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Euro Growth Indicator, related practical issues

by

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The purpose of this paper is to present the Euro Growth indicator, a GDP growth rate predictor aiming at forecasting the y-o-y GDP rate of change two quarters ahead of official statistics. It is monitored by the OFCE, a Sciences Po's Economic Research Center, for EUROFRAME, a consortium of ten independent research institutes combining their knowledge in order to provide quantitative analysis, forecasts and policy recommendations for the European Union and for national decision makers. The indicator has been run since 2000, but structural changes made some updates in the original specification necessary: extension of the estimation period, switch from constant prices to chain-linked GDP data, loss of significance of some series.

This type of quantitative leading indicators provides an alternative method to anticipate short-term developments in aggregate activity. It fits the gap between the traditional business cycle analysis and the conventional model forecasting: while it allows for a needed quantification of the cyclical development, it also eases the adjustment of the model to the current and near-term economic situation. By taking into account a valuable field of short-term monthly data, i.e. business surveys which are usually excluded from structural macro econometric models, growth indicators gives models a more reliable starting point for any forecasting exercise.

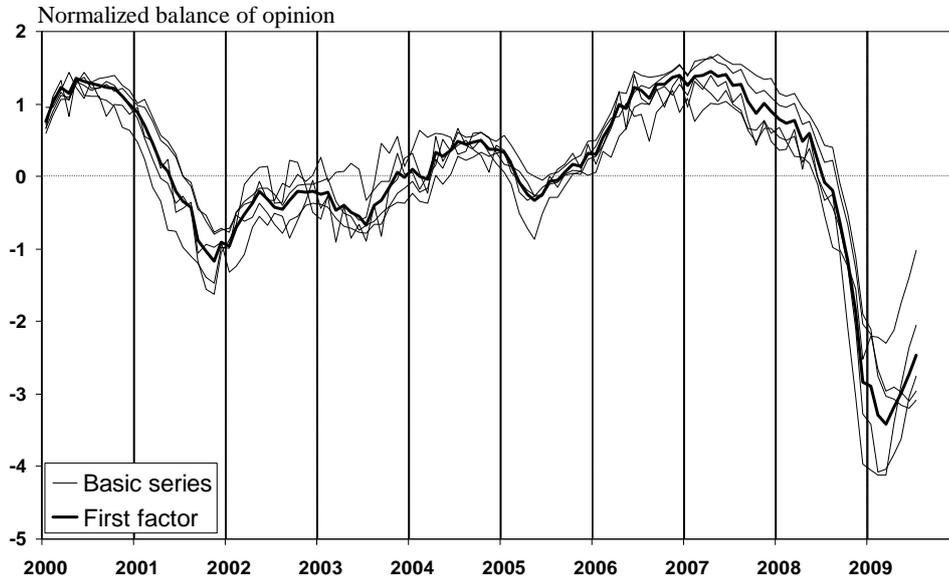
We start with presenting the nature and processing of the indicator components. We then discuss the current specification and estimation of the indicator in the conventional regression framework. In the third section, we investigate the possibility of forecasting the dependant variable, given some regressors are not leading GDP growth rate. In the fourth section, we assess the monthly 'real time' forecasts of the indicators run over the last four years.

I- Nature and processing of the indicator components

The current Euro Growth indicator is based on one equation containing both coincident and leading variables. **Business surveys** provide the bulk of the coincident (retail trade) or slightly leading (industry) components. After trend removing of the basic series, their information content is extracted by means of a principal component analysis (PCA), which

