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THE EUROPEAN UNION GDP FORECAST RATIONALITY UNDER ASYMMETRIC PREFERENCES

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ABSTRACT

EU Commission forecasts are used as a benchmark within the framework of Stability and Growth Pact, aiming at providing a prudential view of economic outlook, especially for Member States in an Excessive Deficit Procedure. Following a newly established method by Elliott et al (2005), we assess the preference asymmetries and rationality of the Commission's GDP growth forecasts from 1969-2004. Our empirical evidence is robust across information sets and shows that the loss preferences and rationality tend to vary across large vis-à-vis small Member States and seem not to be always consistent with a prudent view of economic forecasting.

Keywords: Asymmetric Loss Preferences, Forecast Rationality, GDP Growth Forecasts, GMM Estimation, Lin-Lin.
JEL Classification: C1, C44, C53, E17, E27

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1. Introduction

The Stability and Growth Pact plays a central role in the European Economic and Monetary Union. Given the single monetary policy and the constraints imposed by the rules of the Pact, member states are effectively left with little margin of manoeuvre over the business cycle. Automatic stabilizers together with limited fiscal discretion, with the latter being highly dependent on the projection of GDP growth, could be used to guide economic policy in the short term. For this reason, the European Commission forecasts, and in particular GDP growth forecasts, are bound to receive increased attention, even more so in the light of the discussions to reform the pact by allowing a more flexible interpretation of budgetary aggregates over the cycle. To a large extent, Commission forecasts could bypass the hazards of bias from national forecasters, and thereby they could effectively provide a rational benchmark upon which the assessment of the Stability and Growth Programs, that in turn set the main national macroeconomic projections over the next three to four years, is based. A limited number of studies have dealt with the rationality of the Commissions forecasts, see Keereman (1999) and Artis and Marcellino (2001). Keereman for the period 1969 to 1997 strongly argues that the Commission forecasts are indeed unbiased and efficient, while they provide a sufficient safety margin against the realization of uncertainties concerning downturns. In addition, Artis and Marcellino (2001), used Mincer-Zarnowitz (1969) regressions to show that the null of forecast rationality cannot be rejected, indicating unbiasedness under quadratic loss, a result consistent with Keereman (1999).

In this paper, we assess the structure of forecast loss preferences and the rationality of Commissions forecasts using Keereman's data set updated until 2004. We do not impose any specific preference structure since both symmetric and asymmetric loss functions are included in the model as special cases. We adopt a newly established approach by Elliott *et al* (2005) and estimate the parameter of the forecast error loss function which controls its shape, allowing for asymmetries in the classes of linear and quadratic loss functions. Further, we test the null hypothesis of rationality by applying a J-statistic under a variety of instruments and loss function shapes. Our results suggest that the Commission forecast error loss preferences tend to vary across member states. In particular, for current year forecasts and an asymmetric quadratic loss function, our evidence suggests that the Commission preferences are pessimistic for half of the Member States and symmetric for the remaining ones. This picture drifts towards symmetry under a linear loss function. In the case of year ahead forecasts and a linear loss function our estimates indicate symmetric preferences with the exception of pessimism for two small counties, whilst for a quadratic loss function this picture of symmetry reverses to significant optimistic preferences for four countries and the EU as a whole. Optimist growth forecasts imply lower projected levels of nominal deficit and thus they allow some leeway against the required fiscal adjustment within the framework of the Stability and Growth Programme, especially for countries in an excessive deficit procedure. To this end, it should come as no surprise that the four countries with significant optimistic growth forecasts are all in an excessive deficit procedure. The massive improvement in the preference structure of current year forecasts, effectively reflects the fact that the latter constitute a revision of year ahead forecasts.

