Matti Viren

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Aboa Centre for Economics

Discussion Paper No. 5
Turku 2006

ISSN 1796-3133

Turun kauppakorkeakoulun monistamo
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ABSTRACT

This paper focuses on the determination of inflation expectations. The following two questions are examined: How much do inflation expectations reflect different economic and institutional regime shifts and in which way do inflation expectations adjust to past inflation? The basic idea in the analysis is an assumption that inflation expectations do not mechanically reflect past inflation as may econometric specification de facto assume but rather they depend on the relevant economic regime. Also the adjustment of expectations to past inflation is different in different inflation regimes. The regime analysis is based on panel data from EMU/EU countries for the period 1973–2004, while the inflation adjustment analysis mainly uses the Kalman filter technique for individual countries for the same period. Expectations (forecasts) are derived from OECD data. Empirical results strongly favour the regime-sensitivity hypothesis and provide an explanation for the poor performance of conventional estimation procedures in the context of Phillips curves

JEL Classification: E32, E37

Keywords: inflation expectations, Kalman filter, stability

Contact information

Matti Viren
Department of Economics
FIN-20014 University of Turku
and
Bank of Finland
PO Box 160
00101 Helsinki
E-mail: matti.viren@utu.fi

Acknowledgements

Emmi Martikainen and Pellervo Hämäläinen have helped a lot with the data and with the computations. Useful comments from Jouko Vilmunen, Juha Tarkka and the participants of Bank of Finland workshops, and Financial support from the Yrjö Jahnsson Foundation are gratefully acknowledged.

1 Introduction

This paper deals with inflation expectations. Put very simply we want to examine the question of how sensitive inflation expectations are in terms of different economic regimes. For regimes, we consider some basic institutional regimes like the EMU membership. But above all, we are interested in the role of different inflation regimes. Then relevant question is whether inflation expectations are invariant to these regimes (or more precisely, whether the way in which inflation expectations respond to past inflation stays the same in different inflation regimes).

The role of inflation expectation is crucial in modelling and explaining changes in actual inflation. Concretely this shows up in the context of Phillips curves. The problem is that in this context we have not been very successful and this is true both in general and in particular concerning the role of inflation expectations (see e.g. Zhu (2005) and Linzert (2005) and Tillman (2005)). When we deal with inflation expectations we usually mean expected future values of inflation that is constructed by means of the (orthogonality conditions of) GMM. This way of constructing inflation expectations has its obvious shortcomings, especially because it postulates a quite mechanical relationship between expected inflation and past inflation and, in addition, past values of some (usually quite few) other variables. Thinking about other relevant variables which may characterize the inflationary environment and the Central Bank's ability and willingness to control inflation this approach might well be quite deficient and that in turn might explain the relatively poor performance of Phillips curves.

This is why we in this paper try to shed some light on question of how much measured inflation expectations or forecasts seem to reflect things other that past inflation, and to which the extent they just reflect past inflation. In terms of the latter channel, the interesting question is has this relationship changed over time, or over different inflation regimes. "The other things" here mean various policy regimes or environments such as the EMU membership. When we focus on the "inflation regimes" and the possible variance of expected inflation past actual inflation relationship we mainly think about the high inflation regime in the 1970s and the subsequent steps towards lower inflation in the 1980s and 1990s

A lot of work has already been done in establishing the effect of monetary policy regimes in inflation expectations (see e.g. Andolfatio and Gomme 2003 and Rocketts and Rose 1995). Besides showing that certain differences do exist they have provided a rationalization to the fact the rational expectations hypothesis based on direct measures of inflation expectations from surveys is typically rejected. More specifically, the reason is the so-called ex post bias which follows from the fact agents incorporate the possibility of a regimes change into their expectations[1].

[1] Alternatively, one might the "near rational model of expectations" to explain the persistence of inflation and also poor performance of New Keynesian Phillips curves (cf. Ball 2000 and Akerlof and Yellen 1985).

As a practical tool we use the time-variant adaptive expectations rule originally proposed by Stephen Turnovsky in 1969 which easily allows for time-variant parameter estimates with the Kalman filter technique.

The whole analysis makes use of inflation (and output) forecasts made by the OECD. Although some alternative sources of inflation forecasts do exist (see e.g. Mankiw, Reis and Wolfers (2003) and Adam and Padula (2004)) OECD forecasts are superior in the sense that they cover all industrialized countries in the same way and, moreover, they also facilitate the follow-up the inflation up-dating procedure. In other words, we can instead of the most recent (2005) inflation numbers use the so-called real-time data which corresponds the most recent inflation estimate of actual inflation that forecasters have had in making assessments on future inflation.

2 Analytical framework

When analyzing the role different regimes we follow a quite straightforward way in tracking the regime effects. That is, we fit the following simple dummy regression into the data.

$$p^{e}_{it+1} = a_{i0} + \sum_{j} a_{j} D_{ijt} + u_{it} \tag{2.1}$$

where i is the index for the country, j for the regime (dummy) and t for the time period. The dummies represent such things as: adoption of formal inflation target, change in Central Banks legislation, depreciation or appreciation of currency, (major) change in financial markets which in practice means various steps in liberalizating credit (and foreign exchange) controls, (major) fiscal stabilization efforts (packages) and various institution regime indicators (EU membership, EMS and ERM membership and, finally, the EMU membership). The corresponding data are collected from the OECD Economic Outlook, from the OECD country surveys, and from various policy reviews from individual countries (published by the ministries of finance and the central banks). The model is estimated from panel data which cover the period 1972–2004 and using OECD forecasts for p^{e}_{t} (Table 1).

In addition to regime dummies, we use some ex-post data for fiscal balances and import prices to assess their importance as indicators of different fiscal and inflation regimes (Table 2). This is partly motivated by the fact that in the analysis of regime indicators (dummies) it clearly shows up that these variables cannot really explain the change of inflation expectations during the two oil crises in 1974 and 1979/1980. As for the fiscal indicators, we want to use also actual data in distinguishing (possible) fiscal regimes. The data which we otherwise have are (non-quantitative) data for pronounced fiscal stabilization programs which may obviously tell more on fiscal stabilization problems than successful fiscal policy. It might be tempting to think that the performance of fiscal variables might also shed some light on the relevance of the “fiscal theory of inflation” but obviously this is not way the theory could be tested.

