

Ronny Nilsson
OECD
Paris, France
ronny.nilsson@oecd.org

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CONFIDENCE INDICATORS AND COMPOSITE INDICATORS

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by
Ronny Nilsson, OECD

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CONFIDENCE INDICATORS AND COMPOSITE INDICATORS

Keywords: *Business Tendency Surveys, Economic Sentiment Indicators, Confidence Indicators, Composite Indicators, Leading Indicators, Turning Point Analysis, Cross-correlation, Components, Weighting, Normalisation, Smoothing, Months for Cyclical Dominance, Timeliness, Revisions.*

1 Introduction

Most institutes conducting business tendency surveys select a set of survey series and combine them into a single cyclical composite or confidence indicator. This is done in order to reduce the risk of false signals, and to provide a cyclical indicator with better forecasting and tracking qualities than any of its individual components.

The reason why a group of indicators combined into a composite indicator should be more reliable over a period of time than any of its individual components is related to the nature and 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 fluctuation over a period of time in overall activity. The performance of individual indicators will then depend on the causes behind a 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 changes, and to use all potential indicators as a group.

This paper looks into the construction of the economic sentiment indicators calculated by the European Commission (EC) and the composite leading indicators calculated by the OECD. The aim of the paper is to evaluate the current rather coincident performance of the EC Economic Sentiment Indicators for a number of countries and to investigate possibilities of constructing sentiment indicators which would forecast cycles in economic activity with longer lead times. In particular, the following issues are discussed:

- *Selection of component series:* standard set of components for individual countries or aggregates or best performing series for individual countries;
- *Weighting of component series:* different or equal weights for individual components or aggregates;
- *Normalisation of cyclical amplitudes* and *smoothing* of component series;
- *Prompt availability* of component series and *revisions* to components and composite indicators.

The study is restricted to the EC Economic Sentiment Indicators (ESI) and OECD Composite Leading Indicators (CLI) calculated for France, Germany, Italy, the United Kingdom and the European Union as a whole. In Section 2, the performances of the EC ESIs and component series are evaluated over the period 1970-1999. The performances are evaluated both at turning points and over the whole cycle (cross-correlation) against total industrial production as a proxy for economic activity. These results are compared with the performance of the OECD CLIs for the same countries.

A standard set of components is used in the EC system. This set is mainly based on qualitative data from business or consumer tendency surveys. The EC ESI combines the following component series:

- industrial confidence indicator;
- construction confidence indicator;
- consumer confidence indicator;
- share price index.

Section 3 looks into the cyclical performance of the individual component series in order to identify the components with the best leading characteristics. The results of this evaluation are then used as a basis for selection of country specific component series and the construction of alternative ESIs. A set of alternative ESIs for each country is constructed and evaluated in Section 4.

The effect of weighting of component series is also studied in Section 4. Different weights are used in the current EC system. The performances of the current EC ESIs are evaluated against the performance of the same ESIs but with equal weighting for individual component series.

A standard set of components across countries is used in the EC system while the OECD system includes series with best leading performance at turning points for individual countries. In Section 5, the component series used for the construction of the OECD CLIs are investigated and compared with the components used in the EC system.

The basic steps for the calculation of a composite index or confidence index are outlined in Section 6 and differences in methods applied by the OECD and the European Commission are discussed. In particular, the method of normalisation used in the current EC system is discussed. This method standardise each component series so that their average month-to-month changes are equal i.e. by dividing the month-to-month changes with the average month-to-month change. This method however gives little weight to the more irregular series in the cyclical movements of the composite index, unless some prior ad-hoc smoothing is performed. In the current EC system no smoothing is applied to component series and the effect of smoothing of components with a moving average equal to the month for cyclical dominance (MCD) measure, which is used in the OECD system, is studied.

Timeliness and absence of excessive revisions are obvious requirements of good cyclical indicators and these characteristics are also discussed Section 6 in connection with the aggregation of component series for the construction of composite indicators.

Finally, a summary of the main results from each section is presented and some general conclusions about the possibilities of constructing alternative ESIs with better leading performance are discussed.

2 Performance of the EC Economic Sentiment Indicators

The historical cyclical performance of the EC ESIs for France, Italy, the United Kingdom and the European Union as a whole are evaluated over the period 1970-1999. The performances are evaluated both at turning points and over the whole cycle (cross-correlation) against total industrial production as a proxy for economic activity and reference series for dating of cyclical turning points. The performances of the EC ESIs are compared with the performance of the OECD CLIs for the same countries and the EU as a whole. The evaluation results are presented in Table 1 and the cyclical developments of the EC ESIs and the OECD CLIs against the reference series are illustrated in Charts 1-10.

The results of the evaluations of the ESIs show rather coincident performance for all investigated countries and the EU as a whole according to the turning point analysis. The median lead of the ESIs at all turning points against the reference series is in the range of 1 to 3 months for all countries and the EU zone. However, the ESIs for Germany and the EU zone show longer leads at peaks, while the ESI for the United Kingdoms shows a better performance at troughs. The correlation results indicate better performances for Germany, the United Kingdom and the EU zone with leads in the range of 6 to 8 months. The cyclical profiles between the ESIs and the reference series are, however, not very close for any of the countries or the EU zone. In particular, the ESIs for Italy and France show very low correlation coefficients of 0.38 and 0.52 respectively.

In contrast to above results, the OECD CLIs for the same countries and the EU as a whole show in general much better results with longer leads at turning points and a closer correspondence with the reference series over the whole cycle. The median lead of the OECD CLIs at all turning points against the reference series is between 5-10 months for the EU zone and all countries except Germany. The lead is, in addition, rather good at both peaks and troughs for the EU zone and all countries except Germany which shows shorter leads at troughs and the United Kingdom, which shows shorter, leads at peaks. The cyclical profiles between the OECD CLIs and the reference series are very good with correlation coefficients in the range of 0.67 to 0.83 for all countries and the EU zone.

The construction of composite cyclical or leading indicators such as the EC ESI and the OECD CLI is the main objective of a cyclical indicator system, but the type of component series used in international indicator systems may be quite different. A standard set of indicators across countries may be used or an individual set of indicators per country may be used. An indicator system may be almost totally dependent on qualitative business and consumer survey series such as the EC system or based solely on quantitative statistical series which is the rule in the United States. The OECD system makes use of a blend of both qualitative business survey series and quantitative statistical series.

The use of a standard set of indicators across countries is a good approach for obtaining international comparability. However, cyclical indicators, which perform well in one country may not work well in another because of differences in economic structure and statistical system.

The EC ESI is calculated on a standard set of indicators while the OECD CLI is based on individually selected leading indicators for each country. The above results point in favour of the OECD CLI in comparison to the EC ESI and in the following section we will look into alternative combinations of component series for the construction of the EC ESI in order to improve the forecasting capacity for individual countries.

Table 1 Historical Performance of EC Economic Sentiment Indicators and OECD Composite Leading Indicators over the period 1970-1999

Zone/Country/ Composite Indicator	Performance 1970-1999 Against ratio to trend of industrial production						
	Extra (x) or missing (m) cycles	Turning point analysis Median lag (+) in months at			Mean absolute deviation around median	Cross-correlation	
		Peak	Trough	All turning points		Months Lag (+)	Peak value
France OECD Composite Leading Indicator		-8	-6	-6	6.1	-8	0.78
EC Economic Sentiment Indicator		-3	0	-1	12.0	-3	0.52
Germany OECD Composite Leading Indicator	1x	-6	-1.5	-2	4.6	-4	0.72
EC Economic Sentiment Indicator	1x	-7	-0.5	-2	5.8	-6	0.62
Italy OECD Composite Leading Indicator		-10	-9	-9.5	4.4	-9	0.79
EC Economic Sentiment Indicator		-2	0	-1	7.1	-3	0.38
United kingdom OECD Composite Leading Indicator	2m	-2	-7	-5	6.8	-11	0.67
EC Economic Sentiment Indicator	2m	-1	-5	-3	4.9	-8	0.68
European Union OECD Composite Leading Indicator		-7	-6	-7	4.1	-8	0.83
EC Economic Sentiment Indicator		-5	-2	-2	4.8	-6	0.61