2. Data: the Commission forecasts

The European Commission produces short-term annual GDP growth projections for member states twice a year, in spring and autumn, focusing on the current year and the year ahead. The forecasts are derived from an analysis of the country desks in DG II, ECFIN of the EU Commission using to a different degree statistical method. In particular, a forecasting round starts with a position paper, including the monetary assumptions and the outlook for the world economy and international trade. In the light of new information these external assumptions can be adapted in the course of a forecasting exercise. The major forecasting work is done by country desks which follow a judgmental approach. By aggregation the EU-wide data are obtained. The forecasts by the country desks are confronted with the econometric projections of DGII′s QUEST-model (see Keereman (1999) for a comprehensive analysis), albeit Commission forecasts are not based on a formal macroeconomic modelling. Effectively, Commission forecasts are formed within an environment in which there exists mostly an interplay process between committee iteration and judgmental discretion. The QUEST-model only serves as a partial formal modelling that could be used as a consistency check. As a separate consistency check a trade model is applied so as to control variations in statistical discrepancies between bilateral import and export flows and prices, and also to ensure consistency both at the EU level and at the world level.

Once consistency checks are completed, a preliminary forecast is discussed internally in DG II and it is eventually adapted as a provisional forecast which is then sent to the national desk's experts. An exchange of views between national experts and DG II takes place in the Working Group on Economic Forecasts leading to the final version of the forecasts the main figures of which are published. Thus, it becomes apparent that both the judgmental approach of the forecasting exercise and the exchange of views under certain conditions could alter the underlying loss preferences of the forecasts. With respect to the time horizon, the focus is on the current year and the year ahead, but in the autumn exercise an additional year is added.

For reasons of data availability, we shall consider the EU-12 thus excluding member states that joined the Union in 1995 and thereafter. The sample size for each member state varies, from 35 data points for founding members to 18 data points for Spain and Portugal that joined in 1986. The current year forecast represents the projection as reported in Spring Forecasts for the same year, while the year ahead forecast deals with the following year. Our year ahead forecasts are taken from the Autumn forecasts. As in Artis and Marcellino (2001) and Keereman (1999) we collect the realised GDP series from the most recent revision available. It is worth noticing that the choice of realised data has not been met free of controversy, as reported in Keereman (1999) and given that they are often subject to revisions in later years. Following Artis and Marcellino (2001) the realisation data for the current year forecasts, "first available estimates", are found in the Spring forecasts following the year to be forecast. The realisation data for the year ahead forecasts are taken from the Autumn forecasts following on the year to be forecast, "first settled estimates". The current year forecast represents the projection as reported in Spring Forecasts for the same year. Our year ahead forecasts are taken from the Autumn forecasts.

The use of first available estimates in the assessment of current year forecast accuracy is motivated by the greater attention usually attracted by first available estimates, compared to later revisions. Indeed, a quick evaluation is necessary if a policy reaction is required. The greater precision of the first settled estimates is an attractive feature and they have been used in the analysis of the year ahead forecasts. Realisations are continuously revised as a result of new information and of methodological changes (e.g.: change of base year, change of treatment of particular transactions in the government accounts) and another approach would be to identify them with the most recent revised data, presumed to reflect best the truth. According to Artis (1996) *"it is crucial to use the most accurate estimate of the actual data in order to avoid penalising the best prediction of what actually happened as opposed to the best prediction of what initially was mistakenly t - 1, t, t + 1 thought to have happened"*. It is likely that previous data have been subject to several revisions, while the recent data just to a few. This would alter the nature of the forecast error through time and make the affirmation that the forecast accuracy has increased through time less robust. Therefore, it was preferable to work with a constant vintage of outturn data as in Keereman (1999).

Moreover, in this paper we opt for the definition of forecast error as realisation minus the forecast, thus implying that a negative value signifies overprediction in the growth rate. A first glance at the mean forecast errors has revealed a number of negative signs, implying overpredictions for some large Member States and EU average (see Diagrams 1-4), though for certain countries like Belgium, Portugal, Ireland, Greece and Luxemburg we find evidence of underprediction. Note that preliminary analysis of the data set using Mincer-Zarnowitz (1969) regressions shows that the null of forecast rationality cannot be rejected, indicating unbiasedness under quadratic loss, a result consistent both with Artis and Marcellino (2001) and Keereman (1999). However, Batchelor and Peel (1998) and Christodoulakis (2005) have shown that such regression results should be biased in the presence of asymmetric preferences and further exacerbated under non-normality.

