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REAL-TIME GDP FORECASTING IN THE EURO AREA

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Abstract

Quantitative information on the current state of the economy is crucial to economic policy-making, but the quarterly national accounts data for GDP in the euro area are released with a significant delay. This paper presents alternative models for the real-time forecasting of euro area GDP and assesses their performance. We estimate univariate/multivariate statistical models, bridge models (systems of autoregressive distributed lags equations with indicators) and a small structural model. The models are estimated for aggregate GDP and components both area-wide and for the three main countries. They are estimated and tested for the period 1980-1999. Data from 1999 to 2001 are used to compare the forecasting ability, gauged by rolling-origin one-step-ahead errors.

JEL classification: C53, C22, E37
Keywords*:* short-term GDP forecast, bridge model, out-of-sample forecasting accuracy.

Contents

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1. Introduction[1]

Information on the state of economic activity is obviously a crucial ingredient in policy-making. The need for updated and reliable data is also apparent in the case of macroeconomic forecasting, which is directly affected by the quality and completeness of our knowledge of the initial conditions.

The data provided by official statistical agencies are essential. The EU Commission, Eurostat and the ECB are all working to redress the critical situation of the statistical information. The adoption of the European system of accounting rules (ESA 95) greatly facilitates the production of a common set of accounts based on homogenous criteria for Europe and the euro area. Problems of timeliness and reliability are still on the Eurostat agenda, however, owing to differences in national practices and experiences. In particular, Eurostat is striving to shorten the lag in publication of the quarterly national accounts (NA) data of the single countries to seventy days[2]. In the meantime, in order to close the information gap, there is a plan for flash estimates (suggested delay 45 days) of the key NA items (see Eurostat, 2000).

Timely information on the economic situation may be obtained by estimating bridge models (BM), where all sorts of short-term indicators (qualitative as well as quantitative) may be linked to the corresponding NA variables. They are an efficient procedure for obtaining a consistent quantitative interpretation of the pieces of information conveyed by the indicators. They are different from the so-called flash estimates: "A flash estimate is

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[2] A great effort has been made to improve and enlarge the supply of short-term economic information by the national statistical institutes. On September 25, 2000, the EU published the "*Action Plan on EMU Statistcal Requirements*", which contains for each country of the Union a timetable for the release of several statistical indicators. The ECOFIN Committee of the EU has issued two reports on the implementation of the statistical requirements (on January 11, 2001, and on October 26, 2001), where the activity of the national statistical institutes in this field is closely scrutinised.

defined as the earliest picture of the economy according to national accounts concepts, which is produced and published as soon as possible after the end of the quarter, using a more incomplete set of information than that used for traditional quarterly accounts. Because this preliminary estimate is based on incomplete information, the compilers must use ad hoc statistical procedures for reducing the margins of error associated with it." (Eurostat, 2000, p. 374). BMs are more general and may be interpreted as autoregressive distributed-lag models plus indicators, where a prominent role is played by the dynamic characteristics of the variables. Since indicators cover a wide range of short-term macroeconomic phenomena, they can be used in different bridge equations for the main GDP components (private consumption, government purchases of goods and services, fixed investment, inventory investment, export, and import), or at aggregate GDP level. In the first case, the model is labelled demand-side BM (where the GDP equation is the NA income-expenditure identity); in the second, supply-side BM (where the GDP equation is a single bridge equation with *ad hoc* indicators for the GDP).

It is important to note that the equations of the BM are not behavioural, as the underlying structure is not a standard macroeconometric model: specific explanatory indicators are included in each bridge equation because they embody timely updated information about the dependent NA variable. As BMs require that the whole set of regressors (lagged endogenous and explanatory indicators) be known over the projection period, they may be conceived of as a tool providing an estimate of the current situation, a "nowcast", rather than a pure forecast. In practice, however, only some realisations (months) of the indicators are known, which leads one to interpret the BMs estimates as forecasts. The forecasting horizon of BM is of one or at most two quarters ahead, and in the paper we present alternative forecasting experiments with BMs, in order to verify performance in situations as close as possible to the actual forecasting activity.

This paper presents alternative models for the real-time forecasting of euro area real activity and assesses their performance. Many are estimated for aggregate GDP and its components, both area-wide and for the three main countries. The BMs refer to France, Germany, Italy and the euro area. They are estimated over the period from 1980.1 to 1999.4 and the forecast comparison is computed over the period 1999.1-2001.2, thus considering one year used for the estimation (1999) and the next out-of- sample six quarters.

The paper is organised as follows. Section 2 focuses on the main methodological issues. The benchmark models, based on ARIMA, VAR, and structural approaches for France, Germany, Italy and the euro area are described in Section 3. Section 4 presents the BMs for both the area and the single countries, along with a discussion of the main properties of the *ex post* aggregating procedure. The forecasting performance of benchmark and bridge models are assessed and compared in Section 5. Section 6 concludes. Data sources are listed in Appendix 1. Appendix 2 gives details on BM specification and estimation.

2. Methodological aspects

2.1 Bridge, ARIMA and VAR models

The main forecasting issues dealt with in this paper may be clarified by decomposing the forecasting error as follows (see for instance Stock, 2001):

$$y_{t+h} - \hat{y}_{t+h} = \left[y_{t+h} - E\left(y_{t+h}|F_t\right)\right] + \left[E\left(y_{t+h}|F_t\right) - \mu_h\left(F_t|\vartheta\right)\right] + \left[\mu_h\left(F_t|\vartheta\right) - \mu_h\left(F_t|\hat{\vartheta}\right)\right]$$

where y_t is the variable to be forecast, $\hat{y}_{t+h}$ is the h-period ahead forecast of y (h = 1, 2), and F_t is the information set on which the forecast is based. The conditional expectation $E(y_{t+h}|F_t)$ is unknown but may be approximated by the model $\mu_h(F_t|\vartheta)$, where ϑ is the vector of parameters ($\hat{\vartheta}$ the corresponding estimates). The first component of the forecasting error is unavoidable since it is related to the stochastic nature of the link between y_{t+h} and F_t. The other two components entail a trade-off between simple and complex models: simple models reduce parameter uncertainty (the third source of error), but have a limited information set, making the (second) approximation potentially relevant; the advantages of a model with a lot of parameters to be estimated are obtained at a cost in terms of greater parameter uncertainty. In order to deal with this trade-off, it is advisable to make a simulated out-of-sample forecast comparison to assess the performance of the different approaches over the recent past.

In the univariate ARIMA models, the information set F_t is based only on the past observations of the series being forecast; they are purely statistical models, since modelling options do not exploit additional information either from economic theory or from short-term indicators. Though very simple, the ARIMA parametric approximation (with unit root pretesting and data-dependent lag-length selection) is the best univariate forecasting tool for a wide family of loss functions, as is shown by Stock and Watson (1998). In addition, being very parsimonious, ARIMA models have a low cost in terms of parameter uncertainty (the third source of forecasting error).

In the VAR approach the choice of the variables in F_t influences the estimates heavily (see Lutkepohl, 1982). Though only past observations of the variables of interest are in F_t , VAR models exploit a larger information set than ARIMA models, making the second source of forecasting error less relevant. In presence of non-stationarity, the use of cointegration techniques in the field of the VEqCM (Vector Equilibrium Correction Model) provides statistical foundations for the identification of structural relationships based on economic theory and allows one to assess the usefulness of past level disequilibria between actual realisations and structural targets in forecasting the short-term dynamics of the variables of interest (see Clements and Hendry, 1999). In other terms, the cointegrated VAR approach may lead to small macroeconometric models, such as the area-wide structural model we will use later in the forecasting exercise.

In the BM approach, the information set F_t is based not only on past observations (as in ARIMA-VAR cases), but also includes some indicators. Hence, with respect to previous modelling approaches, here the first component of the forecasting error should be less important because at least some months of the indicator realisations in quarter $t+1$ are known. In order to assess the BM forecasting performance in situations as close as possible to actual forecasting activity, however it is advisable to perform five exercises: two one-quarter-ahead (h=1), and three two-quarter-ahead (h=2):

(1) *The nowcast*: a one-quarter-ahead forecast where the indicator observations of quarter $t+1$ are completely known.

(2) *The pure one-step-ahead forecast*: a one-quarter-ahead forecast where no monthly observations of the indicator for quarter $t+1$ are known.

(3) *The two-step-ahead nowcast*: a two-quarter-ahead forecast where the indicator observations of both $t+1$ and $t+2$ are completely known.

(4) *The mixed two-step-ahead forecast*: a two quarter-ahead forecast where we know the monthly observations of the indicators for quarter $t+1$, but not those for $t+2$.

(5) *The pure two-step-ahead forecast*: a two-quarter-ahead forecast where we do not know any realisation of the indicators for either $t+1$ or $t+2$.

With respect to benchmark ARIMA-VAR models, the nowcasts (cases 1 and 3) are the most favourable situations for BMs: the exploitable indicator information, which is completely unknown to the other forecasting approaches, is maximised. On the other hand, the pure one- and two-step-ahead forecasts (cases 2 and 5) represent the most unfavourable situation to BMs: indicator data for t+1 (and t+2) are not available and, in our exercises, are computed with univariate AR(5) models with a substantial increase in the number of parameters to be estimated. Case (4) is intermediate: the BM has some informational advantages (the indicators over the t+1 quarter) over the benchmark approaches.

2.2 Aggregation issues

As we are interested in forecasting area-wide GDP, we must determine the optimal level of aggregation in modelling variables by country and by GDP component. On the first point, the issue is whether it is better to forecast euro-area NA variables by *ex post* aggregation of the corresponding country-model forecast, or by directly modelling the aggregate area-wide variables; on the second, it is whether it is better to forecast GDP by *ex post* aggregation of the forecast of each component (demand-side models) or by modelling GDP directly (supply-side models). Note that in the demand-side approach the single components are modelled separately and the GDP is obtained through the NA identity.

A number of papers deal with these issues. Fagan and Henry (1998), Dedola *et al.* (2001) and Golinelli and Pastorello (2002) present results for euro-area money demand, which show the superiority of the aggregate approach. In contrast, Espasa *et al.* (2002) find evidence against the use of area-wide models, and prefer to forecast euro-area inflation at country level. In Bodo *et al.* (2000), the performance of area-wide models is superior to national (disaggregated) models in forecasting the euro-area index of industrial production, while Zizza (2002) and Marcellino *et al.* (2001) obtain better results with disaggregated models. The latter findings can be ascribed to the use of a particularly good French, German and Italian indicator set in Zizza (2002) and to a new methodological approach (which also allows for automatic data pre-processing and smoothing) in Marcellino *et al.* (2001). As far as disaggregation by item is concerned, Parigi and Schlitzer (1995) show that both supply- and demand-side approaches perform satisfactorily, slightly better in the supply-side case.

As no solution to the aggregation dilemma can be established on a purely theoretical basis, we compare the forecasting performance of supply and demand side benchmark and bridge models, estimated both area-wide and at country level.

Though the euro area includes 12 countries, we analyse single-country models only for France, Germany and Italy, since detailed and timely information is more easily available for these countries, whichin any event account for almost three-quarters of total euro-area GDP. This implies that when using country-level equations, area-wide GDP cannot be forecast by a straightforward *ex post* aggregation. Indeed, the GDP forecasts by country are used as regressors in a second-step model aimed at predicting aggregate euro-area GDP. It should be noticed that, in terms of forecasting performance, given the trade-off between "more information" and "less parameter uncertainty", the parsimony of our approach may offset the information loss arising from the exclusion of the 9 smaller countries.

