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This paper only exists in English.

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NON-TECHNICAL SUMMARY

This paper assesses the extent to which the macroeconomic policy architecture of EMU represents a break with the past. This is carried out by estimating forward-looking fiscal and monetary policy rules for the Member States and by analysing them within the conceptual framework of the Fiscal Theory of the Price level. The pre-EMU economic policy system turns out to be a monetary dominance regime, in which monetary authorities in the Member States apply an *'active'* (counter-inflationary) monetary policy, whereas fiscal policy is *'passive'*. In particular, fiscal authorities react to debt accumulation by increasing primary surpluses, thereby guaranteeing fiscal solvency. Interestingly, the macroeconomic institutional architecture of EMU can also be categorised as a monetary dominance regime. While the ECB pursues an *'active'* monetary policy, the SGP objective is that fiscal discipline prevails, so that governments guarantee their own solvency. In sum, the key characteristics of the systematic component of macroeconomic policy in EMU may not be different from what they used to be. Yet, some differences are worth noting.

First, although fiscal solvency seems to be guaranteed in both regimes, there is a clear contrast as regards the way it is ensured. While the SGP puts a brake on debt accumulation by explicitly limiting the variability of the deficit, the rules applied by fiscal authorities in the past basically relied on the systematic responses to debt accumulation. *Second*, pre-EMU fiscal behaviour did not ensure close-to-balance positions in the medium term, while deficits above 3% were not unusual. *Third*, a stronger response to debt in EMU might accelerate the consolidation efforts to reach close-to-balance positions. *Finally*, and perhaps more important, a reduction in the variability of fiscal-policy shocks may be needed in order to respect the 3% constraint. Overall, the volatility of such shocks should remain low if just automatic stabilisation and no discretionary actions prevails in EMU.

Several by-products from our analysis should be mentioned:

- The fiscal rule characterises governments as generally reactive to debt accumulation and applying a counter-cyclical fiscal policy.

- Monetary authorities across the EU have systematically adjusted nominal interest rates to counteract inflation pressures. This reproduces previous results published in the literature.

- However, in this paper, the counter-cyclical activity of monetary policy looks stronger than previously reported.

- There is unambiguous and robust empirical evidence of the leading role of Germany in the setting of European monetary policy during the 80s and 90s.

- In connection with the two pillar strategy of the ECB, we present evidence suggesting that money may legitimately belong to the second pillar, but its relative informational content may not justify the existence of a first pillar.

- Finally, our results regarding non-systematic policy behaviour suggest that co-ordination has been absent at the level of discretionary shocks. While the variability of monetary and fiscal shocks does not show significant correlation both within and across countries, non-systematic fiscal policy appears as a more active policy tool than non-systematic monetary policy.

1. INTRODUCTION

The official adoption of the euro by 11 EU Member States[1] in January 1999 marked a key step in the process of economic and political integration in Europe. Currencies contain a mix of economics and politics, as they convey elements of national identity. In that sense, Economic and Monetary Union (EMU) is not only the latest step in the process toward an "ever closer union" that took off in Europe after World War II, but probably the most daring so far. The importance of the event may have created a tendency to label as "new" basically any element connected with EMU. This is certainly the case with its key aspect, namely its macroeconomic policy architecture. This architecture has a single independent central bank on the monetary policy side with a strict mandate to preserve price stability, and the Stability and Growth Pact setting behavioural lines for national authorities on the fiscal policy side. The resulting combination is commonly referred to as a fully new macroeconomic policy framework. This paper attempts to assess the extent to which such macroeconomic policy architecture of EMU represents a genuine policy-regime change.

In the spirit of the holistic approach to macroeconomic policy analysis emphasised in the recently proposed Fiscal Theory of the Price Level (FTPL), we look jointly at fiscal and monetary policy behaviour. This is done in contrast with the bulk of the policy rule literature, which has focused on monetary policy behaviour. We use two decades of pre-EMU macroeconomic data to estimate forward-looking fiscal and monetary policy rules for the individual EU countries. The resulting rules provide a characterisation of the systematic and non-systematic components of macroeconomic policy behaviour before the formal start of EMU. The identified behaviour for the pre-EMU period is then compared with the one implied by the EMU framework. Within the conceptual framework of the FTPL, we identify and characterise both pre-EMU and EMU policy behaviour as representing a "monetary dominance" regime. This suggests that the shift brought by EMU might not represent a dramatic change in the conduct of economic policy across Europe. Yet, we also present empirical evidence that the EMU framework may affect the exogenous component of policy.

Beyond this central conclusion, other interesting contributions of this paper include the identification and estimation of the pre-EMU fiscal behaviour in each Member State, while previous monetary rule results have been extended to a larger set of countries and to a longer sample period. Moreover, the paper presents an assessment of the informational content of money to forecast inflation. Finally, it also analyses of the correlation among fiscal and monetary policy shocks.

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[1] Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal and Finland. Greece adopted the euro in January 2002.

The paper is organised as follows. Section 2 reviews the case for simple policy rules in macroeconomic analysis looking at key developments in the area during the last few decades. Section 3 describes the specification of the simple partial-adjustment forward-looking policy models used in the study. Section 4 presents the ready-for-estimation version of the policy rules and describes other estimation details. Section 5 contains the analysis and interpretation of the results. It first discusses the empirical relevance of the estimated rules. Then it identifies the pre-EMU policy regime. Next it briefly characterises the behaviour of the exogenous component of policy during the pre-EMU period. Section 6 compares the pre-EMU policy behaviour with the one prescribed by EMU. Finally, section 7 contains some concluding remarks.

2.   THE CASE FOR SIMPLE RULES

The view that policy making should be based on simple behavioural rules is not new, although its normative and empirical relevance have not been established until recently. The view dates back to at least the 1950s, when several proposals centred around money growth were suggested. The most well known of them is the fixed money growth rate rule put forward in Friedman (1959). Friedman´s rule was based on the idea that long and variable lags of the effects of monetary policy could destabilise rather than stabilise the economy. Accordingly, his proposal conveyed two separate arguments: First, policy should follow a rule, and, second, it should favour a simple non-activist rule.

That rules are better than discretion is by now a widely accepted theoretical principle. The normative relevance of following rules rather than discretion was initially established by the pioneering work of Kydland and Prescott (1977). These authors formalised the notion of time inconsistency of optimal policy under discretion, showing how incentives to push output above potential will tend to create an inflationary bias under discretion. More recently, Clarida, Galí, and Gertler[2] (1999) have shown that the time inconsistency problem is relevant in a more realistic framework, where the policy authority does not necessarily have a preference to push output above potential. They claim that all that is needed to obtain gains from commitment to a policy rule is that current price setting be dependent on future expectations about economic conditions. In such a framework, current inflation is a forward-looking variable that depends on expected inflation. Therefore, a credible policy commitment to respond to future inflationary shocks will reduce expected inflation and will improve the short-run output/inflation trade-off, lowering inflation for any given output gap.

The time inconsistency argument provides normative support for rules but not for simple *non-activist* rules, the relevance, empirical or normative, has never been established. In fact, the recent

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[2]   CGG later on.

proliferation of the analysis of simple policy rules has its origin in Taylor (1993) proposal to use a simple *activist* rule as a guideline for monetary policy. Taylor's specific proposal was to use the following interest rate rule:

$$R_t^* = \alpha + \beta(\pi_{t-1} - \pi^*) + \gamma x_t \qquad ; \qquad \beta > 1, \gamma > 0 \qquad (1)$$

where "*" represents target values, R is the short run nominal interest rate, π is the quarter on quarter yearly inflation rate, x is the output gap expressed as a percent of target potential output, and $\alpha = \bar{r} + \pi^*$ is the long run target nominal interest rate, with $\bar{r}$ representing the steady state real interest rate.

Rule (1) takes the short-run nominal interest rate as the monetary policy instrument and calls for an active policy that adjusts the nominal rate upwards (downwards) when inflation and output are above (below) target values. At the time, Taylor defended the normative relevance of this type of rule on the basis of simulation results obtained with (mainly) rational expectations econometric models. These models suggested that rules with direct focus on inflation and output targets tended to deliver more price and output stability than rules with focus on money supply or exchange rate targets. Besides, he claimed that the rule was empirically relevant for the US by informally setting the values:

$$\beta = 1.5, \ \gamma = 0.5, \ \bar{r} = 2, \pi^* = 2 \qquad (2)$$

and showing that during the period 1987-92 the implied targeted interest rate was remarkably closed to the actual rate.

New research has recently reinforced the relevance of simple feedback rules of type (1). On the normative side, Taylor (1999) has collected simulation evidence from a wide range of dynamic stochastic general equilibrium models (small and large, closed and open, with and without rational expectations, with different degrees of microeconomic foundations, estimated and calibrated) with some form of temporary nominal rigidities. One of his conclusions is that, in terms of the variance of output and inflation around targets, simple rules like (1) tend to perform better across models than specific optimal rules, which tend to be very model dependent.

Also in the normative side, CGG (1999) have analysed monetary policy in a stylised broad macroeconomic framework with temporary nominal price rigidities, where the monetary authority sets the interest rate as to minimise a quadratic loss function on inflation and output deviations from targets. In the list of general optimality principles obtained by these authors are the two characteristics embedded in rule (1), namely, that the interest rate has to adjust more than one-for-one with inflation

($\beta > 1$) and that it has to respond to output gap (as opposed to output level), so supply shocks (e.g. productivity shocks) that affect both potential and actual output must be accommodated (i.e. call for no action) whereas demand shocks that affect the output gap call for counter-cyclical actions ($\gamma > 0$).

CGG (2000) have in addition made the point that the value of the parameter measuring the degree of response to inflation deviations from target in policy rules of type (1) may be crucial for output and inflation stability. Specifically, they show that in their sticky-price theoretical framework, equilibrium is unique when the monetary rule embeds the optimality principle $\beta > 1$, but it is indeterminate, and so potentially more unstable, with $\beta \leq 1$. They estimate the rule for the US and find that β is lower than 1 for a sample period before 1979. However, the estimation of the coefficient of inflation is greater than one for the post-1979 sample. As this latter period is characterised by higher macroeconomic stability, CGG (2000) conclude that the clear anti-inflationary policy of that period has been a significant stability factor[3].

In another paper (CGG, 1998) Clarida, Galí and Gertler have reassessed the empirical relevance of simple interest rules by specifying and formally estimating a forward-looking generalisation of rule (1)[4] for a set of major economies[5]. Their results confirm that Taylor´s informal setting in (2) is reasonable, and show that the estimated target rates perform well in tracking the actual rates set by the respective central banks during the 1980s and early 90s.

Overall, the literature reviewed above, and the references therein, have contributed to create what by now seems a wide consensus around the virtues of thinking about policy making in terms of simple rules of type (1). It should be noted, however, that the discussion in the literature has almost exclusively focused on monetary policy, with relatively much less attention to fiscal policy, specially in the area of establishing empirical relevance[6] of simple rules. To our knowledge, the only exceptions are Bohn (1998) and some informal work in Taylor (2001), both for the US.

3.   SPECIFICATION OF THE FISCAL AND MONETARY POLICY RULES

A characteristic of rule (1) is the assumption that the monetary authority looks at lagged inflation in setting its policy instrument. The rationale for the above mentioned forward-looking generalisation of the Taylor rule recently proposed by CGG (1998 and 2000) is that although policy makers have in

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[3]   Section 5 will elaborate more on this issue.

[4]   This generalisation is described in the next section.

[5]   US, Japan, Germany, France, UK, and Italy.

[6]   In section 5 we will refer to the recent fiscal theory of the price level, which emphasises both monetary and fiscal rules from a theoretical perspective.

effect simple rules in mind, they generally look forward, not backward, using sophisticated methods to forecast their target objectives. As a consequence, target instruments are set according to a rule that focuses on expectations about deviations from target objectives rather than on past economic performance. Besides, inertia is omnipresent in policy making, implying that instruments will adjust slowly to their target values. This justifies the use of a partial adjustment mechanism to relate actual and target instruments.

CCG (1998 and 2000) use this partial-adjustment forward-looking model to characterise monetary policy behaviour, but its principles are general enough to apply to fiscal policy behaviour as well. Thus, in this section we use such a type of models as the common framework to specify both fiscal and monetary policy rules.

Fiscal policy rules

Our fiscal rule specification takes the government primary surplus as the policy instrument and assumes that the fiscal authority sets its target for that instrument as a function of two economic indicators: the deviation of the inherited public debt from target and the expected output gap for the current year. Formally, we have:

$$s_t^* = \alpha_F + \delta_F (d_{t-1} - d^*) + \gamma_F E(x_t / \Omega_{Ft}) \qquad (3)$$

where "*" represents target values, s and d are primary surplus and debt, respectively, both relative to the output level, E is the expectation operator, x is the output gap as a percent of potential output, and Ω_{Ft} is the information set at the beginning of period t, when the fiscal authority sets its target.

There are theoretical arguments that can be used to justify specification (3). For instance, Bohn (1998) rationalises a similar equation by resorting to Barro (1979) tax smoothing model. According to this latter model, debt and cyclical variability of output play a role in optimal tax setting. Although in a different theoretical framework, a calibrated dynamic stochastic model, Leeper (1993) and Andrés, Ballabriga and Vallés (2000, 2001) also use rules like (3) and show that they are helpful in eliminating equilibrium indeterminacy. However, these arguments notwithstanding, our favoured justification for (3) is plausibility. It is plausible because it provides a formal stylised way of explaining fiscal behaviour by focusing on two key dimensions of government concern, namely government solvency and output stabilisation.

It is true, on the other hand, that, although plausible, the rule may be seen as a too stylised representation. As mentioned above, policy processes tend to have a strong inertia. In the case of fiscal policy, inertia is to a large extend explained by the political difficulty of changing past spending

commitments and carrying out regular and recurrent drastic adjustments in tax codes. Besides, policy consists not only of endogenous reactions to economic developments, as (3) suggests, but also of unexpected actions. Neither of these features (inertia and shocks) is captured by (3). This is why it may often turn out to be too simple to provide a good description of the actual variability of the policy instrument.

Thus, in order to gain empirical relevance, we introduced inertia and shocks in our specification through the following partial adjustment model:

$$s_t = (1 - \rho_F)s_t^* + \rho_F s_{t-1} + V_{Ft} \qquad (4)$$

where $0 \leq \rho_F \leq 1$. According to (4), the current value of the fiscal policy instrument partially adjusts from last period value towards the current government target by a fraction of $(1 - \rho_F)$. Besides, the value of the instrument is affected by the shock V_F, which reflects the effect of non-systematic actions. More specifically, V_F may incorporate variability stemming from the imperfect control of the fiscal process (e.g. "political" shocks), as well as true fiscal policy actions or, in other words, genuine non-systematic, discretionary policy shocks. Expressions (3) and (4) define our model of fiscal policy behaviour.

Monetary policy rules

CGG (1998) have documented how the leadership exerted by the Bundesbank in the European monetary policy process translates into a significant empirical relevance of the German interest rate for the evolution of the interest rates in other European economies. The monetary rule specification that we consider here takes this asymmetry directly into account. Thus, the rule takes the short run nominal interest rate as the policy instrument and assumes that, in the case of Germany, the monetary authority sets the target for that instrument as a function of expected deviations from inflation and output targets. The rest of the EU countries looks in addition to the German rate when setting their instrument target. Formally, for Germany:

$$R_t^* = \alpha_M + \beta_M E(\pi_{t+k} - \pi^* / \Omega_{Mt}) + \gamma_M E(x_t / \Omega_{Mt}) \qquad (5)$$

and for the rest of the EU countries:

$$R_t^* = \alpha_M + \beta_M E(\pi_{t+k} - \pi^* / \Omega_{Mt}) + \gamma_M E(x_t / \Omega_{Mt}) + \lambda_M R_t^D \qquad (6)$$

where R is the short run nominal interest rate, π_{t+k} is the inflation rate k periods ahead -which is the relevant horizon for the monetary authority-, R^D is the German short run nominal rate, and as above "*" represents target values, x is the output gap, and expectations are conditional on the information set available at the beginning of period t, when target rates are set.

