Reference turning points in the South African business cycle: Recent developments

by J C Venter[1]

Introduction

The South African Reserve Bank (the Bank) had previously established reference turning points in the South African business cycle for the period 1946 to 1999. These historic reference turning points were discussed in various articles and notes published in earlier editions of the South African Reserve Bank's *Quarterly Bulletin*. The most recently identified trough (lower reference turning point) in the business cycle occurred in August 1999 (Venter and Pretorius, 2001).

1 The author wishes to thank Mr W S Pretorius for his valuable contributions in preparing this article.

During the current business cycle expansion, the Bank's composite coincident business cycle indicator exhibited two short periods of decline, i.e. in the second and third quarters of 2001 and again during the first half of 2003. These downward movements necessitated an evaluation of the possible occurrence of reference turning points in the periods mentioned.

The purpose of this article is to describe the methodology applied by the Bank to determine reference turning points in the business cycle, as well as to present the outcome of the analysis applied for identifying potential recent reference turning points.

Defining business cycles

The most comprehensive and widely quoted definition of the business cycle was first formulated by Mitchell in 1927. It was later modified slightly by Burns and Mitchell (1946:3), to read as follows:

> "Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organise their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of change is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own."

This definition was originally formulated to define classical business cycles, i.e. *absolute* declines in aggregate economic activity followed by *absolute* increases in aggregate economic activity. It also applies to growth cycles, which represent the fluctuations around the long-term growth trend of aggregate economic activity, i.e. the trend-adjusted business cycle.

From the outset, the South African Reserve Bank monitored cyclical changes in the South African economy in terms of growth cycles. When dates indicating the reference turning points in the South African business cycle were first published in 1970, the analysis was done on the cyclical components of the time series considered, implying that the long-term trend was eliminated from each time series considered (Smit and Van der Walt, 1970:24). The Bank's business cycle chronology, published regularly in the *Quarterly Bulletin,* therefore represents reference turning point dates that distinguish

between periods when aggregate economic activity increased by more than its long-term growth trend (upward phases) and periods when aggregate economic activity either contracted, or increased by less than its long-term growth trend (downward phases).

The Burns and Mitchell definition recognises three significant features of business cycles that are particularly relevant when determining reference turning points in the business cycle, namely *duration, amplitude* and *scope.* This definition imposes fairly broad limits on the duration of a full cycle: More than a year to ten or twelve years. No limitations are placed on the duration of either an expansion or a contraction. According to Moore (1980:14), however, past experience suggests that contractions (or expansions) that fit the definition in other respects, should last for at least six months.

Furthermore, Moore (1980:14) suggests that the requirement in terms of amplitude is that expansions and contractions should reflect an absolute rise and an absolute fall in aggregate economic activity. In the case of growth cycles, this implies an absolute rise and an absolute fall in trend-adjusted aggregate economic activity. The requirement that cycles must not be "divisible into shorter cycles of similar character with amplitudes approximating their own" implies that if, for example, a long upward phase is interrupted by a decline, the decline should be recognised as a downward phase if, and only if, it lasts as long as the shortest downward phase in the historical record.

Although the concept *aggregate economic activity* is not clearly defined, this reference to the scope of the business cycle certainly does not imply some limited measure of economic activity. In fact, Moore (1980:15) states that no single index of economic activity has been found to be superior to every other. The definition states that expansions or contractions occur "at about the same time in many economic activities". This illustrates the one common characteristic of business cycles, namely the high cyclical conformity or coherence of numerous variables, or the pervasive nature of business cycles (Moore and Zarnowitz, 1984:3). Reference turning points in the business cycle can therefore never be determined by merely analysing a single measure of economic activity, such as gross domestic product, or only a limited number of individual indicators.