Chart 1

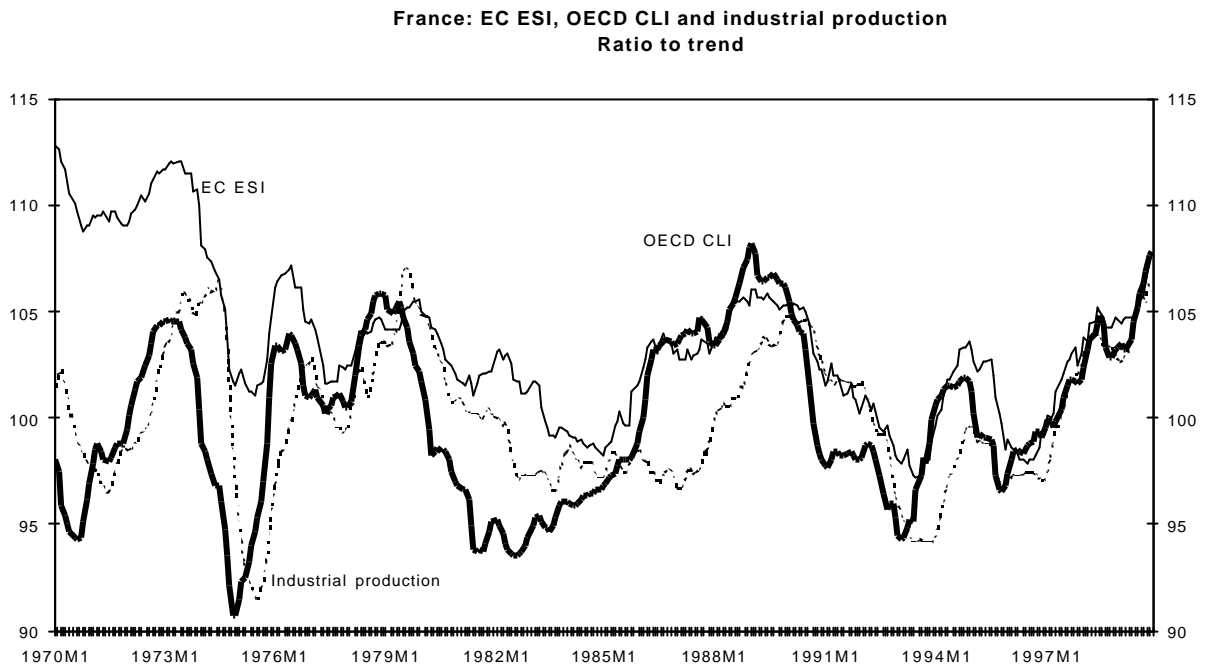


Chart 2

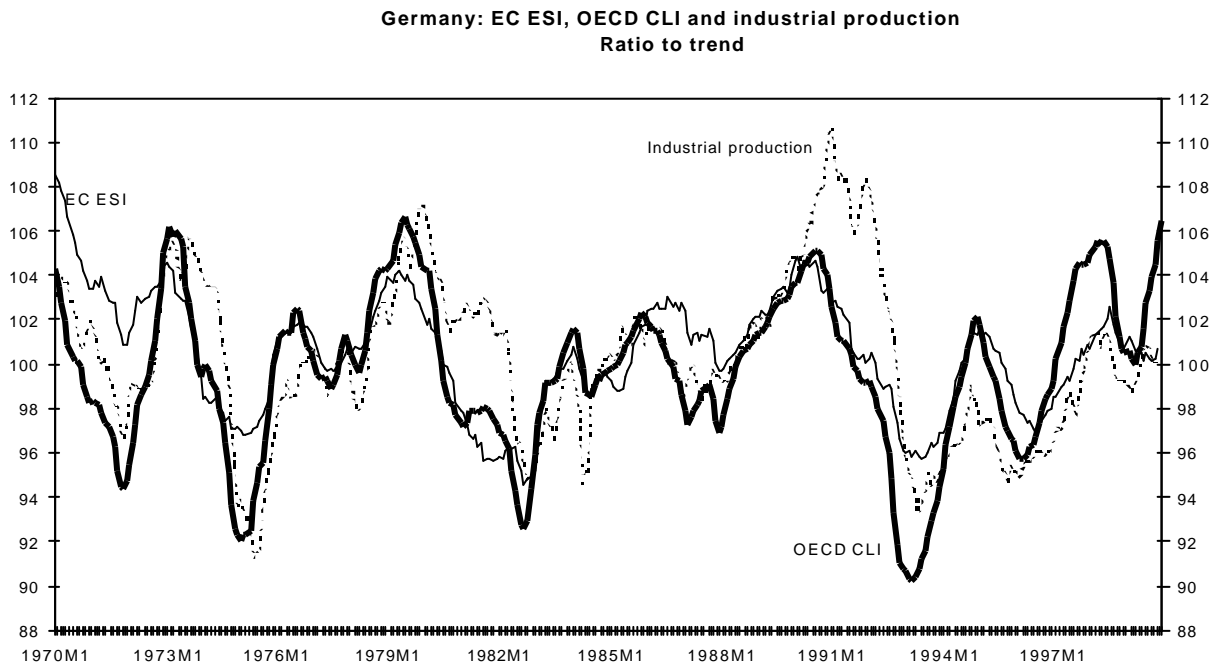


Chart 3

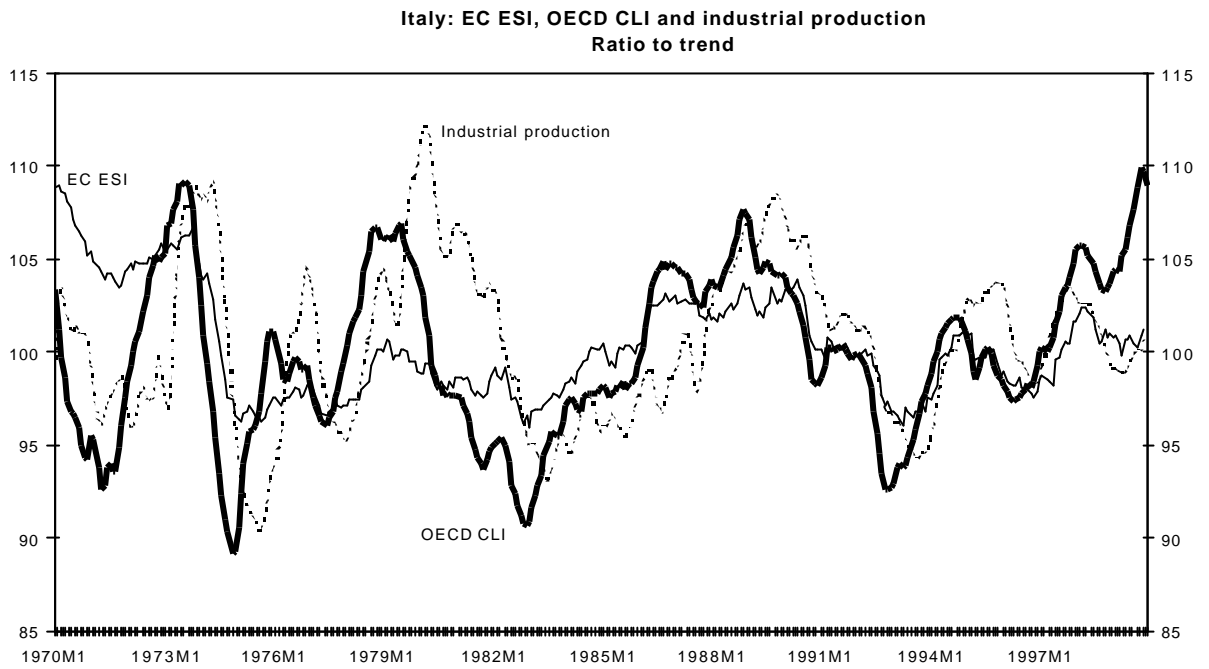


Chart4

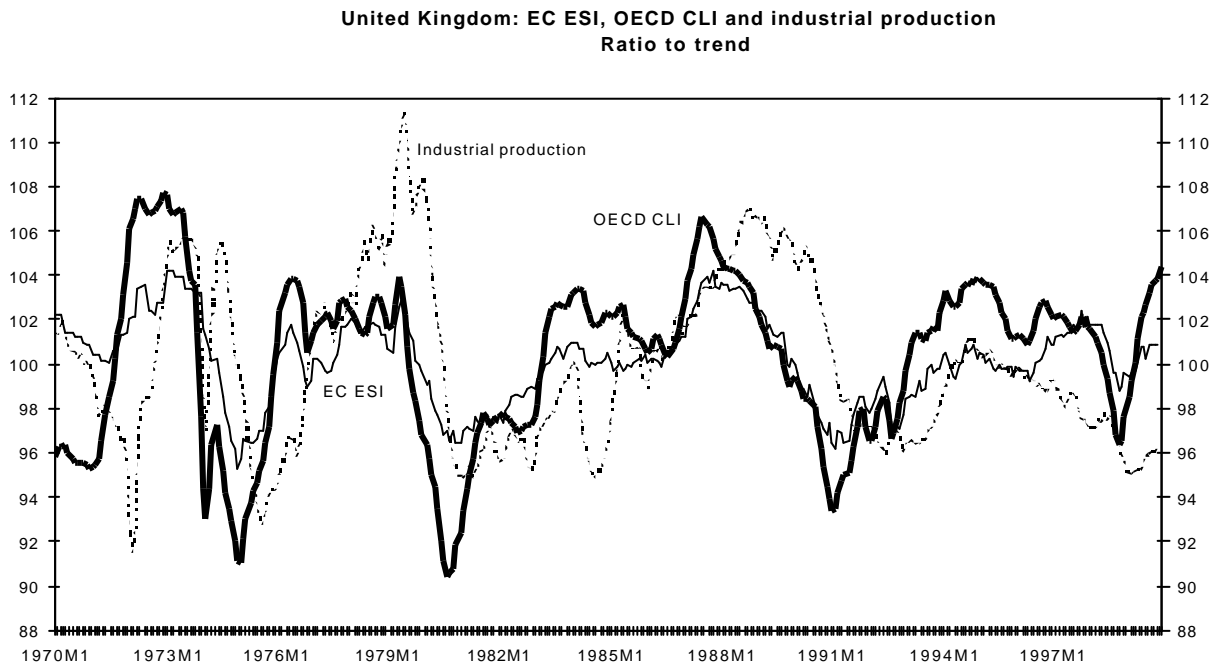
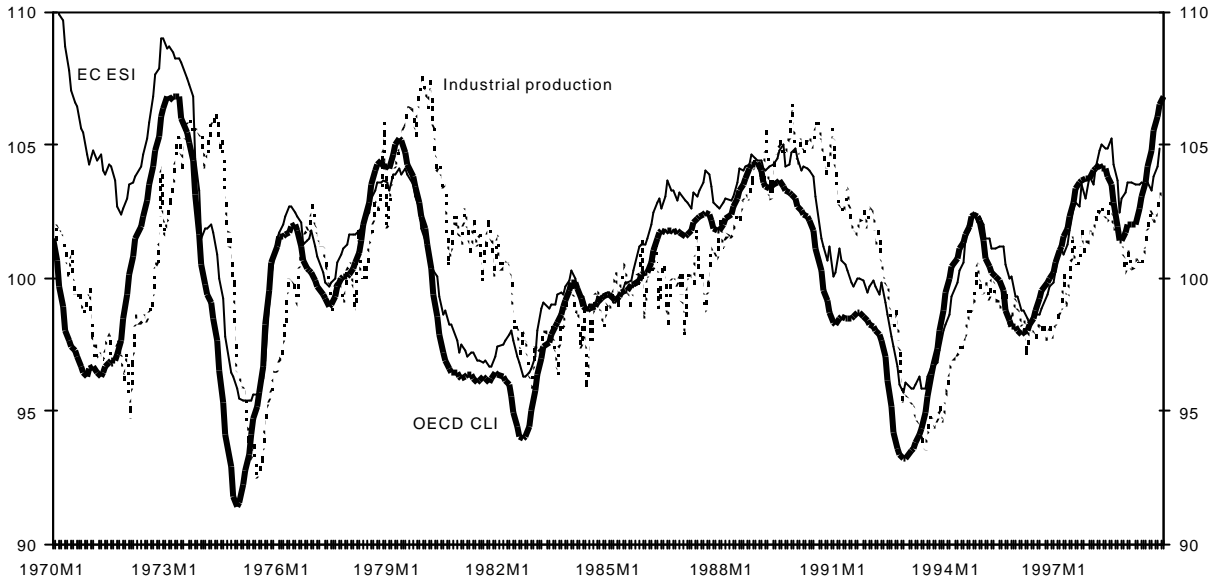