3. Methodology and results

The first forecast rationality test under asymmetric loss was proposed by Bachelor and Peel (1998) but their method is not applicable in our context due to the low frequency of our data set[1]. Elliott *et al* (2005) have recently proposed a more universally applicable method and in this paper we shall follow their paradigm. They consider a flexible loss function of the form:

$$L(p,a) \equiv [a + (1-2a)\mathbf{1}_{(Y_{t+1}-f_{t+1}<0)}]\left|Y_{t+1} - f_{t+1}\right|^{p} \qquad (1)$$

where p=1,2, $\alpha \in (0,1)$, **1** is an indicator and $Y_{t+1}-f_{t+1}$ is the forecast error. The above function nests the double linear (Lin-Lin) loss for p=1 and the double quadratic (Quad-Quad) for p=2. For α<1/2 (α>1/2) the loss exhibits asymmetry towards a higher penalty for over-predictions (under-predictions) and for α=(1/2) the loss is symmetric.

By observing the sequence of forecasts $\{f_{t+1}\}$, $\tau \le t < T+\tau$ an estimate for α is constructed using a linear Instrumental Variable estimator $\hat{\alpha}_T$, as follows:

$$\hat{a} = \frac{\left[\frac{1}{T}\sum_{t=\tau}^{T+\tau-1} v_t \left|Y_{t+1} - \hat{f}_{t+1}\right|^{p_0-1}\right]' \hat{S}^{-1} \left[\frac{1}{T}\sum_{t=\tau}^{T+\tau-1} v_t \mathbf{1}_{(Y_{t+1}-f_{t+1}<0)} \left|Y_{t+1} - \hat{f}_{t+1}\right|^{p_0-1}\right]}{\left[\frac{1}{T}\sum_{t=\tau}^{T+\tau-1} v_t \left|Y_{t+1} - \hat{f}_{t+1}\right|^{p_0-1}\right]' \hat{S}^{-1} \left[\frac{1}{T}\sum_{t=\tau}^{T+\tau-1} v_t \left|Y_{t+1} - \hat{f}_{t+1}\right|^{p_0-1}\right]} \qquad (2)$$

where v_t is a dx1 vector of instruments which is a subset of the information set used to generate $\hat{f}$, while $\hat{S}$ is given by:

[1] For a general treatment of decision-based forecast evaluation see Clements (2005).

$$\hat{S} = \frac{1}{T} \sum_{t=\tau}^{T+\tau-1} v_t v_t' (\mathbf{1}_{(Y_{t+1} - f_{t+1} < 0)} - \hat{a}_\tau)^2 \left| Y_{t+1} - \hat{f}_{t+1} \right|^{2p_0 - 2} \quad (3)$$

Since S depends on α_T estimation is performed iteratively, assuming S=I in the first iteration to estimate α_T, 1, until convergence. Elliott *et al* (2005) show that the estimator of α_T is asymptotically normal and construct a J-statistic which under the joint null hypothesis of rationality and flexible loss function is distributed as a X^2(d-1) variable for d>1 and takes the form:

$$J = \frac{1}{T} \left[\begin{array}{l} \left(\sum_{t=\tau}^{T+\tau-1} v_t \left[\mathbf{1}_{(Y_{t+1} - f_{t+1} < 0)} \right] \left| Y_{t+1} - \hat{f}_{t+1} \right|^{p_0 - 1'} \right) \hat{S}^{-1} \\ \times \left(\sum_{t=\tau}^{T+\tau-1} v_t \left[\mathbf{1}_{(Y_{t+1} - f_{t+1} < 0)} - \hat{a}_T \right) \right] \left| Y_{t+1} - \hat{f}_{t+1} \right|^{p_0 - 1} \right) \end{array} \right] \sim X_{d-1}^2 \quad (4)$$

Next, we expose our data to the method proposed by Elliott *et al* to uncover the shape of the loss function implied by the forecasts. For robustness, we estimate equations (2) and (3) for both p=1and p=2 using two and three instruments, in particular a constant and lagged forecast error as well as the latter two and the lagged realization. Elliott *et al* (2004) apply the same methodology to US GDP growth forecast data and indeed uncover a variety of preferences for different forecasters.