The three features of business cycles discussed above have also been referred to as "the three Ps" (Achuthan and Banerji, 2004), i.e. aggregate economic activity should change direction in a way that is *persistent, pronounced* and *pervasive.*

Methods used in determining reference turning points in the business cycle[2]

2 For a detailed discussion of these methods, see Smit and Van der Walt (1970).

The South African Reserve Bank employs several methods to establish whether a reference turning point in the business cycle occurred. Firstly, the three composite business cycle indicators, released monthly on the Bank's Internet website, are analysed. Should sufficient evidence of a possible turning point in the business cycle be found, two comprehensive diffusion indices, namely the historical diffusion index and the current diffusion index, are constructed.

The identification of a reference turning point in the business cycle can never be reduced to a purely statistical calculation. Important economic events and developments occurring in the vicinity of a possible turning point, as well as various other macroeconomic indicators, must be considered, since the statistical methods employed seldom all point to exactly the same turning point date. Indeed, some of the statistical methods employed may not even indicate the occurrence of a turning point.

Composite business cycle indicators

A composite business cycle indicator is compiled by integrating various economic indicators into a single indicator time series. The three composite business cycle indicators comprise three samples of economic indicators that are grouped together according to their ability to lead, coincide with, or lag movements in the business cycle.

The first sign of a possible turning point in the business cycle is usually when the *composite leading business cycle indicator* clearly changes direction for a period of at least six months. Another leading indicator of movements in aggregate economic activity, which could be used to confirm movements in the composite leading business cycle indicator, is the ratio of the composite coincident business cycle indicator to the composite lagging business cycle indicator (Venter, 2004). When the change in direction in the leading indicator is followed by a similar change in direction in the composite coincident business cycle indicator for a period of at least six months, the likelihood of a turning point in the business cycle rises significantly. Apart from its use in the ratio described above, the composite lagging business cycle indicator will usually change direction after the coincident indicator, confirming the movements in the other two composite business cycle indicators.

Historical and current diffusion indices

When movements in the composite business cycle indicators reflect the possible occurrence of a turning point in the business cycle, historical and current diffusion indices are constructed to confirm or refute the occurrence of such a reference turning point in the business cycle. During the current analysis, a total of 190 seasonally-adjusted economic time series were used to construct the two diffusion indices. These time series cover all the relevant economic processes in the different sectors of the economy such as production, sales, employment, income, investment, monetary aggregates, international trade and government activities, as well as capital market developments.

The *historical diffusion index* can be defined as a measure of the dispersion of the changes in a number of economic time series in a specific period, mostly a calendar month. This index is constructed by first determining the specific turning points in the cyclical component (deviation from trend) of each of the 190 time series considered. A set of peak and trough dates is thus obtained for each time series. A series is regarded as increasing for each period subsequent to a trough, up to and including the following peak. Conversely, a series is regarded as decreasing for each period subsequent to a peak, up to and including the following trough. The historical diffusion index value for a particular month is then obtained by expressing the number of increasing time series (relative to their long-term trends) in that month as a percentage of the total number of time series considered. An index value exceeding 50 therefore indicates that more than half of the series considered are increasing during a particular month, implying that the economy is in an upward phase of the business cycle. Similarly, an index value below 50 implies that the economy is in a downward phase of the business cycle. Turning points in the historical diffusion index therefore occur when the index passes through the 50-per-cent mark.

The *current diffusion index* is a comprehensive composite index compiled from the actual month-to-month changes in each of the total number of seasonally-adjusted time series considered. As an approximation of the growth cycle, the deviation of the current diffusion index from its long-term trend provides a quantitative indication of the cyclical

movement in aggregate economic activity. For the construction of both the historical and the current diffusion indices, the sectoral contributions are weighted according to each sector's contribution to gross value added.