Chart 5

European Union: EC ESI, OECD CLI and industrial production
Ratio to trend



3 Performance of component series included the EC Economic Sentiment Indicators

A standard set of components is used in the EC system. This set is mainly based on qualitative data from business or consumer tendency surveys. The EC ESI combines the following component series:

- industrial confidence indicator (ICI);
- construction confidence indicator (CCI);
- consumer confidence indicator (CSCI);
- share price index (SPI).

The industrial confidence indicator is the arithmetic average of the answers (balances) to the question on production expectations, order books and stocks of finished goods (inverted). The construction confidence indicator is the arithmetic average of the answers (balances) to the questions on order books and employment expectations. The consumer confidence indicator is the arithmetic average of the answers (balances) to the four questions: on the financial situation of households; on the past and future general economic situation; and on the advisability of making major purchases (of consumer durable).

Different weights are used in the current EC system. The components are divided into two groups with equal weights to components in each group. The first group contains the industrial confidence indicator and the consumer confidence indicator, and the second group includes the construction confidence indicator and the share price index. The components in the second group are given half the weight of the components in the first group.

The results of the evaluation of the ESIs in section two showed rather coincident performances for all investigated countries. In this section, the cyclical performances of the individual component series are investigated in order to identify the components in each country with the best leading characteristics. The results of this evaluation are then used as a basis for selection of country specific component series and the construction of alternative economic sentiment indicators.

The historical performances of the ESIs and its component over the period 1970-1999 for France, Germany, Italy and the United Kingdom are set out in Table 2 and the cyclical profiles of the confidence indicator components are presented in Charts 6 - 9. The cyclical performance of the ESIs and its components are evaluated against industrial production as reference series.

The results for *France* show a rather coincident relationship between the reference series and two of the components, namely the industrial confidence indicator and the construction confidence indicator. Both series show a lead of only 1-2 months but a good correspondence with the reference series with correlation coefficients around 0.70. The consumer confidence indicator and the share price index, however, show good leads of 6-8 months according to the median lag, but show rather weak correspondence with the reference series with correlation coefficients of about 0.50.

The evaluation measures for *Germany* indicate different performances for two of the components. According to the median lag, the construction confidence indicator shows a long lead of 10 months against the reference series but only a 3 months lead as measured by the correlation lag. On the other hand, the consumer confidence indicator shows a zero lag according

to the median but a long lead of 16 months as measured by the correlation lag. The industrial confidence indicator shows a coincident relationship with the reference series on both measures while the share price index shows a lead of 6 and 11 months on the two measures but the correlation is rather weak with a correlation coefficient of only 0.35.

In the case of *Italy*, the share price index shows no correspondence at turning points with the reference series and the correlation results are not significant. The construction confidence indicator shows coincident behaviour with a short lead of 2 months according to the median but a lag of 1 month as measured by the correlation lag. The industrial confidence indicator shows a lead of 5 months according to median and a good correspondence with the reference series with a correlation coefficient of 0.70. A lead of 10 months is registered for the consumer confidence indicator but the relationship with the reference series is rather weak with a correlation coefficient of 0.41.

Three of the four component series for the *United Kingdom* show rather long leads in the range of 6-12 months as measured with both the median lag and the peak-correlation lag. Only the construction confidence indicator shows a shorter lead of 1 month as measured by the median but register a 6 months lead according to the peak-correlation lag. All components, with exception of the consumer confidence indicator, show a rather good correspondence with the reference series with correlation coefficients in the range of 0.60 - 0.77.

Table 2 Historical Performance of EC Economic Sentiment Indicator and components

Zone/Country/ Composite Indicator	Components	Performance 1970-1999						
		Extra (x) or missing (m) cycles	Turning point analysis			Mean absolute deviation around median	Cross- correlation	
			Median lag (+) in months at		All turning points		Months Lag (+)	Peak value
Peak	Trough							
France EC Economic Sentiment Indicator			-3	0	-1	12.0	-3	0.52
	EC Industrial Confidence Indicator		-3	1.5	0	7.4	-2	0.67
	EC Construction Confidence Indicator		-1	3.5	-1	13.9	-1	0.71
	EC Consumer Confidence Indicator		-8.5	-6	-6	10.9	-3	0.48
	Share price index		-7	-8	-8	5.9	-7	0.51
Germany EC Economic Sentiment Indicator			-7	-0.5	-2	5.8	-6	0.62
	EC Industrial Confidence Indicator		-1	-1	-1	4.5	-2	0.67
	EC Construction Confidence Indicator		-8	-12.5	-10	13.1	-3	0.61
	EC Consumer Confidence Indicator		-7	3	-2	10.9	-16	0.58
	Share price index		-9	-4.5	-6	6.1	-11	0.35
Italy EC Economic Sentiment Indicator			-2	0	-1	7.1	-3	0.38
	EC Industrial Confidence Indicator		-7	-4.5	-5	3.9	-3	0.70
	EC Construction Confidence Indicator		-0.5	-5.5	-1.5	7.6	+1	0.53
	EC Consumer Confidence Indicator		-14.5	-7	-7	17.1	-10	0.41
	Share price index		nc	nc	nc	nc	nc	ns
United kingdom EC Economic Sentiment Indicator			-1	-5	-3	4.9	-8	0.68
	EC Industrial Confidence Indicator		-4.5	-6	-6	7.8	-8	0.61
	EC Construction Confidence Indicator		0	-2	-1	5.9	-6	0.77
	EC Consumer Confidence Indicator		-6	-4.5	-6	8.8	-12	0.44
	Share price index		-10	-2.5	-8	9.1	-11	0.59