We report results for year ahead forecasts in Table 1 for both quadratic (p=2) and linear (p=1) loss functions using two (d=2) and three (d=3) instruments. Our estimated loss function parameters are all statistically different from zero. For quadratic loss, in six out of twelve cases the estimated parameter is centred around symmetry, indicating neutral preferences, whilst for Ireland the loss preferences appear to be highly pessimistic. Interestingly, estimates of the asymmetry parameter α for France, Germany, Italy, Portugal and the EU as a whole are found to be statistically larger than 0.5 by a big margin. These results indicate that for some Member States, forecast under-prediction is more costly than equal over-prediction.

This picture is weaker for linear loss estimates in which eight out of twelve cases are statistically indifferent from 0.5, with the exception of Greece and Ireland for which the Commission exhibits pessimistic preferences.

We also report the J-statistic for three null hypotheses, $H_0 : a = \hat{a}$ (from the estimation), a=0.25, and a=0.75, the latter two representing pessimistic and optimistic preferences respectively. Under quadratic loss, it is shown that for alphas which are not statistically different from 0.5, the likelihood to reject the null of 0.25 or 0.75 is higher. Moreover, we find strong evidence of optimism, that is rejection of the null α=0.25, in the case of France, Germany, Italy, Portugal and the EU both for the case where d=2 and d=3. To the extent that a prudent macroeconomic manager should tend to be pessimistic regarding GDP forecasts, our results for year ahead forecast optimism and neutrality release a warning signal. Higher growth rate forecasts than realised could allow Member States to exploit a certain degree of flexibility over the year to year economic monitoring under the examination of their Stability and Growth Programmes as it lowers the future required fiscal adjustment within this framework, a result of some significance. Especially since the Member States for which such optimism in forecasts were found are all in an Excessive Deficit Procedure (Portugal, Italy, France and Germany). On the other hand, we find evidence of strong pessimism, that is acceptance of the null α=0.25, in the case of Ireland. Under a linear loss function, the J-statistics tend to indicate that both null hypotheses of α=0.25 and α=0.75 are rejected which is in accordance with the estimated alphas.

The massive improvement in the preference structure of current year forecasts as reported in Table 2, effectively reflects the fact that the latter constitute a first estimate GDP growth based on information of the first quarter of National Accounts data. For quadratic loss, most Member States have a parameter ‘α’ statistically close or lower than 0.5, implying that over-prediction is more costly than under-prediction in the case of the first estimate for GDP growth in the current year. Under linear loss, the estimated alphas further approach symmetry. Our results are also complemented with the J-statistic for the joint null of rationality and flexible loss function. Elliott *et al* (2004) apply the same methodology on US GDP growth forecast data and indeed uncover a variety of preferences for different forecasters.

4. Conclusion

In this paper we examine the structure of loss preferences and the rationality of European Commission GDP growth forecasts in the context of asymmetric flexible loss functions. We follow a newly established method proposed by Elliott *et al* (2005) and present estimates for the loss function asymmetry parameter as well as results from a joint test of forecast rationality and a flexible loss function. Our empirical results provide evidence that the Commission loss preferences and rationality tend to vary across different member states of EU, though for current year forecasts, most Member States exhibit prudential asymmetric loss preferences and the respective rationality. However, the year ahead GDP growth forecasts for France, Germany, Italy, Portugal and the EU average show a clear aversion to under-prediction, reflecting an underlying loss preference towards optimism rather than pessimism.

In terms of fiscal adjustment, optimist growth forecasts imply, given revenue and expenditure elasticities, a lower projected nominal deficit. Thus, in its annual assessment of fiscal adjustment of EU countries within the Stability and Growth Programme framework the Commission could be less critical for some countries over the uncertainties surrounding the magnitude of their projected nominal deficit. Also, optimistic growth forecasts allow countries to claim *ex-post* that they could not meet their fiscal target due to negative surprises in growth developments. Notice that under the new Pact it is legitimate for countries to receive repetition of legal steps within the excessive deficit procedure in the event of unforeseen economic events that would imply lower growth rates than projected due to events outside the control of the government. This is clearly stated in the new EU Council Regulation No 1467/97 on speeding up and clarifying the implementation of the excessive deficit procedure "*unexpected adverse economic events with major unfavourable consequences for government finances occur after the adoption of that recommendation, the Council may decide, on a recommendation from the Commission, to adopt a revised recommendation under Article 104 (7) and Article 104(9) of the Treaty*". Reversely, prudent growth projections, in the sense of $\alpha<0.5$, would urge the EU countries to stand ready to take additional fiscal effort *ex-ante* so as to accommodate uncertainties with regards to growth developments.