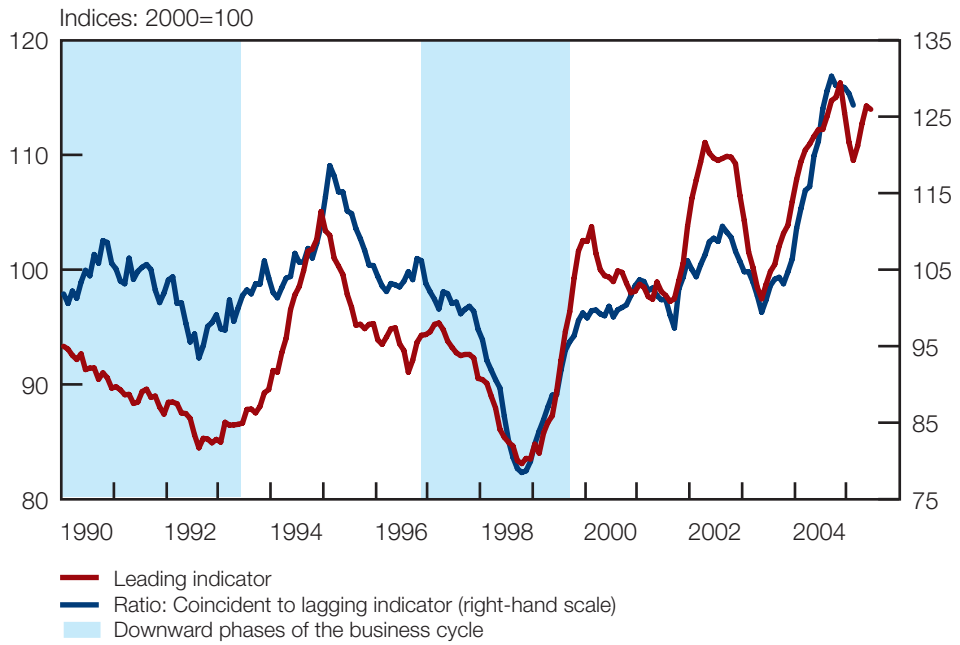
Statistical results

In the introduction to this article, mention was made of two periods during which the current expansion might have been ended by short downward phases of the business cycle. Since reference turning points in the business cycle are not revised after the event and due to various data constraints, such as changes to a number of statistical surveys released by Statistics South Africa, as well as changes in the base year of constant price estimates of South Africa's national accounts statistics, the investigation into the occurrence of these two possible downward phases of the business cycle was delayed until a consistent data set has become available. During the current analysis, the various methods described in the previous section show conflicting results, both with regard to the timing and the occurrence of turning points. These results are presented graphically and discussed in more detail below.

Composite business cycle indicators

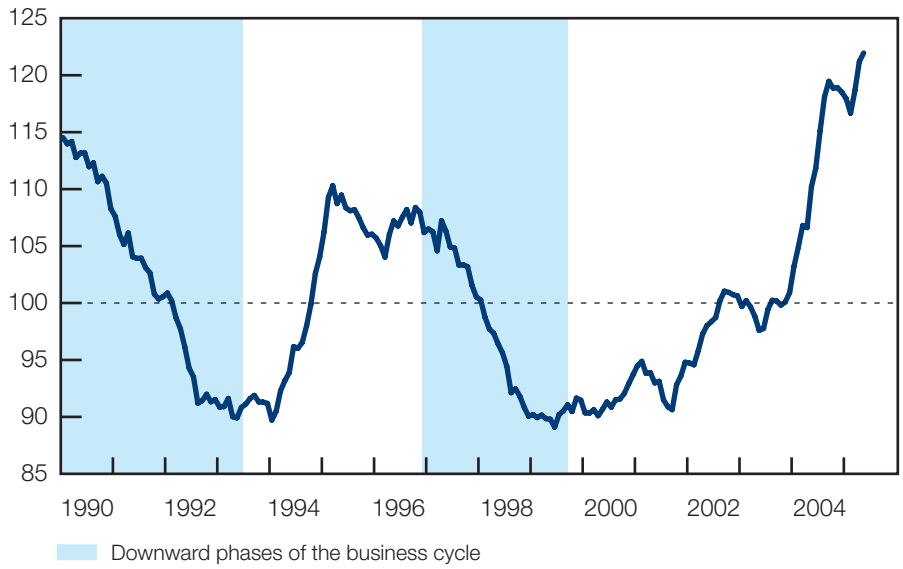
The first indication of a possible turning point in the business cycle was provided by the composite leading business cycle indicator. The leading indicator reached a peak in February 2000, whereafter it followed a downward trend up to August 2001. The indicator then reached another peak in April 2002 and retracted sharply until May 2003. Although the turning points have not corresponded exactly, these movements in the leading indicator have been corroborated by the movements in the ratio of the composite coincident business cycle indicator relative to the composite lagging business cycle indicator. This ratio, as well as the composite leading business cycle indicator, is depicted in Graph 1.

