A MONTHLY DATING OF THE FRENCH ECONOMIC CYCLE

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In this article, we attempt to put precise dates — to the nearest month — on the various phases of the French economic cycle from 1985 to the present.
A new methodology makes it possible to construct a monthly synthetic indicator (ISeco) on the basis of the major quantitative indicators for the French economy and not only GDP.
Using this indicator, we distinguish seven cyclical phases during this period, only one of which is a recession, lasting from September 1992 to May 1993.
Finally, using the same methodology, we take a fresh look at the synthetic indicator for the business climate in manufacturing industry (IS manuf), published each month by INSEE, comparing it with that obtained by the inclusion of GDP (ISmanufbis). The differences relating to the discrepancies between business leaders' expectations and the overall economic reality would seem to show either an error of appreciation regarding the recent past or a very marked dichotomy between industry and the other sectors.

An economic recession is usually defined as a contraction in real GDP in two successive quarters. Using this definition implicitly means making GDP the sole measure of economic activity.

The NBER[1] adopts a broader approach: "a recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production and wholesale-retail sales". By including the various sectors of the economy, the NBER moves away from the definition taking only GDP into account. As a result, a decline in manufacturing activity that would be passed on into GDP but would not be simultaneous with a decline in services cannot be considered as a full-scale recession.

This definition raises a number of technical questions:

- how to take several series into account simultaneously

- how to deal simultaneously with series having different frequencies

- how to compile a signal of the economy that is precisely dated (monthly) and in real time

In this article, we propose a statistical method to apply this definition in a way that provides responses to these questions.

In so doing, we obtain a month-by-month reading of the French economic situation from 1985 to the present. On the basis of this reading, we distinguish seven distinct phases, only one of which is a recession.

We then go on to apply this methodology to business surveys for industry in France. This approach makes it possible to generalise the synthetic indicator of the climate in manufacturing (ISmanuf) published by INSEE (cf. Informations Rapides and publications in the present series). We extract an indicator (ISmanufbis) that is common to the monthly surveys of the situation in French industry and French GDP. The new indicator ISmanufbis obtained in this way turns out to come very close to the synthetic indicator of the business climate. Comparison between the synthetic indicator ISmanuf currently used, compiled from six balances of opinion in the monthly business survey, and a new indicator ISmanufbis compiled from these same six balances of opinion plus quarterly GDP makes it possible to distinguish between the expectations reflected in the surveys and actual economic activity.

A new synthetic indicator of economic activity compiled using quantitative data including GDP

Monitoring of the short-term economic situation is rendered difficult by the multiplicity of indicators, for at least two " traditional" reasons. For one thing, the level and amplitude of evolutions vary from series to series. For another, the series can apparently have conflicting month-to-month

(1) National Bureau of Economic Research.

evolutions. These two considerations make overall judgements on the economic situation difficult.

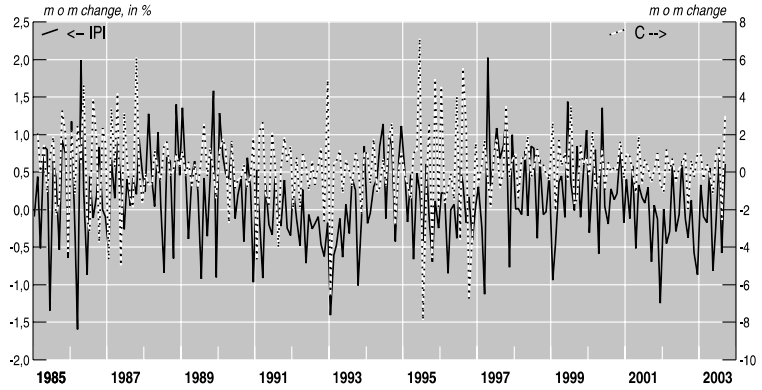
In order to meet these difficulties, short-term economic analysts compile synthetic monthly indicators. For example, Stock and Watson (1989) have drawn up for the United States a coincident index based on four major quantitative indicators for the American economy: number of non-farm jobs, total personal income excluding transfer payments, index of industrial production, total real manufacturing and trade sales. The method they use is that of dynamic factor analysis. Doz et Lenglart (1995) have defined a synthetic indicator for the business climate in France using balances of opinion obtained in the industry survey *(see box 1)*.

