Chapter 1

Euro Area Macroeconomic Outlook and Forecasts

Annex B

1. Introduction

In this paper we compare alternative procedures for forecasting fiscal variables for the largest countries in the Euro area. An important motivation for this exercise comes from the recognition that fiscal forecasts are playing an increasing role in macroeconomic policy decisions. This has been particularly obvious in the European context where, for example, the operating procedures of the Stability and Growth Pact involve reference to forecast values of the fiscal deficit and debt at more than one point.

We consider five different types of forecasts. First, standard ARMA model based forecasts, which perform quite well for several European macroeconomic variables, both on a country by country basis and at the euro area aggregate level, see e.g. Marcellino (2002a, 2002b) and Banerjee, Marcellino and Masten (2003). Also, Artis and Marcellino (2001) found that even simple random walk forecasts sometimes outperform the leading international organizations such as the IMF, the EC or the OECD.

Second, VAR based forecasts, since VARs have been often used to model fiscal variables and their interaction with other macroeconomic variables, see e.g. Blanchard and Perotti (200?) for the US, Perotti (200?) for some OECD countries, and Marcellino (2002c) for the largest countries in the Euro area.

Third, forecasts from small scale structural models containing three types of variables: macroeconomic indicators, fiscal policy indicators and monetary policy indicators. We consider both national models, along the lines of Favero (2002) who used similar models to study the interaction between fiscal and monetary authorities, and a larger euro area model, where the national models are linked up together to take into account the implications of the convergence process started by the adoption of the single currency, and in particular the presence of a single monetary policy with different fiscal policies.

Fourth, pooled forecasts obtained by taking either the mean or the median of the previous three types of forecasts. Since the pioneering work of Bates and Granger (196?) pooling has been found to be useful in improving the forecasting accuracy, see e.g. Clements and Hendry (2002) for possible reasons underlying this result. Recent papers highlighting the good performance of pooling for forecasting macroeconomic variables include Stock and Watson (1999) for the US and Marcellino (2002d) for the Euro area. Stock and Watson (2002) find that the simple average or median of the single forecasts perform well compared with more sophisticated pooling procedures.

Finally, we consider the OECD forecasts, as published in the World Economic Outlook. The forecasts in question are not directly derived from formal macroeconometric models but emerge from the iterative interplay between partial formal modelling, committee iteration and judgmental discretion.

Besides four key fiscal variables, i.e. government expenditures and receipts, the deficit and the government debt, we also consider forecasting the output gap, inflation and a short term interest rate, since these are important variables to determine the evolution of the fiscal aggregates. All data are semi-annual and are extracted from the OECD dataset, with details provided below. We report results for one-step and two-step ahead forecasts, that can be used to derive current year and year ahead forecasts. We also summarize the findings for four-step ahead forecasts to evaluate whether the gains from structural models increase with the forecast horizon. Longer horizons are not worth evaluating because of the substantial uncertainty surrounding the forecasts and the large biases that emerge.

We can anticipate some of the main results we obtain. First, for the macroeconomic variables the ARMA forecasts are often the best, with a slightly worse performance at the longer horizon. Second, for the fiscal variables the time-series forecasts in general are the most accurate at the shorter horizon, while more mixed results are obtained at the longer horizon. Third, the good performance of the random walk forecasts mentioned before emerges also from our analysis, though in general it is possible to find a model that outperforms the random walk. Fourth, in general the structural models do not yield any substantial forecasting gains, and a similar result holds for the OECD forecasts at the shortest horizon. This finding is likely due to the fact that our models are not fine-tuned for forecasting, but it is yet another indication that simple time series models or pooling often yield the best forecasts. Finally, substantial uncertainty surrounds the forecasts, so that the competing forecasts are seldom statistically different, and the size of the average forecast error for the fiscal balance, perhaps the most interesting fiscal variable from the policy point of view, is rather large.

The structure of the paper is the following. In section 2 we briefly describe the dataset. In section 3 we discuss the different forecasting methods we adopt. In section 4 we present the results. In section 5 we summarize and conclude.

2. Data

We focus on the four largest countries of the Euro area, namely, Germany, France, Italy and Spain. For each country we consider seven variables: the output gap; the CPI inflation rate; a monetary policy indicator (a money market rate); primary government deficits, also decomposed into revenues and expenditures; and total government debt. The fiscal variables are expressed as ratios to GDP.

The data source is the OECD and the frequency is half-yearly. This choice contrasts with the standard adoption of monthly or quarterly data for the analysis of macroeconomic variables. It is dictated first by data availability, and second by the fact that in most countries the major fiscal decisions are taken once a year, and possibly revised once. Perotti (2002) constructs a quarterly dataset, but Germany is the only country within the Euro area for which such data are available.

For all countries the sample under analysis is 1981:1-2001:2, as in Marcellino (2002c). Though for some countries longer series are available, both Favero (2002) and Perotti (2002) found a clear indication of different behaviour of fiscal and monetary policy policy after the ‘70s, which suggests to focus on the most recent period.

The variables are graphed in Figure 1. There is a substantial co-movement of the business cycles of France, Germany, Spain and Italy, in line with the more detailed analysis in Artis, Marcellino and Proietti (2003). The convergence process in inflation and interest rates is also evident. Both features of the series should be taken into consideration in the model specification stage. Figure 1 also shows the working of the Maastricht Treaty in reducing the fiscal deficit and the government debt in all the four countries, a reduction that appears to be due more to expenditure cuts than to tax increases.

The figure does not highlight a non-stationary behaviour for the variables, possibly with the exception of the debt to GDP ratio. Since there are strong economic reasons to assume that all the seven variables are stationary, we will proceed under this assumption even though the outcome of

ADF unit root tests is mixed, likely due to the low power of these tests in samples as short as our (42 observations).

3. Forecasting models

We now describe the four different types of forecasts we construct, namely, ARMA, VAR, Simultaneous Equation Model (SEM), and pooled, focusing more on the SEM since it is the most original method. All models are specified using the full sample available, which is rather short (42 observations) so that recursive modelling is not suited.

For the specification of the ARMA models we start with an ARMA(2,2) for each variable and country, and select the combination of AR and MA length that minimizes the BIC. The resulting models are summarized in Table 1. Overall the fit is good, though this does not represent a reliable indication for forecasting, with lower values in the case of Germany. It is also interesting to point out the similarity of the models for Italy and Spain, and the fact that an MA component is always included in the model for inflation. In the subsequent analysis, following standard practice, we will also include a random walk based forecast.

For the (seven variable) VAR models, we can only include one or two lags because of the degrees of freedom constraint. Rather than selecting the lag length with an information criterion, we compute forecasts for both cases, which also allows to compare the performance of the same model for each country and variable.

About the SEM, it is useful to distinguish between national models and the "euro area" model. The general specification of the national models follows Favero (2002) and is sketched below, with j indexing the countries, more details are provided in the Appendix.

$$\pi_t^j = c_1\pi_{t-1}^j + c_2 y_{t-1}^j + u_{1t}^{NP,j} \tag{1}$$

$$y_t^j = c_3 + c_4 y_{t-1}^j + c_5\pi_{t-1}^j + c_6 i_{t-1}^j + c_7 g_{t-1}^j + c_8\tau_{t-1}^j + c y_{t-1}^{US} + u_{2t}^{NP,j} \tag{2}$$

$$i_t^j = c_{10} + c_{11} i_{t-1}^j + c_{12}\pi_t^j + c_{13} y_t^j + c_{14} i_t^{GER} + u_3^{M,j} \tag{3}$$

$$\begin{aligned} g_t^j = {} & c_{17} + c_{18} g_{t-1}^j + c_{19} y_t^j + c_{20} y_{t-1}^j + \frac{c_{21}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\ & + c_{22}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{5t}^{g,j} \end{aligned} \tag{4}$$

$$\begin{aligned} \tau_t^j = {} & c_{23} + c_{24}\tau_{t-1}^j + c_{25} y_t^j + c_{26} y_{t-1}^j + \frac{c_{27}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\ & + c_{28}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{6t}^{\tau,j} \end{aligned} \tag{5}$$

The notation is as follows. π is annual inflation of the GDP deflator; y is the output gap, i.e., the percentage difference between output and potential output as measured by the OECD, i is the monetary policy rate; avc is the average cost of debt, i.e., the ratio of interest payment on government debt to GDP; g is the ratio of government expenditure to GDP; τ is the ratio of government revenue to GDP; DY is the ratio of government debt to GDP; and Δx is real annual GDP growth.

Equations (1) and (2) represent aggregate supply and demand. The specification is similar to the one adopted in the recent strand of the empirical macroeconometric literature based on small scale models, see e.g. Rudebusch and Svensson (1999), Clarida, Gali and Gertler (2000). In the demand equation we introduce lagged government expenditures and revenues, to take into account the delays in the effects of fiscal policy and allow for a different elasticity of output to the two fiscal components. Demand can be also influenced by he corresponding US variables, and by the interest rate, possibly in real terms.

From the estimated models reported in the Appendix, in all countries the output gap enters with the proper sign into the specification of the aggregate demand (Phillips curve) equation, but it is significant only for France and Spain. Fiscal and monetary policy appear to have a limited effect on the evolution of the output gap in all countries, with often a negative coefficient for public expenditures. Instead, in all countries the output gap reacts positively and significantly to the US gap.

Equation (3) is a monetary reaction function, in line with a Taylor-rule type of specification. It can be derived as the solution of the optimization problem of a central bank that has a quadratic objective function in the deviation of inflation from target, the output gap, and volatility in the policy rates, see e.g. Favero and Rovelli (2002). The inclusion of the German interest rate in the equation for the other countries captures the anchor role of Germany over this sample period, see e.g. Clarida, Gali and Gertler (1998).

From the Appendix, both inflation and the output gap have the proper sign and are significant for Germany, the output gap seems to matter less for the other countries (likely due to the overall marked decline of inflation over our sample period), while the German interest rate exerts an important role. To evaluate whether the monetary authority reacts to fiscal policy we have also included the government deficit and/or debt in the specification, but they were never statistically significant.

The evolution of government expenditures and receipts is determined by equations (4) and (5). The specification of these equations follows Bohn (1988), who allows for a smooth reaction of primary deficits to the output gap and to the debt to GDP ratio. Yet, we prefer to separately model the components of the primary balance since they separately enter the demand function. Moreover, our specification allows for a time-varying reaction of the primary deficit (and its components) to the debt to GDP ratio, which depends on the nominal rate of growth of output and the average cost of debt.

From the Appendix, in all countries there is substantial inertia in public expenditures, and they also increase in the presence of negative output gaps, but virtually without any long run effects. Taxes are also persistent, the effects of the output gap are minor (the output level matters more), while taxes increase significantly with the cost of public debt.

The model includes an equation for the evolution of the average cost of debt,

$$avc_t^j = c_{15} avc_{t-1}^j + c_{16} i_t^j + u_{4t}^{NP,j} \tag{6}$$

and for dynamic simulation purposes it is closed by the two equations below, describing the evolution of the debt to GDP ratio and the relationship between real GDP growth and the output gap.

$$DY_t^j = DY_{t-1}^j + \frac{avc_t^j - \Delta x_t^j - \pi_t^j}{\left(1 + \Delta x_t^j + \pi_t^j\right)} DY_{t-1}^j + \left(g_t^j - \tau_t^j\right) \qquad (7)$$

$$\Delta x_t^j = c_{29} + c_{30} y_t^j \qquad (8)$$

The parsimonious specification of the national models reflects the limited number of degrees of freedom. Though more complex dynamics or cross variable relationships might exist, they can be hardly detected and accurately estimated with such a short sample. On the other hand, the estimated equations (using SUR), reported in the Appendix, in general provide a good fit and do not present heavy signals of misspecification. Moreover, parsimony is usually a benefit when forecasting is the goal of the analysis, as in our case. Similarly, the use of dummy variables could further improve the fit and diagnostic tests of the model, but it could deteriorate the forecasting performance of the model by making its specification too much sample dependent.

Since forecasting is our goal, we are also not interested in investigating whether the backward looking structure of the model is genuine or whether it is the reduced form of a forward looking model. Instead, it can be interesting to evaluate the dynamic behaviour of the model in equations (1)-(8) when all shocks are set to zero. The short run behaviour is of particular relevance for our short term forecasting exercise, but the long run behaviour is also important to evaluate the soundness of the economic hypothesis we made in specifying the model.

The dynamic behaviour of the national models is summarized in Figure 2, and overall it is quite satisfactory. The gap, inflation and interest rate tend to move together across countries. There are some differences in the long run values but stochastic simulations of the model have shown that these differences are not statistically significant. Actually, as expected, the standard errors around the point estimates tend to be quite large at the long horizon. About the fiscal variables, the expenditure and receipt ratios do not show any marked dynamics, while the government balance fluctuates in the range [-2.5%,0] and the debt ratio converges to values below 60%. The latter is an important finding since it indicates that we do not need to impose any restrictions on the model to guarantee that the Maastricht criteria are satisfied.

