

Indicators of business cycle changes in South Africa

By B.E. van der Walt*

There are probably few fields of research in which such an abundance of statistics is as freely available as in economics. Every day, week, month and any other regular time interval, a wide variety of quantitative information on economic activity is becoming available. In order to study the characteristics or behaviour of a particular economic variable, observations are recorded for specific time intervals. The resulting time series, therefore, reflects the magnitude of, as well as the changes in, that particular form of economic activity over time. In order to use a time series effectively in economic analysis, it is necessary to analyse the structure of the time series in terms of its dynamic components, and to study its relationship with other time series and the business cycle.

The purpose of this article is to identify, on the basis of business cycle theory as well as empirical observation of business cycle developments, those economic time series which can be regarded as reliable indicators of business cycle changes in South Africa and to use these time series for the calculation of composite business cycle indicators. However, in order to do so, it was necessary to first analyse the cyclical behaviour of a large number of time series, representative of economic activity in all sectors of the South African economy, over a period of twenty years or more.¹ The methods employed in this historical study and in the analysis in this article generally correspond to those which were developed and are still being used by the National Bureau of Economic Research in the United States of America. At the same time, cognisance was also taken of other studies such as those by the Organisation for Economic Co-operation and Development and the Center for International Business Cycle Research.²

* The views expressed and conclusions drawn in this article are those of the author and do not necessarily represent those of the South African Reserve Bank.

¹ Van der Walt, B.E.: *Die identifisering en waardebeoordeling van ekonomiese aanwysers vir 'n studie van die konjunktuur in Suid-Afrika*. Unpublished D.Com. Thesis, University of Pretoria, Pretoria, 1982.

² Organisation for Economic Co-operation and Development, Economic and Development Review Committee: *Report on reference cycle chronologies and composite cyclical indicators*, Paris, 1981; "Cyclical developments and leading indicators", *OECD Observer*, September 1981, and *OECD Economic Outlook* No.29, Organisation for Economic Co-operation and Development, Paris, July 1981. National Bureau of Economic Research: *55th Annual Report*, New York, September 1975; Moore, G.H. and Klein, P.A.: "Monitoring business cycles at home and abroad", in Fellner, F. ed., *Contemporary economic problems*, American Enterprise Institute for Public Policy Research, Washington, D.C., 1978. Center for International Business Cycle Research: *International economic indicators*, Rutgers University, Newark, N.J., various issues.

Identification and classification of economic time series which can serve as business cycle indicators

In order to identify time series which can serve as accurate indicators of business cycle changes, the cyclical behaviour of a large number of time series over a long uninterrupted period needs to be studied. In particular, it should be kept in mind that every observed business cycle is unique and that the behaviour of individual time series shows large variations during successive business cycles. It is necessary, therefore, to analyse the behaviour of economic variables over as many cycles as possible.

In the first instance, the cyclical sensitivity of individual time series has to be determined. For this purpose, the cyclical component of each time series has to be isolated so as to be able to determine the amplitude of this component's fluctuations and to compare it with that of other time series. Secondly, it has to be determined in which cyclically sensitive time series the timing of changes shows a consistent relationship with that of the general business cycle. In order to do so, the specific turning points of the chosen cyclically sensitive time series have to be compared with the reference turning points of the general business cycle. In this way, it can be established which time series will serve as fairly accurate indicators of business cycle changes.

Changes in individual time series may lead, coincide with or lag behind changes in the general business cycle. On the basis of this characteristic, the chosen series may be classified as leading, coincident or lagging business cycle indicators. The leading series have specific turning points which precede the turning points of the general business cycle. They usually serve as projections and reflect expectations and the likely future course of general economic activity. The coincident business cycle indicators are mostly comprehensive measures of general economic activity and the specific turning points of these series more or less coincide with the general business cycle turning points. The lagging business cycle indicators serve to confirm changes in general economic activity, and changes in these series usually lag continuously in relation to the general business cycle.

Determination of business cycle indicators for South Africa

Already for many years several individuals and institutions have been collecting and processing information for the purpose of analysing business and economic conditions. A lack of good statistics initially hampered this work and the first business cycle studies had to be based on relatively few and statistically inadequate data. But during the past two decades in particular, the Central Statistical Services has performed a gigantic

task in collecting and processing a wide range of statistics, while the South African Reserve Bank has become a comprehensive source of information relating to national accounts, balance of payments and financial operations.

In broad outline, reference has already been made to the procedures involved in the determination of business cycle indicators. The various steps actually followed in the calculation of business cycle indicators for South Africa are now set out in more detail below.