INSEE has accordingly adopted this factor-analysis-based methodology, involving breaking down each balance of opinion into two independent components, the one common to all the balances of opinion, the other specific to the series being considered. The first component, also known as "the common factor", has similarities with the business climate index in manufacturing industry.

However, we then found ourselves confronted with a third problem. The quantitative indicators have different periodicities: GDP is quarterly, whereas the industrial production index is monthly. This makes interpretation more difficult. Murasawa and Mariano (2003) get around this difficulty, also with the help of factor analysis *(see box 2)*.

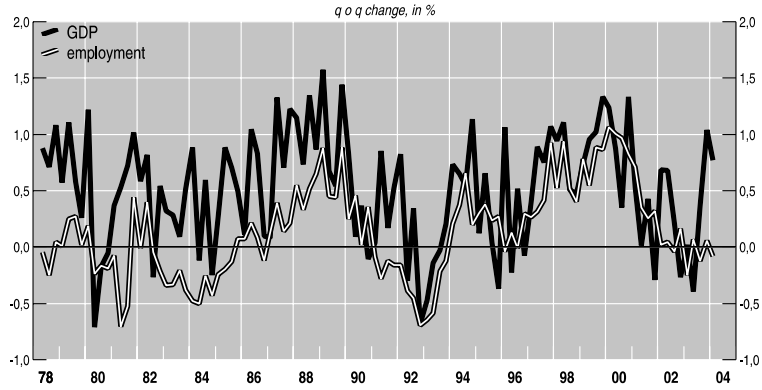
1

IPI AND HOUSEHOLD CONSUMPTION OF MANUFACTURED PRODUCTS



2

GDP AND EMPLOYMENT



In an initial stage, we try to find quantitative indicators *(see graphs 1 and 2)* that represent the main branches of the French economy. Other criteria for selection also enter into consideration, namely, availability of data and frequency of publication. GDP, the principal aggregate of economic activity, is obviously one of the indicators chosen. In order to describe the industrial branch, we chose the industrial production index which has been available on an sa + wda basis[2] since 1978. On the demand side, private consumption is represented by household spending on manufactures, a series that has been available since January 1985. Finally, as regards the labour market, it is the dependent workforce that was chosen, having been available with quarterly frequency since Q1 1978 *(see Table 1 in the Annex)*.

The following analysis shows that it is possible to derive a monthly indicator of the business climate in the form of a synthetic indicator ISeco *(see graph 3)* that summarises the element that is common to the different aggregates. This indicator is not the chance result of independent short-term movements in each branch of economic activity. On the contrary, it is omnipresent, even if the form and pattern it takes depend on the particular features of each branch. Finally, confrontation between this indicator and each of the individual quantitative indicators throws light on the economic situation of a given branch, especially in relation to the situation of the economy as a whole.

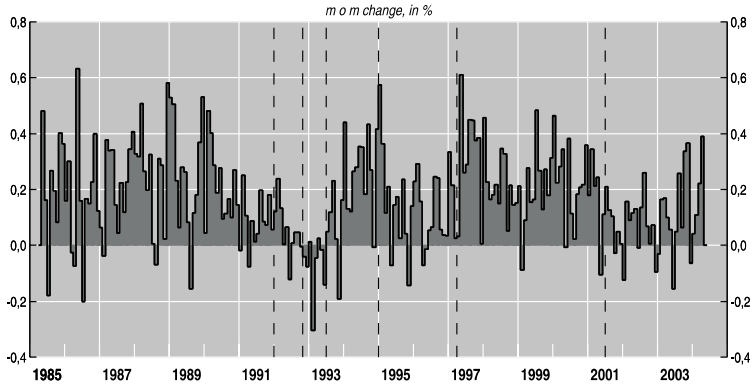
The ISeco indicator can therefore be seen as giving quantitative content to the NBER definition. A recession corresponds to negative values of the indicator during several consecutive months, which is equivalent to a fall in the same cumulative ISeco-cumul indicator during several months.