We can now discuss the euro area model. This model links the national models together but also takes into account the convergence process associated with the monetary union that was already evident from the graphs of the macroeconomic variables. The euro area variables are constructed as averages of their national counterparts using real 1995 GDP weights.

The main characteristics of the model are the following. The national inflation rates can react also to the lagged euro area inflation and its change, and in general they do. The national output gap can react to its past difference with respect to the area gap. This term usually has a negative sign (except for Italy where it is not significant) supporting real convergence. The German interest rate can react not only to national but also to area wide inflation (positive and significant) and output gap (positive but not significant). The equations for expenditures and receipts are similar to those for the national models, since fiscal policy is not coordinated at the euro area level.

A detailed description of the area model can be found in the Appendix. The dynamic simulation of the model is reported in Figure 3. The results are similar to those for the national models, possibly with a closer convergence of the macro variables. The standard errors around the point estimates remain quite large, in particular at longer horizons.

Finally, we consider two forecast pooling procedures, the mean and the median of the forecasts we discussed so far, which notwithstanding their simplicity have performed quite well in previous analyses.

4. Forecasting fiscal variables

In this section we briefly review the forecasting methodology, which is rather standard, present the results, and finally discuss a comparison with the OECD fiscal forecasts.

4.1 Forecasting methodology

As we mentioned in the previous section, the specification of the forecasting models is based on the full sample. Yet, the chosen model is re-estimated over the forecast period, either recursively with the first sample ending in 1995:2, or with a 15 year rolling window, so that the first window ends again in 1995:2.

The estimated models are used to produce 1-, 2- and 4- semester ahead forecasts, where the latter are computed by forward iteration of the model rather than by means of dynamic estimation to avoid a further specification search (see e.g. Marcellino, Stock and Watson (2003) for details on dynamic estimation).

The resulting forecasts and the actual values are used to compute the mean square error (mse) and the mean absolute error (mae). Both the mse and the mae of each model are expressed as a ratio of the corresponding values for the random walk forecasts, so that ratios smaller than one indicate a worse performance of the random walk forecasts.

Finally, we compute the Diebold and Mariano (1995, DM) test statistic to evaluate the statistical significance of the loss differentials. Two comments are in order on this topic. First, even though we apply the small sample corrections in Harvey, Leybourne and Newbold (199?), the very limited number of forecasts casts some doubts on the reliability of statistical testing in our context. Second, since some models are nested, the asymptotic distribution of the DM test could be different from the standard normal, see e.g. Clark and McCracken (200?). Yet, Giacomini (2002) has shown that the use of a fixed rolling window for estimation restores the validity of the DM results also in the case of nested models.

4.2 Results

Table 2 presents the MSE of each forecasting method relative to the random walk. ARMA models are clearly the best at the shortest horizon for most variables and countries (17 out of 28), with pooled forecasts ranked second (6 out of 28). The performance of the ARMA models deteriorates with the forecast horizon, ARMA produce the lowest MSE in 12 out of 28 cases for h=2 and 9 out of 28 for h=4 (Table 6), while that of the pooling methods is basically unaffected (7 out of 28 best forecasts for h=2 and 8 out of 28 for h=4).

The structural models do slightly better at the longest horizon, they are the best in 6 out of 28 cases for h=4 and only in 3 out of 28 cases for h=1, but are still beaten often by the time series methods.

These models perform best for gap and expenditure forecasts in Germany and for the interest rate in France.

Tables 3 and 6 report the relative MAE for h=1,2 and 4, respectively. Basically, they show that the ranking above is robust to the use of the MAE to compare the forecasts. Tables 4, 5 and 7 repeat the MSE and MAE comparison using rolling estimation. Also in this case there are no major changes in the ranking of the forecasts, while no clear cut comparison of rolling and recursive estimation emerges.

As we mentioned before, because of the short sample size the forecasts are surrounded by a rather large uncertainty. As a consequence, the MSEs and MAEs are seldom statistically different from those of the random walk model, even though the latter is systematically beaten by the best forecast in terms of point MSE and MAE values.

Finally, comparing the MAEs with the average value of the variables in the last column of Tables 2 and 6, it emerges that the forecasts for the expenditure and receipt ratios and for the debt ratio are much more accurate than those for the fiscal balance.

4.3 Comparison with OECD forecasts

The OECD publishes current year forecasts in June and year ahead forecasts in December for some of the variables we consider. It is therefore interesting to compare their forecasts with ours, using the same methodology as above, but with an accurate choice of the timing (to reflect the availability of OECD forecasts), and forecast definition. Notice that our models are slightly advantaged by the full sample specification. We also include pooled OECD – structural model forecasts in the comparison.

The results in Tables 8-11 indicate that pooled (mean) forecasts perform quite well for the current year, with the OECD being the best for all countries only for the interest rate. The OECD improves for the year ahead forecasts, but pooling or one of our models remains best for gap and debt. Again the results are robust to the choice of loss function (MSE or MAE) and method of estimation (recursive or rolling). The good performance of the random walk is confirmed also with respect to the OECD, in particular one step ahead.

5. Conclusions

The common finding of good performance of simple time-series or pooled forecasts for macroeconomic variables is confirmed also for fiscal variables for the largest countries in the Euro area. This finding can be due to several reasons, including the short sample available that makes the specification and estimation of structural models complicated, the robustness of simple methods to structural breaks (this is particularly so for random walk and pooled forecasts), and the difficulty of modelling the joint behaviour of several variables in a period of substantial institutional and economic changes.

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Figure 1: Macro and Fiscal variables – 1981:1 2002:2

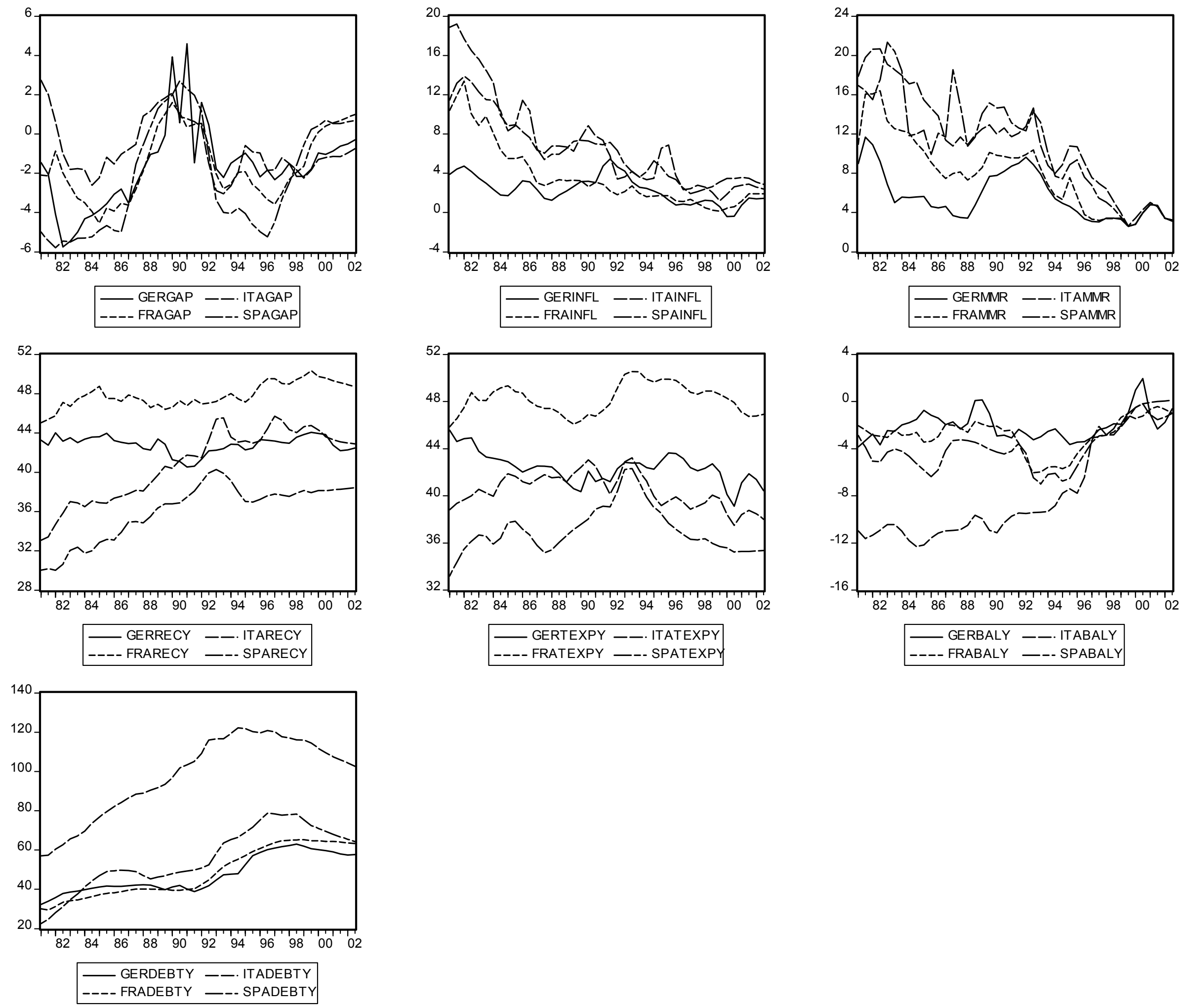
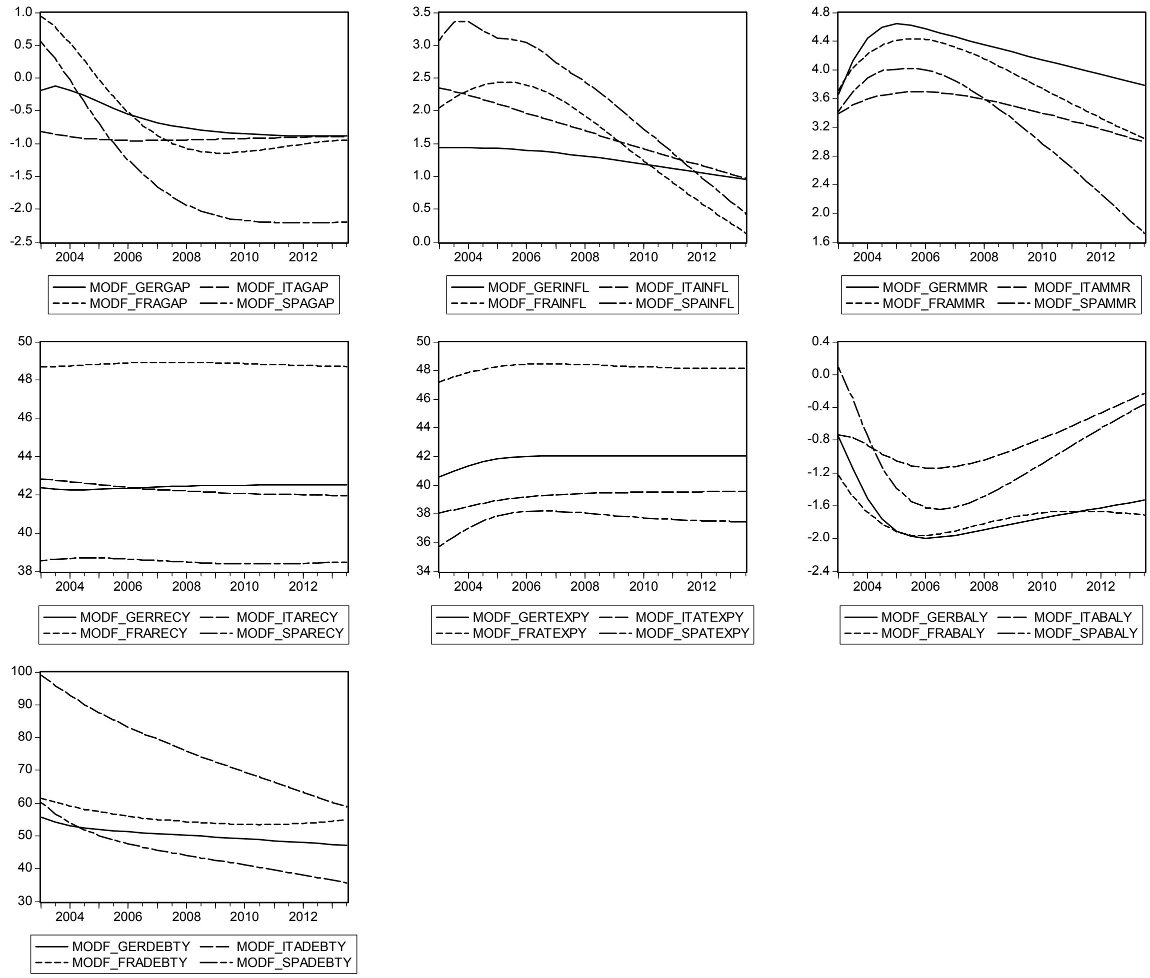
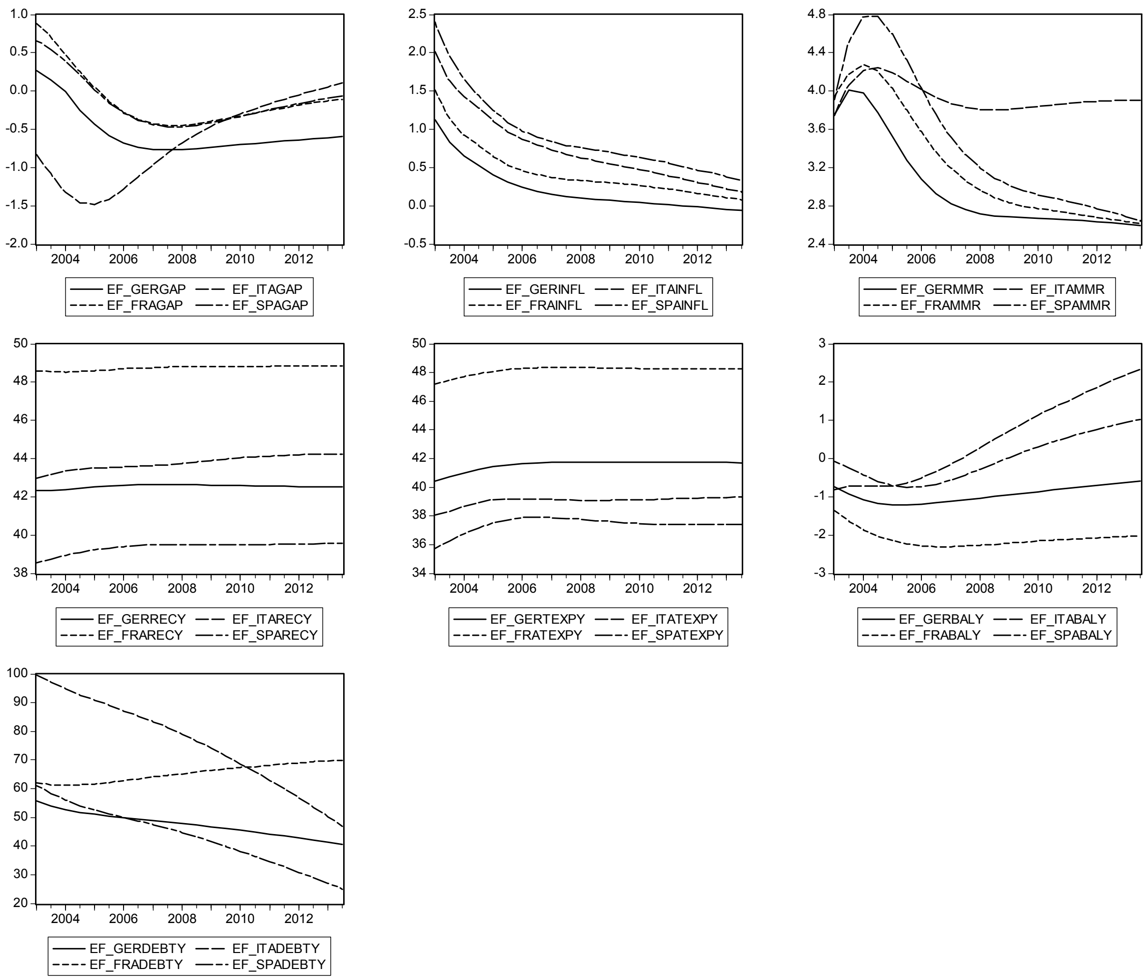


