OECD Composite Leading Indicators
a tool for short-term analysis

The leading indicator approach is based on the view that market-oriented economies experience repetitive and non-periodic fluctuations of economic activity. During the 1980's the OECD developed its system of leading indicators and business cycle analysis to provide economic analysts with early signals of turning points in economic activity. This information is of prime importance for economists, businesses and policy makers to enable correct analysis of the current economic situation and for the anticipation of economic developments. Composite Leading Indicators (CLI) data are compiled and disseminated by the Statistics Directorate of the OECD.

Within the OECD, CLI results are widely disseminated to in-house users. In particular, analysts in the Economics Department responsible for country forecasts, use CLI results for judgmental analysis of the current state of the economy. In addition, the Economics Department is currently implementing the NEFTCI method[a] which calculates an explicit probability of turning points for the total economy, using CLI data. The Education, Employment, Labour and Social Affairs Directorate regularly publishes comparisons between the cyclical behaviour of the general economy and specific indicators related to the labour market.

The primary purpose of this document is to show how CLIs can be used in practice to predict economic turning points (peaks and troughs) and to assess the general behaviour of the economy. This is done in Section 4 below. However, it is first necessary to briefly describe the methodology used in the compilation of these indicators. This is done in Section 2. Section 3 presents the different CLI data which are calculated and indicates where they are regularly disseminated. A bibliography listing more detailed descriptions of the methodologies used to compile CLIs, as well as the most recent work carried out by the OECD, are also provided.

1. INTRODUCTION

OECD CLIs are aggregate time series which show a leading relationship with the growth cycles of key macro-economic indicators (the average lead is 6-months). Typically, they are constructed to predict the cycles of total industrial production or gross domestic product in industry, which are chosen as proxy measures for the aggregate economy. CLIs are calculated by combining component series in order to cover, as far as possible, the key sectors of the economy. These component series cover a wide range of short-term indicators such as observations or opinions about economic activity, housing permits, financial and monetary data, etc. The aggregation of components series into the CLI reduces the risk of "false signals", changes in the indicator due to irregular movements which do not correspond to any later developments in the aggregate economy.

CLIs are a straightforward tool for empirical analysis of readily available data. They provide timely and pertinent information, and give a useful overview of the current and future economic situation. Their usefulness in this regard is enhanced by the fact they are released with a shorter delay than direct measures of economic activity. For instance, quarterly gross domestic product data are available with a longer delay and are subject to subsequent revisions. CLIs provide an important aid for short-term forecasts (from 6 to 12 months) of changes in direction of the economy. However, it should also be emphasised that CLIs complement, but cannot substitute for quantitative or long-term forecasts based on econometric models.

At the OECD, official economic quantitative forecasts for Member countries are derived from models. These models include simulations of exogenous shocks and equation prediction. Forecasts are published half-yearly in *OECD Economic Outlook*. CLI results are not used directly in these models. However, CLIs provide useful empirical information based on available statistical data. Therefore, they are used at the OECD, among other tools, for the preparation, interpretation and judgmental revision of economic forecasts. Some institutes responsible for economic analysis (including Statistics Netherlands and the European Commission) use different approaches. These include plugging leading indicator results or cyclical indicators directly into econometric models for the compilation of their forecasts.

Data for OECD CLIs are calculated each month for 22 Member countries and six aggregate geographical zones. These data

are available in various publications issued by the Statistics Directorate (for details see Table 1).

2. THE OECD SYSTEM OF LEADING INDICATORS

A brief outline of key aspects of the methodology used to compile the OECD CLIs is presented below. For a more comprehensive description see [1].

The following terminology and definitions are used in the OECD system:

- a peak or a trough is marked by a turning point;
- a phase is the time span between a peak and a trough;
- a cycle is the time span separating two turning points of the same nature (two peaks or two troughs);
- a change in regime is defined as the change between a period of recession and a period of expansion (i.e. trough); or as a change between a period of expansion and a period of recession (i.e. peak);
- the reference series is a proxy measure for the aggregate economy.