(2) Seasonally-adjusted, working-day-adjusted

3

SYNTHETIC INDICATOR ISeco

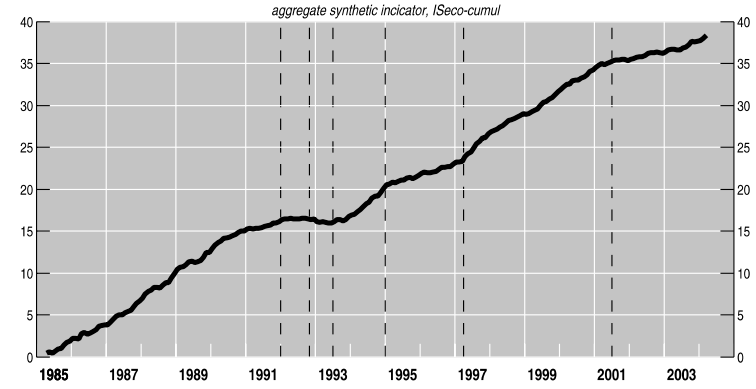
m o m change, in %



4

PHASES OF FRENCH ECONOMIC CYCLE

aggregate synthetic incicator, ISeco-cumul



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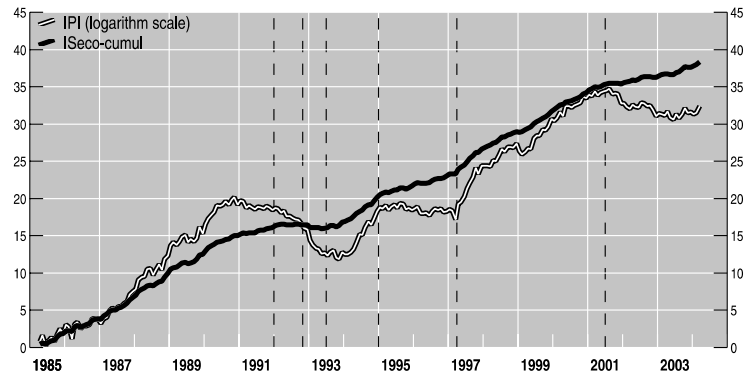
IPI AND COMMON FACTOR



Precise dating of the French economic cycles

The evolutions in the aggregate common factor ISeco-cumul offer a new means of identifying the cyclical phase:

- the decreasing (increasing) segments of the curve correspond to periods of recession (growth)

- the steeper the slope, the more intense the recession or the growth

In this way, we are able to distinguish seven periods for the French economy between 1985 and 2004 *(see graph 4)*.

1) from January 1985 to January 1992: strong growth

2) from February 1992 to August 1992: stability.

3) from September 1992 to May 1993: recession

4) from June 1993 to December 1994: strong growth.

5) from January 1995 to April 1997: medium growth.

6) from April 1997 to June 2001: strong growth.

7) from July 2001 on: modest growth.

This dating appears to be consistent with that obtained for the period 1985-1995 by Doz and Lenglart (1995), basing their analysis on the business survey for industry.

In the case of the 1993 recession, the detail in the quarterly accounts does indeed show, for the year 1993, a fall in real GDP. Most of this occurred in the period from Q4 1992 to Q2 1993 in the case of private spending, corporate investment and household investment. We are able to date it precisely from September 1992 to May 1993.

Although the analysis makes it possible to determine the existence of an indicator ISeco that is

common to the various quantitative indicators, the latter nevertheless still shed their own individual light on the situation.

