International Seminar on Timeliness, Methodology and Comparability of Rapid Estimates of Economic Trends
27-29 May 2009, Ottawa, Canada

Session 4: Extrapolating, Modelling, econometric and sampling techniques used in the preparation of rapid estimates

A system of rapid estimates to improve real time monitoring of the economic situation: the case of euro area

By Gian Luigi Mazzi, Gaetana Montana
European Commission
Eurostat
Gianluigi.Mazzi@ec.europa.eu, Gaetana.Montana@ec.europa.eu

1 Introduction

The regular monitoring of the economic situation requires, especially under uncertain conditions, a complete, timely and reliable set of statistics and statistical indicators giving a clear picture of economic movements.

The euro area system of shot-terms statistics has been built up in the 90's with the adoption of a set of new legal acts. Since the beginning of the new century, with the definition of the Principals European Economic Indicators (PEEIs), Eurostat has launched an improvement strategy mainly focusing on the reduction of the publication delays and on the progressive harmonisation of data production processes at national and european level.

Furthermore, concrete actions have been undertaken to fill the availability gap especially in the areas of services and labour-market statistics. Nowadays, almost all PEEIs are available and tangible results have been achieved concerning the timeliness, especially thanks to the use of flash estimates techniques (i.e. GDP and HICP) or to earlier estimates based on an incomplete set of information (i.e. Retail Trade).

Nevertheless the situation is not yet satisfactory from the users' point of view:

1) further improvements of timeliness are required without a significant decrease of accuracy; 2) the length of euro area series is not as long as needed for economic modelling and business cycle analysis purposes; 3) the frequency at which data are available is, in some cases, not appropriate to ensure a regular follow-up of the cyclical situation and an effective implementation of monetary policy actions.

The last drawback is particularly relevant and requires some additional reflections. In the past, the Industrial Production Index was considered as the reference variable for the short-term analyses. With the continuous growth of the services sector and the consequently decrease of the industrial one, the role of the Industrial Production Index has also been substantially re-thought. Additionally, the empirical evidence of cyclical movements in the services sector has convinced business cycle analysts of the opportunity of finding a new and more comprehensive measure of the economic activity. This belief has been even reinforced by the fact that in the recent years, some industrial cycles have not generated fluctuations for the whole economy. Finally, the high degree of volatility of the Industrial Production Index, which prevents a clear identification of signals, has also played a role in diminishing the relevance of this variable. For those reasons ongoing studies aim to produce a more significant monthly indicator for business cycle purposes.

Another issue is that statistics themselves can not answer to all users' needs especially because data give a general measure of a phenomenon. Analysts, often, want to extract specific signals from data in order to emphasize some specific cyclical features. Statistics are also characterised by some gaps and specific indicators can be used to fill them and complete the information set to be put at disposal of analysts.

Thus, statisticians are required, starting from official statistics, to:

a) extract from statistics some special signals to help the correct understanding of the economic situation; b) combine official statistics to derive new indicators filling some specific gaps in data availability.

Improvements of statistics by means of statistical and econometric techniques, as well as compiling new indicators using existing statistics, are not traditionally considered part of official statistics. Anyway; in the recent years, more and more statistical agencies have been involved in such kind of activities. It is also clear that, statisticians, due to their deep knowledge of data and of production systems, are in a privileged position to produce reliable and statistically sound estimates and indicators. Users could benefit from the availability of such estimates and indicators, using them in their analyses as well as in the decision-making process.

This paper shortly presents some ongoing activities in Eurostat related to the improvements of PEEIs and to the construction of new indicators in order to help analysts and policy-makers to the correct interpretation of the economic situation.

In section 2 we discuss alternative ways to increase data timeliness and we present some preliminary results. In section 3 we describe our approach for the construction of a euro area monthly indicator of economic activity, which can be viewed as a very good proxy of the GDP at monthly frequency. Section 4 presents the statistical framework for business cycle analysis developed at Eurostat. This framework mainly consists of two parts: a turning points dating and detection system and a set of growth cycle estimates. The most recent results are also presented. Section 5 presents some conclusions and lines for further investigations and improvements.

