Notes on revision of the composite business cycle indicators

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1. Introduction

Composite business cycle indicators are calculated to reflect the movement of and the turning-points in the business cycle of the economy. Such indicators usually comprise only a small selection of the total number of economic time series. These time series, however, represent the whole spectrum of economic activities and are divided into three groups, namely, those leading the business cycle, those coinciding with the business cycle, and those which lag behind the cycle. Because of changes in the size and structure of the economy, it is important that the data series that are included in the composite indicators be re-examined regularly.

The purpose of these notes is first of all to provide a description of the evaluation of the indices included in the composite business cycle indicators and to indicate which of those indicators with major shortcomings have been replaced by more appropriate ones. Secondly, a revised list of leading, coinciding and lagging business cycle indicators is furnished. These indicators were also tested against the criteria laid down by the evaluation system. Finally, the results obtained from the new composite indicators are compared with the time paths followed by the previously compiled composite business cycle indicators.[1]

2. Composition of previous business cycle indicators

The economic indicators included in the previous composite leading, coinciding and lagging business cycle indicators have been used for business cycle analyses since 1980.[2] The series included in the composite business cycle indicators are listed in Table 1.

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[1] The time series of the new composite business cycle indicators are furnished in the Supplement to this *Quarterly Bulletin*.

[2] Van der Walt, B.E.: "Indicators of business cycle changes in South Africa", South African Reserve Bank *Quarterly Bulletin*, March 1983.

Table 1. Previous economic indicators

Leading business cycle indicators

Total employment in the mining sector
Utilisation of production capacity in manufacturing: durable goods
Physical volume of gold ore milled
Physical volume of mining production, excluding gold
Physical volume of steel exports
Number of new motorcars sold
Value of merchandise exports at constant prices, excluding gold
Value of building plans passed at constant prices: residential buildings
Net number of new companies registered
Value of real estate transactions
Ratio of inventories to sales in manufacturing
Prices of industrial and commercial shares
Prices of all classes of shares
Dividend yield on industrial shares
London gold price in rand
Company profits, after tax
Ratio of output prices to unit labour costs in manufacturing
M1 money supply: percentage change over twelve months
Net gold and other foreign reserves
Value of new mortgage loans and re-advances granted by building societies for the construction of buildings
Tender Treasury bill discount rate

Coincident business cycle indicators

Employment in manufacturing, mining and the construction sector
Registered unemployed Whites, Coloureds and Asians
Gross domestic product at constant prices, excluding agriculture
Physical volume of manufacturing production: durable goods
Physical volume of manufacturing production: non-durable goods
Utilisation of production capacity in manufacturing
Value of retail trade sales at constant prices
Value of wholesale, retail and motorcar sales at constant prices
Value of imports at constant prices, excluding mineral products
Value of total building plans passed
Number of mortgages registered

Lagging business cycle indicators

Employment in non-agricultural sectors
Number of appointments per 100 production workers in manufacturing
Total number of hours worked by production workers in the construction sector
Physical volume of mining production of building materials
Value of wholesale sales of metals, machinery and equipment at constant prices
Number of new commercial vehicles sold
Value of unfilled orders as percentage of sales in manufacturing
Value of fixed investment in machinery and equipment
Value of residential buildings completed
Value of all buildings completed
Labour costs per unit of physical volume of manufacturing production

3. The identification and evaluation of economic indicators

In the 1980s it was already clear that the established behaviour patterns of some economic variables included in the composite business cycle indicators were being disrupted. In addition, the comparability or continuity of a number of economic indicators was being seriously eroded by institutional and policy changes.[3]

Work carried out by leading research institutions[4] has identified a number of new economic indicators which comply with the criteria laid down for cyclically sensitive data. Consequently, the previous indicators and some newly chosen ones were subjected to a comprehensive assessment in order to examine the sensitivity and stability of their timing relationships with the overall business cycle. The objective of these assessments was to ascertain the validity of all three composite indicators since 1979.

In order to reduce the degree of subjective discretion in choosing the individual business cycle indicators, an objective evaluation system was designed. The main criteria used in the evaluation system are the economic significance of the activity or process which is represented by the indicator, the statistical adequacy of the data, the historical conformity and the relationship with the business cycle as to the timing of changes, the smoothness of the time series and the timely availability of the data.

