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Evaluation and development of confidence indicators based on harmonised business and consumer surveys

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Directorate General

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Evaluation and development of confidence indicators based on harmonised business and consumer surveys

Study contracted by the EU Commission
Directorate General for Economic and Financial Affairs

G.Goldrian, J.D. Lindbauer, G. Nerb
With a contribution of B. Ulrich

Study of the IFO Insitut
for Economic Reasearch

Introduction

DG ECFIN conducts a number of surveys within the framework of the Joint Harmonised EU Programme of Business and Consumer Surveys. This programme was launched in 1962 with the industrial survey, and since then there has been a spectacular growth of business and consumer surveys in the EU. At present five surveys are conducted on a monthly basis: Industry, Consumers, Retail Trade, Construction and Service Sector. In addition, twice a year data for a harmonised investment survey is collected and published. Finally, the quarterly ESI (Economic Survey International) provides us with an assessment of the world-wide economic situation by 500 experts in 60 countries.

The results of these surveys have for many years provided policy makers, researchers, managers and other economic agents with timely and relevant information for the evaluation of economic conditions. The increasing demand for these results by the public in general and by the European Central Bank in particular, as well as the escalating coverage in the media seems to confirm this fact.

All indicators must be revised from time to time in order to validate their explanatory properties. Therefore, structural economic changes demand periodic revisions of the indicators in order to explain the economic reality.

For this reason, in the early months of 2000, DG ECFIN launched a restricted call for tenders (ECFIN 2000/7) in order to establish a contract for the evaluation of the present Economic Sentiment Indicator and its components. Moreover, the study was to include the development of an alternative composite indicator optimised at EU and euro area levels.

The IFO Institute from Munich was selected. This institute was the first to conduct business surveys in Europe back in 1949. Since then, their constant work in data collection and survey design, as well as in the research and analysis of these surveys, have made this institute an excellent candidate for conducting such a study.

For the creation of a new indicator that could eventually replace the current one, DG ECFIN suggested using the results from the retail trade survey. This survey has been conducted for a number of years and its series are now long enough to be seasonally adjusted and included in the construction of the composite indicator.

On the other hand, DG ECFIN also recommended the elimination of one of the components of the Economic Sentiment Indicator, namely the Share Price Index, which occasionally introduces some undesirable backward revisions of the series.

The following study was submitted by IFO. It shows that although there is some room for improvement, the current indicators still seem to be quite adequate. The study contains four main suggestions which will be extensively tested by DG ECFIN in order to evaluate the convenience of adopting each one of them for an eventual overhaul of the Economic Sentiment Indicator in the near future.

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Summary and conclusions

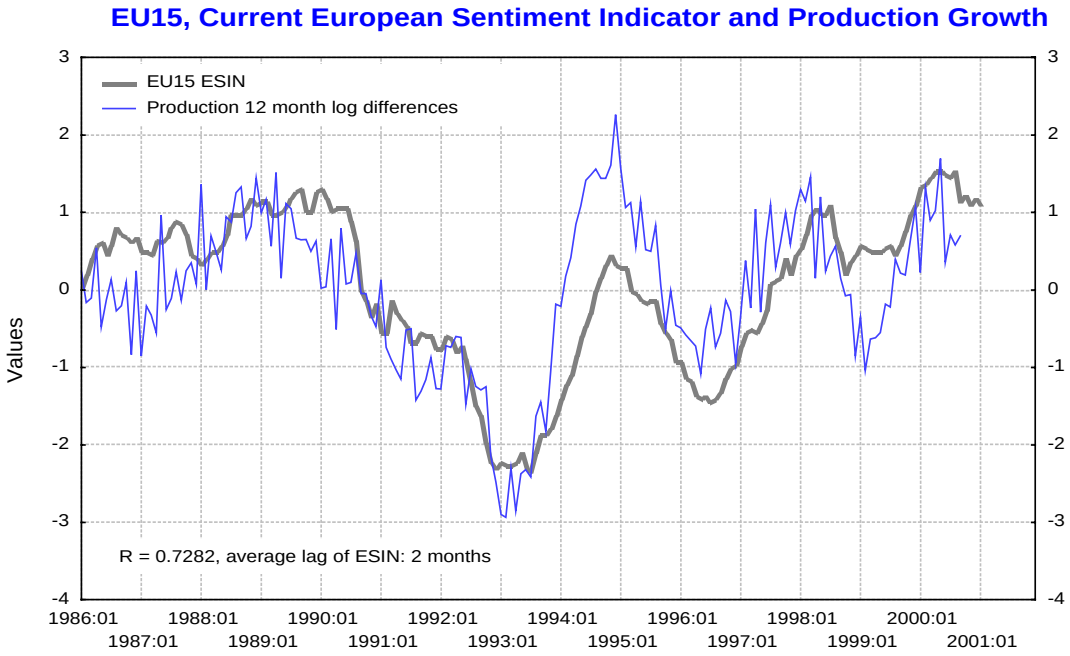
1. It has to be kept in mind that there is no general construction principle for a perfect composite leading indicator. It is only possible to optimise the construction of such an indicator with respect to specified demands. In the case of the EU Economic Sentiment Indicator the question is if top priority should be given to the performance of this indicator at the EU – or the euro zone level – or equally also to the performance at the member country level. In the latter case it would be necessary to develop for each individual member country a tailor-made leading indicator and to sum up the national figures to get an optimal EU or euro zone indicator. However, according to information provided by the European Commission and confirmed at an expert meeting in November 2000 in Brussels, the top priority should be given to the fit of the indicator at the EU and euro zone and not to the performance at the national level. Apart from that, it was clearly stated at the meeting that a uniform indicator construction method is intended at the European as well as at the member country level. Under this precondition the strategy to follow in this study is clearly to try to optimise the leading indicator at the European level and to apply this approach to some member countries to check to what extent the findings at this level are also acceptable though there is – as the case studies for Germany and the UK have shown – clearly room for designing country-specific indicators which show a better fit and longer lead than the harmonised overall leading indicators. Thus, the harmonised sentiment indicators as published in Supplement B of the "European Economy" should be mainly used as guidelines for the economic development at the EU and euro zone level and only as a rough guide for the development in the individual member countries.

2. A second point to take into consideration when constructing composite sentiment indicators is the breadth of data. As the study has shown, the restriction to business and consumer survey data results in very promising composite leading indicators. The further inclusion of monetary indicators like the yield gap (difference between long-term and short-term interest rates) money supply M2 or M3 in some cases helps to smooth the indicator somewhat and to marginally extend its lead. However, the improvement due to those external, i.e. not business and consumer survey based data, is relatively small. Apart from that, the inclusion of a monetary variable like money supply growth would cause some problems at the member country level as those data only make sense at the aggregate level (euro zone). For these reasons, the focus of this study lies on the construction of leading indicators based on business and consumer survey results. For the practical forecasting business it appears preferable to have a set of at least two composite indicators, e.g. one focussing on the business and consumer survey data and the other one on financial data. For a quantitative forecast of GDP a

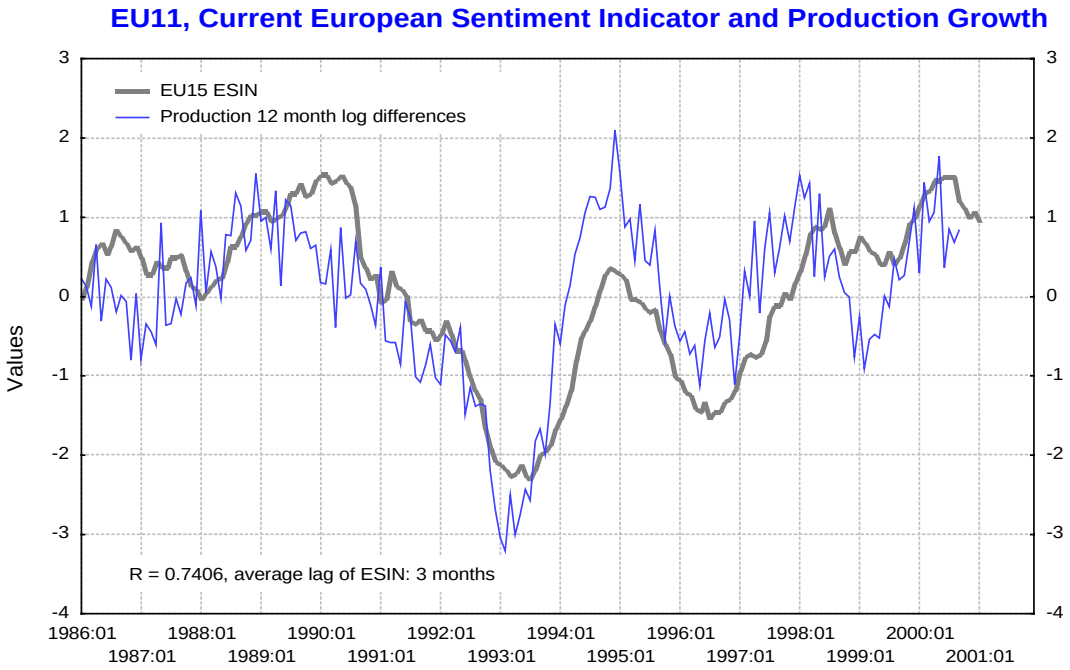
combination of these two composite indicators may be advisable; however, this is beyond the aim of this study.

3. The most important feature of the current sentiment indicators that needs to be improved is without doubt the extension of the lead time. As the analysis has shown, the current indicators, e.g. Economic Sentiment Indicator (ESIN), appear to be more coincident or lagging than leading (Graphs 1 and 2).

Graph 1



Graph 2



To be sure, even a coincident nature of these indicators would not be a negligible advantage as the quantitative data (e.g. industrial production, GDP) are published with a significant delay and show much volatility so that even coincident business survey results have an informational lead at the very end of the time series. However, the aim should be to have not only an informational but also a factual lead. This aim was mainly achieved in this study by changing the methods of indicator construction at the phase when the components industrial confidence, construction confidence, consumer confidence and confidence in retailing are combined. Instead of the current form of standardisation (dividing the month-to-month changes by the average, without regard to the sign of changes) a somewhat modified one (subtracting the mean value and dividing by the standard deviation) proved to be preferable. Moreover, it has been shown, that the transformation of three of the four components (with the exception of consumer confidence) into yearly differences (compared with the value in the same month previous year) clearly improved the lead. However, due to the transformation of differences the volatility of the indicator increases, which suggests the use of some type of smoothing. Here a type of low pass filter developed by the Ifo Institute proved to be very successful. An additional type of smoothing, wavelet de-noising, is presented in point 9, and in the Annex.

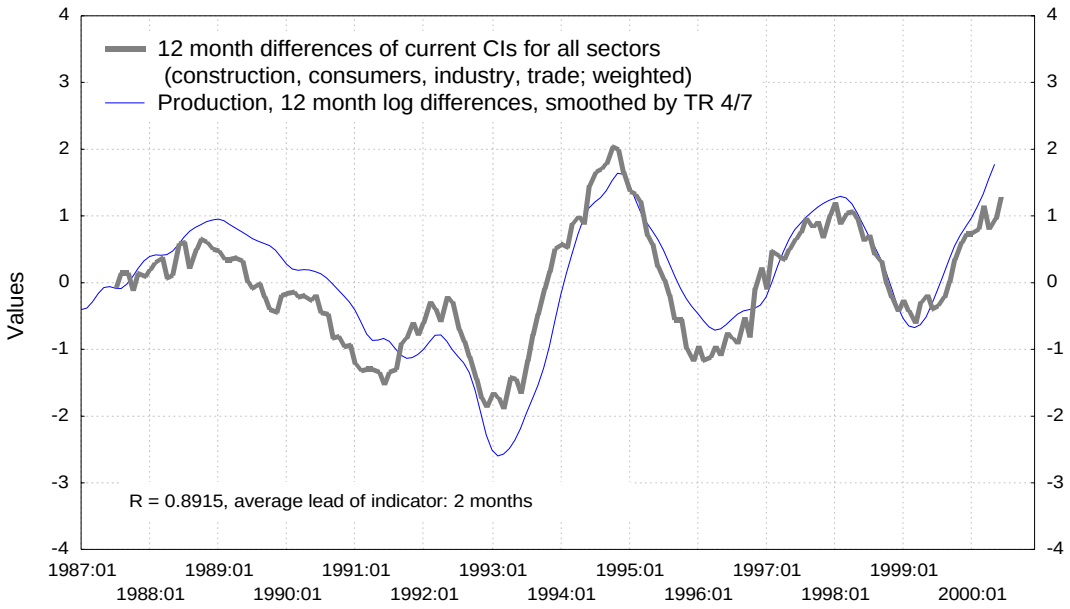
4. With regard to the composition of the four components (industrial confidence, construction confidence, confidence in retailing and consumer confidence) the findings of the case studies were not so clear-cut that a change from the current procedure, would seem absolutely necessary, though some minor improvements can be achieved. (In the case of consumer confidence the inclusion of unemployment expectations, and savings expectations is advisable.)

5. Regarding the combination of the four components a pragmatic approach appears to be justified. This study has clearly shown that the confidence in manufacturing industry is by far the single most important component. Thus, it appears justified to give this component a double weight (40%) compared to the other three components, which each receive the weight of 20% (Graphs 3 and 4).

As can be seen from Graph 5, in which weights to combine the four components were derived from a factor analysis approach, the pragmatic weighting approach of Graphs 3 and 4 yields a similar lead and a better fit.

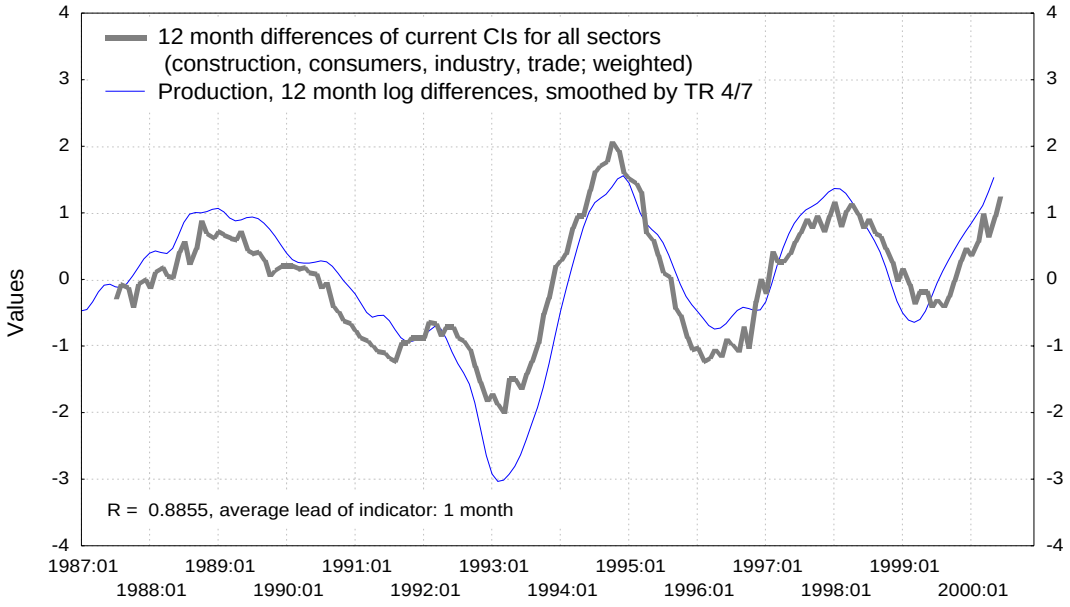
Graph 3

EU15, New Economic Sentiment Indicator (Weighted Four Sector Indicator) and Industrial Production Growth



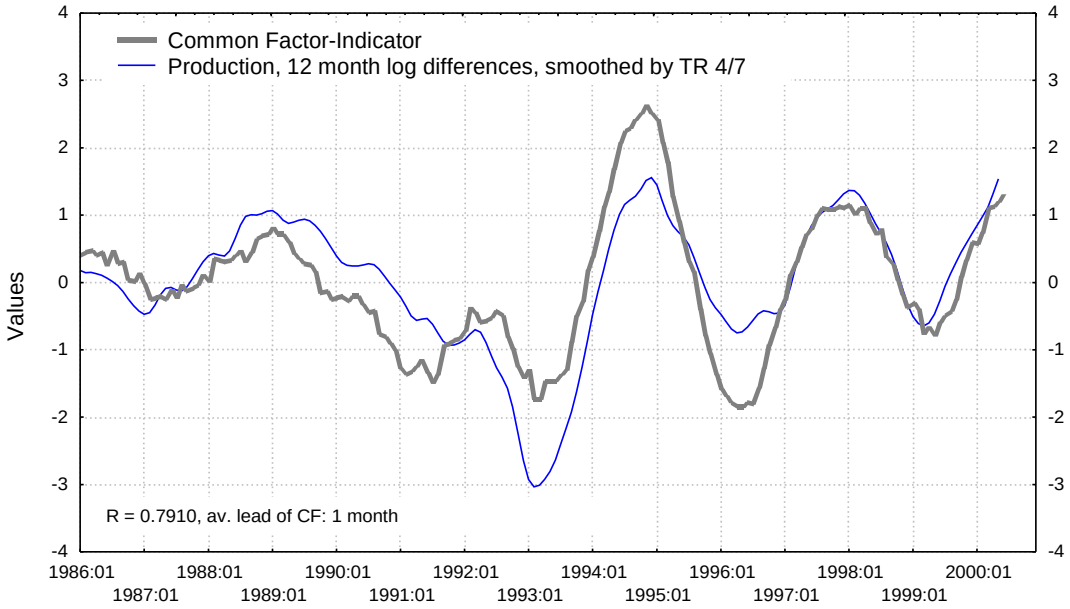
Graph 4

EU11, New Economic Sentiment Indicator (Weighted Four Sector Indicator) and Industrial Production Growth



Graph 5

EU11, Alternative Economic Sentiment Indicator Based on Factor Analysis and Industrial Production Growth



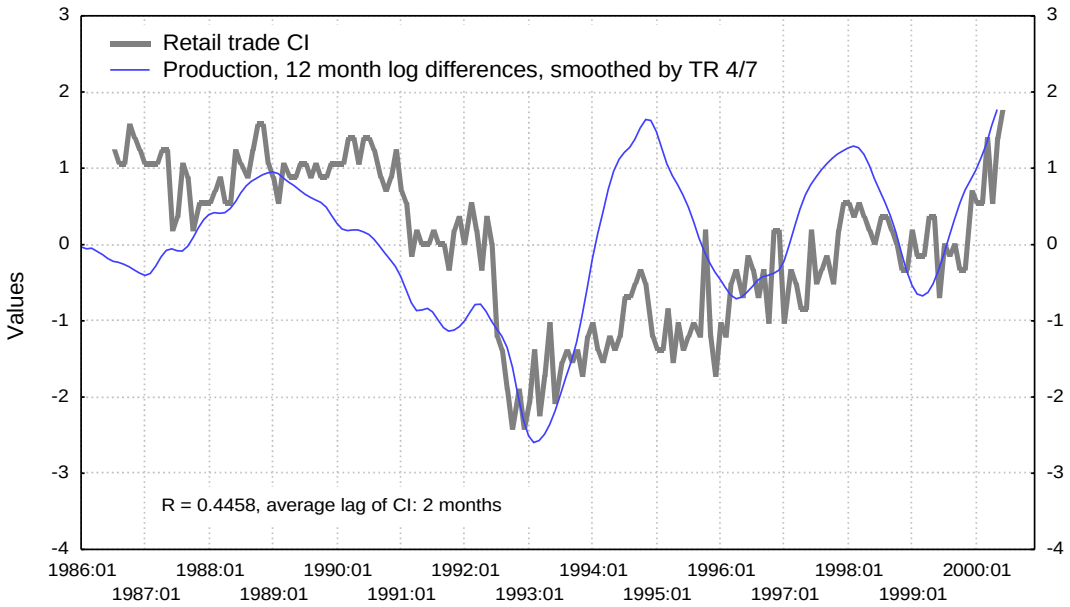
6. One of the basic tasks for this study was the integration of retail trade into a new overall confidence indicator. The first monthly series of this sector have been published for the Euro area beginning with November 1985, the first figure of the Confidence Indicator for retailing could be calculated only in July 1986 after introducing the survey question asking for the expected business situation which became, together with the assessment of stocks and the assessment of the present business situation, a component of the Retail Confidence Indicator (CI).

So, the series now are not only long enough to allow seasonal adjustment, but also to show several cyclical peaks and troughs, important to assess their behaviour around these crucial periods.

Graphs 6 and 7 present the CI together with the smoothed curve of the industrial production growth used as cyclical reference. The first impression is that of a high participation of volatility in the series, a low correlation with regard to the general cycle and an unstable timing with long lags at some turning points, characteristics which do not seem to recommend the new sector as a partner for the traditional three, i.e. industrial confidence, construction confidence, and consumer confidence.

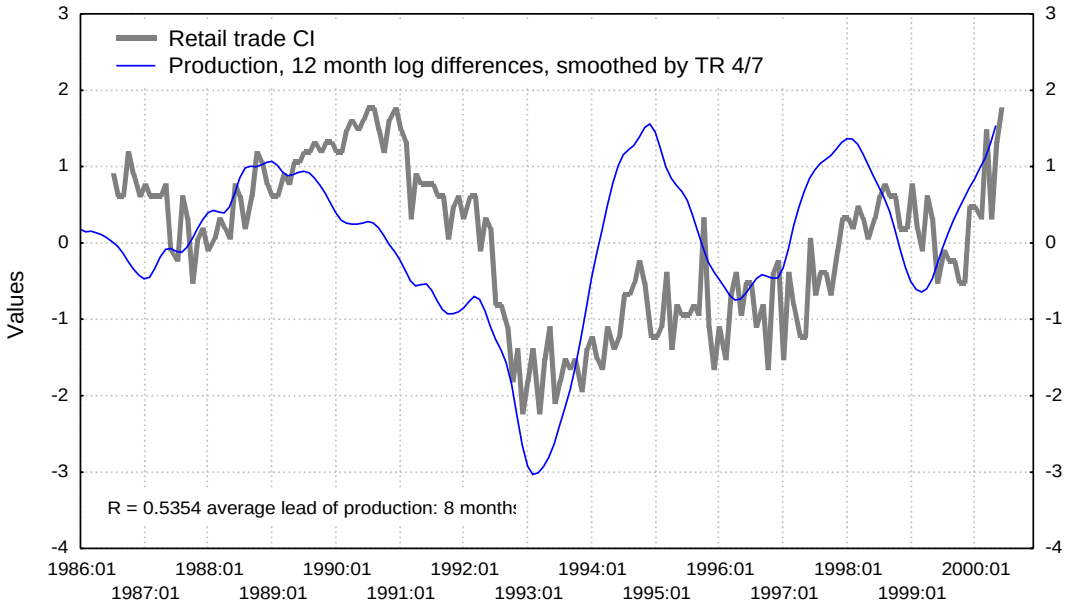
Graph 6

EU15, Confidence Indicator in Retail Trade and Industrial Production Growth



Graph 7

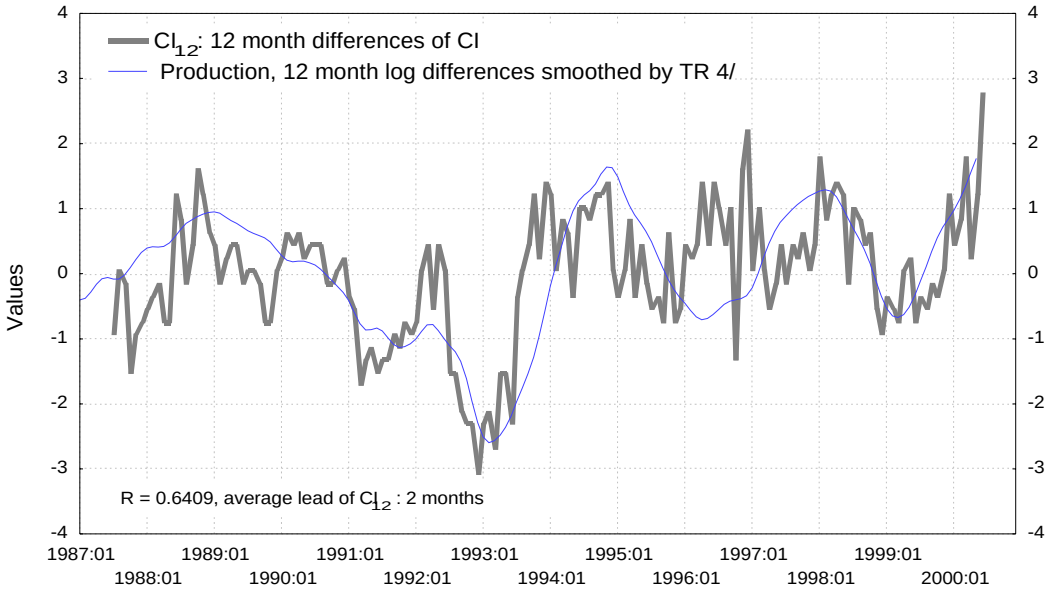
EU11, Confidence Indicator in Retail Trade and Industrial Production Growth



The picture changes as soon as the CI is also transformed to a growth series, calculating 12 month differences (CI_{12}). Now the CI for retail trade shows a closer fit to production and a better timing (Graphs 8 and 9).

