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Dating business cycle end points

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The BER has developed a method to provisionally identify and date the latest turning point of the business cycle with a lag of only two quarters. The objective is not to replace the SA Reserve Bank's (SARB) official chronology. Rather, it is to develop a transparent, replicable method that provides a provisional estimate of the most recent turning point until the Bank's official dating becomes available.

In many of the economic graphs used by the BER, the business cycle is shown using the dates published by the SARB in the statistical tables of its **Quarterly Bulletin**. However, the Bank's official business cycle dates are only published after a considerable delay. While appropriate for historical dating, this can create practical difficulties when interpreting current economic developments.

For example, the Bank only identified a downward turning point occurring in April 2022 in the Quarterly Bulletin of September 2025 – a lag of more than three years. As a result, the official business cycle dates can appear inconsistent with economic developments. The chronology still indicated this downturn in 2026, despite a clear and persistent upswing in business confidence since the middle of 2024. To address this issue, the BER decided to develop a method to provisionally date the latest turning point of the business cycle for analytical use until the Bank's official dating becomes available.

Dating methodologies

As background to the dating of business cycles, this section summarises the methodologies used by the SARB and Business Cycle Analytics (Laubscher, 2014), before describing the alternative mechanical methods evaluated by the BER.

THE SA RESERVE BANK

The SARB identifies reference turning points in the business cycle according to the **growth-cycle definition**. Growth cycles represent the fluctuations around the long-term trend of aggregate economic activity and are also referred to as trend-adjusted business cycles. Unlike the classical business cycle, which focuses on contractions in the level of activity, the growth cycle identifies periods when economic activity is above or below its long-term trend.

The process comprises the following steps (Venter, Business cycles in South Africa from 2020 to 2025, 2025).

1. The SARB's **three composite business cycle indicators** (leading, coincident and lagging) are continuously monitored for any indication of a possible turning point. The following are considered such a signal:
    a. When the leading indicator clearly changes direction for at least six months.
    b. When this is followed by similar changes in the coincident and lagging indicators, for at least six months (Venter, 2005).

Once a turning point is indicated, two comprehensive diffusion indices are compiled: the current and the historical diffusion index, which are used to confirm possible turning points.

2. The **current diffusion index**
    a. This index is compiled from the month-to-month symmetric percentage changes ($S_t = 200 * (X_t - X_{t-1}) / (X_t + X_{t-1})$) in each of the approximately 150 seasonally adjusted economic time series considered, covering all the relevant economic processes in the various economic sectors. Sub-components are weighted relative to each sector's contribution to gross value added.
    b. A Hodrick-Prescott (HP) filter (with λ=108 000) is then used to decompose the time series into trend and cyclical components.
    c. The deviation of the current diffusion index from its long-term trend provides an indication of the depth (amplitude) and duration of the growth cycle phases, with the resulting turning points serving as a proxy for reference turning points in the business cycle.

3. The **historical diffusion index** is a measure of the dispersion of the changes in the same set of economic time series. This index is constructed by:
    a. Determining the specific turning points (peak and trough dates) in the cyclical component (the deviation from trend, using the HP-filter) of each of the same approximately 150 time series.
    b. Counting the number of time series that are increasing in that month (relative to their respective long-term trend) and expressing this as a percentage of the total number of time series considered.
    c. An index value exceeding 50 indicates an upward phase of the business cycle (as more than half of the time series analysed were increasing relative to their long-term trend in that month).
    d. Similarly, an index value below 50 indicates a downward phase.

4. Contextualising the indicated turning points against **expert assessment** of other macroeconomic indicators and significant economic events, recognising that the process is not purely a mechanical statistical exercise.

BUSINESS CYCLE ANALYTICS

Pieter Laubscher (2014) from Business Cycle Analytics developed a recession-dating algorithm for the BER to identify turning points more quickly than the SARB's method. The algorithm is based on methods developed by Leamer (2008), and Bry & Boschan (1971) at the National Bureau of Economic Research in the United States. The algorithm identifies turning points by combining information from five economic indicators and then applying a series of statistical filters to eliminate short-lived or spurious fluctuations.

In the **first step**, this method considers five economic indicators, pre-processed where needed, as follows:

a. Converted to monthly frequency.
b. A five-month centred moving average is calculated to reduce noise in the data.
c. A rate of change calculated over six or nine months (by log differences: $\log(y_t/y_{t-9})$).