The empirical and theoretical rationale for this kind of interest rate rule has already been documented in section 2. As in the case of fiscal policy, these monetary target rules are generally too stylised, as they lack inertia and the effect of exogenous disturbances. In the case of monetary policy, inertia is often justified by the observed tendency of central banks to smooth interest rate changes[7]. On the other hand, once inertia is taken into account, differences between actual interest rates and those implied by (5) or (6) may be the consequence of failures to follow the rule (e.g. political pressure on the central bank) or the result of true discretionary monetary policy actions. As with fiscal policy, we introduce these two features, inertia and policy shocks, into the analysis at once through the following partial adjustment equation:

$$R_t = (1 - \rho_M)R_t^* + \rho_M R_{t-1} + v_{Mt} \qquad (7)$$

where $0 \leq \rho_M \leq 1$ measures the degree of smoothing and v_M is the exogenous component of policy, thereby reflecting failures to follow the rule and/or genuine discretionary actions. Expressions (5), (6), and (7) define our model of monetary policy behaviour.

4. ESTIMATION

In order to obtain ready-for-estimation versions of the fiscal and monetary policy rules we need to apply some simple algebraic transformations to the models described in section 3.

Where fiscal policy is concerned, we add and subtract the output gap term $\gamma_F x_t$ to the right hand side of equation (3), then let the unobserved target level debt $d*$ be part of the constant term, and rearrange to get:

$$s_t^* = \tilde{\alpha}_F + \delta_F d_{t-1} + \gamma_F (E(x_t / \Omega_{Ft}) - x_t) + \gamma_F x_t \qquad (8)$$

where $\tilde{\alpha}_F = \alpha_F - \delta_F d^*$. Next we substitute (8) in the partial adjustment model (4) to obtain:

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[7] Explanations for this observed tendency include fears of financial disruption (Goodfriend, 1991) and uncertainty about policy effects due to model uncertainty (CGG, 1999).

$$s_t = (1 - \rho_F)\tilde{\alpha}_F + (1 - \rho_F)\delta_F d_{t-1} + (1 - \rho_F)\gamma_F x_t + \rho_F s_{t-1} + \varepsilon_{Ft} \qquad (9)$$

with $\quad \varepsilon_{Ft} = -(1 - \rho_F)\gamma_F(x_t - E(x_t / \Omega_{Ft})) + v_{Ft}$

Therefore, the error term in (9) is the sum of the exogenous component of fiscal policy v_F and a term involving the error of forecasting the output gap. We assume that policy shocks are zero mean i.i.d. stochastic process,

Similar transformations can be applied to the monetary policy model. Specifically, in (5) and (6) we add and subtract $\beta_M \pi_{t+k}$ and $\gamma_M x_t$ to the right hand side, then we place the unobserved target for inflation in the constant term, and rearrange. In the case of Germany we get:

$$R_t^* = \tilde{\alpha}_M + \beta_M(E(\pi_{t+k} / \Omega_{Mt}) - \pi_{t+k}) + \gamma_M(E(x_t / \Omega_{Mt}) - x_t) + \beta_M \pi_{t+k} + \gamma_M x_t \qquad (10)$$

and for the remaining EU countries:

$$R_t^* = \tilde{\alpha}_M + \beta_M(E(\pi_{t+k} / \Omega_{Mt}) - \pi_{t+k}) + \gamma_M(E(x_t / \Omega_{Mt}) - x_t) + \beta_M \pi_{t+k} + \gamma_M x_t + \lambda_M R_t^D \qquad (11)$$

where $\tilde{\alpha}_M = \alpha_M - \beta_M \pi^*$. Next we substitute (10) and (11) in equation (7) and rearrange to obtain the following expressions for Germany and the rest of the EU, respectively:

$$R_t = (1 - \rho_M)\tilde{\alpha}_M + (1 - \rho_M)\beta_F \pi_{t+k} + (1 - \rho_M)\gamma_M x_t + \rho_M R_{t-1} + \varepsilon_{Mt} \qquad (12)$$

and

$$R_t = (1 - \rho_M)\tilde{\alpha}_M + (1 - \rho_M)\beta_F \pi_{t+k} + (1 - \rho_M)\gamma_M x_t + (1 - \rho_M)\lambda_M R_t^D + \rho_M R_{t-1} + \varepsilon_{Mt} \qquad (13)$$

with $\quad \varepsilon_{Mt} = -(1 - \rho_M)[\beta_M(\pi_{t+k} - E(\pi_{t+k} / \Omega_{Mt})) + \gamma_M(x_t - E(x_t / \Omega_{Mt}))] + v_{Mt}$

Consequently, as in the fiscal case, the error term is a combination of forecasting errors and an exogenous policy shock v_M, which we assume to zero mean i.i.d.

In sum, the models described in section 3 boil down to equation (9) for fiscal policy and to equations (12)-(13) for monetary policy. The corresponding equations express policy instruments (primary balances, nominal interest rates) in terms of observed variables (inflation rates, output gaps, debt stocks, lagged variables) plus a random error. The equations are non-linear because policy inertia reduces the effect of objective variables on policy instruments. More importantly, their error terms are correlated with the explanatory variables, since the former contain the forecasting errors of the latter.

We therefore need to apply non-linear instrumental variable estimation methods, while standard errors would ideally be calculated using heteroskedastic and autocorrelation-consistent methods. As in CGG (1998), we apply non-linear GMM[8]. Reasonable instruments for estimation in this context are variables useful for forecasting the objective variables (inflation and output gap), which are not observable at the beginning of period t. Such instrumental variables would belong to the information set of the policy authority when it sets it target for the corresponding policy instrument. Additionally, instrumental variables have to be uncorrelated with ε, so that the moment conditions needed for unbiased estimation are satisfied:

$$E(Z_t \varepsilon_t) = 0$$

where $Z_t \in \Omega_t$ is the vector of instrumental variables.

The policy equations are estimated for the sample period 1979-1998[9]. We use annual data for fiscal policy and quarterly data for monetary policy. Such time frames reflect reasonably well those of actual policy choices in each branch of macro policy making. We assume that the monetary authority looks at one year ahead expectations for inflation when assessing deviations from target, so we set $k = 4$. Following CGG (1998)[10], the set of instruments for monetary policy includes four lags of all the variables in equations (12)-(13), four lags of the effective real exchange rate and the commodity prices, and, in some cases, four lags of money supply (M3). By comparing models including and excluding money growth, we are in a position to assess the role of money as an instrumental variable. Similarly, the set of instruments for fiscal policy includes one lag of all the variables in equation (9) plus one lag of the short run nominal interest rate, the effective real exchange rate, and the commodity price indicator[11]. In both cases, fiscal and monetary, the dimension of the vector of instruments exceeds the dimension of the vector of parameters, thereby testing for over-identification provides a way to assess the empirical relevance of the models.

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[8] See the Statistical appendix for further details.

[9] See the Statistical appendix for details concerning sample period exceptions.

[10] They use monthly data, however.

[11] The effective real exchange rate, the commodity price indicator and money supply are included as annual quarter-on-quarter growth rates in the monetary rule. The effective real exchange rate and the commodity price indicators are included in annual growth rates in the fiscal rule. See the statistical appendix for the details.

5. ANALYSIS AND INTERPRETATION OF THE RESULTS

5.1. The empirical relevance of the rules

5.1.1. *Fiscal rules*

A look at Table 1 reveals the satisfactory statistical properties of the fiscal model. On one side, in terms of the overall specification, the value of the J-statistic implies in all countries that the model is not rejected by the data at conventional significance levels. On other side, in terms of the statistical significance of the coefficients, note first that the partial adjustment coefficient is significant for most countries (the exceptions are Austria, France, the Netherlands, and Portugal) and is in the range [0.47, 0.86], implying a considerable degree of policy inertia. The inertia seems specially high in Ireland (0.86) and the UK (0.84).

Table 1: Fiscal policy rules, 1979-1998 [a]

	$\square_{F}$ [b]	$\tilde{\alpha}_{F(c)}$	$\square_{F}$ [d]	$\square_{F}$ [e]	$.\ \square_{(f)}$	J [g]
Belgium	0.47	-12.8	0.14	0.34	1.04	3.68
	(0.13)*	(1.66)*	(0.02)*	(0.12)*		[0.24]
Denmark	0.49	-0.75	0.10	1.14	1.32	6.03
	(0.10)*	(0.99)	(0.02)*	(0.15)*		[0.11]
Germany	0.54	-2.01	0.08	-0.09	0.90	6.32
	(0.16)*	(1.34)	(0.04)*	(0.12)		[0.10]
Spain	0.50	-4.90	0.09	0.33	0.91	3.69
	(0.14)*	(0.95)*	(0.02)*	(0.10)*		[0.30]
France		-0.17	0.02	0.26	0.52	4.53
		(0.32)	(0.01)*	(0.04)*		[0.34]
Ireland [h]	0.87	-31.0	0.38	0.20	1.17	2.70
	(0.08)*	(17.0)	(0.20)	(0.55)		[0.44]
Italy	0.58	-14.5	0.16	0.06	1.13	1.08
	(0.10)*	(1.85)*	(0.02)*	(0.13)		[0.78]
The Netherlands		-3.69	0.08	0.24	1.00	1.43
		(0.58)*	(0.01)*	(0.09)*		[0.84]
Austria		-1.29	0.04	0.24	0.78	2.44
		(0.67)*	(0.01)*	(0.04)*		[0.66]
Portugal		-20.0	0.35	0.05	1.40	3.81
		(2.40)*	(0.04)*	(0.02)*		[0.43]
Finland	0.47	2.19	0.04	0.92	1.04	1.99
	(0.06)*	(0.42)*	(0.02)*	(0.08)*		[0.58]
Sweden	0.62	-0.86	0.08	1.46	1.67	6.05
	(0.06)*	(4.02)*	(0.07)	(0.21)*		[0.11]
United Kingdom	0.84	-49.6	1.04	1.05	1.04	6.49
	(0.05)*	(18.8)*	(0.39)*	(0.63)		[0.09]

Standard errors in parentheses; '*' significant at 5%.
[a] Except for Portugal, where the sample period is 1982-1998.
[b] Coefficient of (fiscal) policy inertia; see equation (4).
[c] Intercept of the fiscal rule; see equations (3) and (8).
[d] Fiscal response to the stock of debt at the beginning of the period; see equation (3).
[e] Fiscal response to the contemporaneous output gap; see equation (3).
[f] Standard error of the regression.
[g] Test for over-identifying restrictions (Chi-square with 3 degrees of freedom); p-values in brackets.
[h] The p-values associated to α_F and δ_F are 0.07.

The rest of the coefficients are also statistically significant in most cases. Specifically, all countries except Sweden respond to the accumulation of debt by increasing its primary surplus. Although the samples are not directly comparable, the estimated response of the primary surplus to the stock of debt is in most cases within the 95% confidence values based on estimates in tables I and III of Bohn (1998). Leaving aside Sweden, the most outstanding exceptions are the UK and Ireland, where the estimated coefficients are very large, although in this latter country the p-value associated to the coefficient is 0.07. The estimated response to the output gap is also mostly significant (Germany, Ireland, Italy, and UK are the exceptions) and has the expected positive sign, implying that fiscal policy behaviour is counter-cyclical. Finally, it is worth mentioning the generally negative (except Finland) and significant (except in Germany, France, and Sweden) constant term. Recall that according to our specification $\tilde{\alpha}_F = \alpha_F - \delta_F d^*$, where α_F represents the long term primary surplus target or, in other words, the desired surplus when both debt and output gap are at their target values (see expression (3)). Thus, if we reasonably assume that $\alpha_F \approx 0$ and target debt d^* is correlated with actual debt ratios, we would expect a negative $\tilde{\alpha}_F$ higher in absolute value for high-debt countries. Such an absolute value should also be higher in countries with a larger response of the primary surplus to debt (δ_F). This turns out to be the case in Table 1. For low estimated values of δ_F, $\left|\tilde{\alpha}_F\right|$ is overall higher for countries with higher average debt ratios during the sample period analysed, while it is also very high in Ireland, Portugal, and the UK, where the responses to government debt are the largest in the panel of countries.

Additional evidence regarding the relevance of the estimated rule to describe actual fiscal behaviour can be obtained by making the standard comparison between the actual and model-implied target values for the primary surplus, (see expression (3)), which provides a test of the empirical "tracking" ability of the estimated target rule for the policy instrument. This is done in Figure 1. As can be seen, except in the cases of Ireland and the UK, the target equation traces reasonably well the evolution of the actual surplus, although some temporary deviations occur. In particular, the German deviation from the target in 1990, the year after reunification, is clearly visible, as are its fiscal difficulties in the mid 90s. Worth to mention is also the consolidation effort in most Member States during 1997 and 1998, the pre-selection period for participation in EMU, when the surplus was trending upward across the EU. However, if we naturally measure the effort in terms of the difference between the actual surplus and that required by the target rule, we can clearly see that fiscal consolidation was particularly strong in a number of future EMU members, such as Belgium, Ireland, Italy, the Netherlands or Austria. In contrast, during the same period, the implied target surplus was above actual in those countries (Denmark, Sweden or the UK) that, for one reason or another, had already decided not to adopt the single currency.

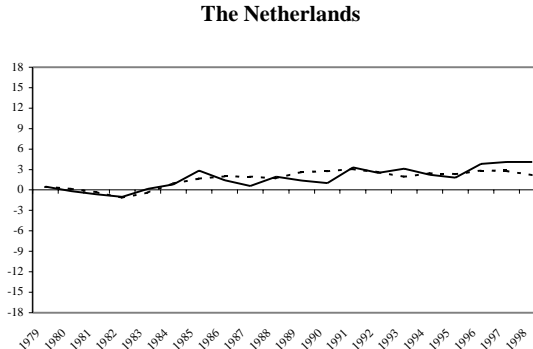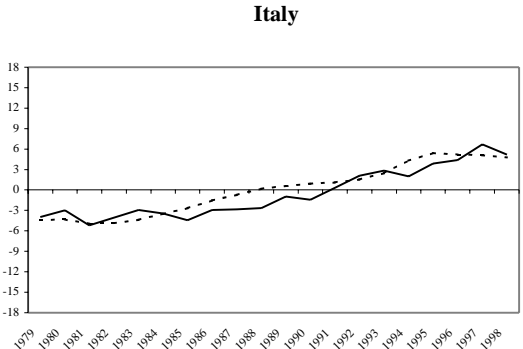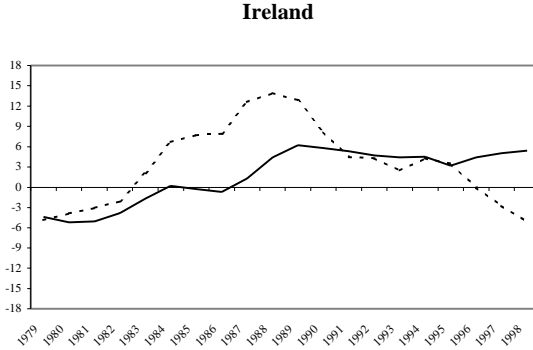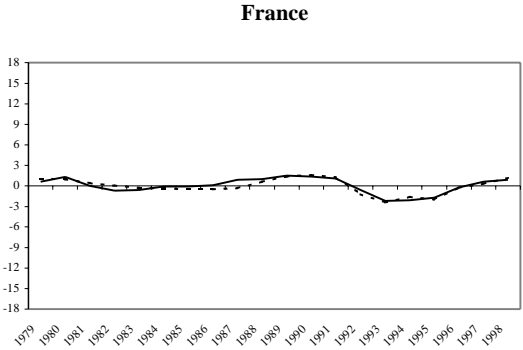**Figure 1: Actual and Target Government Primary Surplus (% of GDP)**