2.3 BM and provisional data

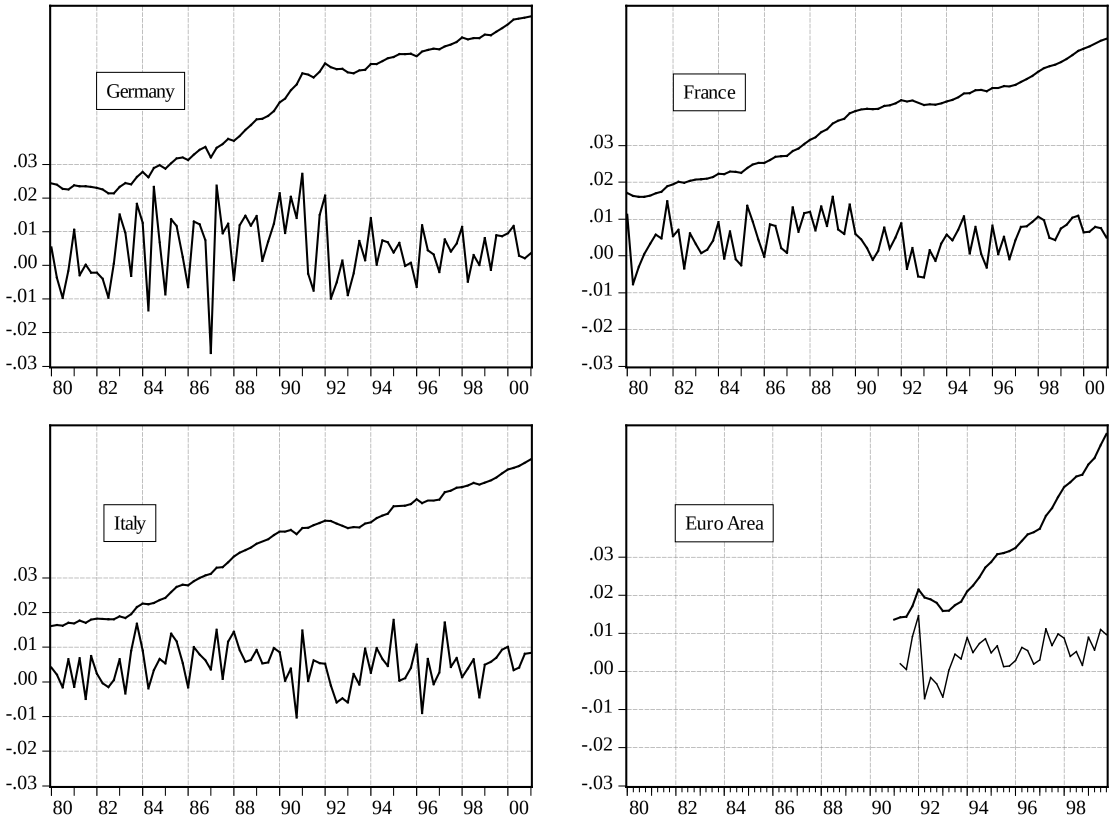
The efforts of Eurostat and the EU Commission appear to be essentially directed to improving the timeliness of the statistical indicators with little concern for their quality and reliability. This implies that problems of revisions of the provisional data will be more substantial, similar in magnitude to those of the US (for a discussion of the latter, see Croushore and Stark, 2000 and 2001). Moreover, Kozicki (2001) shows that in empirical modelling the choice of the latest available or real-time data is critical for variables subject to large revisions, but almost irrelevant for variables subject to only small revisions.

Hence, in perspective, the relevance of the vintage of data used in short-term modelling in Europe is certain, but at present a real-time data-set is far from fully available. It is worth remembering that it took seven years to complete the US data-set. However, nowadays the topic is of growing interest in the literature. Faust *et al* (2001) provide an analysis of the bias stemming from provisional data on the assessment of the economic cycle and/or macroeconomic forecasting in the G7 countries (see Busetti, 2001, for an application to Italy). Camacho and Perez-Quiros (2002) find that the information content of the Conference Board Composite Leading Index is useful in anticipating both turning points and output growth, even in real time. D'Amato and Swanson (2000) find that often the ranking of the performance of alternative models does not change with data vintage.

In the present paper we follow the traditional practice and use the latest available data, leaving a full assessment of the impact of different data vintages for future research. Hence, we acknowledge that our outcomes are subject to a *caveat*, given that the latest available data may imply a bias for the ranking of different models according to their short-term forecasting performance.

Figure 1

GDP, LOG-LEVELS AND FIRST DIFFERENCES



3. The benchmark models for GDP

In this section GDP benchmark models are derived by using univariate as well as multivariate time series techniques. Every series is seasonally and – except for Italy – working-day adjusted; the series are log-transformed (except for the stocks variation). Since integration and cointegration concepts can be useful in order to set the appropriate transformations to the variables of interest (levels or first-order differences), Section 3.1

reports both unit root tests and Box-Jenkins univariate modelling of GDP and Section 3.2 reports multivariate outcomes from a three-country GDP VAR model. Finally, Section 3.3 reviews a small structural model for the euro area, developed in the field of cointegrated VAR models.

3.1 Preliminary data analysis and the univariate models

Analysis of the levels and the first differences of GDP time series for France, Germany and Italy for 1980-1999 (Figure 1; see Appendix 1 for details on the statistical sources) suggests that non-stationarity is the main feature of the variables to be modelled. Figure 1 also reports the euro-area GDP time series for 1991-99 (which is the largest officially available sample at area-wide level). Due to this data shortage, we have to be particularly careful in interpreting results of euro-area models.

The average growth rate is similar among countries (about 2% on annual basis), while quarter-by-quarter variability is greater (almost twice as great in Germany than in France or Italy. The path of first differences does not show relevant outliers, as suggested by plots in figure 1 and normality tests in table 1. Figure 1 also shows that, over the common 1991-99 period, the variability of euro-area GDP growth is about the same as that of the French (0.0049 and 0.0048 respectively), German volatility is still the highest (0.0071) though less than in the whole sample, and Italian volatility (0.0059) is the same as for the whole period.

Table 1

GDP GROWTH DESCRIPTIVE STATISTICS (1)
(1980.1-1999.4)

	Euro area (2)	Germany(3)	France	Italy
Mean	0.0046	0.0049	0.0050	0.0046
Standard deviation	0.0049	0.0096	0.0052	0.0058
Jarque-Bera test of normality, P-values	0.487	0.684	0.595	0.958

(1) First differences of log-levels. (2) euro area statistics refer to the 1991.2-1999.4 period. (3) Pre-unification years refer to Western Germany only.

The correlogram approach to time series differencing advocated by Box and Jenkins (1970) sometimes leads to an incorrect filter selection and, consequently, to biased forecasts (see Franses and Kleibergen, 1996). As an alternative, the choice of specific differencing filter may be chosen by following a formal procedure using both unit root and stationarity tests (the unit root pretesting advocated by Stock and Watson, 1998).

As Newbold *et al.* (2001) argue, the distinction between trend-stationary and difference-stationary processes can be important for forecasting purposes (on this, see also Clements and Hendry, 2001); in addition, Diebold and Kilian (2000) show that unit root pretesting selects models with better forecasting accuracy. Results from both unit root and stationarity tests for single-country and area-wide GDP are reported in Table 2.

Table 2

GDP UNIT ROOT AND STATIONARITY TESTS (1)

(1980.1-1999.4)

Variable (2)	ADF	k (3)	PP	q (4)	KPSS	l (5)
Y^{eu} (6)	-3.945^{*}	4	-1.100	3	0.3568^{**}	6
Δy^{eu}	-3.933^{**}	1	-3.996^{**}	3	0.5377^{*}	6
Y^{ge}	-2.760	4	-2.011	3	0.3376^{**}	9
Δy^{ge}	-3.134^{*}	3	-8.933^{**}	3	0.1836	9
Y^{fr}	-2.344	3	-1.621	3	0.3346^{**}	9
Δy^{fr}	-3.636^{**}	3	-7.013^{**}	3	0.1722	9
Y^{it}	-1.715	2	-1.588	3	0.4422^{**}	9
Δy^{it}	-9.319^{**}	0	-9.279^{**}	3	0.1285	9

(1) ADF = Dickey and Fuller (1979), PP = Phillips and Perron (1988) unit root tests. KPSS = Kwiatkowski *et al.* (1992) stationarity test. All test regressions of levels include both constant and trend; the first differences ones omit trend. (2) *y* (log-levels of GDP); *eu* (euro area), *ge* (Germany), *fr* (France), *it* (Italy). Δ is the first difference operator. (3) *k* is chosen by starting from a maximum number of lags (k_{max} = 5) and reducing the model by dropping the lag parameters not 10% significant (see Ng and Perron, 1995). (4) The truncation lag *q* is based on the Newey-West automatic truncation lag selection. (5) The order *l* of the MA(*l*) approximation for residuals of the test regressions is set to $T^{1/2}$. (6) Sample period 1991.2-1999.4 . (*) 5% and (**) 1% significant.

The results by country are clear-cut: over the sample period, log-GDP levels are I(1), and must be put in differences to be stationary, then the ARIMA models (1)-(3) are identified and estimated by following the Box-Jenkins specific-to-general approach (standard errors are in brackets below the parameter estimates, and e^{cc}_t are the residuals of the country *cc* model).

$$\Delta y^{ge}_t = \underset{(0.0012)}{0.0036} + \underset{(0.105)}{0.255}\, \Delta y^{ge}_{t-4} + e^{ge}_t \qquad (1)$$

$$\Delta y^{fr}_t = \underset{(0.0008)}{0.0037} + \underset{(0.111)}{0.255}\, \Delta y^{fr}_{t-2} + e^{fr}_t \qquad (2)$$

$$\Delta y^{it}_t = \underset{(0.0007)}{0.0046} + e^{it}_t \qquad (3)$$

On the other hand, possibly because of data shortage, area-wide test results are mixed, and the choice of the best univariate model is not easily validated: though in (4) we only report an ARIMA(1,1,0) model, a simple trend stationary ARMA model (not reported) also seems to perform quite well.

$$\Delta y^{eu}_t = \underset{(0.0012)}{0.003} + \underset{(0.171)}{0.356}\, \Delta y^{eu}_{t-1} + e^{eu}_t \tag{4}$$

The explanatory power and residual misspecification tests for the models (1)-(4) are shown in the first four columns of Table 3. For ease of comparison the last four columns of the table also report the statistics of the other benchmark models in the following sections. At first sight, the performance of the univariate models is not very satisfactory: though residual diagnostics do not show relevant specification problems, R^2 are quite low. The model for Italy is the simplest, since GDP levels are modelled as a random walk with drift. The euro-area ARIMA model performance is open to poor-sample criticism.