1. Adjustment of basic time series

A large number of economic time series are available in South Africa for the purpose of business cycle analysis. Although most economic time series can readily be used, after seasonal adjustment, to study changes over time in the variables concerned, it is necessary in some cases to make certain adjustments in order to achieve greater comparability over time and to highlight the cyclical component of the time series. The following are the main adjustments which have been made for purposes of this study:

- (i) As a result of the sharp increase in the prices of goods and services, in particular since the early nineteen-seventies, time series which are expressed in current prices, have to be adjusted for price changes. Appropriate deflators or price indices are used for this purpose and in practice this means that the adjusted time series are expressed in the constant prices of a base year, for example 1975. This adjustment is necessary because time series observations not only measure underlying real changes, but also price changes. If a time series consists of various components, the components are deflated separately and are then aggregated to obtain the adjusted series.
- (ii) Some time series data reflect the results of periodic censuses which are updated by means of sample surveys during those periods in which censuses are not conducted. The comparability of the observations of these series is affected by changes in the coverage of successive censuses and sample surveys. It is necessary, therefore, that time series data which have been compiled from various censuses and sample surveys, be linked or made comparable. In many instances the incomparability which has to be eliminated is of small proportions, but in some cases it may be sufficiently large to require that data for the periods before and after a certain census date be evaluated separately.
- (iii) In order to obtain a complete picture of one form of economic activity, it is sometimes necessary to consolidate the data relating to certain activities or sectors. For instance, real wholesale, retail and motor vehicle sales are aggregated in order to obtain an indicator of the volume of trade.
- (iv) In order to correspond with the general direction of

change in economic activity, certain economic indicators, such as unemployment numbers, the number of insolvencies, share dividend yields and inventory/sales ratios, are analysed in an inverse form.

- (v) Instead of using the observations of a time series themselves, changes over certain periods in these observations are calculated in order to highlight the cyclical component of the series. In particular, this applies to series with predominating growth trends and cyclical components which cannot be observed clearly. Examples are the level of inventories, financial aggregates such as the money supply and credit extension, prices and labour unit costs.

2. Determination of the cyclical components and specific turning points of individual time series

After the chosen time series have been adjusted, if necessary, in the above-mentioned ways, the cyclical component and specific turning points of the individual time series are determined. The cyclical component of a time series is calculated as the residual, after seasonal fluctuations, the long-term trend and random fluctuations have been eliminated. To eliminate seasonal fluctuations from time series data, the Census Method II Seasonal Adjustment Program³ is used. The long-term trend of the time series is determined by means of the method of least squares (logarithmic functions) and it is then eliminated by dividing the seasonally adjusted observations by the calculated trend values. To eliminate random fluctuations from the remaining combined cyclical-irregular component of a time series, a moving average⁴ of the observations of this component is calculated. This average then represents the cyclical component of the time series.

The specific turning points of each time series correspond with the peaks and troughs of the cyclical component.⁵ In the process of identifying and choosing turning points, the historical characteristics of that particular time series are taken into account. In some cases the amplitude of the cyclical component in the past may prove to be of assistance in the identification of turning points. In determining turning points for purposes of this study, it was accepted that the minimum duration

³ United States of America, Department of Commerce: *The X-11 Variant of the Census Method II Seasonal Adjustment Program*, Technical Paper No. 15, Washington, D.C., 1967.

⁴ The Henderson moving average method was used to calculate the cyclical component in individual series. For an explanation of this method see Macaulay, F.: *The smoothing of time series*, National Bureau of Economic Research, New York, 1931.

⁵ In order to determine the cyclical turning points of an economic time series, it is necessary to examine the values of both cyclical and cyclical-irregular components in the vicinity of potential turning points. The computed cyclical component may not give a clear indication of a potential turning point so that the computed cyclical-irregular component has to be used to identify a turning point.

of an upswing or a downswing is six months, while that of a full cycle from one trough to the following or from one peak to the following is fifteen months.

3. Classification of time series according to timing relationship between changes in economic indicators and in the general business cycle

On the basis of the prominence and size of the amplitude of the cyclical component, 109 economic time series, representative of various forms of economic activity, have been selected as business cycle indicators. The timing of the specific turning points of the chosen individual time series is compared with that of the reference turning points of the general business cycle. Depending on the degree of correspondence or deviation, the chosen time series are then divided into three groups, namely leading, coincident and lagging business cycle indicators.

In the case of the leading series, the specific turning points generally occur earlier than the reference turning points of the business cycle. These variables usually point to future changes in economic activity and are, therefore, fairly sensitive to changes in the economic climate. A continuous increase in new orders, for instance, will precede an increase in production; an upward tendency in the number of building plans passed indicates a rise in future investment in buildings and an increase in construction employment; and a change in the number of overtime hours worked points to future changes in the level of employment.

The coincident business cycle indicators are those economic time series of which the specific turning points more or less coincide with the reference turning points of the business cycle. These series are often comprehensive measures of economic activity, such as real gross domestic or national product, the volume of industrial production and trade, and employment.

In the case of lagging business cycle indicators the specific turning points of the economic indicators concerned, appear only after the reference turning points of the general business cycle have been recorded. The lagging indicators are sluggish to change in response to changes in general economic activity, but they nevertheless serve the useful purpose of confirming business cycle changes.