Figure 1 *(Continued)*

Austria

Portugal

Finland

Sweden

United Kingdom
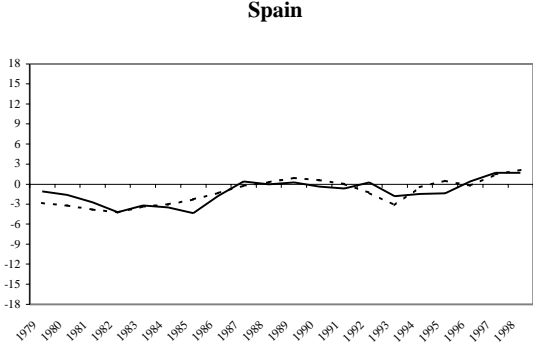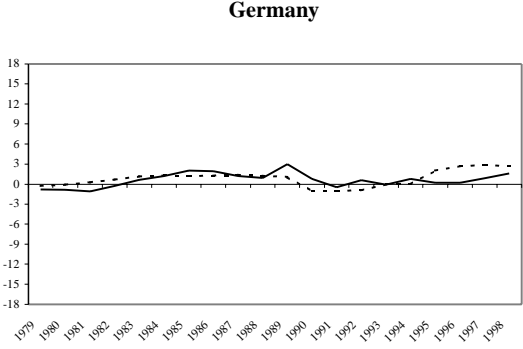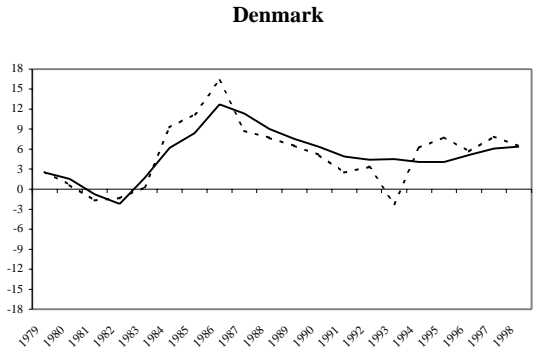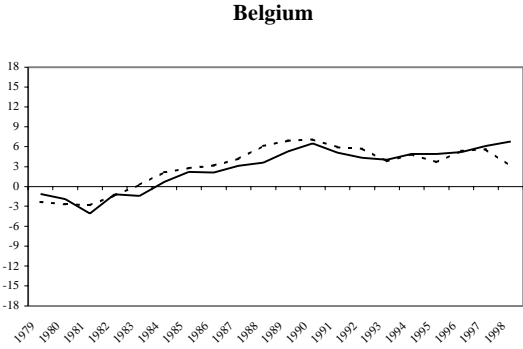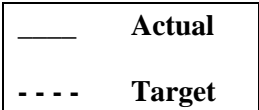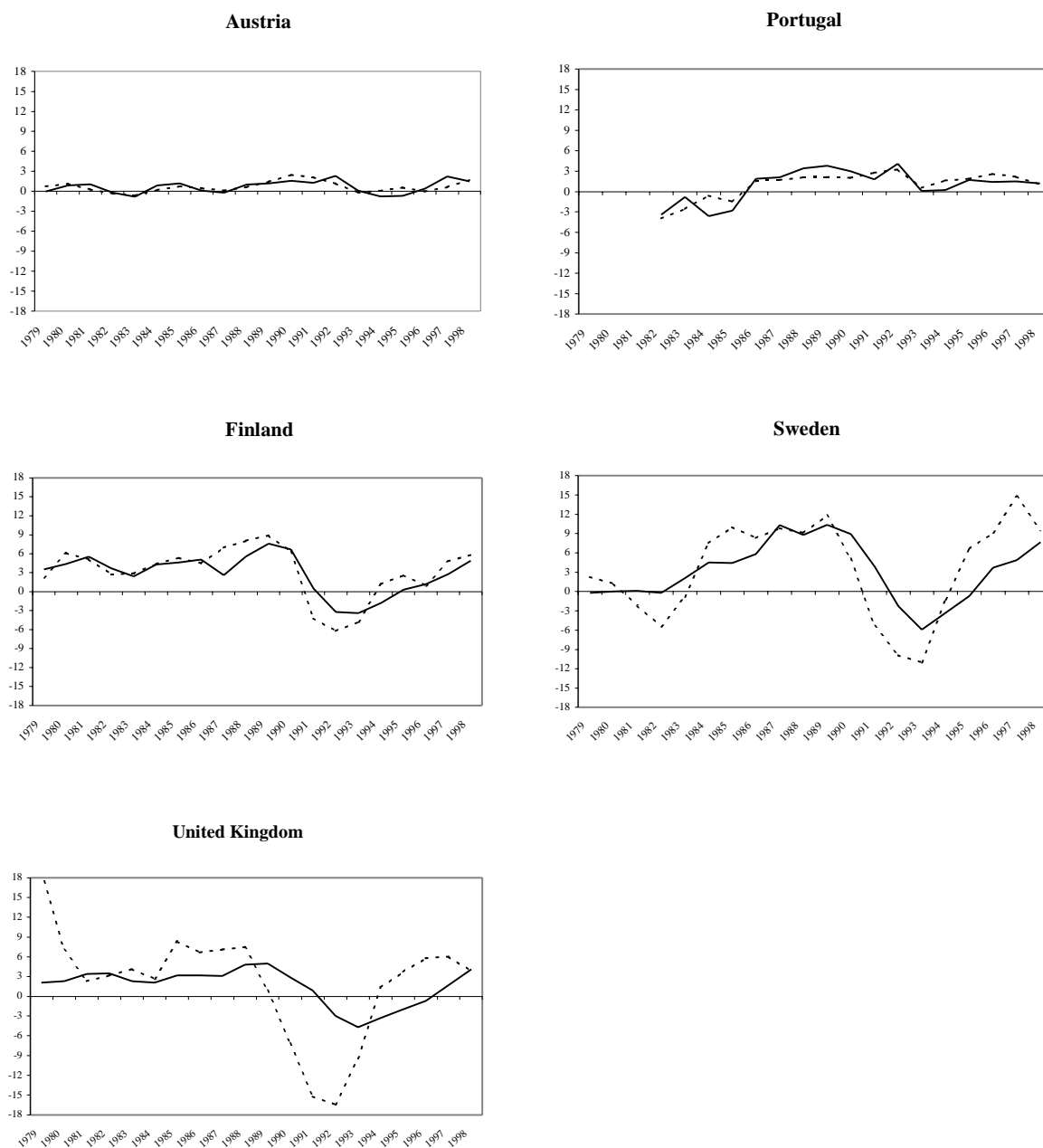
A last and specific mention is needed for Ireland and UK. In both cases the evolution of the estimated target instrument turns out to be mostly driven by the accumulation of debt, that varies a lot through the sample and to which they respond relatively strongly[12], as highlighted above. This fact in combination with their high policy inertia coefficient imply that the deviations between actual and target instrument values tend to be large in both countries.

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[12] Specially UK with a point estimate of 1.04, but also IRL with 0.3 (the associated p-value is 7% in this case).

The cyclical response of fiscal policy deserves a more detailed discussion. As we have pointed out, most countries in our panel appear to behave counter-cyclically. More specifically, we can split our panel in three groups. *First*, the group of Nordic countries (Denmark, Finland, and Sweden) with a relatively strong response to the output gap. *Second*, a group with a significant but relatively weaker response (Austria, Belgium, Spain, France, the Netherlands, and Portugal). *Finally*, a third group with non-significant response to the evolution of the output gap (Germany, Ireland, Italy, and UK).

Since it is a widely accepted proposition that fiscal policy should be counter-cyclical, an interesting question is whether the non-significant response of the third group may be the consequence of a pro-cyclical discretionary fiscal policy that offsets the counter-cyclical effects of automatic stabilisation. To answer this question we estimated our model replacing the primary surplus by the cyclically adjusted primary surplus as dependent variable[13].

The results of the exercise are reported in Table 2, which suggests a number of comments. *First*, the discretionary policy response to the output gap is statistically non-significant in most countries. The only exceptions to this rule are Denmark, Germany, Austria and Sweden. Germany is the only country, where discretionary fiscal policy seems to be significantly pro-cyclical during the period analysed. *Second*, the comparison with Table 1 shows that the coefficient of debt is basically unaffected by the change of dependent variable, which indicates that the response to debt accumulation is a purely discretionary response. *Third*, accordingly, the intercept of the equation in Table 2 is pretty close to that of Table 1, while, leaving aside France and the Netherlands, much the same can be said of the estimates of fiscal inertia. As a consequence, the difference between γ_F in Table 1 and that in Table 2 gives a rough measure of the size of automatic stabilisers in each country. Interestingly, in most countries with significant response to the output gap, that difference implies that primary surpluses change on average between 0.25 and 0.5 percentage points of GDP per percentage point change in the output gap. This is quite comparable to recent estimates of the cyclical sensitivity of the primary surplus to the output gap (see, for instance, van den Noord, 2002). Yet, some countries are situated outside this general norm. While Austria and Portugal exhibit a relatively low cyclical sensitivity, the size of automatic stabilisers in Finland is the largest in our panel of countries.

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[13] It should be emphasised that we interpret this exercise as a way of learning about the behaviour of the discretionary component of fiscal policy. We do not consider the estimated equation as a policy rule, since we do not view the adjusted primary surplus as the policy instrument of fiscal authorities.

Table 2: Discretionary fiscal policy, 1979-1998 [a]

	ρ_{F} [b]	$\tilde{\alpha}_{F}$ [c]	δ_{F} [d]	γ_{F} [e]	σ [f]	J [g]
Belgium	0.63	-16.6	0.17	-0.05	1.64	3.48
	(0.13)*	(4.34)*	(0.04)*	(0.29)		[0.32]
Denmark	0.47	-0.25	0.10	0.70	1.62	2.15
	(0.16)*	(2.28)	(0.04)*	(0.21)*		[0.54]
Germany	0.61	-0.62	0.06	-0.58	0.99	5.56
	(0.06)*	(1.12)	(0.03)	(0.17)*		[0.13]
Spain	0.40	-4.14	0.08	0.08	0.90	2.87
	(0.20)*	(0.73)*	(0.02)*	(0.13)		[0.41]
France	0.23	-0.84	0.04	-0.07	0.58	4.12
	(0.10)*	(0.56)	(0.01)*	(0.07)		[0.25]
Ireland	0.90	-42.8	0.53	-0.29	1.42	2.92
	(0.08)*	(27.3)	(0.34)	(0.40)		[0.40]
Italy	0.63	-15.2	0.17	-0.14	1.20	1.92
	(0.09)*	(2.47)*	(0.03)*	(0.15)		[0.59]
The Netherlands	0.63	-3.54	0.08	-0.32	1.28	1.54
	(0.13)*	(2.18)	(0.04)*	(0.31)		[0.67]
Austria		-2.72	0.06	0.22	0.95	2.05
		(0.092)*	(0.02)*	(0.06)*		[0.73]
Portugal		-17.8	0.33	0.02	1.12	6.23
		(1.32)*	(0.02)*	(0.02)		[0.18]
Finland	0.52	1.85	0.04	0.08	1.30	3.95
	(0.13)*	(1.09)	(0.02)	(0.10)		[0.27]
Sweden	0.60	-0.86	0.08	0.97	1.69	7.45
	(0.06)*	(4.02)	(0.07)	(0.19)*		[0.06]
United Kingdom	0.81	-26.5	0.57	0.58	1.31	6.67
	(0.09)*	(16.4)	(0.34)	(0.65)		[0.08]

Standard errors in parentheses; '*' significant at 5%.
[a] Except for Portugal, where the sample period is 1982-1998.
[b] Coefficient of (fiscal) policy inertia; see equation (4).
[c] Intercept of the fiscal rule; see equations (3) and (8).
[d] Fiscal response to the stock of debt at the beginning of the period; see equation (3).
[e] Fiscal response to the contemporaneous output gap; see equation (3).
[f] Standard error of the regression.
[g] Test for over-identifying restrictions (Chi-square with 3 degrees of freedom); p-value in brackets.

5.1.2.   Monetary Rule

Turning now to the results obtained for the monetary rule (see Table 3), a first general point to emphasise is that they reproduce for our extended sample period and panel of EU countries the overall results reported in CGG (1998) for the four largest European economies (Germany, France, UK, and Italy)[14].

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[14] Roughly, their estimates are for the 1980s in the case of France, UK, and Italy, and extend up to 1993 for Germany.

Table 3: Monetary policy rules, 1979Q1-1998Q4 [a]

	ρ_{M} [b]	$\tilde{\alpha}_{M}$ [c]	β_{M} [d]	γ_{F} [e]	λ_{M} [f]	σ [g]	J [h]
Belgium [i]	0.74	0.65	0.47	0.16	0.79	0.65	23.9
	(0.04)*	(0.41)	(0.16)*	(0.11)	(0.11)*		[0.46]
Denmark [i]	0.75	-2.91	0.68	0.93	1.54	1.75	20.0
	(0.05)*	(1.26)*	(0.20)*	(0.27)*	(0.28)*		[0.70]
Germany [i], [k]	0.87	2.53	1.29	1.00		0.46	19.6
	(0.02)*	(0.43)*	(0.16)*	(0.21)*			[0.55]
Spain [i]	0.82	2.77	0.62	0.79	0.67	1.91	22.9
	(0.05)*	(1.56)	(0.20)*	(0.40)*	(0.28)*		[0.53]
		[0.07]					
France [i]	0.88	1.46	0.52	1.54	0.65	0.89	19.1
	(0.03)*	(1.37)	(0.16)*	(0.64)*	(0.26)*		[0.75]
Ireland [i]	0.65	3.11	0.53	0.35	0.66	2.20	16.9
	(0.05)*	(0.78)*	(0.09)*	(0.11)*	(0.14)*		[0.85]
Italy [j]	0.92	-1.67	0.60	0.85	1.37	0.94	19.0
	(0.03)*	(3.30)	(0.23)*	(0.66)	(0.58)*		[0.52]
Netherlands [j]	0.55	0.23	-0.07	0.48	1.0	0.64	22.0
	(0.03)*	(0.30)	(0.08)	(0.09)*	(0.05)*		[0.34]
Austria [j]	0.62	0.87	0.21	0.33	0.76	0.54	21.0
	(0.08)*	(0.34)*	(0.14)	(0.10)*	(0.08)*		[0.40]
Portugal [j]	0.77	-0.43	0.22	0.03	1.52	1.77	15.2
	(0.05)*	(1.35)	(0.08)*	(0.05)	(0.27)*		[0.76]
Finland [j]	0.93	2.56	1.63	-0.53	-0.23	1.11	10.7
	(0.02)*	(2.98)	(0.58)*	(0.71)	(0.73)		[0.95]
Sweden [i]	0.53	2.73	0.08	0.33	1.05	1.73	21.0
	(0.09)*	(0.89)*	(0.09)	(0.10)*	(0.15)*		[0.58]
United Kingdom [j]	0.85	1.29	0.52	1.20	0.86	1.20	25.3
	(0.03)*	(1.24)	(0.21)*	(0.36)*	(0.26)*		[0.19]

Standard errors in parenthesis; '*' significant at 5%.

[a] The sample size is 80, except in Belgium (size 68; period 1982Q1-1998Q4), Ireland (76; 1980Q1-1998Q4) and Portugal (68; 1982Q1-1998Q4).

[b] Coefficient of (monetary) policy inertia; see equation (7).

[c] Intercept of the monetary rule; see equations (5)-(6) and (10)-(11).

[d] Monetary response to expected inflation; see equations (5)-(6).

[e] Monetary response to the contemporaneous output gap; see equations (5) and (6).

[f] Reaction to the German interest rate; see equation (6).

[g] Standard error of the regression.

[h] Test for over-identifying restrictions (Chi-square with 24 degrees of freedom in countries type (j), 20 in countries type (k) and 21 in Germany); p-value in brackets.

[i] Long enough series of money growth **are** available and they **enter** the set of instruments.

[j] Long enough series of money growth **are not** available and, consequently, they **do not enter** the set of instruments.

[k] The policy instrument equation only includes expected inflation and the output gap; see equation (5).