Table 3

BENCHMARK MODELS FOR GDP

(1980.1-1999.4)

Model:	ARIMA				Restricted VAR			Structural
Country:	Germany	France	Italy	Euro area	Germany	France	Italy	Euro area
Equation:	(1)	(2)	(3)	(4)	(1’)	(2’)	(3’)	(5)
Diagnostic checks ([1])				([2])				
Adjusted R^2	0.059	0.051	0.000	0.126	0.069	0.208	0.032	0.210
S.E. of regression	0.009	0.005	0.006	0.005	0.009	0.005	0.006	0.005
Durbin-Watson	2.065	1.646	1.978	2.070	2.071	1.711	1.826	1.918
LM(1)	0.758	0.144	0.952	0.190	0.044	0.005	0.004	0.764
LM(4)	0.369	0.337	0.636	0.425	0.278	0.001	0.023	0.645
ARCH(1)	0.310	0.327	0.924	0.439	0.862	0.475	0.695	0.664
WHITE	0.535	0.433	-	0.005	0.735	0.714	0.206	0.387
JB	0.558	0.543	0.958	0.002	0.445	0.640	0.734	0.427
RESET(2)	0.807	0.744	-	0.001	0.807	0.130	0.122	0.085
CHOW	0.931	0.994	0.531	0.972	([3])	([3])	([3])	([4])

([1]) To improve readability, only the *p*-values (%) of the misspecification tests are reported, LM(p) p-th residuals autocorrelation test; ARCH(p) p-th autoregressive conditional heteroschedasticity test; WHITE heteroschedasticity test; JB normality test; RESET nonlinearity test up to the third power; CHOW predictive failure test over the period 2000.1-2001.1. ([2]) Estimation period: 1992.1-1999.4 . ([3]) System parameter constancy forecast test (2000.1-2001.1): F(15, 67) = 0.659 [0.814]. ([4]) Structural model parameter constancy forecast test (2000.1-2001.1): F(20, 71) = 1.055 [0.415]

As far as the univariate models for GDP components are concerned, proper ARIMA specifications were estimated: their specification was more complicated and considerably less stable than the simple autoregressions characterising GDP models (1)-(4), since they often include short-memory MA terms (the results are available on request). However, ARIMA specifications may be reasonably well approximated by AR models with a sufficient number of lags without impairing their forecasting performance. Following the usual practice (see Canova and Ciccarelli, 2001), we have taken into account AR(5) models in levels for both GDP and its components (at both country-specific and area-wide level) to be used in the forecasting exercises in Section 5.

3.2 The multicountry VAR model

Given the unit root test results, the reduced-rank VAR models are the natural multivariate extension of the integration-test-and-ARIMA-modelling approach applied in the previous section. However, as far as the forecasting performance is concerned, the usefulness of imposing cointegration has not yet been fully proved. For example, Christoffersen and Diebold (1998) show that, in long horizon forecasting, imposing the correct order of integration is crucial, while imposing cointegration is not. In addition, Clements and Hendry (1999) claim that, in the presence of structural breaks and parameter non-constancy, forecasting systems in differences can deliver more accurate results than those from econometric models including variables in levels (say, cointegrated); the practical relevance of the issue is confirmed by Eitrheim *et al.* (1999).

In our case, the empirical evidence counselled getting rid of GDP levels, in line with this stream of literature. In fact, experiments in the field of Johansen (1995) cointegration tests (not reported) yield very unsatisfying results. Hence, we start from a well behaved unrestricted VAR(4) (UVAR) in differences, simplify from general to specific, and obtain a model where the equation specification for Germany is exactly the same as the univariate model (1); the Italian GDP equation is only slightly different and the French equation (2’) presents additional (and significant) explanatory variables from the other two countries. Full information maximum likelihood parameter estimates of the restricted VAR model are reported in equations (1’)-(3’):

$$\Delta y^{ge}_t = \underset{(0.0012)}{0.0034} + \underset{(0.093)}{0.290}\, \Delta y^{ge}_{t-4} + e^{ge}_t \qquad (1')$$

$$\Delta y^{fr}_t = \underset{(0.0008)}{0.0036} + \underset{(0.086)}{0.360}\,\Delta y^{fr}_{t-2} + \underset{(0.079)}{0.204}\,\Delta y^{fr}_{t-3} - \underset{(0.087)}{0.184}\,\Delta y^{fr}_{t-4} - \underset{(0.043)}{0.118}\,\Delta y^{ge}_{t-2} + \tag{2'}$$

$$+ \underset{(0.061)}{0.208}\,\Delta y^{it}_{t-1} - \underset{(0.067)}{0.194}\,\Delta y^{it}_{t-3} + e^{fr}_t$$

$$\Delta y^{it}_t = \underset{(0.001)}{0.0052} + \underset{(0.060)}{0.145}\,\Delta y^{ge}_{t-4} - \underset{(0.129)}{0.262}\,\Delta y^{fr}_{t-4} + e^{it}_t \tag{3'}$$

The main diagnostics of equations (1')-(3') are reported in Tab. 3. Some evidence of residual autocorrelation emerges, which disappears when system diagnostics and residual correlograms are taken into account. The 27 zero-restrictions necessary to pass from UVAR to (1')-(3') are largely accepted (χ^2_{27} = 16.27 with p-value = 0.948). Even with the addition of significant parameters the standard error for equation (2') is only slightly smaller than for model (2) (0.0046 vs. 0.0050). Overall, with the three-country multivariate approach we have obtained the restricted VAR (1')-(3') whose statistical performance over the estimation sample is in line with univariate models (1)-(3). These findings have led us not to extend the multivariate analysis to the components of GDP.

3.3 The area-wide structural model

In this section we briefly sketch the main features of a small structural model for the euro area proposed by Bagliano *et al.* (2002a and 2002b), whose GDP forecasts can be used as an additional benchmark. As previously pointed out, a more complex structure of relationships may improve the approximation to the true data generation process but with a greater probability of errors and structural breaks in the parameter estimates.

The most appealing characteristics of the structural approach are: *(i)* it is explicitly based on economic theory; *(ii)* its empirical structure has been derived from the econometric evaluation of cointegration and parameter constancy. These two properties should entail a reduction of the dangers claimed by the literature that advocates the use of models in differences. In particular, our structural model represents a way in which the P-star and the output-gap economic theories synthesise important issues such as dynamics, aggregation and equilibrium-correction (details about the theoretical foundations can be found in Bagliano *et al.*, 2002b).

Though the model is made up of five equations, we report only the equation for GDP, the variable we want to forecast. The list of explanatory variables includes the rate of capacity utilisation (*qr*), an indicator typically belonging to the information set of the BM described in Section 4.

$$\Delta y^{eu}_t = \underset{(0.049)}{-0.210} \{\Delta r_{t-4} - \Delta dp_{t-2}\} + \underset{(0.085)}{0.224} \Delta qr_{t-1} + \underset{(0.033)}{0.069} [m_{t-1} - \underset{(0.017)}{1.47} y^{eu}_{t-1}] + e^{eu}_t \qquad (5)$$

where Δ is the first difference operator, r is the nominal long-term interest rate, dp is the HICP inflation rate, m is the real M3 index, and e^{eu} represents the residuals (whose diagnostics are presented in the last column of Table 3). Parameters are Fiml estimated over the 1980.1-1999.4 period using partially reconstructed data (see Bagliano *et al.*, 2002a and 2002b). In the short run, output changes are explained by lagged changes in the real interest rate and in the rate of capacity utilisation. In the long run, a level relationship between output and real money holds, and the adjustment of output to past imbalances is quite slow (about 30% per year) but very significant. This finding provides evidence of the usefulness of money in forecasting GDP.

4. The bridge models

The main characteristic of BMs is the joint exploitation of the dynamics of the dependent variable along with the information contained in the short-term indicators. This should improve the forecasting performance of the purely univariate or VAR time series models.

Section 4.1 summarises the main BM estimation results for GDP and its components, both by country and area-wide. For components, we explicitly model the following variables: total private consumption, public consumption, gross fixed capital formation, exports, imports, and variation in stocks (for Italy a finer disaggregation is used in more detailed models, distinguishing between consumption of durable and non-durable goods and between investment in constructions and in other components). In all models Public consumption is included for completeness but it is forecast using univariate autoregressions only.

Since we want to forecast euro-area GDP using alternative models, some of which are disaggregated by country and/or by GDP component, Section 4.2 discusses the results in terms of aggregation issues.

4.1 Main estimation results

The bridge models reported in this study can be classified into two broad categories: a single bridge equation for GDP (the supply-side model), and bridge equations for each GDP component (the demand-side model).

All equation specifications are based on the general-to-specific methodology; at each step, the validity of model specifications has been checked through the usual battery of misspecification tests. In particular, we have computed test statistics for normality, autocorrelation and autoregressive conditional heteroschedasticity of the residuals; the RESET and the out-of-sample Chow test have also been performed. In-sample stability of parameter estimates has been checked by estimating each regression over different sub-samples and by recursive least squares (results are available on request). All variables have been transformed into logarithms (apart from the variation in stocks which has been considered as a percentage of total demand) in order to take account of both different units of measurement and outliers ; in many cases (17 out of 33) the first difference specification has been adopted (in the Italian case, the larger number of dynamic level regressions is probably due to the availability of specific indicators for more highly disaggregated GDP items). While the starting date is different for each regression, end date is always 1999.4, thus leaving 6 observations (up to 2001.2) for the computation of the Chow test. We did not use dummy variables in order to avoid an excess of model fine tuning and respect the principle of parsimony (the three dummy variables in the Italian BM improve the in-sample statistical performance, without affecting the forecasting ability of the model).

As far as area-wide models are concerned, Appendix 2 lists the aggregate supply side equation (A2.1), the aggregator equation for the national supply side models (A2.2) and the aggregator equations for national demand side equations (A2.3-A2.8). The aggregator equations explain each area-wide variable by using the corresponding national variables of the three main countries; they are used to aggregate country-level forecasts. The statistical foundation for the euro-area GDP supply equation (A2.1) in log-levels plus trend is from ADF unit root test in Table 2. For both the national GDP aggregator equation (A2.2) and almost all demand side equations (A2.3-A2.8), we have simple regressions of each area-wide series in differences on the intercept and the corresponding variables at country-level (in differences); the only exceptions are the investment and export equations. It is important to stress that even these simple specifications in differences are the result of a search and are not imposed *a priori*: the corresponding variables of the three major countries in the euro area, along with the ordinary least squares approximation, are enough to track the area-wide aggregate.

Appendix 2 reports the BM for France (equations A2.9-A2.15), Germany (equations A2.16-A2.22), and Italy (equations A2.23-A2.33). The Italian BM is an improved (and updated) version of the Parigi and Schlitzer (1995) specification, while the French model is very similar to the specification proposed by Irac and Sedillot (2002).

GDP supply-side equations by country are characterised by a strong link with the index of industrial production and a set of variables from the qualitative manufacturing surveys. The presence of other indicators is interpreted as a proxy for the lack of reliable information on the service sector.

In the case of private consumption, the French and the German equations stress the importance of the retails sales index, while this is not the case for Italy because of the well known problems with the Italian indicator. A result common to all countries is the marginal role of the consumer confidence index, probably because other explanatory variables correlated with it are already included in the specification (such as the unemployment and the inflation rates and some proxy for the level of activity; for more details see Carnazza and Parigi, 2001; Golinelli and Parigi, 2002). However, in periods of deep recession (1992-93 in Italy) the consumer confidence index proves to be a source of additional explanatory power for consumption equations, as for the. Finally, new car registrations confirm their validity for consumption of durable goods.