2 Increasing data timeliness

Users and especially institutional ones consider the timeliness of statistics as one of the most important characteristics. Theoretically they should welcome to receive real-time or quasi real-time information on main economic indicators. On the other hand, data producers are often reluctant to anticipate the release date because they worry about the lost of precision that such anticipation could determine.

The trade off between quality and precision is a key aspect to be considered when deciding on the timing of macroeconomic statistics releases. For the euro area the timeliness is not only relevant in absolute terms but also on comparative terms with respect to the US release dates. Despite significant improvements in euro area release dates observed in the last 5-6 years, the gap between euro area and US releases is still very relevant with the only exception of the Consumer Price Index.

The only exception is represented by the case of Consumer Prices where we anticipate the US release thanks to the production of our flash estimates.

The increase of timeliness can be achieved by different strategies:

1) the speeding up of the data production process, thanks to the use of advanced survey techniques, simplification of questionnaires, etc.;

2) the use of statistical and econometric techniques to extrapolate indicators by using incomplete information set;

3) the use of so called EU sampling techniques, which consist in the construction of European samples which do not necessary generate national significant ones;

4) the construction of coincident indicators for main economic variables, which give an idea of their latest trends.

The first strategy is clearly a structural one which can be feasible in the medium-long term and which can be considered, from the producers' point of view, the most suitable way to approach this issue.

The third strategy implies a definition of European sampling scheme applicable to the most relevant surveys on which key economic variables are based (e.g. the industrial production index, quarterly level cross surveys, etc). This solution appears of difficult applicability for National Accounts which are mainly a synthesis of various macroeconomic information. Until now, Eurostat has obtained interesting results based, at least partially, on this approach in the field of Retail Trade Turnover. In this paper we mainly present some ongoing studies related to the second and the fourth strategy.

2. 1 Use of statistical and econometric techniques

The use of statistical and econometric techniques can significantly contribute to the increase of timeliness in the short and medium term. In this context, the key tool is represented by a set of forecasting techniques adapted to estimate the recent past or the present instead of the near future. Since 2006, we have been working on a simulation study aiming to produce flash estimates for Producer Price Index at t+16, Employment at t+30 and, more recently GDP at t+0, t+15 and t+30. The flash estimates, which we are working on, are based on the following main principles agreed with Eurostat Production Units:

- whenever partial information on the target variable, either at geographic or sectoral level is available, this has to be included in the flash estimation model;
- soft data (e.g. business and consumer surveys) can be integrated into the model under the condition that a minimum amount of hard data is available;
- in order to increase forecasting accuracy, statistically related indicators (e.g. conventional earnings in case of flash estimates of Labour Cost Index) can be used in the model either in case of unavailability of significant partial information on the target variable or to complement such partial information;
- any hypothesis based on economic theories has to be avoided in the model specifications;
- purely univariate models should not be taken into account;
- the selected model should be as simple as possible, statistically sound, easy to use in the regular production process and characterized by a very simple dynamic specification where needed.

In the simulation exercise we pay particular attention to the identification of the most appropriate variable selection strategies and to the comparison of alternative model specifications to achieve the

best performance of our estimates. Combining forecasting techniques are also tested to increase the reliability of estimates.
The table 1 shows for the period April 2007 – March 2009 the real time simulation of the flash estimates for the Producer Price Index against the Eurostat first and final estimates for the euro area. The selected model is based on German Producer Price Index and on oil price data according to the BIC selection criterion. Results appear quite encouraging: despite the presence of two cases of sign discordance, often the flash are quite close to Eurostat first estimates. The model reacts quite well to the change of regime even if a bit slowly. Our opinion is that this constitutes a very good starting point, which could be easily improved either by adding more national information either by including euro area Import Prices which where not yet available when we started the simulation.