The rule seems to provide a satisfactory description of monetary policy behaviour, with its specification being accepted for all the countries analysed according to the J-test at conventional significance levels. As for the statistical significance of the coefficients, the degree of policy inertia is high, ranging in the interval [0.53, 0.93]. The monetary authority responds significantly to expected deviations from target for domestic inflation by increasing rates in most countries (except in Austria, the Netherlands, and Sweden), with coefficient value of 1.29 for Germany and in the interval [0.22, 0.68] for the rest of the countries (except in Finland with 1.63).

Besides, the external constraint imposed by the evolution of the German rate is clearly reflected by its pervasive significant positive effect on the rates of the rest of the EU countries, except Finland. This gives formal empirical support to the conventional view regarding the leadership exerted by Germany in the setting of European monetary policy during the 80s and 90s. Finally, in terms of the tracking ability of the target interest rates, the estimated model performs reasonably well, as shown in Figure 2. The only exceptions are Finland and the first half of the sample in Italy. In the case of Italy, the high inflation variability of the 80s combines with a relatively high degree of interest rate smoothing to induce large deviations between the actual and estimated target rates. A similar argument applies in Finland, where in addition the specially turbulent episodes of the early 90s (Soviet block disintegration and financial crisis) operate to generate large deviations also in the second part of the sample. Leaving aside these cases, some particular temporary deviations are certainly visible, like, for instance, that observed in the UK by the exceptionally large inflationary spike of 1980.

Other aspects of the monetary rule results provide contrasting evidence with earlier literature and deserve especial attention.

First, on the basis of figure 2, it appears that the rule tends to provide a better description of policy behaviour during the 1990s, a decade characterised by lower inflation variability. One plausible interpretation of this fact is obtained by applying the argument used above for Finland and Italy, namely, that policy inertia combined with the higher macroeconomic turbulence of the 1980s to generate larger deviations between actual and target rates. In the 1990s, the so-called Maastrict effect, which has been extensively documented in the literature in the case of fiscal behaviour[15], reduced policy-induced turbulence by constraining the behaviour of central bankers. The Maastricht criteria, specially those referring to inflation and interest rates, by establishing clear targets to the central banks, introduced an additional factor of monetary discipline.

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[15]   See, for instance, von Hagen, Hughes Hallet, and Strauch (2002).

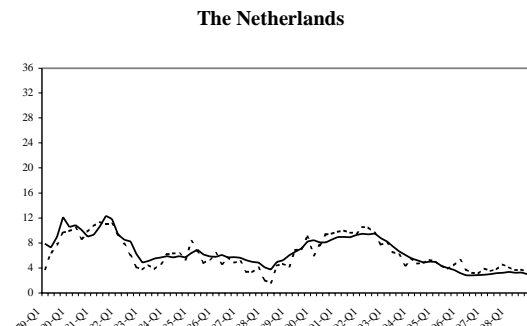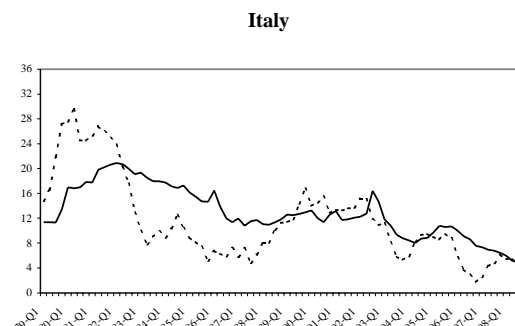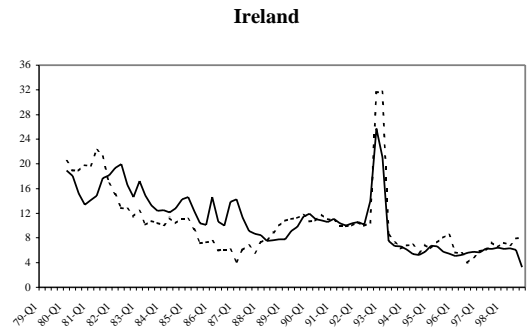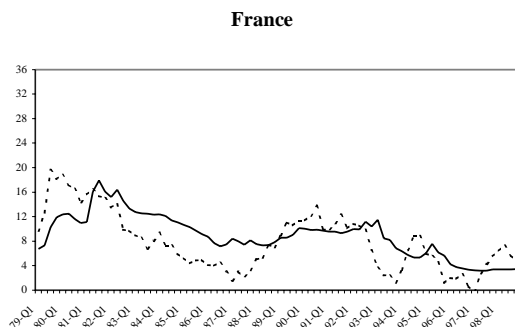**Figure 2: Actual and Target Short Term Interest Rates**

Legend:
— Actual
- - - - Target

Belgium

Denmark

Germany

Spain

France

Ireland

Italy

The Netherlands

22

Figure 2 *(Continued)*

Austria

Portugal

Finland

Sweden

United Kingdom
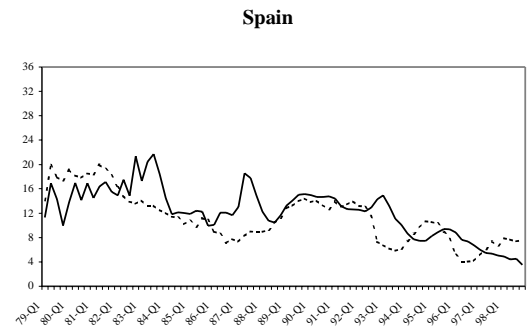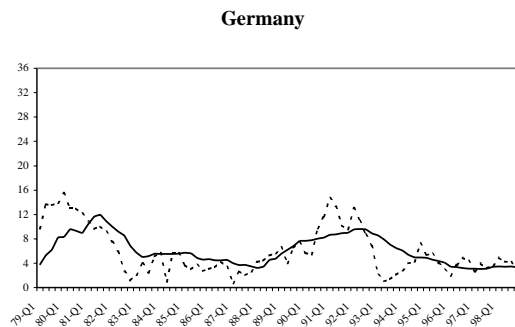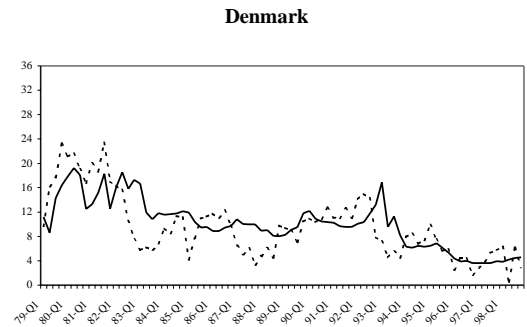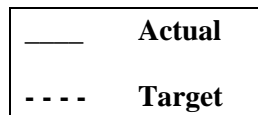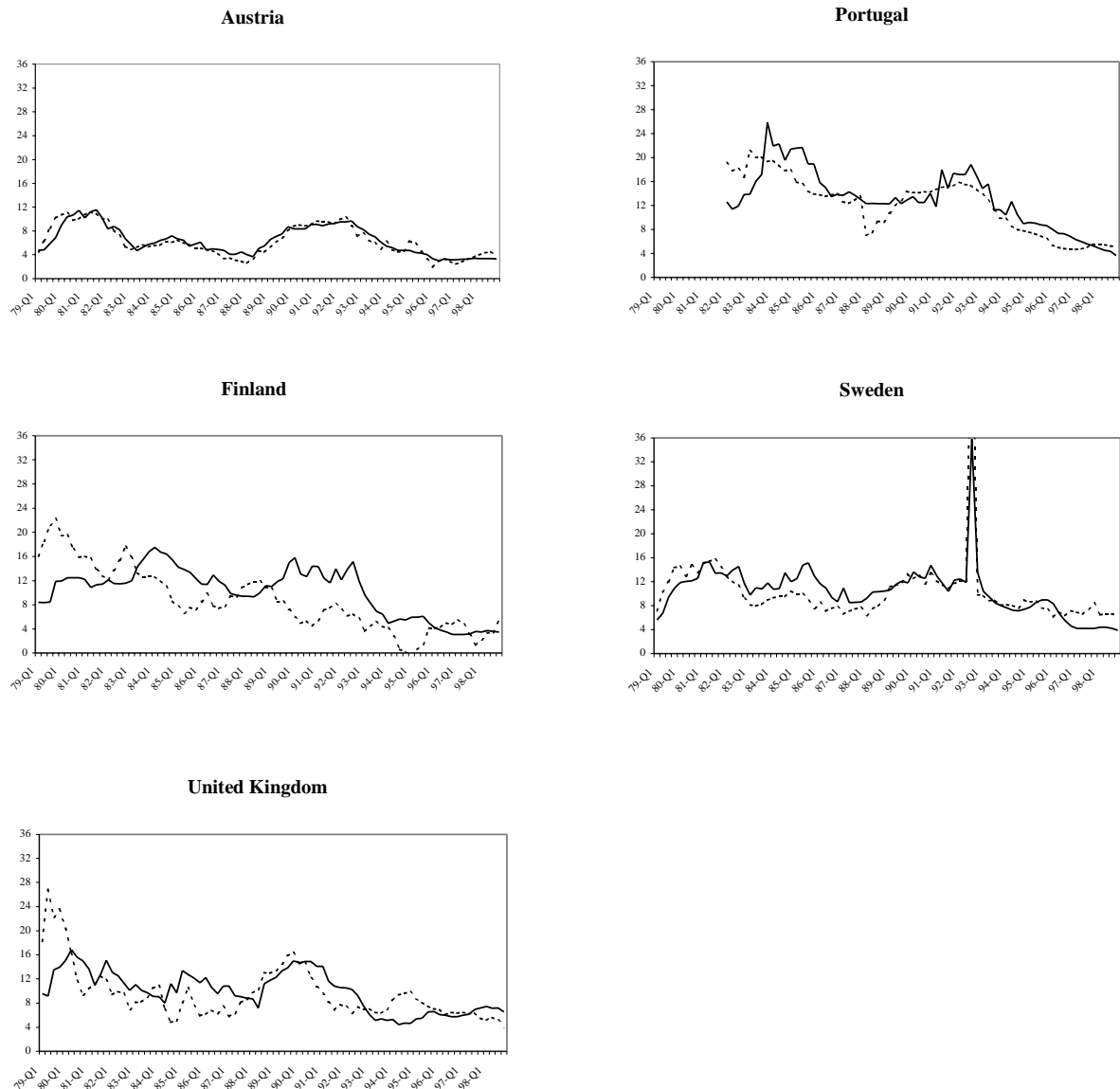
Second, the addition of the German interest rate to the equations of the rest of the EU countries is of key importance to obtain rules that provide a good description of monetary policy behaviour. Dropping the variable from the rule does not have much impact on the fit of the model, but reduces dramatically the tracking ability of the estimated target rates. As an illustration of this effect, figure 3 contains the actual and estimated ta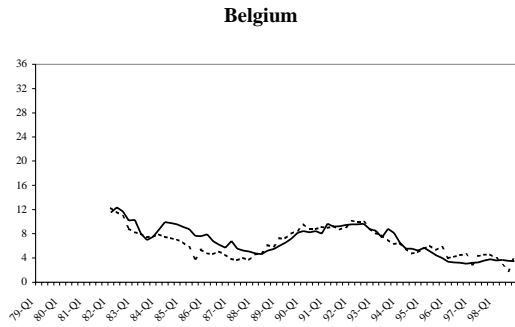rget rates using the same model as in table 3, but without including the German interest rate. Although the relevance of the German rate in the monetary rules across the EU is evident from the figure, unsurprisingly, cases like Belgium and The Netherlands provide the most clear examples of the German leadership in the setting of monetary policy in Europe.

Figure 3: Actual and Target Short Term Interest Rates (model excluding German interest rates)

24

Figure 3 *(Continued)*

Portugal

Finland

Sweden

United Kingdom

Third, the coefficient of the output gap is positive and significant in most countries (except in Belgium, Finland, Italy, 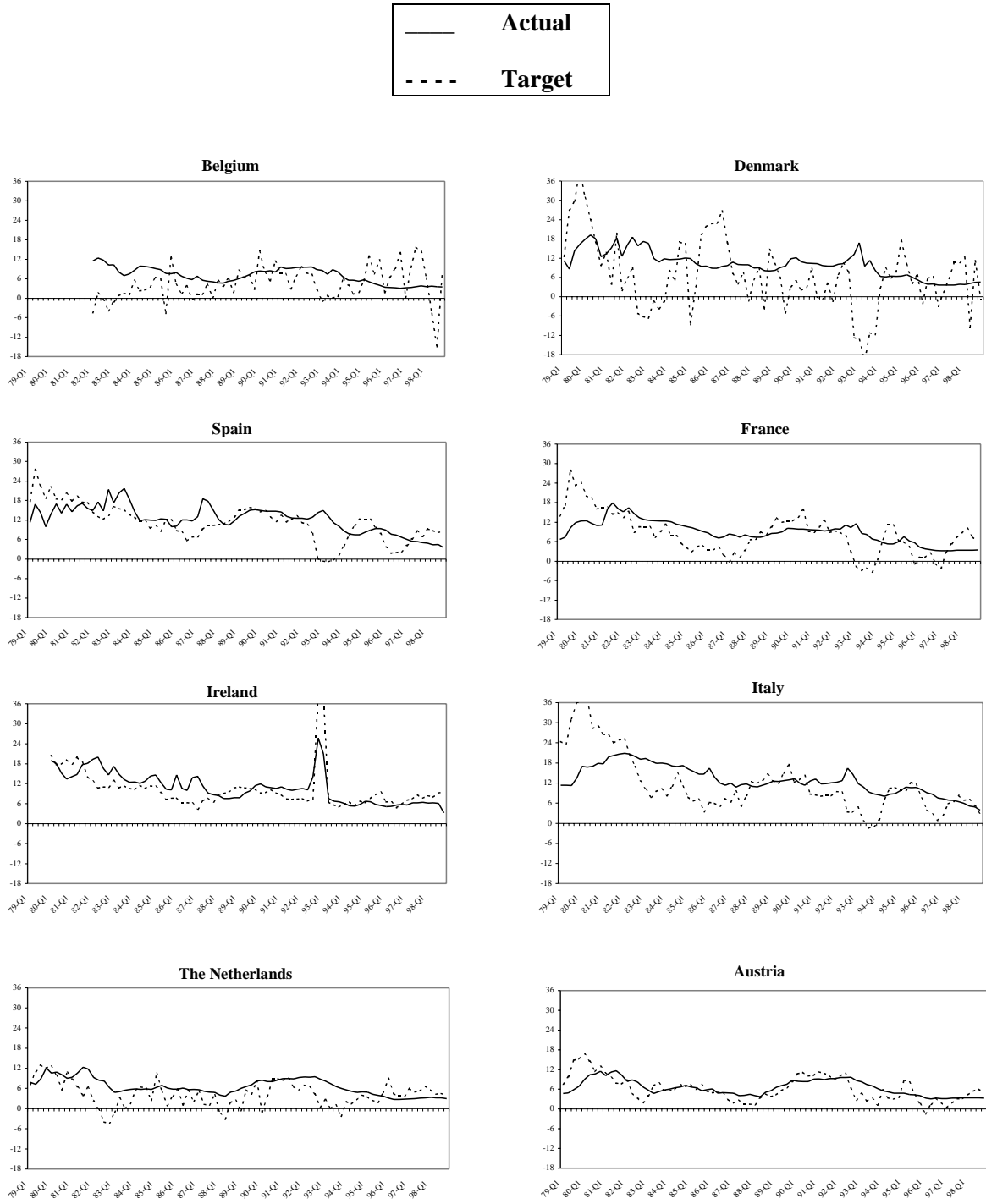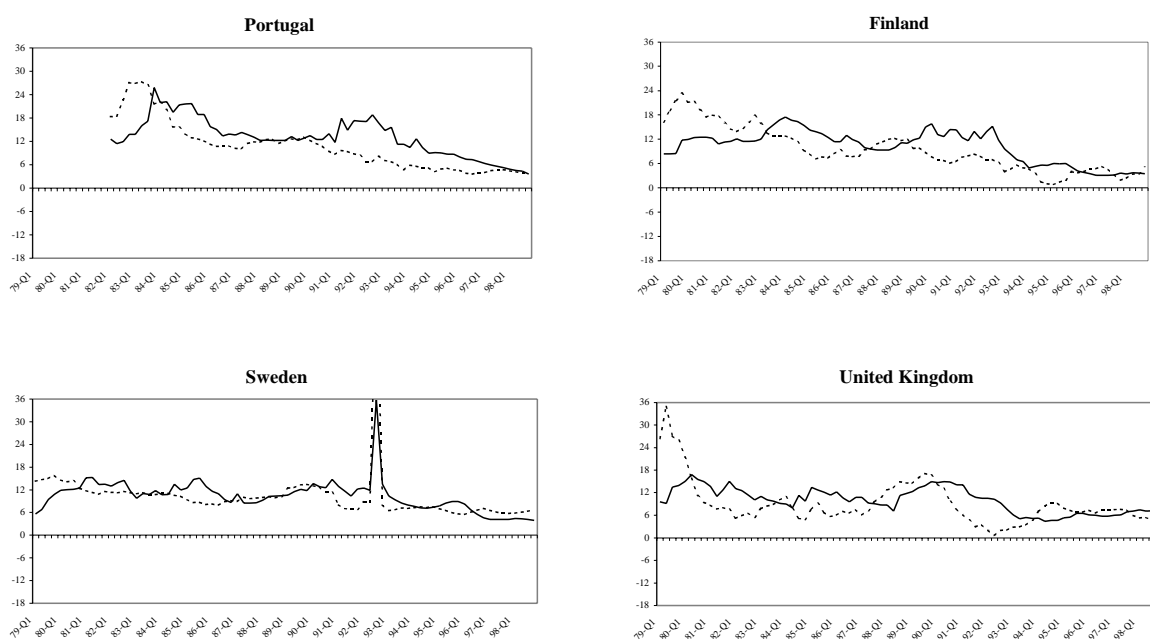and Portugal), and its estimated value ranges between [0.33,1.63]. This result implies that monetary policy is generally counter-cyclical and, taking standard errors into account, it suggests that the response of the monetary authority to expected output fluctuations seems to be stronger on average than reported in CGG (1998)[16].

