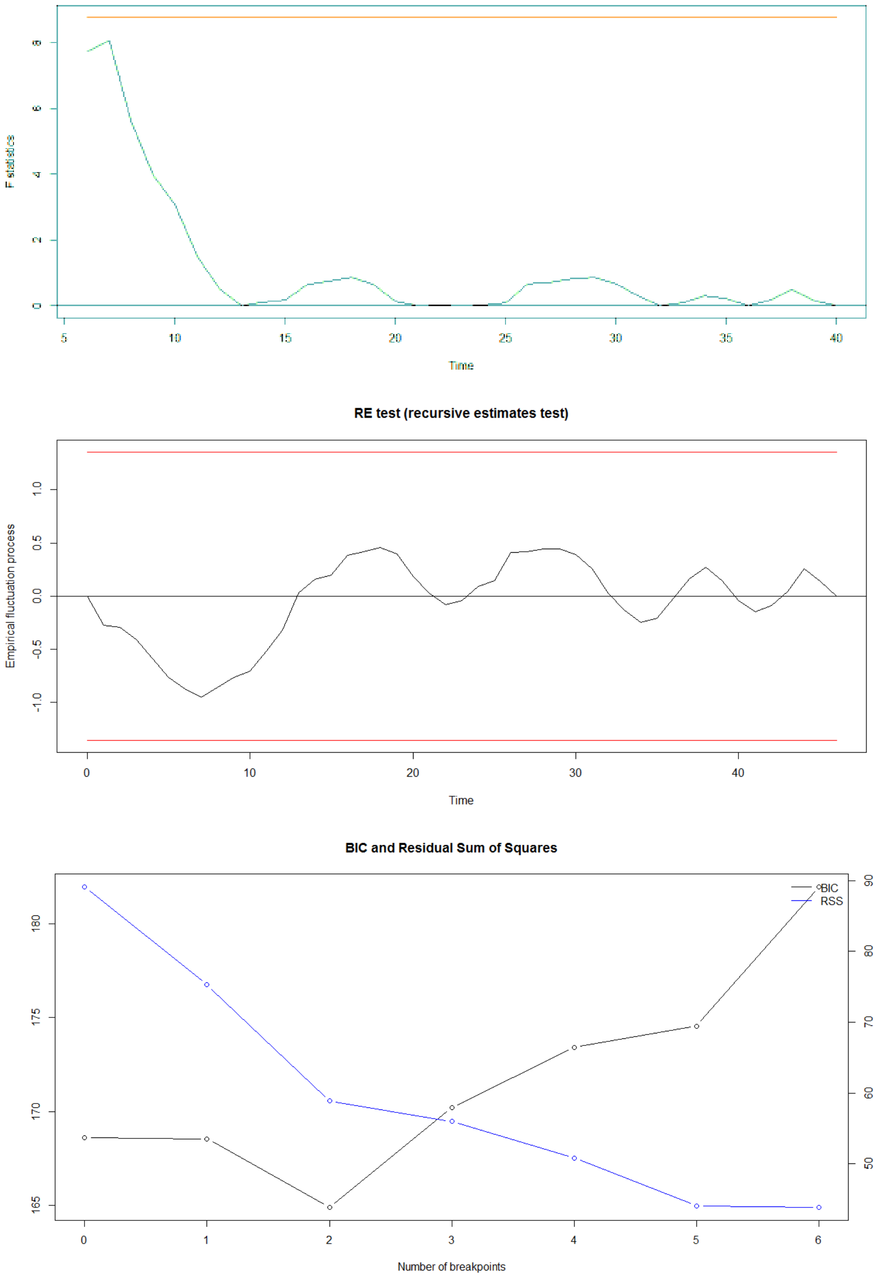
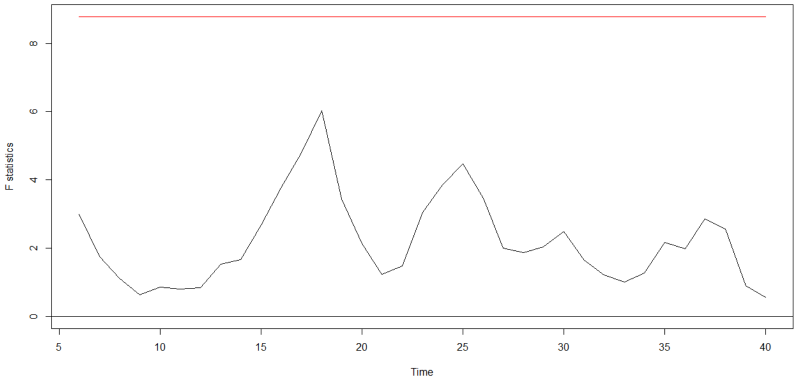
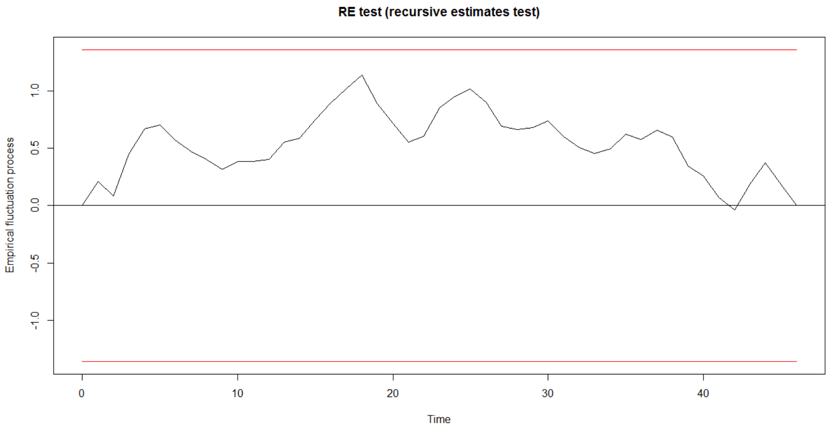