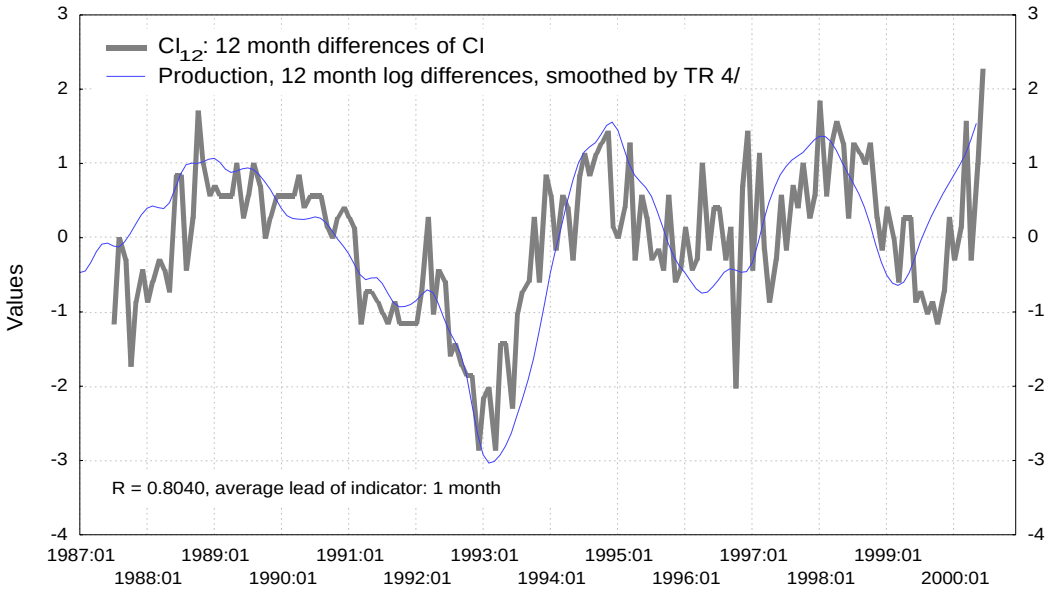
Graph 8

EU15, Confidence in Retail Trade (Year to Year Change, CI_{12}) and Industrial Production Growth



Graph 9

EU11, Confidence in Retail Trade (Year to Year Change, CI_{12}) and Industrial Production Growth

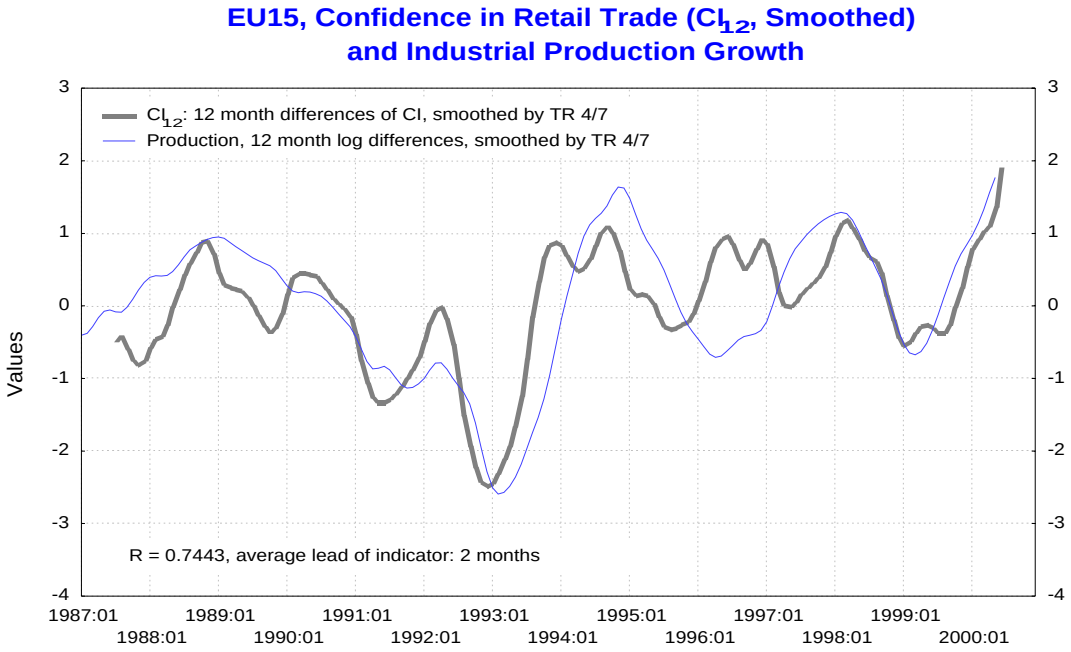


Still the indicator shows high volatility which would prohibit a reliable up-to-date analysis of the series - but averaging it together with the CI_{12} for manufacturing already leads to a valuable overall indication of the cycle (Graph 2.5/27). As this impression is backed by the series for Great Britain – but with a change of the traditional composition

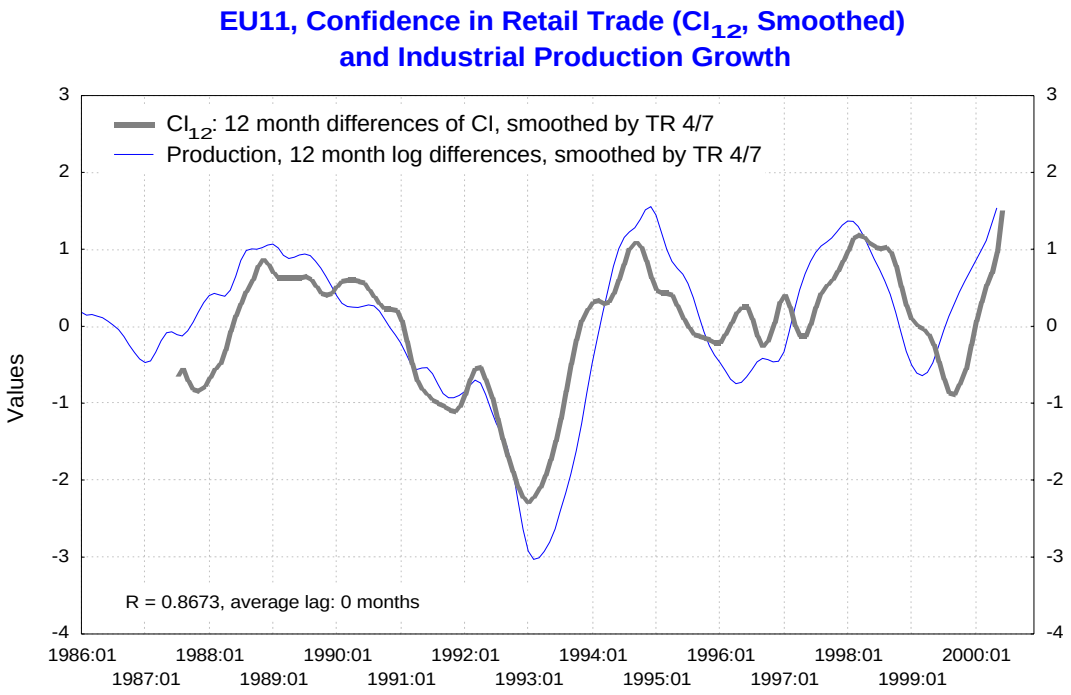
of the CI – trade should be an integrating part of a future overall indicator (Graphs 3 and 4).

The high frequency disturbances can be reduced by ifo's low pass filter with relatively little later revisions. This procedure again enhances the correlation between the CI_{12} and production, so there is also a good cyclical fit of the retail indicator (Graph 10 and 11).

Graph 10



Graph 11



7. In recent discussions critique regarding the composition of the Consumer Confidence Indicator came up. In this study two new approaches were tested. The first one uses only expectation variables:

- Financial situation over next 12 months,
- General economic situation over next 12 months,
- Unemployment expectations over next 12 months,
- Savings over next 12 months.

The second approach was based on extensive regressions and resulted in the following set of series:

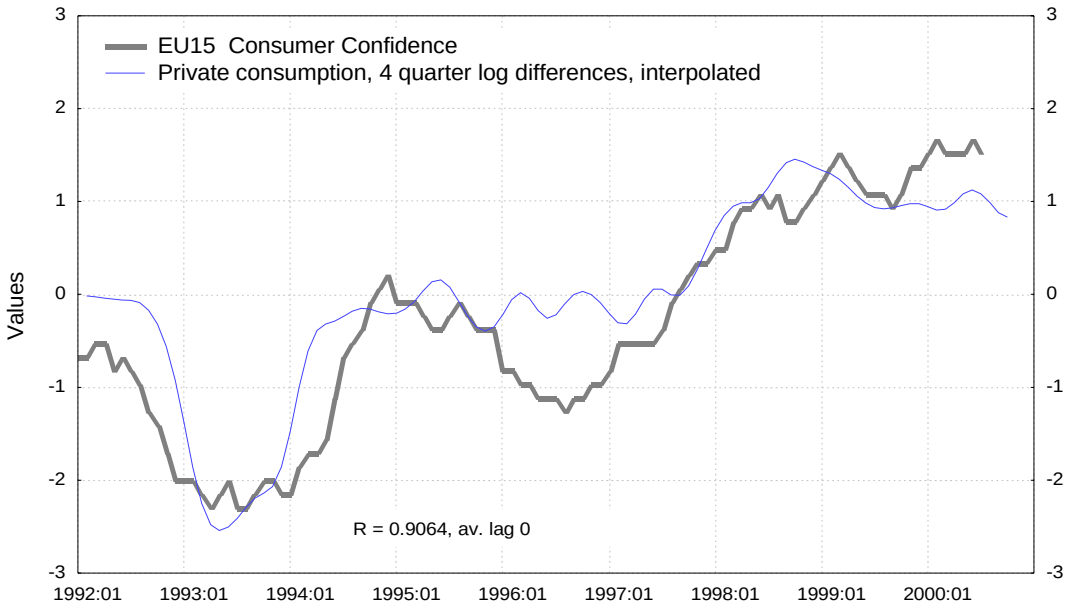
- Unemployment expectations over next 12 months,
- Savings over next 12 months
- 12 month differences of assessment of time for purchases.

As the intercorrelation studies showed, the relations between the private consumption as target series and these single indicators all were positive except for unemployment expectations. The **alternative indicators for consumption** consist of the arithmetic averages of the data mentioned (the series are standardised) i.e. with equal weighting. The two approaches led to almost equal results, therefore only the outcomes of the second one will be shown in Graphs 14 and 15. First Graphs 12 and 13 present the comparisons of the current CIs for EU-15 and EU-11.

It turned out that most of the series for the formulation of the questions already best correspond to the growth (12 month log differences) of private consumption. Thus it is recommended for the **integration of private consumption together with construction, industry and retail trade into a new overall indicator** (Graphs 16 and 17) ***not*** to calculate year-on-year changes of the consumer confidence because this indicator reflects already annual changes of real private consumption.

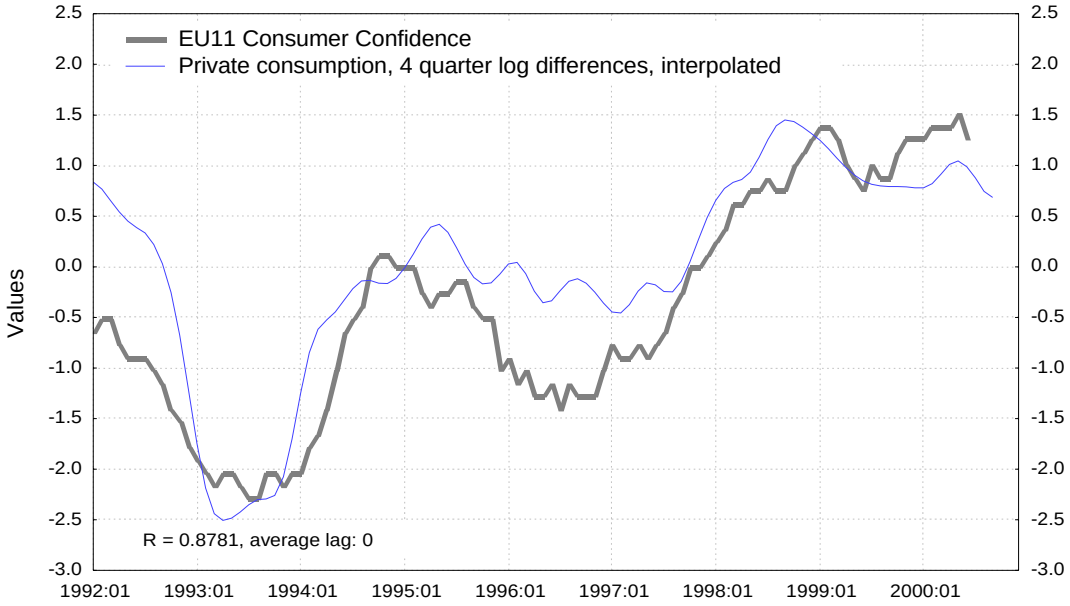
Graph 12

EU15, Current Consumer Confidence and Private Consumption Growth



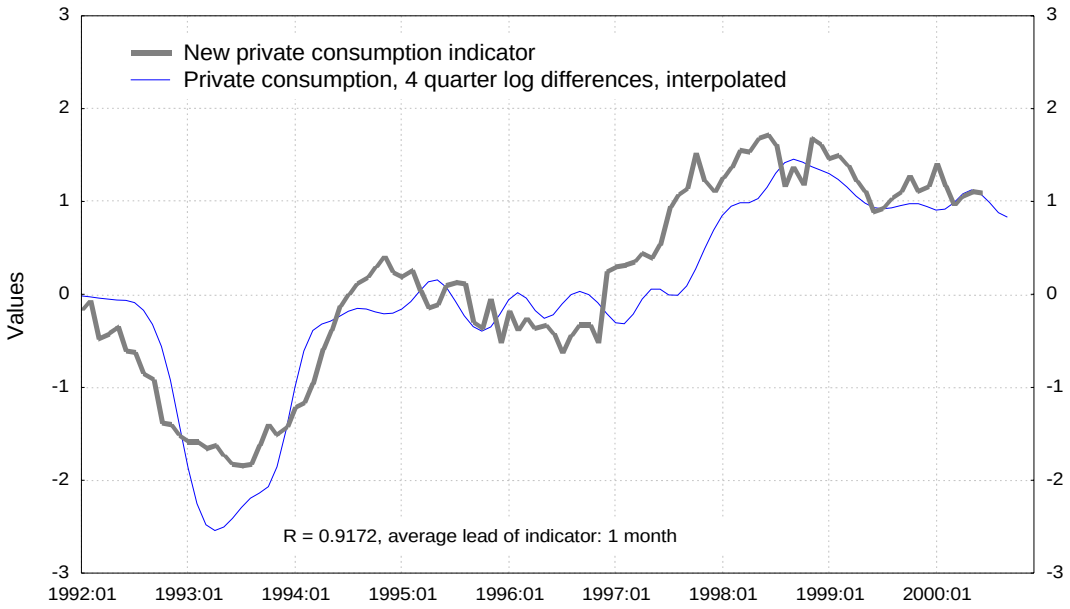
Graph 13

EU11, Current Consumer Confidence and Private Consumption Growth



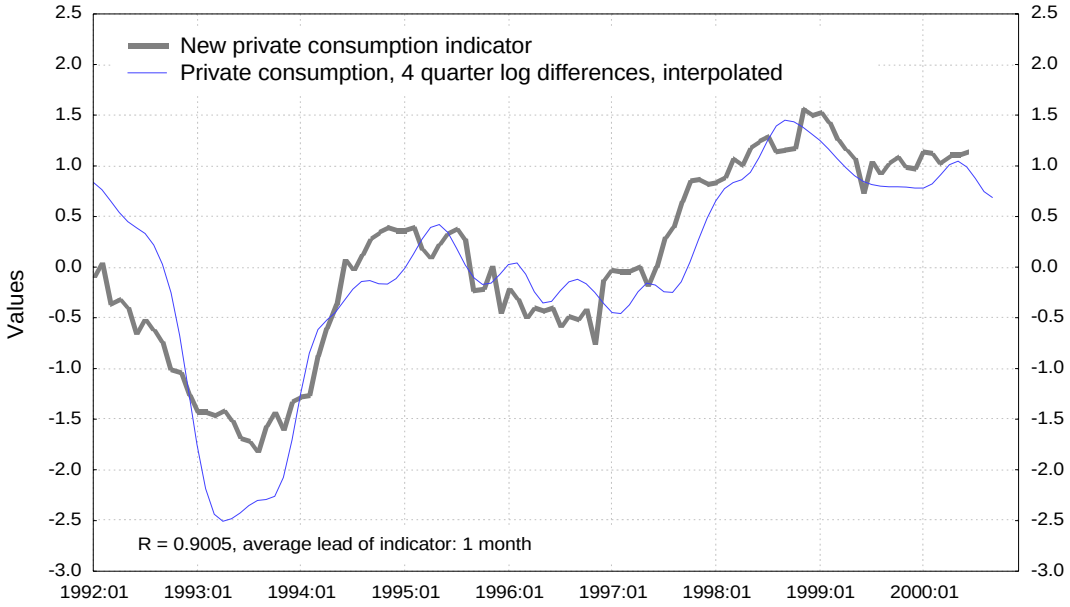
Graph 14

EU15, New Consumer Confidence and Private Consumption Growth



Graph 15

EU11, New Consumer Confidence and Private Consumption Growth



8. Construction of an improved overall economic sentiment indicator: The integration of the proposed alternative indicators into a new overall economic sentiment indicator was accomplished by calculating a weighted average of the CIs for construction, industry, retail trade and the original form of the New Consumer Confidence . The proposed weighting of the four components corresponds to the one employed on the series for Graphs 3 and 4, i.e. double weight for the industrial confidence (40%) compared with the other three components, which receive the weight of 20% (Graphs 16 and 17). The modified overall economic sentiment indicator clearly is superior to the current one with regard to the lead and the general fit with regard to industrial production as benchmark.

Summing up, the proposed new overall Economic Sentiment Indicator (ESIN) differs from the current one in the following points:

a) Other form of standardisation: It is proposed to standardise all individual time series by subtracting the mean value and dividing by the standard deviation (instead of taking the individual series in their original form and only standardising the confidence indicators for construction, industry and consumers by dividing the month-to-month changes by the average, without regard to the sign of change.)

b) **Replacing the share price index as component of the ESIN by the retail trade confidence**.

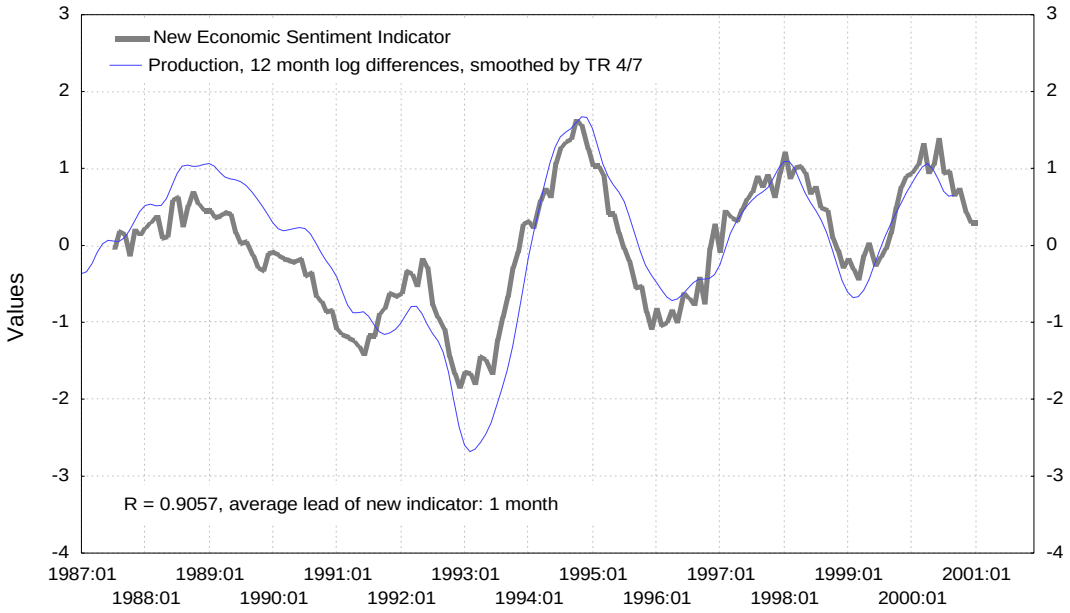
c) New way to construct consumer confidence: Instead of the current five questions concerning the general economic situation - ex post and ex ante - , the financial situation of the household - ex post and ex ante - and the assessment of current buying conditions it is proposed to base the consumer confidence only on the following three questions: *Unemployment expectations over next 12 months (inverted)*; *savings over next 12 months* and 12 month differences of *assessment of buying conditions* (good or bad time for big-item purchases). Alternatively the arithmetic mean of four questions (expected financial situation over next 12 months; expected general economic situation over next twelve months; unemployment expectations over next 12 months and expected savings over next 12 months resulted in similarly good results when compared with the benchmark annual growth rates of real private consumption).

d) When combining the four components of ESIN it is proposed to first **convert the confidence series - except the consumer confidence - in year-on-year changes** before combining them in a weighted form (industrial confidence weight 40, the other three components each weight 20). Only in the case of the new Consumer Confidence the original data are used, i.e. no transformation into annual changes is applied.

Graph 16

EU15, New Economic Sentiment Indicator and Industrial Production Growth

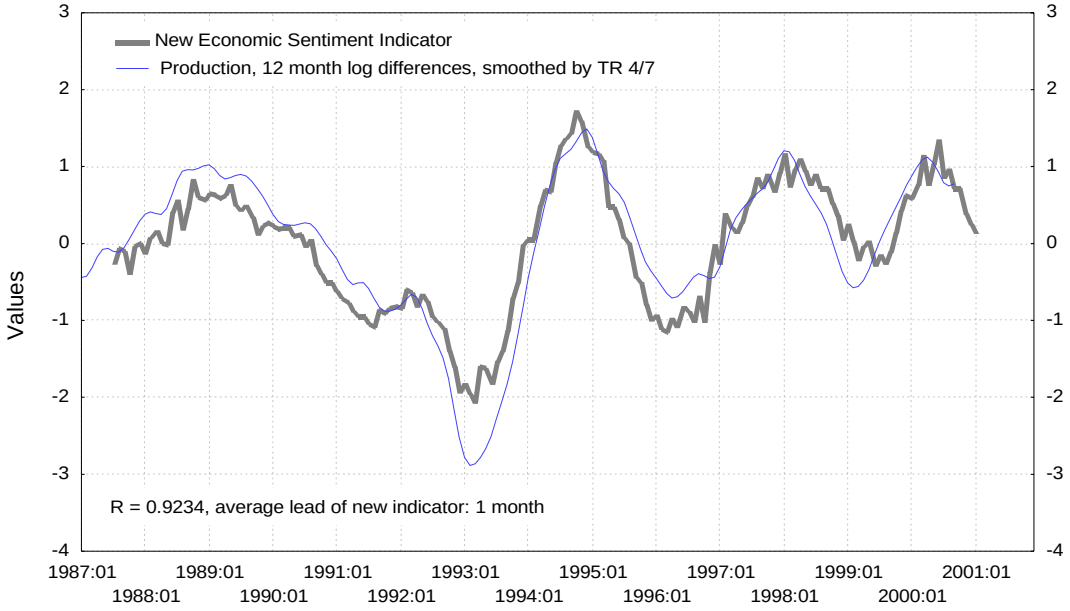
(For consumption: New Consumer Indicator)



Graph 17

EU11, New Economic Sentiment Indicator and Industrial Production Growth

(For consumption: New Consumer Indicator)

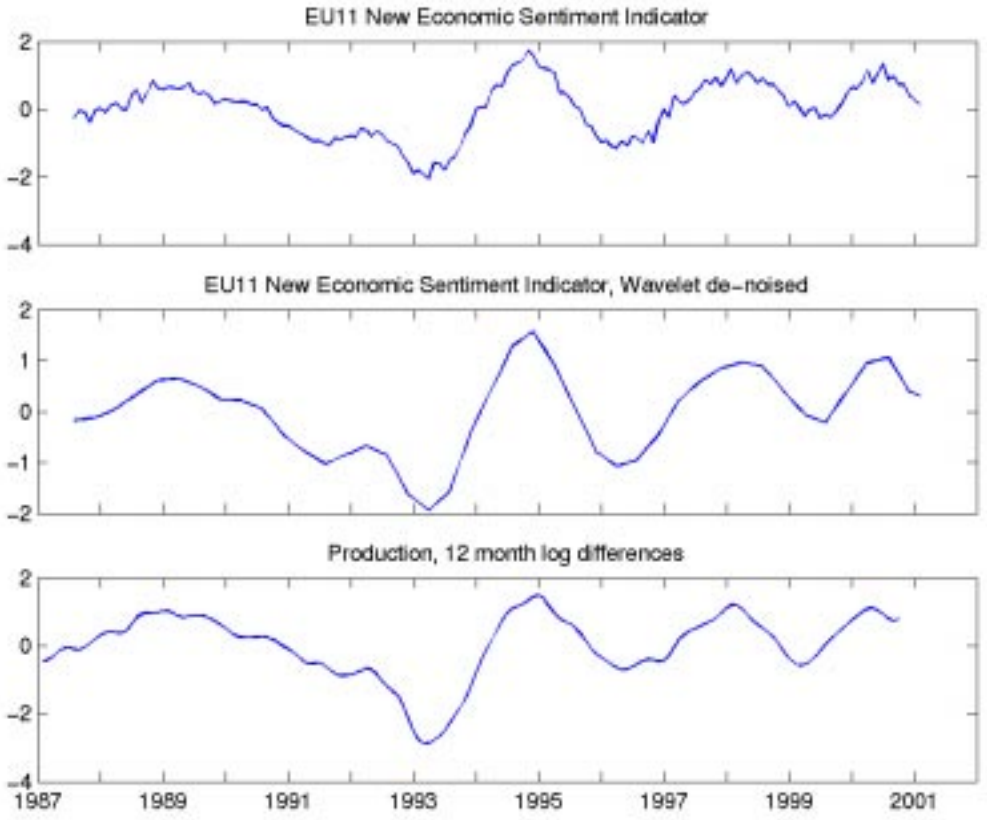


9. An additional method of de-noising based on Wavelet Analysis, is presented in the Annex. When new data is added to the current end of a series, the wavelet approach appears to be nearly "back adjustment" free. That is, wavelet de-noising appears to produce little change in an already de-noised series when new data is added to the current end. The method also de-noises without phase lag. Such a stability feature can be extremely helpful in providing a reliable up-to-date smooth version of a leading indicator.