As a separate exercise we scrutinize the relationship between OECD inflation and output growth forecasts. More precisely, we want to see whether the corresponding forecast errors reflect some form of Phillips curve. In practice, this analysis boils down in estimating the following relationship in a panel data set- up for 15 EU countries for the sample period 1973–2004

$$p - p^e = \alpha * (y - y^e) + u \qquad (2.2)$$

The corresponding results are reported in Table 3 and in Figure 2.

As for the inflation regime analysis, we proceed as follows. We examine the relationship between inflation forecasts and past (observed) inflation using the following adaptive expectations formula as a starting point

$$\Delta p^e = \theta(p_{-1} - p^e_{-1}) \qquad (2.3)$$

where p denotes the rate of inflation p^e being the corresponding forecast value.

In an old (classical) paper Turnovsky (1969) shows that it is now point of assuming θ constant. Instead, one may use the idea of Bayesian "learning" in a cross-section setting to derive the following expression for it

$$\theta = \left(1 - \frac{\omega_{t+1}}{\omega_t}\right) \qquad (2.4)$$

where ω denotes the subjective variance associated to the average price level. It can be shown that $\frac{1}{\omega_{t+1}} = \frac{1}{\omega_t} + \frac{n_t}{\sigma_t^2}$, where σ^2 is the variance of individual prices and n the number of markets (goods).

Clearly, the coefficient of "adaptive expectations" parameter does not stay constant unless the sampling procedure of the decision maker (forecaster) satisfies some quite strict (unrealistic) assumptions (cf. Turnovsky (1969) for details). Clearly if $\frac{1}{\omega_t} = 0$, i.e. the precision of the estimate of the price level is extremely low, we end up with simple static expectations' rule where $p_t^e = p_{t-1}$. By contrast, full inertia in expectations results when $\sigma^2 = \infty$ and one cannot improve the initial estimate of ω (except for investing infinite amount of resources to the sampling procedure).

Now if one just focuses prices and inflation (and ignores all other relevant information) we may expect that that expected inflation react to past inflation quite differently in different regimes (which basically differ in terms of the relative variances of relative and aggregate prices). Thus, in the high-inflation regime of the 1970s θ may we be close to 1 while in the current "no inflation" regime θ is zero.

Technically, the problem could be solved by using the Kalman filter in estimating the adaptive expectations scheme (2.1) and acknowledging that the evolvement of θ depends on the respective signal-noise ratio.

A simple way to test this hypothesis is to estimate a threshold model in which the coefficient θ in equation (2.3) is made conditional to the inflation regime. Thus, we may estimate a threshold value for inflation rate which divides the sample to "low inflation" and "high inflation" sub-samples. Given these threshold values we get the corresponding adjustment parameter θ values and may test whether the updating equation (3) is indeed linear across inflation regimes (see Hansen (1999) and (2000) for details of the methodology in a panel setting). A representative set of estimates is presented in Table 4 below.

A bit more sophisticated way to solve the problem is to use the Kalman filter in estimating the adaptive expectations scheme (2.3) and to acknowledge that the evolvement of θ depends on the respective signal-noise ratio

Then the estimating model is of the following form

$$\begin{aligned} \Delta p^e &= g*(p_{-1} - p^e_{-1}) + \mu \\ g &= g_{-1} + \varepsilon \end{aligned} \qquad (2.5)$$

where change in the (expected) inflation now represents the signal and the coefficient of the forecast error the state. μ and ε are both assumed Gaussian and contemporaneously uncorrelated. μ represent a shock on inflation expectations while ε represent a shock on the prediction formula. Assume that we (i.e. agents) know the signal-to-noise ratio $\frac{\delta^2\varepsilon}{\delta^2\mu}$, we can compute the filter. Here, in the same way is in Edge, Laubach and Williams (2004), we use not only the actual data but also the real-time data, in computing the forecast errors.

Time-variant θ parameter can estimated more easily in a panel-data context by just fitting the "adaptive expectations" formula $\Delta p^e = \theta_i(p_{-1} - p^e_{-1})$, i = 1973,…,2004, into the data. Results from these analyses are reported in Figures 3–4. Kalman filter estimates are reported in Table 5 and Figures 5–11. The figures represent both average values for all EU countries and individual country results. As for individual country results, the case of Germany is analyzed separately (Figure 7).

3 Results

Turn first to the result with regime dummies. The results in Table 1 quite clearly show that they can in a reasonable way explain the changes in inflation expectations. This is true even in the case the models include annual dummies which presumably take into account changes in overall inflationary environment. The dummies seem mainly to reflect two oil shocks and subsequent high inflation periods (see Figure 1) which obviously cannot be controlled by our regime dummies.

As for individual dummies, we find that all perform in a meaningful way irrespectively of the estimation method and data transformations. Thus, inflation targeting and strengthening of central bank position in control of inflation seem to lower inflation expectations. Developments in exchange rates seem to be even more important in this respect. Obviously this may simply reflect the direct pass-through of import prices as a consequence of depreciation/appreciation of exchange rates. But equally well it may reflect the changes in monetary policy credibility. In the environment in which exchange rate targeting represented the dominating policy rule failures in preserving the target must have had some effect in anticipations on future monetary policy developments.

Financial market reforms do not seem to affect very strongly on inflation expectations, or maybe the effect is a sum some conflicting tendencies. Reforms have created more efficient and transparent markets but also, at least in the short run, created some inflationary pressure due to asset price increase (which was often characterized as bubbles).

As for different "membership" dummies, we find that membership in the European Union has not been particularly important although it has a quite systematically negative effect on inflation expectations. In this respect, memberships in the EMS/ERM and EMU have been more important – at least in the sense their effects can be estimated more precisely.

Finally, turn to the effects of so-called fiscal stabilization programs. At face value, one might imagine they affect inflation expectations in "a correct way" (lower expected inflation"). The data tells a different story. An obvious explanation is a "sample selection bias" type effect which is due to the fact that fiscal stabilizations were needed only in the case fiscal balance had either been lost or there has been a great danger of loosing the balance. Of course, fiscal stabilization efforts could have been useful from the perspective of inflation control (in the case fiscal problems do exist) compared with the alternative of "do nothing". Still the (overall) effect which obtained here may tell that the fiscal programs have not been very effective in general.

The considerations give a good reason to look the effects of (measured) true fiscal balance on inflation expectations. Results form this analysis are reported in Table 2. In the estimating equation we have also import prices mainly to control the development in oil prices. The results represent really no surprise; better fiscal balance seems lower expectations on future inflation.