The **economic indicators used** in the algorithm are summarised in Table 1**.**

Table 1: Economic indicators (Laubscher algorithm)

Indicator	Source	Transformation applied
Composite RMB/BER Business Confidence Index (BCI)	BER	Five-month centred moving average; nine-month rate of change
Manufacturing production volume	Stats SA	Five-month centred moving average; six-month rate of change
Manufacturing capacity utilisation	Stats SA	Six-month rate of change
Manufacturing working hours	BER	Five-month centred moving average; nine-month rate of change
Wholesale sales volumes	Stats SA	Five-month centred moving average; six-month rate of change

The **second step** is to identify recession periods[1] for each selected time series:

a. Recession ahead: when the current six- or nine-month change is above a predetermined threshold (-12 points for the BCI), but below it six or nine months ahead.
b. Recession behind: when the current six- or nine-month change is above the predetermined threshold, but below it six or nine months before.

The **third step** is to identify the peak and trough dates of each selected time series by:

a. Calculating a second derivative over six or nine months as $\log(y_{t+9}/y_t) - \log(y_t/y_{t-9})$
b. Within the "recession ahead" periods, when the second derivative is maximally negative, a peak is identified.
c. Within the "recession behind" periods, when the second derivative is maximally positive, a trough is identified.

The **fourth step** is to apply the following censoring rules to the indicated turning points of each series, respectively (to filter out spurious turning points):

a. Complete cycles with a total duration shorter than fifteen months are eliminated.
b. Business cycle phases shorter than six months are eliminated.
c. If a peak (trough) turning point signal follows another peak (trough), it can be ignored as a spurious fluctuation.

In the **last step,** the combined business cycle turning points are determined:

a. When suggested peak or trough dates of the five sub-indices cluster, the median date is taken as a general turning point.
b. At least three of the five indices (of which the wholesale volume index should be one) need to indicate a trough or peak.
c. Subject to expert judgement.

Advantages and disadvantages

A key advantage of the Laubscher algorithm above, compared to that of the Bank, is that it is more timeous. Turning points can be called with a lag of nine months, whereas the Bank's method can take up to three years. However, the preferred mechanical method discussed in the next section can call turning points with a lag of only six months.

A possible disadvantage of the Laubscher algorithm is its reliance on expert judgement, implying that the index cannot be easily replicated by another analyst or committee. Further, for the BER's intended purpose, which is to mimic the Bank's results as closely as possible, we found the mechanical method more suitable.

[1] The algorithm distinguishes between forward-looking ("recession ahead") and backward-looking ("recession behind") recession windows.

MECHANICAL METHODS

In order to identify simpler and even more timely alternatives, the BER considered the following mechanical methods. The advantage of these methods is that turning points can be dated with a much shorter time lag than the Bank's method. They also only rely on statistical signals, making them more objective and replicable. These methods were applied to only two quarterly economic series, namely the BER's Business Confidence Index (BCI) and annual GDP growth. The methods can be subdivided into two approaches, namely smoothed indices and smoothed changes relative to a threshold.

For the **smoothed-index approach**, a down cycle is marked when the index in the current quarter is lower than in the preceding quarter (Cycle = down if $X_t < X_{t-1}$).
The following methods were considered:

1. Annual real GDP growth smoothed by an HP-filter (with λ=100)
2. The BCI smoothed by an HP-filter (with λ=100).
3. The average of the standardised smoothed BCI and smoothed real annual GDP-growth rate by HP-filter (with λ=100)

For the **smoothed-change approach**, a threshold of ±5% is used to determine when the business cycle changes phase. A down cycle begins when the change in the smoothed index falls below -5% and continues until the change exceeds 5%. In this case, the following two methods were considered:

4. Relative change in the three-quarter centred moving average (3qcma) of the BCI. $\mathbf{Y}_t = (x_{t+1} + x_t + x_{t-1})/(x_t + x_{t-1} + x_{t-2})-1$
5. Relative change in the five-quarter centred weighted moving average (5qcwma) of the BCI. $\mathbf{Y}_t = (x_{t+2} + 2*x_{t+1} + 3*x_t + 2*x_{t-1}+ x_{t-2})/(x_{t+1} + 2*x_t + 3*x_{t-1} + 2*x_{t-2}+ x_{t-3})-1$

The risk of endpoint revisions

The Hodrick-Prescott filter is known to suffer from endpoint problems (Baxter & King, 1995). This implies that the smoothed index converges to the start and end points of the series and is therefore prone to revisions as the series progresses. Results for a specific period only converge to their final value with a lag of three to twelve periods (depending on the frequency). Given this property, the methods above that rely on the HP-filter are more susceptible to revisions when identifying turning points. This is a key reason why the Bank (and other business cycle analysts) only call turning points with a considerable lag.