This result characterises forecasts that could improve their prudence by applying less optimism in the loss preference structure, and thus enhance their rationality in light also with the developments in the economic outlook of recent years, where the Commission forecasts have repeatedly failed to predict the sharp deceleration of economic activity, especially of large Member States in the euro area, where growth rate has slowed significantly and fallen below potential.

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Table 1. Parameter Estimates Under Lin-lin Loss and Forecast Rationality Tests (1-year ahead)

	D=3 P=2					D=3 P=1					D=2 P=2					D=2 P=1				
	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$
Belgium	0.55	0.1	3.53	5.37	6,023	0.5	0.08	3.68	7.76	8.29	0.6	0.1	0.72	5.35	2.65	0.5	0.08	0.16	6.85	6.89
Denmark	0.55	0.12	0.82	4.7	3.08	0.46	0.09	0.08	4.78	7.34	0.56	0.11	0.09	4.65	2.36	0.46	0.09	0.017	4.76	7.3
France	0.74	0.08	1.74	10.25	1.76	0.59	0.08	0.58	11.06	3.54	0.71	0.09	0.048	10.13	0.16	0.59	0.08	0.58	11.06	3.54
Germany	0.7	0.09	1.15	10.1	1.3	0.57	0.1	2.9	10.2	5.56	0.69	0.09	0.045	10.08	0.77	0.56	0.08	0.68	9.71	4.6
Greece	0.47	0.14	1.1	2.77	4.35	0.33	0.08	1.68	2.2	8.88	0.41	0.15	0.0026	0.96	3.57	0.36	0.01	0	1.16	8.62
Ireland	0.23	0.08	2.67	2.72	10.91	0.31	0.08	0.175	2.06	13.5	0.23	0.08	2.63	2.67	10.76	0.31	0.08	1.75	2.06	13.5
Italy	0.75	0.08	1.86	11.1	1.85	0.59	0.08	1.1	11.02	4.16	0.75	0.08	0.009	10.63	0.01	0.58	0.08	0.26	10.97	3.6
Luxemburg	0.49	0.11	2.19	4.58	5.5	0.46	0.08	2.14	6.18	8.83	0.5	0.1	0.14	4.1	4.7	0.46	0.08	1.75	6.04	8.75
Netherland	0.53	0.11	0.4	4.57	4.09	0.5	0.08	0.59	6.97	6.97	0.53	0.1	0.059	4.69	3.89	0.5	0.086	0.03	6.08	6.8
Portugal	0.86	0.07	1.94	6.02	3.1	0.65	0.11	0.19	6.97	0.85	0.87	0.07	1.81	5.32	3.1	0.65	0.12	0.18	6.97	0.86
Spain	0.54	0.15	1.58	2.28	2.5	0.46	0.12	1.53	3.4	4.4	0.53	0.16	1.27	2.11	2.14	0.46	0.12	0.71	3.08	4.2
UK	0.52	0.11	1.28	4.7	3.72	0.5	0.09	0.28	6.06	6.1	0.53	0.11	1.26	4.59	3.72	0.5	0.09	0.17	6.05	6.05
EU	0.74	0.09	2.1	10	2.1	0.56	0.08	0.93	9.66	4.8	0.73	0.09	0.33	9.55	0.37	0.55	0.08	0.15	9.52	4.43

D is the number of instruments and P is the exponent of the loss function

Table 2. Parameter Estimates Under Lin-lin Loss and Forecast Rationality Tests (current-year)