CHART 3. STRUCTURAL BREAKING POINT TESTS FOR SERIES XCORE





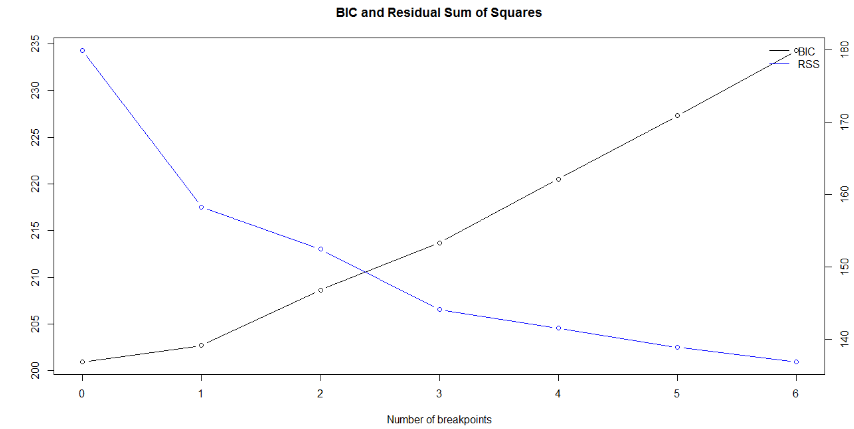


CHART 4. STRUCTURAL