Advantages of the moving average

In contrast, the centred moving-average methods (methods 4 and 5) are limited to the pre-specified window, meaning that once sufficient observations become available, the estimated values are final and no longer subject to later revision. Consequently, the five-quarter centred weighted moving average produces a final estimate with a two-quarter lag.

Comparing the cycles of the various methods

As stated above, the purpose is not to replace the business cycle identified by the Reserve Bank, but to provisionally identify the latest turning point. Accordingly, the ideal methodology should identify turning points that most closely match the historical chronology published by the Bank.

ECONOMIC INDICATORS SELECTED

To keep the intended methodology uncomplicated, the mechanical methods above are applied only to annual real GDP growth and the BER BCI (both at quarterly frequency). The advantage of both indicators is that they are broadly representative of the overall economy, with GDP covering all major sectors and the BCI covering the key secondary and tertiary sectors (Kershoff, 2000). By including subsectors separately would thus be duplicating what is already captured by these two indicators. Other advantages of a simpler method are that results can be duplicated by other analysts, ease of regular calculation, lower risk of calculation errors and lower risk of data revisions.

GRAPHIC COMPARISON

First, graphical comparisons are presented to give the reader some indication of the respective methods.

The SARB business cycle

In the two figures below, the shaded areas indicate a downturn in the Bank's business cycle, while both the actual and smoothed versions of each respective indicator are shown.

Figure 1: Annual real GDP growth

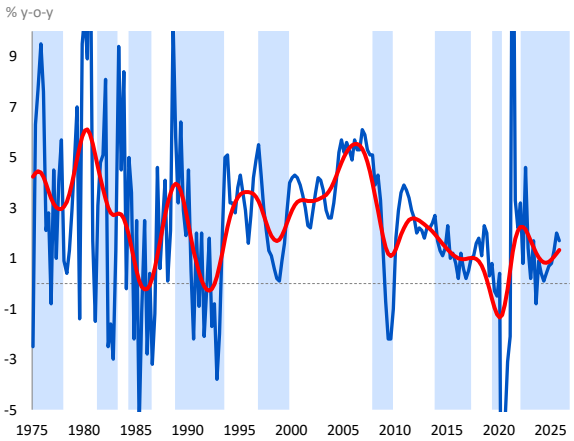
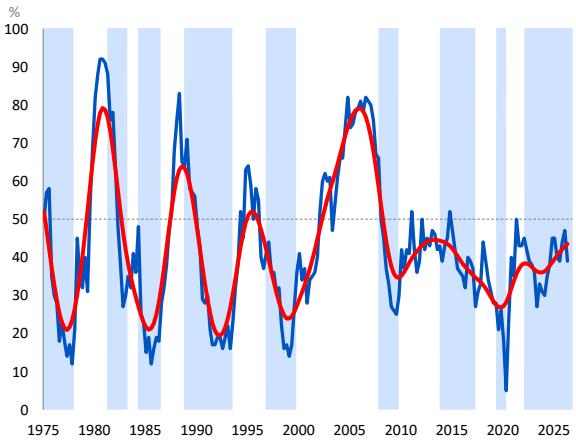


Figure 2: RMB/BER business confidence index



Source: SARB, Stats SA, BER

The annual real GDP growth rate (Figure 1) was extremely volatile before 1993 (at the quarterly frequency only), but much less so thereafter (following a Stats SA methodology change). As such, before 1993, it was very hard to see a clear relationship between the

business cycle and periods of growth acceleration and deceleration. This relationship becomes clearer once the series is smoothed. Shaded areas (down cycles) coincide with periods of growth deceleration. For the BER BCI (Figure 2), the visible relationship is even clearer. Periods of rising business confidence coincide more closely with up cycles, while periods of declining business confidence coincide with down cycles.

This suggests that smoothing removes much of the short-term volatility while preserving the broader cyclical movements that the methodology aims to identify.

Mechanical methods 1 and 2

The two figures below present the same two economic indicators, but with business cycles derived by mechanical methods 1 and 2 listed above. Although there are visible differences between these two cycles and the Bank's cycle, the similarities are more profound. Of note is that the GDP-cycle exhibits some very brief cycles (1983, 2001 and 2016/17), which is not the case for the BCI-cycle. The greater sensitivity of the GDP-cycle suggests that it is more prone to identifying short-lived fluctuations that may not reflect genuine business-cycle turning points.