Before we turn to analysis on the role of past inflation we shortly scrutinize the relationship between expected inflation and expected output growth. The results from this analysis which in precise terms concerns the relationship between the respective forecast errors (with different time horizons) are reported in Table 3 and Figure 2. The somewhat surprising result is the fact these two forecast errors seem to negative correlated (except for a long – two years' – time horizon). The result is somewhat puzzling from the Phillips curve point of view and cannot be simply explained. One important point is the fact that correlation between the forecast errors is after all relative small (of the magnitude of 0.01–0.04 measured by the R^2 of the estimated equation) which suggests that forecast errors are to large extent variable-specific and reflect difference sources of effects.

Next we turn to the analysis of inflation regimes which in practice means estimating the adaptive expectations formulas (2.2) and (2.3). (2.2) was estimated panel data using time-variant coefficients of lagged inflation forecast errors (see Figures 3 and 4). Equation (2.3), in turn, is estimated in a cross-country panel set-up with a threshold model and in a single country equation framework with the simple Kalman filter representation.

The results of both analyses point to same direction: parameter θ has clearly decreased over time.[2] If one tests the constancy of the coefficients of lagged inflation forecast errors (equation 2.3) the relevant F statistic turns out to be 1.76 which corresponds to the 4.4 per cent critical value. With the threshold model the equality of coefficients below and above the threshold is clearly rejected by the data (see the Wald test statistics in Table 4). Thus below the 4 per cent threshold (which minimized the sum of squares function) the value of θ is of the magnitude of 0.5 or 0.6 while above the threshold (in the "high inflation" regime) it is close to one. Introducing an additional threshold did not make much difference. Anyway, the closer one comes to zero inflation the lower become the updating coefficient. By contrast, if one goes beyond 4 per cent beyond, say, 10 per cent, that changes the θ coefficient only marginally[3]. All of that obviously shows up in calendar time. Thus, while in the mid 1970 the coefficient seems to have been close to one now it is decreased, if not to zero, but to 0.5, or below that. In the 1970s the mechanism of inflation expectations was close to regressive expectations in which expected inflation is just a reflection of past inflation. Now we have turned to a system in which – according to the Kalman filtering results - past inflation is less important, and in some cases even of zero importance.

This is true especially in the case long (two-year) forecast horizon. Then, as shown in Figures 8 and 9, the θ coefficient goes almost to zero. The corresponding data cover the period 1990-2004 only so that we really distinguish the consequences of longer time horizon and low inflation regime. Anyway, we may safely conclude that the role past inflation is currently completely different from what it was in the 1970 and early 1980s[4].

Basically this is no surprise; if inflation settles down to the proximity of the inflation target level variations of past inflation are not very informative in predicting future developments.[5] For the sake of future developments, other things, like overall policy credibility, perceived effectiveness of policy and policy uncertainty may be more important.

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[2] The decline of the θ parameter is not monotonic as can be seen from figures 10-11. Thus, for instance, in the case of Germany the parameter starts to increase again in about 1990 (Figure 7). This may be explained by German unification but it is not all clear whether this is the (whole) explanation. Similar changes appear in many other countries as well and also Figure 1 indicates that at this point of data inflation expectation experience a sudden increase (which by the way cannot be explained by exchange rate depreciation and appreciation dummies).

[3] The two-threshold case is here more of illustrative nature than of a final result (thus it does not represent a minimum of a sum of squares function). Setting two thresholds is already a bit complicated issue as pointed out by Hansen (1999).

[4] If one estimates a panel data model of (2.3) for this short period with the two-year inflation forecast variable the estimates of coefficient θ vary between 0.051 and 0.156 (the lowest value coming from SUR estimation with real-time inflation data and the highest with GLS estimation with actual inflation data).

[5] This is a bit similar thing than the gold standard before the first Wold War. Then price level was more or less stationary and inflation could not be properly forecast. Accordingly, the Fisher equation does not seem to perform very well for this period. See e.g. Barsky (1987) for details. To rationalize these results we might use the Akerlof and Yellen (1985) "near rational model of expectations" in which agents do not react to small deviations of price changes.

4 Concluding remarks

This analysis has showed that one should careful in treating inflation expectations in mechanical way as reflections of past values of inflation or more generally past values of typical set of macro variables. The formation of inflation expectations is probably sensitive to different policy regimes and there identification of these regimes becomes important. It is also important both because of interpretation of the data and because of assessment of the nature of inflation expectations (e.g. from the point of view of rational expectations). An idea of single inflation expectations regime is appealing but it has never really been under careful testing which it definitely deserves.

These considerations suggest that efforts in rescuing the currently standard New Keynesian Phillips curve by, for instance, introducing more dynamics, may not be very successful. One may able to get reasonable ex-post predictive power to the Phillips curve but that may not translate to equally good en ante predictive power. Irrespectively of question what is the right remedy it seems well-founded to put more effort in examining the propagation mechanism of inflation expectations because it is surely much more complicated than what most econometric models implicitly or explicitly assume.

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Tables 1–5

Table 1. **Testing the impact of regime-change dummies**

	1	2	3	4	5	6
Constant	4,868 (13.541)	6.055 (26.67)	8.917 (19.25)	9.316 (15.79)	8.543 (19.53)	
Inflation target	-.301 (0.68)	-3.503 (3.61)	-1.331 (5.87)	-1.189 (3.95)	.127 (0.73)	-.513 (2.29)
Devaluation of currency	.590 (1.45)	2.060 (2.53)	.725 (2.02)	2.413 (2.48)	1.284 (2.06)	.022 (0.08)
Revaluation of currency	-.650 (2.55)	.184 (0.42)	-.845 (2.12)	-1.291 (2.72)	-2.987 (3.41)	-.089 (0.53)
Liberalization of financial markets	-.028 (0.09)	-.165 (0.23)	-.128 (0.36)	-1.032 (1.25)	.428 (0.50)	.432 (1.95)
Change in Central Bank position	-.195 (0.80)	-1.909 (32.85)	.212 (0.81)	-1.046 (2.77)	.370 (0.80)	.308 (2.09)
EU membership	.562 (0.98)	-.951 (0.58)	-.198 (0.89)	-.894 (1.40)	-.169 (0.52)	-1.220 (2.63)
EMS membership	.649 (1.55)	1.627 (2.02)	-3.331 (16.03)	-4.422 (8.14)	-3.776 (6.08)	.700 (1.71)
EMU membership	-2.017 (2.22)	-2.324 (4.16)	-1.892 (4.87)	-1.512 (4.87)	-.029 (0.14)	-.300 (2.23)
Major stabilization package	3.210 (3.39)	4.894 (2.37)	2.293 (2.38)	3.785 (1.94)	4.681 (3.02)	1.518 (1.92)
R^2/SEE	0.213 0.825	0.129 4.361	0.634 0.902	0.430 4.015	0.549 3.282	0.054 0.977
DW	1.07	0.47	1.33	0.68	0.55	2.01
Estimator	SUR	GLS, CSFE	SUR	GLS	GLS,TSFE	SUR
Dummies	impulse	impulse	permanent	permanent	permanent	impulse