BREAKING POINT TESTS FOR SERIES COREFOOD

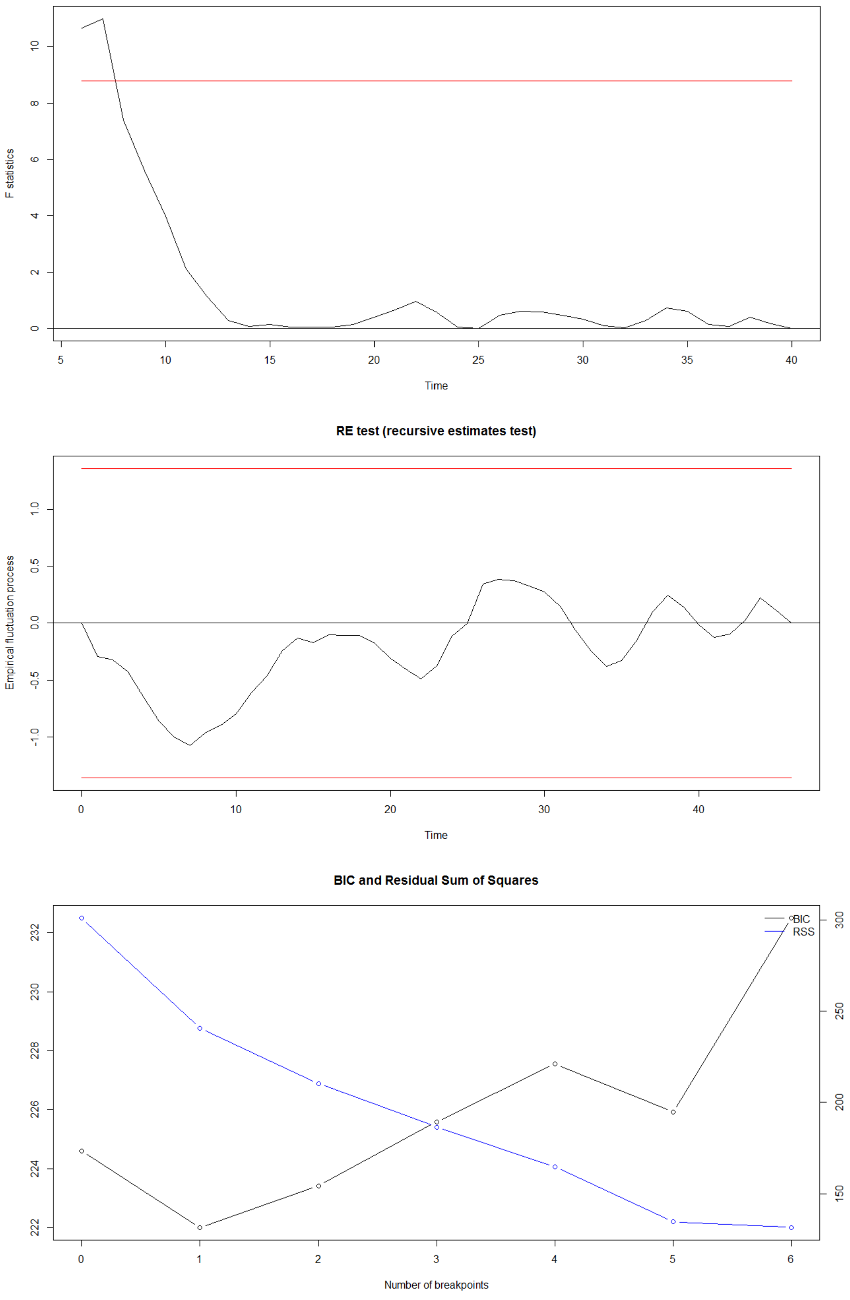


CHART 5. STRUCTURAL BREAKING POINT TESTS FOR