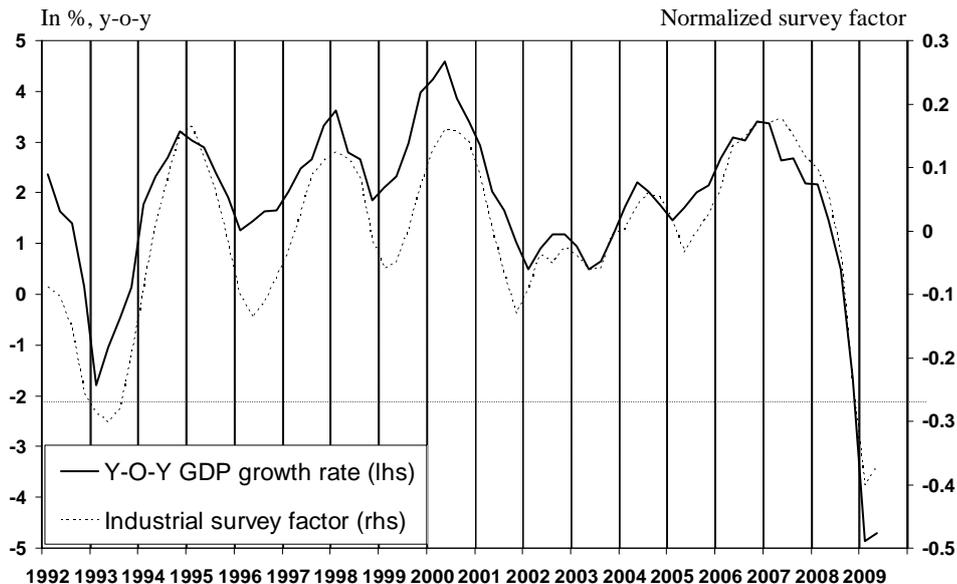
provides a weighted average of the most highly correlated questions within each survey (order books, recent or future trend in production...). Whatever the survey, the first factor usually sums up properly the information contained in the basic series, as the industrial survey in the euro area shows (Chart 1).

Chart 1: Industrial survey in the euro area



The growth rate that is modeled is the year-over-year growth rate. Choosing a year-on-year basis to estimate and forecast GDP growth is justified by the high correlation found with the business survey series (Chart 2).

Chart 2: Correlation between GDP and industrial business survey in the euro area



Monetary conditions have a consistent and well documented lagged influence on the real economy. Here they are captured, on the domestic side, through the spread between the euro

area short-term real interest rate and the trend growth rate (actual yearly rate for the last five years), on the external side, through the euro per dollar exchange rate. Their yearly changes are used — 2 years for the rate of interest, 1 year for the exchange rate — and lead GDP by two quarters. The gap between the real interest rate and the trend growth rate depicts the impact of financial constraints bearing on agents: considering a given interest rate level, the highest the growth rate, the greater the capacity of agents to get into debt.

The external demand is caught here by the ISM survey in the US industry. It is processed the same way than other surveys by conducting a principal component analysis on the questions and selecting the first factor.

Table 1 shows the current components of the indicator and their processing with regard their quarterly conversion and transformation for regression purpose.

Table 1: Coincident and leading variables included in the current Euro Growth indicator

<i>Variables</i>	<i>Lead in quarter</i>	<i>Quarterly conversion</i>	<i>Transformation</i>
Industrial survey factor	1	Average	none
Retail trade survey factor	0	Average	trend-removed
Short-term interest rate	2	End of quarter, cyclical component	trend-removed
Real dollar/euro exchange rate	2	Average, y-o-y growth rate	trend-removed
ISM industrial survey factor	0	End of quarter	none

Over the estimation sample, 1992Q1 to 2009Q1, some regressors are trended. To avoid spurious regression, trended series should be trend removed; this is the case for the retail trade survey factor, the cyclical component of the short-term interest rate and the real dollar/euro exchange rate.