Table 1 Euro Area Flash Estimates of Producer Price Index

	Flash t+16	Eurostat First estimate	Eurostat Final estimate	Error First estimate	Error Final estimate
2007m4	0.31	0.45	0.38	0.14	0.07
2007m5	0.28	0.29	0.38	0.01	0.10
2007m6	0.31	0.13	0.14	-0.18	-0.17
2007m7	0.25	0.26	0.30	0.01	0.05
2007m8	0.31	0.06	0.16	-0.25	-0.15
2007m9	0.24	0.36	0.41	0.12	0.17
2007m10	0.33	0.64	0.70	0.31	0.37
2007m11	0.78	0.90	0.91	0.12	0.13
2007m12	0.11	0.10	0.18	-0.01	0.07
2008m01	0.43	0.85	0.83	0.42	0.40
2008m02	0.74	0.66	0.57	-0.08	-0.17
2008m03	0.65	0.70	0.60	0.05	-0.05
2008m04	0.97	0.79	0.78	-0.18	-0.19
2008m05	0.93	1.21	1.19	0.28	0.26
2008m06	0.90	0.96	1.11	0.06	0.21
2008m07	1.73	1.23	1.40	-0.50	-0.33
2008m08	-0.25	-0.50	-0.39	-0.25	-0.14
2008m09	0.23	-0.20	-0.15	-0.43	-0.38
2008m10	0.01	-0.80	-0.89	-0.81	-0.90
2008m11	-1.26	-1.96	-2.07	-0.70	-0.81
2008m12	-1.19	-1.58	-1.49	-0.39	-0.30
2009m01	-0.79	-0.88	-1.13	-0.09	-0.34
2009m02	-0.57	-0.43	-0.43	0.14	0.14
2009m03	-0.69	-0.70	-0.70	-0.01	-0.01

2. 2 Coincident indicators

Coincident indicators aim to forecast the evolution of economic variables during the reference period or just after it. For this purpose, they are based on same principles of leading indicators. The main advantage of coincident indicators is that they are subject to fewer constraints than flash estimates, even if, once again, the use of economic relationship is not recommended. In the recent years, we have investigated alternative model specifications for GDP, IPI and more recently Employment. The results for the IPI are not very satisfactory also because of the high degree of volatility of this indicator. In this paper we briefly present our approach to construct a coincident indicator of GDP. We have compared four different models: 1) a first bridge model containing only Business and Consumer Surveys data and financial variables, 2) a second bridge model which differs from the first by the inclusion of the IPI, 3) a bridge model based only on financial variables 4) a factor based model, where data are selected by the LARS (Least Angle Regression) algorithm. In the real time simulation, we have used for the first part an estimate based on combining forecasting techniques with equal

weights of the three bridge models and for the latest part the factor model which seems to perform slightly better than the other ones.
For each quarter we produce three estimates of GDP: the first at the end of the second month (t-30), the second at the end of the quarter (t+0) and the last one at the end of the first month of the next quarter (t+30).
Table 2 shows the real time results obtained by using the factor model and the LARS algorithm for data selection over the period Q1 2007 – Q1 2009. We compare the three estimates of the coincident indicator to the Eurostat flash. The results appear very encouraging. We observe only one case of sign discordance in Q2 2008, where the growth is around zero. Furthermore, the coincident indicator anticipates correctly the GDP growth in most cases. In the fourth quarter 2008, we note an unusual size of the error between the estimates of the coincident indicator and Eurostat flash one. Obviously, the simulation period presented in the table is quite short and further simulations are required, but the coincident indicator presented in this section appears to be robust and reliable enough.

