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Business cycles

Having determined the turning points in the deviation cycles and step cycles of each of the twenty-one indicators, the remaining task is to combine them into a business cycle chronology. This is done by a simple mechanical procedure rather than by the NBER method of selecting the reference turns for the United States. The difference in method is due to the difference between our materials and those available for the same purpose for the United States. For the U.S. we can (1) utilize numerous indicator series; (2) rely on a large stock of information, accumulated over decades, regarding the timing and regularity of these indicators; and (3) draw upon a vast body of other information on the United States economy. All these sources of knowledge are not at our command for foreign cycles.

From extensive experiments with U.S. data we are in a position to know that the mechanical procedures used are likely to yield business cycle turning dates very close (i.e., within a month or two) to those obtained by less mechanical methods. Our method relies on the count, for each month covered, of the number of indicators in expansion as defined in one instance by their deviation cycles, and in the other by their step cycles. Periods in which the majority of indicators move from upturn to downturn are speedup phases. Periods when the majority of indicators move from downturn to upturn are slowdown phases. The last month of the phase is the turning point. This can also be described as constructing a diffusion index defined as the excess of the percentage of indicators expanding over the percentage contracting in a given month. The last month before the index crosses the zero line is the turning date.[27]

[27] *The treatment of turns in quarterly series:* It is customary to assume that turns in quarterly series occur in the center month of the quarter. The computation of the diffusion index also rests in general on this assumption. The assumption is dropped, however, and the month of turn is determined by a more refined procedure, when a business cycle turning point occurs during an indicator's turning quarter.

Three sets of diffusion indexes are computed, placing the indicator turns into the first, second and third months, respectively. From these three indexes the final index and the final turning month are selected by the following rules.

1. When all three indexes turn in the same month, that month is selected as the quarterly indicator's turn. This has the effect that the difference between the standings of the index in the month of the turn and the subsequent month is larger than it would be if the quarterly turn had been assumed to occur in one of the other two months. A large step in the index after the turn is preferable to a small step.

2. When the three indexes indicate different turning months, we select the index that results in the largest step after the turn.

3. When the three indexes indicate different turns, but the magnitudes of the

The two diffusion indexes - one based on step cycles, the other on deviation cycles - are displayed in Chart 1. Both indexes trace smooth, sharp cycles of considerable amplitude. The business cycle turning dates (i.e., the points at which the indexes pass through the zero line) can, with one or two exceptions, be selected with confidence because there is practically no oscillation of the indexes around the zero lines.

Chart 2 presents the same findings in another shape. Here the differences between the per cent of indicators rising and the per cent falling are cumulated from month to month starting with an arbitrary 100 for January 1950. The cumulated curve will rise as long as more series are rising than falling, it begins to decline when the number falling exceeds the number rising. In contrast to Chart 1, it thus depicts the cycles in the accustomed way with the highest and lowest points as turning dates. The amplitudes of the curves reflect the scope and the duration of expansions and contractions. They are not affected, it should be noted, by the amplitudes of the indicator cycles.[28]

The most reassuring aspect of the findings is that four out of five business cycle turns, 1954-63, are the same whether they are based on trend adjusted indicators or on step cycles in the indicators' growth rates. The single discrepancy, at the downturn of 1955-56, is a matter of only one month. The agreement is not as close in the turns near either end of the period. The downturns in 1951 and 1965 differ by three and four months between deviation and step cycles; the upturn in 1967 differs by one month. Since, as explained previously, turns within about two years of the beginning and end of a series must be regarded as tentative, these discrepancies appear moderate.

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steps following the turns are equal, we select the date of turn in the index which is closest in time to the corresponding turning month in the other type of cycle (deviation cycle or step cycle). This rule suffices to decide all such cases because there is no instance in which rules 1 and 2 fail for both types of cycle.

The turning points selected by the three rules are:

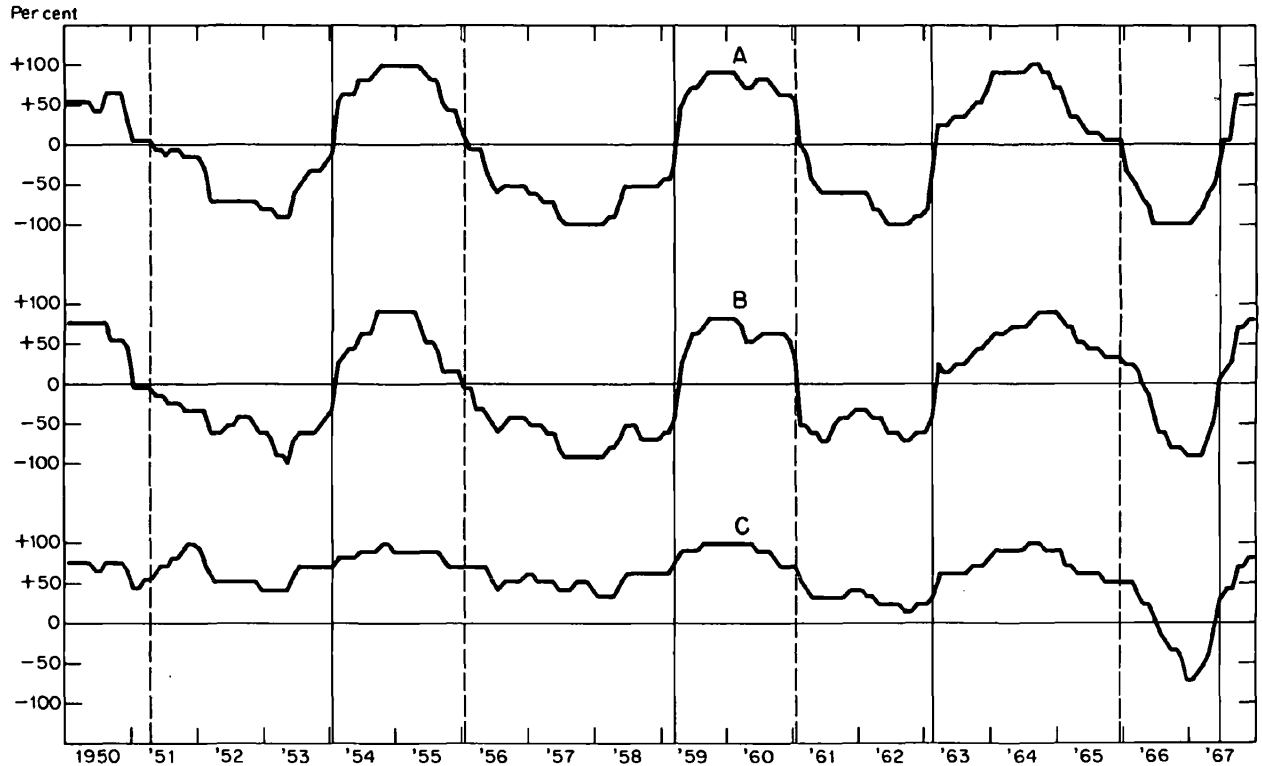
Rule No.	Deviation cycles		Step cycles	
1	April	1951	Dec.	1950
	Jan.	1954	Dec.	1955
	June	1967	Jan.	1961
			March	1966
2	March	1959	Jan.	1954
	Feb.	1963	Feb.	1963
	Dec.	1965	May	1967
3	Jan.	1959	March	1959
	Jan.	1961		

[28] All diffusion indexes mentioned in this study are of the "historical type," i.e., they are based on the turning points in the component series.

Curve C in Chart 1 will be discussed later on.

CHART 1

German Business Cycles, 1950-67, Net Per Cent in Expansion, Twenty-One Indicators



A: Based on cycles in indicators' deviations from their trends.

B: Based on high and low steps in growth rates of indicators.

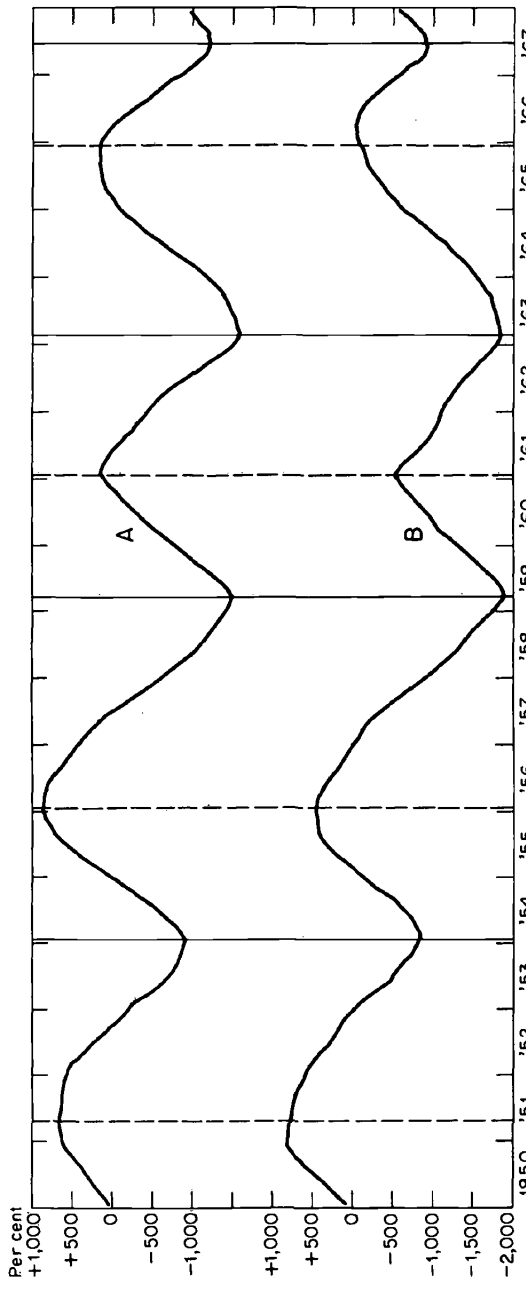
C: Based on classical cycles in indicators.