Finally, a word on the role of money. The two-pillar strategy of the ECB assigns to the monetary aggregate M3 the role of a prominent indicator for the evolution of prices (first pillar) and pools a set of additional demand and supply indicators as a second pillar. This special role for money has been a source of controversy because there seems to be no solid rationale for it on either theoretical or empirical grounds[17]. In fact, even the inclusion of money in the pool of the second pillar has been questioned.

A piece of empirical evidence on this issue can be naturally obtained in our analysis by modifying the set of instrumental variables used in the estimation of the monetary rules. More specifically, in the forward-looking monetary rule that we consider, the potential instrumental variables play a role in the setting of the monetary policy instrument only to the extent that their informational content helps policy makers to forecast policy objectives, in particular inflation. Thus, as a way to assess the informational content of money, we can estimate our model both with and without money in the set of

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[16] CGG (1998) find a positive significant response to the output gap only for Germany and UK, with coefficient value around 0.25 and standard error around 0.03.

[17] See for example Galí (2001).

instruments, and then check whether the specification that includes money is rejected by the data. We have performed this exercise for the countries where M3 data was available for the full sample period[18]. A formal test based on the difference between the J-statistics of the models including and excluding money is presented in Table 4. The result is that the inclusion of money is not rejected and, therefore, it was legitimately added to the set of instruments when available. However, it should be pointed out that the performance of the estimated rule as a descriptive tool of policy behaviour was basically unaffected by the inclusion of money. Besides, the statistical effects of including/excluding other instrumental variables (e.g. commodity prices) were similar, suggesting that their relative informational content may also be similar. Thus, a fair conclusion out of this evidence could be that money may legitimately belong to the second pillar, but its relative informational content does not seem to justify a first pillar.

Table 4: Test of the informational content of money

	(a)	**(b)**	**(c) = (a) – (c)**
Belgium	23.9	17.5	6.4
Denmark	20.0	15.5	4.5
Germany	19.6	18.6	1.0
Spain	23.0	20.5	2.5
France	19.1	18.2	0.9
Ireland	16.9	13.9	3.0
Sweden	21.0	18.3	2.7

(a) Model including money in the set of instruments. See table 3. The degrees of freedom of the Chi-square are 21 in Germany and 24 in the rest of the countries.
(b) Model in table 3 excluding money from the set of instruments. The degrees of freedom are 17 in Germany and 20 in the rest.
(c) Difference between (a) and (b) distributed as a Chi-square with 4 degrees of freedom, with a critical value of 9.49 at 5%.

5.2. The policy regime during the 20 pre-EMU years

A policy regime is defined by a specific combination of fiscal and monetary policy behaviour. The need to look simultaneously at both branches of macro policy in order to correctly characterise a policy regime is often recognised in public debates, as for instance in the debates about EMU. This stands in sharp contrast with traditional economic analysis, which, with few exceptions[19], has studied them separately. Since monetary and fiscal policy are in fact closely connected, any positive or

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[18] This was not the case for Austria, Italy, the Netherlands, Finland, Portugal, and Sweden. See footnotes in table 3 and the statistical appendix.

[19] The classical reference is Sargent and Wallace (1981)

normative conclusion about one branch of policy depends on assumptions about the behaviour of the other branch. When both are analysed separately those assumptions are not explicitly spelled out, thereby giving a misleading sense of the generality of the conclusions and making it difficult to identify the specific policy regime under scrutiny.

Recently, a holistic approach to macroeconomic policy analysis has been proposed in the literature that represents a challenge to traditional economic analysis and views about the role of monetary and fiscal policies. It is known as the Fiscal Theory of the Price Level (FTPL) and was originally proposed by Leeper (1991), Sims (1994), and Woodford (1994)[20]. FTPL models look simultaneously at fiscal and monetary behaviour combining a traditional monetary sector with the explicit formulation of the long run solvency condition for the fiscal sector, which requires that the current stock of debt equals the discounted flow of future primary surpluses. A key question in these models is how fiscal solvency is achieved. The fiscal authority itself may guarantee solvency by setting the primary surplus sequence in accordance with the solvency condition. In such a case, fiscal policy is said to be "passive" or "Ricardian". Alternatively, fiscal behaviour may lack discipline and set a sequence of primary surpluses which is incompatible with solvency. In this case, fiscal policy is said to be "active" or "non-Ricardian, and the endogenous adjustment of the price level is required to guarantee fiscal solvency. A similar terminology is used for monetary policy. It is called "active" when the monetary authority effectively counteracts inflation by implementing a policy that induces an increase in the real interest rate when inflationary pressures increase, and vice versa. Otherwise, monetary policy is termed "passive".

The discussion under the FTPL framework has been helpful to identify and analyse different policy regimes. A specific policy regime is explicitly defined as a combination of fiscal and monetary behaviour that delivers a unique stable equilibrium. The two most widely discussed regimes are the so called "monetary dominance" (MD) and "fiscal dominance" (FD) regimes. The MD regime is identified by a combination of an active monetary policy and a passive fiscal policy, whereas the FD regime combines a passive monetary policy with an active fiscal policy. Interestingly, this analysis of policy regimes has often been done with models where policy is represented using simple feedback rules of the type we have estimated, in which different parameter value combinations define different regimes. As shown below, such a conceptual framework provides a way to characterise empirically the policy regime that has prevailed in our panel of EU countries during the sample period analysed in this paper.

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[20] Woodford (2000) provides a recent survey of this literature.

As the FTPL literature has pointed out[21], the empirical discrimination among policy regimes, and in particular between MD and FD regimes, is not straightforward. The reason is that simply designing a test for fiscal solvency, as it might first come to mind, will not lead to conclusive results. As we have mentioned, the violation of the solvency condition is not what characterises an FD regime. In equilibrium, the fiscal solvency condition holds under both MD and FD. The difference between both regimes lies in how solvency is achieved: Through endogenous price adjustment under FD and through endogenous primary surplus adjustment under MD.

However, as Woodford (1999, 2000) has argued, empirical evidence on monetary and fiscal indicators may be reasonably interpreted as being generated by a specific policy regime if one looks at the joint structural behaviour of fiscal and monetary policy, as the FTPL framework suitably allows. As we have just mentioned, policy analysis in FTPL models has used the same type of structural policy rules that we have specified[22] to investigate the sets of parameter combinations that deliver a unique stable equilibrium[23] and, therefore, lead to clear-cut predictions regarding policy effects. Each of such sets of parameter combinations identifies a policy regime. More specifically, using a broad underlying macroeconomic framework, this line of research has spotted out the response of monetary policy to inflation deviations from target (β_M) and the response of the fiscal authority to the stock of debt (δ_F) as the key parameters to obtain unique stable equilibria[24]. In particular, an active monetary policy ($|\beta_M| > 1$) in combination with a passive fiscal policy ($|1 - \delta_F| < 1$) delivers uniqueness, defining an MD regime, whereas a passive monetary policy ($|\beta_M| < 1$) combined with an active fiscal policy ($|1 - \delta_F| > 1$) defines an FD regime[25].

The immediate interesting question at this point is whether we can identify a policy regime for the countries in our panel on the basis of the estimated policy rules. Focus first on the monetary rule: Does it implies that monetary policy has been active? Certainly yes for the case of Germany, where the inflation coefficient is clearly greater than one. The same can be said with respect to Finland. However, the answer is less straightforward for the rest of the countries in the panel. The dominant

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[21]   See for example Cochrane (1998).

[22]   See for example Leeper (1993) and Andrés *et al.* (2000, 2001).

[23]   As opposed to indeterminacy or non-existence.

[24]   The wide consensus about the key role for stability of these two parameters has recently received some criticisms. Benhabib *et al.* (2001) point out that considering potential effects of monetary policy on the supply side may affect the stability regions. From a different perspective, Leeper and Zha (2001a) argue that stability may depend on a broader set of parameters when the highly stylised macroeconomic framework that typically underlies the stability analysis is replaced by a less restricted one.

[25]   For simplicity, all these parameter ranges assume a time-preference factor equal to one.

role of Germany during our sample period has imposed a strong external constraint to the monetary policy of these countries, implying that the empirical specification of their monetary rules does not conform with the theoretical analysis of stability. Thus, the fact that their estimated coefficients for domestic inflation are less than one is not sufficient to infer that monetary policy has been passive, because the evolution of the German rate also exerted influence on the setting of nominal interest rates across the European central banks.

To get around of this problem, we perform a counterfactual experiment inspired by CGG (1998). Specifically, we ask whether during the two decades of our sample the rest of EU countries implemented a monetary policy as active as a German type of rule would have implied. Thus, for each country, we drop the German interest rate in the target rule (6) and set the inflation coefficient equal to the value estimated for Germany (1.29). However, we keep their respective estimates of the intercept and the response to output gap, as they depend on the specific structural features of the country. On the basis of this hypothetical monetary rule we simulate the implied interest rate for the series of inflation and output gap actually observed in the country. In doing so, we build a benchmark active rule, which can be compared with the policy behaviour actually observed over the sample period. Figure 4 plots the difference between the interest rates actually observed in each country and those implied by the benchmark active rule. A positive difference between both rates indicates that the actual monetary policy in the country has been tighter than it would have been in case of having applied the benchmark rule, in which interest rates react to inflation as they do in Germany. As can be seen, in all countries and on average over the sample, actual monetary policy, as represented by the observed interest rates, has been similar or even tighter than that implied by the benchmark active rule. It is worth noting that the stress of the European Monetary System (EMS) crisis in the early 90s is clearly visible. We can therefore conclude that monetary policy has been active in all EU countries.

Given an active monetary policy, and assuming that one favours the interpretation of the evidence in Table 3 as representing a unique stable equilibrium in each country, we could infer that fiscal policy must have been passive during our sample period. In fact, this is what our estimation results for the fiscal rule suggest. According to table 1, the response to debt accumulation is significantly different from zero (except in Sweden), and lies in all cases within the theoretical interval $|1 - \delta_F| < 1$, which places the economies in the MD region of stability. As Bohn (1998) has shown, a greater than zero response to debt accumulation is a sufficient condition for solvency, independently of the relative evolution of interest rates and output growth.

We can therefore conclude that policy discipline is omnipresent in our sample. Overall, the empirical evidence presented so far seems to support the prevalence of a monetary dominance policy regime during the two pre-EMU decades.