Indeed, applying this reading, it is possible to isolate the contribution made by each individual economic magnitude and to relate it to the common cyclical indicator. From this comparison, the short-term analyst is able to draw two types of conclusion:

- the lead or lag taken by a given branch in relation to activity in general

- the relative dynamism of a branch in relation to activity as a whole

For example,

1) The industrial production index turns out to be coincident for the recent past *(see graph 5)*

The IPI was already showing signs of weakness around the end of 1990 (November), in other words somewhat in advance of the general climate represented by the ISeco-cumul indicator.

Between February 1995 and March 1997, the IPI was sluggish, whereas the ISeco-cumul synthetic indicator continued to progress. Between March and October 1997, the IPI was in ad-

BOX 1: SURVEYS OF THE ECONOMIC SITUATION IN INDUSTRY

Each month, INSEE publishes a survey of the immediate economic situation in industry. The coverage chosen comprises manufacturing, food processing and oil refining. The sample used for the survey is made up of roughly 4000 firms, who are asked questions concerning the evolution of their activity in the past three months (past production tendency) and on their prospects for the next three months (expected tendency). INSEE also asks for their views concerning the situation of their total and export order books as well as their inventories in relation to what they consider a "normal" level. Industrial leaders also give their views on the general evolution of the situation in industry (general prospects). In addition, supplementary questions are put to the industrial leaders once a quarter, notably concerning the recent and future evolution of the demand for their products. It should be remembered that the replies to a series of questions are qualitative (improvement, no change or deterioration). The breakdown between the three types of reply is expressed in percentages and the information relating to each question is then expressed in the form of a balance of opinion (difference between the percentage of firms reporting improvement and the percentage reporting deterioration). The month-by-month observation of these balances makes it possible to monitor the evolution of industrial leaders' opinions on these questions.

What are the advantages of these surveys?

First of all, they provide a signal that is obtained directly from the economic players regarding the short-term evolution in their behaviour. They are considered as stationary, as is verified by the usual tests. Moreover, they are published very soon — in a matter of days — after the end of the month in question, in other words much sooner than the data relating to the main macroeconomic aggregates. Because they have been available on a monthly basis since March 1976, the number of observations is considerable. Lastly, the results are subject to only very minor corrections. ■

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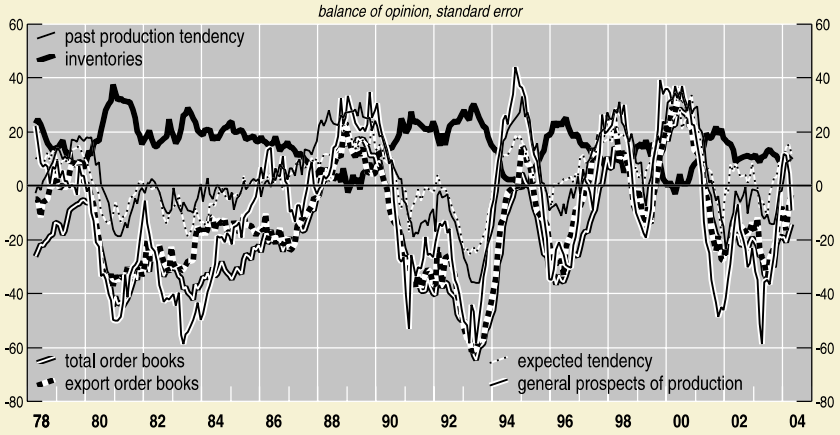
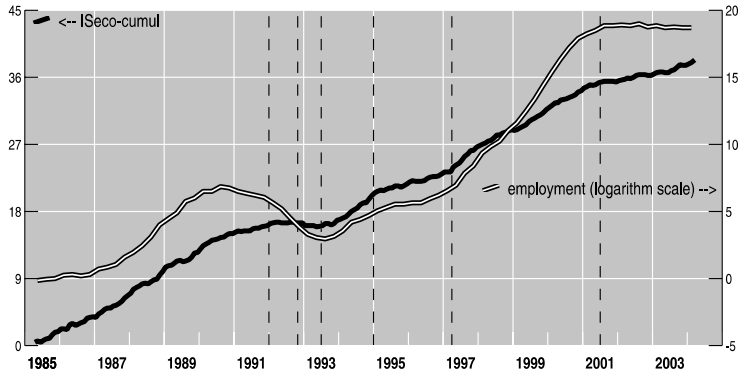
SURVEYS OF THE ECONOMIC SITUATION IN INDUSTRY