The dependent variable in equations 1–5 is the OECD forecast for next year's inflation. In equation 6, it is the difference between inflation forecasts for the current year (published in this year's December and the previous year's December). Equations 1 and 3 are estimated by SUR and equation 2 with GLS using the fixed effects specification. The number of data points is 335. Numbers inside parentheses are corrected t-values. The dummies are either expressed as impulse (0, 1) dummies or permanent (1) values from certain period until the end of the sample period. This formulation applies to all membership dummies and the inflation targeting dummy.

Table 2. **Testing the impact of government deficits and import prices**

Dependent variables	1	2	3	4
Actual (lagged) inflation	.688 (33.32)	.160 (3.22)		
Forecast for current year's inflation			.846 (55.49)	.477 (9.49)
Deficit/trend GDP	-.037 (1.96)	-.084 (3.28)	-.009 (0.78)	-.054 (2.33)
Change rate of import prices	.147 (8.98)	.090 (8.59)	.028 (2.52)	.050 (4.34)
R^2/SEE	0.834 0.921	0.275 0.937	0.957 0.942	0.490 0.936
DW	1.47	2.18	1.88	2.58
Form of data	level	difference	level	difference

Positive values of deficit represents surplus. The dependent variable is (the difference of OECD December) inflation forecast for the next year. The number of data points is 189. All estimates are (cross-section) SUR estimates (with no fixed effects).

Table 3. **Relationship between inflation and output growth forecast errors**

Forecast horizon	Data	OLS	GLS	SUR
S1	actual	-.112 (2.39)	-.095 (3.29)	-.077 (3.93)
S1	real time	-.004 (0.21)	-.011 (0.55)	-.005 (0.45)
K1	actual	-.117 (2.19)	-.058 (1.93)	-.078 (4.13)
K1	real time	-.067 (1.72)	-.032 (1.15)	-.021 (1.01)
S2	actual	-.097 (1.65)	-.066 (1.52)	-.080 (3.16)
S2	real time	-.070 (1.23)	-.063 (1.51)	-.060 (1.86)
K2	actual	-.030 (0.72)	-.020 (0.67)	-.065 (4.23)
K2	real time	-.046 (0.98)	-.026 (0.85)	-.070 (4.28)
S3	actual	.017 (0.38)	.061 (2.10)	.023 (2.97)
S3	real time	.017 (0.36)	.058 (2.29)	.012 (1.49)

Numbers are the coefficient estimates of output growth forecast errors (with different time horizons). The data consist of 423 observations for D1, J2 and S2, 314 for J2 and 228 for D3. Corrected t-values are inside parentheses. S1 denotes the forecast published in OECD December Economic Outlook the current year, S2 forecast for the next and S3 forecast for two years ahead. Similarly K1 and K2 correspond to forecasts published in OECD June Economic Outlook.

Table 4 Threshold model estimates for the inflation updating equation (3)

	1	2	3	4	5	6
θ| Δp<4	.652	.576	.633	.711	.586	
	(13.23)	(13.51)	(8.76)	(13.07)	(8.76)	
θ| Δp≥4	1.013	1.001	1.038	1.031	1.028	
	(16.23)	(28.61)	(13.82)	(17.26)	(13.55)	
θ| Δp<2						.495
						(9.05)
θ| 2≥Δp<10						.857
						(19.11)
θ| Δp≥10						1.031
						(22.22)
R2	0.645	0.527	0.636	0.687	0.619	0.500
SEE	1.438	0.997	1.447	1.444	1.447	0.976
DW	1.807	1.934	1.977	1.975	1.909	1.916
Wald	20.34	65.08	16.27	16.21	19.29	27.83
Estimator	GLS	SUR	OLS, FE	GLS, FE	GLS, RE	SUR

Numbers inside parentheses are corrected t-values. All equations are estimated with OECD December inflation forecast for the following year. FE (RE) indicates the fixed (random) effects specification. The Wansbeek-Kapteyn estimator is used for the RE model. Wald indicates a F test statistic for the hypothesis θ|Δp<4 = θ|Δp≥4. The number of data points in all equations is 434.

Table 5. **Results from Kalman filter estimation**

		Dec, R	Dec, H	June, R	June, H	Dec, D
AUT	Var(μ)	0.84	0.33	0.56	0.38	0.54
		3.53	*2.93*	*2.66*	*3.52*	*3.81*
	g_T	0.32	0.96	0.14	0.56	0.75
		0.78	*2.47*	*0.39*	*1.54*	*1.97*
BEL	Var(μ)	0.38	0.49	0.33	0.83	0.42
		4.08	*5.82*	*5.16*	*4.83*	*3.77*
	g_T	0.57	0.51	0.60	0.75	0.63
		1.59	*1.40*	*1.76*	*1.93*	*1.77*
DEN	Var(μ)	2.06	1.54	0.76	0.65	1.97
		4.75	*4.94*	*4.41*	*4.19*	*5.21*
	g_T	0.79	0.71	0.24	0.25	0.87
		1.72	*1.65*	*0.67*	*0.70*	*1.84*
FIN	Var(μ)	2.58	2.45	0.54	0.51	1.99
		5.25	*6.08*	*3.14*	*3.09*	*4.82*
	g_T	0.66	0.62	0.40	0.41	0.90
		1.75	*1.55*	*1.42*	*1.40*	*2.36*
FRA	Var(μ)	0.74	0.83	0.42	0.54	0.80
		3.95	*3.26*	*3.78*	*3.75*	*4.62*
	g_T	1.07	0.98	0.88	0.72	1.12
		2.50	*2.30*	*2.18*	*1.81*	*2.55*
GER	Var(μ)	0.59	0.56	0.43	0.43	0.46
		3.33	*3.40*	*2.74*	*3.01*	*2.81*
	g_T	0.44	0.41	0.54	0.56	0.51
		1.10	*1.11*	*1.57*	*1.67*	*1.35*
GRE	Var(μ)	5.39	4.57			5.62
		7.03	*4.75*			*6.26*
	g_T	0.76	1.18			0.60
		1.66	*2.51*			*1.29*
IRL	Var(μ)	3.17	1.91	1.51	0.88	3.14
		4.71	*4.15*	*4.27*	*5.50*	*4.72*
	g_T	0.45	0.75	0.26	0.69	0.61
		1.18	*1.83*	*0.85*	*1.92*	*1.59*
ITA	Var(μ)	3.95	2.65	2.12	1.66	4.29
		5.10	*4.44*	*3.59*	*2.85*	*5.26*
	g_T	0.84	0.86	0.74	0.81	0.95
		1.87	*2.01*	*1.75*	*2.04*	*2.00*