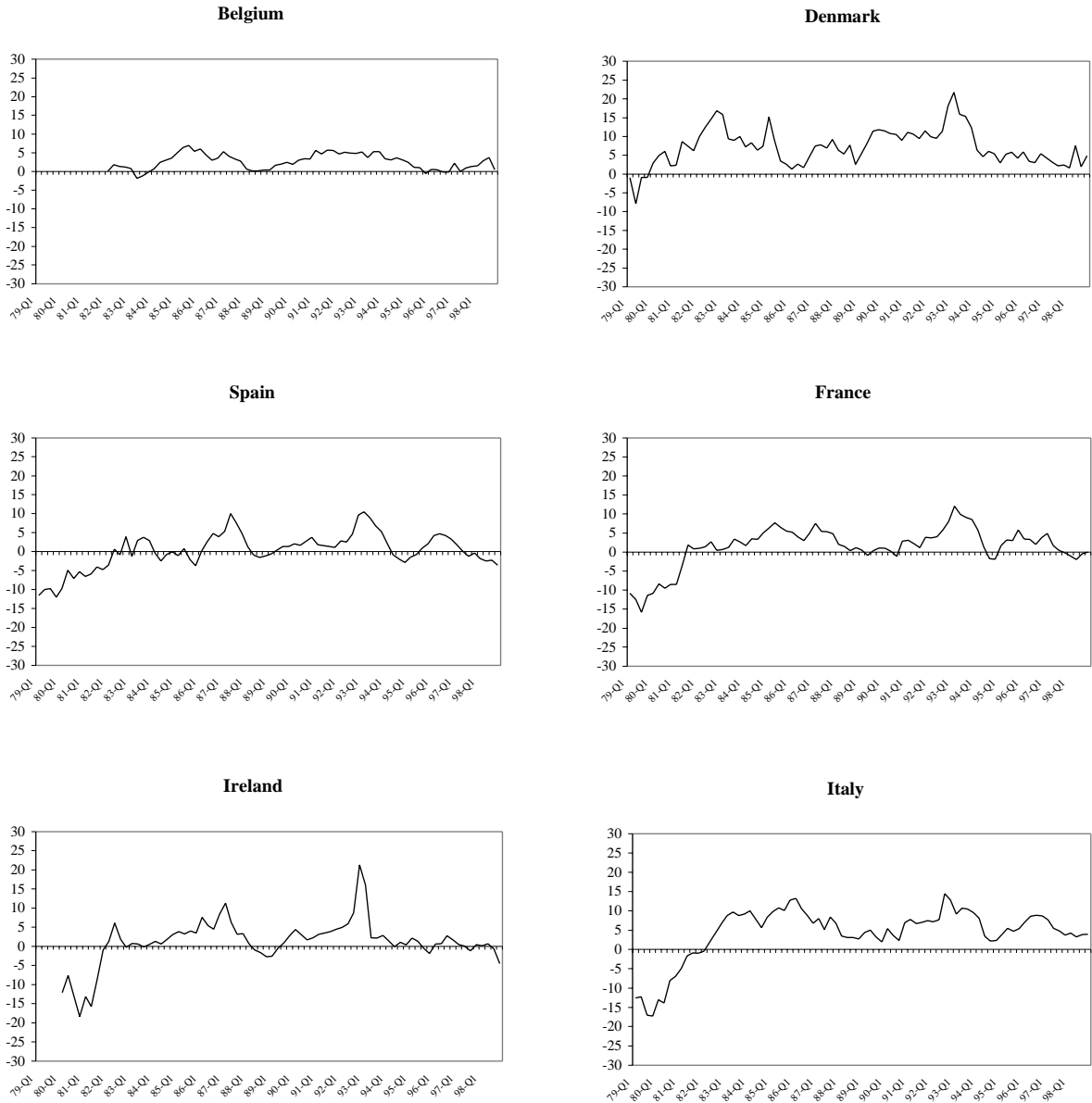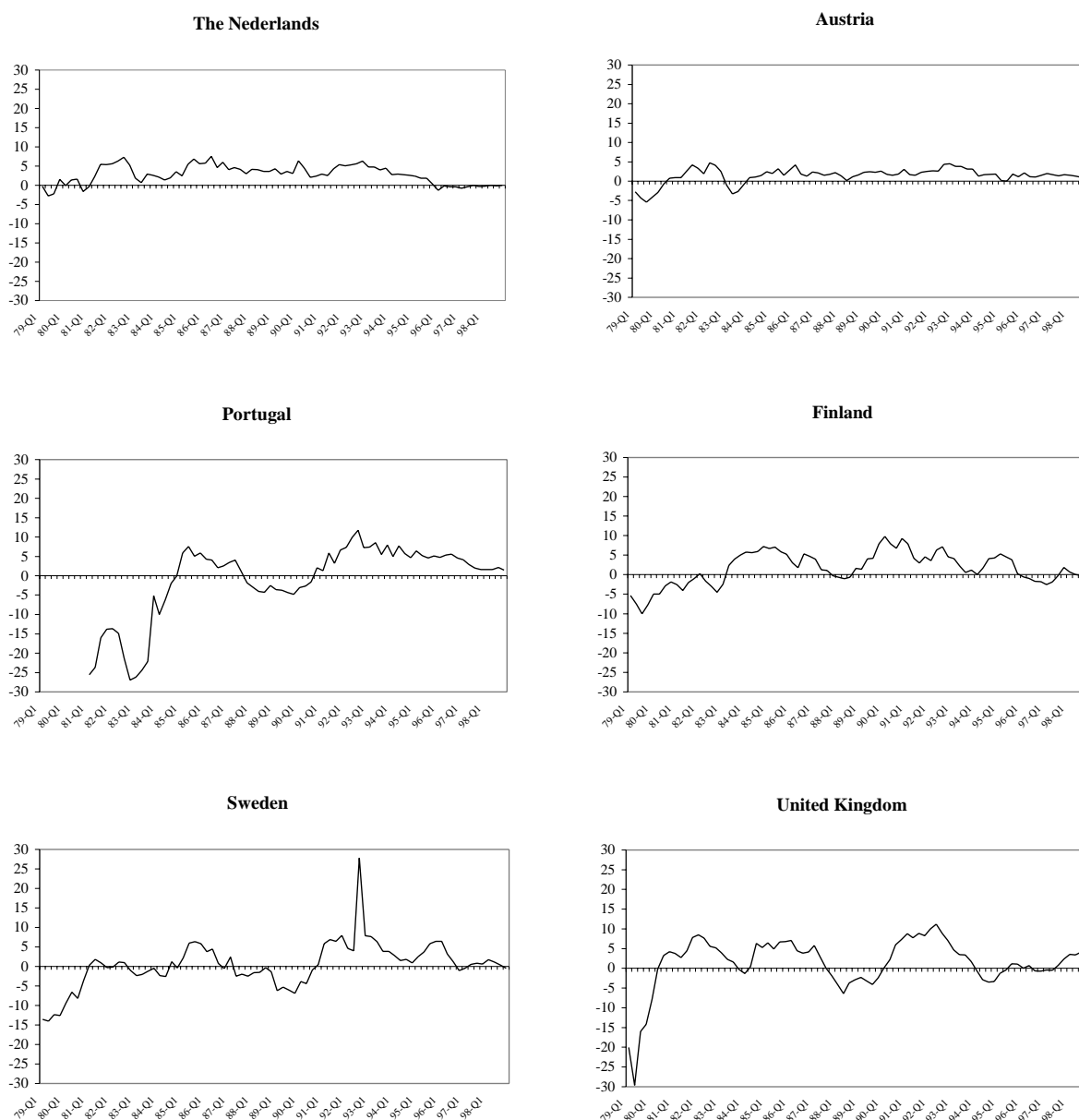**Figure 4: Difference Between Actual and Counterfactual Short Term Interest Rates**

Belgium

Denmark

Spain

France

Ireland

Italy

Figure 4. *(Continued)*

The Nederlands

Austria

Portugal

Finland

Sweden

United Kingdom

5.3.   Policy shocks during the 20 pre-EMU years

Our characterisation of policy behaviour has two basic components. One is the systematic component, which is represented by the part of the rule that describes the elements of inertia and the endogenous response of the policy authority to past (debt) or expected (inflation, output gap) economic variables. The other one is the set of non-systematic actions represented by the random component of the policy rule. So far we have focused on the systematic behaviour of policy. In this section we look at some empirical characteristics of the non-systematic policy actions.

As we argued in sections 3 and 4, and formally reflected in expressions (9), (12), and (13), the random component of our estimated rules is a mixture of sources of variability stemming from (a) errors in forecasting the policy target variables, (b) the imperfect control of the policy process, and (c) true discretionary policy actions. Thus, interpreting this component of the rule as reflecting discretionary policy shocks requires caution. One could argue that the contribution of forecasting errors may be negligible because they are buffered by the high policy inertia and because offsetting effects between errors of different sign may occur. Moreover, we can reasonably assume that shocks arising from an imperfect control of the policy process source may be exceptional and, in any case, exhibit a relatively low variability. Consequently, one could think of the non-systematic component as mainly reflecting genuine discretionary policy actions.

With these caveats in mind, we have used the residuals of estimated policy rules to compute[26] the contemporaneous correlation between monetary and fiscal policy shocks within and across countries. Some of the correlation coefficients are presented in table 5. We have also computed standard deviations of such estimated policy-rule residuals for the whole sample, for the 1980s, and for the 1990s to measure non-systematic variability and its changes over the sample period (Table 6).

Table 5: Correlations across policy shocks [(a)]

| | Within country | Between Germany and each country | |
	Between fiscal and monetary policy shocks.	Fiscal policy shocks	Monetary policy shocks
Belgium	-0.068	-0.050	0.469*
Denmark	0.237	-0.026	0.045
Germany	0.308		
Spain	0.252	-0.092	-0.185
France	0.246	0.050	0.653*
Ireland	-0.103	-0.074	-0.055
Italy	0.055	0.015	-0.058
The Netherlands	-0.336	-0.169	0.621*
Austria	0.247	0.110	0.262
Portugal	0.253	0.204	-0.100
Finland	-0.017	0.018	0.171
Sweden	0.211	0.010	0.113
United Kingdom	0.354	-0.091	0.239

(a) Correlation coefficients based on the residuals from models in tables 1 and 3. Quarterly residuals in the monetary rules have been annualised by taking arithmetic averages over the year.
* Significant at 5%
Critical value at 5% $2\times(17)^{-1/2}=0.49$ for a sample size of 17, and $2\times(20)^{-1/2}=0.45$ for sample sizes of 20.

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[26] Yearly monetary policy residuals have been obtained as averages of quarterly residuals.

Table 6: Standard deviations of policy shocks [a]

	Fiscal			Monetary		
	Whole Sample (79-98)	1980s (79-89)	1990s (90-98)	Whole Sample (79-98)	1980s (79-89)	1990s (90-98)
Belgium	0.952	0.892	1.029	0.377	0.404	0.289
Denmark	1.203	0.991	1.487	0.821	1.053	0.414
Germany	0.795	0.775	0.823	0.282	0.329	0.176
Spain	0.832	0.867	0.833	0.904	1.110	0.540
France	0.472	0.568	0.345	0.433	0.489	0.278
Ireland	1.066	1.084	1.093	1.481	1.207	1.686
Italy	1.039	0.978	1.154	0.425	0.261	0.542
The Netherlands	0.940	0.728	1.132	0.407	0.409	0.187
Austria	0.738	0.496	0.992	0.365	0.443	0.167
Portugal	1.263	1.629	0.849	0.671	0.866	0.468
Finland	0.939	1.209	0.499	0.540	0.614	0.457
Sweden	1.529	1.713	1.313	1.110	0.944	0.933
United Kingdom	0.956	0.906	0.954	0.516	0.569	0.397

(a) Standard deviations based on the residuals from models in tables 1 and 3. Quarterly residuals in the monetary rules have been annualised by taking arithmetic averages over the year.

To the extend that our residuals can be interpreted as mainly representing discretionary policy actions, the following empirical facts regarding non-systematic policy behaviour arise form the tables:

[1] Fiscal and monetary policy shocks are uncorrelated within each country (Table 5).

[2] Fiscal shocks are uncorrelated across countries (Table 5)

[3] Monetary policy shocks are also uncorrelated across countries (Table 5), except for some relatively high correlation not only among countries traditionally included in the former Deutschmark area, particularly Belgium and the Netherlands[27], but also between France and Germany.

[4] Fiscal policy shocks display significantly higher variability than monetary shocks. The exceptions are Ireland, where it is lower, and in Spain and France, where it is similar (Table 6).

[5] Relative to the 1980s, the volatility of monetary policy shocks generally decreased in the 1990s (Italy, Ireland, and Sweden are the exceptions), whereas no clear pattern arises for fiscal shocks between both sub-periods (Table 6).

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[27] Pairwise correlation between other countries of the former Deutschmark enlarged with France, such as Belgium-Austria or France-Netherlands, are also statistically significant. Overall, correlation coefficients between Belgium, Germany, France, Netherlands and Austria tend to be relatively high, compared with the rest of the simple correlation coefficients in the panel. Full results are available on request from the authors.

These facts signal two characteristics of the non-systematic component of economic policy during the pre-EMU period that deserve to be emphasised. First, [1] to [3] suggest that co-ordination of fiscal and monetary policy measures was absent, both within and across countries. Thus, each policy seems to have acted as an independent stabiliser and as a potential source of asymmetric macroeconomic variability. Second, while it is probably true that [5] is explained by the policy constraints imposed during the 90s by the Maastricht criteria for participation in the third stage of EMU[28], [4] suggests that, over the sample period, non-systematic actions have been taken much more frequently by fiscal authorities than by the central banks.

As we argue below, EMU might bring a policy shift by introducing effective constraints to the variability of non-systematic fiscal policy, which seems to have been the most active independent discretionary policy tool in the pre-EMU period.

6. TO WHAT EXTENT IS THE EMU MACRO POLICY FRAMEWORK "NEW"?

The macroeconomic institutional architecture of EMU has two basic pieces. On the one side, a single independent central bank, the ECB, is in charge of conducting monetary policy with the strong mandate of preserving price stability, explicitly defined as an inflation rate below 2% over the medium term. On the other side, the Stability and Growth Pact (SGP) constraints the behaviour of the various independent national governments in conducting fiscal policy. The SGP calls for 'close to balance or in surplus' medium term budgetary positions, and requires that, leaving aside exceptional circumstances, national budget deficits never go above the explicit upper limit of 3% of GDP. The SGP is a guarantee for sound public finances in EMU, which provides a fiscal environment in which the ECB can effectively preserve price stability.

The usual way to refer to this institutional macroeconomic architecture is to say that it represents a unique historical development that brings a genuine policy regime change for macroeconomic policy. There is a question to ask to what extent the empirical evidence presented here is consistent with this interpretation of the institutional setting of EMU. In a first approximation, we would say that the change might be more apparent than real. In any case, on the basis of the results presented here, the policy shift seems less drastic than anticipated at the outset of stage 3 of EMU.

Indeed, such assertions need additional explanations and some qualifications. It may be useful to start by redefining the institutional setting of EMU in terms of the policy-rule framework applied in this paper.

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[28] In particular, interest rates convergence.

With regard to monetary policy, the ECB mandate calls for an effective counteraction against inflationary pressures. This implies that when the ECB expects inflation to deviate from target it must adjust its target policy instrument (the nominal interest rate) strongly enough to affect the real interest rate in the appropriate direction. Therefore, according to section 5.2, we can say that the ECB pursues an *"active"* monetary policy. As for fiscal policy, the SGP objective is that fiscal discipline prevails or, in other words, that governments guarantee their own solvency. The close-to-balance-or-in-surplus clause, albeit not necessary, is a sufficient condition to keep the stock of debt under control in the medium run. Applying again the conceptual framework of section 5.2, the Stability and Growth Pact calls for fiscal policy to be *"passive"* in Member States. As we have pointed out, the combination of an active monetary policy and a passive fiscal policy identifies a *"monetary dominance"* policy regime, which therefore provides an accurate description of the EMU regime. Interestingly, this is precisely the regime that we claim has prevailed during the 20 pre-EMU years. Since in both cases the system of fiscal and monetary rules can be classified as monetary dominance, pre-EMU and EMU policy regimes seem to be alike. This suggests that the key characteristics of the systematic component of macroeconomic policy in EMU may not be different from what they used to be.

Although fiscal solvency seems to be guaranteed in both regimes, there is a clear difference as regards the way solvency is ensured. While the SGP puts a brake to debt accumulation by explicitly limiting the variability of the deficit, the rules applied by fiscal authorities in the past basically relied on the systematic responses to debt accumulation. Where fiscal behaviour under EMU is concerned, this can make a significant difference. On the basis of historical series of total deficits in the different Member States, pre-EMU fiscal behaviour seems to be in conflict with the two requirements of the Pact. Pre-EMU fiscal behaviour cannot be characterised as ensuring close-to-balance positions in the medium term, while deficits above 3% have not been unusual.

But how will EMU affect fiscal behaviour? The answer does not seem straightforward. The reason is that the two requirements of the SGP are compatible with a wide range of "passive" fiscal rules. However, we can take our pre-EMU fiscal specification as the benchmark for comparison and look at what type of modifications could make it compatible with the requirements of the Pact. In this sense, one should bear in mind that, according to our results, the estimated fiscal reaction (primary surplus adjustments) to the output gap basically represents the response associated with automatic stabilisation. This seems to be consistent with the spirit of the Pact, which implicitly favours the use of automatic stabilisers in order to maintain close-to-balance positions in the medium term. Therefore,

we can rather safely consider that the output gap component of systematic fiscal policy will not change significantly in EMU[29].

This leaves us with potential for modification in two other elements of fiscal behaviour: The response to the stock of debt and the variability of fiscal policy shocks. A likely scenario is that the SGP forces a modification of both elements. A stronger response to debt will accelerate the consolidation efforts needed during the transition period to a close-to-balance position. At the same time, a reduction in the variability of, according to pre-EMU evidence, the most volatile non-systematic policy tool may be needed in order to respect the 3% constraint during the transition to a close-to-balance position. Once this position is reached, the variability of fiscal-policy shocks should remain lower than in the pre-EMU period if a strict interpretation of the Pact calling for just automatic stabilisation and no discretionary actions prevails. Yet, a larger response to the stock of debt would certainly shift the historical rule, but still leave the economy in an MD regime. Therefore, as mentioned above, there will be no policy shift in the context of the conceptual setting o section 5.2.

With regard to fiscal shocks, a reduction of their volatility will imply a change in the variance of the non-systematic component of fiscal policy. However, as Leeper and Zha (2001b) point out, where policy analyses are concerned, the relevance of a change in the variance of the random component of policy depends on the extend to which anticipated or unanticipated changes are important for macroeconomic variability. If, as New Keynesian macroeconomics suggests, anticipated policy changes are a main source of macroeconomic variability, a change in the properties of the unanticipated component of policy may be largely irrelevant. Thus, even if it were permanent, a reduction in the variance of the non-systematic component of fiscal policy brought by EMU may turn out to be a policy shift of minor importance[30].

7. CONCLUDING REMARKS

An interesting question in connection with EMU is to what extent we can rely on pre-EMU macroeconomic variability to analyse EMU macroeconomic interactions. We tackle this question by assessing the evidence of a policy shift between the pre-EMU and EMU periods.