An example of wavelet de-noising is shown for the New Economic Sentiment Indicator by the middle curve of Graph 18, where it is compared to the raw indicator, and to production.

Graph 18

Success of De-Noising upon the New Economic Sentiment Indicator



It is proposed to investigate this new approach, Wavelet Analysis, for the survey areas. The goal is to find an improved way to combine de-noised components into a composite indicator.

1. Experience with EU composite indicators

1.1 Why composite indicators?

The philosophy of combining individual time series into a composite indicator is related to the nature and the causes of business cycles. Each cycle has its unique characteristics as well as features in common with other cycles. But no single cause explains the cyclical fluctuations over a long period of time and in overall activity. The performance of sector indicators will then depend on the causes of the specific cycle. Some indicators will perform better in one cycle and others in a different cycle. It is therefore necessary to have signals for the many possible causes of cyclical change, i.e. to use all potentially important indicators as a group.[1]

1.2 The EU composite indicators

1.2.1 Construction principles

More than 15 years ago the EU Commission began constructing confidence indicators based on the results of harmonised business and consumer surveys. The construction principles are explained as follows: "It was thought that this indicator should combine judgements and attitudes of the principal actors in the economic process, the producers, the consumers and investors. Business and consumer surveys already provide the judgements and anticipations of producers (manufacturing industry and construction) and of consumers (consumer survey). To this end, it was hence thought appropriate to add the anticipations of financial investors as they are reflected in the share price indices.

The component series of the Economic Sentiment Indicator are therefore the following:
Industrial Confidence Indicator
Construction Confidence Indicator
Consumer Confidence Indicator and
Share Price Index."[2]

The method applied to combine these four parts into the overall Economic Sentiment Indicator (ESIN) follows in general the lines proposed by the US National Bureau of Economic Research (NBER): In the first step the indicators based on business and consumer surveys are transformed into month-to-month differences. Only in the case of share prices – the single component of the overall indicator not based on business and consumer survey results – is detrending according to the NBER Bry-Boschan growth cycle program applied. By this method, i.e. by calculating ratio-to-trend data, it is intended to separate short-term or cyclical variations from long-term increases in the value of shares.

[1] See e.g. Ronny Nilsson, Business Tendency Surveys and Cyclical Analysis, ADB Working Papers, 1999.
[2] European Economy, No. 6, 1997, p. 26 (The Joint Harmonised EU Programm of Business and Consumer Surveys).

In a second step the month-to-month changes are standardised by dividing them by the average, without regard to the sign of changes. This standardisation is done in order to prevent series with strong cyclical amplitude from dominating the composite index.

As a third step, a weighted average of the standardised changes is calculated for each month. The industrial confidence indicator and the consumer confidence indicator are given equal weight (together 66%), while the share price index and the construction confidence indicator are given half the weight of the other two (together 34%).

In a fourth and last step, the series of the average standardised changes is cumulated to provide an index which is based on 1995=100.

1.2.2 Performance of the EU Confidence Indicators

The so-constructed Economic Sentiment Indicator (ESIN) and its components proved to be, in general, reliable overall indicators. This was shown in a systematic way in the already mentioned study published in EUROPEAN ECONOMY (No. 6, 1997), not only for the EU as a whole but also for individual member countries. With regard to the industrial confidence indicator – the most important single component of the ESIN -, general findings on the usefulness of these indicators are presented in paragraph 2.3.2.1 (Confidence in manufacturing).

Table 1/1

Manufacturing industry: lead-lag of the monthly variables against production (growth rates, smoothed)

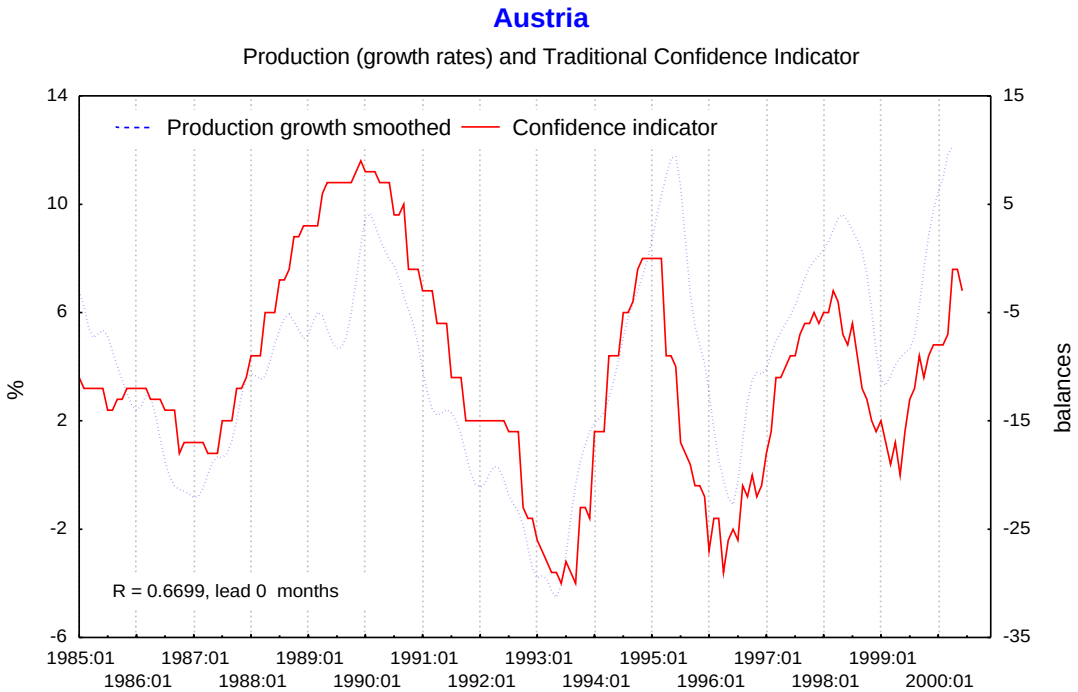
Region	Prod.ex post		Ass.order books		Ass.Export		Ass. Stocks		Prod.expect.		Price expect.		Conf. Indicator	
	lead (+), lag (-)	R	lead (+), lag (-)	R	lead (+), lag (-)	R	lead (+), lag (-)	R	lead (+), lag (-)	R	lead (+), lag (-)	R	lead (+), lag (-)	R
Austria	0	0.75	0	0.63	0	0.73	2	-0.65	1	0.7	1	0.28	0	0.67
Belgium	2	0.69	0	0.74	0	0.74	3	-0.54	2	0.75	2	0.61	2	0.75
Danmark	-2	0.61	-2	0.69	-1	0.55	3	-0.46	0	0.47	-	-	0	0.67
Finland	1	0.75	-2	0.78	-1	0.51	0	-0.54	2	0.83	0	0.46	0	0.83
France	-2	0.93	-3	0.92	-2	0.93	-1	-0.8	0	0.87	-5	0.13	-2	0.91
Germany	-1	0.79	-5	0.85	-3	0.84	-4	-0.8	0	0.87	-3	0.56	-3	0.86
Greece	4	0.31	-1	0.57	0	0.24	-1	-0.15	0	0.42	6	-0.21	0	0.54
Ireland	3	0.4	1	0.62	0	0.51	0	-0.33	4	0.37	0	-0.56	3	0.53
Italy	-3	0.81	-2	0.82	-2	0.7	2	-0.69	0	0.74	-2	0.49	-1	0.82
Luxembourg	4	0.35	-3	0.59	-2	0.67	-5	-0.44	0	0.49	6	0.55	-2	0.62
Netherlands	-1	0.43	-4	0.49	-1	0.41	-5	-0.46	0	0.41	-1	0.36	-1	0.5
Portugal	0	0.5	8	0.56	11	0.62	12	-0.36	1	0.48	10	0.39	10	0.51
Spain	-2	0.94	-3	0.95	-2	0.95	-1	-0.97	-1	0.89	-2	0.77	-2	0.97
Sweden	4	0.86	-1	0.93	-5	-0.17	0	-0.32	3	0.74	2	0.76	2	0.89
United Kingdom	-3	0.79	-3	0.78	-5	0.66	0	-0.72	2	0.72	-10	0.51	-1	0.78
EU	-2	0.95	-2	0.94	-2	0.95	-1	-0.89	0	0.97	-3	0.45	-1	0.96
EURO	-1	0.96	-3	0.94	-2	0.96	-1	-0.92	0	0.97	-2	0.47	-1	0.96

Table 1/2

Manufacturing industry: leads/lags of regional confidence indicators against EU-production (growth rates, smoothed)

Region	Conf.indicator	
	lead (+), lag (-)	R
Austria	-2	0.75
Belgium	0	0.9
Danmark	0	0.7
Finland	2	0.77
France	-1	0.92
Germany	-5	0.74
Greece	0	0.54
Ireland	0	0.7
Italy	0	0.91
Luxembourg	-2	0.83
Netherlands	-1	0.86
Portugal	-1	0.78
Spain	0	0.92
Sweden	1	0.89
United Kingdom	5	0.71
EU	-1	0.96
EURO	-2	0.94

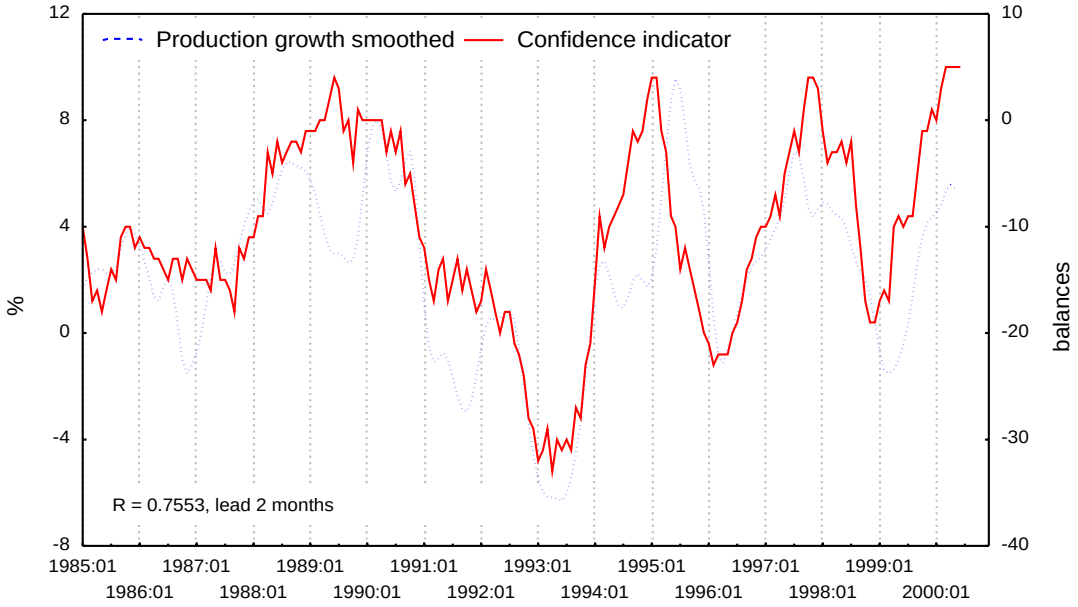
Graph 1/1



Graph 1/2

Belgium

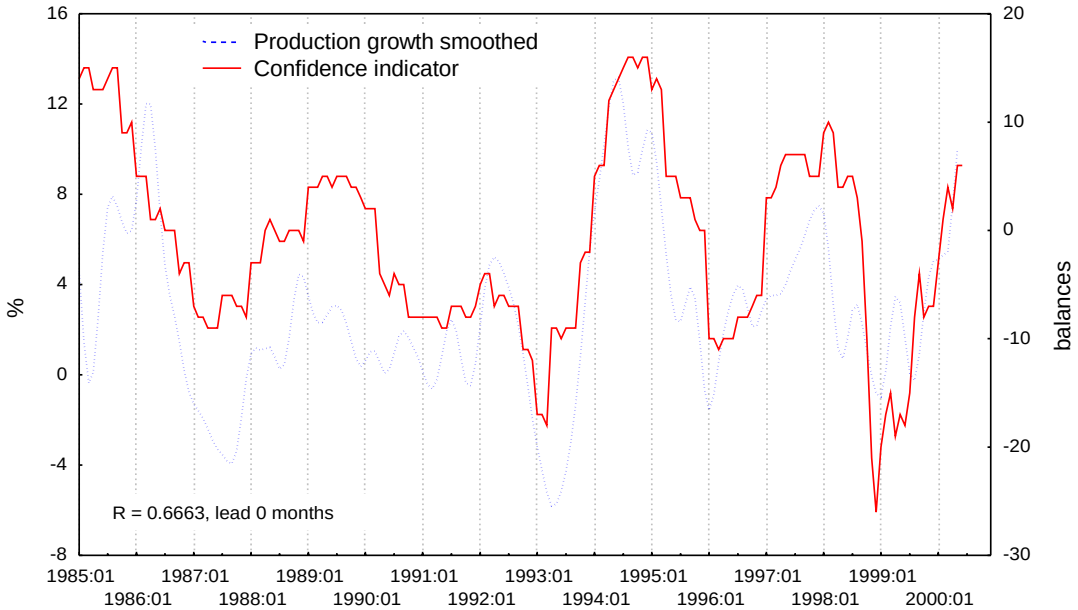
Production (growth rates) and Traditional Confidence Indicator



Graph 1/3

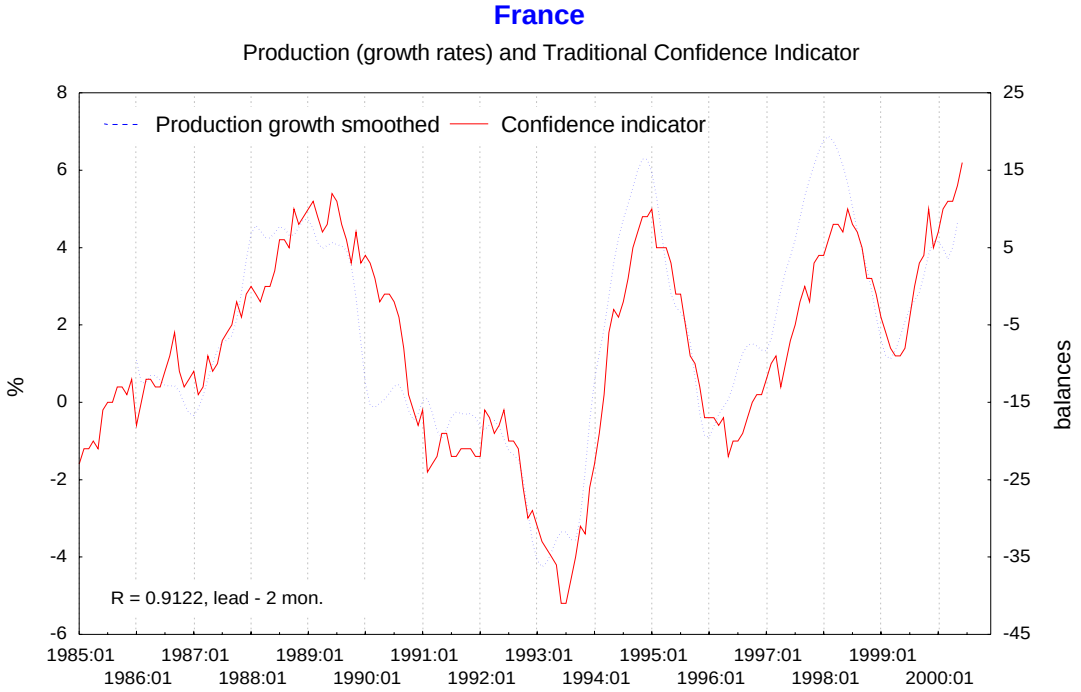
Danmark

Production (growth rates) and Traditional Confidence Indicator



Graph 1/4

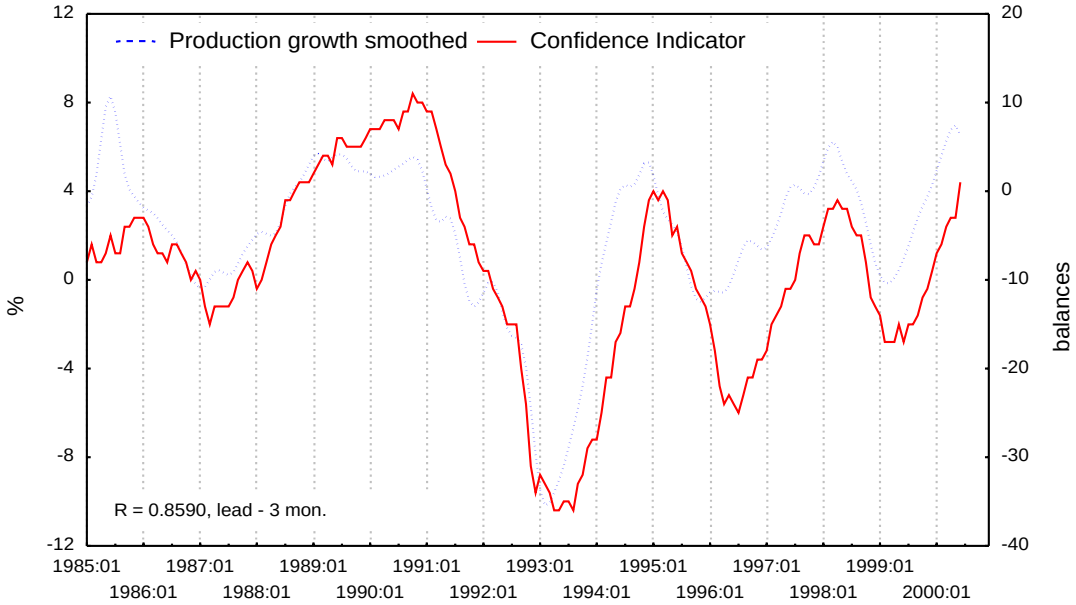
Graph 1/5



Graph 1/6

Germany

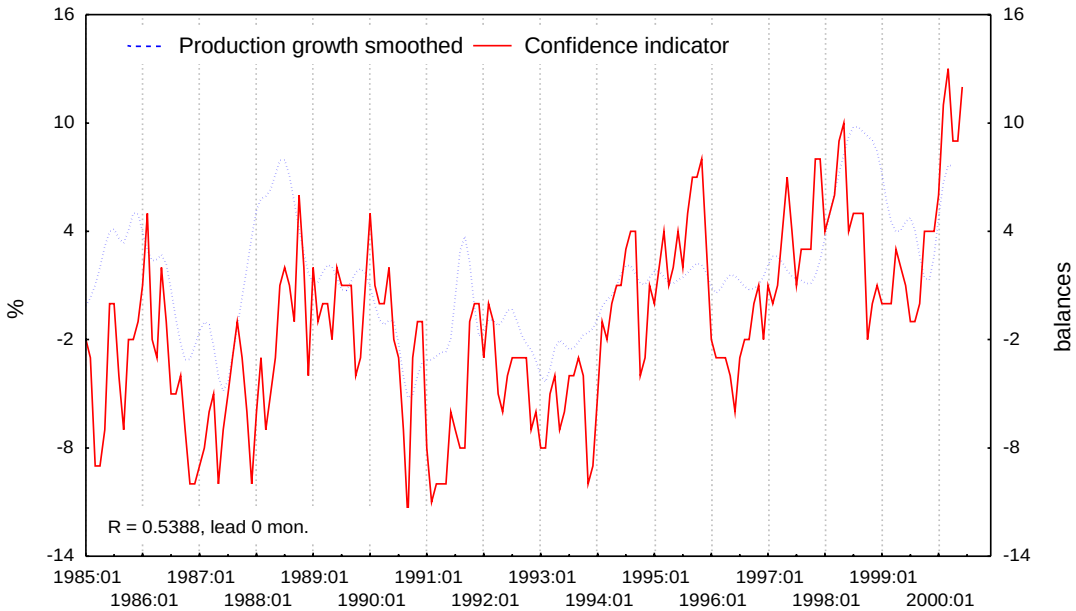
Production (growth rates) and Traditional Confidence Indicator



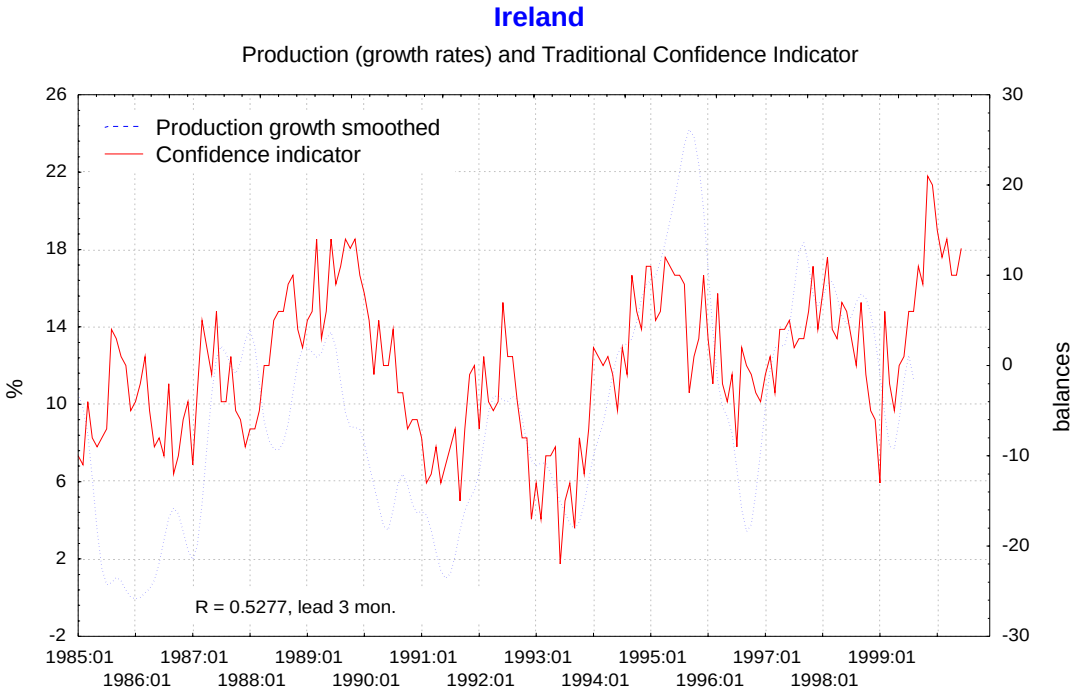
Graph 1/7

Greece

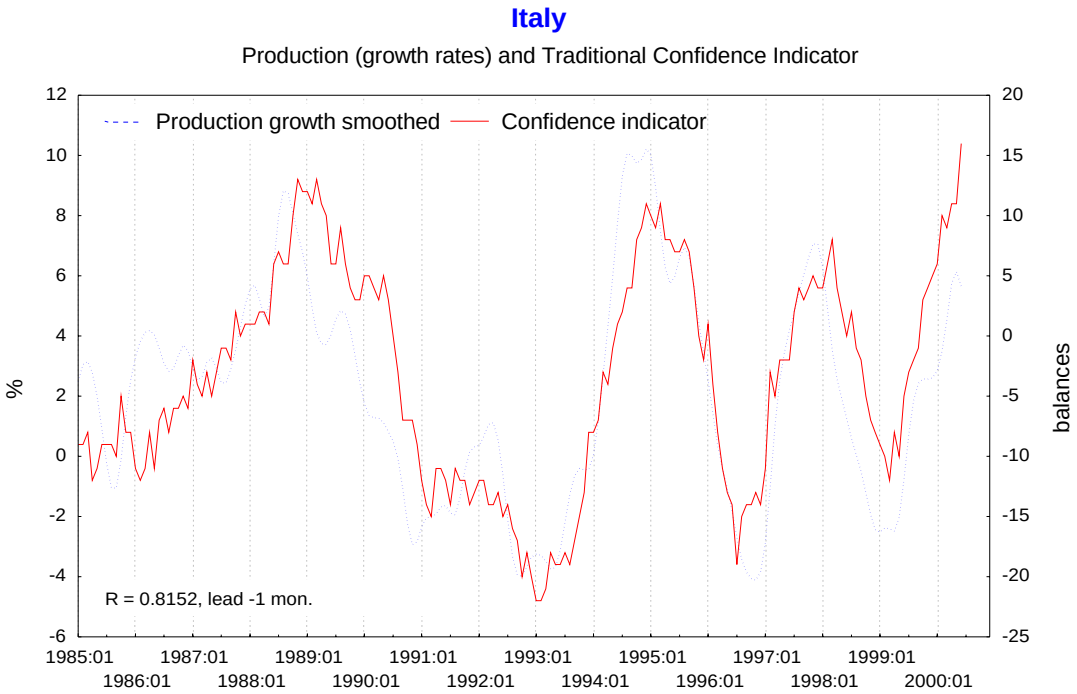
Production (growth rates) and Traditional Confidence Indicator