nc = no correspondence ns = not significant

Chart 6

**France: EC Confidence Indicators
Balance**

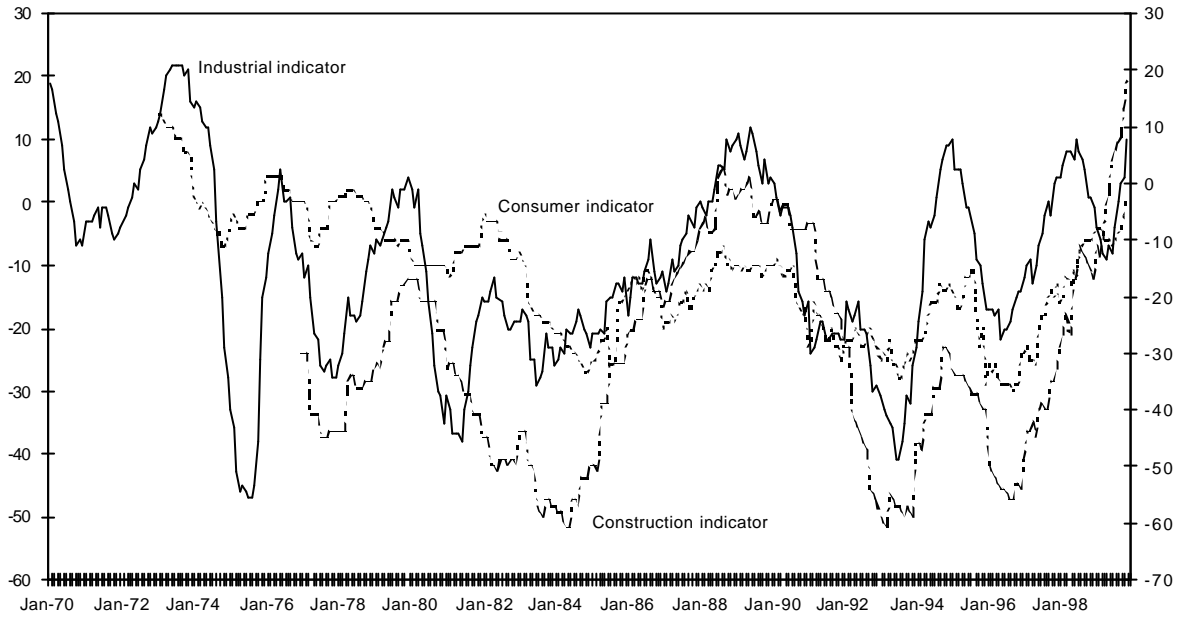


Chart 7

**Germany: EC Confidence Indicators
Balance**

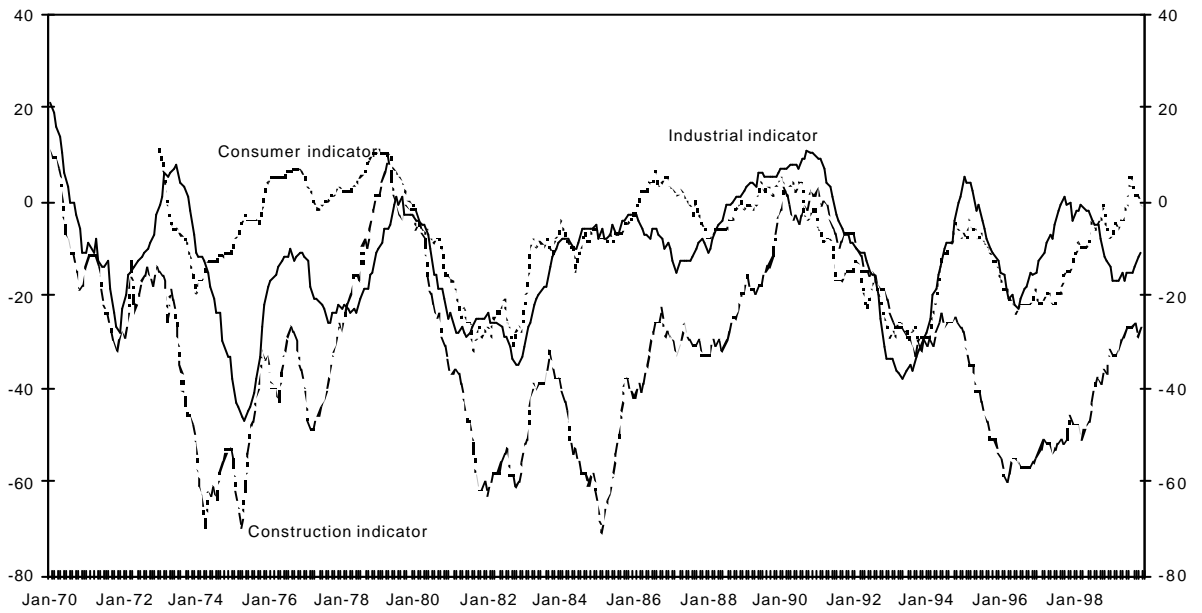


Chart 8

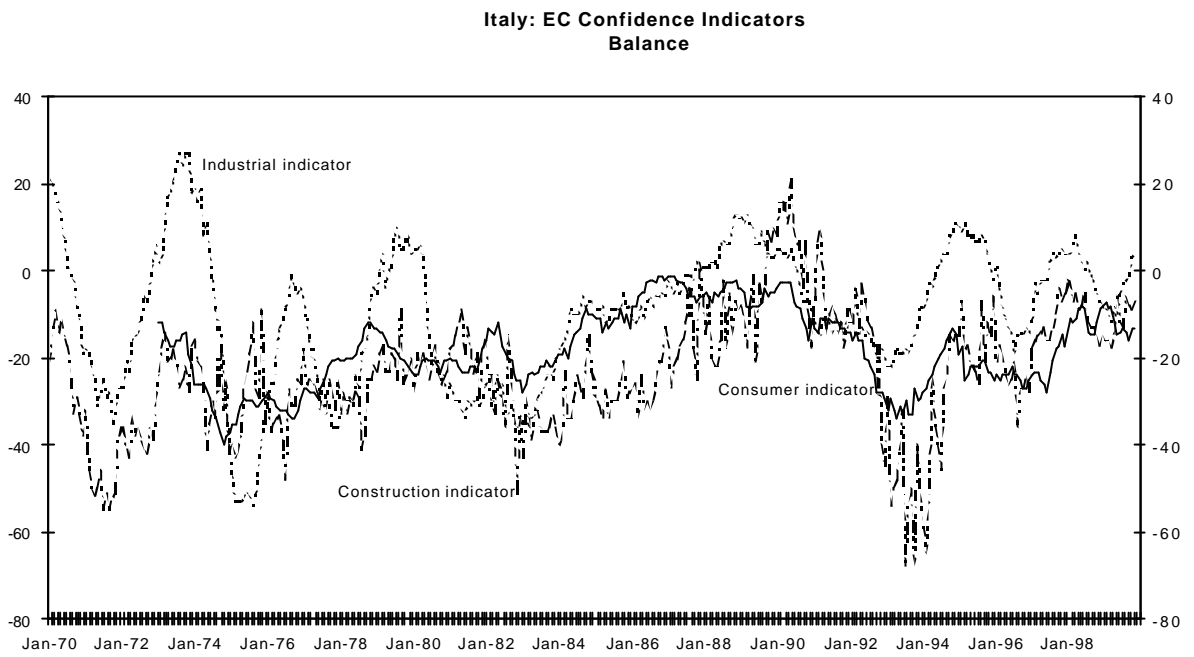
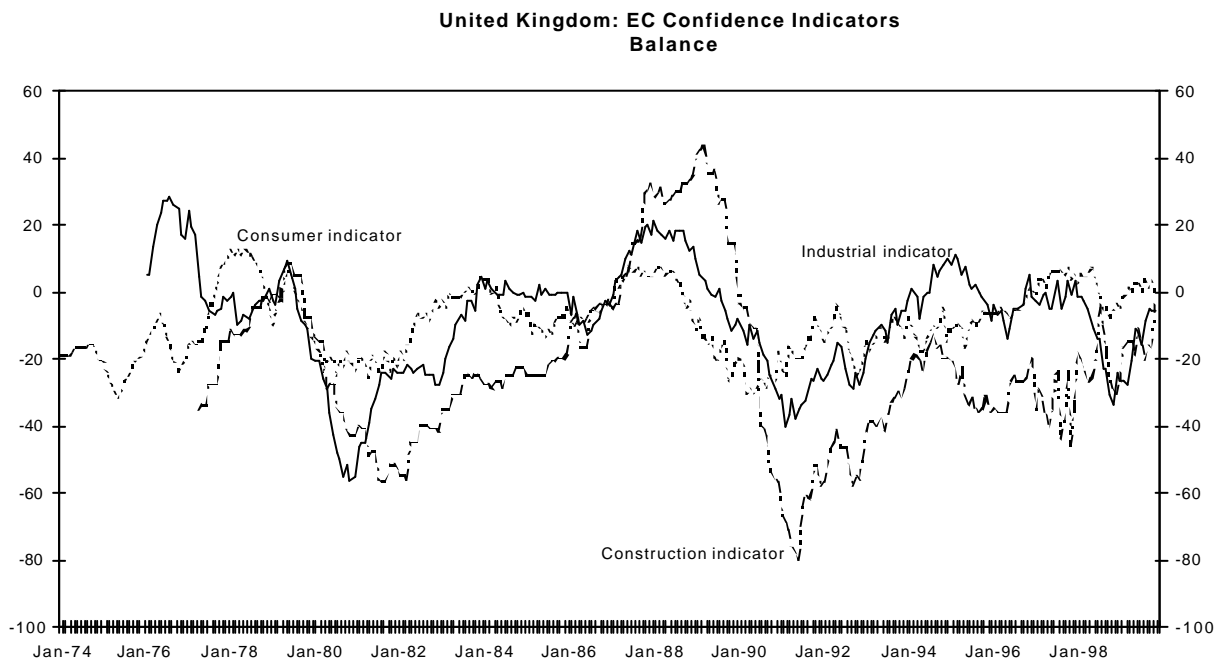


Chart 9



4 Construction and performance of alternative economic sentiment indicators

The results obtained in section three indicate that it may be possible to improve the cyclical performance by selecting and combining only the best components for each country. The historical performances of different sets of alternative ESIs are presented in Table 3.

The existing EC ESI use different weights for the aggregation of component series as noted above. However, if only the best components are selected and combined it would be reasonable to give equal weights to the components and the alternative ESIs evaluated are constructed with equal weights for the different components.

France: Alternative Economic Sentiment Indicators

The four alternative ESIs evaluated for France include the following components:

ESI1	Industrial confidence indicator (ICI) Construction confidence indicator (CCI) Consumer confidence indicator (CSCI) Share price index (SPI)
ESI2	ICI, CSCI, SPI
ESI3	ICI, SPI
ESI4	CSCI, SPI

ESI1 includes the same four components as the existing EC ESI only the weighting system is different between the two indicators. The performance of the ESI1 over the period 1970-99 shows no major differences compared to the EC ESI. Both indicators show coincident relationships with the reference series at all turning points and a short lead of 3-4 months at peaks. However, the ESI1 shows a lag of 3 months at troughs while the EC ESI shows zero lag. On the other hand, the ESI1 registers much higher correlation against the reference series with a correlation coefficient of 0.68 compared to 0.52 for the EC ESI.