Notwithstanding the influence of various exogenous factors on economic behaviour during the 1980s, the assessment of most of the previous business cycle indicators showed sufficient statistical adequacy as well as cyclical sensitivity. However, the inconsistency or change in the timing relationship with the overall business cycle of certain previously included indicators has given reason for them to be excluded from the newly calculated composite business cycle indicators.

In an effort to compile business cycle indicators as accurately as possible, a large number of economic time series was analysed and assessed. Those series that were identified as reliable business cycle indicators were then included in the composite business cycle indicators for one of two reasons. Firstly, a new series replaced an existing component of the composite indicator if the cyclical time path followed by the new series is superior to that of the previous one. Secondly, a time series was included as an additional series if it covered an aspect of the macro-economy which had not been captured before by the composite indicator.

4. Results of evaluating the indicators

4.1 Leading business cycle indicators

Various time series previously included were omitted from the revised leading business cycle indicator. Owing to the unstable cyclical timing relationship, four indicators are no longer included in the composite indicator. They are employment in the mining sector, utilisation of production capacity in the durable goods industries, the physical volume of steel exports and merchandise exports (excluding gold).

The prices of industrial and commercial shares and the dividend yield on industrial shares were both omitted from the leading indicator because these price movements are already included in the prices of all classes of shares. At the same time, the value of new mortgage loans and re-advances granted by building societies for the construction of buildings could no longer be used because of the non-comparability of this series over time.

Some of the series previously included in the composite indices were also replaced by related series which performed better in terms of cyclical sensitivity, namely:

- The real value of merchandise exports, excluding gold, was replaced by the same series at current prices. The new series, however, no longer includes agricultural exports, which were found to be influenced greatly by exogenous factors such as sanctions and unfavourable weather conditions.
- The value of real estate transactions was replaced by the time series of the number of such transactions.
- The opinion survey of the ratio of stocks to demand in manufacturing is now being used, instead of the previous series of the ratio of stocks to sales in manufacturing.[5]
- The series on the percentage change over twelve months in the M1 money supply in nominal terms was replaced by the same series of M1, but expressed in real terms.
- The number of residential building plans passed replaced the value of residential building plans passed at constant prices.

Six new series were also included in the new composite indicator, namely:

- Overtime hours as a percentage of ordinary hours worked in manufacturing.[6]
- Opinion survey of business confidence in manufacturing, construction and trade.[5]

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[3] Examples are the termination of prescribed investment requirements, the granting of mortgage loans by banks in addition to those granted by building societies and the broadening of unemployment registrations to include Black workers.

[4] Moore, G.H.: *Leading Indicators for the 1990s*, Dow Jones-Irwin, Illinois, 1990. Lahiri, K. and Moore, G.H.: *Leading economic indicators. New approaches and forecasting records*, Cambridge University Press, Cambridge, 1991.

[5] This basic information is published by the Bureau for Economic Research, University of Stellenbosch.

[6] For most of the industries it is easier to adjust the length of the working week to changed economic conditions rather than to change the number of workers. Consequently this series is a more sensitive indicator than the number of workers.

- Opinion survey of the quantity of orders in manufacturing.[5]
- An international business cycle indicator, which consists of the industrial production of the eight main trading partner countries of South Africa weighted according to the relative size of the gross domestic products of these countries.
- Percentage change over twelve months in the index of commodity prices. This index comprises ten minerals and four agricultural products.
- Consumer credit at constant prices.

4.2 Coincident business cycle indicators

The irregular movements in the series and their poor timing relationship with the business cycle accounted for the omission of the value of retail trade sales at constant prices, and of the value of building plans passed from the new composite coincident indicator. The series on unemployment and on the number of mortgage bonds registered are no longer available and were therefore also excluded.

Because the remaining series were adjudged to be still very reliable and sensitive indicators, no new series were added to the composite coincident indicator.