Figure 2: Simulation – Single Country Models – Estimation sample 1981:1 2002:2



Notes: the figures report dynamically simulated paths of macroeconomic and fiscal variables over the sample 2003:1 – 2013:2

Figure 3: Simulation – Area Model – Estimation sample 1981:1 2002:2



Notes: the figures report dynamically simulated paths of macroeconomic and fiscal variables over the sample 2003:1 – 2013:2

Table 1: Selection of ARMA models

			R^2	BIC	BIC_2_2
Germany	Gap	ARMA(1,2)	0.588	3.616	3.692
	Infl	ARMA(1,1)	0.905	1.312	1.530
	Intrate	ARMA(2,1)	0.892	2.592	2.606
	Bal	AR(1)	0.491	2.652	2.683
	Exp	AR(1)	0.684	2.262	2.391
	Rec	AR(1)	0.583	1.734	1.838
	Debt	ARMA(1,1)	0.989	2.962	3.129
France	Gap	ARMA(2,2)	0.924	1.694	1.694
	Infl	ARMA(1,2)	0.975	1.801	2.004
	Intrate	ARMA(2,1)	0.932	3.049	3.274
	Bal	AR(2)	0.872	1.690	1.755
	Exp	AR(2)	0.873	1.417	1.606
	Rec	AR(1)	0.822	1.615	1.799
	Debt	AR(2)	0.997	2.066	2.197
Italy	Gap	AR(2)	0.826	1.985	2.148
	Infl	ARMA(1,2)	0.971	2.702	2.835
	Intrate	ARMA(2,2)	0.960	3.232	3.232
	Bal	ARMA(1,2)	0.986	1.573	1.658
	Exp	ARMA(1,2)	0.824	2.079	2.089
	Rec	ARMA(1,1)	0.968	2.112	2.248
	Debt	AR(2)	0.994	3.930	4.114
Spain	Gap	AR(2)	0.968	1.616	1.688
	Infl	ARMA(1,1)	0.964	2.171	2.629
	Intrate	AR(1)	0.832	4.402	4.460
	Bal	ARMA(1,2)	0.956	1.332	1.418
	Exp	ARMA(1,2)	0.959	1.254	1.861
	Rec	ARMA(1,1)	0.986	0.874	1.009
	Debt	AR(2)	0.993	3.510	3.581

Notes: the table reports the “min-BIC” ARMA specification for each variable, along with its adjusted R-squared, BIC and the BIC of the ARMA(2,2) specification.

Table 2: Relative RMSE – Recursive estimates

	1-Step ahead								2-Step ahead							
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE
								Germany								
Gap	1.331	1.386	2.608	1.403	**0.969**	1.158	1.054	0.420	1.003	1.737	3.129	1.215	**0.947**	1.201	1.011	0.525
Infl	**0.762**	0.947	1.075	0.890	0.987	0.801	0.835	0.509	0.894	**0.873**	1.316	1.054	0.934	0.849	0.889	0.874
Intrate	**0.853**	1.209 (*)	1.419 (*)	1.262	1.049	1.061	1.044	0.604	**0.941**	1.133	1.503	1.420	1.024	1.080	1.050	1.019
Bal	**0.959**	1.088	1.073	0.981	1.026	0.989	1.026	1.116	**0.930** (*)	1.037	1.113	0.988	0.994	0.985	1.011	1.809
Exp	0.997	1.124	1.129	0.979	0.976	0.989	**0.965**	0.904	1.002	1.139	1.341	**0.937**	0.956	1.023	0.968	1.447
Rec	1.015	1.060	1.424	1.205	1.148	**1.003**	1.068	0.438	1.025	0.886	1.317	1.079	0.986	**0.847**	0.955	0.689
Debt	**0.905**	1.351	1.468	1.162	1.174	0.911	1.183	0.893	1.253	1.381	1.479	1.026	1.132	**0.877**	1.107	1.615
								France								
Gap	**0.715** (*)	0.837	1.041	0.799 (*)	0.769 (*)	0.797 (*)	0.793 (*)	0.466	**0.714**	0.761	1.186	0.803	0.876	0.823	0.830	0.878
Infl	1.287	2.685 (*)	2.314	1.045	2.470 (*)	1.081	**0.952**	0.347	1.353	2.621 (*)	1.975	1.049	2.508	1.150	**1.016**	0.604
Intrate	0.886	1.007	0.995	**0.835**	1.174	0.893	0.916	0.892	0.944	1.040	1.076	**0.707**	1.069	0.910	0.933	1.504
Bal	**0.823**	0.844	1.233	1.092	1.349 (*)	0.995	1.010	0.497	0.835	**0.802**	1.222	1.087	1.403 (*)	1.001	1.012	0.845
Exp	**0.821**	1.120	1.121	0.874	0.946	0.849	0.918	0.341	0.981	1.123	1.226	0.910	1.020	**0.896**	0.933	0.642
Rec	**1.008**	1.175	1.392 (*)	1.206	1.288	1.130	1.161	0.453	**1.045**	1.258	1.333 (*)	1.196	1.303	1.117	1.190	0.697
Debt	**0.566**	1.537 (*)	1.919 (*)	1.636 (*)	1.402	0.944	1.276	0.748	**0.794**	1.498	2.033	1.835 (*)	1.424	0.998	1.247	1.399
								Italy								
Gap	1.072	1.431	1.926	1.362	1.489	1.074	**1.027**	0.371	1.210	1.253	1.935	1.440	1.490	**0.985**	1.008	0.569
Infl	**0.549**	0.974	1.265	0.972	1.394	0.932	0.965	0.968	**0.706**	0.961	1.208 (*)	0.974	1.283	0.943	0.947	1.603
Intrate	**0.836**	1.201	1.299	1.064	1.303 (*)	1.061	1.029	0.964	**0.837**	1.292 (*)	1.033	1.056	1.296 (*)	1.057	1.052	1.782
Bal	**0.651**	0.736	0.838	1.143	1.165	0.839	0.871	1.058	0.896	**0.794**	0.970	1.225	1.214	0.938	0.963	1.882
Exp	0.940	0.961	**0.783**	0.987	0.945	0.787	0.835	0.601	1.207	**0.773**	0.837	1.107	1.001	0.860	0.924	0.969
Rec	**0.854**	1.259	1.398	1.082	1.154	1.048	1.073	0.614	**1.089**	1.230	1.477 (*)	1.157	1.164	1.101	1.105	1.078
Debt	0.946	1.158	1.188	0.908	0.832	**0.583** (*)	0.821	1.550	1.190	1.242	1.306 (*)	0.930	0.834	**0.548**	0.770	2.934
								Spain								
Gap	**0.470** (*)	0.685	0.586	0.695	0.566 (*)	0.529 (*)	0.524 (*)	0.604	**0.480**	0.609	0.681	0.809	0.622	0.525	0.518	1.184
Infl	**0.556**	1.051	1.552 (*)	0.823	2.299	0.895	0.851	0.427	**0.762**	1.152	1.334	0.943	2.329	1.005	0.972	0.733
Intrate	**0.903**	1.729 (*)	2.332 (*)	1.078	1.633 (*)	1.329	1.282	0.889	**0.843**	1.542	2.318 (*)	1.017	1.834 (*)	1.314	1.257	1.558
Bal	0.964	**0.632** (*)	0.647 (*)	1.167 (*)	1.293 (*)	0.812 (*)	0.838 (*)	0.585	0.948	**0.555**	0.698	1.253 (*)	1.402 (*)	0.864	0.897	1.102
Exp	**0.833**	1.032	1.159	1.308	1.209	0.913	1.073	0.330	**1.023**	1.147	1.345	1.781	1.543	1.104	1.296	0.574
Rec	1.373	2.388 (*)	2.048 (*)	**1.079**	1.738	1.311	1.236	0.193	1.335 (*)	2.832 (*)	2.585 (*)	**1.071**	2.336	1.492	1.398	0.299
Debt	0.732	1.105	1.015	0.953	0.863	**0.675**	0.856	1.886	0.963	1.122	0.972	0.880	0.796	**0.618**	0.791	3.355

Notes: The table entries are the RMSEs of different models, relative to the RMSE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE). A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the squared errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 3: Relative MAE – Recursive estimates