The specific turning points of the selected South African business cycle indicators are compared with the reference turning points of the business cycle and the deviations are recorded in months. The following rules are applied in the classification of these indicators.⁶

⁶ In this regard, see also Organisation for Economic Co-operation and Development, Economic and Development Review Committee: *Report on reference cycle chronologies and composite cyclical indicators*, Paris, 1981, p.12; O'Dea, D.J.: *Cyclical indicators for the postwar British economy*, The National Institute of Economic and Social Research, Occasional Paper No.XVIII, Cambridge University Press, London, 1975, p.41; and Zarnowitz, V. and Boschan, C.: "Cyclical indicators:

- (i) Economic time series with turning points which lead both reference peaks and troughs systematically or by an average (median value) of three months or more, are classified as leading business cycle indicators.
- (ii) Economic time series with turning points which lead or lag reference peaks and troughs by not more than two months, are classified as coincident business cycle indicators.
- (iii) Economic time series with turning points which systematically lag both reference peaks and troughs or by an average (median value) of three months or more, are classified as lagging business cycle indicators.

4. Objective assessment of the value of individual economic time series as business cycle indicators

To reduce subjective judgement in the choice of business cycle indicators, a more objective system was developed to measure the value of the chosen time series as business cycle indicators.⁷ In this system, various criteria, similar to those used in foreign studies,⁸ have to be met by economic time series in order to be classified as reliable business cycle indicators. The various measures are economic significance, statistical adequacy, historical conformity with the general course of the business cycle, fixed relationship with the general business cycle as to the timing of changes, smoothness of the series, and availability of data. Points or scores are allotted to each criterion. Since the reliability of economic time series as business cycle indicators is of overriding importance, historical conformity and the timing of changes are regarded as the most important criteria and, in accordance with studies abroad, they are awarded the highest scores.

The final list of business cycle indicators has been compiled on the basis of the criteria scores awarded to individual series. These indicators are shown in Tables 1 to 3 and are classified as leading, coincident and lagging business cycle indicators. Economic time series which would have qualified as reliable business cycle indicators, but which are components of selected series or duplicate some of them, have been omitted from the final list.

An evaluation and new leading indexes." *Business Conditions Digest*, US Department of Commerce, Bureau of Economic Analysis, Washington, D.C., May 1975, p.172.

⁷ Van der Walt, B.E. *op.cit.*, p.263

⁸ Moore, G.H. and Shiskin, J.: *Indicators of business expansions and contractions*, National Bureau of Economic Research, Columbia University Press, New York, 1967, pp.89-93; Zarnowitz, V. and Boschan, C.: *op.cit.*, p.vii; O'Dea, D.J.: *op.cit.*, p.121; Beck, M.T., Bush, M.G. and Hayes, R.W.: *The indicator approach to the identification of business cycles*, Reserve Bank of Australia, Occasional Paper No.2, June 1973, p.17; and Haywood, E. and Campbell, C.: *The New Zealand economy: Measurement of economic fluctuations and indicators of economic activity, 1947-74*, Reserve Bank of New Zealand, Research Paper No.19, Wellington, 1976, p.17.

5. Selected leading business cycle indicators

The leading economic indicators point to that kind of activity which will influence or anticipate the future or expected course of the economy in general. As indicated in Table 1, 23 time series are selected as leading indicators of business cycle changes.

Various leading business cycle indicators are related to the foreign demand for South African goods and ser-

Table 1: Selected leading business cycle indicators

Economic activity and economic indicator	Starting point
Employment and unemployment	
Employment	
— total mining	Jan. 1953
Production and income	
Utilisation of production capacity in manufacturing	
— durable goods	1st qtr. 1971
Gold ore milled	1st qtr. 1960
Physical volume of mining production, excluding gold	Jan. 1963
Consumption, trade and orders	
Export of steel products	Jan. 1969
Number of new motorcars sold	Jan. 1947
Merchandise exports (excluding gold)*	Jan. 1960
Net new companies registered	Jan. 1950
Real estate transactions	Jan. 1970
Fixed investment	
Building plans passed	
— value of residential buildings*	Jan. 1960
Inventories	
Ratio of inventories to sales	
— manufacturing†	4th qtr. 1964
Prices, costs and profits	
Share prices	
— industrial and commercial	Jan. 1957
— all classes	Jan. 1969
Dividend yield on shares	
— industrial shares†	Jan. 1964
Price of gold (London)	Jan. 1968
Company profits after taxes	1st qtr. 1960
Ratio of prices to labour unit costs	
— manufacturing	Jan. 1961
Money and credit extension	
Changes in M ₁	Jan. 1960
Commercial banks — change in discounts and advances	Jan. 1969
Net gold and other foreign reserves	Jan. 1959
Building societies	
— investments in prescribed assets	Jan. 1965
— new mortgage loans granted for the erection of buildings	Jan. 1965
Money market interest rate	
— Treasury bill tender rate†	Jan. 1958

* At constant 1975 prices.

† Inverse scale

vices. Business cycle changes in South Africa are traditionally preceded by corresponding changes in the industrial countries. A change in foreign demand influences the export sector immediately, but general economic activity only after a certain time lag. The selected leading business cycle indicators, therefore, include merchandise exports, export prices such as the gold price, net foreign reserves and various forms of mining activity (which are mainly export orientated) such as mining production and employment.