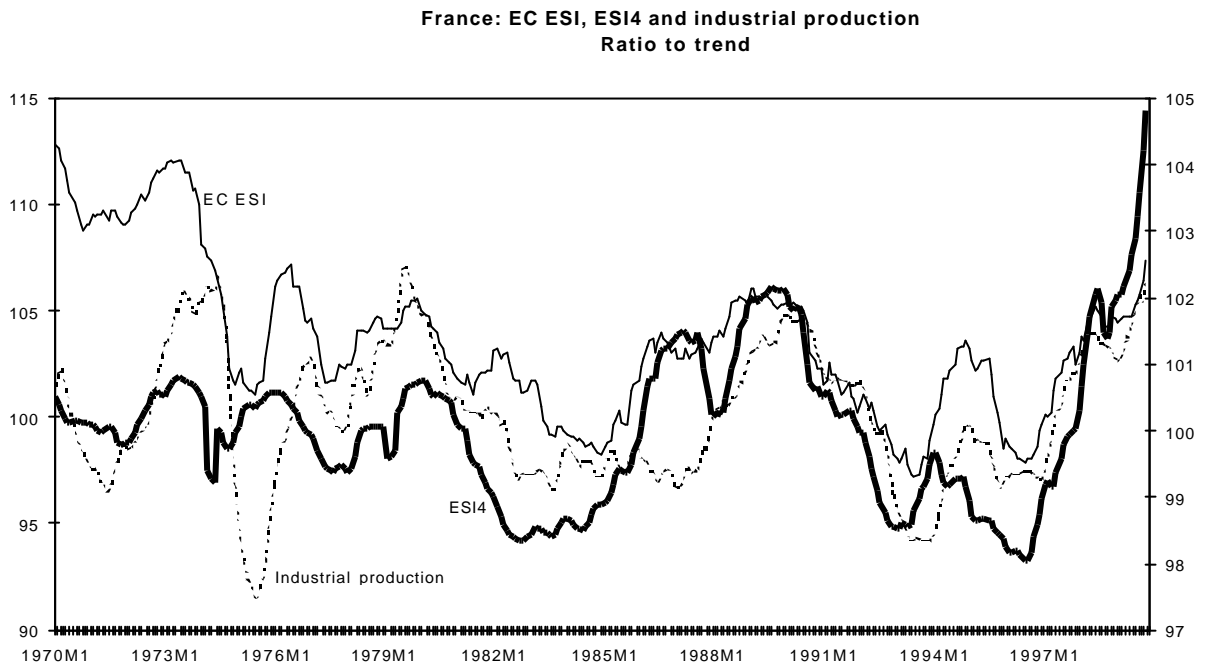
ESI2 includes three of the components in ESI1 with the longest leads against the reference series and excludes the shorter leading construction confidence indicator. However, this indicator shows no improvement in terms of lead times compared to the EC ESI but the correspondence with the reference series is clearly better with a correlation coefficient of 0.72.

Only two components are included in the ESI3, the industrial confidence indicator and the share price index. The performance of this indicator shows more or less the same results as the ones registered for ESI2.

ESI4 includes the consumer confidence indicator and the share price index, the two components with the longest leads against the reference series. The consumer confidence indicator is only available from 1977 and the evaluation of the ESI4 is performed for the period 1977-99 for which both components are available and the period 1970-99. The results show a clear improvement in terms of lead times in comparison to the all other sentiment indicators. The lead at all turning points is 4 months and at the lead at peaks as long as 10 months. In comparison, the EC ESI for the period 1977-99 shows zero lag at both all turning points and at peaks and a lag of 3 months at troughs.

These results indicate, that the use of equal weights for components is not improving the performance of ESI1 compared the EC ESI, which use different weights for groups of components. However, an alternative sentiment indicator for France (ESI4) with better leading performance than the existing EC ESI could be constructed by selecting only the two component series with the longest lead included in this indicator (Chart 10).

Chart 10



Germany: Alternative Economic Sentiment Indicators

The five alternative ESIs evaluated for Germany include the following components:

- ESI1 Industrial confidence indicator (ICI)
Construction confidence indicator (CCI)
Consumer confidence indicator (CSCI)
Share price index (SPI)
- ESI2 ICI, CCI, CSCI
- ESI3 ICI, CCI, SPI
- ESI4 ICI, CCI
- ESI5 CCI, SPI

ESI1 includes the same four components as the existing EC ESI only the weighting system is different between the two indicators. The performance of the ESI1 over the period

1970-99 shows no major differences compared to the EC ESI. Both indicators show coincident relationships with the reference series at all turning points and troughs, but a lead of 7 months at peaks.

All other alternative ESIs with different combinations of component series included in the EC ESI show about the same performance as the ESI1. Not even the ESI5, which only includes the two components with the longest leads against the reference series namely, the construction confidence indicator and the share price index, show an improved leading behaviour in comparison with any of the other ESIs.

These results indicate that it is difficult to construct an economic sentiment indicator for Germany with better performance than the existing EC ESI only by selecting and combining the component series included in this indicator.

Italy: Alternative Economic Sentiment Indicators

The two alternative ESIs evaluated for Italy include the following components:

ESI1	Industrial confidence indicator (ICI) Construction confidence indicator (CCI) Consumer confidence indicator (CSCI)
ESI2	ICI, CSCI

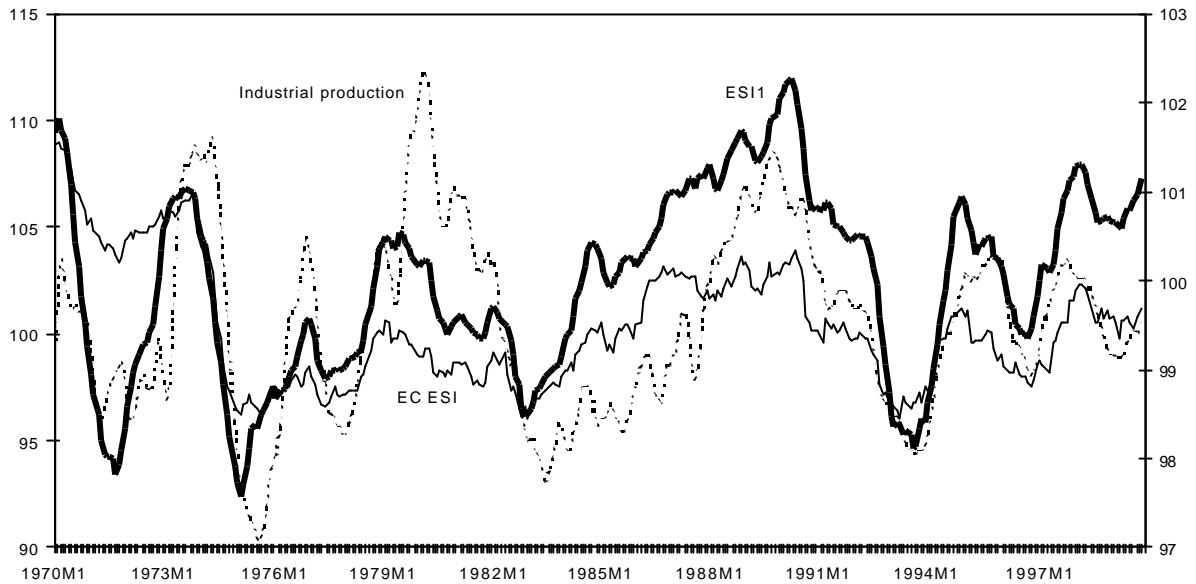
The ESI1 includes three of the four components used in the EC ESI, it excludes the share price index, which shows no correspondence with the cyclical development of the reference series. This alternative sentiment indicator shows an average lead of 5 months at all turning points and peaks and 4 months at troughs over the period 1970-99. This performance is much better than the one registered for the EC ESI, which shows a coincident relationship with the reference series. In addition, the correspondence between the ESI1 and the reference series is rather good with a correlation coefficient of 0.65 compared to 0.38 for the EC ESI.

An even better cyclical performance is obtained if only the two components of the ESI1 with longest leads against the reference series are combined. These components are the industrial confidence indicator and the consumer confidence indicator which are included in the ESI2. This indicator shows an average lead of about 7 months at all turning points and at troughs and a lead of over 10 months at peaks. The correspondence with the reference series is also good with a correlation of 0.62.

These results show that alternative potential sentiment indicators for Italy with better leading performance than the existing EC ESI could be constructed. A first such indicator (ESI1) includes three of the four components used in EC ESI, but excludes the share price index, which shows no correspondence with the reference series. A second potential sentiment indicator includes only the two components with the longest leads against the reference series (Chart 11).

Chart 11

Italy: EC ESI, ESI1 and industrial production
Ratio to trend



United Kingdom: Alternative Economic Sentiment Indicators

The six alternative ESIs evaluated for the United Kingdom include the following components:

- ESI1 Industrial confidence indicator (ICI)
Construction confidence indicator (CCI)
Consumer confidence indicator (CSCI)
Share price index (SPI)
- ESI2 ICI, CSCI, SPI
- ESI3 ICI, CCI, SPI
- ESI4 ICI, CCI
- ESI5 ICI, SPI
- ESI6 ICI, CSCI

The evaluations of the first four alternative sentiment indicators are performed both over the period 1970-99 and 1976-99. This is done because only data for the share price index is available back to 1970 while data for other components start between 1974 and 1977. The results for the period 1976-99 are more representative for the performance of the alternative sentiment indicators and are commented on in the following.

ESI1 includes the same four components as the existing EC ESI only the weighting system is different between the two indicators. The cyclical performance of this potential sentiment indicator over the period 1977-99 shows an average lead of 3 months at all turning points, an average lead of 5 months at troughs and 1 month at peaks. This performance is slightly

better than the one registered for the EC ESI, which shows a more coincident behaviour with an average lead of 1 months at all turning points (Chart 12).

The two alternative sentiment indicators (ESI2 and ESI3) with different combinations of three of the components included in the EC ESI show about the same performance as ESI1.

An even better performance is obtained if only two of the best components with the longest leads against the reference series are combined. Different combinations of these components are included in sentiment indicators ESI4, ESI5 and ESI6. The best performance is registered for ESI5, which includes the industrial confidence indicator and the share price index. This indicator shows an average lead at all turning points of close to 10 months, an average lead of 11 months at troughs and over 7 months at peaks.

These results show that alternative ESIs for the United Kingdom with better leading performance than the existing EC ESI could be constructed. Only by introducing an equal weighting system of the components included in EC ESI gave an indicator (ESI1) with better leading performance. However, the best performance was obtained when combining only two of the three components with the longest leads against the reference series.