Figure 3: Annual real GDP growth and cycle

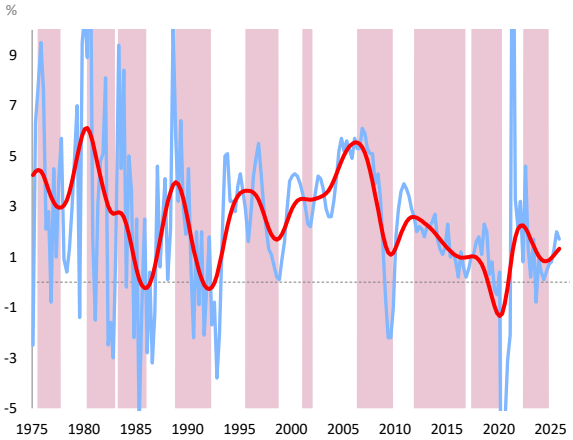
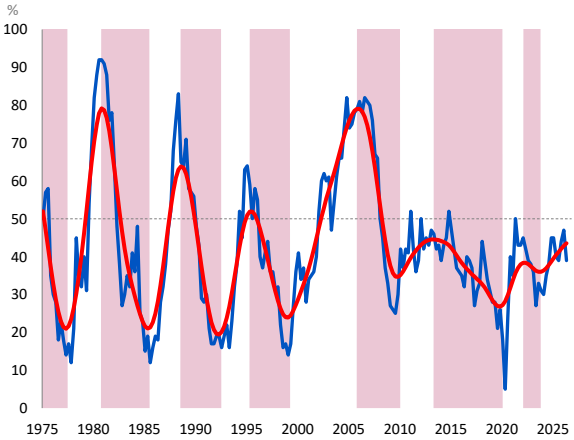


Figure 4: BCI and cycle



Mechanical method 3 and the BCI-exact

The third mechanical method combines the two indicators (GDP and BCI) above into a single composite indicator (Figure 5). The cycle derived from it is smoother with less volatility and fewer short cycles than the component cycles or the Bank's cycle. This suggests that combining the two indicators filters out much of the short-term volatility present in the individual series.

Figure 5: BCI-GDP combined index and cycle

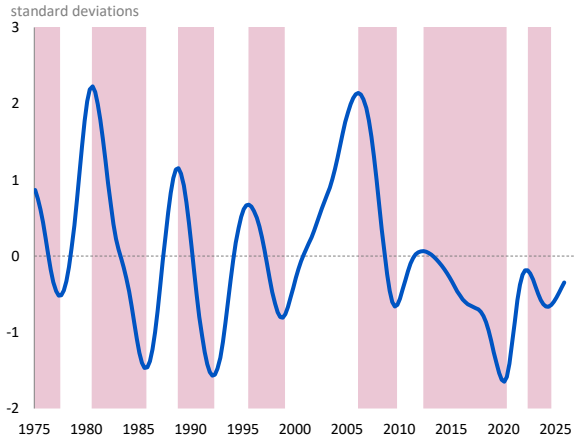
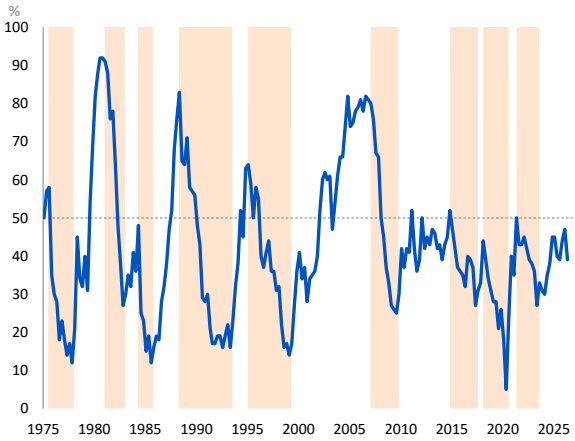