4.3 Lagging business cycle indicators

The most recent data on the number of appointments per hundred production workers in manufacturing become available with a long delay after the actual event has occurred and, furthermore, have an unstable timing relationship with the business cycle. For these reasons this series was excluded from the new composite indicator. The timing of the turning-points of the value of wholesale sales of metals, machinery and equipment at constant prices, and of the number of new commercial vehicles sold, have changed and they no longer fit in with the other lagging time series.

The previous series on the value of residential buildings as well as total buildings completed were replaced by the value of non-residential buildings completed, which showed a much more regular cyclical pattern.

The value of industrial and commercial inventories at constant prices is a new addition to the composite lagging indicator.

5. New composite business cycle indicators

The previous indicators, which were retained after they had been thoroughly evaluated against specified criteria, were combined with the newly identified indicators into a single composite indicator.[7] The contents of the revised composite business cycle indicators are shown in Table 2.

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[5] The method by which the composite leading, coinciding and lagging indicators were compiled, was developed by the National Bureau of Economic Research and the Bureau of Economic Analysis in the USA. Although many users are still using this method, small adjustments and improvements have been developed in the course of time. In this study some adjustments were made to the original method, e.g. instead of calculating a three-month moving average of the month-to-month changes in each individual component of the composite indicator, the actual month-to-month changes were used to allow users to observe and interpret the exact changes in each month. This has the added advantage that the series are available for an extra month. In order to evaluate the underlying short-term tendency, the final series are smoothed by means of a weighted moving average.

Table 2. New economic indicators

Leading business cycle indicators
Overtime hours as percentage of ordinary hours worked in manufacturing
Opinion survey of business confidence: manufacturing, construction and trade
Physical volume of gold ore milled
Physical volume of mining production, excluding gold
Opinion survey of volume of orders in manufacturing
Number of new motorcars sold
International business cycle indicator: industrial production
Value of merchandise exports, excluding gold and agriculture
Number of residential building plans passed
Net number of new companies registered
Number of real estate transactions
Opinion survey of stocks in relation to demand: manufacturing and trade
Prices of all classes of shares
London gold price in rand
Company profits, after tax
Commodity prices: percentage change over twelve months
Ratio of output prices to unit labour costs in manufacturing
Real M1 money supply: percentage change over twelve months
Net gold and other foreign reserves
Consumer credit at constant prices
Tender Treasury bill discount rate

Coincident business cycle indicators
Employment in manufacturing, mining and the construction sector
Gross domestic product at constant prices, excluding agriculture
Physical volume of manufacturing production: durable goods
Physical volume of manufacturing production: non-durable goods
Utilisation of production capacity in manufacturing
Value of wholesale, retail and motorcar sales at constant prices
Value of imports at constant prices, excluding mineral products

Lagging business cycle indicators
Employment in non-agricultural sectors
Total number of hours worked by production workers in the construction sector
Physical volume of mining production of building materials
Value of unfilled orders as percentage of sales in manufacturing
Value of fixed investment in machinery and equipment
Value of non-residential buildings completed
Value of industrial and commercial inventories at constant prices
Labour costs per unit of the physical volume of manufacturing production

5.1 Leading indicator

The composite leading indicator consists of 21 individual indicators: ten of the previous indicators and eleven new indicators, of which five replace previous indicators. The trend-cycle of the new against the previous composite leading indicator is shown in Graph 1.

Up to 1985 the specific turning-points and the time path followed by the previous and the new indicator were virtually the same. During the first few months of 1986 the previous indicator decreased and in 1991-1992 a small cycle was observed which is no longer visible in the new indicator. The peak reached in 1988 occurred at a later stage than determined previously, and the cyclical recovery in 1993 is less steep in the case of the new indicator (see Graph 4).

5.2 Coincident indicator

Four of the original eleven coincident indicators were excluded from the new composite indicator. The composite coincident indicator was calculated from the remaining seven indices. The new and the previous trend-cycle of the composite indicator are shown in Graph 2.

As shown clearly in Graph 2, the specific turning-points of the previous and the new coincident business cycle indicators coincided virtually completely during the period 1979-1991. The main difference between the two is the mild cyclical recovery during 1992-1993 in the new indicator compared to the sharp increase during the second half of 1993 in the previous indicator.