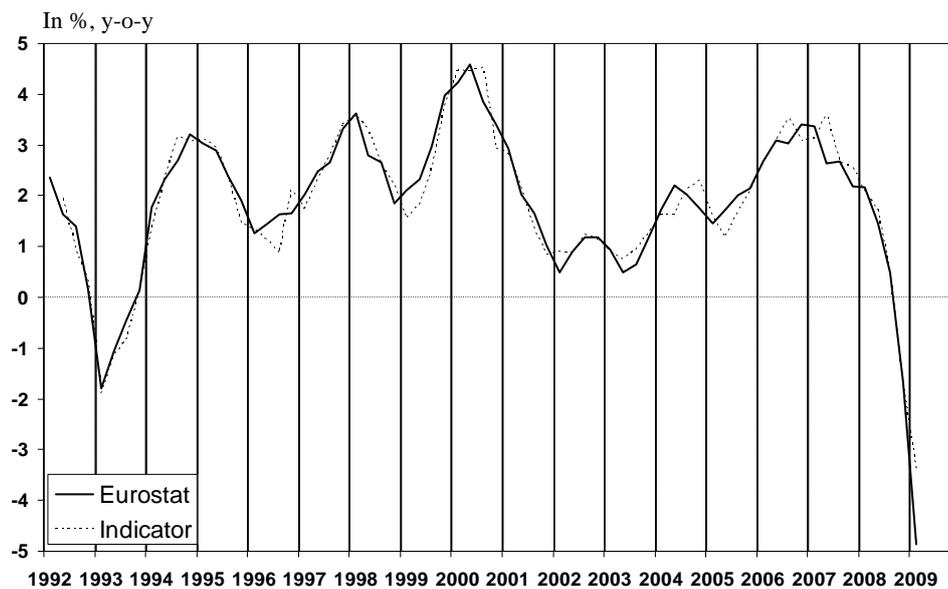
II- The indicator equation

The OLS estimation current results are shown in table 2 and Chart 3. The equation is estimated with two dummy variables, the first one for the first quarter of 1993 because the extent of the former recession is not completely tracked by the explanatory variables, the second one for the second quarter of 2003 to reflect the impact of the Iraq War. The equation does not fully track the GDP growth rate developments; an AR1 term is thus needed to complete the estimation. All variables are significant and have the expected signs.

Table 2: Equation for the current Euro Growth indicator

	Coefficient	t-stat	
Industrial survey factor	7.12	6.6	Estimation sample: 92Q2 – 09Q1
Retail trade survey factor	5.48	3.6	
Short-term interest rate	-0.24	-2.0	Number of observations: 68
Real dollar/euro exchange rate	0.018	2.0	
ISM industrial survey factor	2.79	4.0	Rbar ² = 0.93
Constant	1.48	3.6	
AR1	0.88	9.1	See = 0.4
Dummy, =1 in 93Q1, =0 elsewhere	-0.68	-2.1	
Dummy, =1 in 03Q2, =0 elsewhere	-0.57	-1.9	DW = 1.94

Chart 3: GDP growth rate and fitted values from equation from Table 2



III- Forecasting coincident or one-quarter leading series

As Table 1 shows, monetary conditions depicted by the short term interest rate and the exchange rate are leading GDP growth and can be directly used to forecast GDP growth two quarter ahead of official data. However, business survey series are coincident (retail trade and ISM) or not sufficiently leading (industry). Depending on the forecasting date, these series are thus partially known for the current quarter and possibly for the coming quarter. They will then have to be forecast but over a short time horizon, never exceeding 4 months.

Let Q stands for the last known GDP (for instance 2009Q2) released in month 2 of quarter Q+1 (for instance August 2009). In early month 3 of quarter Q+1 (September 2009), the indicator will forecast Q+1 (2009Q3) and Q+2 (2009Q4). These forecasts will be conducted with business surveys series known up to month 2 of quarter Q+1 (August 2009). These regressors will therefore have to be predicted up to the forecast horizon: one month ahead as concerns the one quarter leading industrial business survey factor, i.e. month 3 of quarter Q+1 (September 2009), four month ahead as concerns the coincident series, i.e. month 3 of quarter

Q+1 (September 2009) and months 1,2,3 of quarter Q+2 (October, November and December 2009).

In early month 1 of quarter Q+2 (October 2009), the industrial business survey factor is known up to month 3 of quarter Q+1 (September 2009) and does not have to be predicted anymore, while the other surveys factors will have to be extended three months ahead, months 1,2,3 of quarter Q+2 (October, November and December 2009). Finally, in early month 2 of quarter Q+2 (November 2009), a two month ahead forecast of the coincident series is needed for month 2,3 of quarter Q+2 (November and December 2009). This sequence of monthly forecasts is then one quarter ahead shifted once released a new GDP figure. Table 3 sums up the available information and the extension period of regressors in order to achieve monthly revised quarterly GDP forecasts.