	1-Step ahead								2-Step ahead								
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
Germany																	
Gap	1.094	1.295	2.302	1.407	1.035	1.074	**1.003**	0.336	0.979	1.646	2.640	1.235	**0.922**	1.181	1.012	0.417	-1.448
Infl	**0.799**	0.951	1.240	0.968	1.103	0.815	0.829	0.358	**0.796**	0.860	1.513	1.023	1.063	0.881	0.871	0.657	0.861
Intrate	**0.943**	1.312 (*)	1.633 (*)	1.247	1.011	1.106	1.089	0.436	**0.902**	1.110	1.571	1.322	0.942	1.054	1.047 (*)	0.840	3.521
Bal	**0.928** (*)	1.037	1.017	0.986	1.076	0.945	0.998	0.779	**0.874**	0.948	1.095	0.992	0.960	0.918	0.945	1.340	-1.576
Exp	0.983	1.020	1.016	0.963	0.940	**0.927**	0.945	0.703	1.011	1.075	1.308	0.950	**0.926**	1.005	0.932	1.088	41.856
Rec	**1.021**	1.179	1.490	1.389	1.323	1.106	1.199	0.301	1.023	0.885	1.385	1.127	1.037	**0.864**	1.011	0.521	43.197
Debt	**0.739**	1.105	1.272	1.021	0.982	0.850	1.018	0.775	1.207	1.064	1.271	0.841	0.878	**0.794**	0.909	1.394	60.129
France																	
Gap	0.649 (*)	0.773	1.006	**0.638** (*)	0.641 (*)	0.698 (*)	0.693 (*)	0.373	**0.657**	0.685	1.090	0.687	0.820	0.749	0.740	0.729	-1.121
Infl	1.400	2.788 (*)	2.154	1.046	2.584 (*)	1.161	**0.990**	0.255	1.218	2.515	1.898	0.999	2.370	1.097	**0.981**	0.492	1.072
Intrate	0.917	1.109	1.143	**0.907**	1.363	0.972	1.001	0.613	0.963	1.068	1.178	**0.723**	1.232	0.952	0.992	1.102	3.691
Bal	**0.794**	0.823	1.082	1.041	1.348 (*)	0.953	0.986	0.408	0.853	**0.825**	1.204	1.092	1.485 (*)	0.995	1.028	0.676	-2.025
Exp	0.925	1.210	1.066	0.902	0.945	**0.818**	0.911	0.258	1.115	1.159	1.113	0.887	1.019	**0.828**	0.900	0.513	48.321
Rec	**1.081**	1.143	1.355 (*)	1.184	1.202	1.127	1.160	0.355	1.107	1.152	1.257	1.075	1.153	**1.049**	1.113	0.573	49.352
Debt	**0.611**	1.618 (*)	2.078 (*)	2.034 (*)	1.573	1.090	1.356	0.534	**0.948**	1.476	2.119 (*)	2.266 (*)	1.493	1.136	1.307	0.997	63.988
Italy																	
Gap	1.053	1.476	1.995 (*)	1.362	1.554	1.005	**0.937**	0.273	1.180	1.182	1.855	1.322	1.391	0.975	**0.968**	0.461	-1.414
Infl	**0.697**	1.050	1.308	0.993	1.561	0.913	0.965	0.603	**0.784**	1.038	1.290 (*)	0.985	1.299	0.942	0.945	1.060	2.798
Intrate	**0.830**	1.224	1.155	1.036	1.335 (*)	1.050	1.024	0.825	**0.803**	1.241	0.936	1.015	1.287 (*)	1.034	1.012	1.570	5.455
Bal	**0.683**	0.781	0.876	1.183	1.170	0.808	0.860	0.752	**0.921**	0.923	1.105	1.294 (*)	1.223	1.020	1.057	1.331	-2.462
Exp	0.864	0.913	0.784	0.960	0.937	**0.753** (*)	0.840 (*)	0.508	1.349 (*)	0.831	**0.814**	1.240	1.029	0.969	1.022	0.727	38.985
Rec	**0.925**	1.244	1.378	1.030	1.070	1.004	1.061	0.472	1.091	1.152	1.388 (*)	1.070	1.061	**1.044**	1.053	0.865	44.044
Debt	0.828	1.114	1.188	0.931	0.777	**0.562** (*)	0.766	1.330	1.158	1.228	1.339 (*)	0.915	0.797	**0.549**	0.778	2.502	113.129
Spain																	
Gap	**0.482** (*)	0.691	0.563	0.751	0.641	0.563 (*)	0.562 (*)	0.460	**0.492**	0.635	0.653	0.817	0.610	0.504	0.507	0.893	-1.353
Infl	**0.540** (*)	1.145	1.635 (*)	0.840	2.032 (*)	0.939	0.841	0.332	**0.804**	1.236	1.356	1.022	2.025	1.020	1.003	0.589	2.978
Intrate	**0.901**	1.801 (*)	2.309 (*)	1.110	1.671 (*)	1.341	1.298	0.743	**0.831**	1.543 (*)	2.163 (*)	0.959	1.792 (*)	1.246	1.197	1.423	4.833
Bal	1.036	**0.558** (*)	0.691	1.256	1.409 (*)	0.822	0.852	0.442	0.996	**0.459**	0.675	1.381	1.539 (*)	0.878	0.933	0.868	-1.739
Exp	**0.957**	1.168	1.328	1.525	1.411	1.066	1.227	0.235	**1.163**	1.300	1.538	2.098	1.830	1.313	1.543	0.420	36.014
Rec	1.443	2.436 (*)	1.897 (*)	**1.047**	1.490	1.191	1.154	0.159	1.465 (*)	3.219 (*)	3.024 (*)	**1.070**	2.153	1.627	1.395	0.217	37.949
Debt	**0.557**	1.202	1.101	1.016	0.944	0.763	0.914	1.499	0.791	1.197	1.050	0.872	0.844	**0.660**	0.841	2.747	72.786

Notes: The table entries are the MAEs of different models, relative to the MAE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the MAE of the random walk model (RW MAE) and the average value of the variables over the forecasting sample. A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the absolute errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 4: Relative RMSE – Rolling estimates

	1-Step ahead								2-Step ahead							
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE
Germany																
Gap	1.416	3.263	4.985	1.801	**0.957**	1.730	1.220	0.420	1.031	3.666	5.846	1.450	**0.682**	1.804	1.082	0.525
Infl	0.762	1.264	0.955	0.921	0.913	0.779	**0.774**	0.509	0.899	1.166	1.198	1.064	0.826	**0.761**	0.783	0.874
Intrate	0.960	1.168	1.261	1.063	0.974	**0.873**	0.908	0.604	1.070	1.515	1.520	1.184	0.959	**0.888**	0.990	1.019
Bal	0.964	1.097	1.281	0.947	0.981	**0.942**	0.993	1.116	0.935 (*)	1.052	1.446	**0.920**	0.946	0.964	0.997	1.809
Exp	1.001	1.265	1.450	0.956	**0.933**	0.973	0.944	0.904	1.011	1.332	1.711	**0.858**	0.885	1.017	0.970	1.447
Rec	1.007	1.156	1.457	1.255	1.159	**0.998**	1.036	0.438	1.011	1.049	1.548	1.159	0.999	**0.869**	0.951	0.689
Debt	**0.938**	1.564	2.068	1.225	1.187	1.043	1.201	0.893	1.173	1.643	2.403	0.998	1.028	1.020	**0.978**	1.615
France																
Gap	0.780	0.901	1.030	0.823	**0.664** (*)	0.732 (*)	0.749 (*)	0.466	0.758	0.816	1.095	0.771	**0.677**	0.746	0.773	0.878
Infl	0.992	1.951	1.851	1.064	1.503	**0.853**	0.900	0.347	0.997	1.709	1.367	1.071	1.553	**0.802**	0.895	0.604
Intrate	**0.827**	0.857	1.163	0.986	1.521	0.925	0.960	0.892	0.926	0.979	1.054	**0.774**	1.463	0.920	0.956	1.504
Bal	**0.838**	1.006	1.276	1.154	1.399 (*)	1.031	1.022	0.497	**0.862**	0.895	1.251	1.128	1.464 (*)	1.032	1.016	0.845
Exp	**0.795**	1.316	1.128	0.855	0.851	0.842	0.870	0.341	0.933	1.123	1.247 (*)	0.999	0.941	**0.898**	0.920	0.642
Rec	**0.981**	1.193	1.381 (*)	1.182	1.310	1.094	1.139	0.453	**1.003**	1.256	1.271 (*)	1.105	1.336	1.062	1.095	0.697
Debt	**0.469**	1.684 (*)	1.947 (*)	1.566 (*)	1.473 (*)	0.973	1.318	0.748	**0.632**	1.639	2.109	1.740 (*)	1.483	1.011	1.287	1.399
Italy																
Gap	1.082	1.337	1.850	1.396	1.416	1.054	**1.045**	0.371	1.227	1.175	1.889	1.471	1.535	**0.984**	1.026	0.569
Infl	**0.549**	0.998	1.344	0.938	1.448	0.888	0.925	0.968	**0.706**	0.963	1.324	0.960	1.418	0.917	0.922	1.603
Intrate	**0.979**	1.282	1.488	1.119	1.350 (*)	1.113	1.052	0.964	**1.011**	1.375	1.144	1.065	1.344	1.099	1.053	1.782
Bal	**0.609**	0.813	0.774	1.211 (*)	1.326 (*)	0.779	0.781	1.058	0.864	0.875	0.952	1.296 (*)	1.378 (*)	**0.858**	0.896	1.882
Exp	0.987	1.061	0.894	1.008	0.963	**0.768**	0.877	0.601	1.304	**0.821**	0.872	1.189	1.067	0.836	0.939	0.969
Rec	**0.826**	1.266	1.401	1.087	1.188	0.995	1.020	0.614	**1.050**	1.290	1.561	1.146	1.199	**1.050**	1.075 (*)	1.078
Debt	0.919	1.338	1.370	0.908	0.934	**0.633**	0.864	1.550	1.148	1.522	1.655 (*)	0.960	0.985	**0.620**	0.830	2.934
Spain																
Gap	**0.466** (*)	0.625	0.606	0.698	0.609	0.505 (*)	0.514 (*)	0.604	**0.475**	0.561	0.659	0.827	0.676	0.490	0.524	1.184
Infl	**0.579**	0.973	1.706 (*)	0.879	2.178	0.773	0.776	0.427	**0.815**	1.135	1.458	1.033	2.285	0.891	0.903	0.733
Intrate	**0.880**	1.848 (*)	2.343 (*)	1.325	1.789 (*)	1.400	1.505	0.889	**0.817**	1.738	2.296	1.167	1.967 (*)	1.374	1.443	1.558
Bal	0.687	0.662	**0.627** (*)	1.171 (*)	1.395 (*)	0.788 (*)	0.816 (*)	0.585	0.698	**0.606**	0.659	1.243 (*)	1.586 (*)	0.842	0.847	1.102
Exp	1.031	1.011	1.082	1.274	1.623	**0.972**	1.080	0.330	**1.112**	1.255	1.293	1.730	2.189	1.208	1.299	0.574
Rec	1.393	2.273 (*)	1.976	**1.058**	1.446	1.199	1.113	0.193	1.648 (*)	2.802 (*)	2.608 (*)	**1.122**	1.832	1.362	1.261	0.299
Debt	0.740	1.142	1.028	0.938	1.001	**0.693**	0.904	1.886	0.969	1.169	0.981	0.846	0.962	**0.634**	0.840	3.355

Notes: The table entries are the RMSEs of different models, relative to the RMSE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE). A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the squared errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 5: Relative MAE – Rolling estimates

	1-Step ahead								2-Step ahead								
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
								Germany									
Gap	1.284	2.869 (*)	4.185 (*)	1.721	**0.966**	1.629	1.212	0.336	0.997	3.049	4.408	1.488	**0.656**	1.628	1.045	0.417	-1.448
Infl	**0.810**	1.276	1.086	1.009	1.028	0.845	0.827	0.358	0.826	1.257	1.383	1.048	0.863	**0.746**	0.809	0.657	0.861
Intrate	1.068	1.269	1.296	1.092	0.908	**0.884**	0.943	0.436	0.990	1.525	1.521	1.132	**0.868**	0.884	0.948	0.840	3.521
Bal	0.930	1.010	1.159	0.998	1.063	**0.876**	0.909	0.779	**0.868**	0.929	1.377	0.898	0.914	0.944	0.959	1.340	-1.576
Exp	0.990	1.093	1.345	0.985	0.946	0.924	**0.913**	0.703	1.014	1.217	1.651	**0.857**	0.860	1.056	0.977	1.088	41.856
Rec	**1.010**	1.185	1.519	1.419	1.337	1.094	1.169	0.301	1.009	1.101	1.545	1.209	1.023	**0.892**	0.985	0.521	43.197
Debt	**0.754**	1.310	1.694	1.108	1.078	0.975	1.089	0.775	1.079	1.212	1.813	**0.887**	0.924	0.905	0.894	1.394	60.129
								France									
Gap	0.722	0.822	1.044	0.665 (*)	**0.531** (*)	0.605 (*)	0.599 (*)	0.373	0.720	0.775	1.062	0.597 (*)	**0.591** (*)	0.631 (*)	0.617 (*)	0.729	-1.121
Infl	1.081	1.835	1.656	1.069	1.546	**0.942**	0.994	0.255	0.928	1.506	1.169	1.041	1.390	**0.791**	0.825	0.492	1.072
Intrate	**0.793**	0.947	1.374	1.017	1.720	1.058	1.054	0.613	0.922	0.972	1.219	**0.760**	1.620	0.984	0.997	1.102	3.691
Bal	**0.823**	0.994	1.173	1.115	1.416 (*)	0.991	0.997	0.408	**0.890**	0.896	1.227	1.111	1.513 (*)	1.014	0.994	0.676	-2.025
Exp	0.895	1.417	1.134	0.851	**0.825**	0.869	0.894	0.258	1.072	1.194	1.296	0.957	**0.875**	0.887	0.903	0.513	48.321
Rec	1.034	1.123	1.345	1.117	1.315	**1.026**	1.047	0.355	1.053	1.129	1.270 (*)	0.963	1.303	**0.933**	0.968	0.573	49.352
Debt	**0.508**	1.806 (*)	2.131 (*)	1.939 (*)	1.803 (*)	1.144	1.443	0.534	**0.719**	1.701	2.234	2.094 (*)	1.834	1.203	1.389	0.997	63.988
								Italy									
Gap	1.047	1.323	1.996 (*)	1.359	1.437	1.012	**0.924**	0.273	1.201	1.122	1.744	1.330	1.457	0.982	**0.974**	0.461	-1.414
Infl	**0.672**	1.102	1.208	0.977	1.772	0.854 (*)	0.940	0.603	**0.762**	1.018	1.265 (*)	0.991	1.566	0.878	0.913	1.060	2.798
Intrate	**0.979**	1.292	1.323	1.087	1.280	1.064	1.036	0.825	**0.959**	1.300	0.969	1.035	1.320	1.080	1.023	1.570	5.455
Bal	**0.617**	0.819	0.823	1.278	1.365 (*)	0.756 (*)	0.736 (*)	0.752	**0.852**	0.968	1.091	1.407 (*)	1.489 (*)	0.928	0.910	1.331	-2.462
Exp	0.976	1.005	0.893	0.984	0.976	**0.745** (*)	0.902	0.508	1.485 (*)	**0.814**	0.825	1.248	1.036	0.925	1.002	0.727	38.985
Rec	**0.879**	1.277	1.473	1.015	1.027	0.979	1.010	0.472	1.058	1.183	1.554	1.038	1.066	**0.985**	1.026	0.865	44.044
Debt	0.798	1.324	1.374	0.953	0.813	**0.603** (*)	0.801	1.330	1.104	1.583	1.689 (*)	0.924	0.864	**0.592**	0.736	2.502	113.129
								Spain									
Gap	**0.484** (*)	0.591	0.622	0.785	0.683	0.569	0.577	0.460	**0.485**	0.538	0.642	0.938	0.678	0.486	0.536	0.893	-1.353
Infl	**0.567**	1.106	1.758	0.927	1.931	0.837	0.817	0.332	**0.849**	1.232	1.479	1.113	2.141	0.900	0.966	0.589	2.978
Intrate	**0.861**	1.788 (*)	2.195 (*)	1.199	1.724 (*)	1.343	1.403	0.743	**0.795**	1.659	2.122 (*)	1.041	1.876 (*)	1.292	1.323	1.423	4.833
Bal	0.706	**0.611**	0.663 (*)	1.282	1.534 (*)	0.803	0.806	0.442	0.693	**0.514**	0.620	1.362	1.787 (*)	0.867	0.850	0.868	-1.739
Exp	1.192	1.245	1.173	1.464	1.923 (*)	**1.073**	1.208	0.235	**1.275**	1.514	1.499	2.085	2.540	1.411	1.536	0.420	36.014
Rec	1.444	2.317 (*)	1.797	0.999	1.423	1.128	**1.117**	0.159	2.008 (*)	3.200 (*)	2.988 (*)	**1.082**	1.940	1.416	1.287	0.217	37.949
Debt	**0.587**	1.256	1.110	0.995	1.066	0.784	0.965	1.499	0.824	1.261	1.048	0.809	0.983	**0.681**	0.884	2.747	72.786