Conditional on a proxy for the level of activity (such as the industrial production index for France and Germany or GDP for Italy), investment seems to be well tracked by survey variables, especially those related to the expected short-term evolution of orders[3]. The results for Germany and Italy show that additional explanatory power may be achieved by considering the construction components expressly.

[3] Carnazza and Parigi (2000) show that better leading properties of the business confidence index may be obtained by substituting firms’ expectations on the evolution of orders for their production expectations.

The export and import equations are based on the corresponding trade variables, with some marginal role for the indexes of the real exchange rate, industrial production, and survey variables. In this context, however, the quality of the results is highly influenced by the statistical problems (noise) of the customs data.

Since variations in stocks are calculated in each country as NA identity residuals, there is no reliable indicator for this variable. Hence, a variety of specifications have been explored with differing results.

A summary of misspecification tests of the regressions outlined above is reported in Table 4, where the frequencies of the p-values of the test statistics less than 10% are shown. The models appear to be quite well specified. In particular the Chow test does not signal many significant departures from stability in all equations for France, Germany and Italy. This is a remarkable result, given that the out-of-sample period (2000.1-2001.2) could be influenced by the advent of the EMU. As far as euro-area equations are concerned, in 3 out of 7 regressions the Chow test is significant, but in 2 of these the forecasting error is very small and in all cases the regression fit is very satisfactory (detailed diagnostics by equation are available upon request).

Table 4

SUMMARY OF BM MISSPECIFICATION TESTS

	France	Germany	Italy	Euro area
Number of equations	7	7	11	8
Normality (^{1}) (^{2})	0	29	27	25
Autocorrelation (^{1}) (^{3})	14.5	0	0	12.5
Heteroschedasticity (^{1}) (^{4})	14.5	29	9	12.5
Reset (^{1}) (^{5})	0	14.5	9	25
Chow (^{1}) (^{6})	14.5	0	9	37.5

(^{1}) Percentage of test-statistics with a p-value inferior to 10%. (^{2}) Lagrange multiplier test statistic for skewness and kurtosis. (^{3}) Lagrange multiplier test statistic for up to the 4th order autocorrelation. (^{4}) Lagrange multiplier test statistic for up to the 4th conditional autoregressive heteroschedasticity. (^{5}) Ramsey's reset test statistic. (^{6}) Chow out of sample test statistic for the period 2000.1-2001.2.

4.2 Aggregation issues of the euro-area GDP forecasting models

The main issue in studying alternative models for euro-area GDP forecasting is the choice between alternative disaggregate and aggregate models. On this regard, Grunfeld and Griliches (1960) pointed out that "it is useful to think of specification error as the general term and aggregation error as a special case of specification error […] What we are contrasting are the results of leaving one macro variable out of K micro equations with the results of leaving out K micro variables from the macro equations." (p. 7). Three of the models discussed above are based on aggregate data: the euro-area univariate equation (4), the structural equation (5) and the BM supply-side equation for the euro area.

Country-specific models were provided only for the 3 largest EMU economies, France, Germany and Italy, in consideration of the large-scale availability of short-term indicators and of these countries very large share of area-wide output. National forecasts are then employed to make the euro-area GDP forecast through equations A2.2-A2.8. Interestingly, in Grunfeld and Griliches's framework this can be seen either as an approximation to a disaggregate model, or as an aggregate model where country-level variables take account of disaggregated information.

In the first case, on the basis of the historical economic performance recorded in the sample period, both the expected value of the area-wide growth rate and its variance may differ from that of the three major countries and their weighted average. The size of the constant in the BM equation provides a sort of correction for the level bias, while the size of regression coefficients allows for the possibly different volatility of the aggregate growth rate. In the BM equation for GDP (A2.2) the constant is significantly greater than 0 while the sum of the regression coefficients is slightly greater than 1, implying that the expected euro-area growth rate is higher and more volatile than that of the 3 countries. This is consistent with the historical records of GDP quarter-on-quarter in the 1990s.

In the second case, the BM equation (A2.2) may be interpreted as an aggregate equation with forecasts of the French, German and Italian GDP growth rates as regressors, which in turn may be interpreted as linear combinations of national short-term indicators. Thus, this equation can be seen as an aggregate regression exploiting country-level information. That is both kinds of information stressed by Grunfeld and Griliches are relevant.

5. The GDP forecast comparison

In this section we compare the BM forecasting performance with those of the benchmark models presented in Section 3, through one- and two-step-ahead forecasting exercises over a rolling fixed-length sample period[4]. The advantages of the rolling approach are well known in literature (see the recent survey of Tashman, 2000).

In Table 5 the root mean squared errors (RMSE) of the euro-area GDP growth rates of one-step-ahead forecasts are shown both for benchmark and bridge models (the results are robust to the use of alternative statistics such as the mean absolute error, the mean error, or Theil's inequality coefficient). The left-hand side of the table reports the RMSE of models using aggregate area-wide data: the ARIMA equation (4), the log-levels AR(5) model, the structural model equation (5) and a supply-side equation for the aggregate GDP (A2.1). The right-hand-side results are based on single-country forecasts aggregated by equations (A2.2), supply-side, or (A2.3-A2.8), demand-side. As explained in Section 2.1, the RMSE of the BM forecast are obtained in two different ways that are the lower and the upper bounds of the usual practice (best-case and worst-case scenario, respectively): complete information (first column) and no information (second column) about the indicators over the *t+1* quarter (missing *t+1* indicator realisations are obtained from AR(5) models).

Table 5

RMSE OF THE EURO AREA ONE-STEP-AHEAD GDP FORECASTS
(1999.1-2001.2)

Area-wide models			Aggregation of national-models		
ARIMA equation (4)	0.32		ARIMA equations (1)-(3)	0.33	
AR(5) model	0.37(1)		AR(5) models	0.32(1)	
Structural equation (5)	0.37		VAR equations (1')-(3')	0.34	
	(2)	(3)		(2)	(3)
Supply-side equation (A2.1)	0.34	0.51	Supply side BM	0.12	0.38
			Demand side BM	0.25	0.43
			Supply-demand average	0.14	0.39

(1) Average of supply and demand forecasts. (2) Nowcast exercise, where t+1 quarter indicator data are known. (3) Pure forecast exercise, where t+1 quarter indicator data are not known .

[4] Additional models were provided by AR(5) specifications in levels. In all forecasting exercises, these models play the role of automatic-univariate model, because they account for the possible presence of unit roots and main dynamic features of the series (see Canova and Ciccarelli, 2001).

The main feature of Table 5 is the superior performance of the forecasts from the aggregation of national BM nowcasts, and specifically the supply-side BM nowcast through equation (A2.2). This result is consistent with the implications of Grunfeld and Grilliches's prescription to exploit as much disaggregate information as possible to model aggregate phenomena. In this view, the combination of country-level forecasts in equations (A2.2-A2.8) can be interpreted as an attempt to model area-wide GDP by means of disaggregate variables. The RMSE of the supply-side BM nowcast is significantly lower than that of the benchmark AR(5) models obtained both with the area-wide model and the aggregation of national models. The p-values of the Diebold-Mariano (1995) test for the equality of the two RMSE's - computed according to the suggestion of Newbold *et al.* (1997) - are 0.002 and 0.059 (according to the test proposed by Newbold *et al.* (1998), the BM nowcast is found to encompass all other benchmark models).

Another important finding is that, as expected, the one-quarter-ahead BM forecasting performance worsens when no indicator is available. In particular, the forecasting performance of all the benchmark models is equivalent to that of the aggregation of the single-country BM forecasts. So we can tentatively conclude that in real-time GDP forecasting there is no significant gain from BM when indicators are not updated promptly (see the results of two-step-ahead forecasting exercises below, however), but BM usefulness starts growing with the availability of some information on the quarter to be forecast.

The forecasting performance just discussed at area-wide level depends on: *(i)* the validity of single-country BM equation specifications, and *(ii)* the timely availability of updated indicators.

For point *(i),* in Tab. 6 we report the one-step-ahead RMSE of national GDP forecasts for benchmark and bridge models (results by GDP component are available upon request). Again, as in the case of the euro area, the superiority of the supply-side BM nowcasts emerges clearly. However, the French and Italian demand-side specifications perform poorly with respect to the benchmark models: the quality of the indicators and the degree of misspecification for the single components may have played a role (this is certainly the case for the variation in stocks). This feature is dramatically reinforced when the BM forecasts are computed without the help of additional information about the quarter t+1 indicators.

Table 6

RMSE OF SINGLE-COUNTRY ONE-STEP-AHEAD GDP FORECASTS
(1999.1-2001.2)

	France		Germany		Italy	
ARIMA equations (1), (2), (3)	0.30		0.60		0.31	
AR(5) equations ([1])	0.30		0.52		0.40	
VAR equations (1'), (2'), (3')	0.34		0.60		0.36	
	([2])	([3])	([2])	([3])	([2])	([3])
Supply side BM	0.15	0.36	0.32	0.67	0.16	0.45
Demand side BM	0.45	0.58	0.36	0.74	0.67	0.58
Supply-demand average	0.28	0.40	0.20	0.61	0.31	0.35

([1]) Average of supply and demand forecasts. ([2]) Nowcast exercise, where t+1 quarter indicator data are known. ([3]) Pure forecast exercise, where t+1 quarter indicator data are not known .

For the German model the combination of supply and demand predictions delivers an RMSE significantly lower than in all other cases (this is also true for the pure forecasting exercise for Italy). The better performance of the combination, not unusual in the literature, may be related to the presence of some form of misspecification in both the demand and the supply-side models (see Hendry and Clements, 2002).

As far as point *(ii)* is concerned, in Table 7 we report the RMSE of a two-step-ahead forecasting exercise both by country and by the corresponding area-wide aggregation. Along the rows there are the usual three approaches: supply side, demand side, and the average. To simplify the presentation, along the columns we only report the RMSE of the benchmark AR(5) model, which is not different from that of the other benchmark models. The results reported in Table 7 are somewhat reassuring for the supporters of BM and contrast with the one-step-ahead exercise.

Even when no information on the indicators over the forecasting horizon is available, the RMSE of BM are always lower than those of the benchmark models (although not significantly so). The performance of the BM rapidly improves as more pieces of information on the indicators become available: when indicators are known only for the t+1 quarter the RMSE is almost halved with respect to the benchmark model and it falls to one fifth in the two-step-ahead "nowcast" exercise (fourth and the fifth column in Table 7).

Table 7

RMSE OF TWO STEPS-AHEAD GDP FORECASTS
(1999.1-2001.2)

	Benchmark (1)	BM *(pure forecast)* (2)	BM *(mixed forecast)* (3)	BM *(nowcast)* (4)
Supply side models:				
France	0.94	0.71	0.42	0.20
Germany	1.00	0.84	0.68	0.41
Italy	0.88	0.71	0.50	0.16
Euro area	0.89	0.62	0.43	0.17
Demand side models:				
France	1.00	0.70	0.64	0.45
Germany	0.88	0.86	0.82	0.46
Italy	0.89	1.20	0.83	0.77
Euro area	0.81	0.54	0.45	0.38
Supply-demand avg.:				
France	0.97	0.63	0.47	0.31
Germany	1.00	0.61	0.59	0.25
Italy	0.75	0.81	0.45	0.39
Euro area	0.85	0.53	0.42	0.22

(1) AR(5) models. (2) Pure forecast, where neither t+1 nor t+2 quarter indicator data are available. (3) Mixed forecast exercise, where only t+1 quarter indicator data are available.(4) Nowcast exercise, where the indicator data are available over the whole forecasting horizon.