Table 5 continued

LUX	Var(μ)	0.34	0.30	0.50	0.37	0.31
		3.14	*2.34*	*4.91*	*4.97*	*3.40*
	g_T	0.56	0.68	0.42	0.52	0.71
		1.69	*1.99*	*1.34*	*1.59*	*2.16*
NET	Var(μ)	0.91	0.66	0.58	0.44	0.95
		3.87	*3.99*	*3.10*	*3.84*	*3.88*
	g_T	0.76	0.81	0.32	0.38	0.78
		1.71	*2.10*	*0.91*	*1.22*	*1.79*
POR	Var(μ)	3.93	2.21	2.68	2.52	3.94
		4.19	*3.38*	*4.17*	*4.80*	*4.51*
	g_T	0.75	1.00	0.56	0.70	0.77
		1.75	*2.39*	*1.46*	*1.75*	*1.80*
SPA	Var(μ)	3.62	1.84	1.01	1.05	3.46
		6.01	*4.90*	*4.33*	*4.80*	*6.25*
	g_T	0.87	1.09	0.13	0.26	0.84
		1.85	*2.46*	*0.33*	*0.64*	*1.83*
SWE	Var(μ)	4.14	4.52	2.71	2.64	4.01
		5.73	*5.49*	*6.01*	*6.25*	*5.99*
	g_T	0.73	0.80	0.18	0.28	0.85
		1.57	*1.66*	*0.44*	*0.69*	*1.79*
UK	Var(μ)	5.10	4.17	0.38	0.35	3.97
		6.50	*6.71*	*2.94*	*3.50*	*6.42*
	g_T	0.61	0.58	0.28	0.28	0.86
		1.31	*1.36*	*1.07*	*1.05*	*1.85*

Var(p) denotes the estimated variance of the signal equation and g_T the final estimate of the state variable. t-ratios are below the parameter estimates. The actual rate of inflation is computed either by using the historical ex-post (H) rate of inflation or the corresponding real-time (R) rate which corresponds to the December estimate of the previous year's inflation. The estimates in the last column refer to the signal equation in which is the actual rate is replaced OECD December forecast for the current year's rate of inflation (D).

Figures 1–11

Figure 1. **Time variant constant term from the regime dummy panel regression**

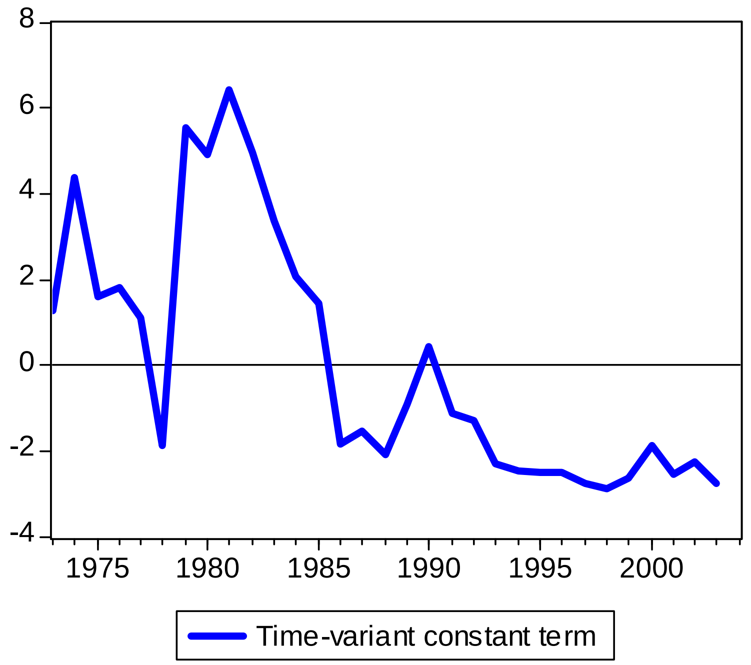
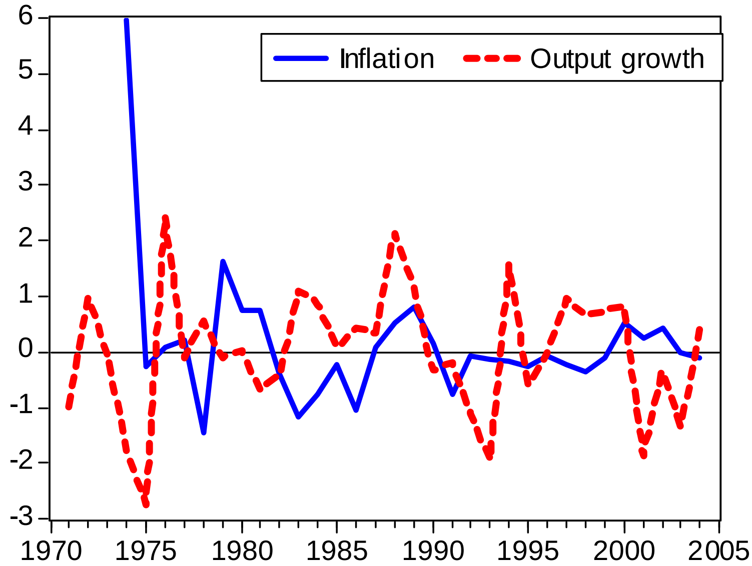
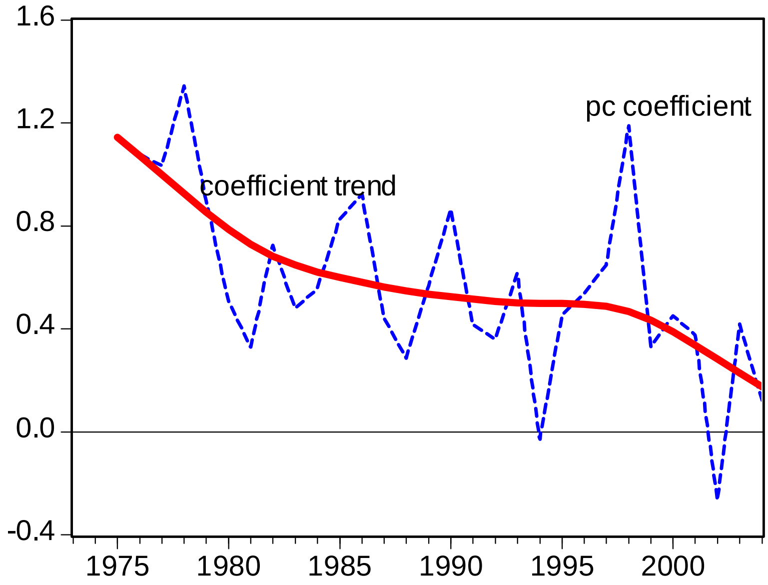


