INFLATION PERSISTENCE IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Highlights

- This paper studies inflation persistence with time-varying-

1 Introduction

Inflation is often exposed to numerous macroeconomic shocks that pull it away from its mean, which is generally identified by the central bank's inflation target. Shocks can be persistent or could have persistent effects on inflation because of, for example, nominal rigidities, leading to persistent deviations of inflation from its target. Knowing the persistence of these shocks and inflation deviations from target plays an essential role for the central bank whose primary aim is to achieve price stability. The adjustment of inflation towards its long-run level after a shock can be characterised by the speed with which it converges back to its mean. The greater this speed, the less complicated the central bank's task of maintaining price stability. Inflation persistence is a measure of this convergence speed, based on different kinds of properties of the impulse response function within the model built to describe inflation.

Inflation persistence has been studied by various models, ranging from simple autoregressions to well-structured dynamic general equilibrium models. In studying univariate autoregressive time-series models, many authors found very high persistence or even could not reje0006 3er this sp

Although the analysis of inflation persistence in the euro area and the US has received much attention[2], there has been very limited research regarding the central and eastern European (CEE) countries. For example, Cuestas and Harrison (2010) use five different unit root tests for 12 CEE countries during 1994-2007, while Ackrill and Coleman (2012) use a variety of unit root tests and tests for fractional integration for a different set of 12 CEE countries for the sample period 1994-2011. Both papers argue that such tests have an implication for inflation persistence. However, while a unit root in the inflation series obviously indicates full persistence (that is, all shock have permanent effects), but a rejection of the unit root in itself is not informative about the nature of inflation persistence. Franta, Saxa and Smidkova (2007) adopt a more sensible approach, based on Dossche and Evaraert (2005). Among others, they measure the magnitude of inflation the time-varying coefficient models two ways: one is based on the maximum likelihood estimation of a state-space model with the help of the Kalman-filter, while the other is a related but less-known methodology, the Flexible Least Squares (FLS) estimator introduced by Kalaba and Tesfatsion (1988).

In Darvas and Varga (2012) we assessed the ability of these two methodologies to uncover the parameters of various autoregressive data generating processes using Monte Carlo methods. We found that neither the FLS, nor the Kalman-filter can uncover sudden changes in parameters, but when parameter changes are smoother, such as linear, sinusoid or even random walk changes in the parameters, the FLS with a weight parameter 100 works reasonably well and typically outperforms even the Kalman-smoother, which in turn performed better than the Kalman-filter. We therefore use the FLS with a weighing parameter 100, but due to the arbitrariness of the selection of the smoothing parameter of the FLS, we also use Kalman-filtering.

The rest of the paper is organised as follows. Section 2 briefly introduces the time-varying coefficient autoregression and sketches Kalman-filtering and the FLS. I, ab ility of these two metho

(9) $$\sum_{t=1}^{T} \left(y_t - x_t' \beta_t \right)^2 + V^{-1} \sum_{t=1}^{T-1} (\beta_{t+1} - \beta_t)' (\beta_{t+1} - \beta_t),$$

where V_ω is the covariance matrix of the ω_t errors of the parameter vector. The proof thus sheds light on the role of the μ smoothing parameter of FLS: comparing (11) to the definition (6) of incompatibility cost we get:

(10) $$V = \mu^{-1} I_K ,$$

where I_K is the $K \times K$ identity matrix. Not surprisingly, equation (10) underlines that the variance of the innovations of the estimated parameter vector of the FLS is inversely related to μ.

As mentioned earlier, we use FLS with μ = 100, considering the simulation results of Darvas and Varga (2012), and use Kalman-filteri

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end of the sample). For the OLS we show two similar lines: the full sample OLS corresponds to the smoothed values, while the recursive OLS corresponds to some extent the filtered values. Naturally, at the last data point the recursive OLS equals the full sample OLS, and the filtered values of the FLS and Kalman-filter correspond to the smoothed values of the FLS and Kalman-filter, respectively. The findings of Darvas and Varga (2012) suggest that we

5 Summary

This paper studied inflation persistence with time-varying-coefficient autoregressions for twelve central European countries, in comparison to the US and the euro area. We used the well-known Kalman-filter and smoother and the less-known Flexible least Squares (FLS), in comparison with the simple OLS.