Notes: The table entries are the MAEs of different models, relative to the MAE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the MAE of the random walk model (RW MAE) and the average value of the variables over the forecasting sample. A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the absolute errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 6: 4-step ahead forecasts – Recursive estimates

	RMSE								MAE								
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
								Germany									
Gap	0.567	1.290	2.850	0.830	**0.352**	0.749	0.541	1.001	0.506	1.122	2.206	0.807	**0.342**	0.700	0.505	0.818	-1.266
Infl	1.266	1.343	2.076	1.581	1.110	1.090	**1.037**	0.838	1.305	1.312	2.330	1.595	1.288	1.131	**1.088**	0.647	0.83
Intrate	0.975	1.275	2.054	1.361	1.283	0.967	**0.900**	1.127	**0.831**	1.221	2.082	1.240	1.176	0.980	0.889	0.929	3.525
Bal	0.879	**0.878**	0.910	0.950	0.957	0.901	0.914	2.014	1.020	**0.898**	0.926	1.014	1.066	0.977	0.976	1.417	-1.108
Exp	0.883	0.876	1.172	**0.696**	0.804	0.779	0.760	1.557	0.908	0.841	1.054	**0.566**	0.731	0.700	0.689	1.164	41.419
Rec	1.129	0.975	1.461	1.029	0.852	**0.830**	0.889	0.941	1.115	0.944	1.309	0.965	**0.757**	0.765	0.822	0.795	43.179
Debt	0.838	0.808	0.734	**0.477**	0.679	0.483	0.564	5.767	0.979	0.678	0.676	**0.475**	0.619	0.541	0.529	4.275	60.162
								France									
Gap	0.430	**0.353**	0.785	0.478	0.614	0.551	0.520	2.243	0.437	**0.344**	0.805	0.460	0.632	0.565	0.523	1.902	-0.533
Infl	**0.768**	2.256	1.587	1.108	2.046	1.093	0.957	1.097	**0.649**	1.949	1.318	1.163	1.817	0.897	0.832	0.943	1
Intrate	0.866	1.118	1.133	**0.531**	1.281	0.862	0.842	1.809	0.773	1.122	1.174	**0.561**	1.428	0.924	0.829	1.403	3.537
Bal	**0.459** (*)	0.426	0.836	0.688	0.928	0.691	0.727	2.084	**0.377** (*)	0.383	0.814	0.699	0.962	0.692	0.724	1.875	-1.552
Exp	0.920 (*)	0.924	1.081	**0.716**	0.822	0.759	0.785	1.349	0.844	0.839	0.892	**0.616**	0.668	0.632	0.662	1.229	47.951
Rec	**0.852**	1.322	1.196	0.946	1.171	0.954	1.040	1.083	**0.859**	1.370	1.279	0.979	1.191	1.019	1.120	0.895	49.363
Debt	0.762	0.883	1.323	1.463	0.988	**0.711**	0.829	4.229	0.975	0.935	1.382	1.738	1.040	**0.849**	0.945	2.983	64.449
								Italy									
Gap	1.099	1.362	1.348	1.320	1.467	**0.726**	0.740	0.795	1.074	1.306	1.251	1.352	1.264	0.783	**0.782**	0.653	-1.377
Infl	**0.619**	0.782	1.160	0.903	1.222	0.752	0.786	2.023	**0.736**	0.923	1.197	0.970	1.496	0.846	0.855	1.309	2.382
Intrate	**0.624**	0.911	0.684	0.822	1.020	0.808	0.806	3.578	**0.665**	1.015	0.730	0.904	1.095	0.876	0.877	2.691	4.456
Bal	0.662	**0.566**	0.665	0.901	0.888	0.651	0.698	3.707	0.616	0.537	0.686	0.821	0.828	**0.575**	0.640	2.990	-1.541
Exp	1.139	0.787	**0.766**	0.912	0.950	0.789	0.768	1.160	1.166	0.792	**0.687**	0.943	0.979	0.818	0.796	0.932	38.805
Rec	1.402	1.261	1.482	0.930	0.938	**0.912**	0.970	1.376	1.355	1.128	1.288	0.718	**0.714**	0.838	0.869	1.238	43.934
Debt	1.180	1.004	1.108	0.606	0.582	**0.339**	0.546	7.735	1.208	0.939	1.076	0.514	0.518	**0.329**	0.472	6.931	111.189
								Spain									
Gap	**0.323**	0.292	0.405	0.584	0.370	0.329	0.331	3.123	**0.288**	0.301	0.392	0.536	0.351	0.300	0.298	2.555	-0.385
Infl	**0.639**	1.071	1.083	0.708	1.538	0.817	0.872	1.516	**0.652**	1.167	1.049	0.719	1.565	0.835	0.863	1.215	2.924
Intrate	**0.634**	1.128	1.398	0.749	1.533	1.013	1.038	3.000	**0.732**	1.427	1.754	0.904	1.812	1.194	1.246	2.215	3.992
Bal	0.507	**0.267**	0.510	0.829	0.960	0.632	0.646	2.948	0.507	**0.200**	0.471	0.854	0.969	0.630	0.653	2.674	-1
Exp	**0.581**	0.725	0.862	1.112	0.994	0.753	0.806	1.710	**0.570**	0.741	0.840	1.177	0.947	0.812	0.831	1.406	35.698
Rec	1.272	2.555	2.712	**0.697**	2.337	1.293	1.252	0.530	1.212	2.556	2.552	**0.633**	1.758	1.214	1.136	0.466	38.062
Debt	0.897	0.746	0.634	0.615	0.385	**0.241**	0.410	8.215	0.794	0.767	0.660	0.625	0.330	**0.216**	0.367	7.366	71.518

Notes: The table entries are the RMSEs and MAEs, respectively, of different models, relative to those of a random walk model, for four-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE/ MAE of the random walk model (RW RMSE/RW MAE) and the average value of the variables over the forecasting sample. A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the squared/absolute errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 7: 4-step ahead forecasts – Rolling estimates

	RMSE								MAE								
	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW RMSE	ARMA	VAR1	VAR2	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
Germany																	
Gap	0.469	2.658	4.983	1.013	**0.412**	1.137	0.484	1.001	**0.382**	1.840	3.281	1.029	0.426	0.886	0.439	0.818	-1.266
Infl	1.263	2.581	2.607	1.556	0.983	1.100	**0.979**	0.838	1.322	2.544	2.760	1.607	0.913	1.097	**0.890**	0.647	0.83
Intrate	1.239	3.663	4.024	0.974	**0.673**	1.448	0.850	1.127	1.132	2.783	3.394	0.959	**0.665**	1.336	0.843	0.929	3.525
Bal	0.879	0.884	0.877	0.955	0.957	**0.858**	0.873	2.014	1.006	0.827	**0.756**	0.970	1.002	0.814	0.792	1.417	-1.108
Exp	0.896	1.146	1.316	0.756	0.895	0.718	**0.671**	1.557	0.899	0.980	1.131	0.701	0.838	0.619	**0.517**	1.164	41.419
Rec	1.117	1.434	2.000	1.126	**0.842**	0.855	0.860	0.941	1.104	1.274	1.615	1.048	**0.745**	0.831	0.763	0.795	43.179
Debt	0.753	1.022	0.869	**0.168**	0.362	0.422	0.284	5.767	0.869	0.814	0.783	**0.185**	0.369	0.468	0.310	4.275	60.162
France																	
Gap	0.413	0.402	0.773	0.391	**0.379**	0.477	0.422	2.243	0.412	**0.356**	0.783	0.372	0.368	0.482	0.428	1.902	-0.533
Infl	0.741	1.151	0.963	1.112	1.405	**0.709**	0.729	1.097	0.636	0.979	0.821	1.141	1.288	**0.575**	0.641	0.943	1
Intrate	0.885	1.039	0.962	**0.639**	1.499	0.842	0.830	1.809	0.786	1.114	1.047	**0.717**	1.510	0.949	0.893	1.403	3.537
Bal	0.480	**0.478**	0.777	0.711	0.989	0.695	0.681	2.084	**0.415**	0.428	0.744	0.719	1.029	0.711	0.679	1.875	-1.552
Exp	0.819	0.950	1.145	0.940	0.824	0.807	**0.805**	1.349	0.738	0.905	0.975	0.795	0.715	**0.679**	0.694	1.229	47.951
Rec	**0.752**	1.259	1.130	0.893	1.260	0.884	0.997	1.083	**0.768**	1.273	1.144	0.850	1.341	0.926	1.056	0.895	49.363
Debt	**0.621**	0.831	1.215	1.363	0.951	0.625	0.774	4.229	0.752	0.801	1.206	1.613	1.154	**0.726**	0.825	2.983	64.449
Italy																	
Gap	1.182	1.524	1.181	1.345	1.643	**0.657**	0.919	0.795	1.144	1.524	1.193	1.404	1.672	**0.717**	1.004	0.653	-1.377
Infl	**0.590**	0.734	1.309	0.915	1.540	0.718	0.730	2.023	**0.625**	0.830	1.237	0.988	1.651	0.753	0.727	1.309	2.382
Intrate	**0.717**	0.963	0.735	0.769	1.044	0.816	0.780	3.578	0.790	1.069	**0.717**	0.869	1.181	0.911	0.868	2.691	4.456
Bal	0.655	0.698	0.803	0.966	1.042	**0.594**	0.689	3.707	0.607	0.683	0.819	0.927	1.120	**0.510**	0.610	2.990	-1.541
Exp	1.220	**0.629**	0.640	1.251	1.125	0.762	0.723	1.160	1.238	0.572	**0.550**	1.238	1.114	0.755	0.725	0.932	38.805
Rec	1.311	1.513	1.857	0.947	1.159	**0.930**	1.065	1.376	1.246	1.394	1.815	0.739	**0.892**	0.901	1.049	1.238	43.934
Debt	1.134	1.334	1.582	0.676 (*)	0.699 (*)	**0.379** (*)	0.604 (*)	7.735	1.152	1.330	1.536	0.606	0.586	**0.322**	0.485	6.931	111.189
Spain																	
Gap	0.315	0.329	0.361	0.547	0.401	**0.265**	0.325	3.123	0.273	0.371	0.337	0.508	0.379	**0.250**	0.281	2.555	-0.385
Infl	**0.723**	1.056	1.093	0.784	1.790	0.808	0.904	1.516	**0.741**	1.128	1.102	0.794	1.782	0.813	0.881	1.215	2.924
Intrate	**0.624**	1.295	1.343	0.823	1.590	1.023	1.115	3.000	**0.728**	1.637	1.660	1.036	1.953	1.251	1.393	2.215	3.992
Bal	0.410	**0.310**	0.468	0.782	1.156	0.617	0.598	2.948	0.395	**0.255**	0.392	0.801	1.191	0.626	0.598	2.674	-1
Exp	**0.487**	0.805	0.886	1.051	1.364	0.789	0.850	1.710	**0.429**	0.833	0.851	1.142	1.411	0.852	0.911	1.406	35.698
Rec	1.504	2.468	2.922	**0.853**	1.856	1.033	1.119	0.530	1.496	2.447	2.881	**0.744**	1.776	0.954	1.082	0.466	38.062
Debt	0.907	0.808	0.640 (*)	0.570 (*)	0.507 (*)	**0.246** (*)	0.432 (*)	8.215	0.818	0.835	0.663	0.567	0.414	**0.221**	0.366	7.366	71.518

Notes: The table entries are the RMSEs and MAEs, respectively, of different models, relative to those of a random walk model, for four-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasts are performed over the sample 1996:1 – 2002:2. Results are reported for ARMA models (ARMA – see table xx for details), one and two-lag VARs (VAR1 and VAR2), single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE/ MAE of the random walk model (RW RMSE/RW MAE) and the average value of the variables over the forecasting sample. A test (see Diebold and Mariano (1995) and Harvey at al. (1997) is also performed on the significance of the mean of the difference between the squared/absolute errors of the different models and those of the random walk. (*) denotes 5% significance.