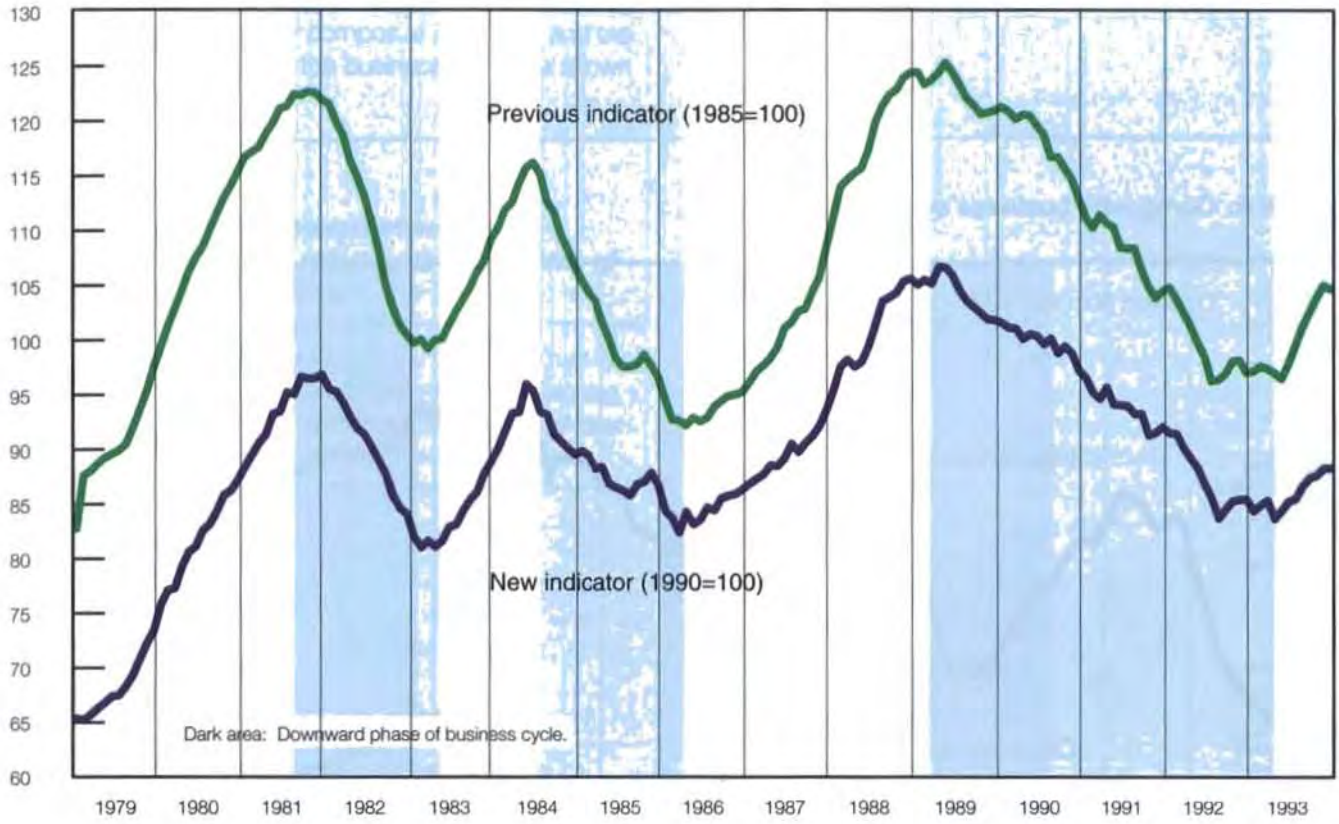
5.3 Lagging indicator

The new composite lagging indicator consists of eight individual indicators. This means that six previous indicators were retained, one new indicator was added and two previous indicators were replaced by a new indicator. The trend-cycle of the previous and the new composite indicators are shown in Graph 3.