	D=3 P=2					D=3 P=1					D=2 P=2					D=2 P=1				
	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$	$\hat{a}$	SE	Ja	$J_{0.25}$	$J_{0.75}$
Belgium	0.44	0.1	5.48	5.47	7.35	0.35	0.08	5.27	5.52	13.64	0.47	0.11	2.48	4.69	6.91	0.36	0.081	5.1	5.43	13.48
Denmark	0.58	0.11	0.2	5.24	2.24	0.55	0.09	0.85	8.35	4.77	0.59	0.11	0.15	5.19	2.28	0.55	0.089	0.51	8.31	4.57
France	0.49	0.11	3.15	4.76	5.81	0.44	0.08	3.38	6.46	9.84	0.52	0.11	2.1	4.76	4.14	0.45	0.08	1.73	5.71	9.51
Germany	0.63	0.09	1.26	7.32	2.62	0.51	0.08	0.71	7.78	6.74	0.6	0.1	0	6.68	2.28	0.51	0.08	1.28	7.7	6.51
Greece	0.33	0.12	1.82	2.12	5.17	0.38	0.1	0.67	2.17	8.18	0.35	0.12	0.47	1.06	5.67	0.39	0.1	0.02	1.78	8.02
Ireland	0.33	0.09	0.18	0.74	10.06	0.31	0.08	0.77	1.26	14.21	0.32	0.1	0.09	0.7	9.73	0.32	0.08	0.26	0.9	14.19
Italy	0.52	0.12	0.99	5.85	3.97	0.54	0.084	1.79	9.38	5.86	0.55	0.14	0.45	5.56	1.58	0.54	0.08	0.035	8.29	5.17
Luxemburg	0.1	0.049	2.72	4.69	11.03	0.25	0.07	4.27	4.26	16.98	0.17	0.07	0.0062	1	9.87	0.31	0.08	0.056	0.69	16.4
Netherland	0.21	0.08	4.5	4.96	10.08	0.26	0.074	3.85	3.84	16.9	0.29	0.1	3.49	3.34	10.67	0.28	0.076	2.4	2.46	16.8
Portugal	0.58	0.14	2.23	3.64	2.59	0.4	0.11	3.86	4.85	5.58	0.58	0.14	1.72	3.36	2.11	0.42	0.11	2.73	4.3	5.32
Spain	0.073	0.06	3.47	5.38	4.85	0.42	0.11	2.3	3.25	5.63	0.17	0.1	2.46	2.84	4.23	0.43	0.12	1.71	3.1	5.31
UK	0.18	0.07	4.17	3.37	6.62	0.44	0.09	2.63	5.8	8.63	0.23	0.09	0.09	0.11	6.33	0.45	0.089	0.006	4.37	8.19
EU	0.5	0.11	5.77	5.89	6.26	0.41	0.08	4.2	5.51	12.41	0.46	0.11	1.2	4.02	4.62	0.42	0.08	0.07	4.06	10.39