Graph 1/8



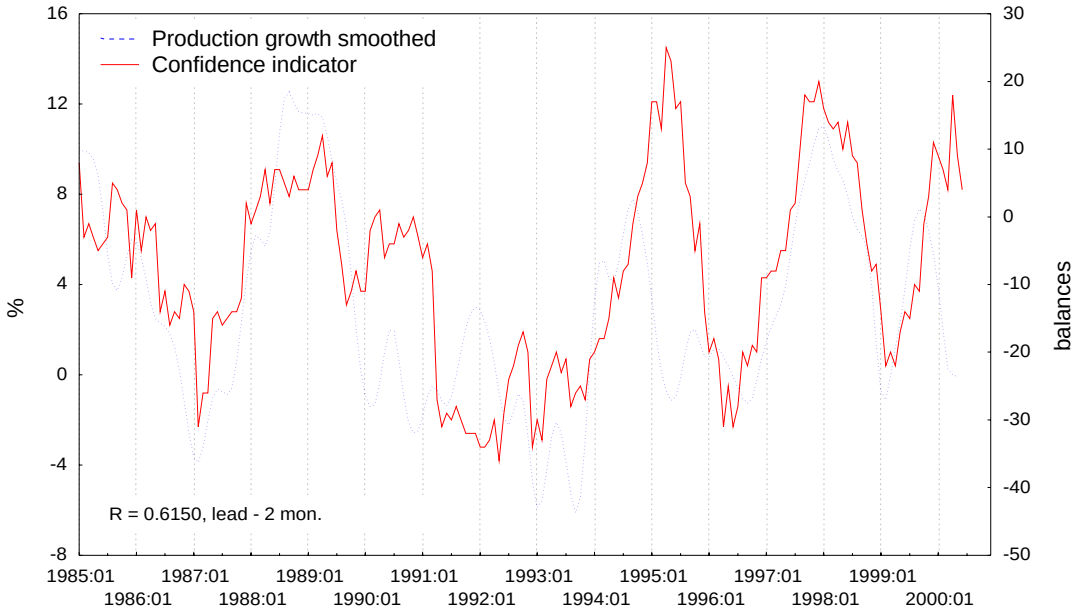
Graph 1/9



Graph 1/10

Luxembourg

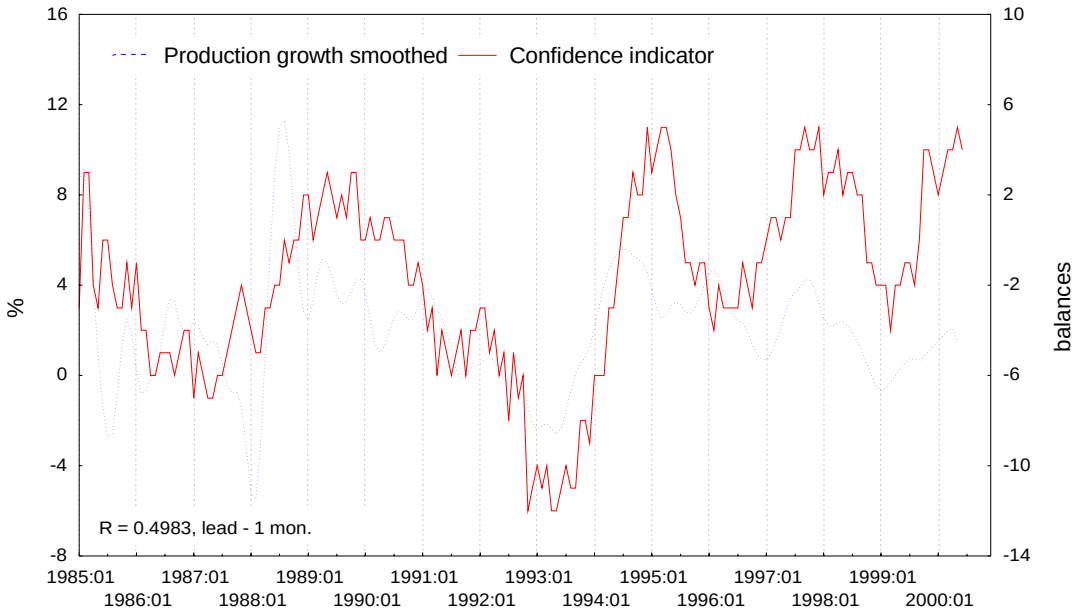
Production (growth rates) and Traditional Confidence Indicator



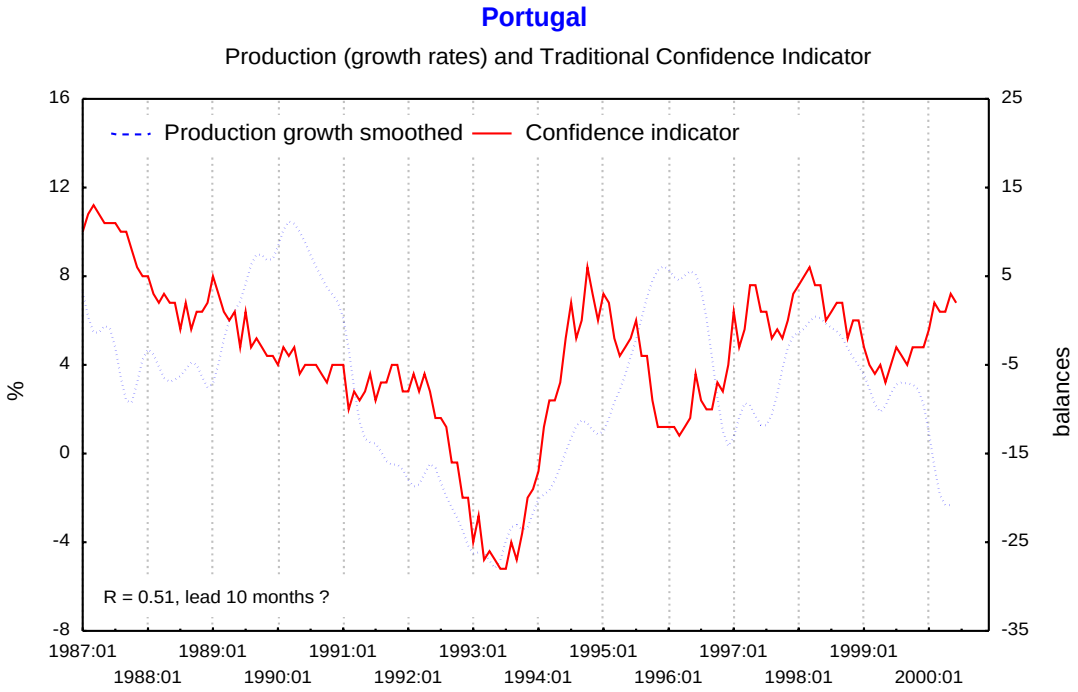
Graph 1/11

Netherlands

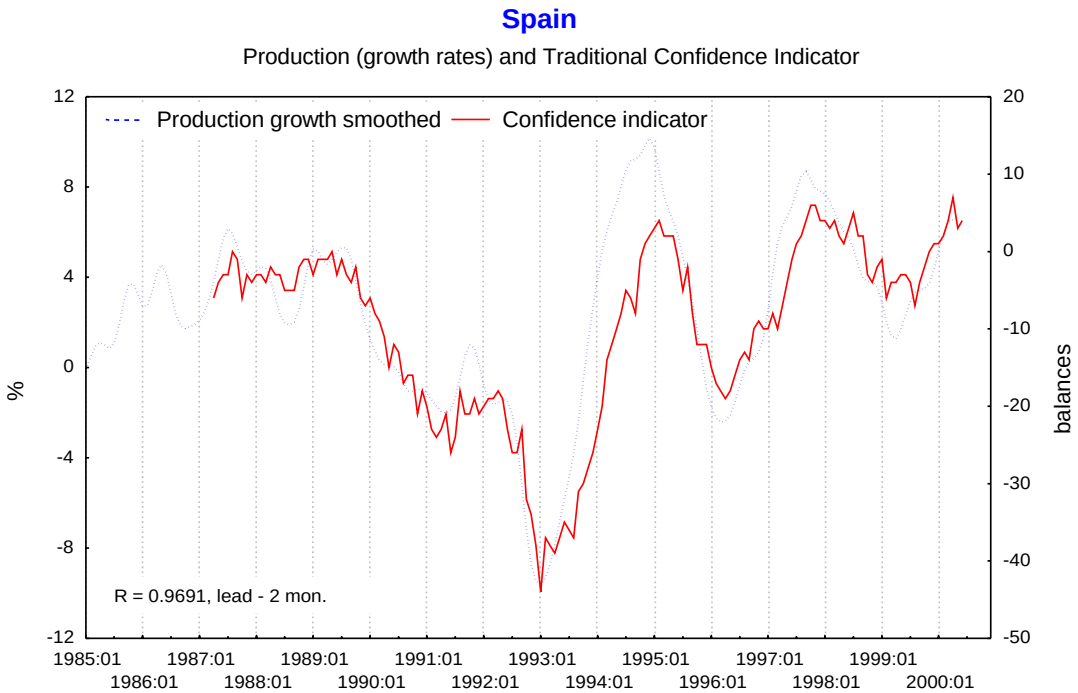
Production (growth rates) and Traditional Confidence Indicator



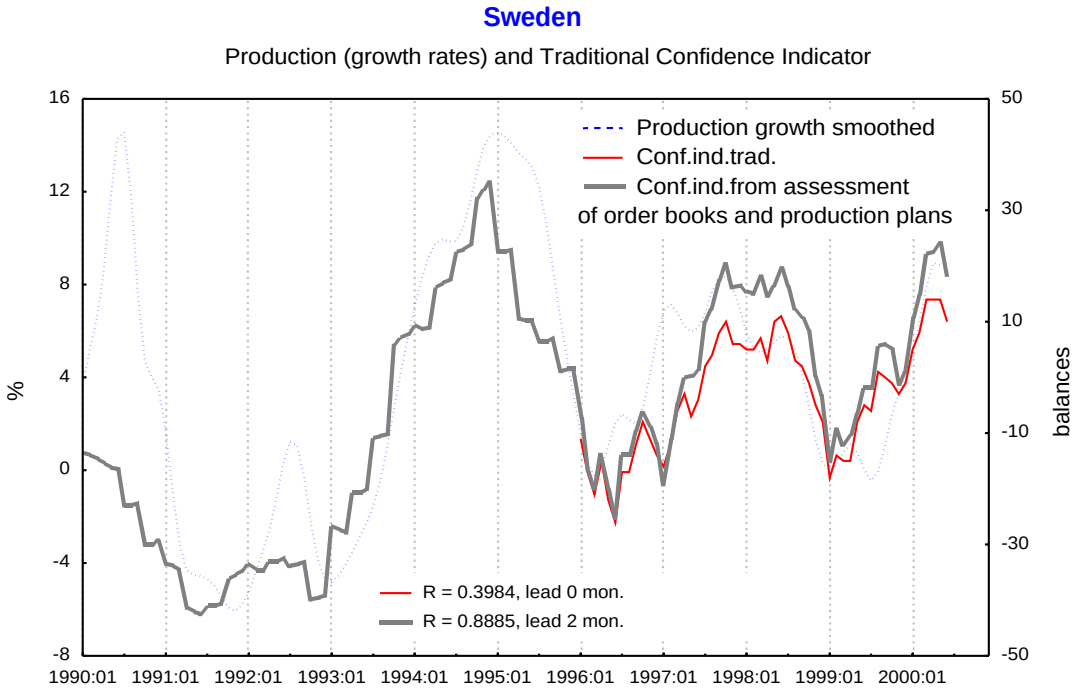
Graph 1/12



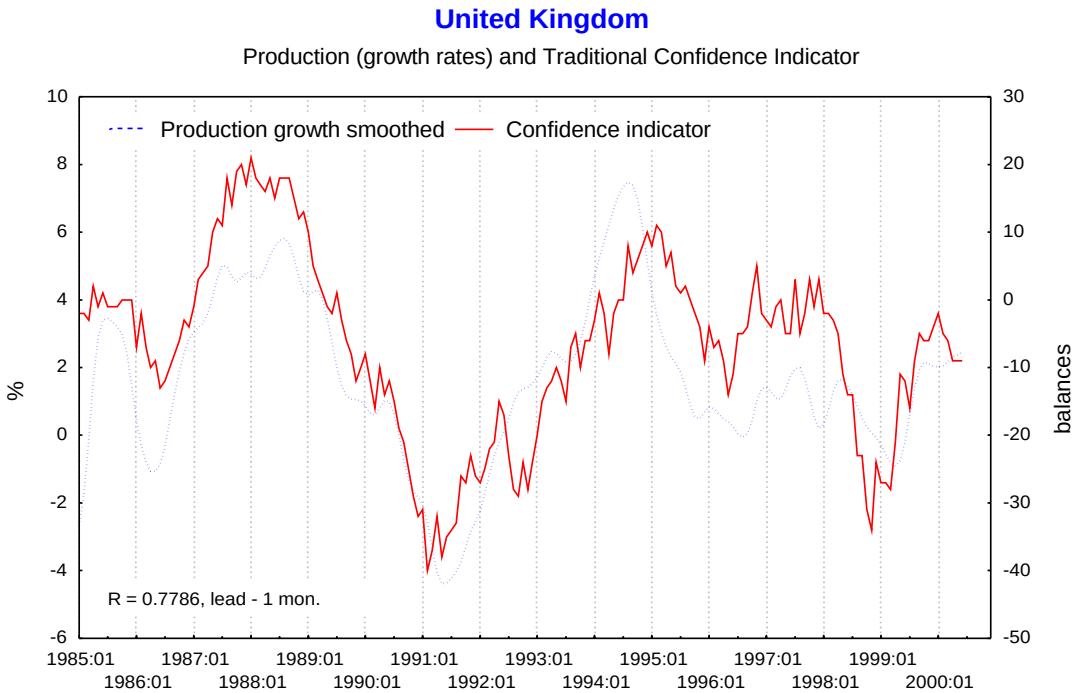
Graph 1/13



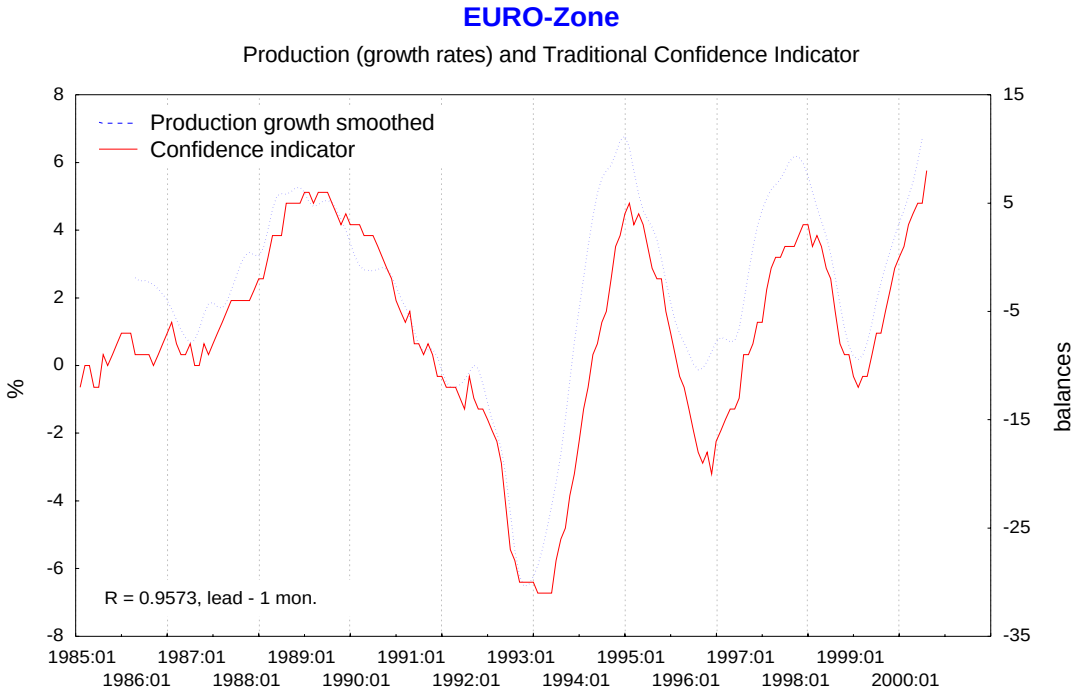
Graph 1/14



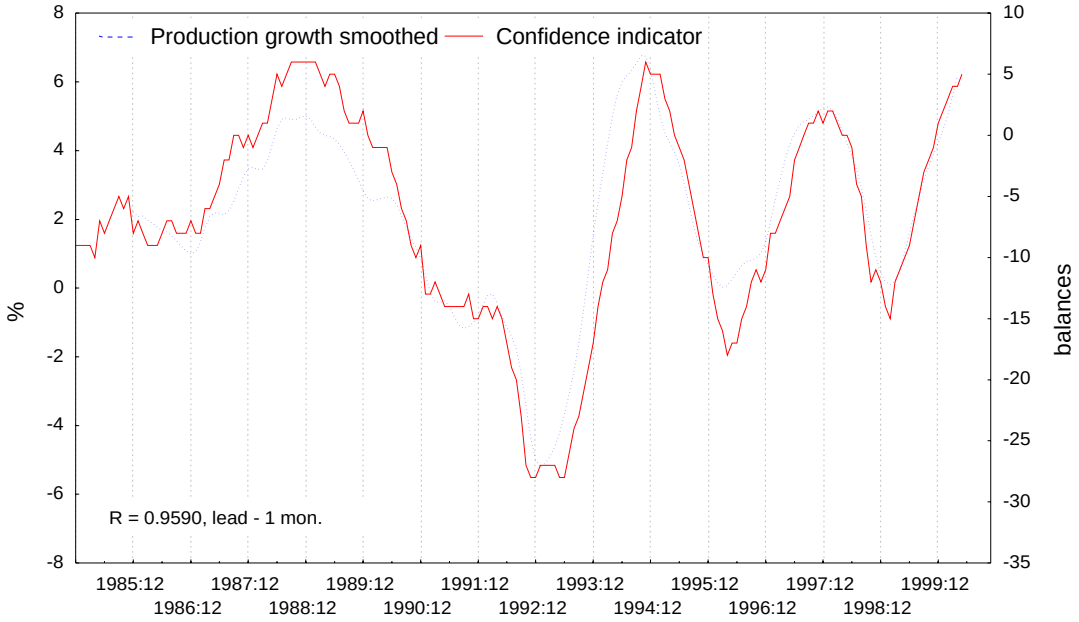
Graph 1/15



Graph 1/16



Graph 1/17



1.2.3 Reasons for modifying the construction of EU confidence indicators

All composite indicators have to be revised from time to time as the importance of individual components may have changed. This is a common practice in the USA and at the OECD in Paris (revisions of the index of leading indicators or of the main indicators published by the OECD).

Some possible shortcomings of the EU Economic Sentiment Indicator lie in the fact that the inclusion of share prices in a ratio-to-trend form may cause ex-post revisions as the trend is very likely to change sometimes. Revisions may also be caused by ex-post changes of seasonally adjusted data, which underlines the importance of choosing seasonal adjustment procedures which produce relatively robust results. Significant ex-post revisions will have a rather annoying effect as leading indicators are designed to give early warning signals to policymakers and it would be rather frustrating if ex-post some signals appear to have been wrong due to changes in seasonal adjustment or due to the inclusion of late incoming company replies into the final data set.

All this caused the EU Commission to tender a study on the revision of its composite confidence indicators, which was given to the Ifo Institute.

2. Examination of EU indicators

2.1 Organisation of research

The examination of EU indicators is organised in the following way: In three case studies (Germany, United Kingdom, euro zone), relevant aspects of the current EU leading indicators based on the harmonised EU business and consumer surveys are examined in order to reach conclusions for a general model of indicator construction both at the European and the member country level. At an expert workshop organised by the EU Commission in November 2000 it was generally agreed that the same construction principle of confidence indicators should be used at the EU and the euro zone level as well as at a national level, though the higher priority is given to the EU level. Thus, the main objective is not to construct for each individual EU member country the optimal leading indicator but to focus in the first place at the EU and euro zone level and only check with the example of some member countries for the extent to which this approach is also successful at the national level. This strategy is clearly different from the approach followed by the OECD, where the performance at the national level has highest priority, which results in a quite different composition of the national composite leading indicators. This approach is not suited for the EU and the euro zone because here, mainly for economic policy reasons, it should be possible to trace a change in the overall assessment of the production outlook, for example, back to the individual member countries. This is only possible if the national indicators are all constructed in exactly the same way.
As in each of the three case studies where somewhat different issues are checked, the presentation of the case study results does not follow one general scheme. Before presenting the three case studies, a decision has to be taken as to which series should

serve as benchmarks to measure the performance of leading indicators (confidence indicators).

2.2. Reference series at the global level

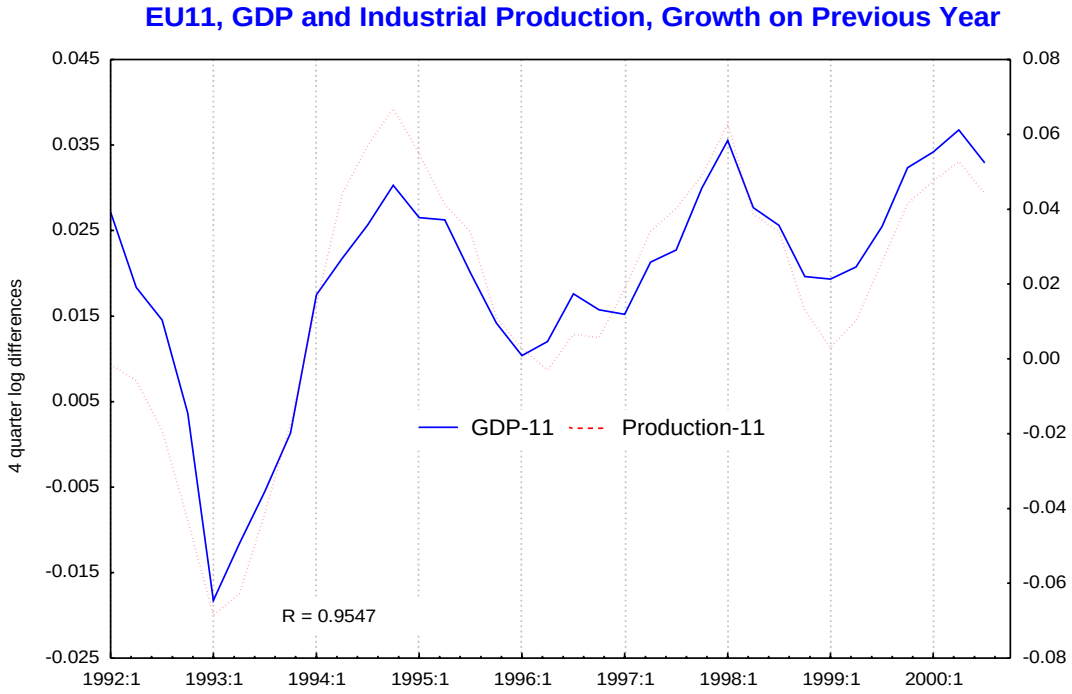
The result of the indicator construction at the top level has to be checked against a top level reference series. This should be the GDP as aggregate of all the sectors of an economy. The problem with GDP is that these figures are only published in quarterly intervals whereas the indicators appear monthly for an always up-to-date analysis. So usually the industrial production is taken as a close enough proxy for the overall cyclical development. Whether this is also advisable for the two global areas shall be analysed in the following. Another interesting question is how far the cycles for EU11 and EU15 are related.

The business cyclical development can be represented by different transformations of the original curve, like the deviation to the trend or by differencing. We here refer to the growth rates of GDP at constant prices in the same quarter of the previous year. Currently GDP and the production series are first transformed to logs and then the annual difference of the logs is calculated.

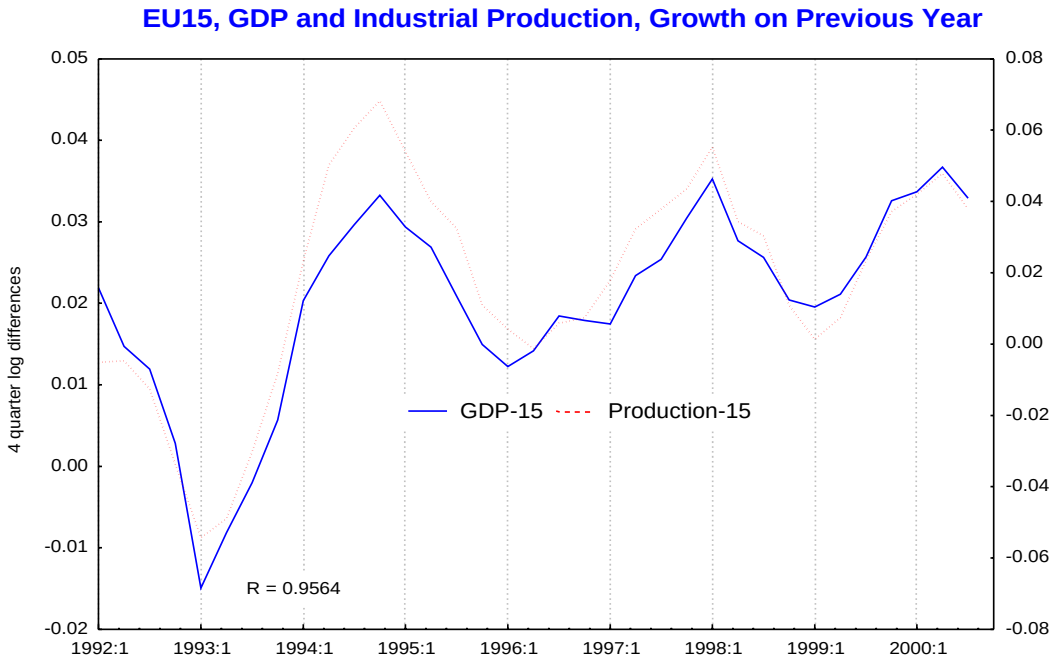
2.2.1 GDP and production

Regarding the GDP series for EU-11 and EU-15, besides the problem of periodicity there is also the shortness of the series (beginning only at 1.1991 and at 1.1992 - for the transformation to growth rates), which is a serious shortcoming for their use as reference. The switch to industrial production will be backed by the following comparisons (Graphs 2/1 and 2/2).