balance of opinion, standard error



6

EMPLOYMENT AND AGGREGATE SYNTHETIC INDICATOR



vance of the overall economic situation and showed greater dynamism.

Between August 2001 and March 2004, the IPI weakened, whereas the ISeco-cumul indicator continued to post a modest rise.

2) Employment is not always in phase with the economic cycle *(see graph 6)*

In November 1990, employment had already begun to weaken whereas the ISeco-cumul indicator was still in a phase of modest growth.

BOX 2: THE METHOD USED, ADAPTED FROM MARIANO AND MURASAWA (2003)

We attempt to combine the common information contained in time series by constructing a monthly index of economic activity. The statistical method chosen lies in the realm of dynamic factor analysis.

The frequency is monthly, meaning that quarterly data are regarded as monthly series with observable values in each of the three periods.

Initially, we suppose the existence of a hidden variable y_t^* such that:

$$y_t = \frac{1}{3}y_t^* + \frac{2}{3}y_{t-1}^* + y_{t-2}^* + \frac{2}{3}y_{t-3}^* + y_{t-4}^*$$

where $y_t = \Delta_3 \ln GDP_t$ is the quarterly change in log GDP. In this way, y_t^* can be assimilated to a monthly GDP growth rate.

A similar assumption is made for quarterly employment numbers.

In a second stage, we assume that it is possible to summarise the behaviour of the variables (observed monthly growth rate for the monthly data, and non-observed monthly growth rate for the quarterly data) in the form of a small number of fictitious, or underlying, variables built up by combination of the initial variables. These fictitious variables, known as factors common to the initial variables, explain the variance that is common to the observed time series. This is the principle of factor analysis.

To be more precise, if we have I available variables $\left(z_t^i\right)_{\substack{1\le i\le I \\ 1\le t\le T}}$ (where $z_t^i = y_t^*$ is the non-observed monthly growth rate for the quarterly variables, $z_t^i = \Delta \ln Y_t^i$ the observed quarterly growth rates for the monthly variables) and $J\,(J < I)$ the common factors $F_1, F_2, \ldots, F_J$, the model can be written as follows:

$$z_t^i = \mu_i + \beta_{i1}F_{1t} + \ldots + \beta_{iJ}F_{Jt} + \varepsilon_{it}$$

The residuals ε_{it}, also known as specific components, represent that part of the variance that is specific to each variable z_t^i. They are orthogonal among themselves and with the $F_{1t}, F_{2t}, \ldots, F_{Jt}$.

In practice, only one common factor is used.

In order to capture the differing evolutions of individual series, we introduced a model of the ARMA (autoregressive moving average) type for the various components of the model. We have chosen the following model for the indicator constructed with the aid of the quantitative indicators:

$$\begin{cases} z_t^i = \mu_i + \beta_i F_t + \varepsilon_{it} \\ F_t = \varphi_1 F_{t-1} + u_t \\ \varepsilon_{it} = \rho_1 \varepsilon_{i,t-1} + \rho_2 \varepsilon_{i,t-2} + w_{it} \end{cases}$$