Net per cent in expansion: excess of percentage undergoing cyclical expansion over percentage undergoing contraction.

Solid vertical lines indicate business cycle upturns; broken vertical lines, business cycle downturns, based on Series A.

CHART 2

German Business Cycles, 1950-67,
Cumulated Net Per Cent in Expansion, Twenty-One Indicators



A: Based on cycles in indicators' deviations from their trends.

B: Based on high and low steps in growth rates of indicators. See note to Chart 1.

These findings are shown in lines 1 and 4 of Table 2. This table also allows comparison of chronologies based on subsamples of the indicators, namely, the thirteen monthly series out of the twenty-one series in the full sample. For step cycles, the turning points of the monthly series are the same as for the full sample with the single exception of a one-month discrepancy in 1965 (lines 4 and 5). For deviation cycles five turns coincide, one at either end differs slightly and the 1956 turn in the monthly series lags the full sample turn by three months. As noted previously, the date of the 1956 downturn is more uncertain than the turns in 1954, 1959, 1961 and 1963.

TABLE 2

German Business Cycle Turning Points, 1950-67; Comparison of Results with Different Methods

	Upturn (U) or Downturn (D)							
	D[a]	U	D	U	D	U	D[a]	U[a]
Deviation Cycles								
1. Diffusion index (21 series)	April 1951	Jan. 1954	Jan. 1956	March 1959	Jan. 1961	Feb. 1963	Dec. 1965	June 1967
Lend (-) or Lag (+) in Months at Turns in Line 1								
2. Diffusion index (13 series)	-2	0	+3	0	0	0	0	-1
3. Modes	+10	0	+3	0	0	0	0	0
Step Cycles								
4. Diffusion index (21 series)	-4	0	-1	0	0	0	+3	-1
5. Diffusion index (13 series)	-4	0	-1	0	0	0	+2	-1
6. Modes	+10	0	+1	0	0	0	+5	+2

NOTE: Step cycles are cycles in growth rates. Deviation cycles are cycles in percentage deviations from trends. *Lines 1 and 4:* Eight quarterly and thirteen monthly series. *Lines 2 and 5:* Thirteen monthly series. *Lines 3 and 6:* Modes of distributions of distributions of twenty-one series.

[a]Tentative

For another comparison, a chronology based on the modes of distributions of indicator turning points is shown in lines 3 and 6. The modes are the months when more indicators reached turning points than in any other month. The diffusion index turns are analogous to medians. The modal dates coincide with those in the full sample diffusion indexes except for the 1955-56 downturn and for the turns at the ends of the period.

In sum, by all six definitions used in Table 2, the turns in 1954, 1959, 1961 and 1963 are found in the same months. The weak downturn of 1955-56 occurs, compared to the full sample index for deviations cycles, one month earlier in the diffusion indexes for step cycles and three months later in the monthly subsample of deviation cycles. The distribution of downturns in both step and deviation cycles is bimodal in this instance with only three indicators turning in August 1955 and another three in February (step cycle) or April (deviation cycle) 1956. By contrast, from six to nine indicators turn in the months of the reference turn in 1954, 1959, 1961 and 1963.

Our aim is to present a single business cycle chronology for Germany. To work with two sets of dates, however similar to each other, would obviously be awkward and confining (see note 15). Therefore we must select either the diffusion index based on deviation cycles or the one based on step cycles or a combination of the two to be the final reference chronology. We rejected the combination because it leaves too much to subjective judgment. Of the two indexes, the one for deviation cycles was chosen since it yields cycles which are smoother and wider and thus more easily recognized than those of the step cycle index.

Smoothness can be measured by counting the months in which the diffusion index moves against the direction of the cyclical trend. Both indexes can be termed smooth by this standard. Out of 216 months covered, the step cycle index moves counter-cyclically in 24 months. Most of these are not erratic zigzag changes, but lengthy hesitations in the main cyclical forces. The most important such instance occurred from about mid-1961 to mid-1962 when the appreciation of the currency affected economic activities in differing ways.

The deviation cycle index, however, strays from its cyclical path in only 8 of the 216 months, showing a near perfect degree of smoothness.

When the index amplitude is defined as the distance traveled from its highest to its lowest point and back again, the maximum possible amplitude per cycle is 200 per cent. The actual average amplitude of the step cycle index in 3½ cycles is 176 per cent, that of the deviation cycle index is 195 per cent. In both instances the amplitudes are very high indicating that in all cycle phases there are months where nearly all series move together. The deviation cycle index reaches the possible maximum for a phase, 100 per cent, in five cycle phases. In the remaining two phases, twenty of the twenty-one series agree in some months.

The arithmetic mean of the diffusion indexes for the entire period, computed without regard to sign, also measures the consensus of the indicators. It shows that the excess of indicators moving in one direction over those moving in the opposite direction was *on the average* 55 per cent for step cycles and 60 per cent for deviation cycles. Again we find general agreement among the indicators with the deviation cycle index coming out on top.