D is the number of instruments and P is the exponent of the loss function

Diagram 1: Italy, Forecast Errors

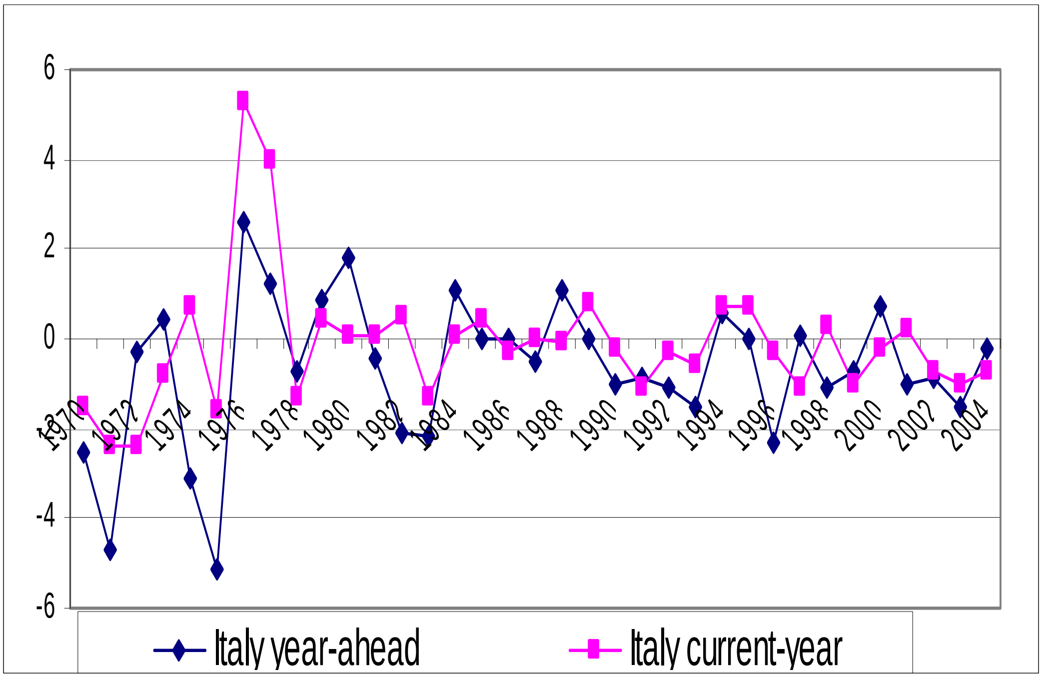


Diagram 2: France, Forecast Errors

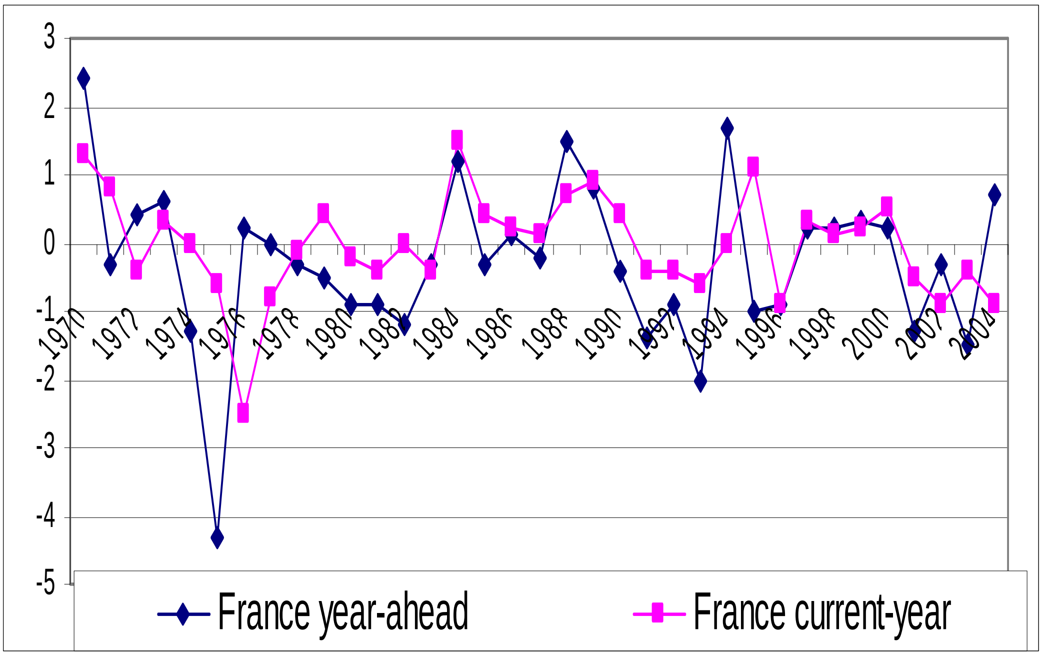