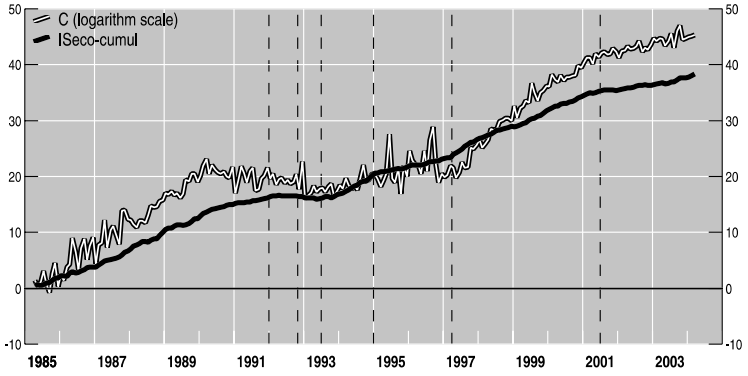
With w_{it} and u_t non-correlated white noise with respective variance σ_i and σ.

This model, of the space-state representation type, is estimated using the Kalman filter method. For reasons of identification, we fix $\beta_1 = 1$. The maximum likelihood algorithm used is a classic procedure for conjugated gradients. The ISeco indicator is the smoothed factor $E(F_t | I_T)\,(t \le T)$.

For the indicator built up on the basis of industrial surveys and French GDP, the dynamic forms chosen are slightly different: that of the common factor is of the AR(2) type while that of the specific components is AR(1). ■

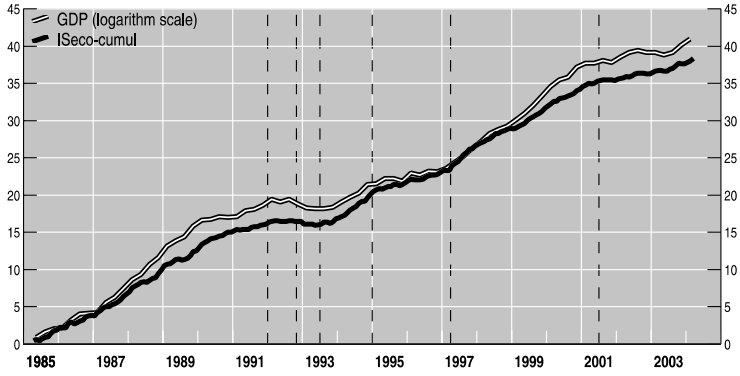
7

HOUSEHOLD CONSUMPTION OF MANUFACTURED PRODUCTS AND AGGREGATE SYNTHETIC INDICATOR



8

GDP AND AGGREGATE SYNTHETIC INDICATOR



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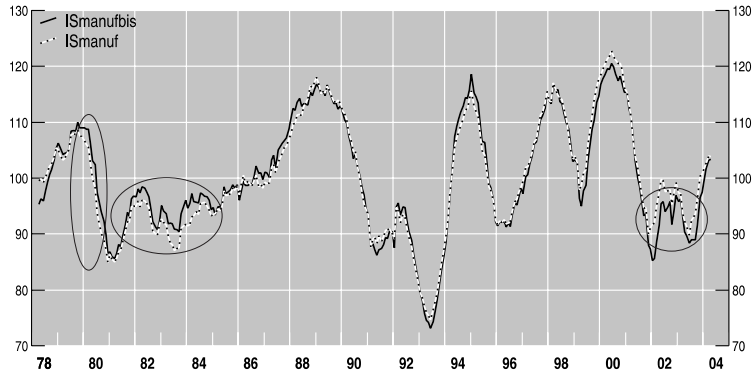
SYNTHETIC INDICATOR FOR MANUFACTURING INDUSTRY



Starting in November 2001, the number of people in work ceased to rise, in contrast to the ISeco-cumul synthetic indicator.

3) Household consumption of manufactures is either in advance of, or coincident with, the economic cycle *(see graph 7)*

Household consumption of manufactures shows a more volatile month-to-month pattern, making it more difficult to interpret.