We found for most of the inflation series we studied that the parameters of the estimated time-varying coefficient autoregression has changed significantly, and hence there was a change in inflation persistence, a result confirmed by formal tests for change in persistence. Inflation persistence tends to be higher in times of high inflation. Since the oil shock, inflation persistence declined to historically low levels in the US and euro area, yet it remained higher in the euro area (where persistence was practically constant since the creation of the euro) than in the US. In most central and eastern European countries inflation persistence has declined since 1995, with the main exceptions of the Czech Republic, Slovakia and Slovenia, for which the Kalman-smoother suggested constant persistence, and the FLS-smoother a minor fall in persistence.

We argued that similar persistence is an important structural similarity in a currency union and progress on this front of the new EU members could contribute to the economic arguments in favour of their entry to the euro area.

We also concluded that the OLS estimate is likely *upward* biased when the parameters of an autoregression change. This finding complement the literature, which concluded that the OLS estimate of the autoregressive coefficient (or the dominant autoregressive root) is *downward* biased when parameters are fixed.

6 References

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Table 1: Test for the change in persistence for CEE countries

Table 3: Box-Pierce and Ljung-Box tests for serial correlation of the residuals of the estimated autoregressions

Lags	Albania		Bulgaria		Czech Republic		Croatia		Estonia		Hungary		Latvia	
	T = 79		T = 79		T = 79		T = 79		T = 79		T = 79		T = 79	
	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB
1	0.001	0.001	**0.193**	**0.168**	**0.101**	**0.076**	0.012	0.008	0.080	0.055	**0.219**	**0.184**	**0.187**	**0.153**
2	0.001	0.000	0.962	0.957	0.069	0.049	0.075	0.053	**0.128**	**0.096**	0.688	0.652	0.133	0.106
3	0.026	0.015	0.990	0.988	0.259	0.212	0.042	0.028	0.159	0.122	0.651	0.613	0.658	0.618
4	0.005	0.002	0.014	0.009	0.993	0.992	0.076	0.053	0.120	0.091	0.362	0.317	0.947	0.935
5	**0.055**	**0.039**	0.012	0.007	0.991	0.989	**0.146**	**0.112**	0.593	0.550	0.049	0.035	0.340	0.283
6	0.001	0.001	0.006	0.004	0.653	0.615	0.188	0.148	0.888	0.870	0.050	0.035	0.842	0.812

Lags	Lithuania		Poland		Romania		Slovakia		Slovenia		Euro-area		USA	
	T = 79		T = 79		T = 79		T = 79		T = 79		T = 171		T = 223	
	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB	BP	LB
1	0.040	0.025	**0.854**	**0.836**	**0.492**	**0.461**	**0.119**	**0.097**	**0.653**	**0.623**	0.012	0.010	0.001	0.001
2	0.024	0.015	0.891	0.873	0.031	0.022	0.118	0.092	0.498	0.462	0.018	0.015	0.002	0.002
3	0.000	0.000	0.856	0.833	0.054	0.042	0.053	0.039	0.650	0.617	**0.156**	**0.140**	**0.145**	**0.133**
4	0.001	0.000	0.783	0.754	0.079	0.063	0.056	0.042	0.225	0.192	0.019	0.016	0.851	0.843
5	**0.265**	**0.217**	0.110	0.081	0.281	0.246	0.085	0.067	0.261	0.222	0.003	0.003	0.893	0.887
6	0.377	0.324	0.180	0.135	0.135	0.110	0.287	0.254	0.055	0.040	0.013	0.011	0.913	0.908

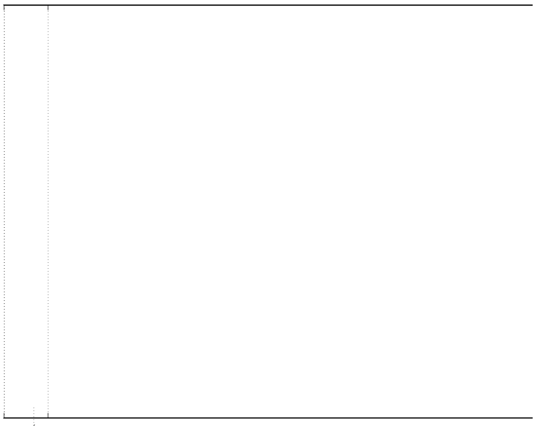
Note: the p-values are indicated. BP=Box-Pierce, LB=Ljung-Box. Bold numbers indicate our selection.