SERIES CORENONFOOD

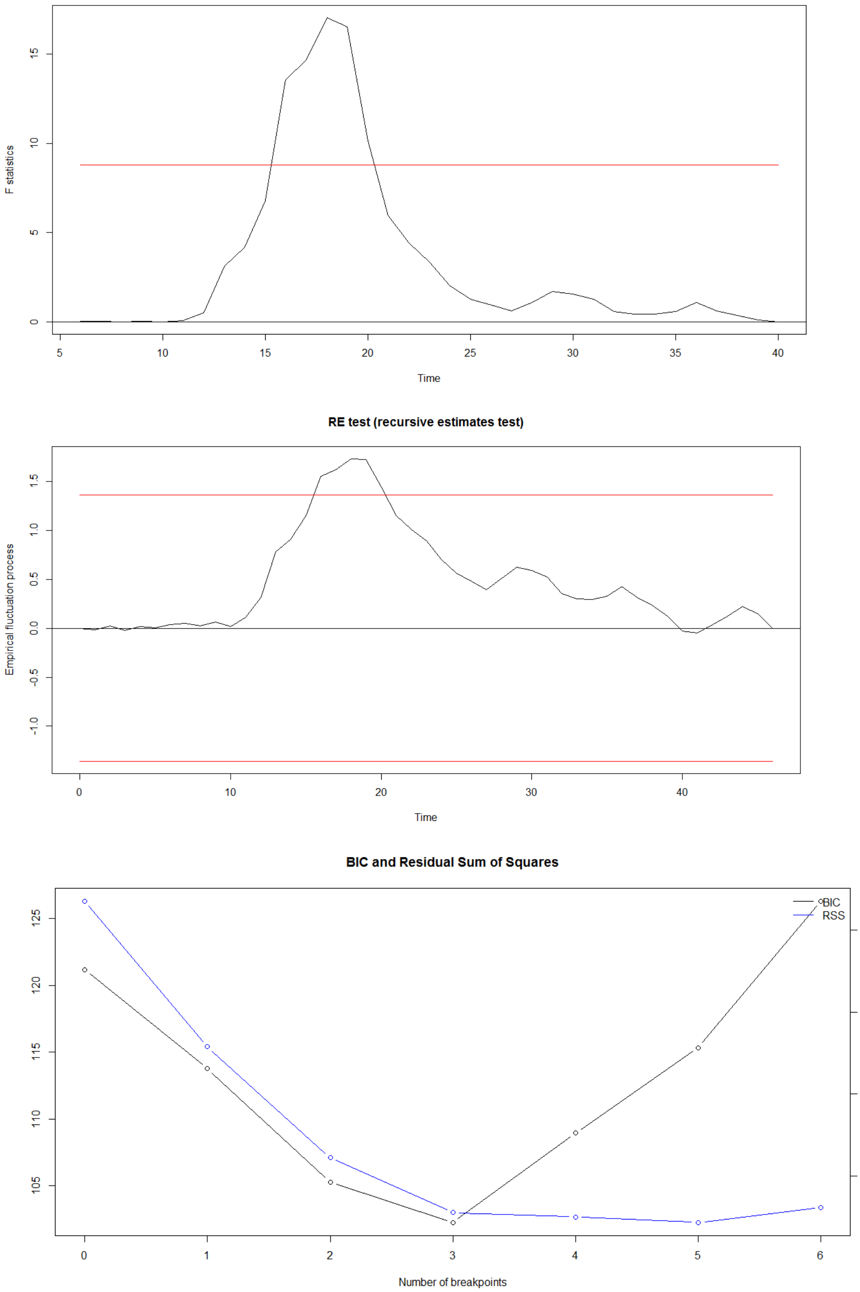


CHART 6. STRUCTURAL BREAKING POINT TESTS FOR SERIES AGRICULTURE