Table 2 Coincident Indicator of the GPD Growth

	Estimates t-30	Estimates t+0	Estimates t+30	Eurostat Flash t+45
2007Q1	0.5	0.5	0.5	0.57
2007Q2	0.4	0.4	0.4	0.34
2007Q3	0.7	0.7	0.9	0.71
2007Q4	0.3	0.3	0.4	0.41
2008Q1	0.25	0.3	0.45	0.8
2008Q2	0.2	0.2	0	-0.2
2008Q3	-0.3	-0.3	-0.2	-0.19
2008Q4	-0.5	-0.8	-1	-1.5
2009Q1	-1	-1.6	-1.6	-2.5

3 Monthly indicator of the economic activity

The GDP is obviously the ideal candidate as reference variable for short-term and business cycle analysis but, unfortunately, it is only available at quarterly basis and the production of a monthly GDP, completely based on National Accounts standards, appears still not feasible. For this reason, several studies have been recently conducted to investigate alternative ways to construct monthly proxies of GDP. Examples of such indicators are available in Sweden, Finland, Estonia, U.K. as well as Canada. From 2006 onwards, we have investigated the possibility of constructing a euro area monthly indicator of economic activity as much as possible consistent with the GDP.

3.1 Euro-MIND: A euro area monthly indicator of the economic activity

The methodology proposed in this document is presented in a detailed way in Frale C., Marcellino M., Mazzi G.L., Proietti T., "A Monthly Indicator of the Euro Area GDP" (CEPR WP 7007). The methodology can be synthetically described by the following steps:

1) We base the construction of the monthly indicator of economic activity on a disaggregate approach represented by the output and expenditure breakdowns of the GDP at quarterly base;
2) For each disaggregate GDP component, a set of monthly indicators are carefully selected, including both macroeconomic variables and survey answers;
3) The indicator is based on information at both monthly and quarterly level, rather than monthly only, modelled with a dynamic factor specification cast in state-space form;
4) The state space methodology has the flexibility of handling data with different frequency of observations. This is achieved by suitably defining the states of the system so as to convert temporal aggregation into a systematic sampling problem;
5) Since estimation of the multivariate dynamic factor model can be numerically complex, computational efficiency is achieved by implementing univariate filtering and smoothing procedures;

6) Special attention is paid to chain-linking and its implications for the construction of a monthly indicator of economic activity, via a multistep procedure that exploits the additivity of the volume measures expressed at the previous year prices;
7) The estimate of the euro area monthly indicator of economic activity is obtained by combining the estimates from the output and expenditure sides, with optimal weights reflecting their relative precision;
8) The resulting pooled estimator is more precise than each of its two components, paralleling the results on the usefulness of pooling in the forecasting literature. The resulting estimates are fully consistent with the quarterly national accounts figures published by Eurostat;
9) We provide an explicit measure of uncertainty around the indicator, which is particularly relevant in a decision making context and for evaluation purposes.

A generalization of this model using two factors, where the second one contains business and consumer surveys data is presented in Frale, Marcellino, Mazzi, Proietti (forthcoming in the Journal of forecasting). This extension increases the forecasting ability of the model at one-two-three steps ahead. A real time simulation of the one factor based model has been carried out since 2006 with very encouraging results. In this simulation we are producing estimates at t+45 each month. So that, in the month t we produce the estimate for the month t-2. At the same point in time, estimates for the month t-1, t, t+1 can be obtained by using the two factors version of the model.