Graph1: Composite business cycle indicators



The deviation of the composite coincident business cycle indicator from its long-term trend (shown in Graph 2) also exhibited two short periods of decline. These periods were from February 2001 to September 2001 and again from September 2002 to May 2003.

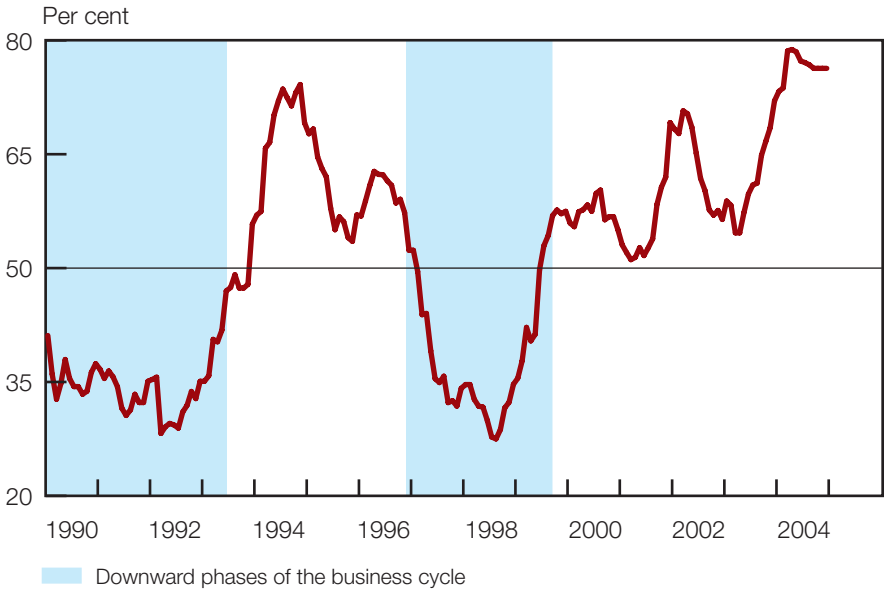
Graph 2: Composite coincident business cycle indicator (deviation from long-term trend)



Historical and current diffusion indices

The historical diffusion index is depicted in Graph 3. According to this index, the upward phase of the business cycle that started in September 1999 clearly lost some