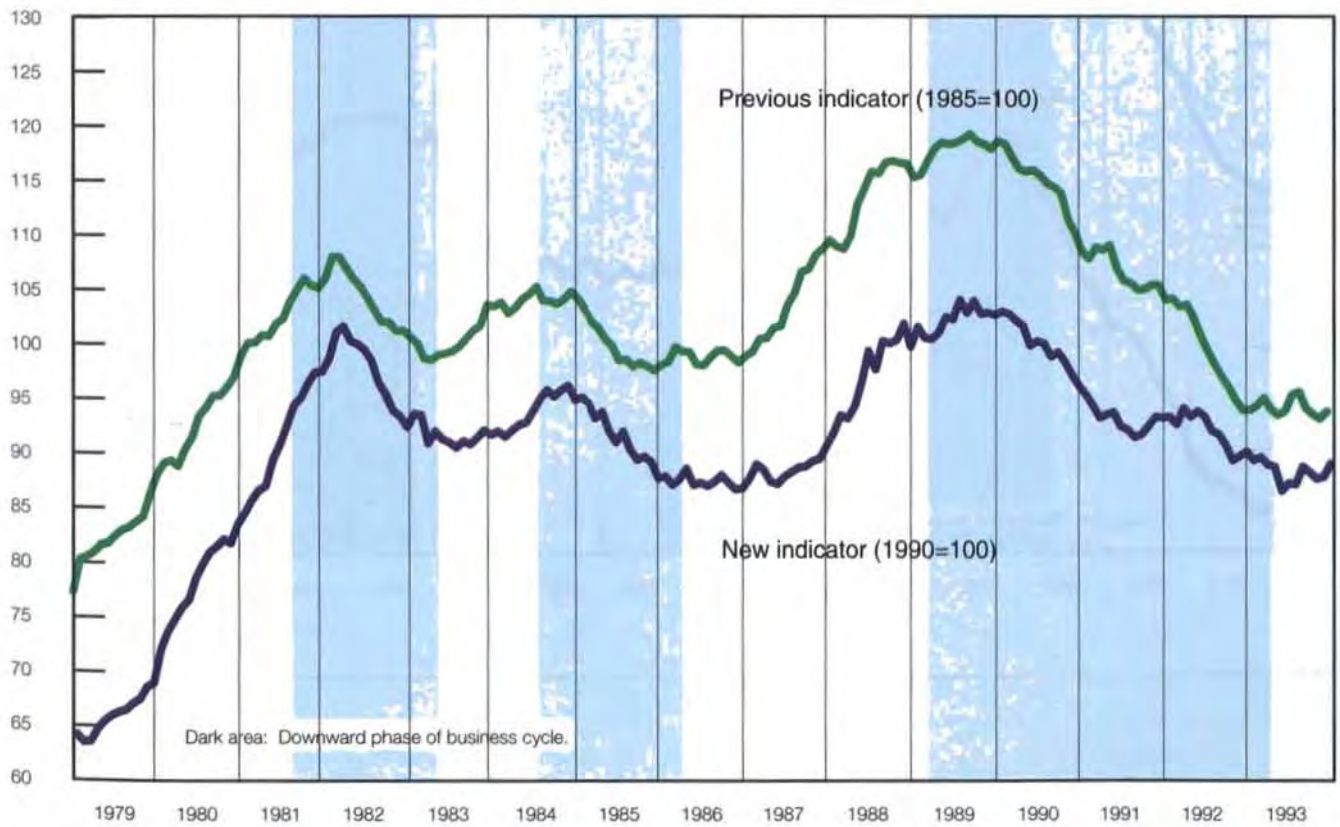
The time paths followed by the previous and the new lagging business cycle indicator coincided almost perfectly during the 1980s. At the end of 1991 the new indicator rose briefly, something which had not been detected by the previous indicator. Three of the specific turning-points in the new indicator lagged behind the corresponding turning-points of the business cycle by a longer period than before.