Graph 2/1



Graph 2/2

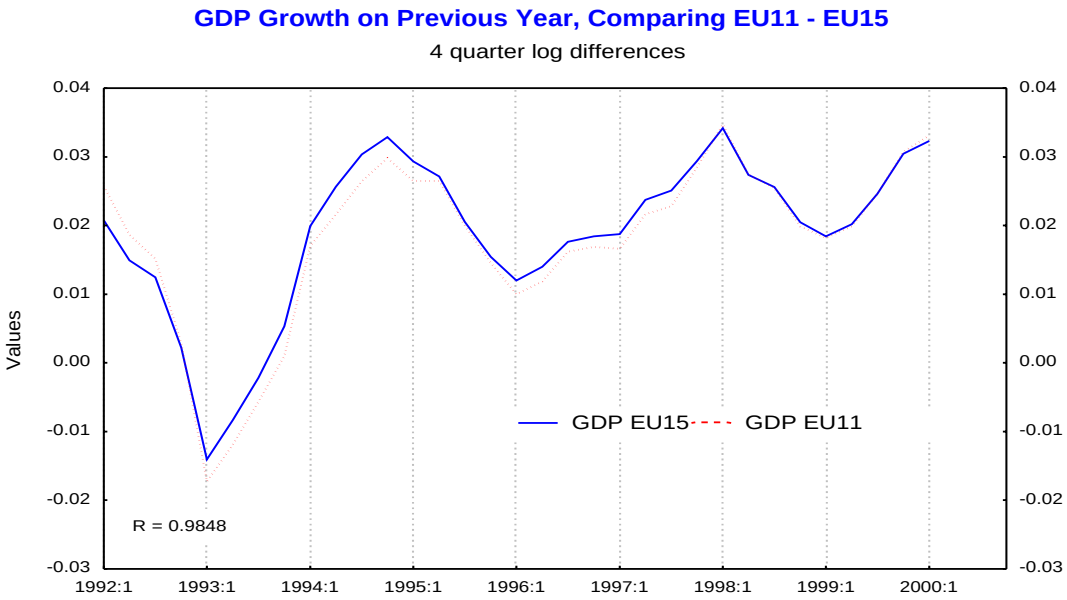


Such a comparison cannot be exact regarding the timing of the turning points, because small differences will easily cause a difference of one quarter. The graphs allow us to use the production series as reference for the evaluation of the indicators' turning points. It is also surprising that despite a relatively low and shrinking participation of manufacturing within GDP, the cycle is still mainly dominated by industrial production.

2.2.2 The cyclical development of EU11 and EU15 compared

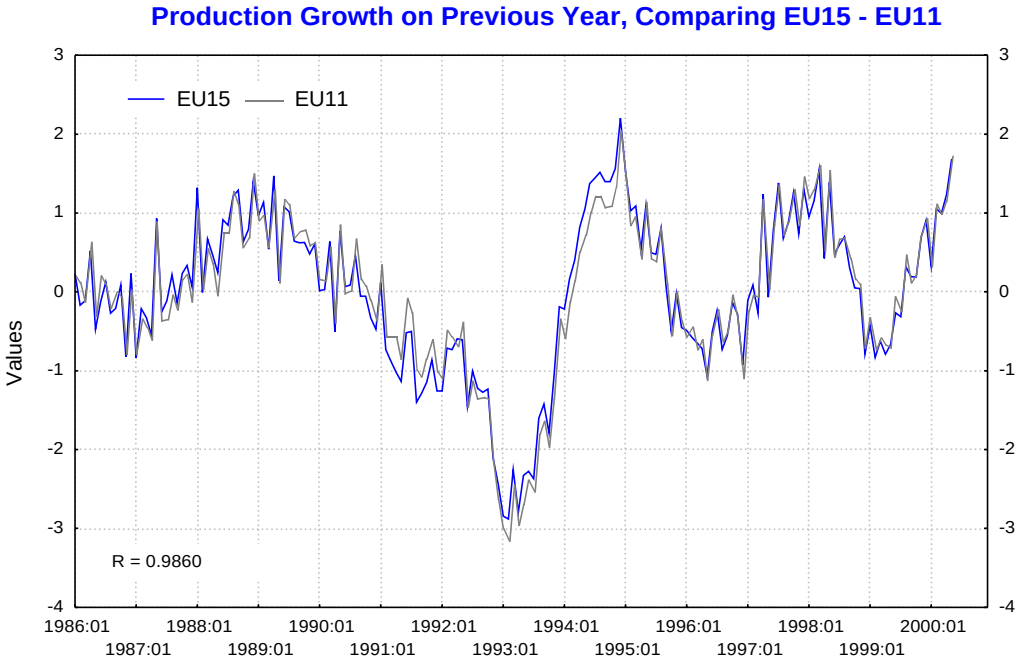
A The gross domestic product

Graph 2/3



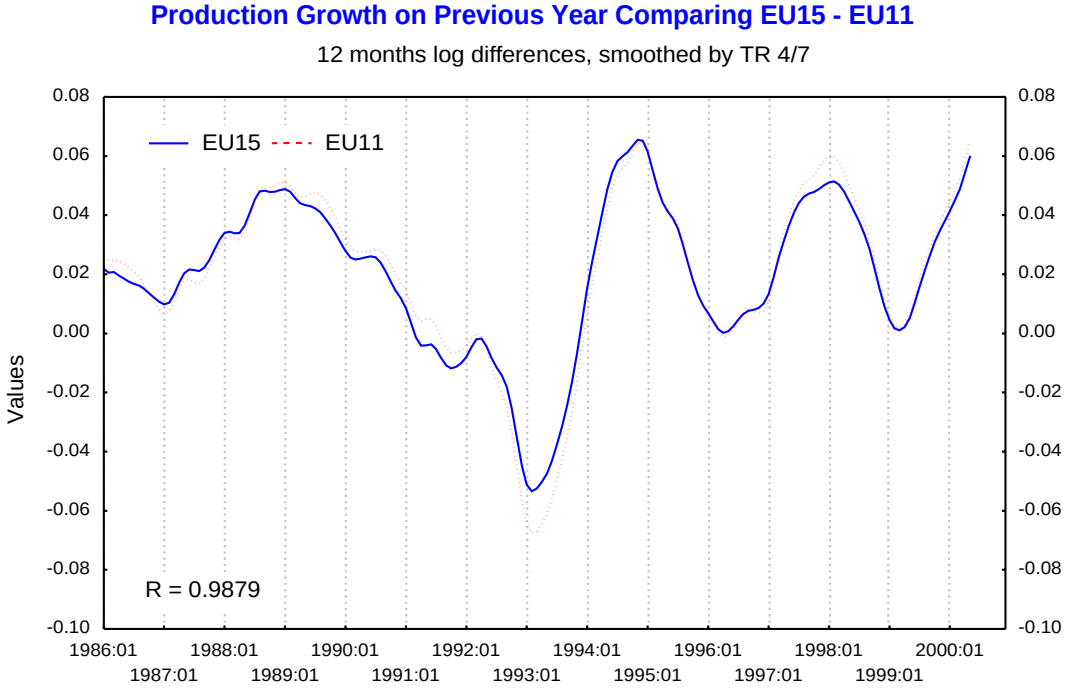
B The production

Graph 2/4



To find the **cyclical** relation between the reference and the indicators, the production series will be smoothed by the TR filter options 4/7 (Graph 2/5).

Graph 2/5



Comparing the growth rates (exactly the 12 month log differences) of production - non-smoothed or smoothed - for EU-11 with those of EU-15, the similarity is striking.

2.3 Case study Germany

The following examination is done in a way that preserves to the greatest possible extent the European Commission's basic philosophy of the construction of early indicators, which still appears to be sound. With the help of regression analyses, what is sought is an optimal weighting, series transformation, and possible lead structure. At first, alternative approaches for the economic assessment composite indicator are proposed, followed by an examination of the sector indicators. Finally we examine whether superior approaches of the sector indicators can further improve the optimal composite indicator.

2.3.1 Economic Sentiment Indicator (ESIN)

As already mentioned, the European Commission builds the composite indicator as a weighted average of the trend-adjusted and standardised indicators of manufacturing, construction, consumption and the financial market (stock prices).

Whereas the survey-based indicators are stationary, i.e. they show no trend, this is clearly not the case with the share price index. Thus, deviations from the trend have to be calculated. The results are dependent on the chosen trend-assessment procedure, on the one hand, and the deviations vary, on the other hand, with a change in the estimated trends over the course of time. In order to achieve stable values for the composite indicator and at the same time use a more consistent procedure, the trend adjustment should be harmonised, i.e. here too use should be made of the calculation of first differences and month to month growth rates.

The reference figure for this examination is GDP interpolated at monthly values and transformed to growth rates compared to the same month of the previous year. With the help of correlation and regression analyses, three different approaches are examined as to the nature of the prior treatment of the combined components.

2.3.1.1 Standardised components

The regression analysis with the (trend adjusted and) standardised four indicators (confidence in manufacturing, construction confidence, consumer confidence and share prices) produced weak results on the whole. Only 7 % of the variance of the reference series (determination coefficient is 0.07) is explained. The parameters of the construction indicator and the stock prices show negative signs; no sector indicator is significant. This result is not surprising since the formation of first differences intensifies the more high-frequency and more irregular movable shares of a times series. If the estimated values are cumulated as in the EU procedure, the determination coefficient increases to 0.22, but it remains far below the value of the original EU composite indicator of 0.43. By means of a lead optimisation, some improvement can be achieved. The explained variance share increases to 28 %, all parameters are positive, the influence of the sector indicators is significant with the exception of the stock prices, and the derived composite indicators leads the reference series by three months. Leads and weights are close together: manufacturing indicator 4 months: 0.41, construction indicator 3 months: 0.26, consumer confidence 5 months: 0.25, and stock prices 4 months: 0.08. With the cumulation of the estimated composite indicator, the adjustment degree of the EU indicator is not yet reached. This result indicates that the EU

procedure of trend adjustment, standardisation, weighting and cumulation must be examined by a differently designed regression analysis. The procedure differs from the first variant and delivers correspondingly different results. Nevertheless it is defensible because the key intention of the EU procedure – standardisation – is maintained and no trend is to be expected, at least in the case of qualitative indicators. If this happens, the determination coefficient increases to 0.51, but the parameter of the consumer indicator remains negative and the influence of this indicator and the stock prices is not significant. It is only a lead optimisation that achieves a uniformly correct sign and significant determinants, along with a slightly improved determination coefficient. For this the lead of consumer confidence must be set at 18 months. Since however both manufacturing and construction display no leads, the derived composite indicator is also without a lead. The parameters of the sector indicators based on qualitative components vary in a range of 0.05 (construction indicator) to 0.14 (industry indicator); the parameter of stock prices is only 0.002.

2.3.1.2 Normalised components

Seen in terms of time-series analysis, the phase shifts linked with trend adjustment of the components and the reference series have an effect on the regression results that are difficult to estimate. Alternatively to the previous treatment, a normalisation (subtracting the mean value and dividing by the standard deviation) does not achieve a trend adjustment (which at least in the case of qualitative time series is not necessary) but a harmonisation of the dynamics of the components without disturbing side effects. The regression analysis with the normalised components yields a higher determination coefficient (0.62) but a continued negative and not significant consumer influence (also the explanatory value of the stock prices is unsecured) so that the parameters cannot be interpreted as optimal weights. A positive but not entirely secured effect of consumer confidence is obtained after its transformation by the calculation of first differences. Here it is assumed that it is not as much the level but the change in the consumer climate that leads to purchasing activity. But a negative effect is also associated with this transformation: the determination coefficient falls to 0.51. The approach does not lead the reference series. From this, the following weights for the period of about the last nine years can be derived: manufacturing 0.59, construction 0.27, consumption 0.10, and stock prices 0.04. These values as well, especially those of the consumption indicator, deviated considerably from the EU weights.

A way of improving the composite indicator lies in replacing the stock prices with an alternative financial indicator or the retail indicator. With the interest rate gap (spread between long-term and short-term interest rates) in an approach consisting of normalised components, each with a month lead, the explanatory degree of the function is not raised (0.51), but now all components are significant (consumer climate transformed in first differences). The real external value of the D-Mark brings the determination coefficient to 0.60, but this employment is not plausible since the external value already influences confidence in industry. Finally, by including the retail indicator there is a slight increase in the explanatory value (0.54) and relatively significant determinants (no lead). This results in the weights: manufacturing 0.50, construction 0.20, consumption 0.09 and retailing 0.21.

2.3.1.3 Components that are not pre-treated

Since the explanatory degree of the previously discussed approaches is still relatively low, approaches with non-standardised components should also be considered. The sector indicators in the conventional composition explain 50 % of the variance in the reference series and thus do not quite reach the level of the normalised series. The influence of the manufacturing and construction indicator is good, but the influence of the other two components is only weakly significant. In addition the consumption parameter displays a false sign. The result of the attempt to even out the phase shifts of the reference series, which are caused by the transformation in growth rates, by a corresponding transformation of the sector indicators (here differences to the same month of the previous year) results in only one improvement in the results, despite a lead optimisation: The lead of the total indicator is two months long (determination coefficient 0.40, negative consumption parameter, not significant stock prices). In contrast, an approach with lead optimisation and sector transformations of the components results in all signs being positive. The consumption indicator is transferred into first differences, the stock prices are transferred into growth rates for the same previous-year months. The leads extend from 0 (manufacturing) to 4 (stock prices) months. The influence of the consumption component is only weakly significant, but the determination coefficient still rises to 0.55. The estimated parameters now allow for conclusions regarding a weighting of non-standardised components. They are: manufacturing 0.47, construction 0.17, consumption (first differences) 0.24 and stock prices (growth rates) 0.12. This weighting comes closest to the terms required by the EU.

The last investigation concerns the question of whether alternative indicators would promise better results, also in the case of approaches with non-standardised components. From the available time series, three-month money (first differences) proves to be a comparable indicator. With similarly significant components, a determination coefficient of 0.54 is achieved (after lead optimisation). The more interesting alternative is again the retail indicator developed by the EU. With it the previous performance level is reached in an approach without differentiating lead structure. The optimal weighting (in the base area of the regression estimation) is: manufacturing 0.41, construction 0.10, consumption 0.33, and retailing 0.16. With the following weights a composite indicator can be created with a determination coefficient of 0.50 and a lead of one month: manufacturing 0.36, construction 0.08, consumption 0.45 and retailing 0.11.

In summing up the investigation it can be stated that the regression analyses with three different approaches in treating the sector indicators provides some assistance for a more advantageous construction of the composite indicator. With a standardisation of the components in accord with the EU concept, the explained variance share remains relatively small, even though here a composite indicator with a lead of three months can be found. In contrast, a slightly changed standardisation variant can produce the very highest determination coefficient but doing this no longer displays a lead. The normalisation of the sector indicators increases the variance of the reference series by about 25 percent. After exchanging stock prices with the interest rate gap, a lead of one

month is achieved. With untreated components an approach with a comparable explained variance share and the same lead (1 month) can be found. For this, the retail indicator is included instead of stock prices. With all three approaches, there is a weak performance of the consumption indicator in light of the high value-added share of private consumption.

2.3.2 Sector indicators (Components of the Economic Sentiment Indicator)

2.3.2.1 Industrial confidence

The reference series here is the net production in manufacturing transformed to previous-year growth rates. The regression analysis (base area: last 10 years) of the questions grouped by the EU in the manufacturing sector on judgements of orders on hand, judgements of inventories, and plans for production as explaining variables of a reference series gives mixed results. The determination coefficient is comparatively high at 0.49 and the parameters (whose size varies between 0.10 and 0.18) show the correct signs. But significance is only achieved for production plans. The search for an alternative selection of the questions available to the EU leads to a grouping of judgements of orders on hand, production trend, and price expectations with clearly better results. The determination coefficient reaches 0.61, all parameters show the correct sign, and all questions are significant. The size of the parameters varies, however, somewhat more strongly between 0.12 (judgements of orders on hand), -0.12 (price expectations), and 0.36 production trend. The overall results speak for a corresponding change in the selection of questions. The unweighted average of the questions correlates with the reference series considerably higher (-0.77) than the EU average (0.59). If the weights that are derived from the estimated parameters are included in the formation of the average, the correlation increases only a little, to 0.79. Hence, there are good reasons, in light of the always present variability of estimated results over the course of time, to stick to the unweighted average. With all previous approaches, no lead to the reference series is obtained.

The attempts to achieve better results by means of series transformations and lead optimisation leads – as the questions were originally constituted – to the calculations of first differences of the series of judgements of orders on hand and to a lead of 4 months for production plans. As a result the determination coefficient rises to 0.58 and the significant now holds for all questions. With a new approach, only the calculation of the previous-year differences of production trend brings a slight improvement in the determination coefficient to 0.63 and a smaller fluctuation range of the parameter (no total lead). If this transformation is done in the formation of averages, the unweighted average correlates somewhat higher with the reference series (0.79). This is a variant worth considering, especially if this effect is also displayed in the indicators of other countries.

The search for quantitative determinants which would further improve the explanatory value of the industrial indicators was not very successful. The only series that showed a slight increase with both approaches was orders received in manufacturing (volume index). In the first approach, orders received (transformed to first differences) achieved

an increase in the determination coefficient of 0.63 with a lead of 3 months; in the second approach 0.67 with a lead of 8 months.

Conclusion: With a changed selection of questions, a clear improvement of the explanatory power of the manufacturing indicator is achieved. The transformation of a series leads to a slight improvement without the need for introducing a weighting. A further increase in the explanatory power is linked with the expansion using a quantitative series. Here the question arises of whether the construction concept of the indicator that previously was based solely on qualitative information should be changed because of a relatively small improvement. No approach shows any lead.

2.3.2.2 Confidence in construction

The reference series here is construction investment, interpolated and transformed to growth rates. The EU approach groups the seasonally adjusted balances of the *judgements of orders on hand* and *employment expectations* into an unweighted arithmetic mean. In addition, the EU has two other harmonised sources of information on construction: construction trend and price expectations.

Correlation and regression analyses with all four qualitative services confirm the EU approach. The regression analyses with the two seasonally adjusted series chosen by the EU display significant questions with practically the same sized parameters (0.13 and 0.16) and with an explained variance share of 0.58. The average weighted with these parameters displays a lead of one month. A lead optimisation, 2 (judgements of orders on hand) and 1 (employment expectations) month(s) only increases the determination coefficient to 0.6 and keeps the same lead length.

Construction investment displays a very seasonal progression. This pattern is also evident in the series on construction activity. In this respect, the seasonally marked series has a high correlation (0.82). But the seasonal adjustment of both series lowers the correlation to 0.16. The correlation of the seasonally adjusted price expectations with the adjusted construction investment still reaches 0.53, but thus shows a weaker correlation than the two preferred series. Both the trend of construction activity as well as price expectations do not bring about a significant improvement in the estimation approach.

The attempt of adding a quantitative explanatory series is only successful for one series. The real external value of the D-Mark increases the determination coefficient to 0.70 with a lead of 6 months. In this approach, the external value has the same explanatory power as the judgements of orders on hand, whereas the employment expectations lose influence and are only weakly significant. Again it remains at a lead of one month.

Conclusion: The selection of questions and the construction principle of the European Commission is optimal in most respects. In the context of lead optimisation, the explained variance share can be raised somewhat, and with the addition of the real external value of the D-Mark it can be raised considerably. The lead of one month cannot be extended, however.

2.3.2.3 Consumer confidence

In the examination of the indicator of consumer confidence, the series of real private consumption interpolated and transformed to previous-year growth rates serves as the reference. The European Commission poses the questions, in an unweighted average, as to: financial situation in the past 12 months, financial situation in the next 12 months, general economic situation in the past 12 months, general economic situation in the next 12 months, and current advisability for major purchases.

The corresponding regression analysis yields a low explanatory value (0.34). The influence of only three questions is significant, and both questions on the financial situation display a negative sign. The lead of the indicator is, however, relatively long at 4 months. The main reason for the poor results is to be found in the high correlation between the questions. Especially the question on the financial situation and on the general economic situation are highly correlated. Or, in other words: The explanatory power of consumer confidence can also be achieved with fewer questions. If however one does not wish to forego too many questions, the only recourse is to transform individual questions in order to lower the inter-correlations. Only in this way can plausible parameters be gained. The filter used in transformation in the form of differences or growth rates have an effect on the lead structures, however.

With the help of a broad transformation of explanatory factors by the calculating of differences at the previous-year value (exception: economic situation in the past 12 months) and a lead optimisation, it is not possible to achieve stable estimation values for all five questions. The negative sign of the financial situation in the past 12 months remains. The explained variance share does indeed rise to 0.60 and the significance of the determinants increases, but the lead of the consumer index falls to 0. Even with no sub-selection from the five questions, satisfactory results can be achieved. Not until additional questions are included is it possible to reach the desired goal. In order to achieve a longer lead in the consumption indicator, expectation questions are preferred. A number of alternative approaches with three or four questions display plausible parameters and significant determinants. The approaches achieve a lead of three months. They always contain the questions of the expectations of unemployment (transformed into previous year differences) with a lead of three months and the question on the general economic situation over the next 12 months with a lead of 10 months. Together with the question of the advisability of major purchases over next 12 months with a lead of 11 months, the determination coefficient is 0.40. With the question of savings intentions (transformed to previous year differences) with a lead of 6 months, the determination coefficient increases to 0.44, and to 0.47 if the question of financial expectations is included (transformed to previous year differences) with a lead of 9 months. The following weights can be derived from the parameters of the approach with three questions: unemployment -0.27, economic situations 0.29, and savings -0.44. The corresponding weights for the approach with four questions are: unemployment -0.16, economic situation 0.12, savings -0.44, and financial situation 0.28.

The question regarding additional quantitative indicators does not allow for a simple answer. One possibility is to examine the influence of disposable income,

unemployment numbers, or interest rate movements. But the information of these series are already directly included via questions on the financial situation and unemployment and indirectly via the questions on the general economic situation. The progress that can be achieved by these quantitative series is correspondingly low. Thus, in the approach with the found questions, the determination coefficient rises only to 0.49 both with the weakly significant long-term interest rates and also with the likewise not significant unemployment numbers.

Conclusion: The approach chosen by the European Commission cannot be confirmed by regression analysis. The high inter-correlation between the five questions necessitates another selection of questions as well as, in part, a transformation of the time series. It is not possible to find a halfway plausible approach with the same leads of the questions which would allow for a simple weighted or unweighted average. Differing leads must always be taken into consideration in the formation of averages. The unweighted average of three questions gained in this way correlates with the reference series with a coefficient of 0.65; the corresponding average of the four questions is similarly high at 0.66. The weighted averages bring about a minimal improvement to 0.67 and 0.69. Regardless of which variant is chosen, the correlation is always considerably narrower than the correlation of the original EU consumer confidence with the reference series (0.50). Here, as well as with the new consumer indicator, the lead is 3 months long.

2.3.2.4 Confidence in retailing

The retail confidence indicator consists of an unweighted average of the seasonally adjusted series of the balances of the business assessments, the judgements of inventories (multiplied by minus one), and the business expectations, each in retailing as a whole. The corresponding regression analysis of the three series with the reference series of real turnover in retailing as a whole largely confirms the EU construction. The signs of the parameters are correct; their size varies between 0.04 (business expectations), 0.09 (business assessments), and 0.14 (inventory assessments). The influence of the series is significant with the exception of business expectations. The determination coefficient is low at 0.38.

The examination of the connections using the alternative questions, taking the leads and series transformations into consideration, produces interesting results: The business assessments, transformed to differences to the same previous-year month, contain a considerably higher explanatory value. If in addition inventory assessments of 3 months and business expectations of 7 months leads are included, the determination coefficient rises to 0.59. In the context of such an optimisation, the inventory assessment loses explanatory power. Its replacement by the development of employment (with a lead of 2 months) additionally improves the overall results to a determination coefficient of 0.61 and to consistently significant explanatory power. Since in the ideal case the transformed business assessment in both instances are included in the regression analysis without leads, the retail indicators derived from it are also without leads.

Quantitative information, which could increase the explanatory power of the retail indicator, have not been found. Instead, the qualitative indicator, consumer confidence,

has a highly secured influence on the retail indicator. Since consumer confidence has already been included in the composite indicator, it has not been employed here.

Conclusion: The considerably higher determination coefficient of the best regression approach compared to the approach that corresponds to the EU construction (0.61 vis-à-vis 0.38) has encouraged an examination of the following alternative. A weighted average is formed with the weights of 0.36 for business assessments (differences against the same previous-year month), 0.20 for business expectations, and 0.44 for employment expectations. The two latter questions are included in the average with shifts of 7 and 2 months respectively. However, with this retail indicator, it is not possible to reach a longer lead.

2.3.3 Economic assessment of alternative Economic Sentiment Indicators (ESIN) based on revised sector indicators

Since the newly constructed sector indicators show better results than the corresponding indicators of the European Commission, measured in terms of the reference series employed here, they should also yield better results in the composite indicator. The tests are conducted with the best approaches from the three groups.