Table 8: Relative RMSE – Recursive estimates – Comparison with OECD forecasts

	1-Step ahead						2-Step ahead					
	OECD	S.C.M	AW.M	Mean	Med	RW RMSE	OECD	S.C.M	AW.M	Mean	Med	RW RMSE
Germany												
Gap	2.789	1.470	1.104	1.229	**1.056**	0.330	2.605	1.414	**0.941**	1.236	0.991	0.386
Infl	1.309	0.766	1.262	**0.778**	0.756	0.382	0.926	0.966	0.893	**0.824**	0.843	0.880
Intrate	**0.341**	1.331	1.076	1.102	1.088	0.548	**0.442**	1.366	1.037	1.081	1.077	0.953
Bal	1.651	1.010	1.108	**0.914**	0.979	0.827	**0.665**	0.967	0.994	0.992	1.014	1.997
Debt	3.342	1.057	1.064	**0.841**	1.001	0.892	1.736	1.051	1.165	**0.890**	1.152	1.701
France												
Gap	1.335	0.927	0.907	**0.903**	0.910	0.508	0.809	**0.669**	0.808	0.735	0.739	0.788
Infl	1.341	1.008	2.219	**0.792**	0.884	0.377	**0.938**	1.050	2.229	1.201	1.064	0.628
Intrate	**0.235**	0.892	1.287	0.894	0.935	0.833	**0.377**	0.655	0.955	0.901	0.915	1.576
Bal	1.380	1.105	1.376	**0.940**	0.994	0.446	**0.638**	1.047	1.324	1.011	0.996	0.902
Debt	2.172	1.649	1.396	**0.935**	1.176	0.686	1.208	1.875	1.470	**1.061**	1.392	1.421
Italy												
Gap	2.285	1.264	1.396	**0.995**	0.996	0.429	2.128	1.431	1.421	**0.953**	0.967	0.524
Infl	**0.397**	0.974	1.196	0.920	0.977	1.166	**0.447**	0.958	1.347	0.897	0.872	1.312
Intrate	**0.361**	1.084	1.346	1.052	1.065	0.946	**0.436**	1.045	1.267	1.070	1.028	1.649
Bal	1.357	1.288	1.271	**0.883**	0.962	0.724	**0.533**	1.129	1.173	0.834	0.840	1.789
Debt	2.174	0.826	0.739	**0.543**	0.730	1.568	1.353	1.103	0.844	**0.623**	0.851	2.819
Spain												
Gap	2.262	0.571	0.431	**0.401**	0.404	0.605	1.188	0.904	0.738	0.634	**0.622**	1.155
Infl	1.002	**0.762**	3.109	1.003	0.889	0.313	**0.849**	0.920	2.149	0.914	0.878	0.776
Intrate	**0.246**	1.001	1.570	1.268	1.215	0.973	**0.420**	1.049	1.902	1.367	1.319	1.393
Bal	**0.730**	1.128	1.350	0.748	0.785	0.478	**0.468**	1.269	1.381	0.887	0.905	1.088
Debt	1.897	0.945	0.858	**0.645**	0.856	1.814	1.034	0.903	0.801	**0.678**	0.804	3.649

Notes: The table entries are the RMSEs of different models, along with those of OECD forecasts (as reported in the *OECD Economic Outlook*), relative to the RMSE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasting sample is 1996:2 – 2002:2. Results are reported for single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE).

Table 9: Relative MAE – Recursive estimates – Comparison with OECD forecasts

	1-Step ahead						2-Step ahead						
	OECD	S.C.M	AW.M	Mean	Med	RW MAE	OECD	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
Germany													
Gap	2.135	1.358	1.072	0.936	**0.859**	0.272	2.521	1.377	**0.778**	1.146	0.915	0.323	-1.448
Infl	1.476	0.797	1.465	0.788	**0.739**	0.269	0.965	1.076	0.972	**0.929**	0.904	0.635	0.861
Entrate	**0.389**	1.188	1.051	1.147	1.137	0.358	**0.424**	1.407	0.966	1.079	1.088	0.803	3.521
Bal	1.523	0.925	1.089	**0.908**	0.971	0.679	**0.698**	0.996	1.017	0.979	0.992	1.452	-1.576
Debt	3.299	1.003	0.973	**0.816**	0.919	0.752	1.592	0.898	0.901	**0.790**	0.938	1.402	60.129
France													
Gap	1.266	**0.802**	0.806	0.817	0.814	0.383	0.794	**0.597**	0.801	0.714	0.703	0.639	-1.121
Infl	1.620	0.931	2.294	**0.829**	0.851	0.277	**0.959**	1.001	2.224	1.255	1.049	0.467	1.072
Entrate	**0.280**	1.080	1.659	1.053	1.091	0.528	**0.385**	0.702	1.108	0.956	0.979	1.122	3.691
Bal	1.365	1.032	1.371	**0.881**	0.944	0.350	**0.661**	1.005	1.307	1.011	1.013	0.709	-2.025
Debt	2.155	1.984	1.559	**1.021**	1.206	0.500	1.283	2.294	1.509	**1.199**	1.465	0.978	63.988
Italy													
Gap	2.057	1.142	1.392	0.924	**0.923**	0.317	2.195	1.348	1.337	1.059	**0.999**	0.408	-1.414
Infl	**0.463**	0.978	1.434	0.851	0.935	0.657	**0.521**	0.971	1.234	0.944	0.907	0.978	2.798
Entrate	**0.300**	1.053	1.441	1.065	1.073	0.779	**0.426**	1.037	1.212	1.034	0.990	1.436	5.455
Bal	1.489	1.249	1.224	**0.708**	0.823	0.547	**0.591**	1.192	1.094	0.910	0.902	1.314	-2.462
Debt	2.081	0.765	0.665	**0.453**	0.595	1.396	1.393	1.113	0.728	**0.622**	0.818	2.336	113.129
Spain													
Gap	2.089	0.685	0.525	0.458	**0.456**	0.433	1.081	0.873	0.733	0.620	**0.596**	0.862	-1.353
Infl	0.868	0.677	2.584	0.961	**0.713**	0.241	**0.826**	0.984	1.773	0.963	0.923	0.607	2.978
Entrate	**0.259**	1.081	1.651	1.304	1.257	0.776	**0.400**	0.938	1.858	1.247	1.229	1.248	4.833
Bal	0.715	1.243	1.489	**0.658**	0.745	0.358	**0.459**	1.387	1.484	0.946	0.990	0.829	-1.739
Debt	1.914	0.987	0.900	**0.671**	0.851	1.416	1.019	0.979	0.925	**0.813**	0.934	2.811	72.786

Notes: The table entries are the MAEs of different models, along with those of OECD forecasts (as reported in the *OECD Economic Outlook*), relative to the MAE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasting sample is 1996:2 – 2002:2. Results are reported for single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE) and the average values of the variables over the forecasting sample.

Table 10: Relative RMSE – Rolling estimates – Comparison with OECD forecasts

	1-Step ahead						2-Step ahead					
	OECD	S.C.M	AW.M	Mean	Med	RW RMSE	OECD	S.C.M	AW.M	Mean	Med	RW RMSE
Germany												
Gap	2.789	2.321	**0.855**	1.976	1.308	0.330	2.605	1.757	0.808	1.948	**0.964**	0.386
Infl	1.309	0.812	1.167	0.786	**0.700**	0.382	0.926	0.988	0.794	**0.754**	0.767	0.880
Intrate	**0.341**	1.103	0.931	0.804	0.919	0.548	**0.442**	1.159	0.918	1.034	0.994	0.953
Bal	1.651	1.092	1.161	**0.816**	0.861	0.827	**0.665**	0.852	0.871	0.944	0.999	1.997
Debt	3.342	1.212	1.150	**1.075**	1.107	0.892	1.736	0.832	0.944	**0.865**	0.940	1.701
France												
Gap	1.335	0.927	**0.783**	0.848	0.871	0.508	0.809	0.700	**0.577**	0.646	0.653	0.788
Infl	1.341	1.013	1.346	**0.702**	0.793	0.377	0.938	1.091	1.350	**0.883**	1.014	0.628
Intrate	**0.235**	1.052	1.699	0.909	0.999	0.833	**0.377**	0.741	1.203	0.913	0.973	1.576
Bal	1.380	1.144	1.376	**0.997**	1.065	0.446	**0.638**	1.069	1.399	1.036	1.010	0.902
Debt	2.172	1.546	1.440	**0.936**	1.220	0.686	1.208	1.798	1.554	**1.095**	1.408	1.421
Italy												
Gap	2.285	1.271	1.306	**0.973**	0.995	0.429	2.128	1.467	1.558	**0.978**	1.066	0.524
Infl	**0.397**	0.948	1.187	0.891	0.951	1.166	**0.447**	0.926	1.747	0.860	0.878	1.312
Intrate	**0.361**	1.099	1.337	1.105	1.033	0.946	**0.436**	1.058	1.399	1.111	1.086	1.649
Bal	1.357	1.442	1.562	**0.797**	0.839	0.724	**0.533**	1.187	1.389	0.773	0.756	1.789
Debt	2.174	0.860	0.854	**0.615**	0.796	1.568	1.353	1.096	1.047	**0.673**	0.887	2.819
Spain												
Gap	2.262	0.545	0.518	0.391	**0.371**	0.605	1.188	0.902	0.777	**0.589**	0.638	1.155
Infl	1.002	0.896	3.056	0.883	**0.774**	0.313	0.849	0.968	2.207	**0.776**	0.817	0.776
Intrate	**0.246**	1.254	1.767	1.367	1.448	0.973	**0.420**	1.159	1.980	1.388	1.454	1.393
Bal	0.730	1.128	1.390	**0.697**	0.730	0.478	**0.468**	1.249	1.617	0.874	0.874	1.088
Debt	1.897	0.943	0.992	**0.672**	0.930	1.814	1.034	0.875	0.970	**0.690**	0.846	3.649

Notes: The table entries are the RMSEs of different models, along with those of OECD forecasts (as reported in the *OECD Economic Outlook*), relative to the RMSE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasting sample is 1996:2 – 2002:2. Results are reported for single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE).