6. Conclusions

The policymaker needs timely information on the present state of the economy (essentially the short-run GDP path), but the release of reliable NA data requires a good deal of time. Can one devise econometric tools that provide timely and accurate data? That is the question addressed in this paper. More specifically, we assess the forecasting performance of a number of alternative tools for the real-time prediction of euro-area GDP. The performance of traditional benchmark models is compared with that of a bridge model that relies heavily on short-run indicators. The BM approach is an efficient way to embody timely but heterogeneous information on several indicator variables by using autoregressive distributed lag models.

The analysis carried out in this paper makes use of a good number of alternative models and variables. This provides useful insights about the aggregation issues related to short-term GDP forecasting for the euro area. In assessing our results, one should bear in mind that BM representations of GDP are not purely statistical (univariate or multivariate), as they rely on some additional information from economic theory and, more crucially, on short-run indicators. This implies that theoretical generalisations, of the sort recently presented by Giacomini and Granger (2001), cannot be drawn from our results, which do nevertheless allow us to offer, by way of conclusion, general operational guidelines.

First of all, BM performance is always better than benchmark models, provided that at least some data over the forecasting horizon are available. It follows from these results that appropriate exploitation of the information contained in short-term economic indicators improves the ability to estimate the current state of the economic cycle. Hence, timely, reliable and high quality short-run indicators are tools for successful forecasting. However, our results show that even when no information on the indicators over the forecasting horizon is available, the forecasting performance of the bridge model is equivalent (one step ahead) or slightly better (two step-ahead) than that of the benchmark models. It thus appears that there is always some gain in building bridge models.

In addition, since euro-area GDP can be disaggregated both by country and component, the forecasting approach may change according to the level of disaggregation used in the BM. In this last regard, our results are quite clear-cut: over a forecasting horizon one to two quarters ahead, the aggregation of forecasts by country performs considerably better in forecasting euro-area GDP and also offers information on the state of the single economies. On the other hand, the aggregation of forecasts by NA components (the demand-side approach) performs slightly worse than modelling aggregate GDP data (the supply-side approach) mainly because of the poor performance of the stocks-variation equations. However, the distance between performances narrows as the forecasting horizon increases.

Finally, our results shed light on whether it is more efficient to forecast the aggregate series directly or to model the individual components separately and then aggregate the forecasts (see Grunfeld and Griliches, 1960), and the empirical literature stemming from that seminal paper). As Granger and Yoon (2001) point out, “In theory at least, more information in general leads to improved forecasts. However, due to difficulties associated with *model specification and estimation* among others, no general consensus is reached among various empirical results” (p. 18, emphasis added). This observation highlights the need to take the nature of the variables forecast explicitly into account. On the one hand, when the variable is “easy to model” (as in the present case, where the usefulness of the economic indicators in explaining short-run GDP is evident), it is more efficient to exploit the advantages of disaggregate models (given data availability). In this context, a role is also played by the quarterly frequency of data, which may imply fairly low statistical noise. On the other hand, when the variables of interest are “traditionally difficult to model” (like money and industrial production), aggregate modelling can often alleviate model specification problems (*e.g.* through statistical averaging effects). Notice that this may also help explain the poor performance of the demand-side bridge model, which is spoilt above all by the well known difficulty of getting a good model for changes in stocks.

Appendix 1: Data

All national account (NA) data are in real terms, at 1995 prices; they are seasonally adjusted and, apart from Italy, working day adjusted. The frequency of all the series is quarterly, i.e. original monthly (or higher frequency) data are suitably transformed into quarterly data.

EURO AREA

BCIBE	Belgian business climate indicator. Source: European Commission
BCIEU	Euro area business climate indicator. Source: European Commission
COCEU	Public consumption. Source: Eurostat, NA
COMPE12	Real effective exchange rate, based upon production prices. Source: BI computations on national and IMF data
CONEU	Total private consumption. Source: Eurostat, NA
ESPEU	Exports of goods and services Source: Eurostat, NA
GDPEU	Gross domestic product. Source: Eurostat, NA
IMPEU	Imports of goods and services Source: Eurostat, NA
INVEU	Gross fixed capital formation. Source: Eurostat, NA
IPEU	Industrial production index, 1995=100. Source: Eurostat
SCOEU	Changes in stocks. Source: Eurostat, NA
TREND	Linear trend
VSPEU	$SCOEU / (GDPEU + IMPEU)_{t-1}$

FRANCE

CCIFR	Consumer confidence. Source: INSEE
COCFR	Collective consumption at 1995 prices. Source: INSEE, NA
CONFR	Total household consumption. Source: INSEE, NA
DISFR	Average quarterly unemployment rate (%). Source: INSEE
EPROFR	Production expectations; balance. Source: INSEE
ESPFR	Exports of goods. Source: INSEE, NA
EXCHFR	Real effective exchange rate, based upon production prices. Source: BI computations on national and IMF data
GDPFR	Gross domestic product. Source: INSEE, NA
GTQFR	Firms opinions on the level of finished goods stocks; balance. Source: INSEE
IMPFR	Import of goods and services. Source: INSEE, NA
INT	Nominal interbank short-term interest rate. Source: Bank of France until December 1998, ECB short-term rate afterwards.
INVFR	Gross fixed capital formation. Source: INSEE, NA.
IPFR	Industrial production index. Source: INSEE
IPFRD	Industrial production index (seasonally adjusted). Source: INSEE
IPUSA	USA industrial production index, 1992=100. Source: The Federal Reserve System
LEADFR	OECD leading indicator for industrial production. Source OECD, Main Economic Indicators
MESFR	Total exports of goods in real terms. Source: BI computations on customs data
MIMFR	Total imports of goods in real terms. Source: BI computations on customs data
ORDFR	Total orders; balance. Source: INSEE
RETFR	Retail sales index, 1993=100. Source: INSEE

SCOFR	Changes in stocks. Source: INSEE, NA.
VSPFR	SCOFR / $(GDPFR+IMPFR)_{t-1}$

GERMANY

COCGE	Collective consumption. Source: Federal Statistical Institute, NA
CONGE	Total private consumption. Source: Federal Statistical Institute, NA
CORDGE	Construction, total new orders index, 1995=100. Source: Federal Statistical Office
DISOCQ	Average quarterly unemployment rate. Source: Federal Statistical Institute
EPROGE	Production Expectations; balance. Source: IFO
ESPGE	Exports of goods and services. Source: Federal Statistical Institute, NA
EXCHGE	Real effective exchange rate, based upon production prices. Source: BI computations on national and IMF data
FORGE	Foreign orders; balance. Source: IFO
GDPGE	Gross domestic product. Source: Federal Statistical Institute, NA
GTQGE	Firms opinions on the level of finished goods stocks; balance. Source: IFO
IMPGE	Imports of goods and services. Source: Federal Statistical Institute, NA
INVGE	Gross fixed capital formation. Source: Federal Statistical Institute, NA
IPGE	Industrial production index, 1995=100. Source: Federal Statistical Institute
ITCGE	Construction, production index, 1995=100. Source: Federal Statistical Office
LEADGE	OECD leading indicator for the industrial production index
MEXGE	Total exports of goods in real terms. Source: BI computations on customs data
MIMGE	Total imports of goods in real terms. Source: BI computations on customs data
ORDGE	Total orders; balance. Source: IFO
PRICE	Harmonised Consumer Price Index. Source: Federal Statistical Institute
RETGE	Retail sales index, 1995=100. Source: Federal Statistical Office.
SCOGE	Changes in stocks. Sources: Federal Statistical Institute, NA
TREND	Linear trend
VSPGE	SCOGE / $(GDPGE+IMPGE)_{t-1}$

ITALY

ANFIA	Car registrations. Source: Transports Ministry
AUTOSIQ	Intentions to buy a car; balance. Source: Isae
CFDK	CFDURN/DURSTOK
CFDURD	Durable goods consumption. Source: Istat, NA.
CFDURN	CFDURD – TRASPQ
CLIMAQ	Households confidence index: Source: Isae
CNDURD	CONRD – CFDURD
COCRD	Collective consumption. Source: Istat, NA
COMPIMP	Real effective exchange rate based on production prices. Source: BI computations on national and IMF data
CONRD	Total private consumption. Source: Istat, NA
CONVEIDQ	Commercial trucks (up to 3.5 tons) registrations. Source: Transports Ministry
DATQ	Expected short-term evaluation of total orders. Source: Isae
DURSTOK	Stock of durable goods. Source: BI computations on Istat NA data.
FROM901	Dummy variable with 1 from 1990.1
FROM904	Dummy variable with 1 from 1990.4

FROM942	Dummy variable with 1 from 1994.2
ESPRD	Exports of goods and services. Source: Istat, NA
FEM	Female participation rate. Source: BI computations on Istat labour force data
GISCO	Gini coefficient of Italian households disposable income. Source: (1)
GMPTD	Firms opinions on the level of raw materials stocks; balance. Source: Isae.
GTQ	Firms opinions on the level of finished products stocks; balance. Source: Isae.
ICOST	Investment in constructions. Source: Istat, NA.
IMARD	INVRD – ICOST – IMTRD
IMATRD	INVRD – ICOST
IMPRD	Total imports of goods and services. Source: Istat, NA
IMTK	IMTRD/TRASTOCK.
IMTRD	Investment in transport goods. Source: Istat, NA.
INVRD	Total investment. Source: Istat, NA.
IP	Industrial production index (1995=100). Source: Istat
IPCOQ	Industrial production index of goods used in constructions. Source: BI computations
KAUTOQ	Stock of transport good. Source: Istat, NA.
LEADING	Leading indicator for the Italian economy. Source: (2)
MAS	Male participation rate. Source: BI computations on Istat labour force data
OCCD	Total employment (standard unit of labour). Source: Istat, NA.
PCFNR	Household consumption deflator. Source, Istat, NA
PILRD	Gross domestic product. Source: Istat, NA
PREL	Ratio between the durables and non durables deflators. Source: Istat, NA
QMB11D	Imports of goods (volume index, 1996=100). Source: Istat, customs data
QXB11D	Exports goods (volume index, 1996=100). Source: Istat, customs data
REALE	(3)
SCORD	Changes in stocks. Source: Istat, NA
SINCED	Uncertainty proxy. Source: (4)
TABOTQ	Nominal interest rate on T-Bills. Source: BI
TAIMPLQ	Nominal interest rate on loans; average. Source: BI
TOTTOQ	Total orders in construction firms; balance. Source: Isae
TRASPQ	Consumption of transport goods. Source: Istat, NA
TRASTOK	Stock of transport goods. Source: Istat, NA
TREND	Linear trend
UCINTD	Domestic orders of machinery (index, 1995=100). Source: UCIMU
VSPIL	SCORD / $(\text{PILRD+IMPRD})_{t-1}$
WFAMC	Total household real wealth. Source: BI computations on Istat, BI data
YD	Proxy for household real disposable income. Source (1)

BI stands for Bank of Italy; IMF and OECD denote the corresponding international organisations.