A second group of leading business cycle indicators are related to future production and expenditure. Included in this group are the utilisation of production capacity in the manufacturing of durable goods, the ratio of inventories to sales (with inverse sign), residential building plans passed, new mortgage loans granted for the erection of buildings, real estate transactions, and changes in the money supply and interest rates.

A third group of leading business cycle indicators reflect expectations regarding the future course of the economy and the general business climate. These indicators include share prices and dividend yields, new companies registered (adjusted for liquidations), and profits.

6. Selected coincident business cycle indicators

As shown in Table 2, 11 economic time series of which the turning points roughly coincide with the reference turning points of the business cycle, are classified as coincident business cycle indicators. Since these indicators are mostly comprehensive measures of general economic activity, they reflect the course of the general business cycle fairly accurately. The chosen indicators are mostly related to real domestic product and consumption, and also to employment in the private sector and the utilisation of production capacity.

7. Selected lagging business cycle indicators

The 11 economic indicators shown in Table 3, are classified as lagging business cycle indicators because they have turning points which consistently lag behind those of the business cycle. The most important lagging indicators are total employment in the non-agricultural sectors of the economy, real fixed investment in machinery and equipment, series related to the construction industry such as the number of hours worked, buildings completed and the production of building materials, and labour unit costs.

The lagging of non-agricultural employment, relative to the course of the general business cycle, may be explained by employment in the public sector, which mostly follows a course different from that of the general business cycle. In addition, the scarcity of skilled labour in South Africa leads to the hoarding of skilled workers during periods of economic downswing. At the same time, this scarcity causes labour costs per unit of production to adjust only with a time lag to changes in business cycle conditions. Real fixed investment in

Table 2: Selected coincident business cycle indicators

Economic activity and economic indicator	Starting point
Employment and unemployment	
Employment in the private non-agricultural sectors	Jan. 1952
Registered unemployed†	
— Whites, Coloureds and Asians	Jan. 1958
Production and income	
Gross domestic product, excluding agriculture*	1st qtr. 1960
Physical volume of manufacturing production	
— durable goods	Jan. 1963
— non-durable goods	Jan. 1963
Utilisation of production capacity in manufacturing	1st qtr. 1971
Consumption, trade and orders	
Sales*	
— retail	Jan. 1948
— retail, wholesale and motorcar sales	Jan. 1966
Merchandise imports*	Jan. 1960
Fixed investment	
Building plans passed	
— total value	Jan. 1960
Money and credit extension	
Number of mortgages registered	Apr. 1955

* At constant 1975 prices
† Inverse scale

machinery and equipment and activity in the building industry inevitably lag in relation to general business cycle changes because investment and building programmes require some time for completion, and in an upswing new programmes will only be started as demand for new production capacity or accommodation develops.

Calculation of composite business cycle indicators for South Africa

1. Advantage of composite business cycle indicators

The behaviour of individual economic variables differs in each business cycle since every cycle is to a large extent unique. The degree of reliability of these variables as business cycle indicators may vary, therefore, from one business cycle to another. The great advantage of the combination of chosen indicators in a composite business cycle indicator is that the latter will probably provide a more reliable indication of business cycle changes than the individual series. In particular, the timing of changes will probably show a more stable relationship with that of the general business cycle. Errors of measurement and other random deviations in individual series will possibly cancel out when indicators

Table 3: Selected lagging business cycle indicators

Economic activity and economic indicator	Starting point
Employment and unemployment	
Employment in non-agricultural sectors ...	1st qtr. 1970
Number of appointments per 100 production workers	
— manufacturing	Jan. 1960
Hours worked	
— construction	Jan. 1960
Production and income	
Volume of mining production	
— building materials	Jan. 1963
Consumption, trade and orders	
Wholesale sales	
— metals, machinery and equipment	Jan. 1966
Number of commercial vehicles sold	Jan. 1947
Unfilled orders as percentage of sales	
— manufacturing	3rd qtr. 1964
Fixed investment	
Machinery and equipment*	1st qtr. 1960
Buildings completed	
— value of residential buildings	Jan. 1960
— total value	Jan. 1960
Prices, costs and profits	
Labour costs per unit of production	
— manufacturing	Jan. 1961

* At constant 1975 prices.

are combined. The composite indicator will, therefore, be a more even series than the individual components.

2. Selection of economic time series for inclusion in a composite business cycle indicator

The time series from which a composite business cycle indicator is computed, should comply with the following requirements:

- (i) Only indicators in which changes show the same consistent timing relationship with the business cycle should be included. For example, economic indicators which have historically reflected business cycle changes, will jointly indicate the vicinity in which the turning points of the business cycle are to be found.
- (ii) The indicators which are selected according to their timing relationship, should cover a variety of economic activities. In the selection of indicators it is also necessary that theoretical considerations as well as practical experience are taken into account. It is important, therefore, that the time series selected in South Africa for business cycle analyses reflect the dynamic characteristics of the economy. Although experience abroad provides a useful basis for analysis, the choice of indicators should not be a

direct imitation of the practice followed abroad. The South African economy clearly has certain unique business cycle features. The selection of time series should, therefore, take into account the unique features of the South African economy.