Table 11: Relative MAE – Rolling estimates – Comparison with OECD forecasts

	1-Step ahead						2-Step ahead						
	OECD	S.C.M	AW.M	Mean	Med	RW MAE	OECD	S.C.M	AW.M	Mean	Med	RW MAE	Variable Average
Germany													
Gap	2.135	2.009	**0.840**	1.748	1.170	0.272	2.521	1.730	**0.735**	1.675	0.861	0.323	-1.448
Infl	1.476	0.856	1.422	0.866	**0.737**	0.269	0.965	1.115	0.887	**0.828**	0.881	0.635	0.861
Entrate	**0.389**	1.140	1.046	0.947	1.078	0.358	**0.424**	1.127	0.814	0.954	0.902	0.803	3.521
Bal	1.523	1.035	1.131	**0.779**	0.792	0.679	**0.698**	0.872	0.889	0.944	0.985	1.452	-1.576
Debt	3.299	1.141	1.123	**1.035**	1.038	0.752	1.592	0.821	0.838	**0.772**	0.866	1.402	60.129
France													
Gap	1.266	0.734	**0.675**	0.742	0.716	0.383	0.794	0.524	**0.504**	0.533	0.515	0.639	-1.121
Infl	1.620	0.933	1.446	**0.715**	0.821	0.277	0.959	1.053	1.373	**0.957**	1.062	0.467	1.072
Entrate	**0.280**	1.181	2.088	1.170	1.154	0.528	**0.385**	0.773	1.427	0.947	1.036	1.122	3.691
Bal	1.365	1.109	1.451	**0.922**	1.009	0.350	**0.661**	0.999	1.329	1.030	0.994	0.709	-2.025
Debt	2.155	1.855	1.679	**1.029**	1.259	0.500	**1.283**	2.143	1.936	1.321	1.573	0.978	63.988
Italy													
Gap	2.057	1.158	1.303	0.918	**0.897**	0.317	2.195	1.410	1.539	**1.098**	1.127	0.408	-1.414
Infl	**0.463**	0.994	1.575	0.813	0.948	0.657	**0.521**	0.920	1.551	0.919	0.938	0.978	2.798
Entrate	**0.300**	1.081	1.352	1.078	1.045	0.779	**0.426**	1.079	1.354	1.106	1.076	1.436	5.455
Bal	1.489	1.473	1.656	**0.646**	0.658	0.547	**0.591**	1.201	1.330	0.852	0.784	1.314	-2.462
Debt	2.081	0.831	0.730	**0.507**	0.676	1.396	1.393	1.034	0.835	**0.648**	0.751	2.336	113.129
Spain													
Gap	2.089	0.639	0.630	0.472	**0.447**	0.433	1.081	1.030	0.770	**0.609**	0.651	0.862	-1.353
Infl	0.868	0.823	2.681	0.859	**0.724**	0.241	0.826	1.012	1.809	**0.811**	0.888	0.607	2.978
Entrate	**0.259**	1.131	1.704	1.313	1.325	0.776	**0.400**	1.016	1.872	1.253	1.301	1.248	4.833
Bal	0.715	1.238	1.552	**0.630**	0.651	0.358	**0.459**	1.368	1.756	0.921	0.928	0.829	-1.739
Debt	1.914	0.970	1.003	**0.702**	0.923	1.416	1.019	0.950	1.102	**0.829**	0.988	2.811	72.786

Notes: The table entries are the MAEs of different models, along with those of OECD forecasts (as reported in the *OECD Economic Outlook*), relative to the MAE of a random walk model, for one and two-step ahead simulated forecasts. Estimation sample is 1981:1 – 1995:2. Forecasting sample is 1996:2 – 2002:2. Results are reported for single-country structural models (S.C. M – see text for details), an area-wide model (AW. M – see text for details), and for pooled forecasts (computed each period as the mean and the median of the forecasts of all models - MEAN and MED respectively), along with the RMSE of the random walk model (RW RMSE) and the average values of the variables over the forecasting sample.

Appendix

Single country models: Germany

$$\pi_t = \underset{(0.116)}{1.492}\pi_{t-1} - \underset{(0.116)}{0.492}\pi_{t-2} + \underset{(0.028)}{0.019}y_{t-1} + u_{1t}^{NP} \quad (1)$$

$\overline{R}^2 = 0.879$ S.E. of reg = 0.486 J.B.=0.275 LM-test=7.792

$$\begin{aligned} y_t &= \underset{(10.337)}{37.341} - \underset{(0.138)}{0.259}y_{t-1} + \underset{(0.094)}{0.443}y_{t-2} + \underset{(0.096)}{0.199} + \underset{(0.126)}{0.174}\pi_{t-1} - \underset{(0.126)}{0.174}i_{t-1} + \\ &\quad - \underset{(0.130)}{0.261}g_{t-1} - \underset{(0.241)}{0.617}\tau_{t-1} + \underset{(0.107)}{0.373}y_{t-1}^{US} + u_{2t}^{NP} \end{aligned} \quad (2)$$

$\overline{R}^2 = 0.824$ S.E. of reg = 0.856 J.B.=23.243* LM-test=6.636

$$i_t = \underset{(0.271)}{0.876} + \underset{(0.124)}{0.958}i_{t-1} - \underset{(0.104)}{0.287}i_{t-2} + \underset{(0.144)}{0.473}\pi_t + \underset{(0.051)}{0.115}y_t + u_{3t}^{M} \quad (3)$$

$\overline{R}^2 = 0.898$ S.E. of reg = 0.764 J.B.=90.792* LM-test=5.670

$$g_t = \underset{(3.803)}{11.388} + \underset{(0.121)}{0.987}g_{t-1} - \underset{(0.131)}{0.259}g_{t-2} - \underset{(0.066)}{0.251}y_t + \underset{(0.057)}{0.215}y_{t-1} + u_{5t}^{g} \quad (4)$$

$\overline{R}^2 = 0.777$ S.E. of reg = 0.610 J.B.=1.036 LM-test=10.849*

$$\begin{aligned} \tau_t &= \underset{(4.250)}{23.793} + \underset{(0.100)}{0.437}\tau_{t-1} - \underset{(0.042)}{0.107}y_t - \underset{(0.045)}{0.027}y_{t-1} + \\ &\quad + \underset{(0.058)}{0.203}\left[DY_t\left(\frac{avc_t - \Delta x_t - \pi_t}{1 + \Delta x_t + \pi_t}\right)\right] + u_{6t}^{\tau} \end{aligned} \quad (5)$$

$\overline{R}^2 = 0.747$ S.E. of reg = 0.434 J.B.=1.565 LM-test=1.218

Single country models: France

$$\pi_t = \pi_{t-1} + \underset{(0.051)}{0.151}\, y_{t-1} + u_{1t}^{NP} \qquad (1)$$

$\bar{R}^2 = 0.934$ S.E. of reg = 0.855 J.B.=29.782* LM-test=16.665*

$$y_t = \underset{(3.099)}{5.583} + \underset{(0.113)}{1.122}\, y_{t-1} - \underset{(0.169)}{0.252}\, y_{t-2} - \underset{(0.043)}{0.027}\, \pi_{t-1} + \underset{(0.043)}{0.027}\, i_{t-1} - \underset{(0.078)}{0.199}\, g_{t-1} + \underset{(0.075)}{0.078}\, \tau_{t-1} + \underset{(0.037)}{0.068}\, y_{t-1}^{US} + u_{2t}^{NP} \qquad (2)$$

$\bar{R}^2 = 0.904$ S.E. of reg = 0.540 J.B.=0.242 LM-test=2.136

$$i_t = -\underset{(0.416)}{0.186} + \underset{(0.077)}{0.577}\, i_{t-1} + \underset{(0.072)}{0.267}\, \pi_t + \underset{(0.092)}{0.057}\, y_t + \underset{(0.086)}{0.443}\, i_t^{GER} + u_{3t}^{M} \qquad (3)$$

$\bar{R}^2 = 0.933$ S.E. of reg = 0.981 J.B.=1.527 LM-test=3.176

$$g_t = \underset{(2.236)}{10.251} + \underset{(0.115)}{1.123}\, g_{t-1} - \underset{(0.099)}{0.336}\, g_{t-2} - \underset{(0.091)}{0.313}\, y_t + \underset{(0.090)}{0.296}\, y_{t-1} + u_{5t}^{g} \qquad (4)$$

$\bar{R}^2 = 0.898$ S.E. of reg = 0.407 J.B.=5.004 LM-test=4.326

$$\tau_t = \underset{(2.919)}{4.062} + \underset{(0.061)}{0.916}\, \tau_{t-1} - \underset{(0.112)}{0.272}\, y_t + \underset{(0.117)}{0.259}\, y_{t-1} + \underset{(0.060)}{0.001}\left[DY_t \left(\frac{avc_t - \Delta x_t - \pi_t}{1 + \Delta x_t + \pi_t} \right) \right] + u_{6t}^{\tau} \qquad (5)$$

$\bar{R}^2 = 0.844$ S.E. of reg = 0.492 J.B.=0.545 LM-test=1.669

Single country models: Italy

$$\pi_t = \pi_{t-1} + \underset{(0.103)}{0.071}\, y_{t-1} + u_{1t}^{NP} \qquad (1)$$

$\overline{R}^2 = 0.939$ S.E. of reg. = 1.206 J.B.=3.524 LM-test=5.193

$$y_t = \underset{(1.150)}{1.517} + \underset{(0.065)}{0.804}\, y_{t-1} - \underset{(0.030)}{0.004}\, \pi_{t-1} + \underset{(0.030)}{0.004}\, i_{t-1} - \underset{(0.028)}{0.039}\, \tau_{t-1} + \underset{(0.041)}{0.105}\, y_{t-1}^{US} + u_{2t}^{NP} \qquad (2)$$

$\overline{R}^2 = 0.814$ S.E. of reg. =0.626 J.B.=0.739 LM-test=4.239

$$i_t = -\underset{(0.435)}{0.122} + \underset{(0.059)}{0.811}\, i_{t-1} + \underset{(0.065)}{0.181}\, \pi_t + \underset{(0.138)}{0.036}\, y_t + \underset{(0.178)}{0.457}\, i_t^{GER} - \underset{(0.177)}{0.304}\, i_{t-1}^{GER} + u_{3t}^{M} \qquad (3)$$

$\overline{R}^2 = 0.963$ S.E. of reg. =0.987 J.B.=4.322 LM-test=5.092

$$g_t = \underset{(2.228)}{4.495} + \underset{(0.109)}{1.271}\, g_{t-1} - \underset{(0.098)}{0.383}\, g_{t-2} - \underset{(0.124)}{0.335}\, y_t + \underset{(0.116)}{0.406}\, y_{t-1} + u_{5t}^{g} \qquad (4)$$

$\overline{R}^2 = 0.839$ S.E. of reg. =0.581 J.B.=1.712 LM-test=7.278

$$\tau_t = \underset{(1.380)}{5.428} + \underset{(0.109)}{1.052}\, \tau_{t-1} - \underset{(0.095)}{0.182}\, \tau_{t-2} - \underset{(0.124)}{0.205}\, y_t + \underset{(0.112)}{0.311}\, y_{t-1} + $$
$$+ \underset{(0.041)}{0.171}\left[DY_t \left(\frac{avc_t - \Delta x_t - \pi_t}{1 + \Delta x_t + \pi_t} \right) \right] + u_{6t}^{\tau} \qquad (5)$$

$\overline{R}^2$=0.979 S.E. of reg. =0.508 J.B.=31.227* LM-test=6.316

Single country models: Spain

$$\pi_t = \pi_{t-1} + \underset{(0.030)}{0.100}\, y_{t-1} + \underset{(0.090)}{0.383}(\pi_{t-1} - \pi_{t-2}) - \underset{(0.087)}{0.579}(\pi_{t-2} - \pi_{t-3}) + u_{1t}^{NP} \qquad (1)$$

$\overline{R}^2 = 0.957$ S.E. of reg. =0.721 J.B.=0.157 LM-test=5.981

$$y_t = \underset{(1.429)}{1.647} + \underset{(0.127)}{1.586}\, y_{t-1} - \underset{(0.219)}{0.779}\, y_{t-2} + \underset{(0.130)}{0.122}\, y_{t-3} - \underset{(0.022)}{0.012}\, \pi_{t-1} + \underset{(0.022)}{0.012}\, i_{t-1} + \\ - \underset{(0.052)}{0.023}\, g_{t-1} - \underset{(0.045)}{0.024}\, \tau_{t-1} + \underset{(0.040)}{0.078}\, y_{t-1}^{US} + u_{2t}^{NP} \qquad (2)$$

$\overline{R}^2 = 0.965$ S.E. of reg. =0.520 J.B.=0.106 LM-test=3.528

$$i_t = -\underset{(0.791)}{0.663} + \underset{(0.089)}{0.745}\, i_{t-1} + \underset{(0.145)}{0.252}\, \pi_t + \underset{(0.119)}{0.043}\, y_t + \underset{(0.159)}{0.294}\, i_t^{GER} + u_{3t}^{M} \qquad (3)$$

$\overline{R}^2 = 0.836$ S.E. of reg. =2.085 J.B.=67.216* LM-test=6.373

$$g_t = \underset{(1.051)}{4.415} + \underset{(0.115)}{1.588}\, g_{t-1} - \underset{(0.182)}{0.926}\, g_{t-2} + \underset{(0.096)}{0.221}\, g_{t-3} - \underset{(0.076)}{0.233}\, y_t + \underset{(0.077)}{0.269}\, y_{t-1} + u_{5t}^{g} \qquad (4)$$

$\overline{R}^2 = 0.957$ S.E. of reg. =0.407 J.B.= 3.593 LM-test=8.490

$$\tau_t = \underset{(1.601)}{7.489} + \underset{(0.041)}{0.811}\, \tau_{t-1} + \underset{(0.077)}{0.007}\, y_t + \underset{(0.075)}{0.098}\, y_{t-1} + \\ + \underset{(0.063)}{0.152}\left[DY_t \left(\frac{avc_t - \Delta x_t - \pi_t}{1 + \Delta x_t + \pi_t} \right) \right] + u_{6t}^{\tau} \qquad (5)$$