Figure 2. **Median of OECD forecast errors**



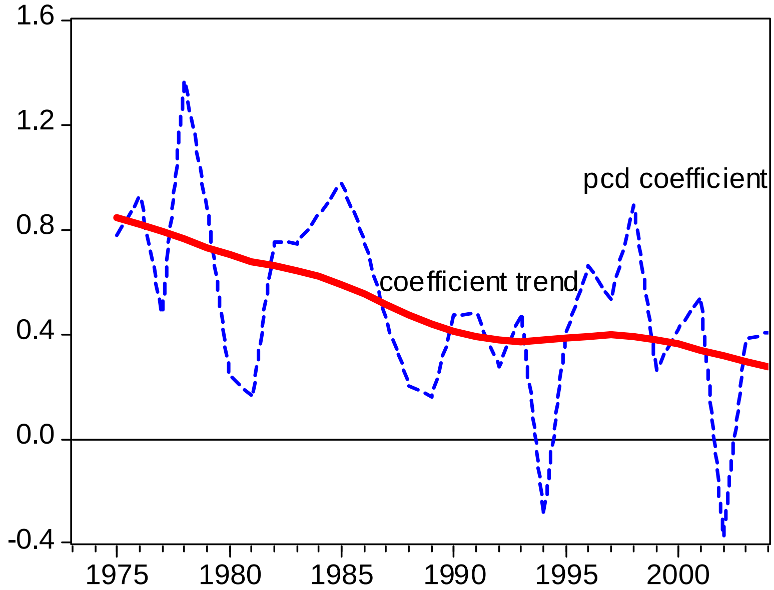
Both errors are related to OECD December forecasts for the next year.

Figure 3. **Time-variant θ-parameter from panel regression with ex-post data**



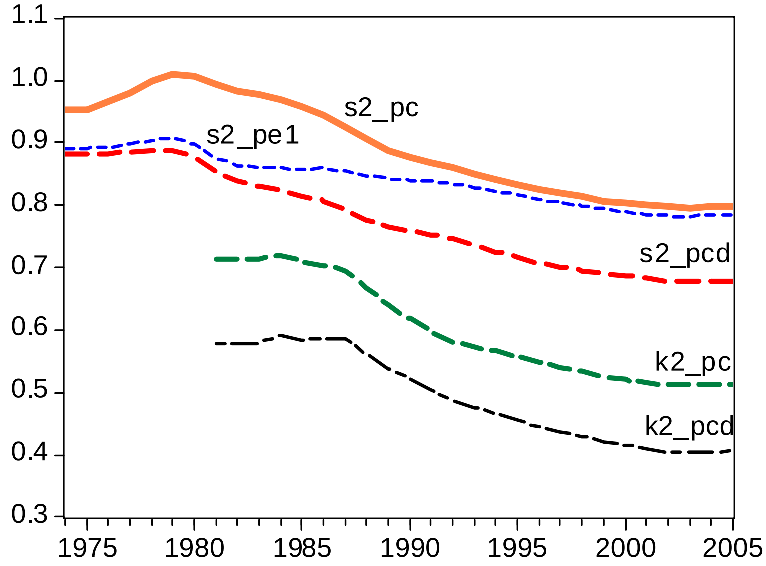
Actual inflation is computed from ex-post (2005) data on consumer prices. Inflation forecasts are OECD December forecasts for the next year.

Figure 4. **Time-variant θ-parameter from panel regression with real-time data**



Actual real-time inflation corresponds to the OECD December data on previous year's consumer price inflation. Inflation forecasts are OECD December forecasts for the next year.

Figure 5. **EU-averages of the smoothed Kalman filter estimates for the θ-parameter**



s2 (k2) denotes the OECD December (June) forecast for the next year. pc denotes the actual ex-post (2005) inflation rate, pcd the OECD real-time estimate of it and pe1 the OECD December forecast for the current year's inflation.

Figure 6. **Median EU values of the smoothed Kalman filter estimates for the θ-parameter**