We have carried out such an assessment in two steps. First we have characterised policy behaviour during the 20 pre-EMU years through the estimation and analysis of forward-looking fiscal and monetary policy rules for EU countries. Then we have asked whether the resulting rules and the

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[29] Indeed, we assume no EMU-induced changes in the size of automatic stabilisers.

[30] We should stress that our focus here is on the relevance of the shift for macroeconomic analysis. A different matter is the political feasibility of the reduction in variance and so of the fiscal architecture of EMU.

policy regime they identify are different from the ones brought by the EMU policy framework. Our conclusion is that the pre-EMU and EMU policy regimes look similar. Although the fiscal response to the stock of debt might be larger in EMU than it was in the pre-EMU period, one should not expect significant changes in the output gap component of systematic fiscal policy. All in all, the EMU economic-policy setting will still be characterised as a monetary dominance regime. However, a potential source of policy shift may be the reduction of the variability in the random component of fiscal policy imposed by the Stability and Growth Pact. This shift might be temporary or, if permanent, of relatively less importance for macroeconomic analysis.

In addition, several by-products follow from our analysis:

1. Our results support the empirical relevance of the simple forward-looking rules that we have considered, in the sense that they provide a reasonable description of actual policy behaviour. In particular:

   • The fiscal rule characterises governments as generally reactive to debt accumulation and applying a counter-cyclical fiscal policy.

   • As for the monetary rule, it reproduces for our extended sample period and panel of EU countries the overall results obtained in previous literature for the major economies.

   • The leading role of Germany in the setting of European monetary policy during the 80s and 90s has been corroborated.

   • In addition, we find that the counter-cyclical activity of monetary policy looks stronger than previously reported.

   • In connection with the two pillar strategy of the ECB, we present a piece of evidence suggesting that money may legitimately belong to the second pillar, but its relative informational content may not justify the existence of a first pillar.

2. In the light of the holistic view to macroeconomic policy analysis provided by the recently proposed Fiscal Theory of the Price level (FTPL), we look jointly at the estimated fiscal and monetary policy rules as a test to identify the policy regime prevalent during the pre-EMU period. We claim that evidence can be reasonably interpreted as pointing to a "monetary dominance" regime.

3. Finally, our results regarding non-systematic policy suggest that co-ordination has been absent at the level of discretionary shocks. While monetary and fiscal variability seem uncorrelated both

within and across[31] countries, non-systematic fiscal policy appears as a more active policy tool than non-systematic monetary policy.

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[31] Except for the monetary correlation coefficients among the former Deutschmark area countries and France.

STATISTICAL ANNEX

1. LIST OF COUNTRIES

Our panel of countries includes 13 EU Member States (Belgium, Denmark, Germany, Spain, France, Ireland, Italy, the Netherlands, Austria, Portugal, Finland, Sweden and the UK). Greece and Luxembourg have been excluded because of the lack of data.

2. LIST OF VARIABLES AND INSTRUMENTS

2.1. List of policy instruments

The **nominal interest rate**, which is the policy instrument in the monetary rule, is a quarterly money market rate (3-month) in percentage points taken from the IMF (IFS). The plots of the series can be found in figure 2.

The **annual primary surplus**, the policy instrument in the fiscal rule, has been obtained from AMECO (a Commission, DG ECFIN, macroeconomic databank) and is expressed as a percentage of GDP. The graphs for these series are in figure 1. The **cyclically-adjusted primary surplus** (from the same source) has been used in the estimation of the discretionary fiscal policy responses to debt and output gap.

2.2. List of policy targets

The **inflation rate**, a policy target in the monetary rule, has been calculated as quarter-on-quarter annual growth rates of the quarterly consumer price index taken from the OECD (MEI). The graphs for these series are presented in figure A1 at the end of the paper.

The **output gap**, which enters both monetary and fiscal rules, has been obtained on the basis of the quarterly series of the industrial production index taken from the IMF (IFS). Such raw series have been de-trended by using the H-P filter ($\lambda=1200$) over the sample period 1968Q1 to 2000Q4, common to all the countries, in order to reduce as much as possible the end-point bias (only the period 1979Q1-1998Q4 has been included in the sample period). The **quarterly output gap** has been calculated as the difference between the actual and de-trended series, expressed in percentage points of the de-trended levels. The series are included in figure A2. In the case of fiscal rules, the **annual output gap** has been calculated by first annualising the quarterly series of the industrial production index and then applying the H-P ($\lambda=100$) over the period 1968-2000. The annual output gap is also expressed as a percentage of the de-trended levels. The resulting series can be seen in figure A3.

The annual **government stock of debt**, a policy target in the fiscal rule, has been obtained from AMECO (DG ECFIN) and is expressed as a percentage of GDP. Since AMECO provides the series of debt calculated at the end of the year, the series enter the fiscal rule with a lag. Figure A4 shows the series used in this paper.

2.3. List of instrumental variables

The real exchange rate has been included in the set of instrumental variables for the monetary rule as the quarter-on-quarter annual percentage change of the **quarterly real exchange rate index** taken from the Commission Services (DG ECFIN). The same series annualised as arithmetic averages within the natural year have been used to calculate year-on-year percentage changes in **the annual real exchange rate**.

The international commodity-price inflation rate has been included in the set of instrumental variables for the monetary rule as the quarter-on-quarter annual percentage change of the **quarterly international commodity-price** index taken from the Commodity Research Bureau (CRB). The same series annualised as arithmetic averages within the natural year have been used to calculate year-on-year percentage changes in the **annual international commodity-price**. The series are common to all the countries.

The monetary growth rate has been included in the set of instrumental variables for the monetary rule as the quarter-on-quarter annual percentage change of the **quarterly M3 index** taken from Eurostat for Belgium, Germany, France, Ireland, and Spain, and from the OECD (MEI) for Denmark, and Sweden. The same series annualised as arithmetic averages within the natural year have been used to calculate year-on-year percentage changes in the **annual M3 index**. The original raw M3 indices are not available at all, or the series are too short, in Italy, the Netherlands, Austria, Portugal, Finland and the UK.

The **nominal interest rate** series annualised taking arithmetic averages within natural years have been used as instrumental variable for the fiscal rules.

3. ESTIMATION

Models in Tables 1 to 3 have been estimated with the GMM routine of TSP (non-linear estimation). Standard errors have been calculated using a heteroskedastic (robust White) and autocorrelation consistent covariance matrix (Barlett –see Newey and West, 1987) over the sample period, which is 1979Q1-1998Q4 for the monetary rule and 1979-1998 for the fiscal rule. As shown in Tables 1 to 3, the exceptions to these sample sizes are, for the fiscal rule,

Portugal (the annual interest rate is only available since1981), and, for the monetary rule, Belgium (quarterly money growth rates are only available since 1981Q1), Ireland (quarterly money growth rates are only available since 1979Q1)[32], and Portugal (the quarterly interest rates are only available since 1981Q1).

Several dummy variables have been included:

3.1. Fiscal rule

Germany: A dummy with value 1 between 1990 and 1994 was included to improve the explanatory power of the model. The estimated coefficient in the equation of the primary balance was –1.79 (standard error: 0.95), with a p-value of 6%. In the case of the cyclically-adjusted primary balance, the estimate was –2.91, clearly significant with a standard error of 1.03.

France: A dummy with value 1 between 1992 and 1995 was included to improve the explanatory power of the model. The estimated coefficient in the equation of the primary balance was –1.86 (standard error: 0.27), significant at 5%. In the case of the cyclically-adjusted primary balance, the estimate was –2.61 (0.25), significant at 5%.

Portugal: A dummy with value 1 between 1983 and 1987 was included to alleviate the pervasive effects of odd values of the output gap on the explanatory power of the model. The estimated coefficient in the equation of the primary balance was –1.34 (standard error: 0.50), significant at 5%. In the case of the cyclically-adjusted primary balance, the estimate was 0.25, clearly non-significant with and standard error of 0.45.

3.2. Monetary rule

Ireland: A dummy taking value 1 between 1992Q4 and 1993Q1 was included to deal with the effects of the disturbances of the EMS crisis on the Irish interest rate. The estimated coefficient was 22.4 (standard error: 6.68), significant at 5%.

Portugal: A dummy taking value 1 between 1983Q1 and 1987Q4 was included to alleviate the pervasive effects of odd values of the output gap on the explanatory power of the model. The estimated coefficient was 5.57 (standard error: 1.41), significant at 5%.

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[32] This represents a lost of 4 observations when introducing lags in this variable

Sweden: A dummy taking value 1 in 1992Q3 was included to control for the effects of the disturbances of the EMS crisis on the Swedish interest rate. The estimated coefficient was 47.4 (standard error: 9.61), significant at 5%.

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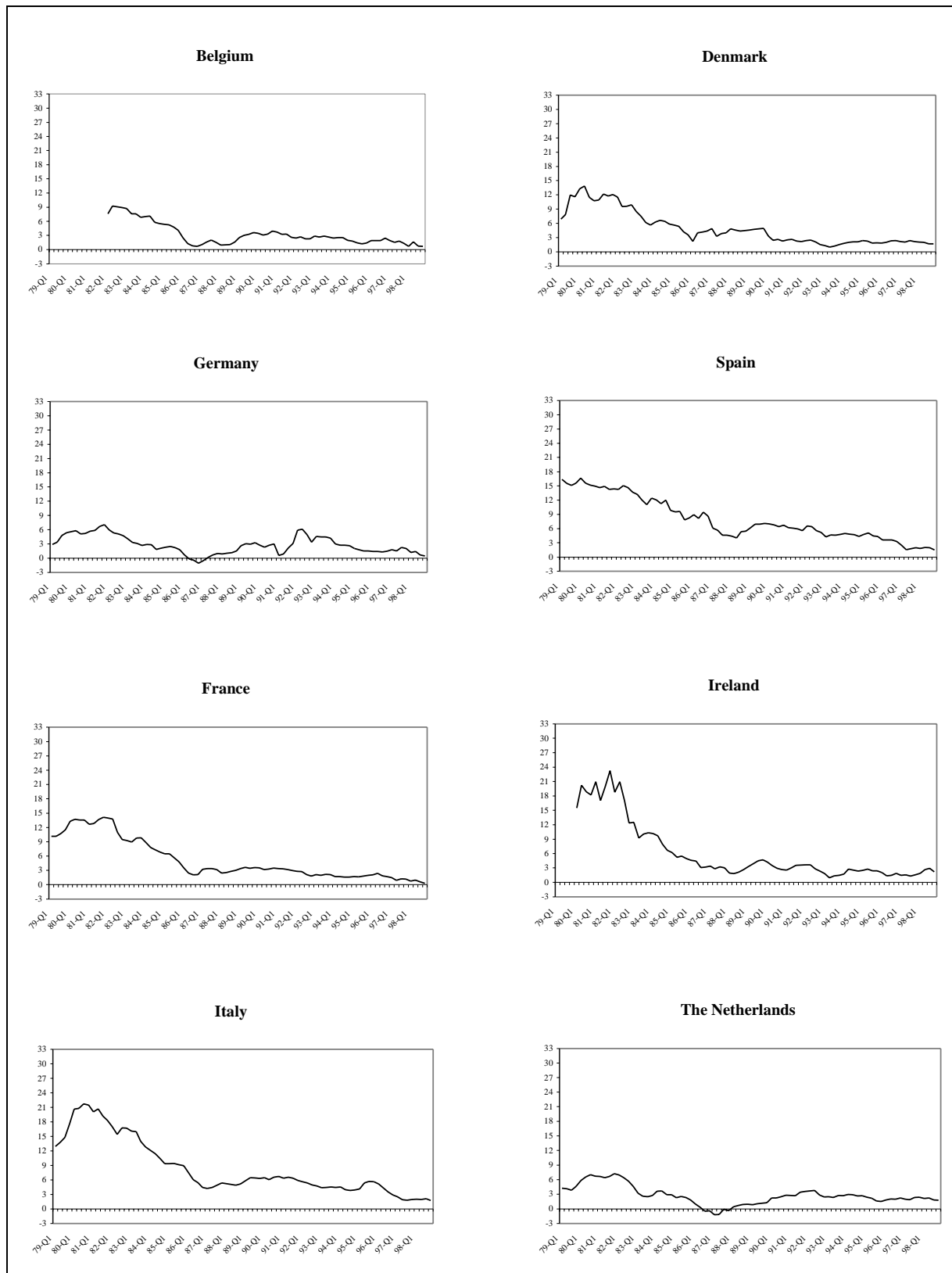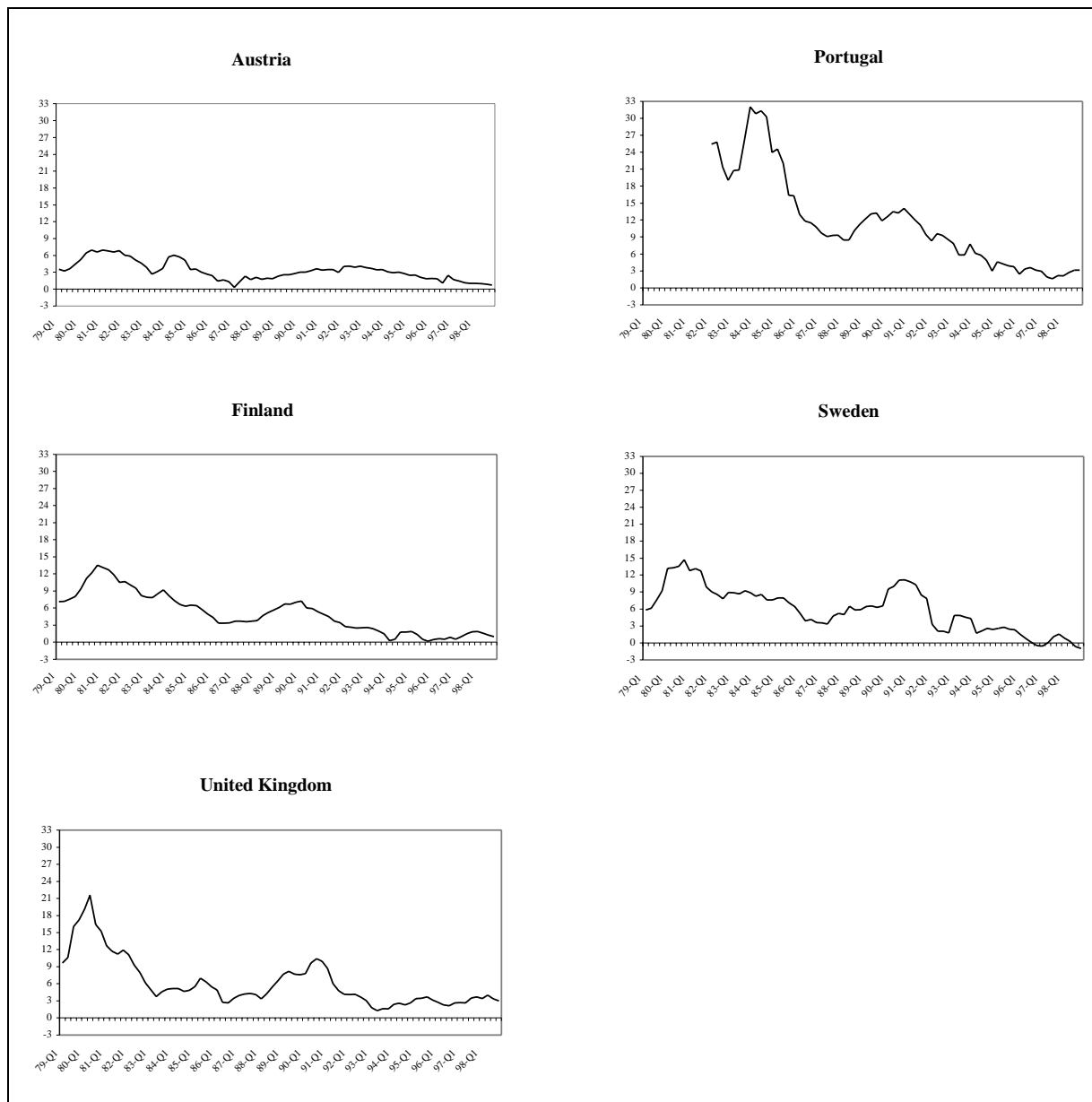**Figure A1: Quarterly inflation rate**
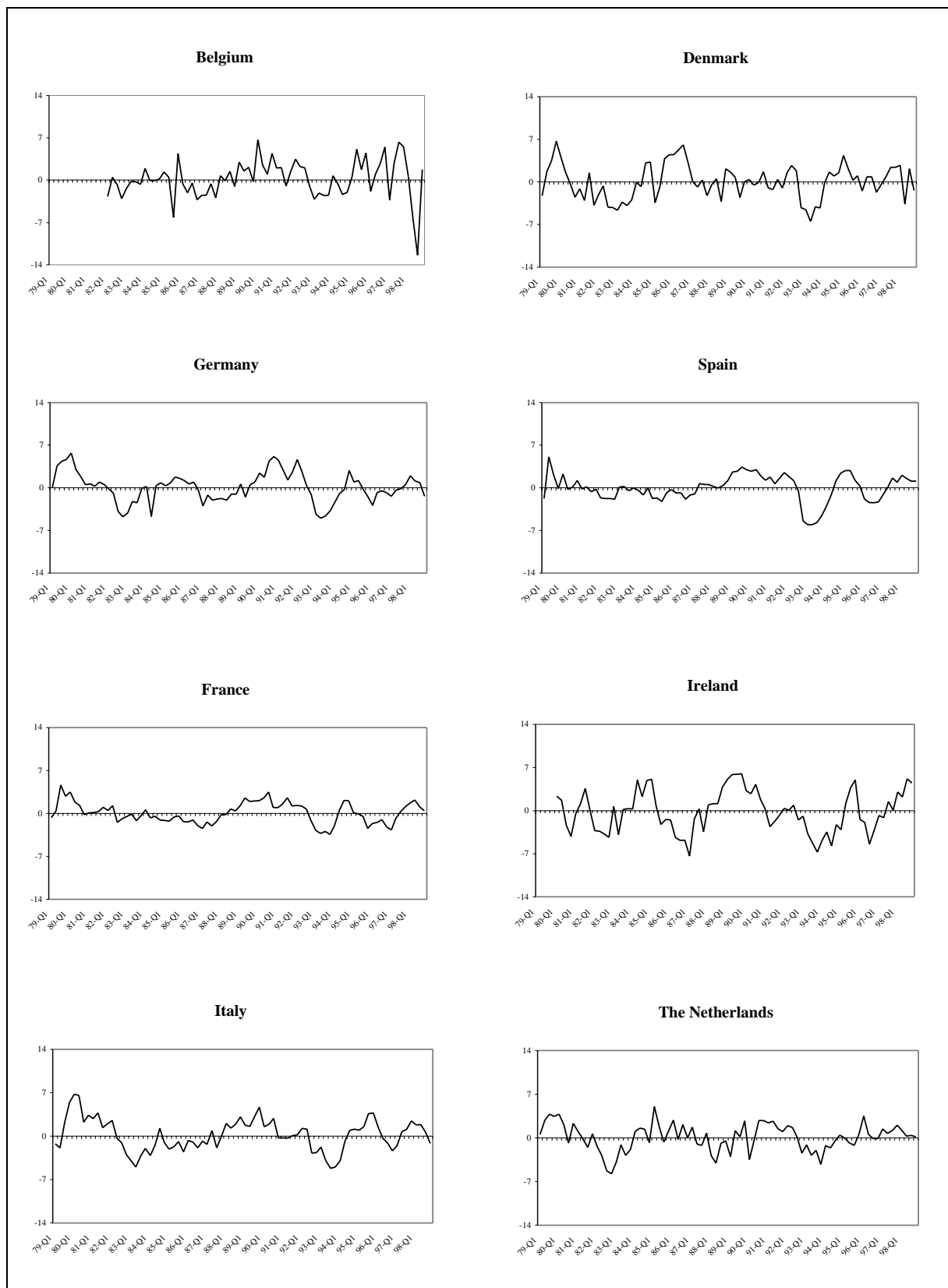
Figure A1 *(Continued)*