Graph 1: Composite leading business cycle indicator

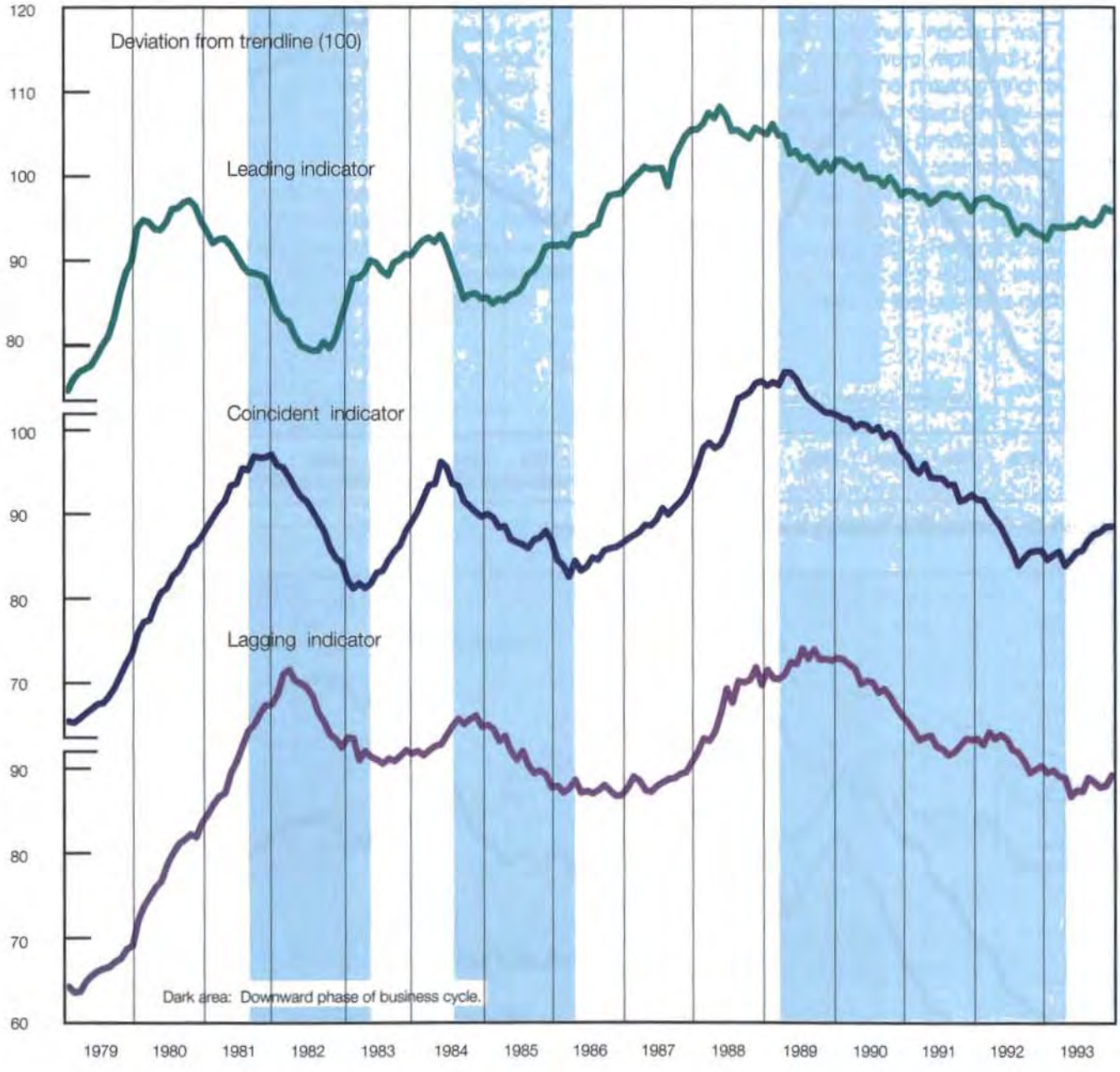
Graph 2: Composite coincident business cycle indicator



Graph 3: Composite lagging business cycle indicator



Graph 4: Composite business cycle indicators



6. Timing relationships of revised indicators

The timing relationship as well as the average monthly deviation between the new composite indicators and the reference turning-points of the business cycle are shown in Table 3.

Table 3. Timing relationship between new indicators and refence turning-points of the business cycle*

Reference turning-points		Coincident indicator	Leading indicator	Lagging indicator
Peak	Trough			
August 1981		+1	-10	+7
	March 1983	+1	-9	+4
June 1984		-1	-1	+5
	March 1986	0	-13	+14
February 1989		+2	-9	+5
Average		**+½**	**-8**	**+7**

* A plus (minus) sign indicates that the relevant indicator lags (leads) the reference turning-point.