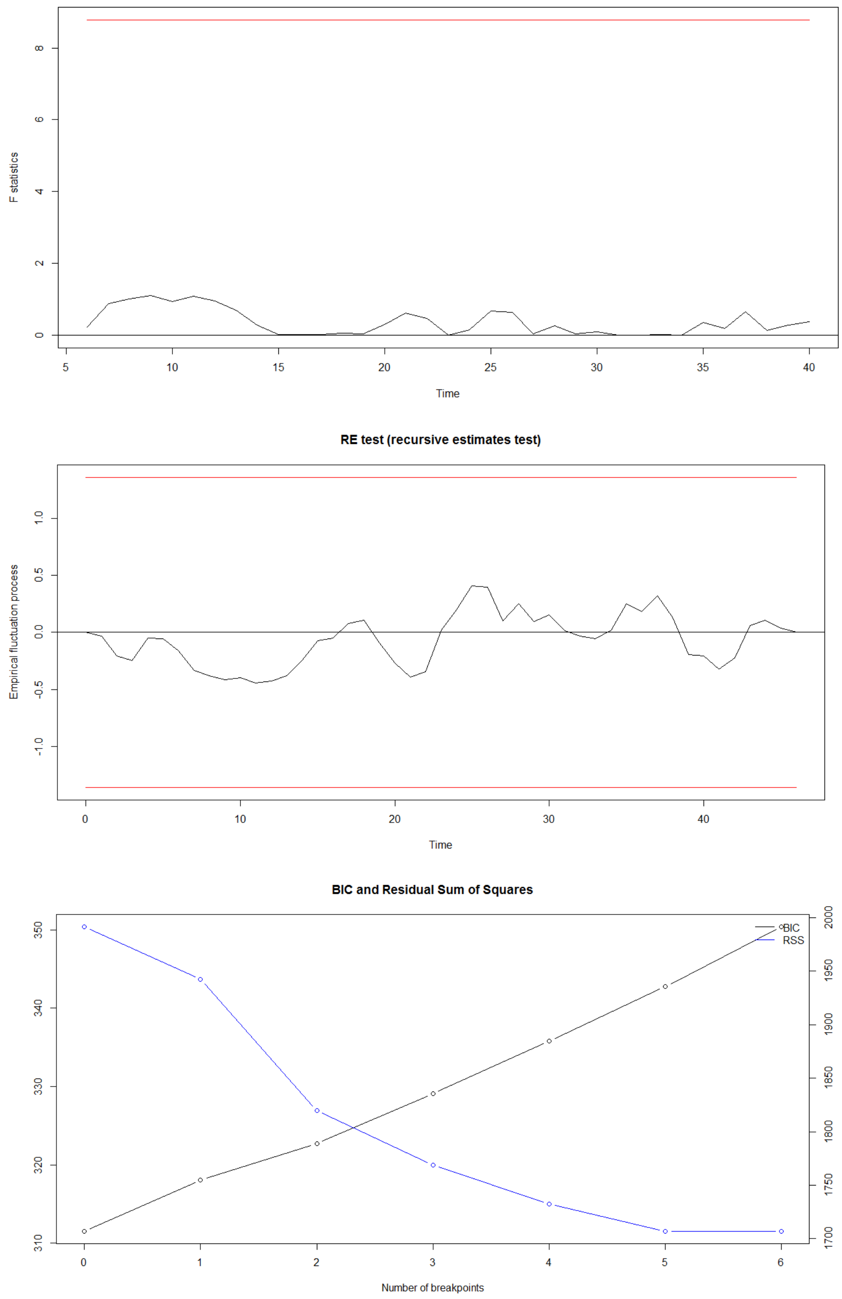
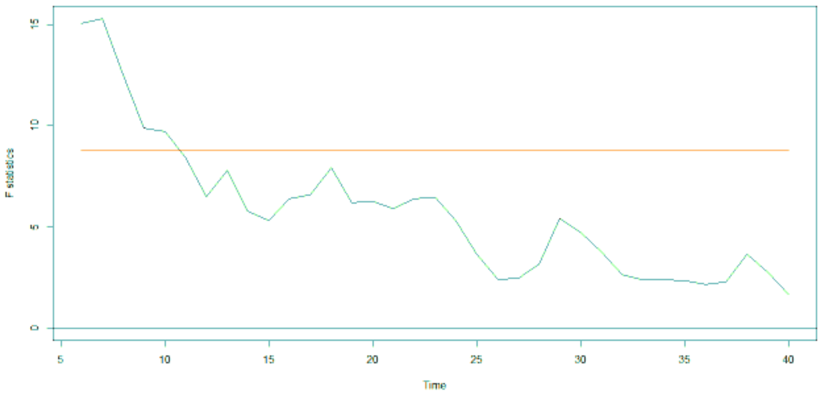
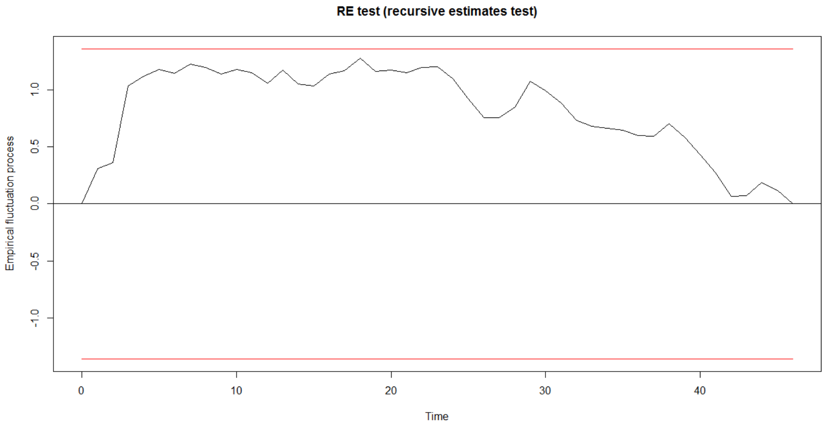