Chart 12

United Kingdom: EC ESI, ESI1 and industrial production Ratio to trend

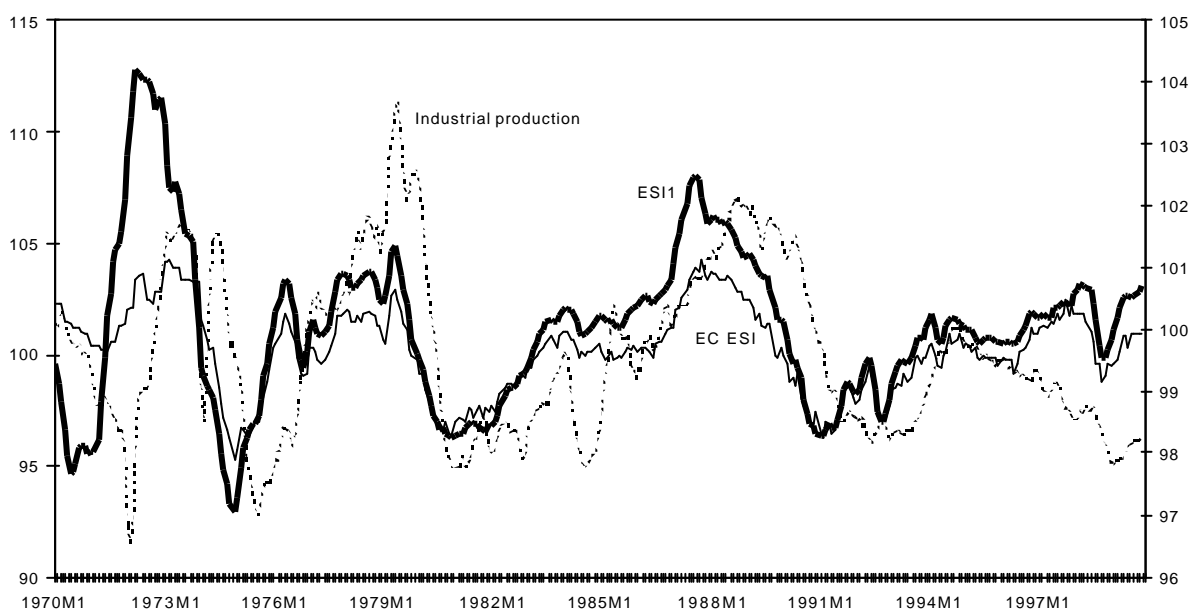


Table 3 Historical Performance of Different Sets of Sentiment Indicators

Country/ Sentiment Indicator	Number of series	Components	Weighting system	Performance 1970-1999						
				Turning point analysis				Cross-correlation		
				Median lag (+) in months at			Mean absolute deviation around median	Test period	Months Lag (+)	Peak value
				Peak	Trough	All turning points				
France EC Economic Sentiment Indicator	4	ICI, CCI, CSCI, SPI	Different weights	-3	0	-1	12.0	1970-99	-3	0.5
				0	3.5	0	13.9	1977-99	-1	0.7
ESI1	4	ICI, CCI, CSCI, SPI	Equal weights	-4	3	-1	7.9	1970-99	-3	0.6
ESI2	3	ICI, CSCI, SPI	Equal weights	-3	4	-1	7.9	1970-99	-2	0.7
ESI3	2	ICI, SPI	Equal weights	-3	4	-1	7.7	1970-99	-3	0.7
ESI4	2	CSCI, SPI	Equal weights	-10	1.5	-4	7.9	1970-99	-6	0.5
				-10	-0.5	-4	7.8	1977-99	-3	0.6
Germany EC Economic Sentiment Indicator	4	ICI, CCI, CSCI, SPI	Different weights	-7	-0.5	-2	5.8	1970-99	-6	0.6
ESI1	4	ICI, CCI, CSCI, SPI	Equal weights	-7	-1	-1	7.6	1970-99	-7	0.6
ESI2	3	ICI, CCI, CSCI	Equal weights	-7	0.5	0	7.9	1970-99	-4	0.6
ESI3	3	ICI, CCI, SPI	Equal weights	-6	-1	-1	7.0	1970-99	-5	0.7
ESI4	2	ICI, CCI	Equal weights	-5	-0.5	-1	5.6	1970-99	-2	0.7
ESI5	2	CCI, SPI	Equal weights	-6	-1.5	-2	7.5	1970-99	-8	0.6
Italy EC Economic Sentiment Indicator	4	ICI, CCI, CSCI, SPI	Different weights	-2	0	-1	7.1	1970-99	-3	0.3
ESI1	3	ICI, CCI, CSCI	Equal weights	-4	-5	-5	5.4	1970-99	-3	0.6
ESI2	2	ICI, CSCI	Equal weights	-10.5	-6.5	-7.5	5.7	1970-99	-4	0.6
United kingdom EC Economic Sentiment Indicator	4	ICI, CCI, CSCI, SPI	Different weights	-1	-5	-3	4.9	1970-99	-8	0.6
				-0.5	-3	-1	5.3	1976-99	-8	0.6
ESI1	4	ICI, CCI, CSCI, SPI	Equal weights	-7	-8	-8	7.1	1970-99	-11	0.7
				-1	-5	-3	6.4	1976-99	-9	0.7
ESI2	3	ICI, CSCI, SPI	Equal weights	-7.5	-8	-8	7.2	1970-99	-11	0.6
				-1	-5	-3	7.1	1976-99	-10	0.6
ESI3	3	ICI, CCI, SPI	Equal weights	-7	-8	-8	7.8	1970-99	-11	0.7
				-1	-5	-3	7.2	1976-99	-8	0.7
ESI4	2	ICI, CCI	Equal weights	-5	-9	-7.5	4.7	1976-99	-7	0.7
ESI5	2	ICI, SPI	Equal weights	-7.5	-11	-9.5	6.4	1976-99	-8	0.6
ESI6	2	ICI, CSCI	Equal weights	-5	-4	-5	7.8	1976-99	-10	0.5

5 Standard set or specific components for individual countries

Two different strategies could be used for the selection of component series to be included in a composite indicator. A standard set of indicators across countries may be used or an individual set of indicators per country may be used. The use of a standard set of indicators across countries is a good approach for obtaining international comparability. However, cyclical indicators, which perform well in one country may not work well in another because of differences in economic structure and statistical system.

The EC ESI is calculated on a standard set of indicators. However, as shown in Section 3, some of the standard indicators used in the EC system did not work equally well in all countries and alternative country specific ESIs could be constructed with better leading performance.

The OECD CLI is based on individually selected leading indicators for each country. The performance of this indicator was compared with the performance of the EC ESI in Section 2 and the results pointed in favour of the OECD CLI. In this section, we will look into the component series used in individual countries for the construction of the OECD CLI and their cyclical characteristics in order to explain the results obtained in Section 2. The historical performance of OECD CLI and components for France, Germany, Italy and the United Kingdom for the period 1960-1996 are set out in Table 4.

France

The OECD CLI for France includes 11 component series: 4 business and consumer survey series, 4 financial series, one export related series (terms of trade), one series related activity in the United States (USA CLI) and a series related to consumption of durable goods (passenger cars registered).

Two series are identical to two of the components used in the EC ESI: the share price index and the consumer sentiment indicator. These two indicators are the components with the longest leads in the EC ESI. Two of the three business survey series are also included in the EC ESI, but as components in the industrial confidence indicator (production future tendency and finished goods stocks).

The performance of most components and in particular all financial components included in the OECD CLI show much longer leads in comparison to the industrial and construction confidence indicators included in the EC ESI which show coincident behaviour. All financial indicators show average leads at all turning points of over 10 months measured by the median lag, while the USA CLI shows a lead of 7 months. However, terms of trade and passenger cars show coincident behaviour according to the median lag.

The inclusion of financial indicators in the OECD CLI for France is the major factor behind the longer lead obtained for this indicator in comparison with the EC ESI. However, as shown in Section 3, the performance of the EC ESI can be improved, if only the two components with the longest leads in this indicator are combined. Such an indicator is on the other hand narrowly based which may reduce its reliability in a specific cycle.

Germany

The OECD CLI for Germany is very much restricted to components related to activity in the industrial sector of the economy. Out of the 6 components included, 4 refer to industrial activity as measured by the business survey in industry. The remaining two components refer to a volume series on new orders and the share price index.

Only the share price index is a component series that is used in common with the EC ESI. Two of the 4 business survey series are also included in the EC ESI, but as components in the industrial confidence indicator (order books and finished goods stocks). The other two survey series are the business climate indicator and order inflow/demand tendency where in particular the later indicator shows the best leading performance at turning points of all survey series.

The performances at cyclical turning points of all components show an average lead in the range 2-7 months measured by the median lag. This performance is not better than that registered for the components included in the EC ESI. In addition, the EC ESI is more broad based in that it includes construction and consumer confidence indicators.

Overall, the OECD CLI and the EC ESI show about the same coincident performance at cyclical turning points. The results in Section 3 also show that it is difficult to improve this performance by combining only the two components included in the EC ESI with the longest leads, that is the construction confidence indicator and the share price index.

Italy

The OECD CLI for Italy includes 6 components: 3 business and consumer survey series, one financial series, one export related series (terms of trade), and a volume series on new orders.

The consumer confidence indicator is the only component in common with the EC ESI. However, the two business survey series are also included in the EC ESI, but as components in the industrial confidence indicator. All survey series show good leading performance at cyclical turning points with an average lead in the range of 7-9 months measured by the median lag. About the same performance is registered for the industrial and consumer confidence indicators included in the EC ESI. However, the construction confidence indicator included in the EC ESI shows coincident behaviour at cyclical turning points.

The performances of the financial series (yield of long term government bonds) and the terms of trade series register the longest leads at cyclical turning points with an average lead of 12 and 14 months respectively. The share price index is not included in the OECD CLI because it shows no cyclical relationship with the reference series. This indicator is, however, included in the EC ESI and this shows the danger of using a standard set of components across countries.