(1) See Brandolini and Parigi (1993).
(2) See Altissimo et al. (2000).
(3) TAIMPLQ less households' expected inflation rate derived from Bank of Italy computations on ISAE data. For more details on this, see Parigi (1993).
(4) The variable has been obtained from the quantification (for the procedure, see Dasgupta and Lahiri (1993)) of the replies of manufacturing firms to a question on the state of the economy one quarter ahead.

Appendix 2: Area-wide and single-country BM specification and estimates

EURO AREA

GDP (Aggregate equation)

$$\Delta \mathrm{Log}(GDPEU)_t = \underset{(6.132)}{2.793} \underset{(5.235)}{+0.467} \mathrm{Log}(GDPEU)_{t-1} \underset{(2.632)}{+0.021} \Delta \mathrm{Log}(BCIBE)_t \underset{(7.517)}{+0.293} \mathrm{Log}(IPEU)_t \underset{(-2.147)}{-0.0396} \Delta \mathrm{Log}(COMPE12)_{t-2} \underset{(-2.689)}{-0.289} \Delta \mathrm{Log}(GDPEU)_{t-2} \underset{(5.174)}{+0.0013} \mathrm{TREND} \qquad (A2.1)$$

GDP

$$\Delta \mathrm{Log}(GDPEU)_t = \underset{(3.933)}{0.0007} \underset{(11.228)}{+0.395} \Delta \mathrm{Log}(GDPFR)_t \underset{(2.021)}{+0.434} \Delta \mathrm{log}(GDPGE)_t \underset{(7.264)}{+0.192} \Delta \mathrm{log}(PILRD)_t \qquad (A2.2)$$

Private consumption

$$\Delta \mathrm{log}(CONEU)_t = \underset{(4.147)}{0.001} \underset{(8.120)}{+0.265} \Delta \mathrm{log}(CONFR)_t \underset{(15.921)}{+0.380} \Delta \mathrm{log}(CONGE)_t \underset{(9.084)}{+0.275} \Delta \mathrm{log}(CONRD)_t \qquad (A2.3)$$

Public consumption

$$\Delta \mathrm{log}(COCEU)_t = \underset{(7.114)}{0.001} \underset{(7.358)}{+0.216} \Delta \mathrm{log}(COCFR)_t \underset{(32.153)}{+0.370} \Delta \mathrm{log}(COCGE)_t \underset{(4.694)}{+0.195} \Delta \mathrm{log}(COCRD)_t \qquad (A2.4)$$

Gross fixed capital formation

$$\Delta \mathrm{Log}(INVEU)_t = \underset{(2.493)}{0.002} \underset{(4.691)}{+0.345} \Delta \mathrm{Log}(INVFR)_t \underset{(14.915)}{+0.436} \Delta \mathrm{Log}(INVGE)_t \underset{(2.644)}{+0.140} \Delta \mathrm{Log}(INVRD)_t \underset{(2.460)}{+0.066} \Delta \mathrm{log}(BCIEU)_{t-1} \underset{(-1.630)}{-0.057} \Delta \mathrm{log}(BCIEU)_{t-2} \underset{(-1.037)}{-0.036} \Delta \mathrm{log}(BCIEU)_{t-3} \underset{(2.546)}{+0.067} \Delta \mathrm{log}(BCIEU)_{t-4} \qquad (A2.5)$$

Exports

$$\Delta \mathrm{log}(ESPEU)_t = \underset{(4.558)}{0.004} \underset{(4.163)}{+0.177} \Delta \mathrm{log}(ESPFR)_t \underset{(9.081)}{+0.385} \Delta \mathrm{log}(ESPGE)_t \underset{(7.969)}{+0.236} \Delta \mathrm{log}(ESPRD)_t \underset{(-1.934)}{-0.049} \Delta^2(\mathrm{Log}(COMPE12))_t \underset{(-3.470)}{-0.108} \Delta \mathrm{log}(COMPE12)_{t-2} \qquad (A2.6)$$

Imports

$$\Delta \mathrm{Log}(IMPEU)_t = \underset{(5.226)}{0.004} \underset{(8.071)}{+0.270} \Delta \mathrm{Log}(IMPFR)_t \underset{(11.661)}{+0.430} \Delta \mathrm{Log}(IMPGE)_t \underset{(9.095)}{+0.179} \Delta \mathrm{Log}(IMPRD)_t \qquad (A2.7)$$

Change in stocks

$$VSPEU = \underset{(1.730)}{0.0004} \underset{(9.760)}{+0.334} VSPFR \underset{(6.597)}{+0.291} VSPGE \underset{(5.417)}{+0.175} VSPIL \qquad (A2.8)$$

FRANCE

GDP

$$\Delta \mathrm{Log}(GDPFR)_t = \underset{(2.391)}{0.161} \underset{(-4.364)}{-0.495} \Delta \mathrm{Log}(GDPFR)_{t-1} \underset{(-1.350)}{-0.089} \Delta^2 \mathrm{Log}(GDPFR)_{t-2} \underset{(4.031)}{+0.133} \Delta \mathrm{Log}(LEADFR)_{t-1} \underset{(3.054)}{+0.0193} \mathrm{Log}(EPROFR)_t$$
$$\underset{(4.965)}{+0.099} \mathrm{Log}(IPFR)_t \underset{(-5.390)}{-0.096} \mathrm{Log}(GDPFR)_{t-1} \underset{(2.015)}{+0.060} \Delta\left(\mathrm{Log}(IPFR),2\right)_t \quad \text{(A2.9)}$$

Private consumption

$$\Delta \mathrm{Log}(CONFR)_t = \underset{(-4.450)}{-0.446} \Delta \mathrm{Log}(CONFR)_{t-1} \underset{(1.863)}{+0.238} \Delta \mathrm{Log}(GDPFR)_{t-5} \underset{(-2.602)}{-0.0121} \Delta^2 \mathrm{Log}(INT)_{t-2} \underset{(5.378)}{+0.155} \Delta(\mathrm{Log}(RETFR),4)_t \underset{(2.871)}{+0.020} \Delta(\mathrm{Log}(CCIFR),2)_{t-4} \quad \text{(A2.10)}$$
$$\underset{(-3.862)}{-0.238} \Delta^2 \mathrm{Log}(DISFR)_t \underset{(-3.162)}{-0.004} \mathrm{Log}(CONFR/GDPFR)_{t-1}$$

Public consumption

$$\Delta \mathrm{Log}(COCFR)_t = \underset{(3.346)}{0.003} \underset{(2.332)}{+0.319} \Delta \mathrm{Log}(COCFR)_{t-1} \underset{(2.361)}{+0.323} \Delta \mathrm{Log}(COCFR)_{t-2} \underset{(2.416)}{+0.333} \Delta \mathrm{Log}(COCFR)_{t-4} \quad \text{(A2.11)}$$

Gross fixed capital formation

$$\Delta \mathrm{Log}(INVFR)_t = \underset{(1.851)}{0.205} \underset{(6.224)}{+0.027} \mathrm{Log}(ORDFR/GTQFR)_t \underset{(2.392)}{+0.081} \mathrm{Log}(IPFR)_t \underset{(-3.369)}{-0.097} \mathrm{Log}(INVFR)_{t-1} \underset{(-2.101)}{-0.160} \Delta^2 \mathrm{Log}(EXCHFR)_{t-4} \quad \text{(A2.12)}$$

Exports

$$\Delta \mathrm{Log}(ESPFR)_t = \underset{(-3.718)}{-0.251} \underset{(-2.907)}{-0.174} \Delta\left(\mathrm{Log}(EXCHFR),2\right)_t \underset{(3.852)}{+0.057} \mathrm{Log}(EPROFR)_t \underset{(8.341)}{+0.406} \Delta\left(\mathrm{Log}(MESFR),2\right)_t \underset{(-6.511)}{-0.589} \Delta \mathrm{Log}(ESPFR)_{t-1} \quad \text{(A2.13)}$$
$$\underset{(-2.115)}{-0.0938} \Delta \mathrm{Log}(GTQFR)_{t-1} \underset{(2.839)}{+0.245} \Delta\left(\Delta\left(\mathrm{Log}(IPUSA)\right),4\right)_{t-1}$$

Imports

$$\Delta \mathrm{Log}(IMPFR)_t = \underset{(2.316)}{0.005} \underset{(-2.166)}{-0.205} \Delta \mathrm{Log}(IMPFR)_{t-1} \underset{(5.301)}{+0.327} \Delta\left(\mathrm{Log}(IMPFR),2\right)_{t-2} \underset{(5.268)}{+0.310} \Delta \mathrm{Log}(MIMFR)_t \underset{(-4.374)}{-0.154} \Delta\left(\Delta \mathrm{Log}(GTQFR),5\right)_t \quad \text{(A2.14)}$$
$$\underset{(2.636)}{+0.718} \Delta\left(\Delta\left(\mathrm{Log}(CONFR+COCFR)\right),2\right)_{t-1}$$

Change in stocks

$$VSPFR_t = \underset{(-0.837)}{-0.0004} \underset{(2.858)}{+0.343} VSPFR_{t-2} \underset{(2.316)}{+0.264} VSPFR_{t-3} \underset{(5.889)}{+0.101} \Delta\left(\mathrm{Log}(IPFR),3\right)_{t-1} \underset{(3.066)}{+0.215} \Delta\left(\Delta \mathrm{Log}(GDPFR),2\right)_{t-3} \underset{(-1.565)}{-0.025} \Delta\left(\mathrm{Log}(GDPFR),3\right)_t \quad \text{(A2.15)}$$

GERMANY

GDP

$$\Delta \mathrm{Log}(GDPGE)_t = \underset{(-6.171)}{-0.548}\ \Delta\big(\mathrm{Log}(GDPGE),2\big)_{t-2} \underset{(-2.029)}{-0.077}\ \Delta \mathrm{Log}(GDPGE)_{t-2} \underset{(8.636)}{+0.313}\ \Delta \mathrm{Log}(IPGE)_t \underset{(6.014)}{+0.169}\ \Delta \mathrm{Log}(RETGE)_{t-4} \underset{(2.040)}{+0.040}\ \Delta\big(\mathrm{Log}(RETGE),2\big)_{t-1} \underset{(2.874)}{+0.019}\ \Delta \mathrm{Log}(CORDGE)_{t-12} \underset{(9.893)}{+0.062}\ \Delta \mathrm{Log}(ITCGE)_t \qquad (A2.16)$$

Private consumption

$$\Delta \mathrm{Log}(CONGE) = \underset{(-3.114)}{-0.228} \underset{(-6.011)}{-0.386}\ \Delta\big(\mathrm{Log}(CONGE),3\big)_{t-1} \underset{(-3.213)}{-0.280}\ \mathrm{Log}(CONGE)_{t-1} \underset{(2.429)}{+0.054}\ \mathrm{Log}(RETGE)_t \underset{(4.816)}{+0.130}\ \Delta\big(\mathrm{Log}(RETGE),5\big)_t \underset{(-2.834)}{-6.053}\ \Delta\big(\mathrm{Log}(LEADGE),3\big)_{t-3} \underset{(-3.726)}{-0.004}\ \Delta\big(\mathrm{Log}(DISOCQ)+\mathrm{Log}(PRICE)\ ,4\big)_t \underset{(3.267)}{+0.181}\ \mathrm{Log}(GDPGE)_{t-1} \underset{(3.206)}{+0.283}\ \Delta \mathrm{Log}(GDPGE)_t \underset{(-2.348)}{-0.167}\ \Delta\big(\mathrm{Log}(GDPGE),2\big)_{t-1} \qquad (A2.17)$$