CHART 7. STRUCTURAL BREAKING POINT TESTS FOR SERIES ADMINISTRATIVE





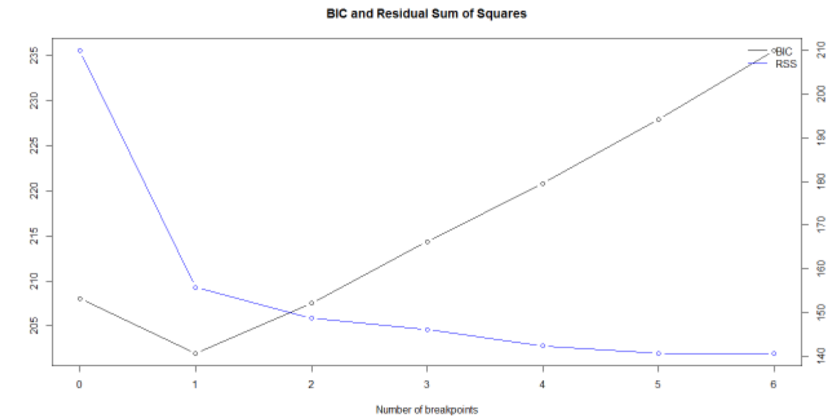
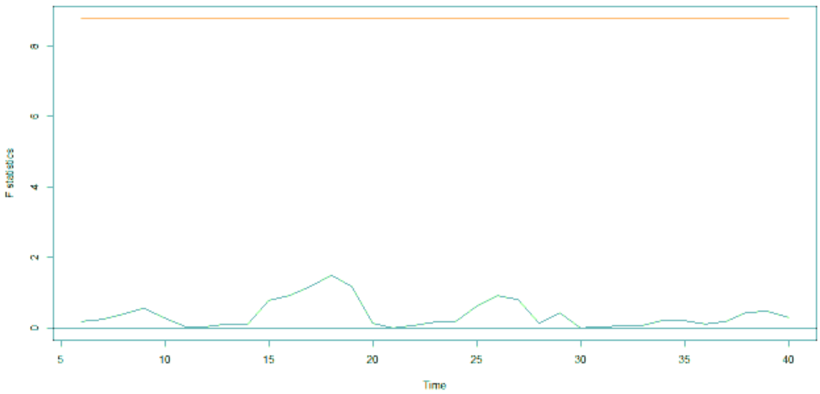
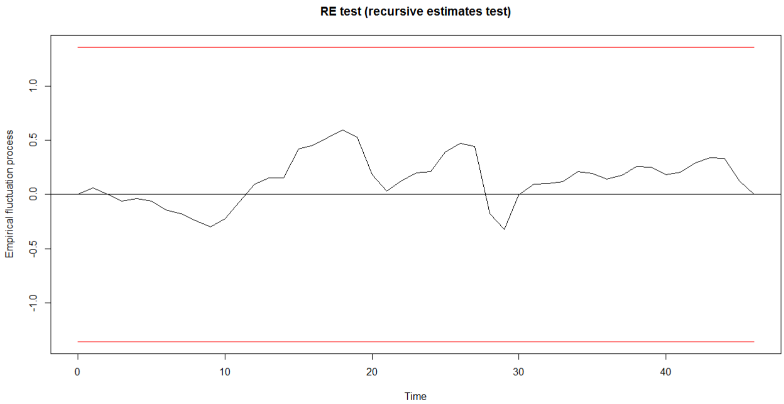
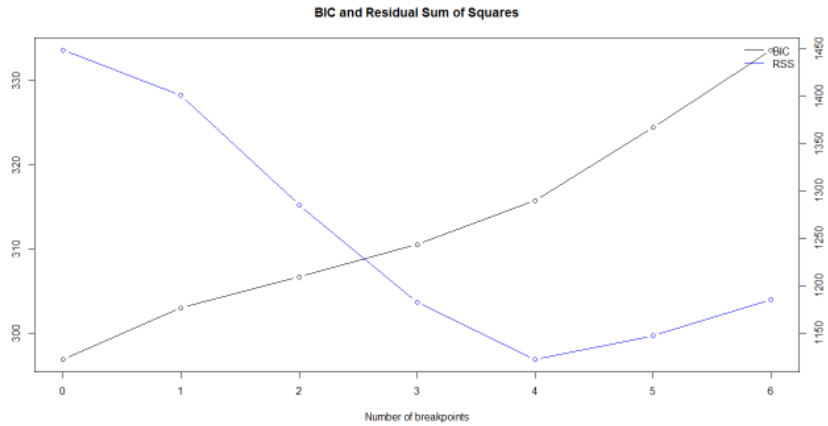