2.1 Reference Series and Economic Cycles

CLIs are constructed to relate to a reference series. An obvious choice for the reference series would be gross domestic product (GDP). However, for the majority of OECD Member countries, the reference series is total industrial production. (It should be mentioned here that many service activities, such as transport, deliveries and repairs, are directly linked to industrial activity.) Industrial production data are generally compiled on a monthly basis, whereas GDP data are only available on a quarterly basis. In addition, industrial production cycles generally lead or are coincident with those of GDP. Therefore, CLIs for total industrial production are leading for the total economy (GDP).

The OECD system of leading indicators is based on the "growth cycle" approach, which measures deviations from the long-term trend. A contractionary phase signals a decline in the rate of growth of the economy though not necessarily an absolute decline in economic activity. This is distinct from classical cycles which are defined as a succession of periods of absolute growth and decline in economic activity. Peaks and troughs of growth cycles tend to appear earlier in time than those of classical cycles.

Long-term trends in time series are estimated using a modified version of the Phase Average Trend method (PAT) developed by the US National Bureau of Economic Research[b]. The PAT procedure requires an initial list of turning points which define the cyclical phases. Initial turning point estimates are calculated using the Bry-Boschan routine (see [2]). The process for deriving the initial list using this procedure entails calculation of an estimated trend for the preliminary identification of peaks and troughs (using a 75-month moving-average). The procedure then executes a series of tests on the deviation from the estimated trend in order to eliminate extreme values. It also specifies a minimum duration of each phase (five months) and the minimum duration for a cycle (15 months). Finally, an OECD expert validates the list of turning points to be used as input to the PAT program. This is mainly to validate each turning point from an economic point of view and to make the distinction between major and minor cycles (only major cycles are taken into account for PAT trend calculation). Trends in time series are calculated on seasonally adjusted data. See Figure 1 for an example (Japan).

Figure 1

Reference series and Trend for Japan

P: peak T: trough

2.2 Selection of Component series

CLIs are constructed from several component series. For each country, these component series are selected according to the following criteria:

- Economic significance: there has to be an economic reason for a leading relationship with the reference series. There are various reasons why series could be suitable components of a CLI. These are indicators which:

  i. cause fluctuations in economic activity (e.g. economic policy instruments such as short-term interest rates);
  ii. express the expectations of economic agents (e.g. consumer or business tendency surveys, share prices);
  iii. measure economic activity at an early stage of the production process (e.g. housing starts, output of intermediate goods); or
  iv. adjust quickly to changes in economic activity (e.g. overtime work).

- Cyclical behaviour: cycles should lead those of the reference series, there should be no missing or extra cycles, the lead at turning points should be homogeneous over the whole period;
- Data quality: statistical coverage of the series should be broad; series should be compiled on a monthly rather than on a quarterly basis; series should be timely and easily available; there should be no break in time series; series should not be revised frequently.

The cross-correlation of the potential component series with the reference series is also examined at different lead lengths. This criteria is not considered essential in the OECD system as the main objective is to give signals of economic turning points. However, a high cross-correlation (close to 1) means that the component series correctly leads the general cyclical behaviour of the reference series, not only at turning points.

The final set of component series is selected in order to:

- maximise the performance of the CLI. Performance is evaluated in terms of missing extra cycles, homogeneity of leads at turning points and cross-correlation of the CLI with the reference series;
- cover, as far as possible, the different sectors of the economy (construction, money and finance, manufacturing, labour market, etc.);

The number of series used for the compilation of the OECD CLIs varies for each Member country, but ranges between five and eleven series[c]. The average number of component series is eight.

2.3 Aggregation into the CLI

The component series in a detrended form (deviation from long-term trend) are aggregated into one single composite indicator. Some transformations are required prior to aggregation. These entail:

- Periodicity. CLI data are published with a monthly periodicity. Quarterly component series are converted to a monthly series using linear interpolation.
- Smoothing. In order to reduce the irregularity of the final composite indicator, component series are smoothed according to their MCD[d];
- Normalisation. All component series are normalised: the cyclical movements are expressed in a comparable form (i.e. for either a multiplicative or an additive model when estimating the trend); the cyclical amplitude is homogenised;
- Weighting. In general, for each country, component series of the CLI have equal weights. Indicators for individual countries are aggregated into geographical zone totals using weights derived from GDP data.