Figure 1 Euro-MIND Growth rate on previous month

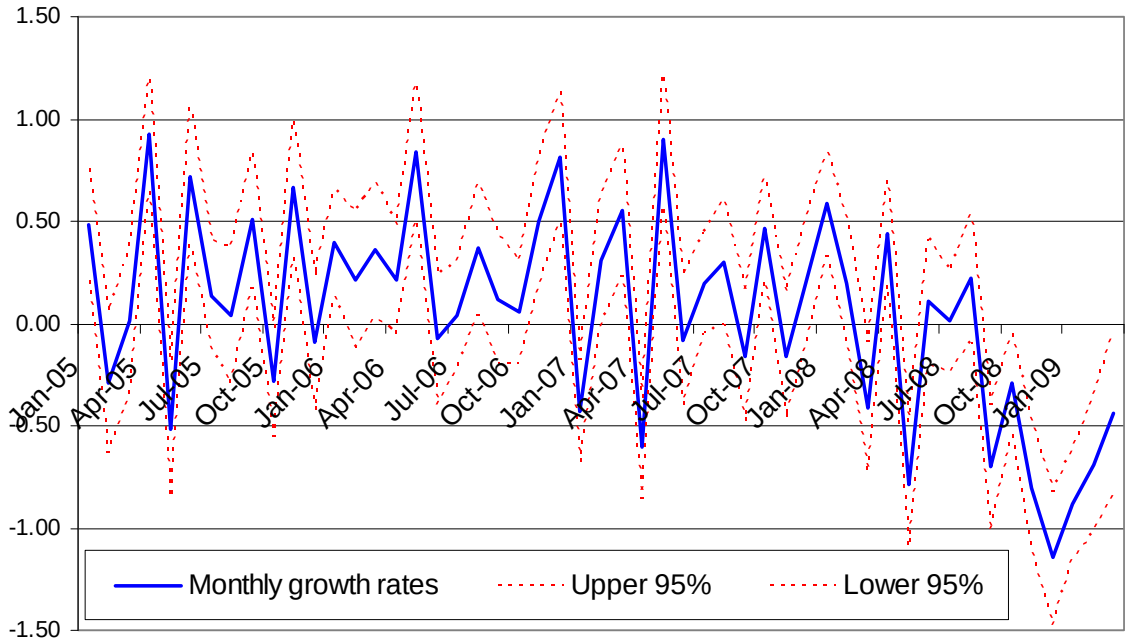


Figure 1 presents the growth rate of Euro-MIND from January 2005 to February 2009 as estimated in April 2009, together with their confidence interval at 95%. Looking at the graph, it is important to note that the evolution of the indicator is quite regular and it follows very well the cyclical movements. The estimates appear very stable and not volatile, that is also confirmed by analysing subsequent vintages for the same period. The main point on which the indicator still needs some improvements is represented by its behaviour in estimating the month of the current quarter especially in the recession phase. Our indicator delivers negative growth rates (e.g. January and February 2009), which appear too optimistic in comparison with the expected results. A most accurate specification of the model for the financial services sector and for the demand side component will probably improve the ability of the model to estimate the most recent months.

4 A statistical framework for business cycle analysis

The set of macroeconomic statistics regularly compiled by a statistical office represents a very useful instrument available to all users and analysts. Nevertheless, we have to recognise that not all the information needed by analysts is explicitly available from an investigation of statistics. Some signals need to be extracted in order to have a clearer picture of the cyclical evolution of the economy, complementing the information supplied by statistics. In this context, we have decided to launch several activities aiming to the definition of coherent statistical framework for business cycle analysis. They include the construction of statistical turning point chronologies, the development of turning point coincident indicators and estimates of growth cycle (i.e. output gap in the case of GDP), which can support economic monitoring and decision making processes.

4.1 Euro area turning point coincident indicators

The methodology for the construction of a euro area turning point chronology and a system of coincident turning point indicators is presented in Anas, Billio, Ferrara, Mazzi (Manchester Bulletin, 2009). The methodology can be synthetically expressed by the following points:

1) simultaneous analysis of classical business cycle and growth cycle in the so called ABCD framework;
2) statistical dating of euro area turning points by means of a simple non parametric dating rule;
3) comparison of euro area and Member States dating to achieve a final statistical chronology ensuring the maximum degree of consistency between the two approaches;
4) preliminary investigation of alternative models for the construction of coincident turning point indicators for classical business cycle and growth cycle, including the identification of appropriate number of regimes and thresholds;
5) variables selection for the growth cycle coincident indicators (Employment expectation, Construction confidence indicator, Financial situation of the last 12 months, IPI, Imports of intermediate goods);
6) construction of the growth cycle coincident indicators (GCCI) as a weighted mean of the transition probability returned by the five univariate two regimes Markov Switching models fitted on each variable. An equal averaging weighting scheme is used.
7) variables selection for the business cycle coincident indicators (IPI, New cars registration and Unemployment rate);
8) construction of the business cycle coincident indicators (BCCI) as a weighted mean of the transition probability returned by the three univariate three regimes Markov Switching models fitted on each variable. The following weighting scheme is used IPI=0.34, Unemployment rate=0.46, New cars registration=0.20.