- (iii) The time series should comply with the criteria laid down for an evaluation of business cycle indicators. Preference should be given to economic indicators which attain the highest scores in terms of their compliance with the different criteria. In some cases, however, indicators may be preferred because of compliance with certain specific criteria. When economic indicators are used to predict the future course of the business cycle, it is particularly important that time series observations should be available at an early date and are not revised frequently. These time series will probably be selected in preference to those indicators which have a greater coverage of a particular economic activity, but which are normally released only with a long time lag between the time of survey and date of release of the data.
- (iv) The business cycle features of the selected time series should also be tested continuously so as to ensure that deficiencies in the components which may arise in the course of time do not reduce the effectiveness of the composite indicator. New economic indicators, which provide a more extensive coverage of a particular economic activity and which also command a relatively high criteria score in terms of the evaluation system, could be included as an additional component or even replace existing indicators.

On the basis of these requirements, the 45 economic indicators in Tables 1, 2 and 3 are selected for the computation of composite business cycle indicators.

Of these, 9 are quarterly series which are changed to monthly series by the application of linear interpolation between successive observations in order to combine them with the other time series in composite monthly series.

3. Method of calculation

Six basic steps are followed in the calculation of composite leading, coincident and lagging business cycle indicators:⁹

- (i) For each seasonally adjusted time series a symmetrical percentage change for consecutive time intervals is calculated according to the following formula:

$$X_t = 200(B-A)/(B+A)$$

A^{1st} = value of index in the first time interval

B = value of index in the second time interval

⁹ Zarnowitz, V. and Boschan, C.: "Cyclical indicators: An evaluation and new leading indexes," *Business Conditions Digest*, op.cit.

In the case of time series expressed in terms of ratios, percentages and balances, the absolute differences for consecutive time intervals are computed.

- (ii) The computed changes are then standardised in order to prevent the more volatile series from dominating the composite series.
- (iii) For each time interval a weighted average is computed of the standardised values obtained in the previous step and the criteria scores awarded to the selected series are used as weights.
- (iv) The weighted average changes in the previous step are also standardised.
- (v) From the first time interval the weighted changes are cumulated successively in order to compile a series and this series is transformed into an index with 1975 as base year.
- (vi) Since the trends of the composite leading, coincident and lagging business cycle indicators may differ substantially, the trend of each of the computed indices is replaced by a uniform new trend or growth rate. In this study the growth rate of the real gross domestic product of the non-agricultural sectors is used as target growth rate or trend. In order to do this substitution, the trends of the composite indicators are calculated by means of log-linear functions for the periods 1960 to 1975 and 1976 to 1981. This distinction between two periods was made to ensure that cyclical changes do not reflect the influence of the structural changes in economic activity during the mid-seventies. The deviations of the computed index values from the substituted long-term trend represent the cyclical component of the composite indicator.

4. Statistical results

The movements of the composite economic indicators in relation to the previously determined reference turning points and phases of the business cycle are shown in Graphs 1 to 3. The computed index values, the percentage deviation of the index values from their trend values and the percentage change over one year¹⁰ are shown in these graphs.

- (i) *Composite leading business cycle indicator*

The specific turning points of the composite leading indicator preceded the reference turning points of the business cycle in South Africa without exception during the period 1960 to 1982. In accordance with research findings abroad, the lead periods of the composite leading indicator are longer at peaks

¹⁰ The index for the current month is divided by the average for the twelve months ending six months before the current month. For example, the December index is divided by the average for the year ending the preceding June; the January figure is divided by the average for the year ending the preceding July, etc. This percentage change is approximately the same as the percentage change in the index for the same month (quarter) over one year. The result is more even because the irregularities in the base of comparison are reduced.

than at troughs.¹¹ The upper turning points of the composite leading indicator led the peaks of the business cycle on average by twelve months, whereas the lower turning points led by a much shorter average period of four months. In the case of the troughs in 1972 and 1977, however, the composite indicator showed longer lead periods.

Specific turning points of composite leading business cycle indicator and number of months by which they lead reference turning points of the business cycle

Date	Number of months by which the index leads (-) reference turning points	
	Peaks	Troughs
June 1961		- 2
March 1964	-13	
October 1965		- 2
December 1966	- 5	
October 1967		- 2
April 1969	-20	
October 1971		-10
August 1973	-12	
May 1977		-7
August 1980	-12	
Average	-12,4	-4,6

If the historical relationship between the timing of changes in the composite leading indicator and the business cycle is accepted, this indicator can be used to confirm as well as predict the peaks and troughs of the business cycle. As a result of the relatively longer period by which the upper turning points of the leading indicator precede the peaks of the business cycle, the leading indicator is especially useful to show the likely termination of expansion phases of the business cycle well in advance. It should, however, be emphasised that only qualitative conclusions can be drawn from changes in the leading indicator within a specific period.