The OECD CLI shows a much longer lead at cyclical turning points in comparison to the EC ESI and the inclusion of the financial series and the terms of trade series mainly explain this. However, as shown in Section 3, the performance of the EC ESI can be improved if the share price index is excluded and can be improved even more if also the construction confidence indicator is removed.

United Kingdom

The OECD CLI for the United Kingdom includes 9 components: 6 business survey series, 2 financial series and a series related to consumption of durable goods (passenger cars registered).

Only the share price index is a component series that is used in common with the EC ESI. Three of the six business survey series are also included in the EC ESI, but as components in the industrial confidence indicator (production expectations, order books and finished goods stocks). The other three survey series are the business climate, prospects for exports and raw material stocks expectations. All these other survey indicators show longer leads at turning points than the survey series included in the industrial confidence indicator.

The performance of the financial series (prime bank bills) register the longest lead at cyclical turning points with an average lead of 17 months, followed by the survey series on export prospects with an average lead of 9 months. However, two of the survey series, order books and finished goods stocks show coincident behaviour at turning points. These two series are also components in the industrial confidence indicator included the EC ESI

The OECD CLI shows a slightly better performance at cyclical turning points in comparison with the EC ESI. The inclusion of the financial series and the longer leading business survey series are the main factors behind this. However, as shown in Section 3, the performance of the EC ESI can be improved, by introducing an equal weighting system of components and can be improved even more if only two of the tree components with longest leads against the reference series are combined.

Table 4 Historical Performance of OECD Composite Leading Indicator and components

Zone/Country/ Composite Indicator	Performance 1960-1996							
	Components	Extra (x) or missing (m) cycles	Turning point analysis			Mean absolute deviation around median (1)	Cross- correlation	
			Median lag (+) in months at				Months Lag (+)	Peak value
			Peak	Trough	All turning points			
France OECD Composite Leading Indicator			-5.5	-5	-5	6.0	-8	0.75
	1. Bond yield granted by government	2x	-10	-10	-10	9.2	-14	-0.50
	2. Share price index	3x	-10.5	-6.5	-7	8.2	-7	0.34
	3. Inter-bank loans (3 months)	3x	-11	-10	-10.5	6.6	-14	-0.69
	4. Call money rate	2x	-15	-10.5	-11	11.8	-14	-0.50
	5. Terms of trade	3x, 1m	-1	1	0	12.6	-13	0.56
	6. Passenger cars registered		-3	0	-2	11.2	-1	0.44
	7. USA Composite leading indicator		-6.5	-7	-7	9.9	-8	0.44
	8. Prospects for industrial sector (BS)	3x	-5	-1	-3	7.1	-7	0.54
	9. Production future tendency (BS)	2x	-6	-2	-3.5	7.0	-6	0.70
	10. Finished goods stocks (BS)	1x	0	-1	-1	10.1	-3	-0.61
	11. Consumer sentiment indicator (BS)	1x	-6	-3	-4.5	2.1	-3	0.60
Germany OECD Composite Leading Indicator			-8	-4	-6	6.0	-8	0.80
	1. Share price index, industrials		-6	-4	-5	6.0	-9	0.50
	2. New orders, total volume		-9	-4	-6	4.0	-3	0.90
	3. Order inflow/demand tendency (BS)	1x	-8	-4	-7	6.0	-9	0.50
	4. Finished goods stocks (BS)		-5	-2	-3	3.0	-5	-0.70
	5. Order books (BS)		-6	-2	-3	3.0	-3	0.80
	6. Business climate (BS)		-4	-2	-2	3.0	-7	0.60
Italy OECD Composite Leading Indicator			-9	-8.5	-9	4.9	-7	0.76
	1. Yield of long term government bonds	1x	-12	-15	-12.5	9.3	-12	-0.53
	2. Terms of trade	1x, 1m	-11	-16	-14.5	12.5	-14	0.58
	3. New orders, total volume	1x	-6	-7.5	-7	5.5	-3	0.43
	4. Production future tendency (BS)	1x	-7	-8	-7.5	6.3	-3	0.61
	5. Order books/demand tendency (BS)	1x	-11	-7.5	-9	5.9	-6	0.62
	6. Consumer confidence indicator (BS)	2x	-12	-8	-8.5	6.8	-8	0.64
United kingdom OECD Composite Leading Indicator			-10	-9	-9	7.2	-12	0.71
	1. Prime bank bills (3 months)	2x	-13	-17	-17	8.4	-18	-0.55
	2. Share price index	5x	-8.5	-7.5	-7.5	7.7	-10	0.57
	3. New cars registered	1x	-4	-9	-6	10.3	-7	0.52
	4. Production future tendency (BS)	2x	-2	-8	-4	6.4	-15	0.63
	5. Order books/demand tendency (BS)		0	-5	0	6.3	8	0.64
	6. Raw material stocks future tend. (BS)	1x	-2	-7	-5.5	6.8	-9	0.56
	7. Finished goods stocks (BS)	3x	-2	-1.5	-2	13.2	-7	-0.72
	8. Prospects for exports (BS)	5x	-8	-13.5	-9	6.7	-5	0.29
	9. Business climate (BS)	1x	-6	-7.5	-6.5	6.6	-5	0.53

(1) Standard deviation

6 Confidence and of composite indicators: Methodological issues

In the following paragraphs some of the basic steps for the calculation of a composite index or a confidence index are outlined and differences in methods applied by the OECD and the European Commission are discussed.

The basic principle to form a composite indicator consists of summing the individual indicator series included in the basket of component series while accounting for the component series relative importance and cyclical amplitude. The basic formula can be written as:

$$CI = \sum w_i s_i C_i$$

where:

CI = composite indicator

C = component series

i = is the number of component series

w = is the weight of the component series

s = is the standardisation factor of the component series

Trend estimation

The first consideration in the construction of a composite cyclical indicator is that of amplitude-stationarity. The first objective is to ensure that each individual indicator series included in the composite indicator is stationary in some way. Both the OECD and the EC indicator systems use the "growth cycle" or "deviation-from-trend" approach. Trend estimation is thus a crucial step in detecting cyclical movements and identifying turning points.

Long-term trends in the OECD system are estimated using a modified version of the Phase Average Trend method (PAT) developed by the US National Bureau of Economic Research (NBER). The PAT method requires an initial list of turning points, which define the cyclical phases, in order to estimate a trend, which cuts through the phases. A first list of turning points is obtained from the preliminary peaks and troughs identified by calculating a first trend estimate based on a 75-month moving-average. A series of tests are then executed on the deviations from the trend in order to eliminate extreme values to obtain a better identification of the final turning points. For this purpose, the program specifies a minimum duration of each phase (5 months) and the minimum duration of each cycle (15 months). The final trend is then calculated with a validated list of turning points as input to the PAT program. The detrended results (deviations from long-term trend) are then used as input to the composite calculation.

Trend estimation in the EC system systems is not performed directly but implied by using month-to-month changes either in percentage form or differences (balances in the case of survey series) as input to the composite index calculation. This method is used in the EC system for the three confidence indicators while the original NBER method is used to de-trend the share price index.

Smoothing

It is necessary to ensure that all component series have equal "smoothness". This is to ensure that month-to-month changes in the composite indicator are not unduly influenced by

irregular movements in any one indicator series. The OECD procedure is to use the "Months for Cyclical Dominance" (MCD) moving average. This procedure ensures approximately equal smoothness between series and also ensures that the month-to-month changes in each series are more likely to be due to cyclical than to irregular movements. The data lost at the end of the series due to the moving average are restored with an extrapolation by regression over the end of the series.

The MCD moving averages used to smooth the component series in the OECD system are set out in Table 5. The MCD values for most series across investigated countries are in the range 1-3. A MCD value of 1 means that no smoothing is needed and this concerns only a few component series: the USA Composite Leading Indicator (France), one business survey series on order books (Germany) and three business survey series on raw material stocks, prospects for exports and business climate (United Kingdom). Most financial and other business survey indicators have an MCD of 2 or 3 while most quantitative statistical indicators show MCD values of 4 or 5 such as terms of trade (France), cars registered (France and United Kingdom), volume of new orders (Italy). The smoothing performed on the component series in the OECD system ensures that the composite leading indicators across all countries are smooth with a MCD value of 1, which means that no further smoothing is needed for an easy identification of a cyclical turning point.

On the other hand, no smoothing of component series is performed in the EC system, but, as can be seen in Table 5, almost all component series used in the EC system show MCD values in the range 2-4. This is reflected in the ESIs, which show MCD values of 2 for all investigated countries except Germany (MCD=1). This means that only in the case of Germany is the ESI smooth enough for easy identification of cyclical turning points.

Standardisation (normalisation)

Standardisation or normalisation of component series is necessary in order to minimise the influence of series with marked cyclical amplitude to dominate the composite indicator. The method used in the OECD system to calculate normalised indices is first to subtract the mean and then to divide by the mean of the absolute values of the difference from the mean. The normalised series are then converted into index form by adding 100.

The method of normalisation used in the EC systems is to reduce each component series so that their average month-to-month changes are equal, i.e. by dividing the month-to-month changes with the average month-to-month change. This method however gives little weight to the more irregular series in the cyclical movement of the composite index, unless some prior ad-hoc smoothing is performed. In contrast in the OECD system the amplitudes of the cyclical movements are normalised but the relative magnitude of the irregular movements are unchanged.

Lagging

Finally, it may sometimes be necessary to lead or lag particular indicators. In the OECD system this is done in only one case, where the indicators selected for a particular country fall into two distinct groups of "longer-leading" and "shorter-leading" indicators. Combining the two types of indicators gave unsatisfactory results because of the interference between the two cycles. The alignment was improved by lagging the longer-leading group of indicators.