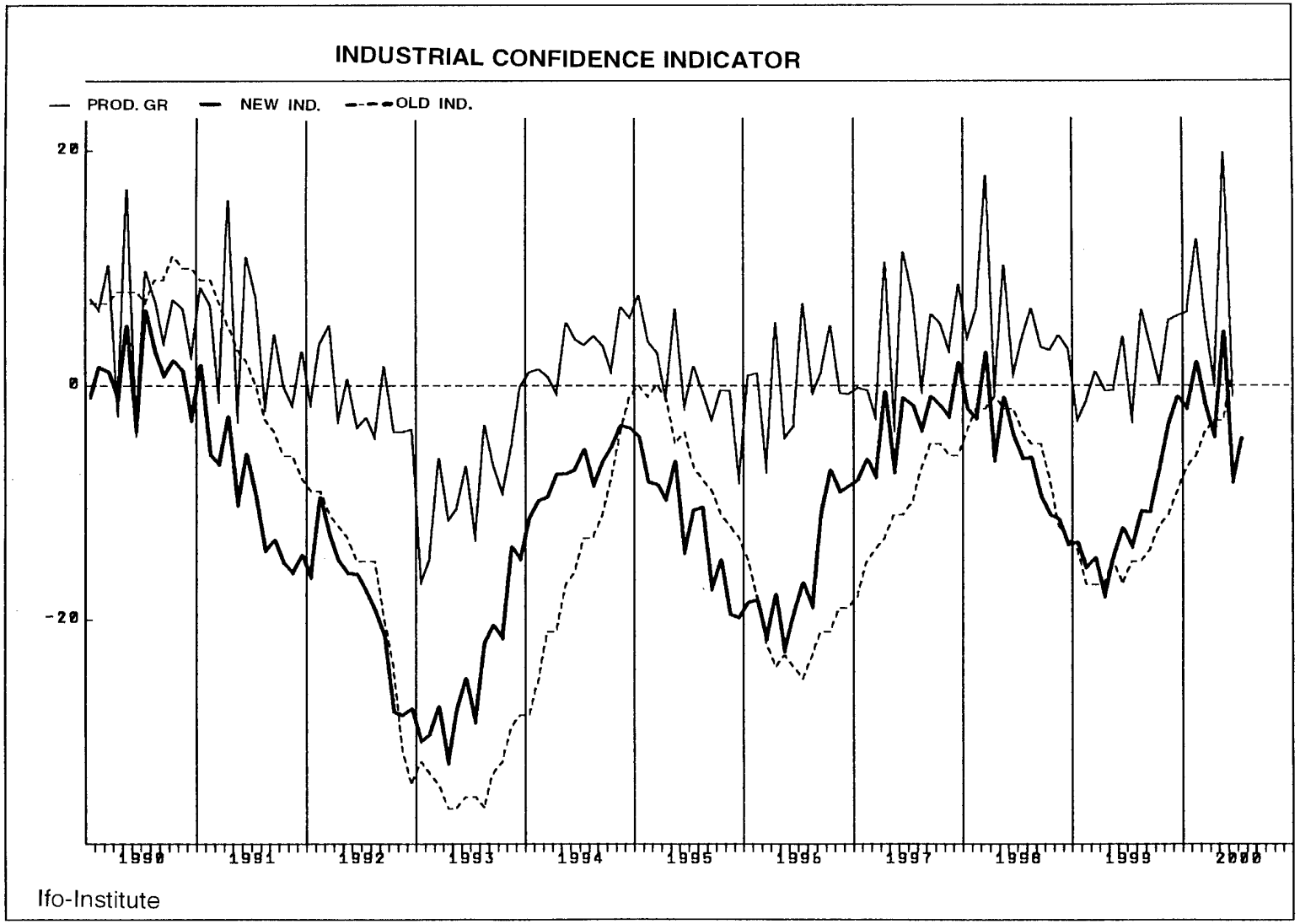
All examined approaches gain in explanatory power, as a rule, with the new sector indicators. In the case of standardised components in the original construction, no gain has been seen. The determination coefficient only reaches 0.12, despite lead optimisation. The influence of the components is not consistently significant, all parameters are positive, and the lead of the composite indicator is long at 4 months. With the second standardisation variant, the lead is again lost and the stock prices no longer show an influence, but the determination coefficient at 0.61 is considerably higher than with the old indicator.

The best results in terms of the correspondence with the course of the reference series are achieved with an approach using the untreated components, in which the new construction indicator has a lead of 2 months and stock prices (transformed to growth rates against the previous year) a lead of 4 months. A determination coefficient of 0.66 and results that are completely plausible as well as significant are characteristics of the composite indicator, which however has no lead. Other approaches of this quality, however, have a lead of one month. The best composite indicator in this group consists of normalised components, the interest rate gap replaces the stock market, and consumer confidence is transformed to the first differences. After a lead optimisation, a determination coefficient of 0.62 is achieved. Compiled from untreated components (first differences of consumer confidence), the approach achieves comparably good results (determination coefficient: 0.61) both with the new retail indicator and also with the short-term interest rates in place of stock prices.

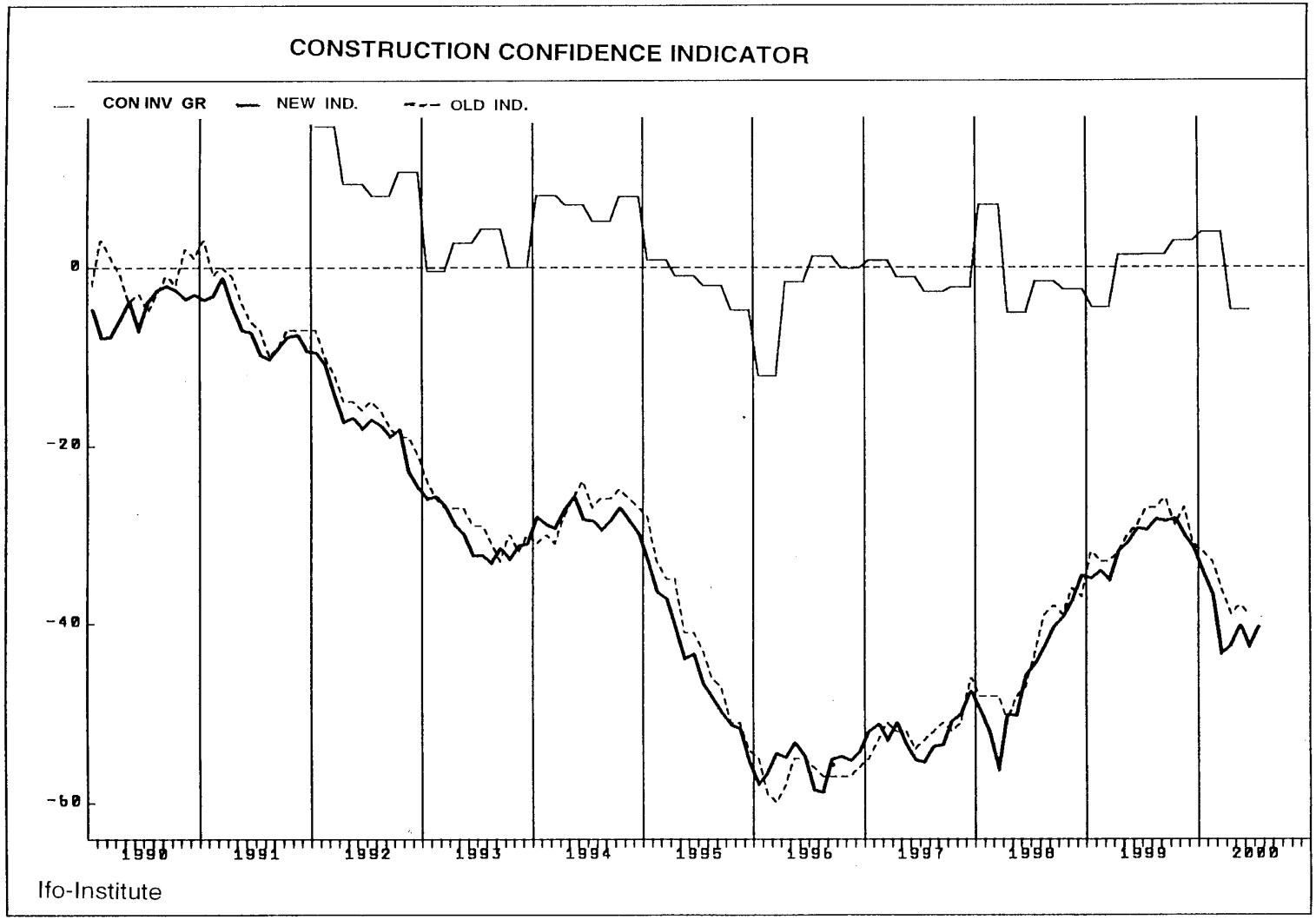
In order to construct a corresponding composite indicator as a weighted average from the best approach, the following weights are to be used: manufacturing indicator 0.33, construction indicator (shifted by 2 months) 0.10, consumer confidence 0.48, and stock prices (growth rates shifted by 4 months) 0.09. For the second best approach with normalised components we have: industry indicator (shifted by one month) 0.31,

construction indicator (shifted by one month) 0.39, consumer confidence (first differences) 0.12, and interest rate gap (shifted by 4 months) 0.18.

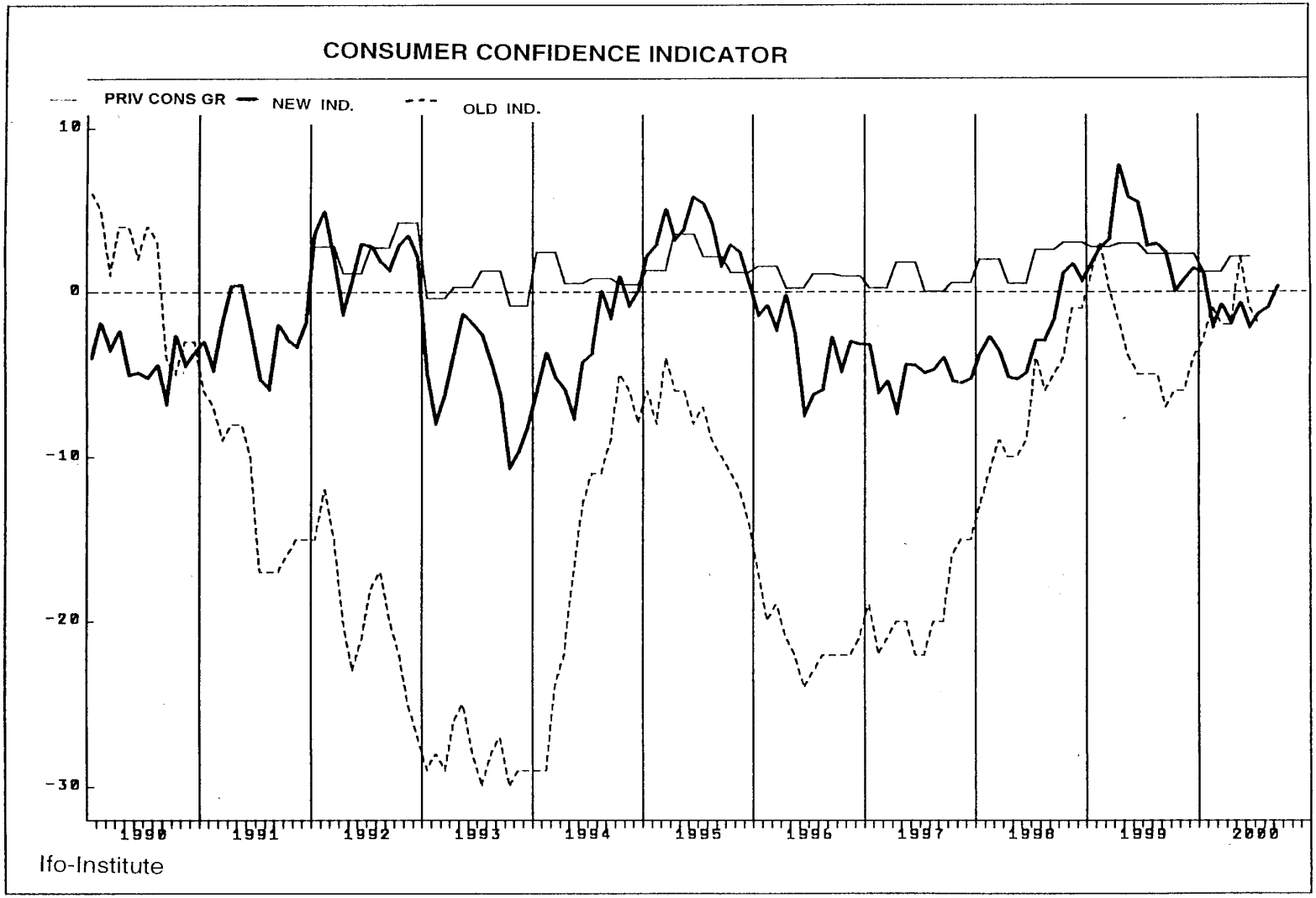
Graph. 2.3.2/1


INDUSTRIAL CONFIDENCE INDICATOR
PROD. GR
NEW IND.
OLD IND.
20
0
-20
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

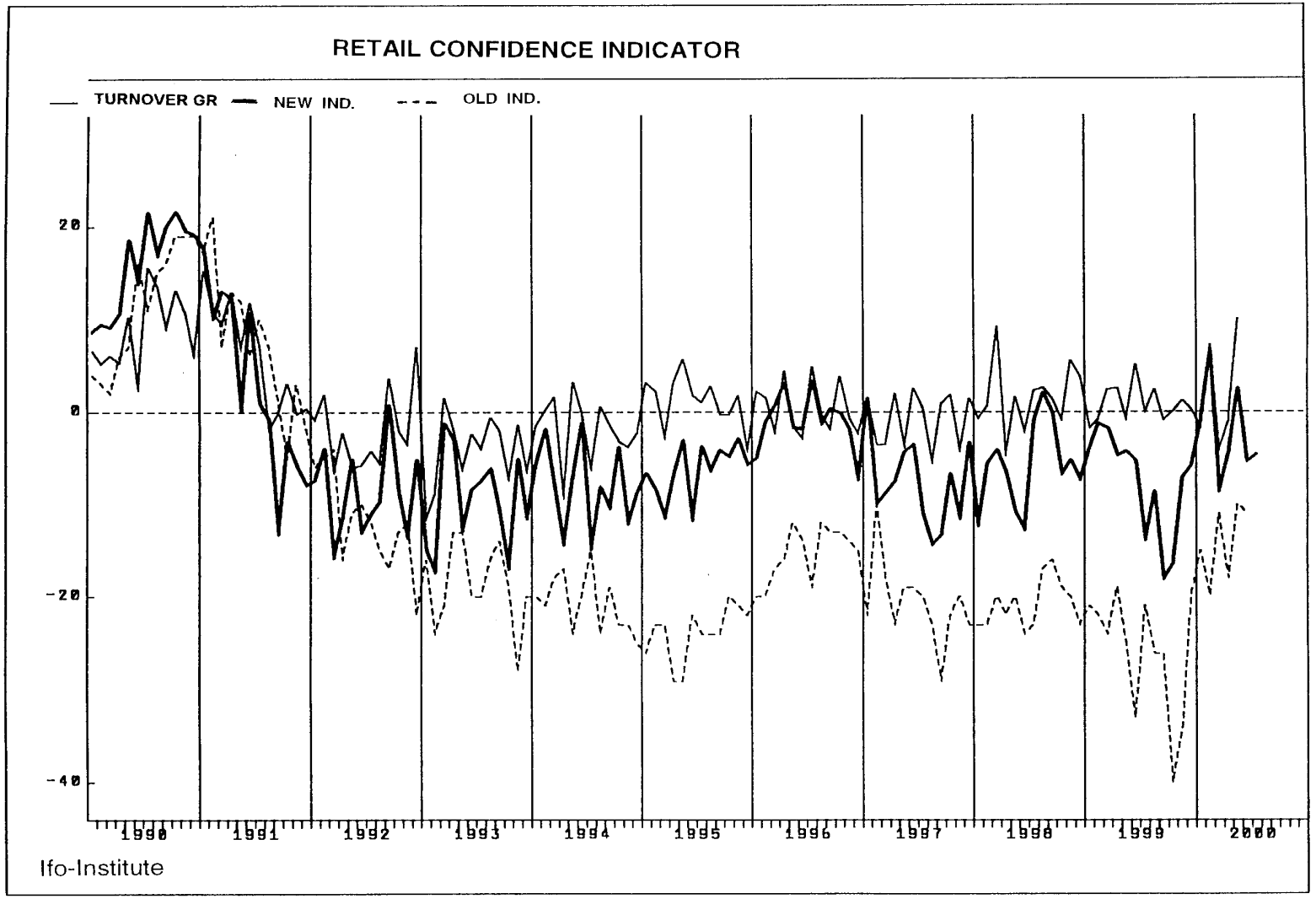
Graph. 2.3.2/2


CONSTRUCTION CONFIDENCE INDICATOR
CON INV GR
NEW IND.
OLD IND.
0
-20
-40
-60
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

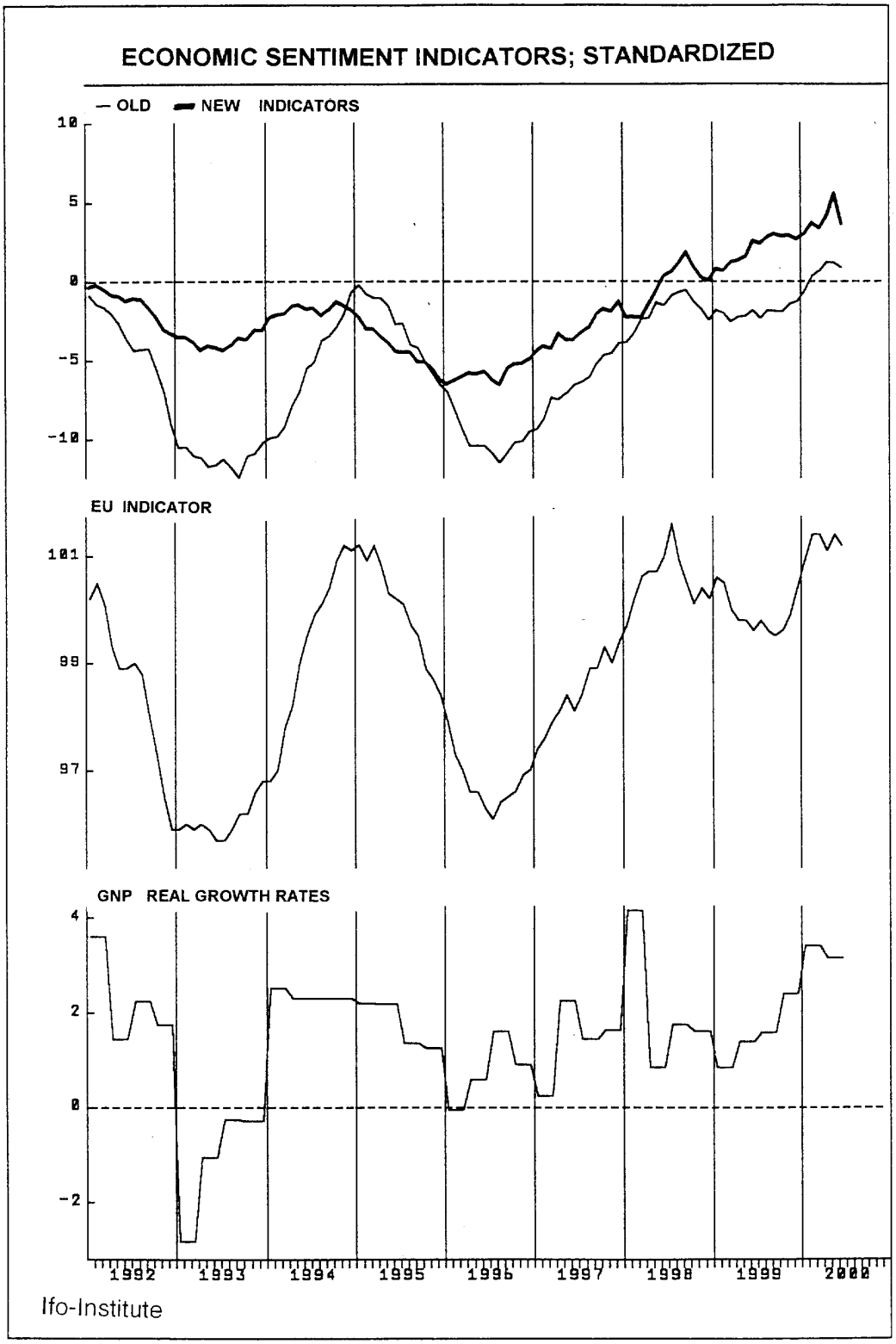
Graph. 2.3.2/3


CONSUMER CONFIDENCE INDICATOR
PRIV CONS GR
NEW IND.
OLD IND.
10
0
-10
-20
-30
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

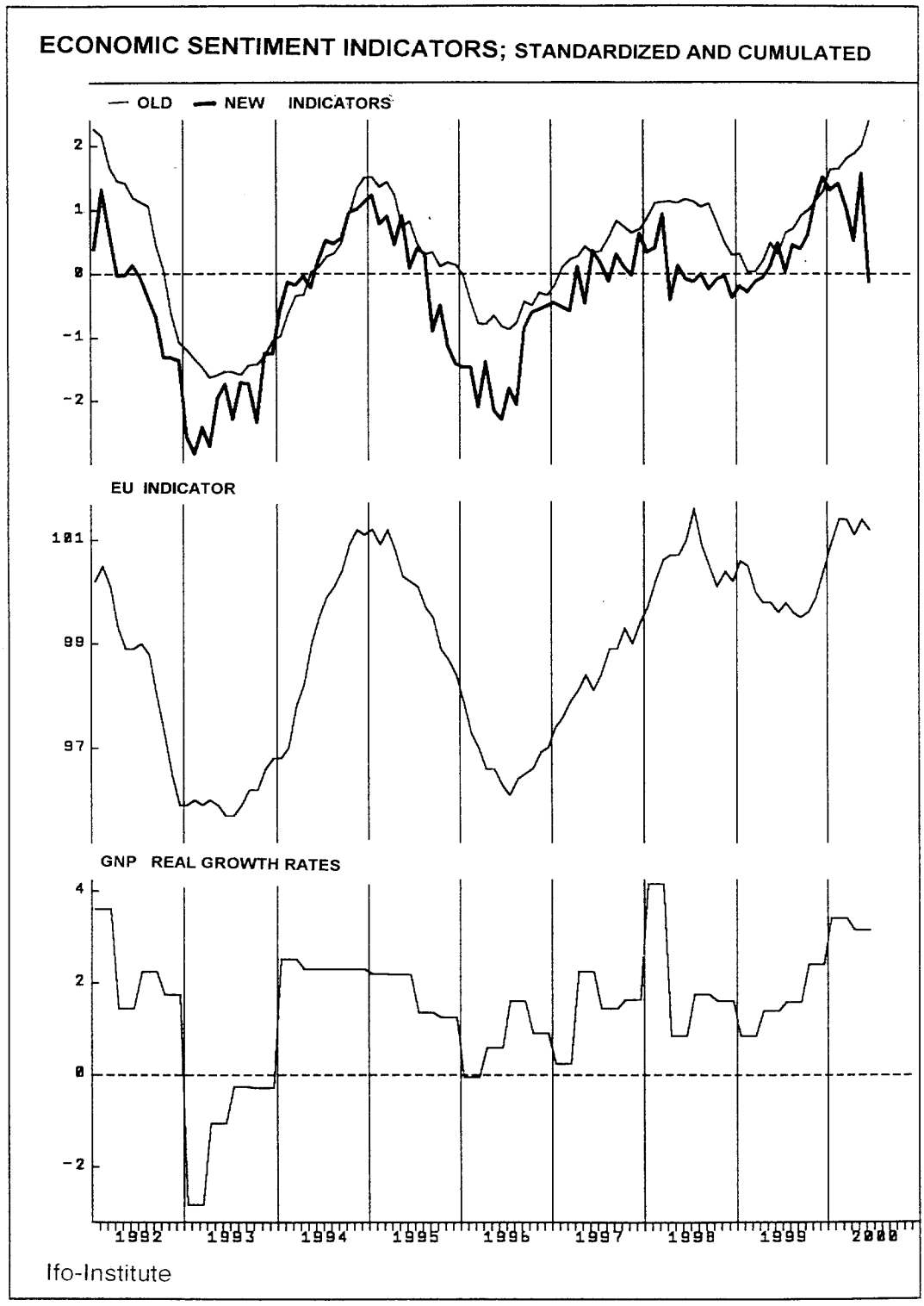
Graph 2.3.2/4


RETAIL CONFIDENCE INDICATOR
TURNOVER GR
NEW IND.
OLD IND.
20
0
-20
-40
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