Table 4: Tests for the equality of the OLS estimate and the mean of the time-varying parameter estimates

Method		Albania	Bulgaria	Czech Republic	Croatia	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia	Euro-area	USA
OLS	Estimate	0.705	0.477	0.579	0.235	0.811	0.877	0.826	0.774	0.847	0.725	0.330	0.692	0.966	0.864
	Standard Error	0.085	0.102	0.093	0.179	0.054	0.049	0.054	0.048	0.037	0.080	0.109	0.070	0.025	0.044
FLS Filtered	Mean of Estimate	0.008	0.056	0.260	-0.003	0.454	0.501	0.622	0.564	0.561	-0.754	0.141	0.305	0.538	0.307
	Standard Error	0.352	0.541	0.107	0.172	0.200	0.156	0.129	0.260	0.101	0.837	0.279	0.119	0.143	0.349
	T-stat Value	16.441	6.522	19.145	8.192	14.700	19.644	12.497	6.789	22.800	15.032	5.374	23.949	37.918	23.333
	T-stat DoF (est)	80	77	141	144	82	86	97	77	91	73	93	116	174	223

Note: see the description of the test in the main text.

Figure 1: Seasonally adjusted quarterly inflation rates (percent)



Note: The central and eastern European countries are grouped according to the highest level of inflation during the sample period.