Filtered probabilities can be viewed as the probabilities of being in a recession phase delivered by each component of the indicators. Indicators deliver the joint recession probabities. Higher value of the indicator corresponds to high probability of being in a recession. The threshold (set at 0.5) corresponds to a decision rule: values exceeding the threshold indicate recession phase, values below the threshold correspond to an expansionary phase.

A real time simulation of the two indicators against respectively the business cycle and growth cycle chronology has been carried out to check the reliability of the models as well as to discover possible false signals. The main results are that the two indicators do not show any significant evidence of false signals and that they are slightly lagging with respect to the corresponding chronologies. Each month we produce estimates of business cycle coincident indicators and growth cycle coincident indicators for the month t-2, based of filtered probabilities. Estimates for the month t-1 and t are based on forecasted probabilities. Figures 2 and 3 show the behaviour of the two indicators GCCI and BCCI as estimated in April 2009. In both graphs the black bold line is the constant threshold equal to 0.5. When the indicators deliver values higher than 0.5 we are respectively in a growth cycle or business cycle recession phase. On the contrary when the indicators deliver values below 0.5, we are in an expansion phase for both cycles. The blue lines show the values of the two indicators obtained by averaging the filtered probabilities of the components. The red part at the end of the line corresponds to the value obtained by averaging forecasting probabilities instead of filtered ones. Looking at the indicators, the negative phase for the growth cycle started in April 2007 and still continues (see Fig. 2). Concerning the business cycle, the recession started in October 2008 and still persists (see Fig. 3). As already mentioned both indicators appear to be slightly lagging and this is particularly true for the BCCI. In fact, nowadays we are thinking that the business cycle recession has started in the first half of 2008.

From this point of view is obvious that BCCI still needs some improvements. Nevertheless, it has to be noted that it is preferable to have indicators detecting later turning points than ones delivering false signals or anticipating too much turning points.