Table 3: Forecast time table

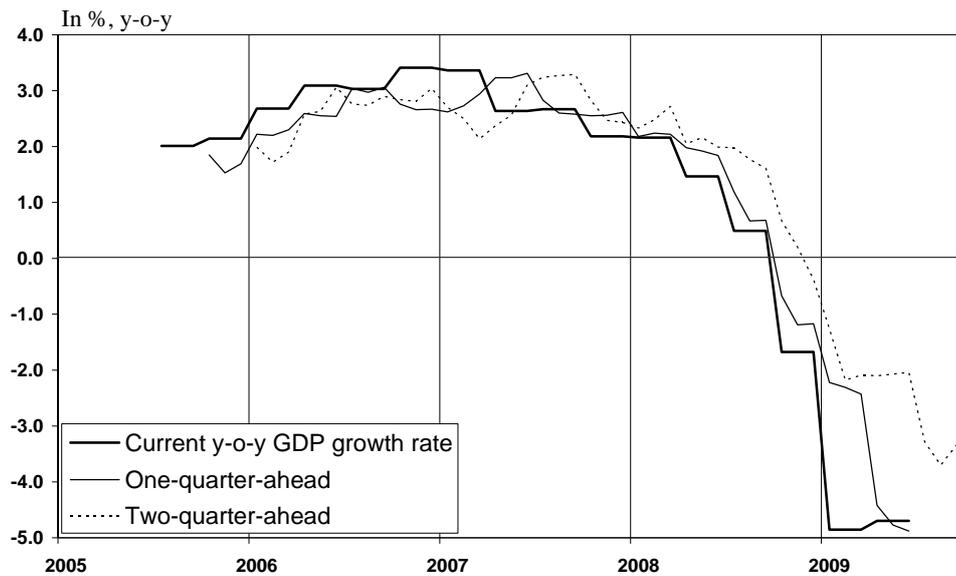
GDP release	Last known GDP	Forecast date	Forecast horizon	Last known industrial survey	Extension period	Last known retail trade and ISM surveys	Extension period
mid-November	Q3	Early Dec.	Q4, Q1	Nov.	Dec.	Nov.	Dec., Jan., Feb., Mar.
mid-February	Q4	Early Mar.	Q1, Q2	Feb.	Mar.	Feb.	Mar., Apr., May, June
mid-May	Q1	Early June	Q2, Q3	May	June	May	June, July, Aug., Sep.
mid-August	Q2	Early Sep.	Q3, Q4	Aug.	Sept.	Aug.	Sept., Oct., Nov., Dec.

Forecasts of business survey factors are conducted using autoregressive equations. Owing to the autoregressivity and the low volatility of business survey factors, such forecasts will be satisfactory, except at cyclical swings where they could be late to recognize and negotiate turning points.

III- Assessment of the ‘real time’ forecasts

We then analyse the out-of-sample forecasting errors which have resulted from running the set of equations presented above, starting from the first release of chain-linked GDP data in mid-November 2005. The first forecast has been conducted in early December 2005, with the GDP growth rate equation estimated from 1992Q1 to 2005Q3. The last one has been released in early August 2009, when Eurostat figures for 2009Q2 were still unknown.

Chart 4: The one and two-quarter-ahead forecasts compared with the current GDP growth rate



The main characteristic of these forecasts is that they underestimated growth during the last GDP upswing, from late 2005 to early 2007, and overestimated it most of the time while GDP was decelerating (Chart 4). The 2007 cyclical peak has not well been negotiated, with a signal of acceleration in mid-year when the cyclical peak occurred in the turn of 2006 and 2007.

As it could have been anticipated, the less accurate forecasts are the two-quarter-ahead ones which rely on the extrapolation of two main series, i.e. the retail trade and the ISM business survey factors. As Table 4 shows, forecasts errors are higher for the two-quarter-ahead forecasts.

The extent of the errors depends also from the forecasting date. In the least favourable state of information, month 3 of quarter Q+1 where the industrial business survey factor has to be predicted and the forecast horizon of the coincident series is four months, forecast errors are higher. They are lower in month 1 of quarter Q+2, where the industrial business survey factor does not have to be predicted anymore and the forecast horizon of the coincident series is three months, and decrease once again in month 2 of quarter Q+2 (two-month-ahead extension of the coincident series).

Table 4: Root mean square errors

Forecast date*	One-quarter-ahead	Two-quarter-ahead
Month 3, quarter Q+1	0.85	1.47
Month 1, quarter Q+2	0.79	1.27
Month 2, quarter Q+2	0.75	1.23

* Month 3, quarter Q+1: December, March, June, September

Month 1, quarter Q+2: January, April, July, October

Month 2, quarter Q+2: February, May, August, November

The indicator gave the right signal of a drop in GDP in 2008Q4, but was unable to anticipate the outstanding low growth in 2009Q1. The reason for this is that business surveys could have been less sensitive to further deepening in the recession beyond 2008Q4. Balances of opinion could be seen as diffusion indexes which measure how much positive appreciation compared to negative appreciation is widely held by economic agents. In the current situation of outstanding downward cyclical developments, balance of opinion may have reached their empirical lower limit in 2008Q4, i.e. not far from 100 % of negative appreciation. Therefore, business surveys became insensitive to additional negative shocks on GDP in 2009Q1 and have temporarily lost their ability to match business developments.