Figure 2: US – Estimated inflation persistence

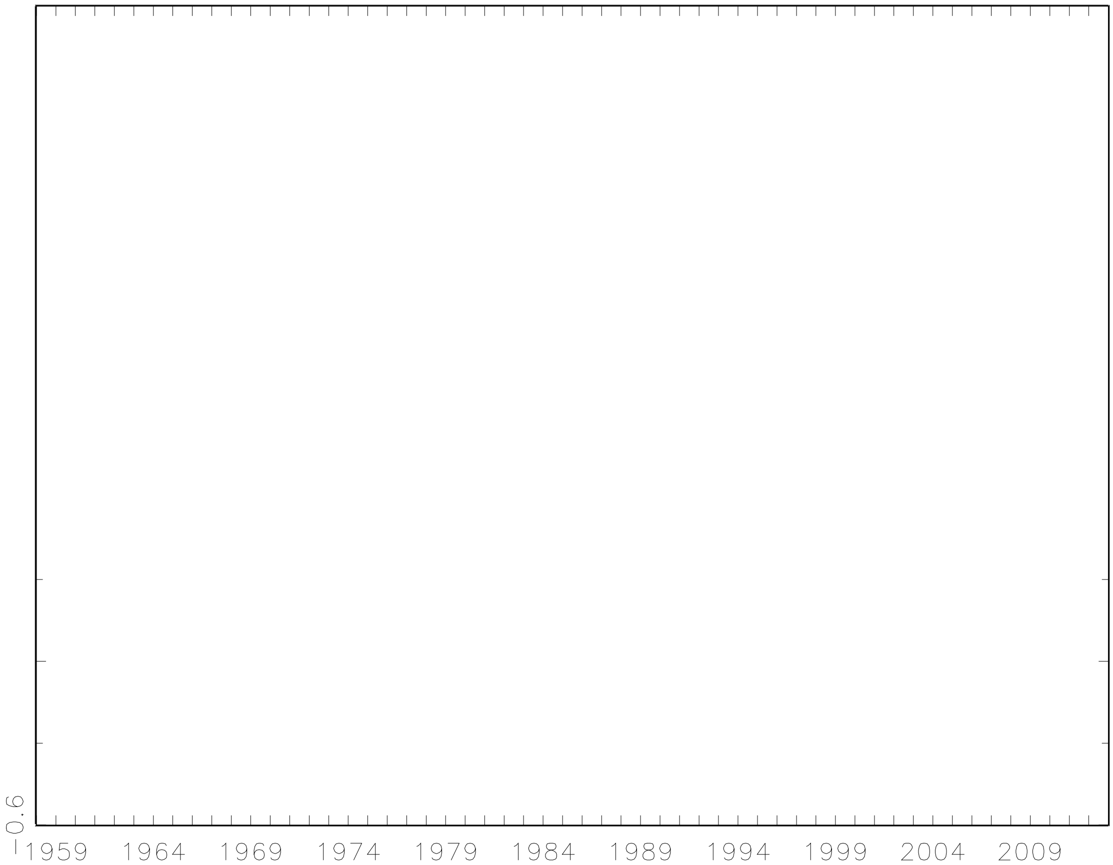


Figure 3: Euro-area – Estimated inflation persistence

Figure 4: Albania – Estimated inflation persistence

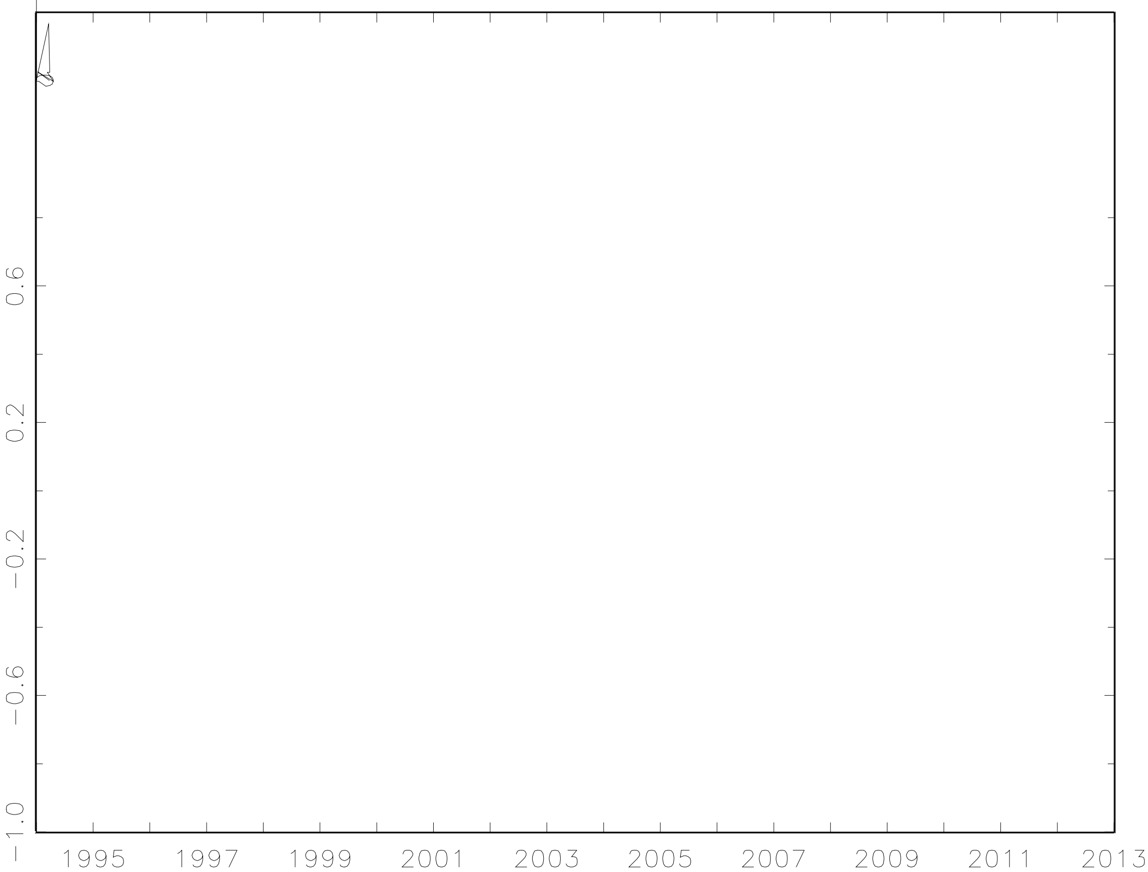