(iii) *Composite coincident business cycle indicator*

The specific turning points of the coincident business cycle indicator, without exception, did not deviate by more than two months from the reference turning points of the business cycle during the period 1960 to 1982. During this period the average deviation was equal to nil. Since the method of computation of the composite index is based on actual standardised changes in comprehensive time series, the composite indicator approximately also shows the relative strength of the expansion or contraction of economic activity. For example, the

Specific turning points of composite coincident business cycle indicator and number of months by which they deviate from reference turning points of the business cycle

Date	Number of months by which index deviates from reference turning points lead (-) or lag (+)	
	Peaks	Troughs
September 1961		+1
April 1965	0	
January 1966		+1
May 1967	0	
October 1967		-2
February 1971	+2	
August 1972		0
July 1974	-1	
November 1977		-1
August 1981	0	
Average	0	0

strong economic growth phases of 1962/64, 1969/70, 1973/74 and 1979/81 are indicated by the index. The decline in, or lower growth of, general economic activity in 1960/61, 1971/72, 1976/77 and 1982 are also clearly indicated.

On the basis of these results, the composite index can be used in conjunction with diffusion indices and other information to determine the historical course of the business cycle. The cyclical component of the composite indicator will provide an approximation of the business cycle in South Africa.

(iii) *Composite lagging business cycle indicator*

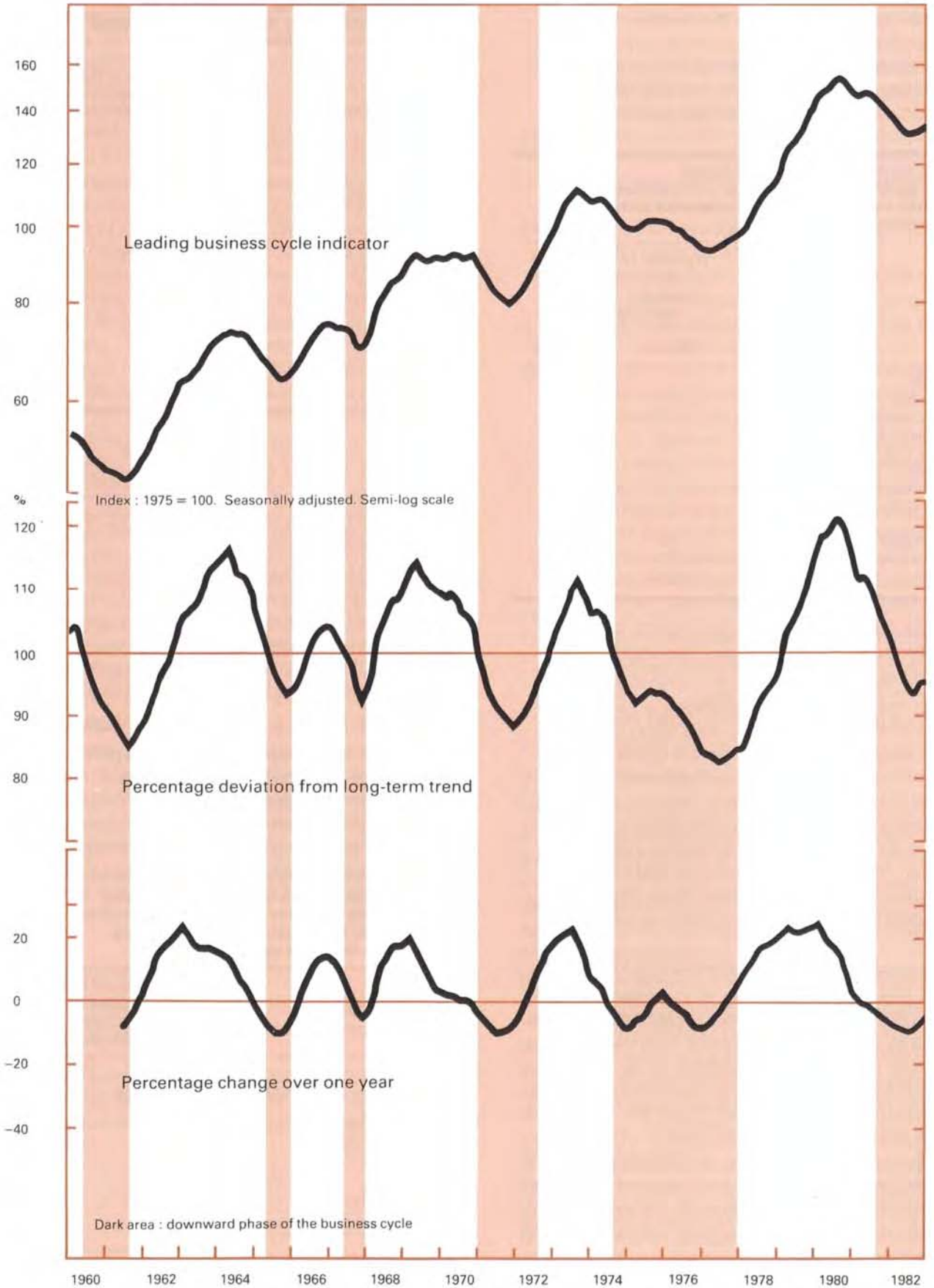
In Graph 3 it is shown that during the period 1960 to 1981 the composite lagging business cycle indicator did not change direction immediately after business cycle turning points had been reached. During this period the peaks and troughs of the