Fig 2 Growth Cycle Coincident Indicators

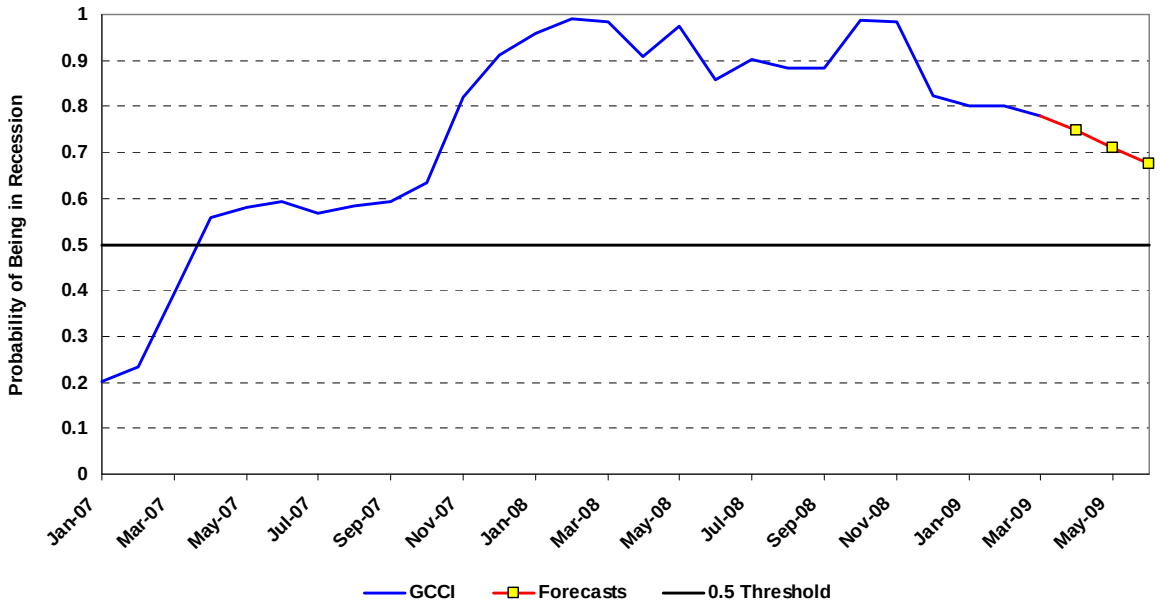
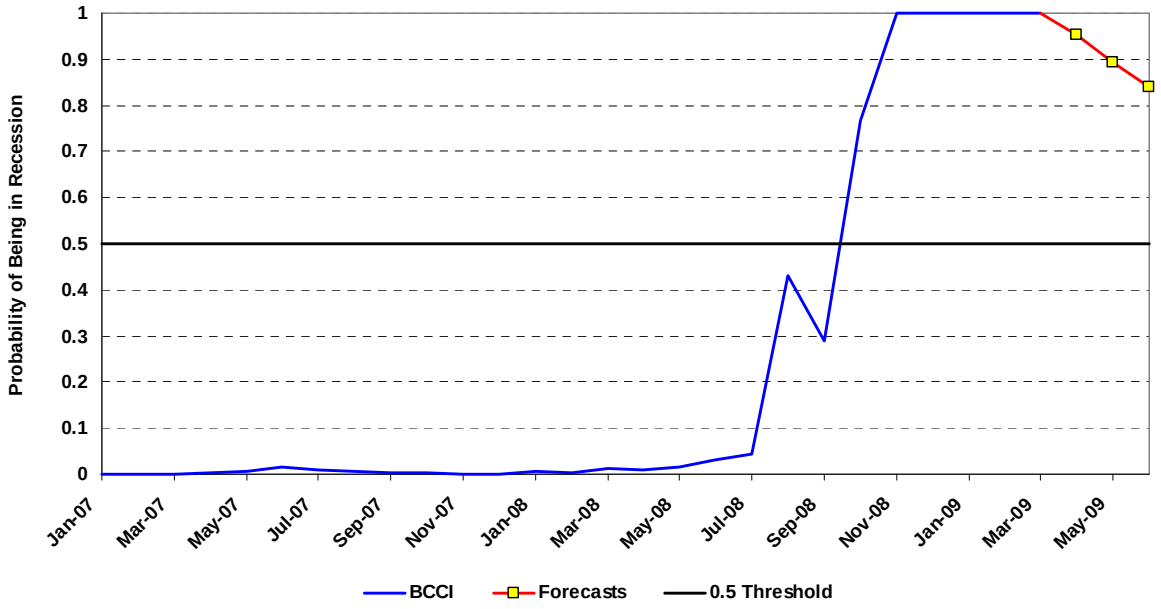