Weighting

Different weights may be assigned to component series in order to reflect their economic significance (coverage and economic reason), statistical adequacy, cyclical conformity, speed of availability of data, etc. The purpose of weighting is to improve reliability by giving higher weight to components with good quality i.e. indicators which correlate highly with each other and the resultant composite indicator.

A statistical method such as principal component analysis could be used to choose optimal weights. However, such a method would minimise the contribution of indicators, which do not move with the other indicators. This may reduce the reliability of the composite indicator because some indicators perform better in one cycle and others in a different cycle. Therefore, most indicator systems in operation use an equal weighting system after standardisation, once the components have been selected.

On the other hand, a weighting or scoring system is a valuable tool in the selection of indicators to be included in the composite index.

In the OECD system, equal weights are normally used to obtain each country's composite indicator. This does not mean that there is no weighting in the OECD system, because equal weighting implies, by default, a judgement on appropriate weights, and the normalisation process is itself a weighting system in reverse. However, when the composite indicators for individual countries are combined into indicators for country groups, each composite indicator is assigned the weight used in calculating group totals for the industrial production index.

Different weights are however used in the EC system. The components are divided into two groups with equal weights to components in each group. The first group contains the industrial confidence indicator and the consumer confidence indicator, and the second group includes the construction confidence indicator and the share price index. The components in the second group are given half the weight of the components in the first group.

Aggregation

In the OECD system, the raw composite index is obtained by averaging the normalised indices of each component series. A composite index calculated on an incomplete set of data is linked to the body of the index by use of a linking factor which is equivalent to applying the growth-rate of the "incomplete" index to the last point at which a full index is available.

Timeliness and absence of excessive revisions are obvious requirements of good cyclical indicators. These two issues are discussed in the following.

The timeliness or availability of component series at the time of the compilation of the OECD composite leading indicators is set out in Table 5. Availability is here measured in terms of months where one indicates that data for a component series is available for the month for which the composite leading indicator (CLI) is calculated. In the OECD system only the CLI for the United Kingdom is calculated with all component series available every month. However, the percentage of component series available for the calculation of the CLIs in France and Germany is over 80 per cent, but only 67 per cent in Italy.

What is interesting to notice is that all series not available for the month for which the CLI is calculated concerns quantitative statistical series such as terms of trade, cars registered and

volume of new orders. On the other hand, all financial and business survey component series are always available for the month for which the CLI is calculated.

The advantage with the EC system is that all components are always available for the calculation of the composite index across countries. This is explained by the fact that all component series refer to business survey and financial indicators.

It is very important that the series are not revised to a significant extent in later periods if they are to be used for analysing the present economic situation and for forecasting. Business survey series rarely are revised whilst in many countries preliminary data for conventional statistics are released very quickly but later revised up to three times. For a few indicators - in particular indices of production and new orders - about 30-40 per cent of the forecasting errors are due to revisions of the first published data in some countries.

7 Summary and Conclusions

The EC Economic Sentiment Indicator (ESI) is calculated on a standard set of indicators while the OECD Composite Leading Indicator (CLI) is based on individually selected leading indicators for each country. The results presented in section two points in favour of the OECD CLI in comparison to the EC ESI and alternative combinations of component series for the construction of the EC ESI in order to improve the forecasting capacity in individual countries were investigated in sections three and four.

The results obtained in section three indicate that it may be possible to improve the cyclical performance of the EC ESI by selecting and combining only the best components for each country. The EC ESI uses different weights for the aggregation of component series. However, if only the best components are selected and combined it would be reasonable to give equal weights to the components and the alternative ESIs evaluated were constructed with equal weights for the different components.

The results in section four shows that the forecasting performance of the EC ESI could be improved in all investigated countries except Germany, if only the components with the longest lead in this indicator were combined. In the case of Italy, a better alternative ESI could be constructed if the share price index was excluded. This indicator shows no cyclical relationship with the reference series and to include it shows the danger of using a standard set of components across countries. The results for the United Kingdom shows that only by introducing an equal weighting system of the components included in EC ESI gave an alternative ESI with better leading performance.

Two different strategies could be used for the selection of component series to be included in a composite indicator. A standard set of indicators across countries may be used or an individual set of indicators per country may be used. The use of a standard set of indicators across countries is a good approach for obtaining international comparability. However, cyclical indicators, which perform well in one country may not work well in another because of differences in economic structure and statistical system.

The OECD Composite Leading Indicator (OECD CLI) is based on individually selected leading indicators for each country. The performance of this indicator was compared with the performance of the EC ESI in section 2 and the results pointed in favour of the OECD CLI.

In section five, we looked into the component series used in individual countries for the construction of the OECD CLI and their cyclical characteristics in order to explain the results obtained in section 2. The results showed that the inclusion of financial indicators in the OECD CLI for France and Italy was the major factor behind the longer lead obtained for this indicator in comparison with the EC ESI. In the case of the United Kingdom, the inclusion of financial series and alternative longer leading business survey series were the main factors behind the better performance of the OECD CLI in comparison to the EC ESI.

The basic steps for the calculation of a composite index or a confidence index were outlined in section six and differences in methods applied by the OECD and the Commission of the European Communities (EC) were discussed. In particular, issues related to smoothing of component series, timeliness of components and revisions to component series and composite indicators were investigated.

In the OECD system, component series are smoothed by the "Months for Cyclical Dominance" (MCD) moving average. This procedure ensures approximately equal smoothness between series and also ensures that the month-to-month changes in each series are more likely to be due to cyclical than to irregular movements.

On the other hand, no smoothing of component series is performed in the EC system. The effect of this is reflected in the Economic Sentiment Indicators (ESI), which show MCD values of 2 for all investigated countries except Germany (MCD=1). This means that only in the case of Germany is the ESI smooth enough for easy identification of cyclical turning points.

In the OECD system only the CLI for the United Kingdom is calculated with all component series available every month. However, the percentage of component series available for the calculation of the CLIs in France and Germany is over 80 per cent, but only 67 per cent in Italy. What is interesting to notice is that all series not available for the month for which the CLI is calculated concerns quantitative statistical series such as terms of trade, cars registered and volume of new orders. On the other hand, all financial and business survey component series are always available for the month for which the CLI is calculated.

The advantage with the EC system is that all components are always available for the calculation of the composite index across countries. This is explained by the fact that all component series refer to business survey and financial indicators.

From above summary the following conclusions may be drawn on how to improve the forecasting potential of the EC Economic Sentiment Indicators in individual countries:

- Select only best performing component series in individual countries;
- Use an equal weighting system for aggregation of component series;
- Perform smoothing of component series;
- Introduce more financial components.

Table 5 Timeliness, irregular variation and smoothing of components in the OECD System of Composite Leading Indicators and in the EC System of Economic Sentiment Indicators

OECD Composite Leading Indicators 1960-1999	Timeliness	Irregular variation MCD	EC Economic sentiment Indicators 1970-1999	Timeliness	Irregular variation MCD
France			France		
<i>OECD Composite Leading Indicator</i>	1	1	<i>EC Economic Sentiment Indicator</i>	1	2
<i>Components</i>			<i>Components</i>		
1. Bond yield granted by government	1	2	1. EC Industrial Confidence Indicator	1	2
2. Share price index	1	3	2. EC Construction Confidence Indicator	1	3
3. Inter-bank loans (3 months)	1	2	3. EC Consumer Confidence Indicator	1	2
4. Call money rate	1	2	4. Share price index	1	3
5. Terms of trade	3	4			
6. Passenger cars registered	2	5			
7. USA Composite leading indicator	1	1			
8. Prospects for industrial sector (BS)	1	2			
9. Production future tendency (BS)	1	2			
10. Finished goods stocks (BS)	1	2			
11. Consumer sentiment indicator (BS)	1	3			
Germany			Germany		
<i>OECD Composite Leading Indicator</i>	1	1	<i>EC Economic Sentiment Indicator</i>	1	1
<i>Components</i>			<i>Components</i>		
1. Share price index, industrials	1	2	1. EC Industrial Confidence Indicator	1	1
2. New orders, total volume	3	3	2. EC Construction Confidence Indicator	1	2
3. Order inflow/demand tendency (BS)	1	5	3. EC Consumer Confidence Indicator	1	2
4. Finished goods stocks (BS)	1	2	4. Share price index	1	2
5. Order books (BS)	1	1			
6. Business climate (BS)	1	2			
Italy			Italy		
<i>OECD Composite Leading Indicator</i>	1	1	<i>EC Economic Sentiment Indicator</i>	1	2
<i>Components</i>			<i>Components</i>		
1. Yield of long term gov. bonds	1	2	1. EC Industrial Confidence Indicator	1	2
2. Terms of trade	5	3	2. EC Construction Confidence Indicator	1	4
3. New orders, total volume	3	5	3. EC Consumer Confidence Indicator	1	2
4. Production future tendency (BS)	1	3	4. Share price index	1	3
5. Order books/demand tendency (BS)	1	3			
6. Consumer confidence indicator (BS)	1	2			
United Kingdom			United Kingdom		
<i>OECD Composite Leading Indicator</i>	1	1	<i>EC Economic Sentiment Indicator</i>	1	2
<i>Components</i>			<i>Components</i>		
1. Prime bank bills (3 months)	1	2	1. EC Industrial Confidence Indicator	1	2
2. Share price index	1	2	2. EC Construction Confidence Indicator	1	3
3. New cars registered	1	5	3. EC Consumer Confidence Indicator	1	2
4. Production future tendency (BS)	1	3	4. Share price index	1	2
5. Order books/demand tendency (BS)	1	2			
6. Raw material stocks fut. tend. (BS)	1	1			
7. Finished goods stocks (BS)	1	3			
8. Prospects for exports (BS)	1	1			
9. Business climate (BS)	1	1			

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