Figure 6: BCI-exact cycle



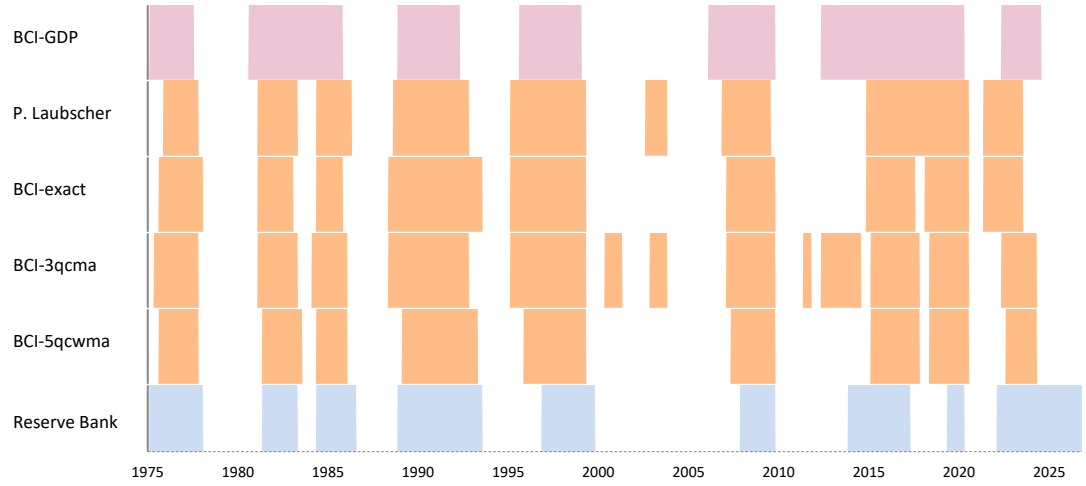
For additional comparison, we also present the "BCI-exact" cycle, which is not a mechanical method but an expert judgement of the exact quarter in which BCI turning points occurred. Although subjective, it provides a useful benchmark to which the mechanical methods can be compared.

Mechanical methods 4 and 5

Mechanical methods 4 and 5 are applied only to the BCI and their cycles are then compared with those of all the other methods in Figure 7 below. The three-quarter centred moving average (BCI-3qcma) is more sensitive and indicates the most cycles (13). By contrast, the five-quarter centred weighted moving average (BCI-5qcwma) is more conservative, indicating the same number of cycles (9) as the Reserve Bank. The most conservative is the BCI-GDP method, which indicates only seven cycles.

A method that identifies too many cycles is likely to overreact to short-term fluctuations, while one that identifies too few may fail to detect genuine turning points. The BCI-5qcwma appears to strike a reasonable balance between these extremes.

Figure 7: Comparison of the business cycles by the various methods *(downtuns are shaded)*



MEASURING CLOSENESS TO THE BANK'S CYCLE

Since the various cycles analysed here are relatively similar, it is difficult to identify the closest match to the Bank's cycle using graphical comparison alone. This closeness can instead be measured by using two quantitative methods: the statistical correlation coefficient and the percentage overlap. The advantage of these two methods is that they can summarise, in a single number, how similar two time series are. They are also transparent in their computation and not subjective to expert judgement (such as for regression analysis).

First, the correlation coefficient is calculated between the Bank's business cycle and each of the respective methods considered. The highest correlation indicates the best match to the Bank's historical business cycle. To calculate these correlations, business cycles are coded as time series, with down cycles coded as one and up cycles as zero.

The second method counts the number of quarters in which each cycle is in the same phase as the Bank's cycle, expressed as a percentage (percentage overlap).

The results of these two tests are presented below. The correlations with the BCI-exact cycle are also presented for reference.

Table 2: Correlation and overlap with the Reserve Bank's cycle

	Correlation with BCI-exact	Correlation with SARB	Overlap with SARB
SARB	*55%*	100%	100%
P. Laubscher	***82%***	45%	73%
BCI-exact	*100%*	55%	77%
BCI	*62%*	45%	72%
real GDP	*48%*	40%	70%
BCI-GDP	*54%*	46%	73%
BCI-3qcma	*68%*	47%	73%
BCI-5qcwma	*77%*	**63%**	**81%**

Among the various methods, the BCI-5qcwma cycle has the highest correlation (63%) with the Reserve Bank cycle, followed by the BCI-exact cycle (55%). The lowest correlation is with the real GDP-cycle (40%). Regarding the percentage overlap, the BCI-5qcwma cycle is also the highest (81%), followed by the BCI-exact (77%).

Taken together, these results suggest that the BCI-5qcwma provides the closest approximation to the Reserve Bank's business cycle dates.

Conclusion

This note evaluated a range of alternative methodologies to provisionally identify South Africa's business-cycle turning points before the Bank publishes its official chronology.

Among the methods considered, the five-quarter centred weighted moving average (5qcwma) of the BER's BCI provides the closest approximation to the Bank's historical business-cycle dates, recording the highest correlation and the greatest percentage overlap. Beyond its empirical performance, the method is also relatively simple, transparent, straightforward to replicate and update, and less susceptible to endpoint revisions than the HP-filter-based alternatives. Adopting this approach will enable the BER to provisionally identify the most recent turning point (or, at most, the two most recent turning points) with a lag of only two quarters, while recognising that the Bank's official chronology remains the definitive historical record of SA's business cycle.

The methodology therefore provides the BER with a practical and transparent framework for monitoring recent developments in the business cycle until the Bank's official chronology becomes available.

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