Specific turning points of composite lagging business cycle indicator and number of months by which they lag behind reference turning points of the business cycle

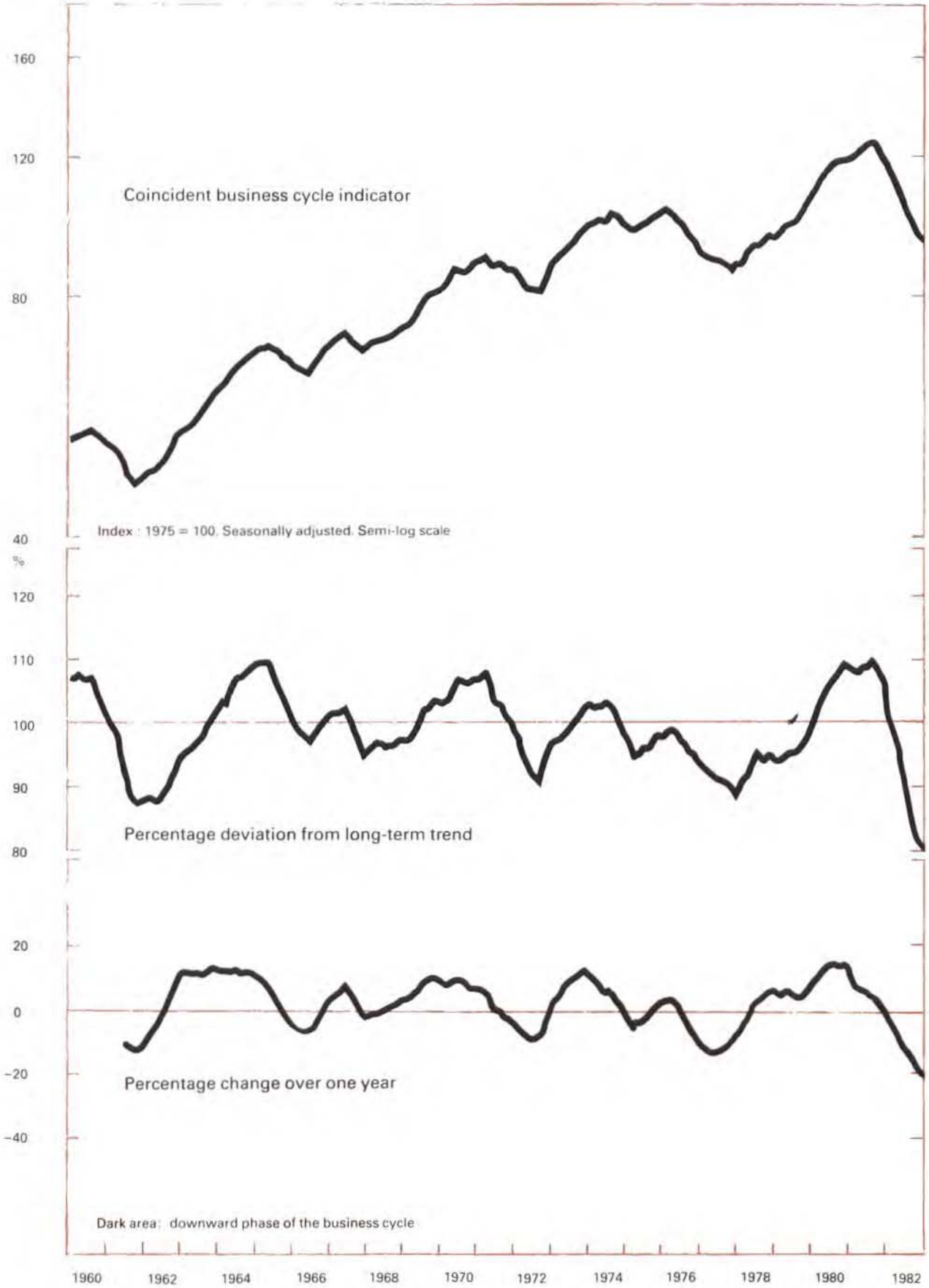
Date	The number of months by which index lags (+) behind reference turning points	
	Peaks	Troughs
October 1960	+ 6	
September 1962		+13
September 1965	+ 5	
October 1966		+10
July 1967	+ 2	
October 1968		+10
March 1971	+ 3	
October 1972		+ 2
June 1975	+10	
February 1978		+ 2
Average	+5,2	+7,4

¹¹ OECD, Economic and Development Review Committee: *Report on reference cycle chronologies and composite cyclical indicators*, op.cit. p.38.