Figure 5: Bulgaria– Estimated inflation persistence

Figure 6: Czech Republic – Estimated inflation persistence

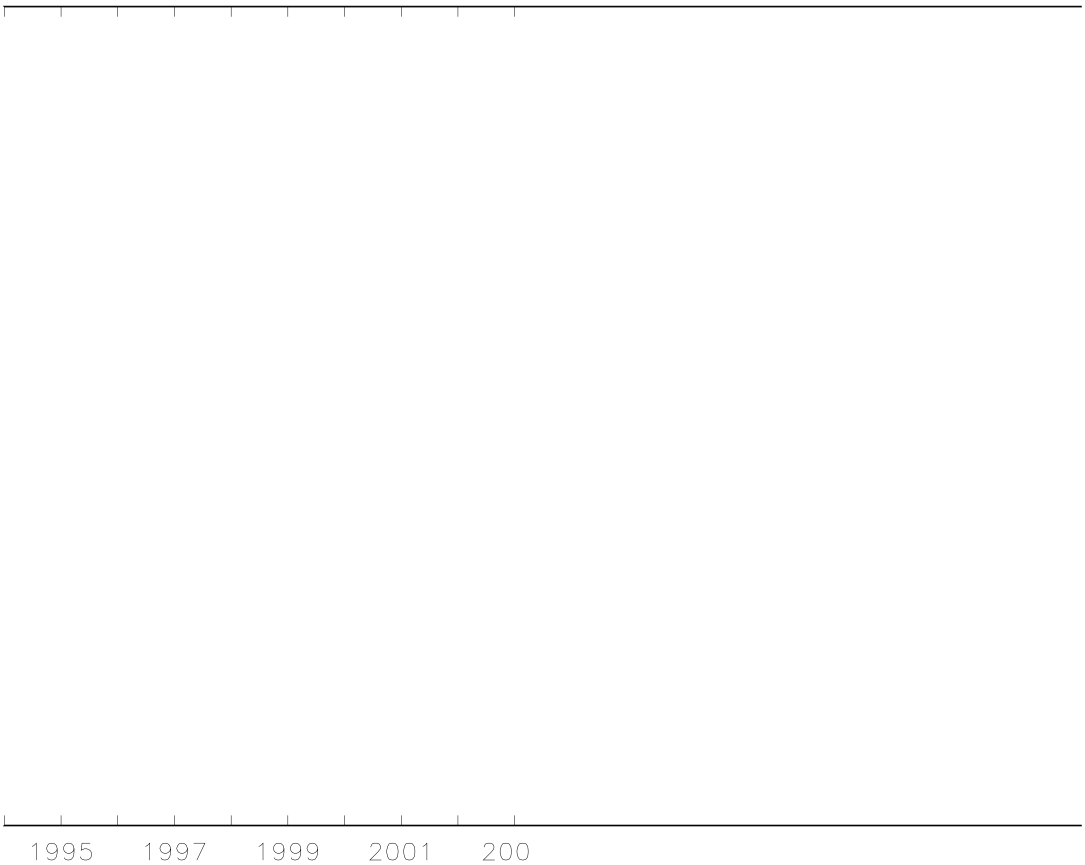


Figure 7: Croatia – Estimated inflation persistence

Figure 8: Estonia – Estimated inflation persistence