Fig 3 Business Cycle Coincident Indicators

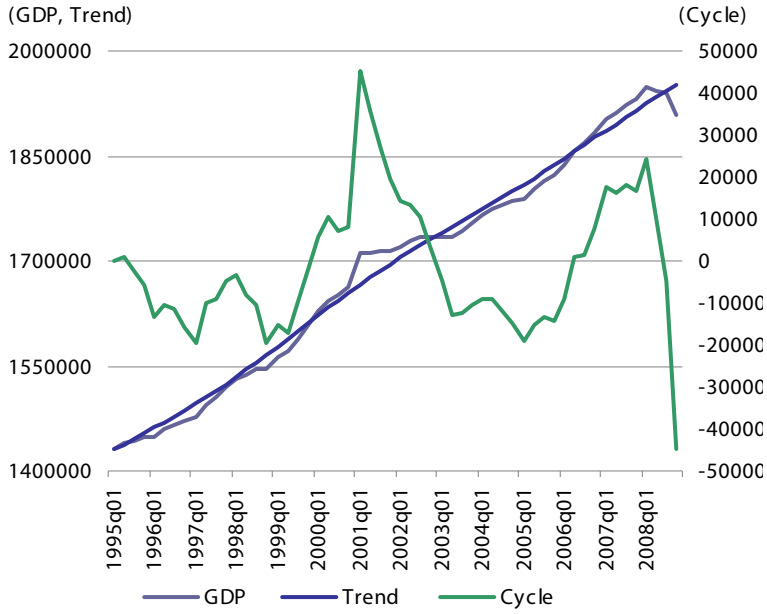


4.2 Growth cycle estimates

The accurate and timely identification of turning points is a very important source of information for policy makers and analysts. Unfortunately, even the most accurate system of turning points detection does not supply details on the shape and on the main features of cycle. This is especially true for the growth cycle which needs to be extracted for the seasonally adjusted version of indicators by means of detrending techniques. From the policy makers' and analysts' point of view, an accurate estimate of the growth cycle is of crucial importance especially for monitoring the inflationary pressures and for designing a monetary policy oriented to inflation control. The main problem we have to deal with when estimating the growth cycle is its instability at the end of sample, due to data revisions from one

hand and to specific characteristics of most detrending filters from the other. During the last year, we have compared alternative univariate techniques for the estimation of growth cycle and nowadays we are regularly publishing three alternative growth cycle estimates based on Hodrick-Prescott filter, on Christiano-Fitzgerald filter and on Unobserved Components models filter in the Eurostatistics publication. We are accompanying such estimates with appropriate meta-information describing the characteristics of alternative procedures. Furthermore, we are investigating several multivariate detrending techniques based on structural VAR and multivariate unobserved component models which are presented in Mitchell, Moauro, Mazzi (paper presented at the 28th Symposium of Forecasters, Nice 2008) and in Lemoine, Mazzi, Monperrus-Veroni and Reynes (forecoming on Journal of Forecasting).
Figure 4 shows the latest EA GDP trend-cycle estimates from 1995Q1 to 2008Q4 using Hodrick – Prescott filter, obtained in May 2009.
As it appears clearly from figure 4, we are in a negative phase of the growth cycle, which confirms the results from the growth cycle coincident indicator shown in figure 2. Due to the endpoint estimation problems characterizing detrending filters, some inconsistencies between the signals delivered by the GCCI and the growth cycle estimates can not be excluded. Users should be advised of that possibility and the producers of business cycle indicators should give their appreciation on the reliability of signals coming from different methods.

Figure 4 EA GDP trend-cycle decomposition using HP filter



5 Conclusions

The paper has synthetically presented several ongoing Eurostat projects aiming to build up a system of rapid estimates giving a clear picture of the short term economic situation at euro area level. The results presented in this paper can be considered as very preliminary ones so that further investigations are needed before taking a final decision on the communication strategy of this kind of information. Nevertheless some results are very encouraging and the approaches proposed can be considered methodologically sound, easy to be understood, as well as replicated and adapted to communicate results in a clear and transparent way. In order to improve the overall quality of the estimates presented in this paper, we are working on the following lines: 1) incorporating as much as possible national information into euro area models, 2) investigating, especially in the field of flash estimates, the possibility of constructing estimates using an indirect approach, working at Member States level instead of euro area one, 3) investigating the usefulness of introducing additional data sources into our models, especially in the case of Euro-MIND to increase the reliability of some components estimates, 4) analysing more sophisticated data and models selection techniques, 5) testing alternative

specification of our turning points coincident indicators to reduce their lagging characteristics especially for the BCCI, 6) constructing a chronology and a turning point indicator also for the acceleration cycle, 7) studying alternative solutions, recently proposed in the literature, to increase the reliability of endpoint estimates of detrending filters. Finally, it is important to note that there are several synergies among the ongoing projects which still need to be better exploited. For example, the coincident indicators of the GDP growth could be used to improve the performance of the EuroMIND for the current quarter and in perspective the EuroMIND itself can replace the Industrial Production Index in the specification of both GCCI and BCCI.