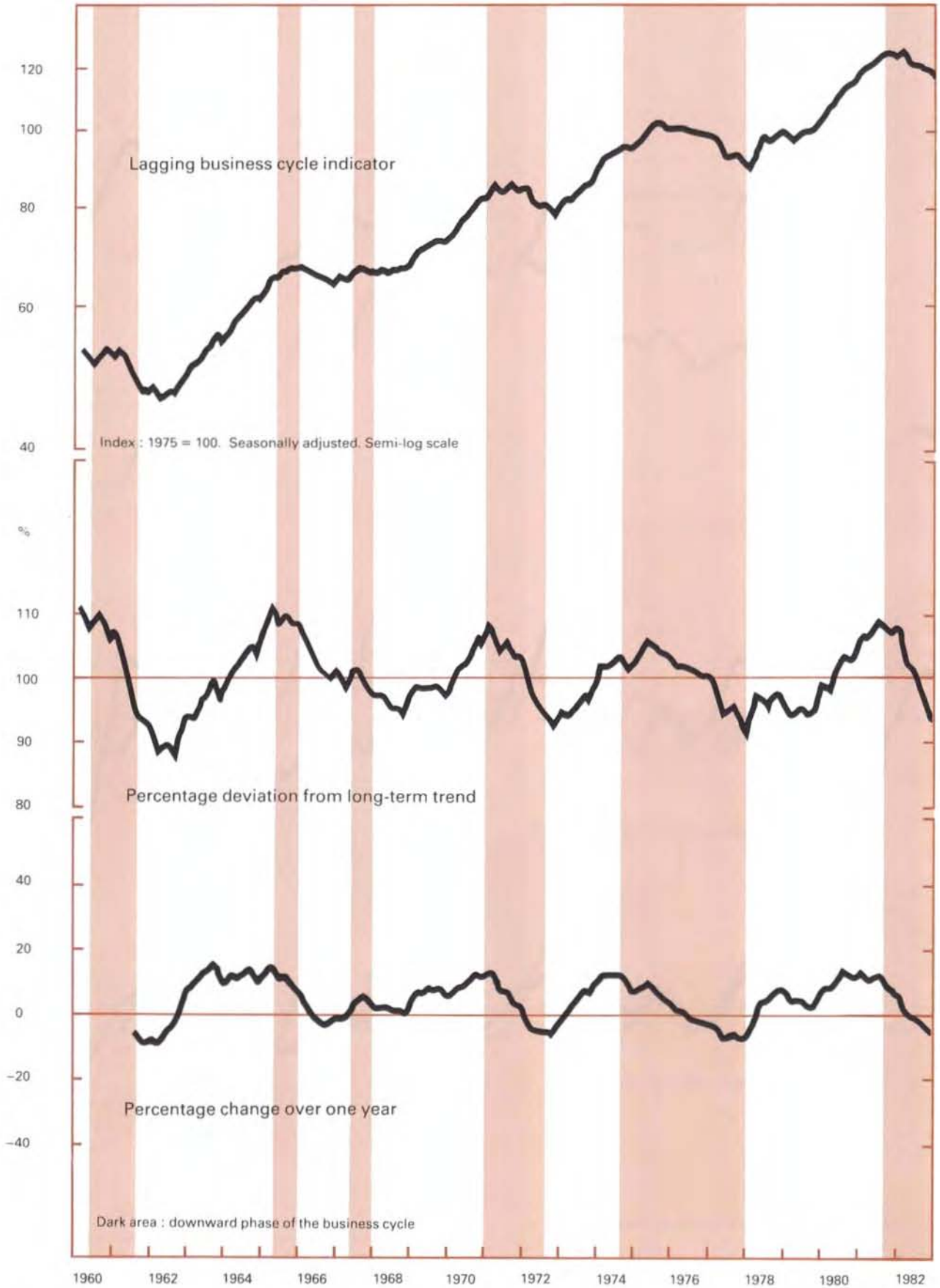
Graph 1: Leading business cycle indicator



Graph 2: Coincident business cycle indicator



Graph 3: Lagging business cycle indicator



composite index lagged on average by five and seven months, respectively, behind the reference turning points of the business cycle. The different phases of the business cycle were, nonetheless, reflected in the movement of the composite indicator, but only with a certain time lag. The advantage of this indicator is that it confirms observed business cycle changes, for example those shown by the coincident business cycle indicator.

(iv) *Composite indicators as measures of the extent of economic change*

Allowing for differences in the timing of the turning points, there is a high degree of correlation between changes in the three composite business cycle indicators. A comparison of the rate of change in these series with the historical diffusion index in Graph 4, shows that they also reflect clearly the extent of change in general economic activity. Because the components of the composite leading indicator are generally more sensitive to changes in economic activity and consequently show fluctuations with a distinct amplitude over time, the amplitude of fluctuations in the composite leading indicator is larger than those of the coincident and lagging business cycle indicators.

Graph 4 : Percentage change in the composite business cycle indicators and the historical diffusion index