$\overline{R}^2 = 0.978$ S.E. of reg. =0.433 J.B.=0.099 LM-test=12.612*

Area model

$$\pi_t^{GER} = \underset{(0.018)}{0.892}\pi_{t-1}^{GER} - \underset{(0.015)}{0.084}\pi_{t-2}^{GER} + \underset{(0.064)}{0.647}\left(\pi_t^{EU} - \pi_{t-1}^{EU}\right) + \tag{I.1}$$
$$+ \underset{(0.016)}{0.108}\pi_{t-1}^{EU} + \underset{(0.016)}{0.025}y_{t-1}^{GER}$$

$\overline{R}^2 = 0.930$ S.E. of reg. =0.368 J.B.=2.918 LM-test=10.310*

$$\pi_t^{FRA} = \underset{(0.041)}{0.851}\pi_{t-1}^{FRA} - \underset{(0.014)}{0.003}\pi_{t-2}^{FRA} + \underset{(0.106)}{1.039}\left(\pi_t^{EU} - \pi_{t-1}^{EU}\right) + \tag{I.2}$$
$$+ \underset{(0.041)}{0.149}\pi_{t-1}^{EU} - \underset{(0.027)}{0.009}y_{t-1}^{FRA}$$

$\overline{R}^2 = 0.971$ S.E. of reg. =0.567 J.B.=4.092 LM-test=4.359

$$\pi_t^{ITA} = \underset{(0.035)}{0.789}\pi_{t-1}^{ITA} + \underset{(0.013)}{0.057}\pi_{t-3}^{ITA} + \underset{(0.117)}{1.269}\left(\pi_t^{EU} - \pi_{t-1}^{EU}\right) + \tag{I.3}$$
$$+ \underset{(0.035)}{0.211}\pi_{t-1}^{EU} - \underset{(0.032)}{0.002}y_{t-1}^{ITA}$$

$\overline{R}^2 = 0.975$ S.E. of reg. =0.758 J.B.=3.452 LM-test=8.755

$$\pi_t^{SPA} = \underset{(0.037)}{0.906}\pi_{t-1}^{SPA} + \underset{(0.114)}{0.936}\left(\pi_t^{EU} - \pi_{t-1}^{EU}\right) + \underset{(0.037)}{0.094}\pi_{t-1}^{EU} - \underset{(0.028)}{0.059}y_{t-1}^{SPA} \tag{I.4}$$

$\overline{R}^2 = 0.952$ S.E. of reg. =0.763 J.B.=6.834* LM-test=12.780*

$$y_t^{GER} = \underset{(3.878)}{15.731} + \underset{(0.064)}{0.352}y_{t-1}^{GER} + \underset{(0.036)}{0.342}y_{t-2}^{GER} + \underset{(0.043)}{0.363}\pi_{t-1}^{GER} - \underset{(0.043)}{0.363}i_{t-1}^{GER} + \tag{Y.1}$$
$$- \underset{(0.053)}{0.306}g_{t-1}^{GER} - \underset{(0.073)}{0.051}\tau_{t-1}^{GER} - \underset{(0.102)}{0.233}\left(y_{t-1}^{GER} - y_{t-1}^{EU}\right)$$

$\overline{R}^2 = 0.868$ S.E. of reg. =0.742 J.B.=3.697 LM-test=5.705

$$y_t^{FRA} = \underset{(3.010)}{0.602} + \underset{(0.064)}{1.248}y_{t-1}^{FRA} - \underset{(0.054)}{0.357}y_{t-2}^{FRA} - \underset{(0.026)}{0.027}\pi_{t-1}^{FRA} + \underset{(0.026)}{0.027}i_{t-1}^{FRA} + \tag{Y.2}$$
$$- \underset{(0.053)}{0.127}g_{t-1}^{FRA} + + \underset{(0.053)}{0.114}\tau_{t-1}^{FRA} - \underset{(0.031)}{0.032}i_y^{GER} - \underset{(0.061)}{0.202}\left(y_{t-1}^{FRA} - y_{t-1}^{EU}\right)$$

$\overline{R}^2 = 0.902$ S.E. of reg. =0.544 J.B.=0.083 LM-test=0.895

$$y_t^{ITA} = -\underset{(2.097)}{10.716} + \underset{(0.073)}{0.757}y_{t-1}^{ITA} + \underset{(0.068)}{0.103}y_{t-2}^{ITA} + \underset{(0.025)}{0.110}\pi_{t-1}^{ITA} - \underset{(0.025)}{0.110}i_{t-1}^{ITA} + \tag{Y.3}$$
$$+ \underset{(0.043)}{0.337}g_{t-1}^{ITA} - \underset{(0.023)}{0.033}\tau_{t-1}^{ITA} - \underset{(0.029)}{0.220}i_y^{GER} + \underset{(0.060)}{0.022}\left(y_{t-1}^{ITA} - y_{t-1}^{EU}\right)$$

$\overline{R}^2 = 0.883$ S.E. of reg. =0.495 J.B.=0.139 LM-test=2.433

$$y_t^{SPA} = \underset{(0.947)}{0.752} + \underset{(0.077)}{1.568}\, y_{t-1}^{SPA} - \underset{(0.064)}{0.612}\, y_{t-2}^{SPA} - \underset{(0.012)}{0.009}\, \pi_{t-1}^{SPA} + \underset{(0.012)}{0.009}\, i_{t-1}^{SPA} + \\ - \underset{(0.034)}{0.007}\, g_{t-1}^{SPA} - \underset{(0.032)}{0.008}\, \tau_{t-1}^{SPA} - \underset{(0.029)}{0.054}\, i_y^{GER} - \underset{(0.058)}{0.049}\left(y_{t-1}^{SPA} - y_{t-1}^{EU}\right) \qquad (Y.4)$$

$\overline{R}^2 = 0.964$ S.E. of reg. =0.525 J.B.=0.529 LM-test=4.941

$$i_t^{GER} = \underset{(0.226)}{1.182} + \underset{(0.048)}{0.165}\, \pi_t^{EU} + \underset{(0.117)}{0.064}\, y_t^{EU} + \underset{(0.086)}{0.787}\, i_{t-1}^{GER} - \underset{(0.073)}{0.193}\, i_{t-2}^{GER} + \\ + \underset{(0.102)}{0.312}\, \pi_t^{GER} + \underset{(0.092)}{0.188}\, y_t^{GER} \qquad (R.1)$$

$\overline{R}^2 = 0.907$ S.E. of reg. =0.728 J.B.=24.840* LM-test=6.223

$$i_t^{FRA} = \underset{(0.299)}{0.075} + \underset{(0.062)}{0.389}\, i_{t-1}^{FRA} + \underset{(0.054)}{0.151}\, i_{t-2}^{FRA} + \underset{(0.043)}{0.301}\, \pi_t^{FRA} + \underset{(0.055)}{0.069}\, y_t^{FRA} + \underset{(0.054)}{0.419}\, i_t^{GER} \qquad (R.2)$$

$\overline{R}^2 = 0.934$ S.E. of reg. =0.972 J.B.=0.681 LM-test=2.889

$$i_t^{ITA} = \underset{(0.343)}{0.481} + \underset{(0.035)}{0.758}\, i_{t-1}^{ITA} + \underset{(0.038)}{0.179}\, \pi_t^{ITA} + \underset{(0.070)}{0.181}\, y_t^{ITA} + \underset{(0.056)}{0.160}\, i_t^{GER} \qquad (R.3)$$

$\overline{R}^2 = 0.961$ S.E. of reg. =1.020 J.B.=2.849 LM-test=5.262

$$i_t^{SPA} = \underset{(0.607)}{0.053} + \underset{(0.068)}{0.813}\, i_{t-1}^{SPA} - \underset{(0.061)}{0.134}\, i_{t-2}^{SPA} + \underset{(0.087)}{0.310}\, \pi_t^{SPA} + \underset{(0.091)}{0.083}\, y_t^{SPA} + \underset{(0.109)}{0.260}\, i_t^{GER} \qquad (R.4)$$

$\overline{R}^2 = 0.837$ S.E. of reg. =2.080 J.B.=74.728* LM-test=3.189

$$g_t^{GER} = \underset{(2.711)}{10.666} + \underset{(0.083)}{0.894}\, g_{t-1}^{GER} - \underset{(0.086)}{0.151}\, g_{t-2}^{GER} - \underset{(0.044)}{0.280}\, y_t^{GER} + \underset{(0.042)}{0.197}\, y_{t-1}^{GER} \qquad (G.1)$$

$\overline{R}^2 = 0.764$ S.E. of reg. =0.627 J.B.=0.809 LM-test=11.989*

$$g_t^{FRA} = \underset{(1.540)}{7.269} + \underset{(0.053)}{1.115}\, g_{t-1}^{FRA} - \underset{(0.047)}{0.265}\, g_{t-2}^{FRA} - \underset{(0.044)}{0.273}\, y_t^{FRA} + \underset{(0.047)}{0.262}\, y_{t-1}^{FRA} \qquad (G.2)$$

$\overline{R}^2 = 0.899$ S.E. of reg. =0.406 J.B.=1.803 LM-test=3.394

$$g_t^{ITA} = \underset{(1.620)}{3.428} + \underset{(0.072)}{1.231}\, g_{t-1}^{ITA} - \underset{(0.066)}{0.317}\, g_{t-2}^{ITA} - \underset{(0.079)}{0.483}\, y_t^{ITA} + \underset{(0.074)}{0.480}\, y_{t-1}^{ITA} \qquad (G.3)$$

$\overline{R}^2 = 0.842$ S.E. of reg. =0.575 J.B.=2.158 LM-test=5.967

$$g_t^{SPA} = \underset{(0.716)}{5.883} + \underset{(0.049)}{1.302}\, g_{t-1}^{SPA} - \underset{(0.045)}{0.406}\, g_{t-2}^{SPA} - \underset{(0.022)}{0.049}\, \tau_{t-1}^{SPA} + \\ - \underset{(0.040)}{0.305}\, y_t^{SPA} + \underset{(0.042)}{0.396}\, y_{t-1}^{SPA} \qquad (G.4)$$

$\overline{R}^2 = 0.953$ S.E. of reg. =0.427 J.B.=4.626 LM-test=12.723*

$$\tau_t^{GER} = \underset{(2.953)}{25.972} + \underset{(0.069)}{0.387}\,\tau_{t-1}^{GER} - \underset{(0.031)}{0.099}\,y_t^{GER} - \underset{(0.034)}{0.013}\,y_{t-1}^{GER} + \\ + \underset{(0.043)}{0.217}\left[DY_t^{GER}\left(\frac{avc_t^{GER} - \Delta x_t^{GER} - \pi_t^{GER}}{1 + \Delta x_t^{GER} + \pi_t^{GER}}\right)\right] \tag{T.1}$$

$\overline{R}^2 = 0.740$ S.E. of reg. =0.440 J.B.=1.812 LM-test=0.675

$$\tau_t^{FRA} = -\underset{(2.529)}{0.694} + \underset{(0.041)}{0.816}\,\tau_{t-1}^{FRA} + \underset{(0.048)}{0.201}\,g_{t-2}^{FRA} - \underset{(0.067)}{0.221}\,y_t^{FRA} + \underset{(0.074)}{0.303}\,y_{t-1}^{FRA} + \\ - \underset{(0.047)}{0.043}\left[DY_t^{FRA}\left(\frac{avc_t^{FRA} - \Delta x_t^{FRA} - \pi_t^{FRA}}{1 + \Delta x_t^{FRA} + \pi_t^{FRA}}\right)\right] \tag{T.2}$$

$\overline{R}^2 = 0.837$ S.E. of reg. =0.502 J.B.=0.778 LM-test=2.602

$$\tau_t^{ITA} = \underset{(0.980)}{4.902} + \underset{(0.069)}{0.987}\,\tau_{t-1}^{ITA} - \underset{(0.061)}{0.104}\,\tau_{t-2}^{ITA} - \underset{(0.084)}{0.235}\,y_t^{ITA} + \underset{(0.078)}{0.384}\,y_{t-1}^{ITA} + \\ + \underset{(0.027)}{0.187}\left[DY_t^{ITA}\left(\frac{avc_t^{ITA} - \Delta x_t^{ITA} - \pi_t^{ITA}}{1 + \Delta x_t^{ITA} + \pi_t^{ITA}}\right)\right] \tag{T.3}$$

$\overline{R}^2 = 0.979$ S.E. of reg. =0.518 J.B.=30.094* LM-test=6.683

$$\tau_t^{SPA} = \underset{(1.192)}{6.037} + \underset{(0.075)}{1.065}\,\tau_{t-1}^{SPA} - \underset{(0.058)}{0.244}\,\tau_{t-2}^{SPA} + \underset{(0.026)}{0.027}\,g_{t-1}^{SPA} + \underset{(0.049)}{0.062}\,y_t^{SPA} + \\ + \underset{(0.046)}{0.055}\,y_{t-1}^{SPA} + \underset{(0.040)}{0.138}\left[DY_t^{SPA}\left(\frac{avc_t^{SPA} - \Delta x_t^{SPA} - \pi_t^{SPA}}{1 + \Delta x_t^{SPA} + \pi_t^{SPA}}\right)\right] \tag{T.4}$$

$\overline{R}^2 = 0.979$ S.E. of reg. =0.422 J.B.=0.778 LM-test=11.487*