Public consumption

$$\Delta \mathrm{Log}(COCGE)_t = \underset{(2.582)}{0.00652} \underset{(-2.353)}{-0.158}\ \Delta\big(\mathrm{Log}(COCGE),8\big)_{t-1} \underset{(2.238)}{+0.287}\ \Delta\big(\mathrm{Log}(CONGE)\big)_{t-1} \underset{(5.401)}{+1.323}\ \Delta(VSPGE)_{t-3} \underset{(3.526)}{+0.136}\ \Delta\big(\Delta\big(\mathrm{Log}(DISOCQ)\big),4\big)_{t-1} \qquad (A2.18)$$

Gross fixed capital formation

$$\Delta \mathrm{Log}(INVGE/GDPGE)_t = \underset{(-6.555)}{-1.311} \underset{(-6.430)}{-0.469}\ \mathrm{Log}(INVGE/GDPGE)_{t-1} \underset{(2.870)}{+0.037}\ \Delta\big(\mathrm{Log}(EPROGE),5\big)_{t-1} \underset{(4.840)}{+0.043}\ \mathrm{Log}(ORDGE)_{t-5} \underset{(5.370)}{+0.092}\ \mathrm{Log}(ITCGE)_t \underset{(7.907)}{+0.185}\ \Delta\big(\mathrm{Log}(ITCGE)\big)_{t-1} \qquad (A2.19)$$

Exports

$$\Delta \mathrm{Log}(ESPGE)_t = \underset{(-2.698)}{-0.131} \underset{(5.589)}{+0.468}\ \Delta \mathrm{Log}(MEXGE)_t \underset{(-1.812)}{-0.153}\ \Delta\big(\mathrm{Log}(EXCHGE),2\big)_{t-1} \underset{(2.863)}{+0.030}\ \mathrm{Log}(FORGE)_{t-4} \qquad (A2.20)$$

Imports

$$\Delta \mathrm{Log}(IMPGE)_t = \underset{(-3.961)}{-0.343}\ \mathrm{Log}(IMPGE)_{t-1} \underset{(-3.587)}{-0.276}\ \Delta \mathrm{Log}(IMPGE)_{t-1} \underset{(4.430)}{+0.440}\ \mathrm{Log}(MIMGE)_t \underset{(2.054)}{+0.141}\ \Delta\big(\mathrm{Log}(IPGE),3\big)_t \underset{(2.441)}{+0.243}\ \Delta \mathrm{Log}(MIMGE)_t \underset{(-3.453)}{-0.002}\ TREND \qquad (A2.21)$$

Change in stocks

$$VSPGE_t = \underset{(-1.417)}{-0.048} \underset{(3.658)}{+0.370}\ VSPGE_{t-1} \underset{(-1.944)}{-0.202}\ VSPGE_{t-3} \underset{(4.984)}{+0.486}\ VSPGE_{t-4} \underset{(4.472)}{+0.025}\ \Delta\big(\mathrm{Log}(GTQGE),4\big)_{t-1} \underset{(1.283)}{+0.009}\ \mathrm{Log}(GTQGE)_{t-5} \underset{(1.697)}{+0.0001}\ TREND \qquad (A2.22)$$

ITALY

GDP

$$\Delta \mathrm{Log(PILRD)}_t = \underset{3.026}{1.931} \underset{(-4.808)}{-0.425} \mathrm{Log(PILRD)}_{t-1} \underset{(5.130)}{+0.135} \mathrm{Log(IP)}_{t-1} \underset{(9.411)}{+0.281} \Delta \mathrm{Log(IP)}_{t-1} \underset{(3.978)}{+0.001} \mathrm{TREND} \underset{(3.176)}{+0.155} \mathrm{Log(OCCD)}_{t-1}$$
$$\underset{(2.425)}{+0.191} \Delta^2\big(\mathrm{Log(CNDURD)}\big)_{t-1} \underset{(2.601)}{+0.029} \Delta\big(\mathrm{Log(ESPRD/IMPRD)}\big)_{t-1} \underset{(2.011)}{+0.026} \Delta^2\big(\mathrm{Log(CLIMAMQ)}\big)_{t-1} \underset{(1.753)}{+0.057} \mathrm{Log(LEADING)}_{t-1} \qquad \text{(A2.23)}$$

Consumption of non-durable goods

$$\Delta \mathrm{Log(CNDURD)}_t = \underset{(5.622)}{0.814} \underset{(-6.467)}{-0.269} \mathrm{Log(CNDURD)}_{t-1} \underset{(-5.740)}{-0.019} \Delta\big(\mathrm{Log(REALE)},2\big)_{t-1} \underset{(4.312)}{+0.053} \Delta\big(\mathrm{Log(GISCO)},4\big)_t \underset{(8.191)}{+0.120} \mathrm{MA\ (CLIMAQ,2)}_{t-1} \qquad \text{(A2.24)}$$
$$\underset{(2.238)}{+0.875} \Delta \mathrm{Log(WFAMC)}_{t-3} \underset{(0.525)}{+0.019} \Delta \mathrm{Log(WFAMC)}_{t-4} \underset{(-1.116)}{-0.047} \Delta \mathrm{Log(WFAMC)}_{t-5} \underset{(-0.231)}{-0.010} \Delta \mathrm{Log(WFAMC)}_{t-6}$$
$$\underset{(-0.628)}{-0.027} \Delta \mathrm{Log(WFAMC)}_{t-7} \underset{(0.644)}{+0.031} \Delta \mathrm{Log(WFAMC)}_{t-8} \underset{(2.116)}{+0.102} \Delta \mathrm{Log(WFAMC)}_{t-9} \underset{(6.224)}{+0.153} \mathrm{MA\ (Log(WFAMC),3)}_{t-1}$$
$$\underset{(-2.502)}{-0.002} \Delta(\mathrm{TABOTQ\text{-}TAIMPLQ})_{t-2} \underset{(5.554)}{+0.007} \mathrm{FROM904{*}MA(CLIMAQ,2)}_{t-1} \underset{(2.308)}{+0.020} \Delta(\mathrm{Log(YD/PCFNR)},7)_{t-2}$$

Consumption of durable goods (excl. transport goods)

$$\mathrm{CFDK} = \underset{(9.783)}{0.589} \underset{(3.313)}{+0.273} \Delta\big(\mathrm{CFDK},3\big)_{t-1} \underset{(-5.678)}{-4.587} \mathrm{MA((DURSTOK\text{-}\ TRASTOK)/WFAMC,17)}_{t-1} \underset{(-3.390)}{+0.184} \Delta\big(\mathrm{Log(PREL)},4\big)_{t-1} \underset{(-2.523)}{-0.010} \Delta\big(\mathrm{Log(REALE)},2\big)_{t-2} \qquad \text{(A2.25)}$$
$$\underset{(-2.189)}{-0.036} \big(\mathrm{(DURSTOK\text{-}TRASTOK)/(CNDURD+TRASPQ)}\big)_{t-1} \underset{(1.010)}{+0.072} \mathrm{MA(Log(FEM/MAS),5)}_{t-2}$$
$$\underset{(1.593)}{+0.012} \Delta\big(\mathrm{Log(REALE)},2\big)_{t-2} \underset{(4.196)}{+0.295} \mathrm{FROM942{*}MA(Log(FEM/MAS),5)}_{t-2} \underset{(4.456)}{+0.188} \mathrm{FROM942}$$

Consumption of transport goods

$$\mathrm{Log(TRASPQ)}_t = \underset{(-1.150)}{-0.406} \underset{(19.440)}{+0.882} \mathrm{Log(TRASPQ)}_{t-1} \underset{(2.177)}{+0.113} \mathrm{Log(ANFIA)}_{t-1} \underset{(10.340)}{+0.590} \Delta \mathrm{Log(ANFIA)}_t \underset{(-2.479)}{-0.107} \Delta \mathrm{Log(REALE)}_{t-1} \qquad \text{(A2.26)}$$
$$\underset{(1.913)}{+0.006} \Delta\big(\mathrm{AUTOSIQ},\ 2\big)_t$$

Collective consumption

$$\Delta \mathrm{Log(COCRD)}_t = \underset{(1.844)}{0.001} \underset{(6.895)}{+0.850} \Delta \mathrm{Log(COCRD)}_{t-1} \underset{(1.256)}{+0.195} \Delta \mathrm{Log(COCRD)}_{t-2} \underset{(-2.308)}{-0.269} \Delta \mathrm{Log(COCRD)}_{t-3} \qquad \text{(A2.27)}$$

Investment in construction

$$\Delta \mathrm{Log(ICOST)}_t = \underset{(-4.680)}{-1.552} \underset{(-4.203)}{-0.192} \mathrm{Log(ICOST/OCCD)}_{t-2} \underset{(2.723)}{+0.092} \Delta^3 \mathrm{Log(IPCOQ)}_t \underset{(4.999)}{+0.071} \mathrm{Log(MA(TOTTOQ,5))}_{t-3} \qquad \text{(A2.28)}$$

Investment in machinery

$$\Delta \mathrm{Log}(IMARD/PILRD)_t = \underset{(-3.979)}{-0.650} \underset{(-4.541)}{-0.237} \mathrm{Log}(IMARD/PILRD)_{t-1} \underset{(-3.501)}{-0.007} (REALE)_{t-1} \underset{(2.848)}{+0.150} MA(DATQ/100,8)_{t-2} \underset{(3.475)}{+0.032} \mathrm{Log}(UCINTD)_t \underset{(-3.779)}{-0.023} MA(SINCED^2,3)_{t-1} \quad \text{(A2.29)}$$

Investment in transport goods

$$\Delta \mathrm{Log}(IMTK)_t = \underset{(-4.629)}{-0.175} \underset{(-5.383)}{-0.267} \mathrm{Log}(IMTK)_{t-1} \underset{(1.615)}{+0.137} \Delta^2(\mathrm{Log}(IMTK)_{t-1} \underset{(4.164)}{+0.083} \Delta\big(\mathrm{Log}(ANFIA/KAUTOQ), 6\big)_t \underset{(-4.164)}{-0.009} REALE_{t-1} \underset{(2.470)}{+0.0008} \Delta\big(DATQ, 9\big)_{t-1} \underset{(4.308)}{+0.168} \mathrm{Log}(CONVEIDQ/KAUTOQ)_t \underset{(3.641)}{+0.071} \mathrm{Log}(CONVEIDQ/KAUTOQ)_{t-1} \underset{(-0.042)}{-0.001} \mathrm{Log}(CONVEIDQ/KAUTOQ)_{t-2} \underset{(-2.213)}{-0.048} \mathrm{Log}(CONVEIDQ/KAUTOQ)_{t-3} \underset{(-1.842)}{-0.070} \mathrm{Log}(CONVEIDQ/KAUTOQ)_{t-4} \quad \text{(A2.30)}$$