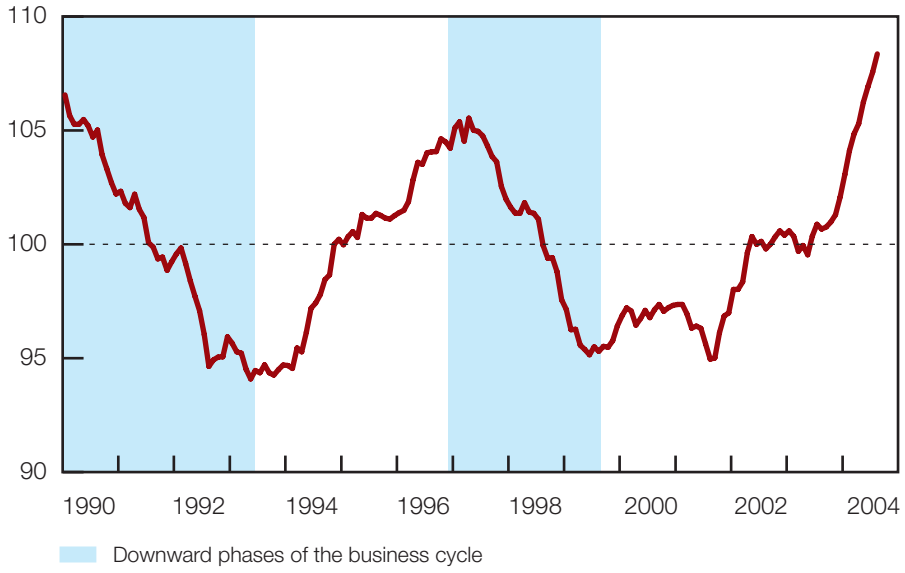
Graph 3: Historical diffusion index



momentum during the first half of 2001 and again in 2002. However, the index never fell below the 50-per-cent mark, implying that more than half of the time series considered continued to increase relative to their long-term trends throughout the current upward phase of the business cycle.

The deviation of the current diffusion index from its long-term trend decreased for a period of exactly six months, between February 2001 and August 2001. This measure of aggregate economic activity again declined slightly during the first half of 2003, albeit only for a period of four months (see Graph 4).

Graph 4: Current diffusion index (deviation from long-term trend)



An analysis of the historical and current diffusion indices of the various sectors of the economy provides further clarity on the cyclical behaviour of the economy during the two periods of economic slowdown currently under review. The mining and manufacturing sectors were the only two sectors that showed periods of decline of at least six months during the periods in question in both the historical and current diffusion indices. The historical diffusion index of the mining sector fell below the 50-per-cent mark for 18 consecutive months, from June 2002 to November 2003. The deviation from trend of the mining sector's current diffusion index reached a peak in November 2002 and a subsequent trough in November 2003. Economic activity in the manufacturing sector declined in both periods under review. The historical diffusion index of the manufacturing sector fell below the 50-per-cent mark for eight consecutive months, from January 2001 to August 2001, and again for 13 consecutive months, from September 2002 to September 2003. The deviation from trend of the manufacturing sector's current diffusion index reached a peak in December 2000 and a subsequent trough in August 2001. The indicator then peaked again in September 2002 and reached a trough in August 2003.

As the mining and manufacturing sectors are to a large extent export-oriented, they are amenable to fluctuations in economic activity in South Africa's main trading-partner

countries, as well as to movements in commodity prices and the exchange rate of the rand. Towards the end of 2000 and in 2001, growth in the global economy slowed down meaningfully, most notably in the United States, where a recession occurred for the first time in a decade. International commodity prices also fell quite sharply throughout 2001. As a result of these developments, manufacturing exports were almost stagnant in 2001 and manufacturing production declined between February and August 2001. The sharp depreciation in the exchange rate of the rand during the second half of 2001, coupled with rising commodity prices at the end of 2001 and the first half of 2002, aided the recovery in the manufacturing sector. This is evidenced by the strong growth recorded in manufacturing production as well as manufacturing exports in the second half of 2001 and the first half of 2002.

From January 2002 onwards, the exchange value of the rand appreciated significantly up to the end of 2004. This development, which severely eroded the price competitiveness of exporters in the mining and manufacturing sectors, was accompanied by weak economic growth in the euro area – South Africa's major export market. These developments eventually led to a decline in mining and manufacturing production and exports during the second half of 2002 and throughout 2003. This is also reflected in the movements of the historical and current diffusion indices of the mining and manufacturing sectors.

Throughout all these developments, domestic demand continued to expand at a solid pace, supported by continued declines in the prices of imported goods in 2002 and 2003, lower rates of inflation and a less restrictive monetary policy from mid-2003. Domestic demand was therefore not as adversely affected by these global economic and exchange rate developments as was domestic production.

Comparing previous downward phases

The two apparent downward phases of the business cycle in 2001 and 2003 were also compared with previous downward phases of the business cycle in terms of duration, amplitude and scope. Firstly, the movements in the deviation from trend of the composite coincident business cycle indicator were compared for five previous downward phases of the business cycle and the two periods currently under review. The first two downward phases chosen, occurring during the 1960s, were both relatively short and can therefore be assumed to resemble the two recent declines in the coincident indicator. The three most recent identified declines were also included in the sample. The seven periods of decline in the coincident indicator were compared in terms of duration and amplitude. This comparison is shown in Table 1.