Starting in March 1990, household consumption of manufactures showed a downward movement, well before the decline in the ISeco-cumul synthetic indicator.

4) GDP is an imprecise aggregate for dating the cycles *(see graph 8)*

Taking merely GDP would indicate a recession lasting from Q4 1992 to Q3 1993. The ISeco-cumul indicator of the general economic climate confines the recession to Q4 1992, Q1 1993 and Q2 1993.

The transposition of the analysis based on the industry survey confirms the relevance of the synthetic indicator for industry published by INSEE

INSEE publishes each month its ISmanuf synthetic indicator for manufacturing industry, compiled with the aid of six balances of opinion derived from the business survey for industry (see box 2). This common factor ISmanuf seems to be an indicator of the business climate in industry, having the advantage of being less volatile from month to month than the series consisting of the surveys and therefore easier to interpret. We have taken a fresh look at this synthetic indicator for manufacturing industry ISmanuf, using the methodology adopted above to construct a new synthetic indicator ISmanufbis on the basis of the six balances of opinion in the monthly surveys of the situation in industry together with quarterly

GDP. The aim is to capture the common factor between the various surveys (qualitative data) and GDP (principal quantitative measure of economic activity).

It should be pointed out, first of all, that this ISmanufbis indicator turns out to come very close to that published by INSEE *(see grap 9)*.

Additional light thrown on the business surveys

Comparison between these two indicators ISmanuf and ISmanufbis is able to provide considerable additional information:

- it enables us to compare business leaders' opinions with a short-term indicator based on GDP and thus distinguish between expectations and economic reality.

- this difference can also be interpreted as an additional item of information regarding services.

Over the estimation period (1978 to 2003) we note the following *(see graph 9)*:

- between 1979 and 1981, the industry common factor ISmanuf is in advance of the new common factor ISmanufbis incorporating GDP. This can be interpreted as the industrial sector being in advance of the overall cycle.

- between 1981 and 1985, business leaders in industry seem to have been unreasonably pessimistic, as the industry common factor ISmanuf lies below the ISmanufbis indicator.

- between 1985 and 2001, the two indicators are highly similar, possibly indicating a synchronisation between the cycles in manufacturing and services.

between 2001 and 2003, we again note a discrepancy between the industrial cycle and the overall cycle: business leaders in industry seem more optimistic than the overall economic situation would suggest, either because their appreciation is at fault, or because of a very marked dichotomy existing between industry and the other sectors. ■

BOX 3: SMOOTHED FACTOR OR FILTERED?

In the article, we have presented the smoothed indicator ISeco. We have used this indicator in the context of the new examination of economic activity, in which we had at our disposal data for the entire estimation period. ISeco takes account at date t of the information available up to the date T (T>t), notably the information available just after date t. This factor corresponds to $E(F_t|I_T)$.

In the framework of a real-time interpretation of economic activity, our ISeco indicator coincides with the filtered factor ISfil. This factor corresponds to $E(F_t|I_t)$, because in real time t=T.

Retrospectively, however, (t<T), the filtered factor is different from the smoothed factor ISeco, since the former is compiled using only past information I_t, whereas the latter takes into account past and future information I_T.

When we carry out the dating exercise in real time, in practice we use the filtered factor ISfil and not the smoothed factor ISeco. In order to assess the relevance of the filtered factor ISfil for the short-term analyst, it is therefore preferable to compare it with the smoothed factor ISeco from 1985 to 2004.