Exports

$$\Delta \mathrm{Log}(ESPRD)_t = \underset{(5.831)}{0.329} \underset{(-5.762)}{-0.697} \mathrm{Log}(ESPRD/QXB11D)_{t-1} \underset{(10.472)}{+0.844} \Delta \mathrm{Log}(QXB11D)_t \underset{(4.096)}{+0.0003} TREND^3 \underset{(-4.274)}{-0.383} \Delta \mathrm{Log}(QXB11D)_{t-3} \quad \text{(A2.31)}$$

Imports

$$\Delta \mathrm{Log}(IMPRD)_t = \underset{(-0.945)}{-0.135} \underset{(-5.217)}{-0.536} \mathrm{Log}(IMPRD/QMB11D)_{t-1} \underset{(11.801)}{+0.815} \Delta \mathrm{Log}(QMB11D)_t \underset{(2.902)}{+0.208} \Delta \mathrm{Log}(QMB11D)_{t-3} \underset{(-2.340)}{-0.148} \Delta \mathrm{Log}(IMPRD)_{t-1} \underset{(-2.232)}{-0.137} \Delta \mathrm{Log}(IMPRD)_{t-5} \underset{(4.821)}{+0.0004} TREND*FROM901 \underset{(2.594)}{+0.077} \mathrm{Log}(COMPIMP)_t \quad \text{(A2.32)}$$

Change in stocks

$$VSPIL = \underset{(-2.983)}{-0.012} \underset{(3.591)}{+0.406} MA(VSPIL,2)_{t-1} \underset{(1.770)}{+0.020} \Delta\big(GMPTD- GTQ\big)_{t-2} \underset{(-3.155)}{-0.0003} \Delta^2(DATQ)_t \underset{(-5.571)}{-0.421} \Delta \mathrm{Log}(CONRD)_t \underset{(4.046)}{+0.002} REALE_{t-8} \underset{(7.218)}{+0.093} \Delta \mathrm{Log}(IMPRD/ESPRD)_t \underset{(4.429)}{+0.005} \Delta(SINCED)_{t-4} \underset{(2.678)}{+0.562} \Delta \mathrm{Log}(IMATRD)_{t-1} \quad \text{(A2.33)}$$

References

Altissimo, F., D. J. Marchetti and G. P. Oneto (2000),"The Italian Business Cycle: Coincident and Leading Indicators and Some Stylised Facts", *Giornale degli Economisti e Annali di Economia*, 60, pp. 147-220.

Bagliano, F. C., R. Golinelli and C. Morana (2002a), "Core Inflation in the Euro Area", *Applied Economics Letters*, 9, pp. 353-57.

Bagliano, F. C., R. Golinelli and C. Morana (2002b), "Inflation Modelling in the Euro Area", in R. Beetsma, C. Favero, A. Missale, V.A. Muscatelli, P. Natale and P. Tirelli (ed.), *Fiscal Policies, Monetary Policies and Labour Markets. Key Aspects of European Macroeconomic Policies after Monetary Unification*, Cambridge University Press, forthcoming.

Brandolini, A. and G. Parigi (1993), "L'uso dell'inchiesta mensile presso le famiglie dell'ISCO per la stima del reddito disponibile e la sua dispersione", Banca d'Italia, mimeo, February.

Bodo, G., R. Golinelli and G. Parigi (2000), "Forecasting Industrial Production in the Euro Area", *Empirical Economics*, 25, pp. 541-61.

Box, G. E. P. and G. M. Jenkins (1970), *Time Series Analysis: Forecasting and Control*, Holden-Day.

Busetti, F. (2001), "The Use of Preliminary Data in Econometric Forecasting: an Application with the Bank of Italy Quarterly Model", *Temi di Discussione*, Banca d'Italia, n. 437.

Camacho M., G. Perez-Quiros (2002), "This Is What the Leading Indicators Lead", *Journal of Applied Econometrics*, 17, pp. 61-80.

Canova, F. and M. Ciccarelli (2001), "Forecasting and Turning Point Predictions in a Bayesian Panel VAR Model", paper presented at the Conference: "Monitoring the Euro Area Business Cycle", Rome, September 7-8.

Carnazza, P. and G. Parigi (2000), "Tentative Business Climate Indicators for the Italian Economy", *Documento di Lavoro*, ISAE, n. 17.

Carnazza, P and G. Parigi (2001), "The Evolution of Confidence for European Consumers and Businesses in France, Germany and Italy", *Temi di Discussione*, Banca d'Italia, n. 406.

Clements, M. P. and D. F. Hendry (1999), *Forecasting Non-Stationary Economic Time Series*, The MIT Press, Cambridge.

Clements, M. P. and D. F. Hendry (2001), "Forecasting with Difference-stationary and Trend-stationary Models", *Econometrics Journal*, 4, pp. S1-S19.

Christoffersen, P. F. and F. X. Diebold (1998), "Cointegration and Long-Horizon Forecasting", *Journal of Business and Economic Statistics*, 16, pp. 450-8.

Croushore, D. and T. Stark (2000), "A Funny Thing Happened on the Way to the Data Bank: A Real-Time Data Set for Macroeconomists", *Business Review*, Federal Reserve Bank of Philadelphia, September/October, pp. 15-27.

Croushore, D. and T. Stark (2001), "A Real-Time Data Set for Macroeconomists", *Journal of Econometrics*, 105, pp. 111-30.

D'Amato J. and N. R. Swanson (2000), The Real-Time Predictive Content of Money for Output, *BIS Working Papers*, n. 96.

Dasgupta, S. and K. Lahiri (1993), "On the Use of Dispersion Measure from NAPM Surveys in Business Cycle Forecasting", *Journal of Forecasting*, 12, pp. 239-53.

Dedola, L., E. Gaiotti and L. Silipo (2001), "Money Demand in the Euro Area: Do National Differences Matter?", *Temi di Discussione*, Banca d'Italia, n. 405.

Dickey, D. A. and W. A. Fuller (1979), “Distribution of the Estimators for Autoregressive Time Series with a Unit Root”, *Journal of American Statistical Association*, 74, pp. 427-31.

Diebold, F. X. and L. Kilian (2000), “Unit Root Tests Are Useful for Selecting Forecasting Models?”, *Journal of Business and Economic Statistics*, 18, pp. 265-73.

Diebold, F. X. and R. S. Mariano (1995), “Comparing Predictive Accuracy”, *Journal of Business and Economic Statistics*, 13, pp. 253-63.

Eitrheim, O., T. A. Husebo and R. Nymoen (1999), “Equilibrium-correction vs. Differencing in Macroeconometric Forecasting”, *Economic Modelling*, 16, pp. 515-44.

Espasa, A., R. Albacete and E. Senra (2002), “Forecasting EMU Inflation: a Disaggregated Approach by Countries and Components”, *European Journal of Finance*, forthcoming.

Eurostat (2000), *Handbook on Quarterly National Accounts*, Brussels.

Fagan G. and J. Henry (1998), “Long Run Money Demand in the EU: Evidence for Area-Wide Aggregates”, *Empirical Economics*, 23, 483-506.

Faust, J., J. H. Rogers and J. H. Wright (2001), “News and Noise in G7 GDP Announcements”, paper presented at the Conference: “Monitoring the Euro Area Business Cycle”, Rome, September 7-8.

Franses, P. H. and F. Kleibergen (1996), “Unit Roots in the Nelson-Plosser Data: Do They Matter for Forecasting?”, *International Journal of Forecasting*, 12, pp. 283-88.

Giacomini, R. and C. W. J. Granger (2001), “Aggregation of Space-Time Processes”, *UCSD Discussion Paper*, n. 7, May.

Golinelli, R. and S. Pastorello (2002), “Modelling the Demand for M3 in the Euro Area”, *The European Journal of Finance*, forthcoming.

Granger, C. W. J. and G. Yoon (2001), “Self-Generating Variables in a Cointegrated VAR Framework”, *UCSD Discussion Paper*, n. 4, February.

Grunfeld, Y. and Z. Griliches (1960), “Is Aggregation Necessarily Bad?”, *The Review of Economics and Statistics*, 42, February, pp. 1-13.

Harvey, D. I., S. J. Leybourne and P. Newbold (1997), “Testing the Equality of Prediction Mean Squared Errors”, *International Journal of Forecasting*, 13, pp. 281-91.

Harvey, D. I., S. J. Leybourne and P. Newbold (1998), “Tests for Forecast Encompassing”, *Journal of Business and Economic Statistics* , 16, pp. 254-59.

Hendry, D. F. and M. P. Clements (2002), “Pooling of Forecasts”, *Econometrics Journal*, 5, pp. 1-26.

Irac, D. and F. Sedillot (2002), “Short Run Assessment of French Economic Activity Using OPTIM”, *Notes D’Etudes et de Recherche*, Banque de France, n. 88.

Johansen, S. (1995), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.

Kozicki, S. (2001), “Implications of Real-Time Data for Forecasting and Modelling Expectations”, *Journal of Macroeconomics*, forthcoming.

Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin (1992), “Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root”, *Journal of Econometrics*, 54, pp. 159-78.

Lutkepohl, H. (1982), “Non Causality Due to Omitted Variables”, *Journal of Econometrics*, 19, pp. 367-78.

Marcellino, M., J. H. Stock and M. W. Watson (2001), “Macroeconomic Forecasting in the Euro Area: Country Specific Versus Area Wide Information”, *European Economic Review*, forthcoming.

Newbold, P., S. Leybourne and M. E. Wohar (2001), “Trend-Stationarity, Difference-

Stationarity or Neither: Further Diagnostic Tests with an Application to US Real GNP, 1875-1993”, *Journal of Economics and Business*, 53, pp. 85-102.

Ng, S. and P. Perron (1991), “Unit Root Tests in ARIMA Models with Data Dependent Methods for the Selection of the Truncation Lag”, *Journal of American Statistical Association*, 90, pp. 268-281.

Parigi, G. (1993), “La determinazione del tasso d’interesse reale *ex-ante*”, Banca d’Italia, mimeo, April.

Parigi, G. and G. Schlitzer (1995), “Quarterly Forecasts of the Italian Business Cycle by Means of Monthly Economic Indicators”, *Journal of Forecasting*, 14, pp. 117-41.

Phillips, P. C. B. and P. Perron (1988), “Testing for a Unit Root in Time Series Regression”, *Biometrika*, 75, pp. 335-46.

Stock, J. H. (2001), “Forecasting Economic Time Series”, in B. H. Baltagi (edited by), *A Companion to Theoretical Econometrics,* Blackwell Publishers, pp. 562-84.

Stock, J. H. and M. W. Watson (1998), “A Comparison of Linear and Non Linear Univariate models for Forecasting Macroeconomic Time Series”, *NBER Working Paper*, n. 6607.

Tashman, L. J. (2000), “Out-of-sample Tests of Forecasting Accuracy: an Analysis and Review”, *International Journal of Forecasting*, 16, pp. 437-50.

Zizza, R. (2002), “Forecasting the Industrial Production Index of the Euro Area Through Forecasts of the Three Main Countries”, *Temi di Discussione*, Banca d’Italia, n. 441.

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2000

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