Diagram 3: Germany, Forecast Errors

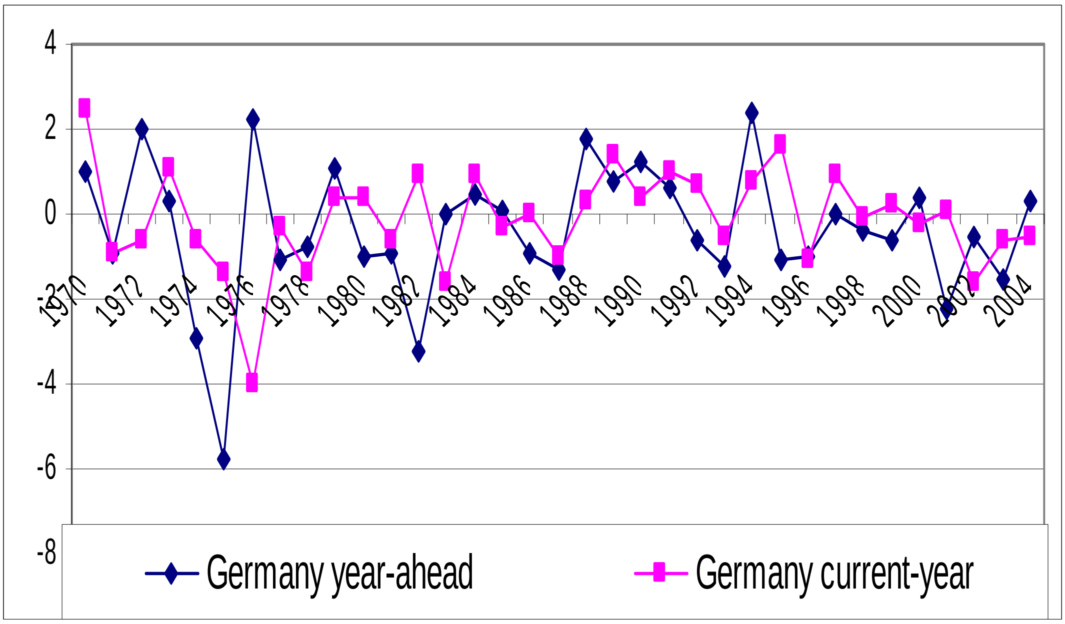
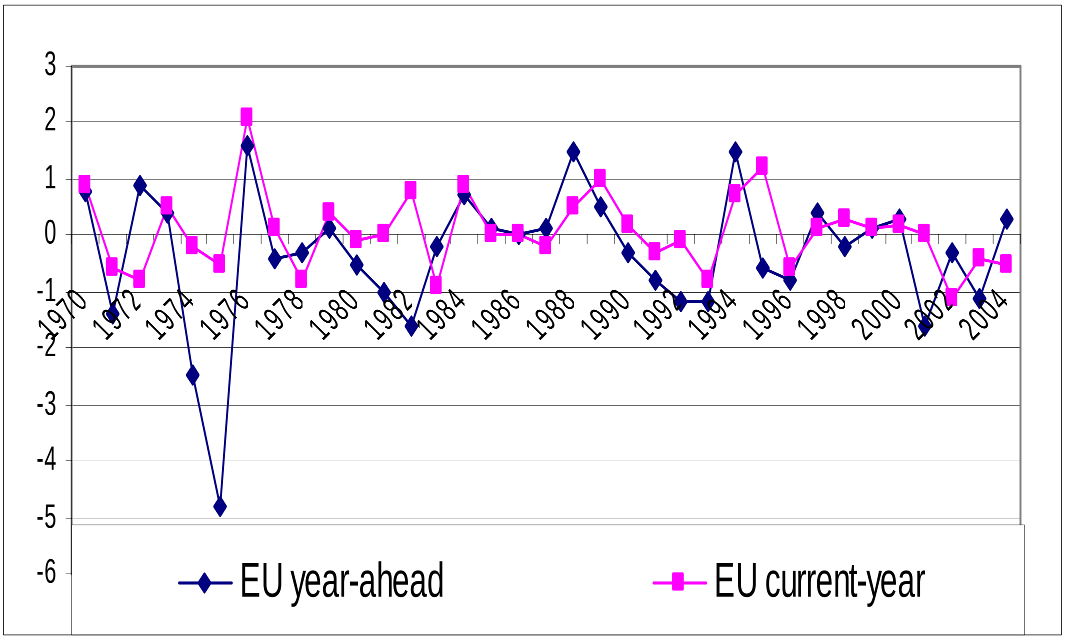


Diagram 4: EU, Forecast Errors



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