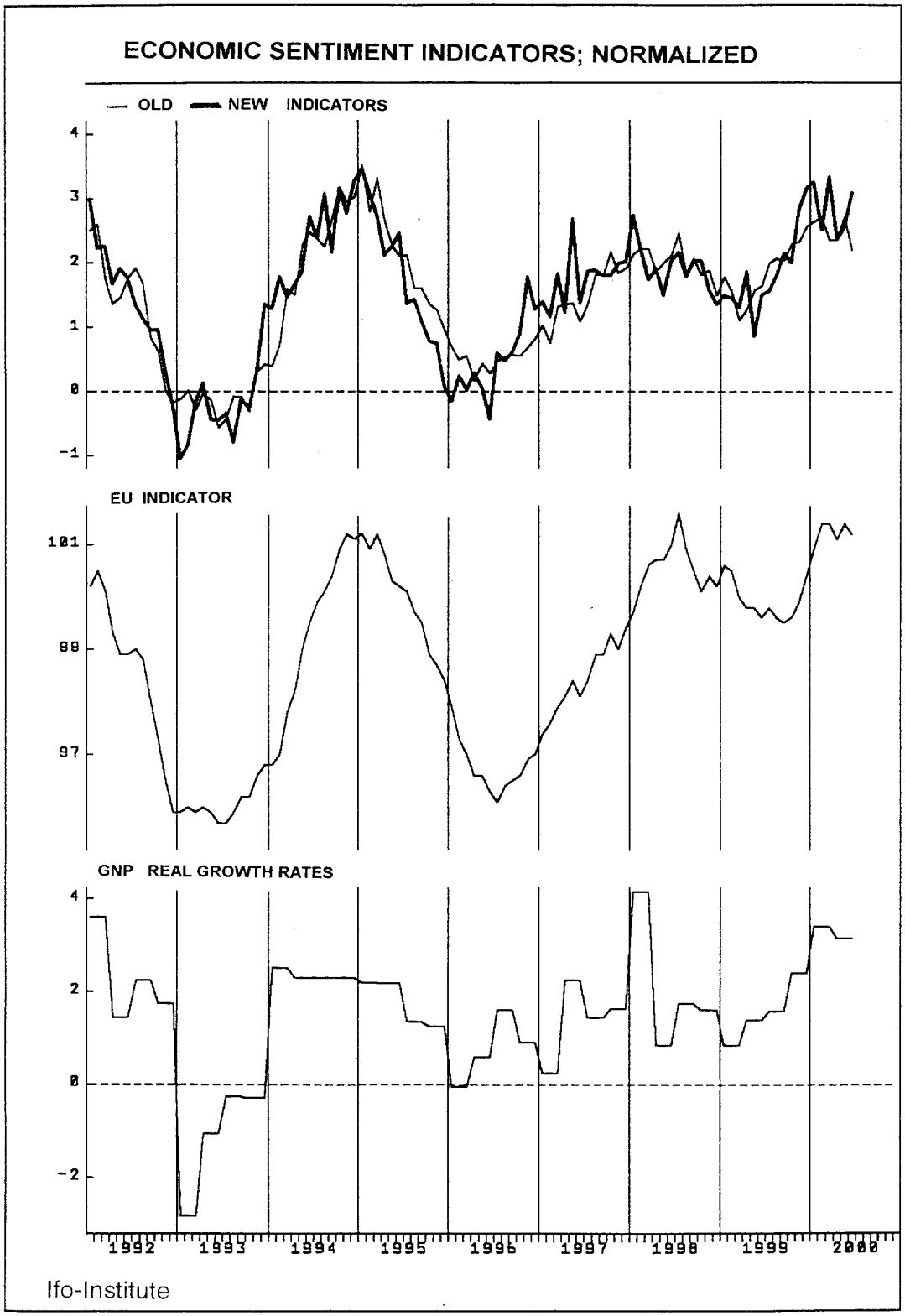
Graph. 2.3.3/1


ECONOMIC SENTIMENT INDICATORS; STANDARDIZED
— OLD ▬ NEW INDICATORS
10
5
0
-5
-10
EU INDICATOR
101
99
97
GNP REAL GROWTH RATES
4
2
0
-2
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

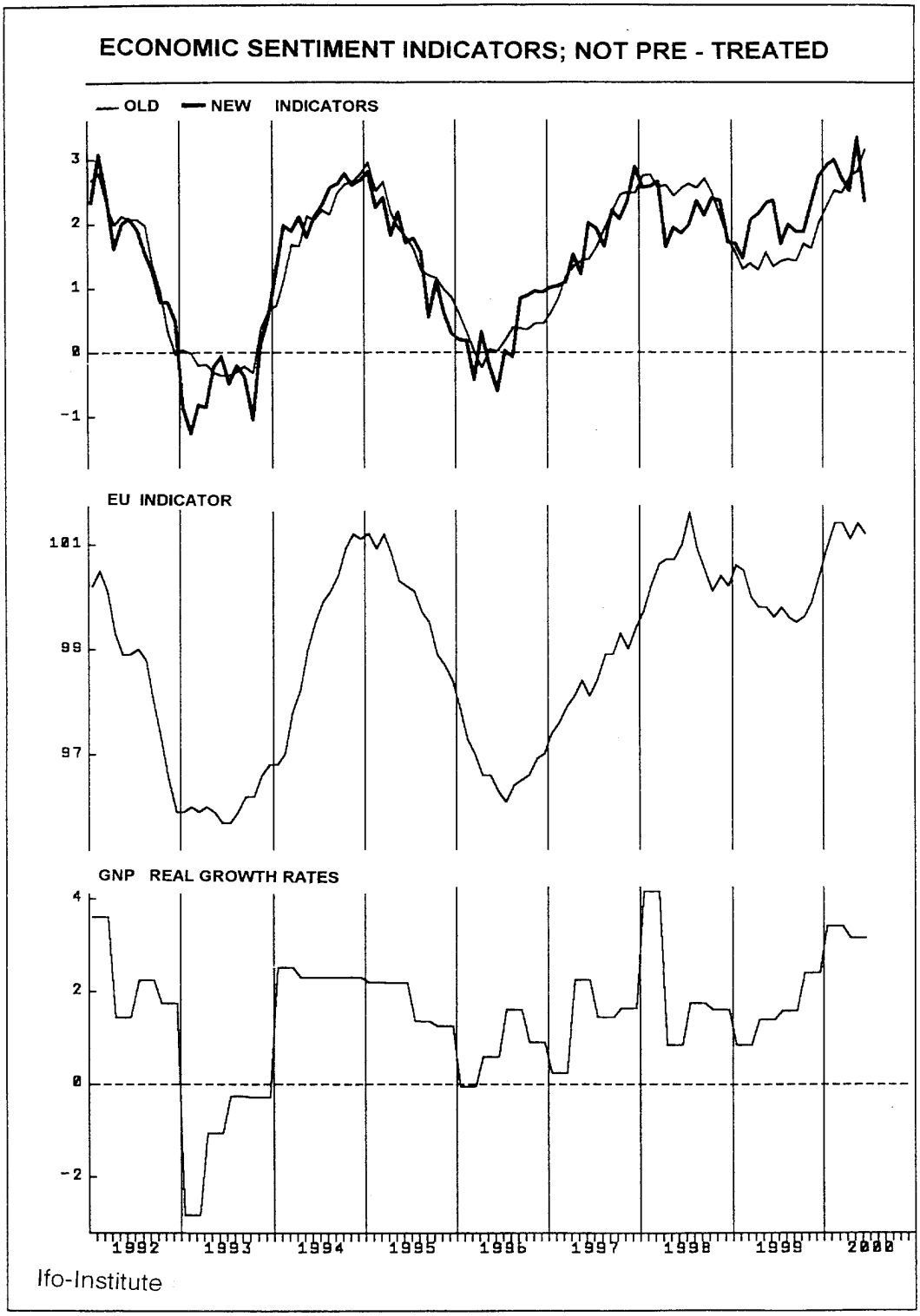
Graph. 2.3.3/2


ECONOMIC SENTIMENT INDICATORS; STANDARDIZED AND CUMULATED
OLD
NEW
INDICATORS
2
1
0
-1
-2
EU INDICATOR
101
99
97
GNP REAL GROWTH RATES
4
2
0
-2
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

Graph 2.3.3/3


ECONOMIC SENTIMENT INDICATORS; NORMALIZED
OLD
NEW
INDICATORS
4
3
2
1
0
-1
EU INDICATOR
101
99
97
GNP REAL GROWTH RATES
4
2
0
-2
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

Graph 2.3.3/4


ECONOMIC SENTIMENT INDICATORS; NOT PRE - TREATED
OLD
NEW
INDICATORS
3
2
1
0
-1
EU INDICATOR
101
99
97
GNP REAL GROWTH RATES
4
2
0
-2
1992
1993
1994
1995
1996
1997
1998
1999
2000
Ifo-Institute

2.3.4 A methodical alternative for the construction of leading indicators

2.3.4.1. General remarks

In so far as the trend adjustment of the reference series growth rates are calculated, the side effects of this simple procedure are to be taken into account, too. When calculating the differences, asymmetric filtering comes into effect, which alongside with the suppression of movements with long periods of oscillation reinforces certain parts of the irregular component, on the one hand, and causes considerable shifts in phases (dependent on the period of oscillation of the frequency range), on the other. Thus in the case of a frequency range with a five-year period of oscillation in which economic activity takes place, a previous year difference leads to a nine-month phase shift.

If a leading indicator is to show the development of a target that has been transformed into growth rates, one can try to transform the components in a similar way in order to assure the lead of the components over the original target. We prefer this method of trend adjustment despite the unfavourable side effects to the calculation of the relative deviations of a trend because the latter is dependent on the trend estimation method chosen and in the course of time entails variable results. Therefore all components of the overall indicator are to be transformed into previous year differences or previous year growth rates - whether they follow a trend or not.

2.3.4.2 Overall indicator for the German economy

The overall indicator for economic activity in Germany which has been calculated using normalised sector indicators serves as a first example for this procedure. This newly-developed overall indicator is characterised by a lead of one month. The alternative overall indicator is an unweighted average of the normalised sector indicators which have been transformed into previous year differences (previous year growth rates). Its average lead amounts to three months over the production in the manufacturing sector. Graph 2.3.4/1 illustrates the lead of the different approach; still there is only coincidence to be registered at the lower turning points. The disadvantage of this approach is the reinforcement of the irregular movement linked with the filtering. A smoothing achievable through cumulation, as is the case with the original overall indicator of the EU, would, however, diminish the excess lead. It might be possible to increase the expressiveness of the indicator with the use of a slightly MCD-determined smoothing if small adjustments at the end of the series can be accepted.

2.3.4.3 Sector indicators for Germany

As the difference approach used for the development of the overall indicator has proved its usefulness, it has also been examined using the example of the sector indicators. The procedure applied to the development of the industrial indicator is relatively successful after a lead optimisation. The industrial confidence indicator is in the lead by two months, while the lead of the assessment of finished goods inventory has a length of 19 months and the lead of the judgement of orders on hand and of the production plans amounts to two months. The accordance with the production, which has been transformed into growth rates, is, however, comparatively low. The normalised series are almost equally weighted so that in future the unweighted average of the three questions would be recommendable provided that the longer lead period of the

estimation of the inventory level is taken into account. Graph 2.3.4/2 makes clear that the average lead of two months with two exceptions at the turning points, does not become noticeable (thick line in the upper part of the image compared with the thin line at the bottom).

For the development of the construction confidence indicator the new approach proves to be less advantageous. In this case the reinforcement of the irregular series movements connected with the calculation of differences does not lead to a longer lead. It is only with the exchange of the assessment of orders on hand through price expectations and an increase in the spread of the difference from 12 to 24 months that a lead of 7 months can be achieved. The construction confidence indicator is, however, very volatile and correlates with the reference series only to a small extent. This result does not favour the application of the difference procedure.

In terms of consumer confidence one should not expect much from the procedure, since in the best approach made by Ifo as many as three variables out of four have been transformed into previous-year differences. If the fourth variable is also transformed, the overall lead will only grow to 4 months without producing negative side effects. Therefore this approach should preferably be applied; if this approach is used, the weights which differ by a factor of 4.5 are to be included in the average.

A variable transformed into differences was also included in the best indicator for retail trade. Similar to the case of the construction confidence indicator, an extension of the transformation to all variables causes an average lead of three months, but the correlation with the reference series is reduced by almost 50% as a consequence of the reinforcement of irregularity. Taking this as an example there is no distinct advantage to be seen for the new procedure.

2.3.4.4 Overall indicator based on improved sector indicators

It is only the alternative consumer confidence, which was already largely composed of transformed variables, that can be recommended as an indicator for the improvement of the overall indicator. It is true that after a lead optimisation a longer overall lead cannot be achieved with the help of the consumer confidence indicator, but an increase of the correlation with the interpolated GDP (growth rates) by almost 50% can be achieved. The weighting is almost equal so that an unweighted average from the transformed sector indicators would be possible if the different lead periods are taken into account. The lead periods are: three for the industry, thirteen for construction, four for consumption and four for share prices. Due to the calculation of differences the overall indicator is rather volatile in comparison with the corresponding indicator of the EU. A subsequent smoothing causes adjustments at the end of the series in the course of time. If these are to be avoided only the variables with a lead longer than the lead period of the overall indicator can be smoothed in advance with the use of low pass filters with a range adapted to the lead difference. Admittedly, this measure increases the determination coefficient to some extent, but the recognisable smoothing effect is relatively low. Graph 2.3.4/3 illustrates the performance of the optimised overall indicator (Ifo new diff.2, thick line) compared with the EU indicator in terms of the smoothed production growth rates in the manufacturing sector.

2.3.4.5 Extension: Application of this approach to the construction of an overall Economic Sentiment Indicator at the EU15 level.

The difference approach in connection with normalised variables has also been used to develop the overall indicator of the European Union (15 countries). Again the time series of the monthly production in the manufacturing sector is included in regression analysis as a reference series. GDP, which would be better suited for this purpose, is not available before 1991, so that only less reliable indications for an appropriate approach are available due to the short range of regression. Initially the sector indicators chosen by the EU are included as explaining variables.

With the use of transformed sector indicators only regression approaches in which one or two variables with a relatively long lead of up to 28 months are included are to be found. After this optimisation relatively high correlation rates with the reference series are to be achieved. Two out of the three approaches with the three sector indicators each show a lead of three months. In the first approach (the construction confidence indicator is missing here) the consumer confidence indicator leads with 23 months and the share prices lead with 28 months. In the second approach which dispenses with share prices the lead period of the consumer confidence indicator amounts to 25 months. Although normalised variables are used, the weighting differs in the first approach by a factor of 7, and in the second approach by a factor of 2. Graph 2.3.4/4 demonstrates the course of the leading indicator (which was estimated in the second approach and which does not differ markedly from the unweighted average due to small differences in weighting. In this case the differences in the lead periods are taken into account). A comparison of indicator with the EU indicator shows a distinct lead concerning the average lead period as well as the dynamic correlation with the reference series.

Finally replacing the share prices by another financial indicator was also tried. Using the money supply M3, a lead period of the overall indicator (this time composed of four variables) of three months and the best degree of correspondence with the reference series can be achieved. As we only have the time series from 1991 onwards at our disposal, the range of regression analysis is comparatively short and thus the result less expressive. The estimated course is shown in the upper part of Graph 2.3.4/4 as a thick line. When comparing this line with the thin line in the second approach there are no significant advantages to be seen in terms of the leading indicator; the advantage compared with the EU indicator is, however, very striking.

2.3.4.6 Extension: Usefulness of smoothing

It is true that the overall economic indicators which we have developed for Germany and the EU show an average lead compared with the corresponding indicators of the Commission, but the indicators based on differences are somewhat more volatile than the cumulated indicators of the Commission (see Graph 2.3.4/3 and Graph 2.3.4/4). Irregular movements at the current end of the series make the identification of a turning point more difficult, so that there is a deterioration in the information capacity of the lead.

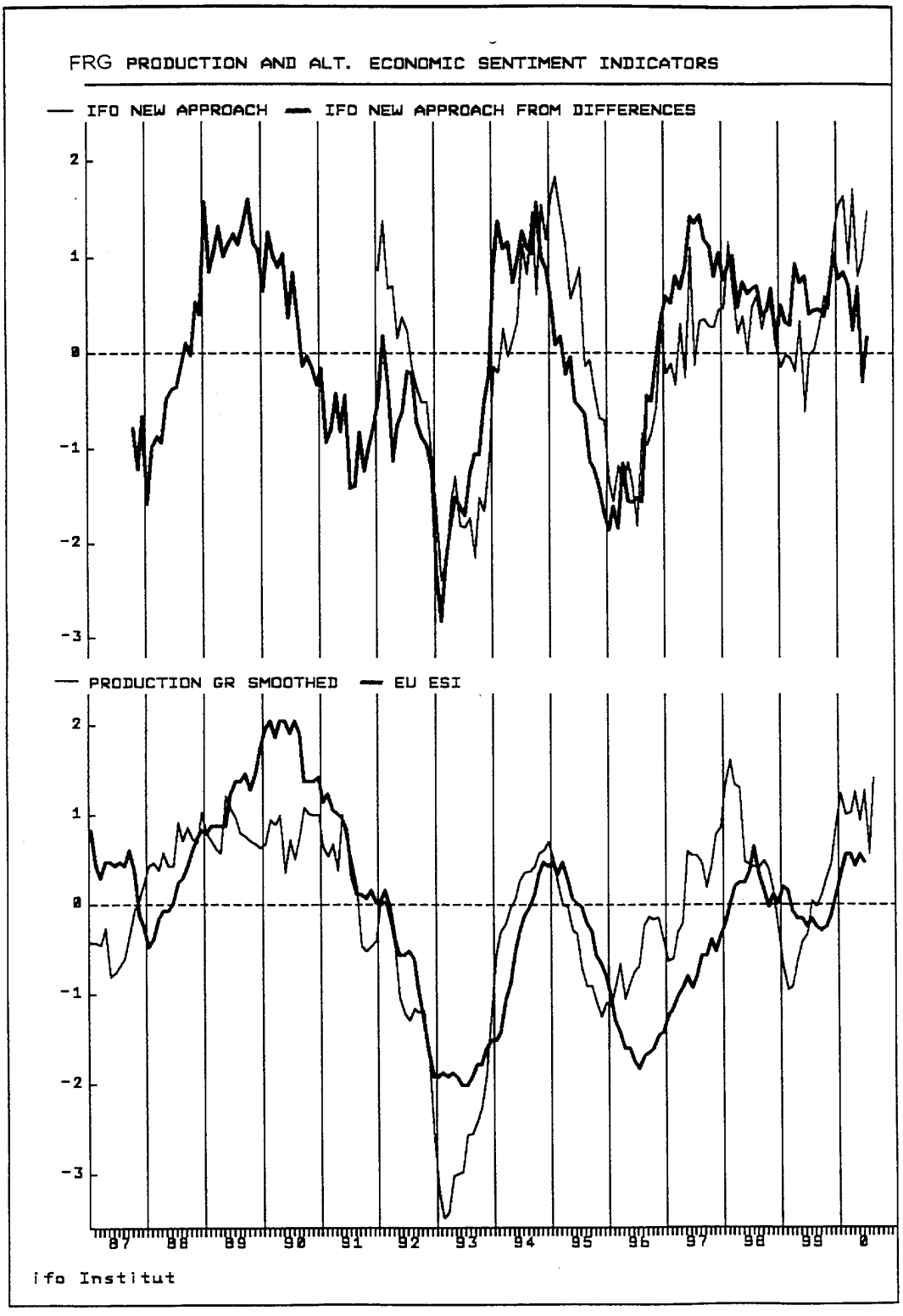
As a matter of principle a subsequent smoothing does not help here. All low pass filters used for this purpose at the current end of the series entail adjustments of the smoothed

values and thus corresponding problems in identifying turning points. The various low pass filters differ concerning the necessity for the adjustment of the smoothed values. The Ifo Institute developed a new low pass filter which is able to indicate a turning point early and reliably at the current end of the series. Admittedly, the last (m-1)/2 values (the range of filter m is odd) of the series in connection with a repeated smoothing that is triggered by an added value, change. These adjustments apply almost exclusively to the level instead of perceptions about the future economic outlook, provided that the range is sufficiently long.

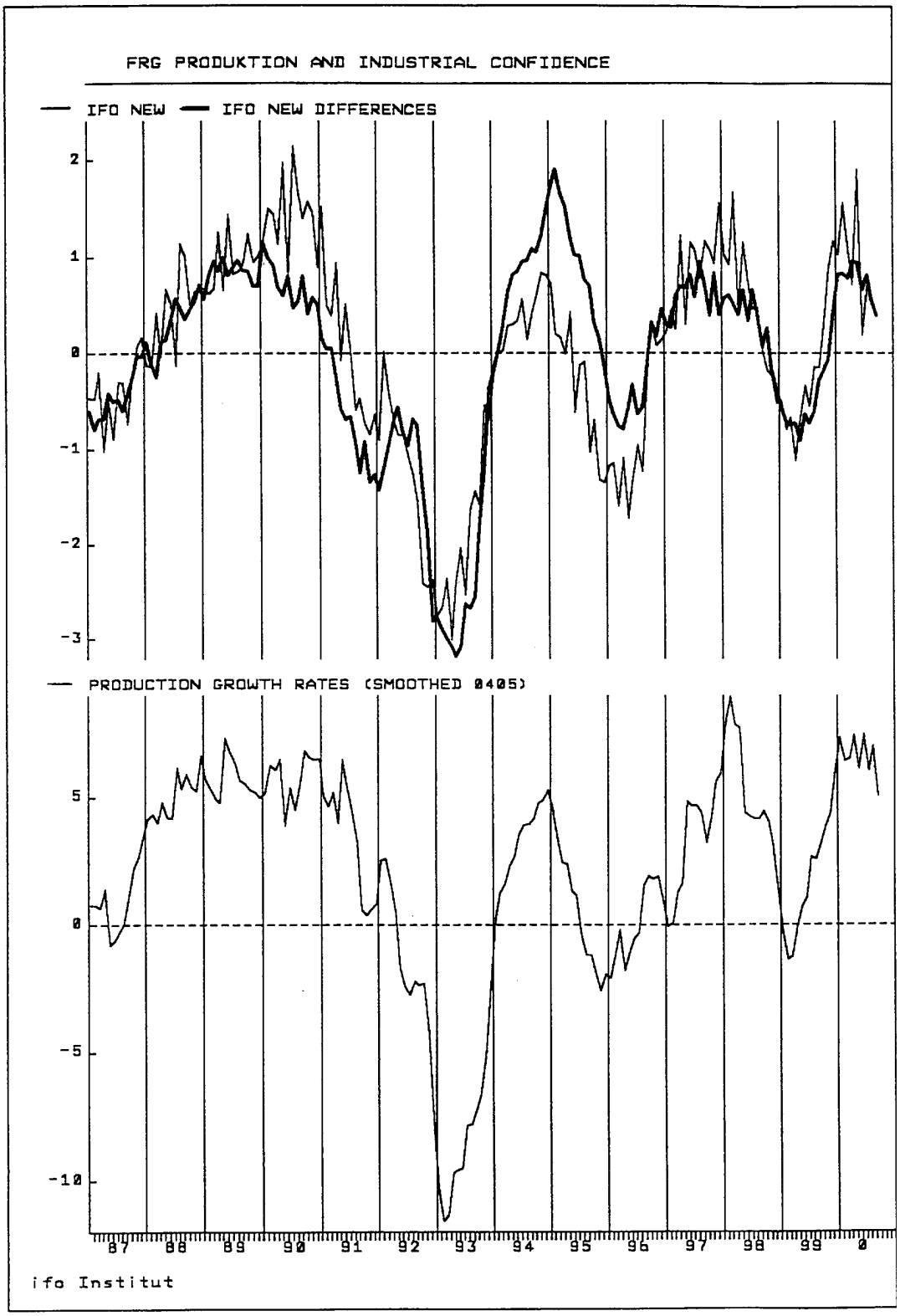
In the following two images (cf. Graph 2.3.4/5 and Graph 2.3.4/6) the smoothing effects for two ranges differing in length are displayed using the difference-based overall indicator for the German economy. In this case two extremely volatile turning points are passed, the indicator is cut out and subsequently, smoothing takes place. Whereas the values smoothed with the longer range indicate the turning points timely and reliably, the values smoothed with the shorter range make it difficult to identify turning points due to the pronounced irregularity.

The next two images (see Graph 2.3.4/7 and Graph 2.3.4/8) compare the overall indicators for Germany and the EU which are smoothed with the new 4/11 filter with the Commission's corresponding indicators. In addition the smoothed reference series are displayed. The images illustrate a considerably better performance of the new indicators, on the one hand, and their lead over the reference series, on the other. In the example of the indicator for the EU economy, there is a lead at all turning points, while the German indicator does not have a lead at all turning points.