CHART 8: STRUCTURAL BREAKING POINT TESTS FOR SERIES DERIVATIVES







The results of estimation presented in Table 2 point to an overall moderate degree of inflation persistence in the case of Serbia. More precisely, persistence parameter for the whole period does not exceed 0.5. Results also point out that inflation persistence is higher for the period before the adoption of inflation targeting regime.

TABLE 2. RESULTS OF ESTIMATION OF INFLATION PERSISTENCE ON AGGREGATE LEVEL

	Period: 2002q3 - 2013q2	Period: 2002q3 - 2008q4
C	1.313737 ***	1.157489
$\pi(CPI)_{-1}$	0.430307***	0.553130***
$\Delta\pi(CPI)_{-1}$	0.322303*	0.083979
	Adj. R^2=0.36; DW=2.1	Adj. R^2=0.30; DW=1.9

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

The differences in the inflation persistence by subcomponents of CPI (core inflation measure, non core inflation measure, prices of fruits and vegetables, prices of oil derivatives and regulated prices) is clearly visible (see Tables 3-9). Lowest degree of persistence is recorded for regulated prices, while core prices have highest persistence. These differences reflect differences in market structure. Results of the analysis indicate that the inflation persistence in the Serbia is higher at the aggregate level compared to the simple average of the components. This is probably consequence of so-called aggregation effect, since the highest persistency have the prices of those products with the largest share in the consumer basket. In the case of Serbia, food prices have the highest degree of persistence and the largest share in the consumer basket.

TABLE 3: RESULTS OF ESTIMATION FOR CORE INFLATION MEASURE (CORE)

	Coefficient	t statistics
C	0.175442	0.328915
$\pi(CORE)_{-1}$	0.436144	3.052733***
$\Delta\pi(CORE)_{-1}$	0.192740	1.337928
$d_t = \begin{cases} 1, & t > 2003q3 \\ 0, & otherwise \end{cases}$	1.571060	2.251646**
$d_t = \begin{cases} 1, & t \geq 2005q4 \\ 0, & otherwise \end{cases}$	-0.692116	-1.661899
	Adj. R^2=0.42; DW=2.1	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 4. RESULTS OF ESTIMATION FOR NONCORE INFLATION MEASURE (XCORE)

	Coefficient	t statistics
C	2.290413	3.704047***
$\pi(XCORE)_{-1}$	0.226559	1.244515
$\Delta\pi(XCORE)_{-1}$	0.168898	1.113937
	Adj. R^2=0.10; DW=1.6	

*Source:Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 5. RESULTS OF ESTIMATION FOR CORE FOOD INFLATION MEASURE (COREFOOD)

	Coefficient	t statistics
C	-0.774491	-0.809321
$\pi(COREFOOD)_{-1}$	0.472511	3.435866***
$\Delta\pi(COREFOOD)_{-1}$	0.230191	1.603480
$d_t = \begin{cases} 1, & t \geq 2003\ q3 \\ 0, & otherwise \end{cases}$	2.085483	1.922420*
	Adj. R^2=0.43; DW=2.11	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 6. RESULTS OF ESTIMATION FOR CORE NON FOOD INFLATION MEASURE (CORENONFOOD)