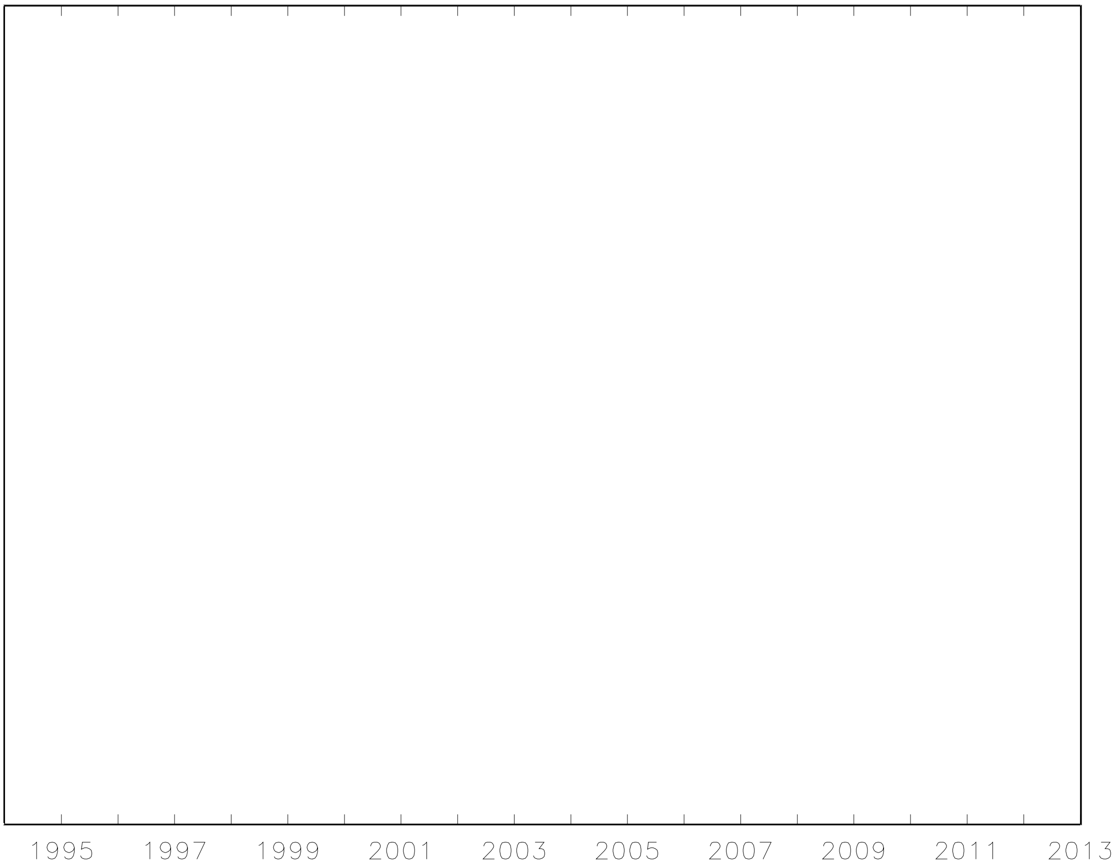


Figure 9: Hungary – Estimated inflation persistence

Figure 10: Latvia – Estimated inflation persistence

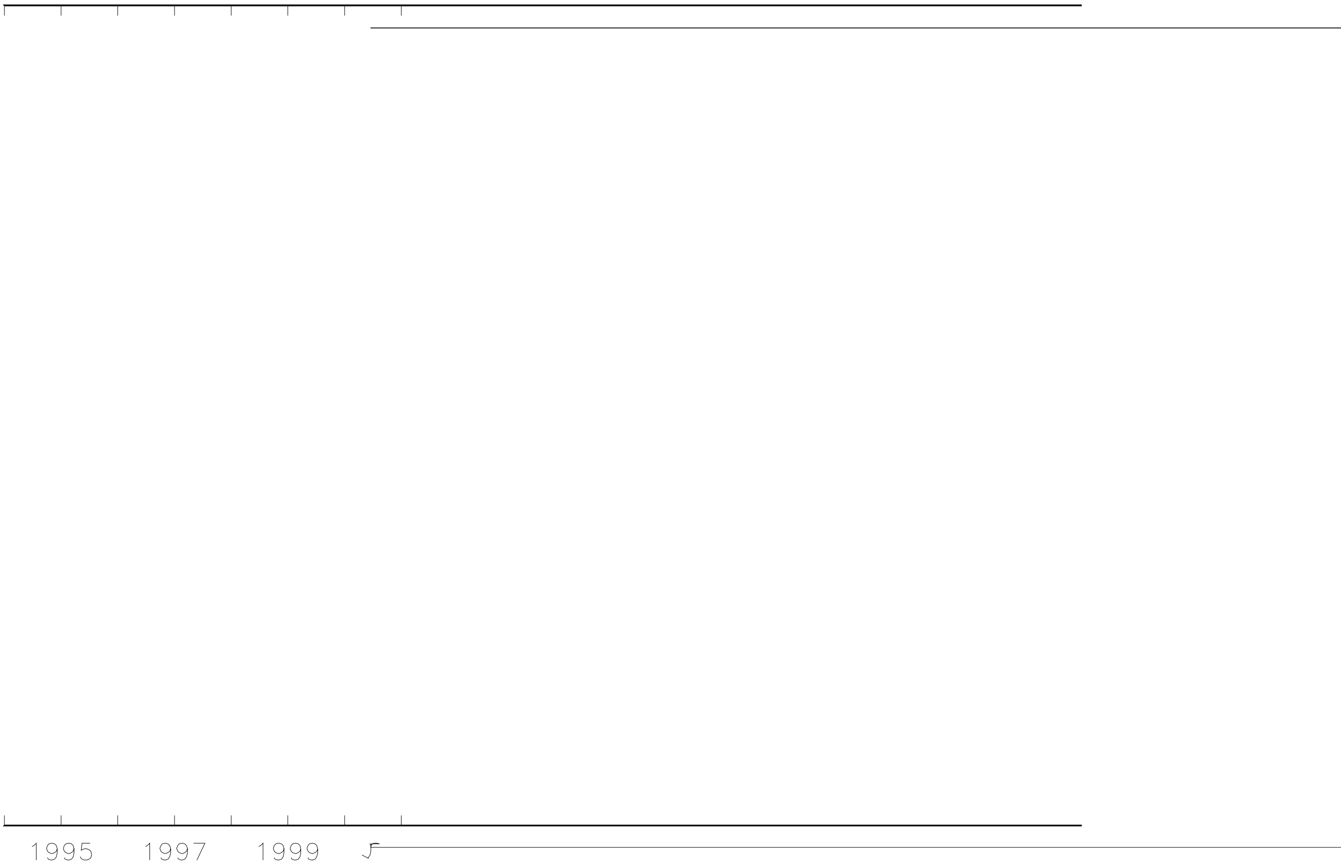


Figure 11: Lithuania – Estimated inflation persistence