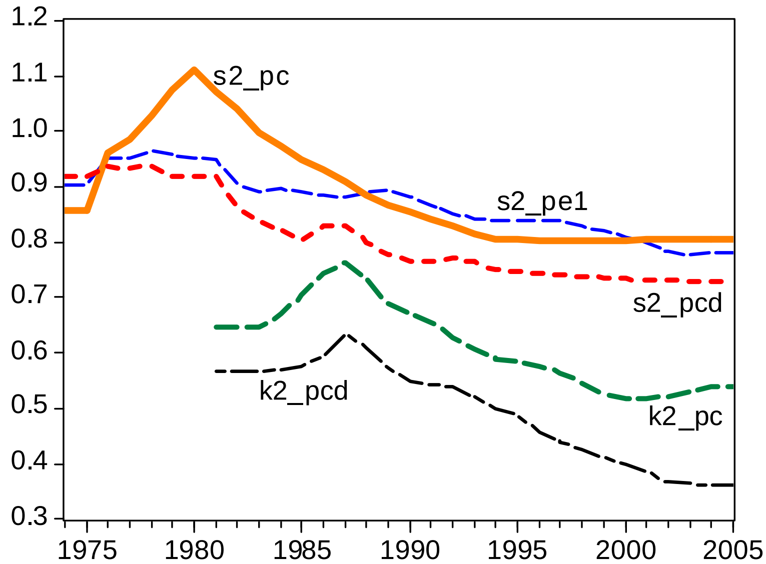
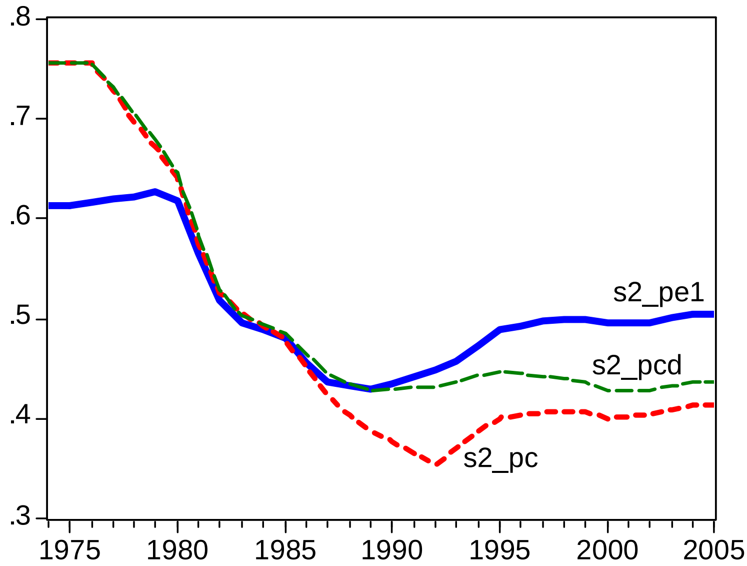
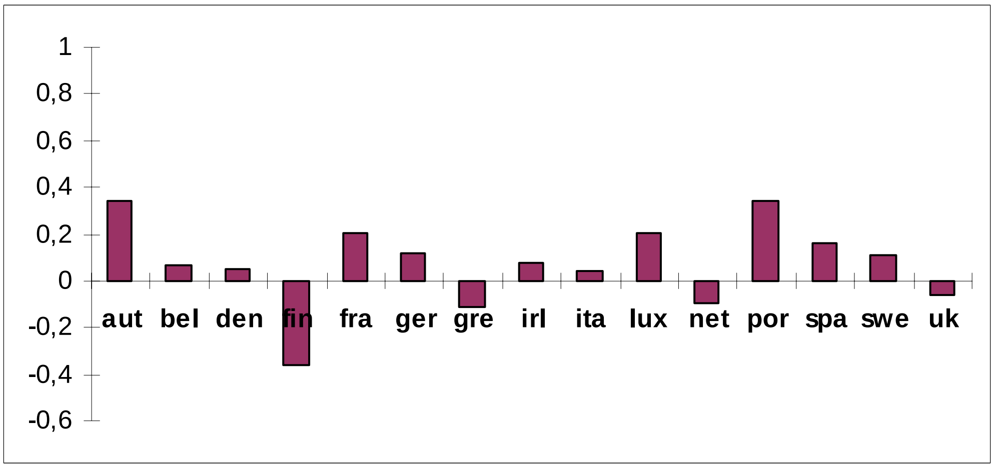


Figure 7. **Smoothed Kalman filter estimates of the θ-parameters for Germany**



Notation is the same as in Figure 5.

Figure 8. **Smoothed Kalman filter estimates of the θ-parameters for forecasts over a two-year horizon**



Values are final (end of period) estimates of the state variable, i.e. the θ parameter. In most cases, we cannot reject the hypothesis that they equal zero.

Figure 9. **EU-average of smoothed Kalman filter estimates of the θ-parameters for forecasts over a two-year horizon**