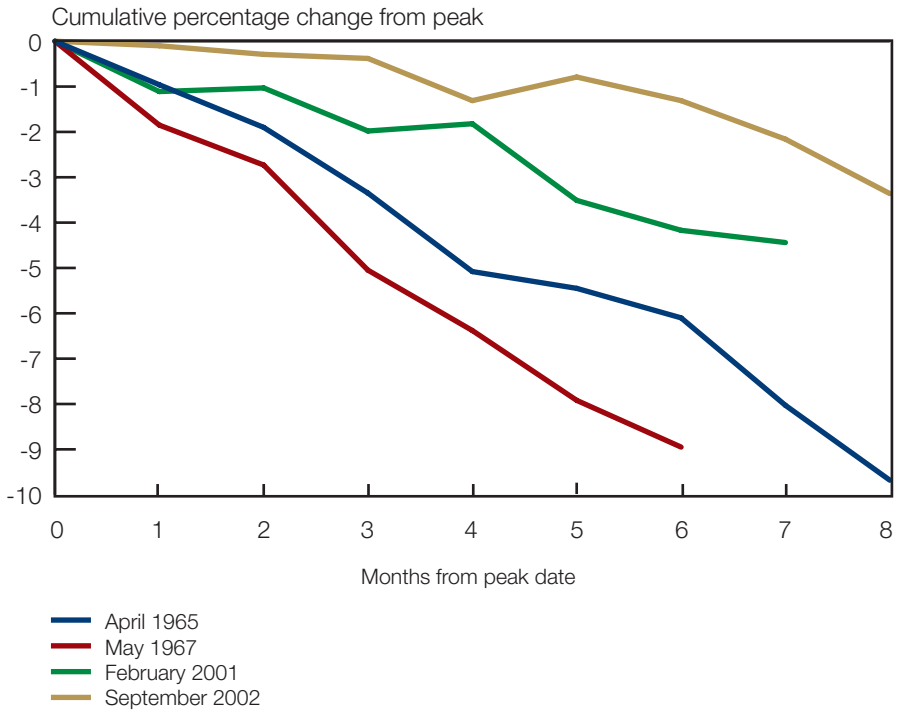
Table 1: Composite coincident business cycle indicator (deviation from trend) – downward phase comparison

Downward phase of the business cycle	Duration (months)	Percentage change: Peak to trough
May 1965 to December 1965	8	-9,7
June 1967 to December 1967	7	-9,0
July 1984 to March 1986	21	-15,1
March 1989 to May 1993	51	-23,7
December 1996 to August 1999	33	-16,4
March 2001 to September 2001*	7	-4,4
October 2002 to May 2003*	8	-3,4

* Period of decline in the deviation from trend of the composite coincident business cycle indicator

In terms of duration, both periods of recent decline (i.e. during 2001 and 2003) in the coincident business cycle indicator are similar to the previous two shortest downward phases of the business cycle (during the 1960s). However, the amplitudes of the coincident indicator (measured as the percentage change from peak to trough in the deviation from trend of the coincident indicator) during both of these two recent periods of decline are significantly smaller than the amplitudes of the other periods considered, even that of the two short declines of the 1960s. The cumulative percentage changes in the deviation from trend of the composite coincident business cycle indicator for the two short downward phases in the 1960s and for the two recent declines in the coincident indicator are illustrated in Graph 5.

Graph 5: Composite coincident business cycle indicator (deviation from trend) – downward phase comparison



A similar comparison was done by using the deviation from trend of the current diffusion index. The current diffusion index was only compiled for the period starting 1985, allowing the inclusion of only the three most recent periods of decline in this analysis. Since the deviation of the current diffusion index from its trend declined for a period of only four months in 2003, implying that no downward phase occurred, this period was excluded from the comparison. The current diffusion index comparison is shown in Table 2. The duration of the 2001 decline was exactly six months, the shortest period required for recognising this as a business cycle phase. Regarding amplitude (measured as the percentage change from peak to trough in the deviation from trend of the current diffusion index), the 2001 decline is once again significantly smaller than those of the other periods considered.