Publication of timely figures for CLIs generally entails the use of an incomplete set of component series. The minimum percentage of component series required varies between 40% and 60% of observations depending on the country. The percentage is established following empirical examination of the availability of component series from the countries.

2.4 Monthly Routine

Each month, historical data for CLIs are calculated for inclusion in different publications produced by the Statistics Directorate. Long-term trends for the component series are re-estimated, and composite indicators are then recalculated from the detrended series. CLI figures are calculated using data available in the OECD's *Main Economic Indicators* database on the Tuesday of the first full week of the month.

2.5 Regular Revisions of CLIs

There is a real need for regular revision of the CLIs. These were created in the mid 1980's, according to the criteria outlined in the previous paragraphs. Since then, a number of the component series have been suspended by national sources. In addition, component series can become outdated either because they become less relevant to the cycles of the reference series or because, over time, their updates have become less satisfactory for the compilation of the composite index. To enable a better trend estimation it is also necessary to review on a regular basis the initial list of turning points used as input to the PAT program (see paragraph 2.1 above). These are possible reasons for deterioration in the quality of the indicators.

Recognising these concerns, the OECD recently completed a review of the CLIs for:

- G7 countries and Belgium (see Revision of Leading Indicators for the G7 and Belgium);
- Norway (see An Update of OECD Leading Indicators).

3. DISSEMINATION OF CLI DATA

To facilitate use and interpretation of the data, CLIs are presented in a number of forms in OECD publications. The following paragraph describes and compares the presentation formats. Table 1 provides details of the regular dissemination of the data (publications, periodicity and dissemination media).

3.1 Types of presentation of OECD CLIs

CLI figures are published in two measurement units; i.e. detrended or trend restored series. It is worth examining each form and their use in predicting economic turning points.

- **Detrended Series**

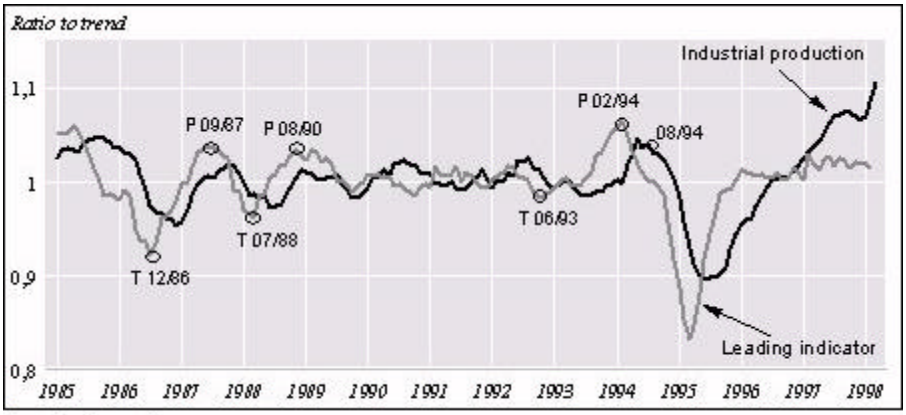
In OECD terminology this is often called "ratio to trend". It refers to the deviation from the long-term trend of the series and focuses on the cyclical behaviour of the indicator. Hence, this presentation makes it relatively easy to detect a new turning point. A turning point observed in the indicator announces a probable change in regime for the reference series.

Very often, the CLI is shown along with the reference series. This facilitates comparison of the evolution of both series and ultimately enables users to predict changes in the reference series. The use of detrended series also enables users to assess the forecasting ability of the indicator (i.e. the absence of false signals, homogeneity of lead, etc.) for all historical data. See Figure 2 for an example. In particular, the composite leading indicator presented in this figure provides a clear signal of the peak of the Mexican economy in February 1994 with a 6-month lead (a peak occurred in industrial production in August 1994).

Figure 2

Composite leading indicator and reference series for Mexico

Ratio to trend



P: peak T: trough

- **Trend Restored Series**

CLIs are also frequently presented in OECD publications in a form directly comparable to the reference series as published by national sources (i.e. in index form with a fixed base year). To enable such direct comparison it is necessary to multiply the indicator in a ratio to trend form by the trend of the reference series. In the OECD system, this procedure is called "trend restoration". See the example for Canada in Figure 3.

This presentation format has many advantag