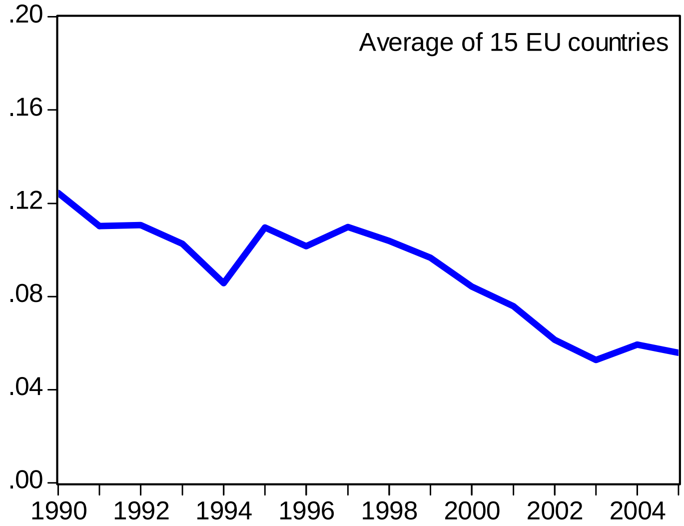


Figure 10 **Individual country estimates of the θ-parameter with ex-post**

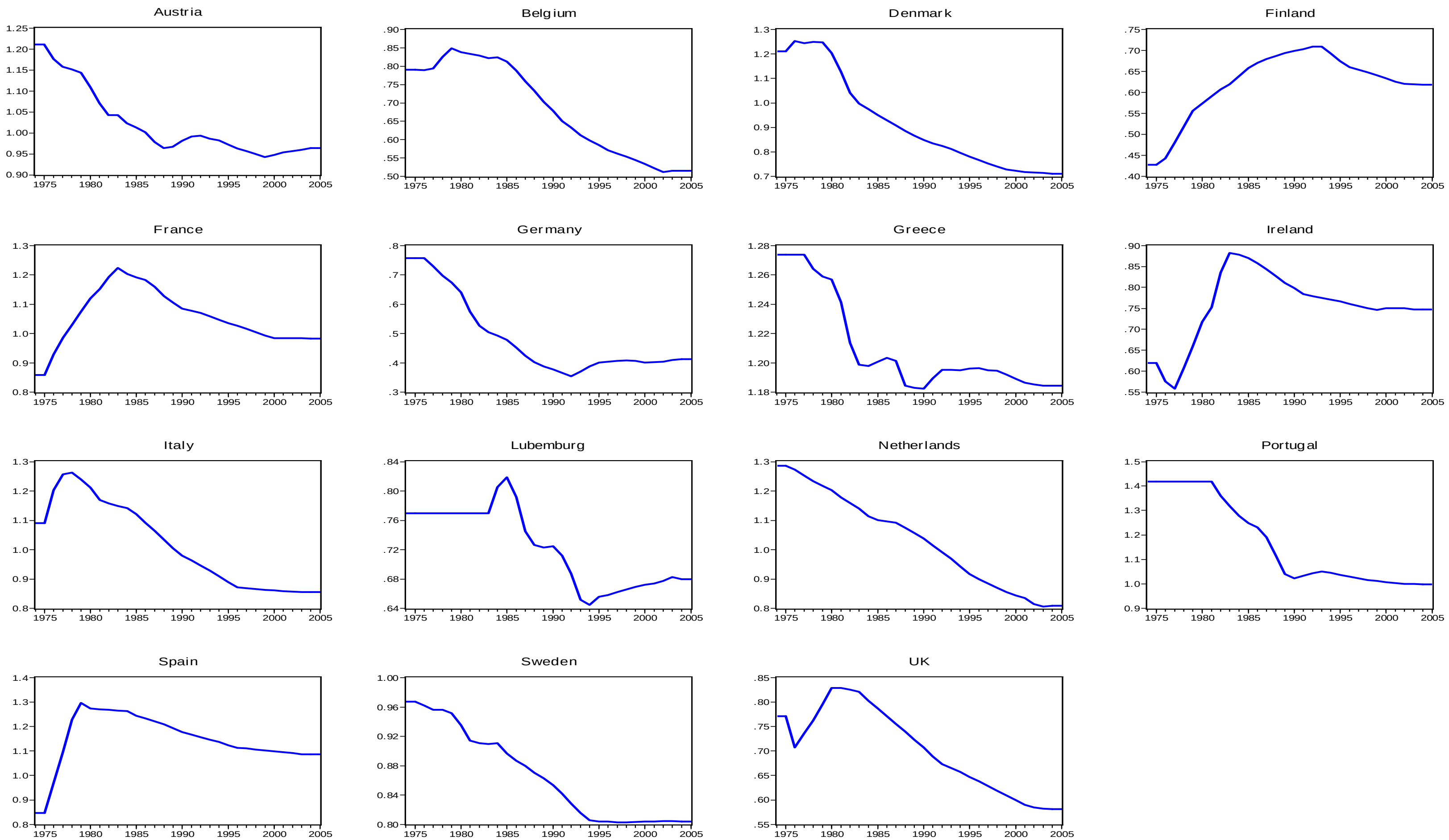
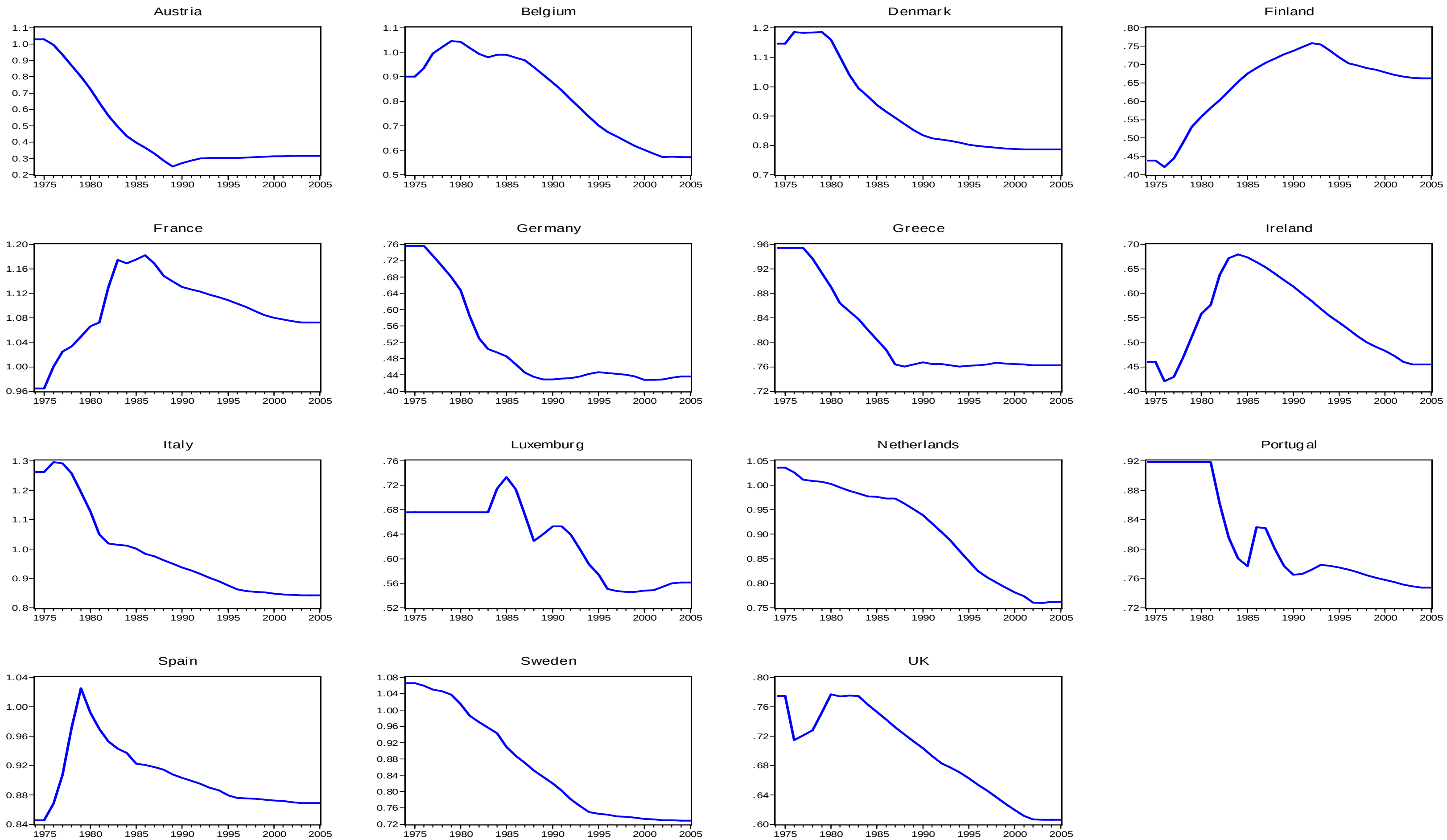


Figure 11 **Individual country estimates of the θ-parameter with real-time data**



Aboa Centre for Economics (ACE) was founded in 1998 by the departments of economics at the Turku School of Economics and Business Administration, Åbo Akademi University and University of Turku. The aim of the Centre is to coordinate research and education related to economics in the three universities.

Contact information: Aboa Centre for Economics, Turku School of Economics and Business Administration, Rehtorinpellonkatu 3, 20500 Turku, Finland.

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Yhteystiedot: Aboa Centre for Economics, Kansantaloustiede, Turun kauppakorkeakoulu, 20500 Turku.

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ISSN 1796-3133