The historical diffusion index, which was discussed in the previous section, provides a close approximation of the scope, or pervasiveness, of the decline in trend-adjusted aggregate economic activity. This measure clearly shows that during both periods under review, the decline in economic activity was not nearly as pervasive as in previous

downward phases of the business cycle. In fact, the index never subsided below the 50-per-cent mark, indicating that more than half of the time series considered still increased relative to their long-term trends.

Table 2: Current diffusion index (deviation from trend) – downward phase comparison

Downward phase of the business cycle	Duration (months)	Percentage change: Peak to trough
July 1984 to March 1986	21	-6,9
March 1989 to May 1993	51	-13,7
December 1996 to August 1999	33	-9,8
March 2001 to August 2001*	6	-2,5

* Period of decline in the deviation from trend of the current diffusion index

Conclusion

This analysis confirms that no downward phase of the business cycle has yet occurred in the South African economy after September 1999. Although a slight slowdown in the expansion of aggregate economic activity occurred in 2001 and again from late 2002 to early 2003, neither of these qualified as downward phases of the business cycle, according to the definition of a business cycle. The criteria, as set out in the definition, were not all met, especially in terms of amplitude and scope. The amplitudes of the two declines under review are significantly smaller than those of the previous downward phases considered. As the historical diffusion index never declined below the 50-per-cent mark, the criteria were not met in terms of scope either. Regarding duration, the requirement of at least six months was met for both periods of decline in the case of the composite coincident business cycle indicator and only for the earlier period in the case of the current diffusion index. In the case of the historical diffusion index, it was not met at all.

The results obtained from the various sectors of the economy reveal that the observed slowdown in economic activity during the periods under review was much more pronounced in the export-oriented sectors of the economy. The deceleration in the growth rate of aggregate economic activity was also much more noticeable on the supply side of the economy than on the demand side. The results obtained during this study therefore emphasise the importance of evaluating all aspects of aggregate economic activity, i.e. all the relevant economic processes and the different sectors of the economy before firm conclusions can be drawn regarding the stance of the business cycle. Reliance on one or a few economic indicators alone when determining reference turning points in the business cycle will, in many instances, not render convincing results.

The current business cycle expansion is confirmed as the longest on record. The previous two longest expansions, from September 1961 to April 1965 and from January 1978 to August 1981, both lasted 44 months. The duration of the expansion that started in September 1999 moved beyond the duration of those expansions in May 2003, and still seems to be progressing unabatedly.

References

Achuthan, L. and Banerji, A. 2004. *Beating the Business Cycle.* New York: Currency Doubleday.

Burns, A.F. and Mitchell, W.C. 1946. *Measuring Business Cycles.* New York: NBER.

Moore, G.H. 1980. Business Cycles, Inflation, and Forecasting. *NBER Studies in Business Cycles No 24.* Cambridge, Mass: Ballinger Publishing Company.

Moore, G.H. and Zarnowitz, V. 1984. The development and role of the National Bureau's business cycle chronologies. *NBER Working Paper No 1394*, June. Cambridge, Mass: NBER.

Smit, D.J. and Van der Walt, B.E. 1970. Business cycles in South Africa during the post-war period, 1946 to 1968. *Quarterly Bulletin*, No 97, September. Pretoria: South African Reserve Bank.

Venter, J.C. 2004. Note on the revision and significance of the composite lagging business cycle indicator. *Quarterly Bulletin*, No 234, December. Pretoria: South African Reserve Bank.

Venter, J.C. and Pretorius, W.S. 2001. A note on the business cycle in South Africa during the period 1997 to 1999. *Quarterly Bulletin*, No 221, September. Pretoria: South African Reserve Bank.