Figure 12: Poland – Estimated inflation persistence

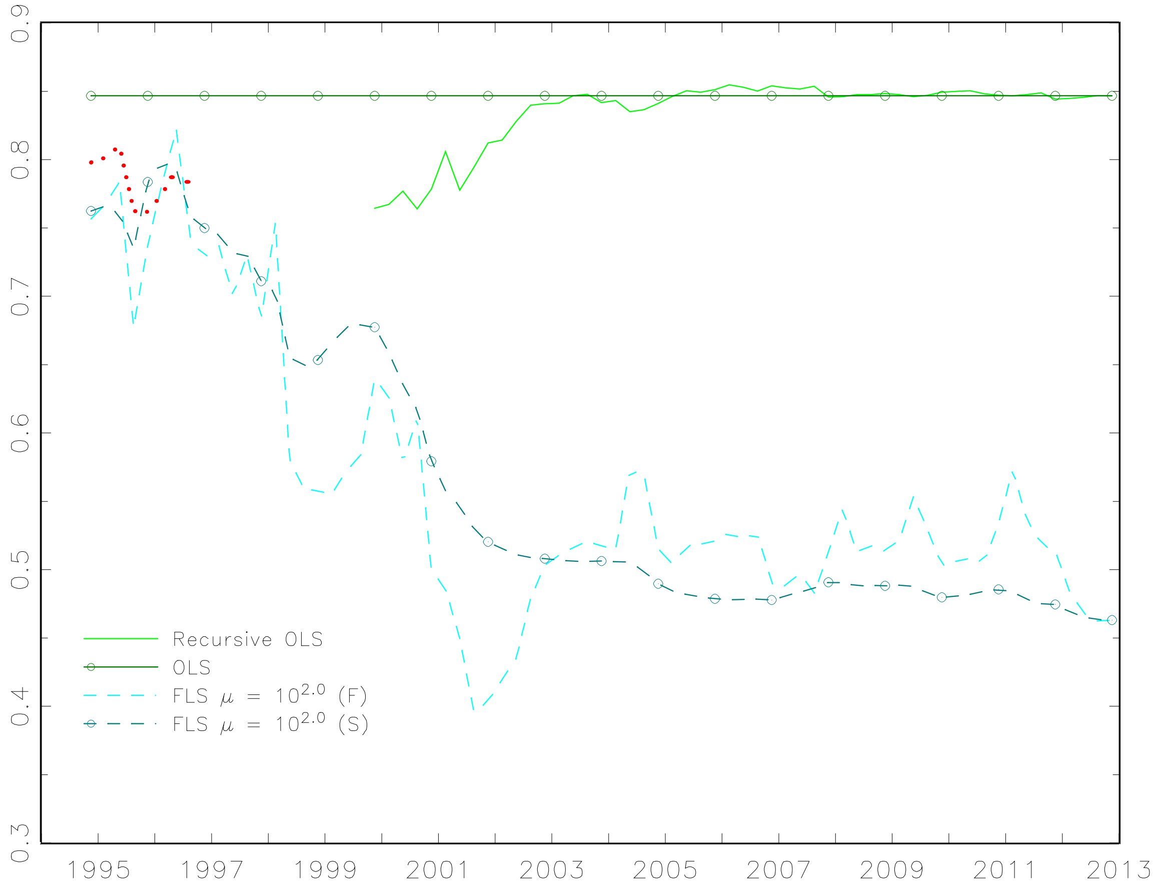


Figure 13: Romania – Estimated inflation persistence

Figure 14: Slovakia – Estimated inflation persistence

Figure 15: Slovenia – Estimated inflation persistence