	Coefficient	t statistics
C	1.271579	3.191430***
$\pi(CORENONFOOD)_{-1}$	0.486203	3.235123***
$\Delta\pi(CORENONFOOD)_{-1}$	0.014656	0.096351
$d_t \begin{cases} 1, & t \geq 2006\ q2 \\ 0, & otherwise \end{cases}$	-0.497807	-2.053693**
	Adj. R^2=0.41; DW=2.0	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 7. RESULTS OF ESTIMATION FOR FRUITS AND VEGETABLES (AGRICULTURE)

	Coefficient	t statistics
C	2.322918	2.425986**
$\pi(AGRICULTURE)_{-1}$	0.181811	1.525289
$\Delta\pi(AGRICULTURE)_{-1}$	0.047830	0.358632
	Adj. R^2=0.10; DW=2.02	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 8. RESULTS OF ESTIMATION FOR REGULATED PRICES (ADMINISTRATIVE)

	Coefficient	t statistics
C	6.164100	2.090385**
$\pi(ADMINISTRATIVE)_{-1}$	-0.025166	-0.110205
$\Delta\pi(ADMINISTRATIVE)_{-1}$	0.022444	0.218954
$d_t = \begin{cases} 1, & t > 2003q3 \\ 0, & otherwise \end{cases}$	-3.390242	-1.400393
	Adj. R^2=0.15; DW=1.6	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

TABLE 9. RESULTS OF ESTIMATION FOR PRICES OF OIL DERIVATIVES (DERIVATIVES)

	Coefficient	t statistics
C	2.960993	4.570732***
$\pi(DERIVATIVES)_{-1}$	-0.025897	-0.180692
$\Delta\pi(DERIVATIVES)_{-1}$	0.420197	3.546166***
	Adj. R^2=0.20; DW=2.0	

*Source: Author's calculation. * denotes statistical significance at 10%, ** at 5% and *** at 1%, respectively.*

In Table 10 we reported results for the persistence parameter from the model without structural break, from the model that takes into account structural breaks and estimates for the subperiod after the break occurred. Results point that core inflation series are less persistent after the structural break occurred.

TABLE 10:COMPARISON OF INFLATION PERSISTENCE ESTIMATES

Measure	ρ without break	ρ with break	ρ after the last break
CPI	0.430307*		
CORE	0.578995*	0.436144*	0.377673* (2006q1-2013q2)
COREFOOD	0.575255*	0.472511*	0.472613*(2003q1-2013q2)
CORENONFOOD	0.632447*	0.486203*	0.336831*(2006q3-2013q2)
XCORE	0.226559		
AGRICULTURE	0.181811		
ADMINISTRATIVE	0.383214*	-0.025166	0.049528 (2003q4-2013q2)
DERIVATIVES	-0.025897		

** denotes significance at 5%*

6 Concluding remarks

In this paper, we analyzed inflation persistence in Serbia, both at the aggregate level as well as for the different components of the consumer price index. The analysis was done for the series of prices given on the quarterly basis for the period from 2002q1 to 2013q2. We applied univariate autoregression model (AR) of order p, whereby sum of autoregression coefficients was used as a measure of inflation persistence.

Our results point the need to account for the presence of a structural break hence the omission of structural breaks could lead to invalid measurements of inflation persistence. We find strong evidence for a structural break in the case of core inflation, core food inflation measure, core excluding food inflation measure and regulated prices. The results point to an overall moderate degree of inflation persistence in the case of Serbia (less than 0.5). Results also point out that inflation persistence is higher for the period before the adoption of inflation targeting regime. Results of the analysis indicate that the inflation persistence in the Serbia is higher at the aggregate level compared to the simple average of the components. This is probably consequence of so-called aggregation effect, since the highest persistency have the prices of those products with the largest share in the consumer basket, such as food.

With regard to components of CPI, the empirical results point that core inflation measures were characterized by higher persistence than regulated prices, prices of oil and fruits and vegetables. A number of extensions could be applied to this empirical research, from extending the framework to a multivariate analysis and from applying methods of time-varying mean to use larger product-level consumer price dataset.

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