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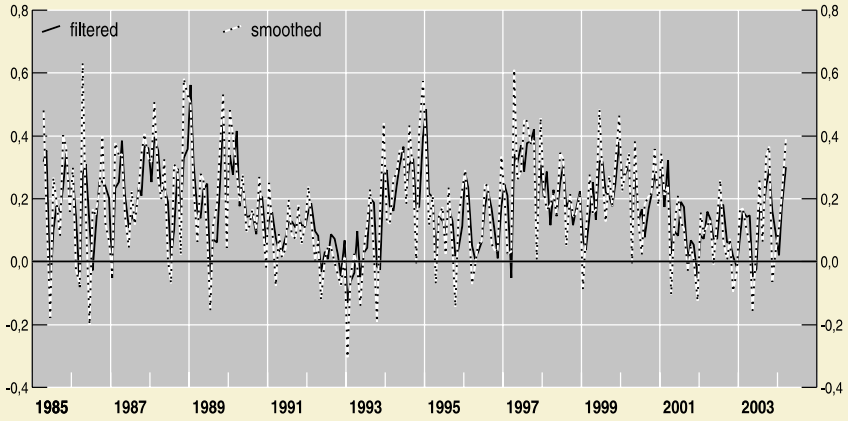
ISeco (SMOOTHED) AND ISfil (FILTERED)



Statistical appendix

Table 1: Quantative indicators used

Name	Description	Begining serie	Frequency	Availability
GDP	Gross Domestic Product (in euros, 1995 base, sa+wda)	1978Q1	Quarterly	+ 42 days(1)
EMP	Dependent workforce, quarterly, all sectors (sa)	1978Q1	Quarterly	+ 45 days
IPI(2)	Industrial production index (base 2000, sa)	1980Q1	Monthly	+ 40 days
C	Household spending on manufactures (volume, 1995 prices, sa+wda)	1985Q1	Monthly	+ 22 days

(1) This is the flash estimate in the quarterly accounts.
(2) The IPI, base 2000, used here has been back-calculated to January 1980 for the purpose of the study.

Table 2: Statistics of quantative indicators (% from april 1985 to march 2004)

Indicator(1)	Average	Standard error	Minimum	Maximum
GDP	0.54	0.52	-0.68	1.57
EMP	0.25	0.40	-0.69	1.06
C	0.20	2.06	-7.87	7.07
IPI	0.14	0.62	-1.60	2.02

(1) The indicators are recorded as percentage growth rates except for the KPSS test. The Gross Domestic Product and employment series are quarterly; the series for in - dustrial production index and comsumption of manufactures are monthly.

Table 3: Statistics of economic situation surveys (% from april 1978 to march 2004)

Indicator(1)	Average	Standard error	Minimum	Maximum
GDP	0.50	0.51	-0.71	1.57
TPPA	3.96	15.46	-36.10	34.69
TPPRE	3.68	11.44	-25.65	33.80
OSCD	-17.69	19.64	-64.51	28.58
OSCDE	-12.28	19.21	-61.57	36.53
OSSK	14.65	7.95	-3.10	37.67
PGP	-8.95	25.49	-58.75	44.03

(1) The Gross Domestic Product and employment series are quarterly; the series for industrial production index and comsumption of manufactures are monthly.
With
TPPA : opinion regarding the past tendency in own-firm production.
TPPRE : opinion regarding the expected tendency in production.
OSCD : opinion regarding overall demand and total order books.
OSCDE : opinion regarding export demand and order books.
OSSK : opinion regading the level of stocks.
PGP : opinion regarding the outlook for the overall level of activity.

Table 4: Parameter estimation

Parameter	GDP(1)	EMP	DET	IPI
β	1.00	0.77	1.44	2.71
(standard error)	(0.19)	(0.56)	(0.43)	(0.17)
ϕ_f (standard error)	0.48 (0.17)			
σ_1^2 (standard error)	0.02 (0.01)			
$\varphi_{u,1}$	0.41	0.14	-0.55	-0.99
(standard error)	(0.67)	(0.79)	(0.04)	(0.06)
$\varphi_{u,2}$	-0.46	-0.30	-0.35	-0.76
(standard error)	(0.14)	(0.26)	(0.06)	(0.10)
$\Sigma_{2,2}$	0.07	0.06	3.00	0.07
(standard error)	0.09	0.01	0.28	0.04

(1) GDP is taken as the quarterly growth rate.

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