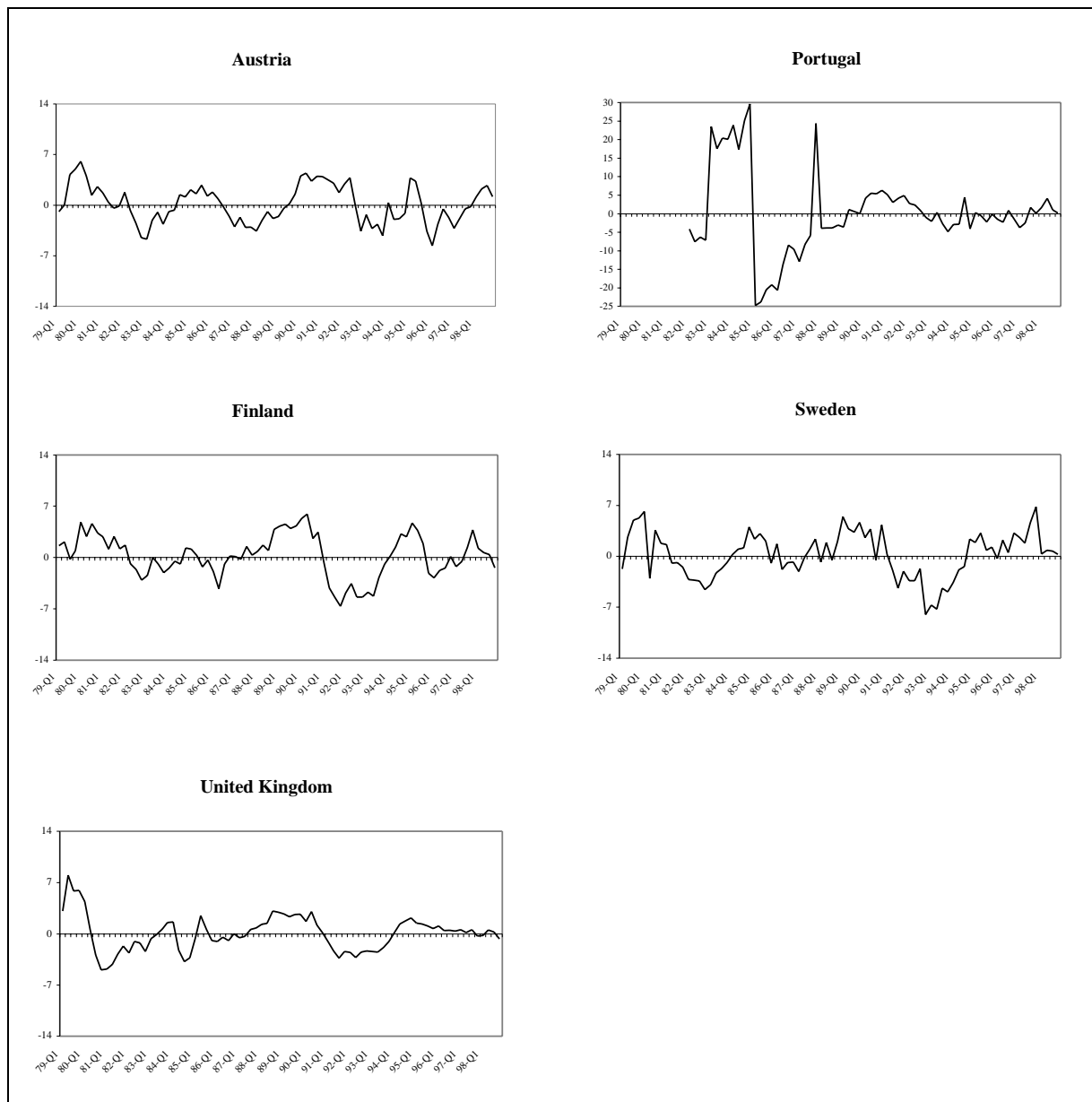**Figure A2: Quarterly output gap**

Figure A2 *(continued)*

Austria

Portugal

Finland

Sweden

United Kingdom

Figure A3: Annual output gap

Figure A3 *(continued)*
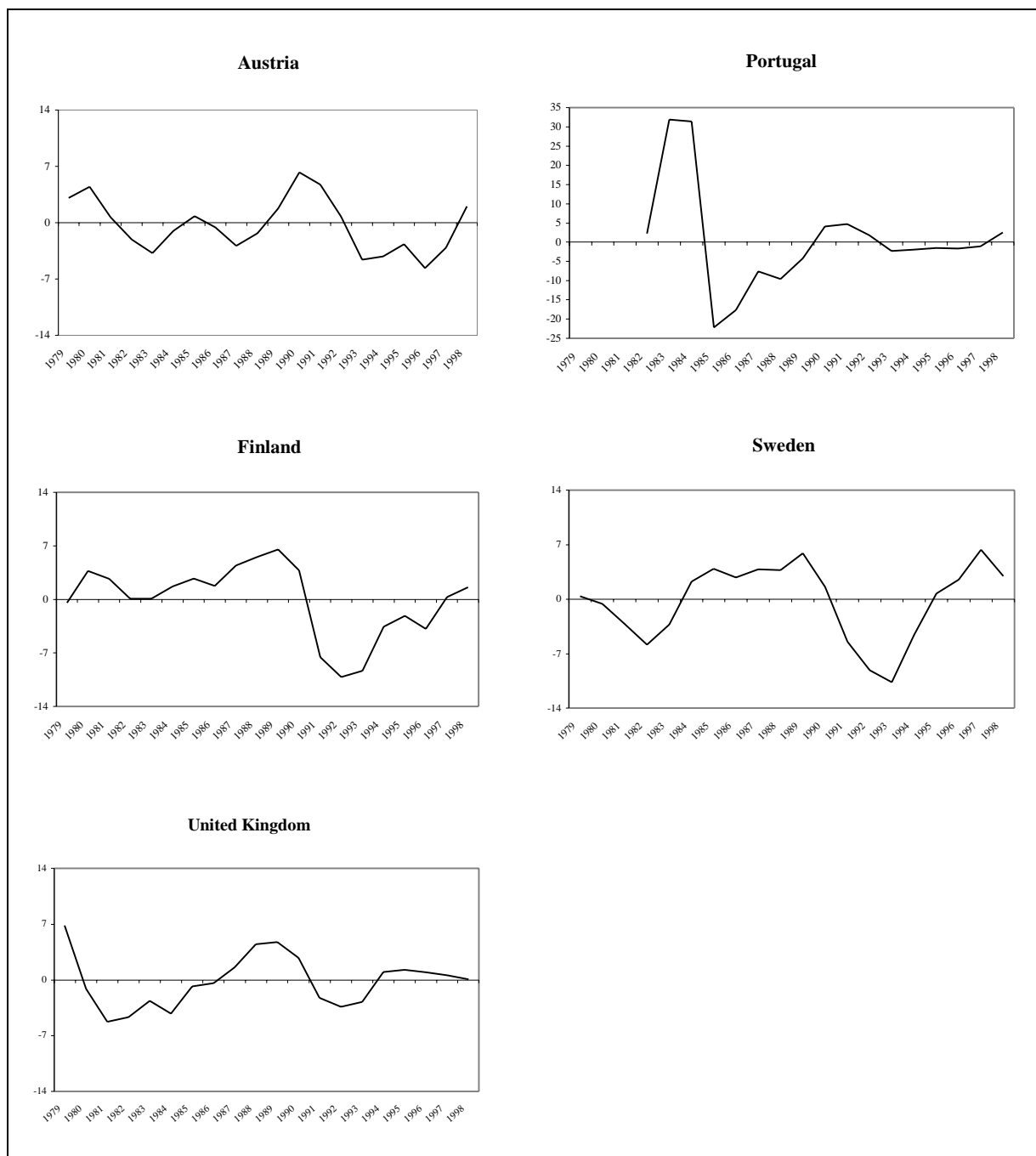

Austria

Portugal

Finland

Sweden

United Kingdom
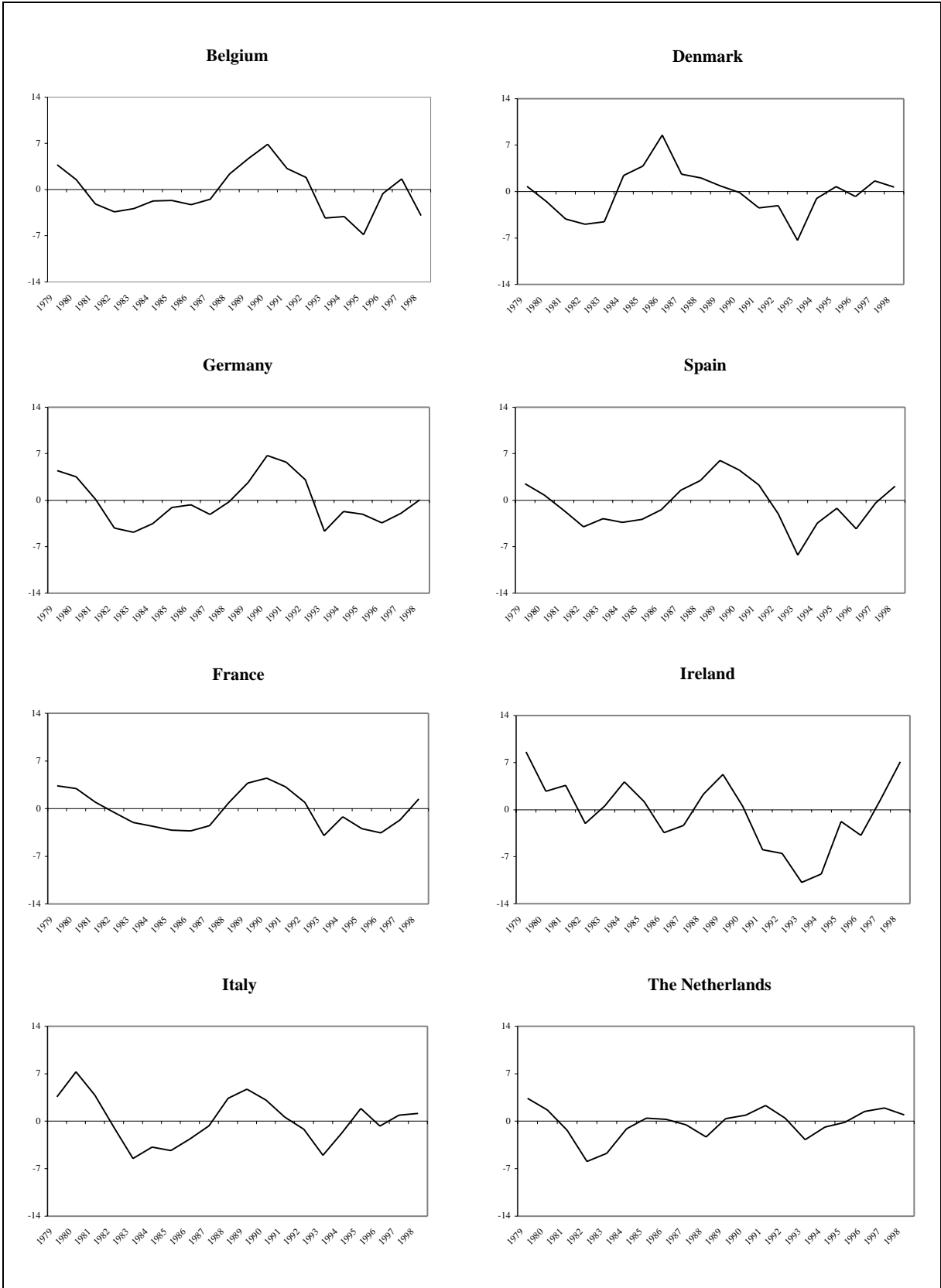
Figure A4: Public Debt as a Percentage of GDP.

51

Figure A4 *(Continued)*

Austria

Portugal

Finland

Sweden

United Kingdom