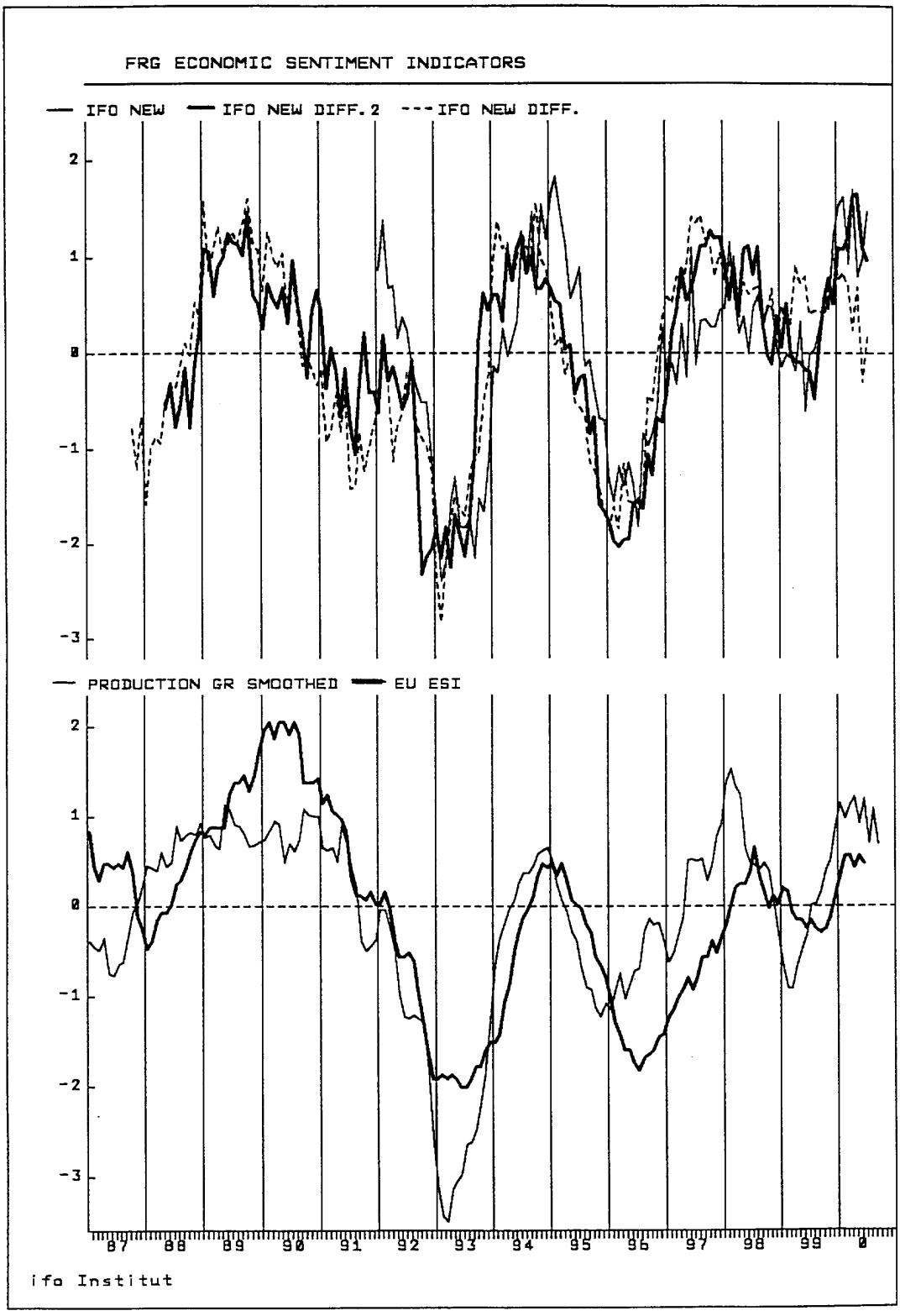
Graph 2.3.4/1


FRG PRODUCTION AND ALT. ECONOMIC SENTIMENT INDICATORS
IFO NEW APPROACH
IFO NEW APPROACH FROM DIFFERENCES
2
1
0
-1
-2
-3
PRODUCTION GR SMOOTHED
EU ESI
2
1
0
-1
-2
-3
87
88
89
90
91
92
93
94
95
96
97
98
99
0
ifo Institut

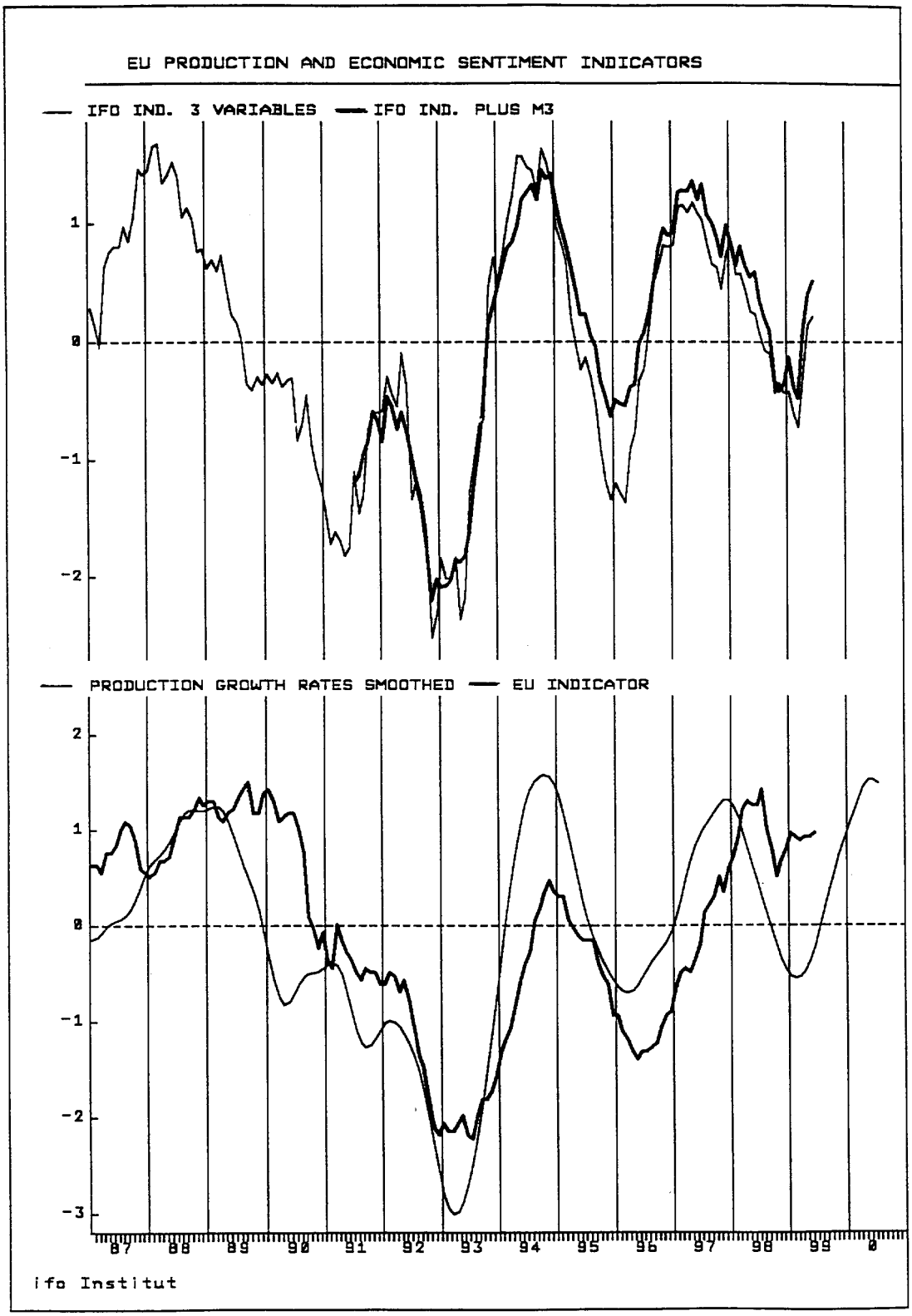
Graph 2.3.4/2


FRG PRODUKTION AND INDUSTRIAL CONFIDENCE
IFO NEW
IFO NEW DIFFERENCES
2
1
0
-1
-2
-3
PRODUCTION GROWTH RATES (SMOOTHED 0405)
5
0
-5
-10
87
88
89
90
91
92
93
94
95
96
97
98
99
0
ifo Institut

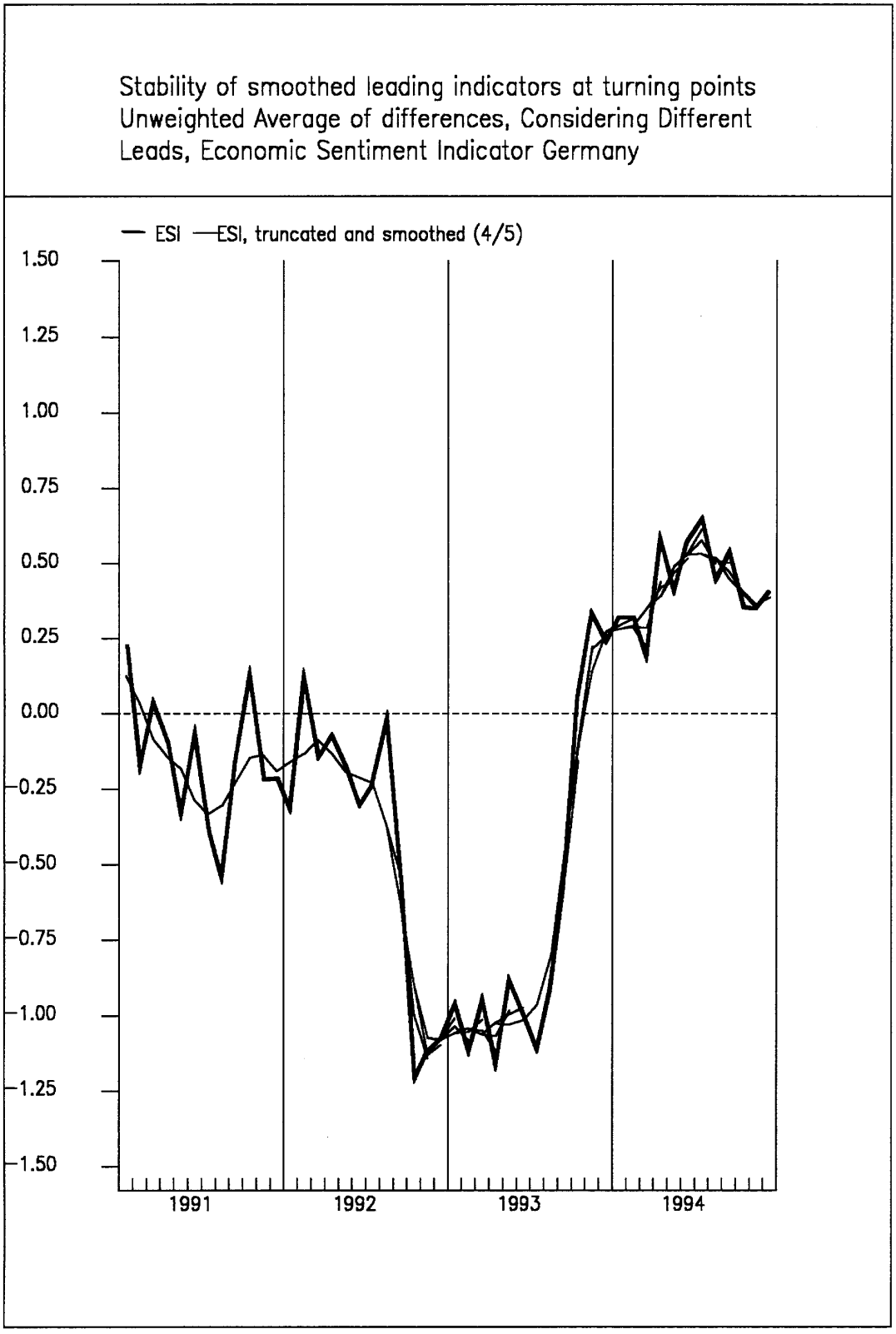
Graph 2.3.4/3


FRG ECONOMIC SENTIMENT INDICATORS
IFO NEW
IFO NEW DIFF. 2
IFO NEW DIFF.
2
1
0
-1
-2
-3
PRODUCTION GR SMOOTHED
EU ESI
2
1
0
-1
-2
-3
87
88
89
90
91
92
93
94
95
96
97
98
99
0
ifo Institut

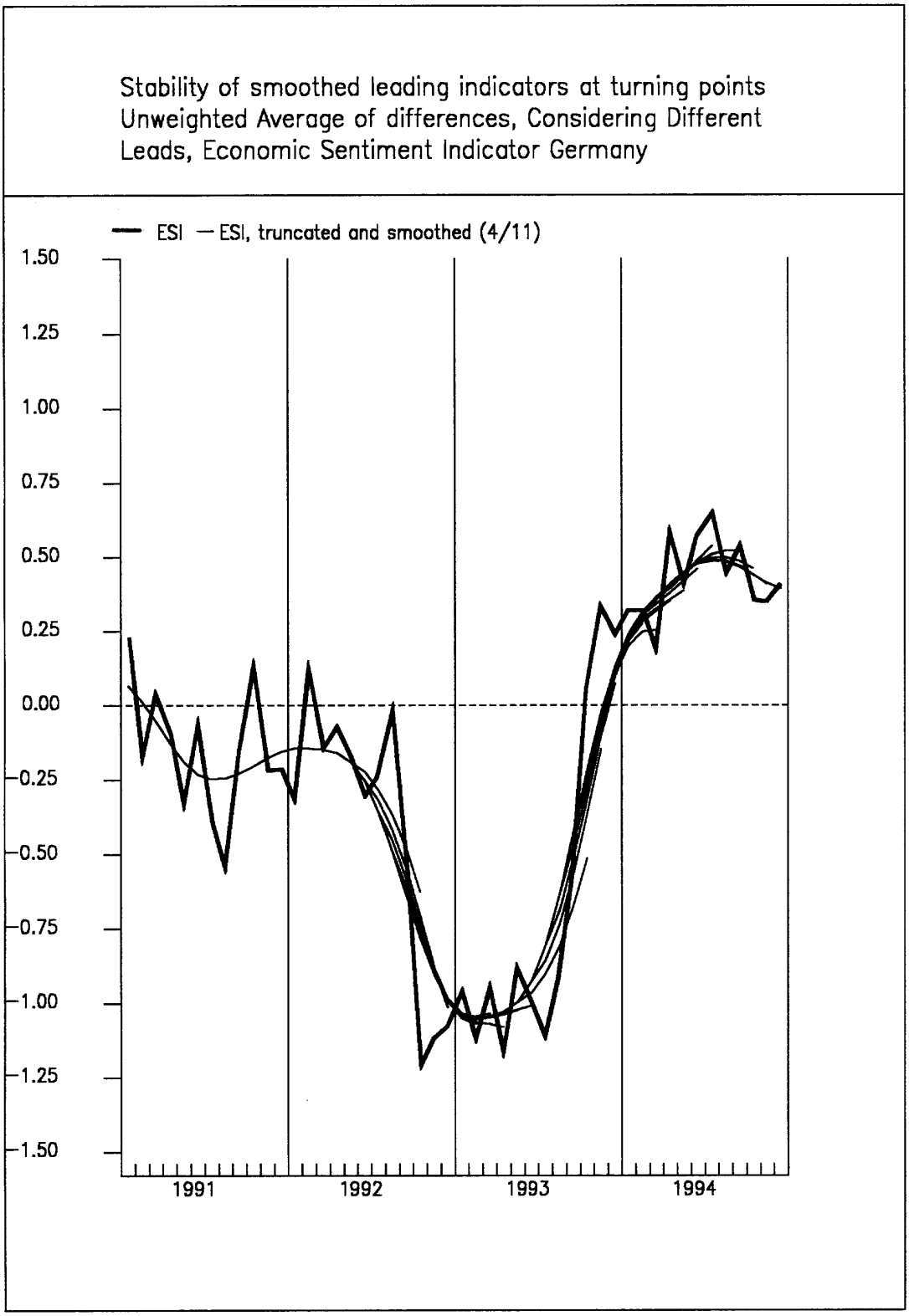
Graph 2.3.4/4


EU PRODUCTION AND ECONOMIC SENTIMENT INDICATORS
IFO IND. 3 VARIABLES
IFO IND. PLUS M3
1
0
-1
-2
PRODUCTION GROWTH RATES SMOOTHED
EU INDICATOR
2
1
0
-1
-2
-3
87
88
89
90
91
92
93
94
95
96
97
98
99
0
ifo Institut

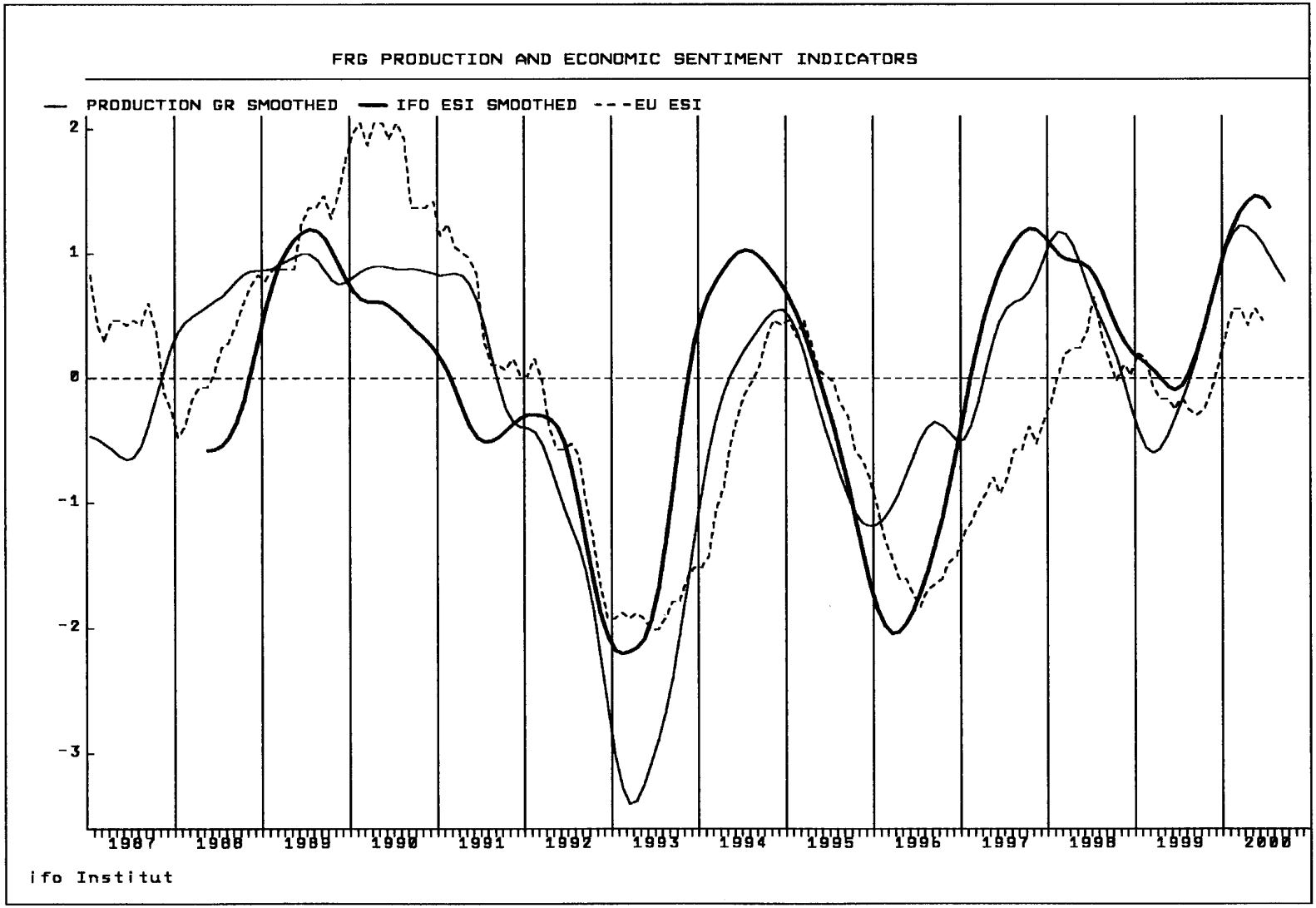
Graph 2.3.4/5


Stability of smoothed leading indicators at turning points
Unweighted Average of differences, Considering Different Leads, Economic Sentiment Indicator Germany
ESI
ESI, truncated and smoothed (4/5)
1.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.50
1991
1992
1993
1994

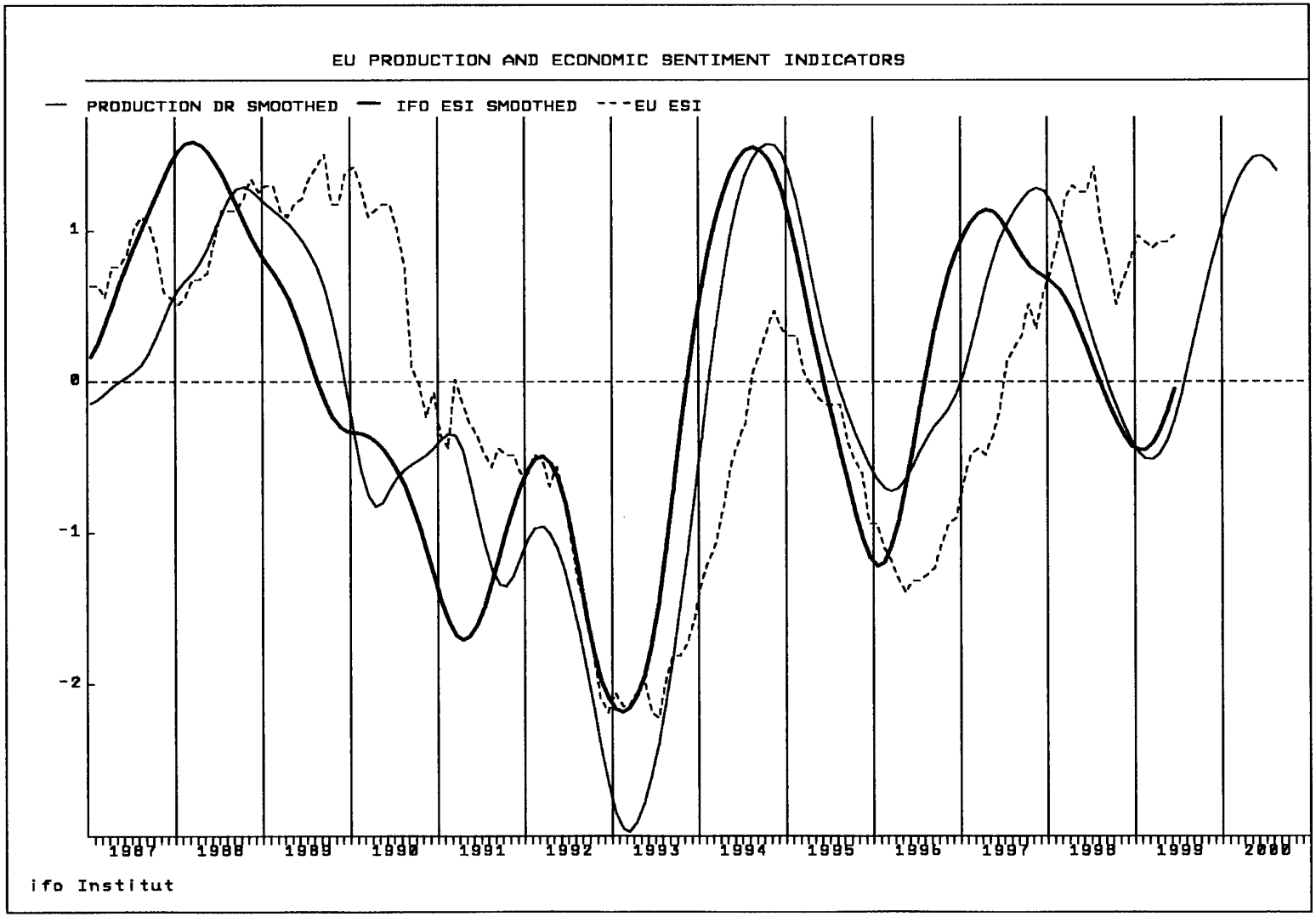
Graph 2.3.4/6


Stability of smoothed leading indicators at turning points
Unweighted Average of differences, Considering Different Leads, Economic Sentiment Indicator Germany
ESI
ESI, truncated and smoothed (4/11)
1.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.50
1991
1992
1993
1994

Graph 2.3.4/7


FRG PRODUCTION AND ECONOMIC SENTIMENT INDICATORS
PRODUCTION GR SMOOTHED
IFO ESI SMOOTHED
EU ESI
2
1
0
-1
-2
-3
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
ifo Institut

Graph 2.3.4/8


EU PRODUCTION AND ECONOMIC SENTIMENT INDICATORS
PRODUCTION DR SMOOTHED
IFO ESI SMOOTHED
EU ESI
1
0
-1
-2
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
ifo Institut

2.3.5 Preliminary conclusions for the construction of EU composite indicators based on the results of the German case study

The regression analytic investigation of the methods used by the EU Commission to develop the leading indicators resulted in several indications of an improved construction procedure. The following suggestions can be derived from the investigation of the German indicators:

In the case of the sector indicators other combinations of the questions available are to be chosen (with the exception of confidence in the construction sector) and lead optimisations and optimisations in terms of transformation are to be implemented in order to achieve a leading indicator with a better correspondence with the reference series. Weighting the sector questions does not seem favourable if exception is made of confidence in the retail trade.

Regression analysis also shows that the EU procedure used to combine the sector indicators into an overall indicator can be improved. The results do not favour standardising the components. The use of the components in their original form or their normalisation produce markedly better results, as further progress is made through taking account of the different leads.

A change in process engineering leads to an additional improvement in the case of some methods. If the components of the indicators are transformed in the same way as the reference series, the original leads of the components over the reference series remain intact. As the quantitative reference series are transformed into growth rates for the purpose of a trend adjustment, the components ought to be transformed (filtered), too. In fact such a procedure entails a longer lead of the indicators, but the reinforced irregular movements caused by the filtering leads to a more volatile indicator so that the advantage resulting from the longer lead is weakened or lost completely. Thus this technique makes it possible to improve consumer sentiment.

With the application of this filtering technique for developing the economic sentiment indicator, an average lead of three months is reached, but there is at maximum only coincidence to be registered at the lower turning points. After lead optimisation the industrial confidence indicator has a lead of three, the consumer confidence indicator as well as the share price have a lead of four, and the construction confidence indicator a lead of thirteen months. Regression analysis results in practically equal weightings of the normalised indicators so that an unweighted average is recommendable, provided that the different leads are taken into account.

Comparable results are to be achieved with the combination of the filtering technique and the normalisation in developing the overall indicator for the EU (15 countries). Here, the use of the qualitative indicators is sufficient and high correspondence rates with the reference series can be achieved if the consumer confidence indicator is in the lead by 25 months (the average lead of the overall indicator again amounts to three months). Including the money supply M1 further improves the result.

It is true that a subsequent smoothing of volatile and thus less expressive indicators with a modern low pass filter leads to adjustments at the end of the indicator in the course of repeated smoothings, but these adjustments almost exclusively concern the level instead of the future economic outlook.