Volume Title: American Exports During Business Cycles, 1879-1958

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Volume Publisher: NBER

Volume ISBN: 0-87014-390-5

Volume URL: http://www.nber.org/books/mint61-1

Publication Date: 1961

Chapter Title: Appendix B: THe Method

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Chapter URL: http://www.nber.org/chapters/c0544

Chapter pages in book: (p. 81 - 83)

Appendix B

The Method

Business Cycles

Business cycles are ". . . 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; . . . in duration business cycles vary from more than one year to ten or twelve years. . . ." [1] The business cycle chronology was determined by Burns and Mitchell after study of cycles in many economic activities and of descriptive evidence found in business annals. Since the publication of *Measuring Business Cycles,* one of the business peaks covered by this study has been revised. The new date—the third quarter of 1929—has been used for timing comparisons, but the old date—the second quarter of 1929—is used otherwise.

Export Cycles, World Trade Cycles

These cycles are wavelike movements in the seasonally adjusted series, corresponding in duration to business cycles.

Cycle Phases

The interval from a trough to the following peak in the series is the expansion phase; the interval from the peak to the following trough, the contraction phase.

[1] Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles,* New York, NBER, 1946, p. 3. The following definitions are adapted from this work.

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Conformity Indexes

These indexes measure the regularity with which a series moves in the direction of the business cycle or in that of another reference series (in our case, world trade cycles).

The index of conformity to expansion is the difference between the number of expansions in which the series rises and the number in which it declines, expressed as a percentage of the total number of expansions covered. The index of conformity to contraction is the difference between the number of contractions in which the series falls and the number in which it rises, expressed as a percentage of the total number of contractions covered.

The index of conformity to full cycles takes account not only of direction, but also of extent of change in the series. The rate of change in each contraction is compared to that in the preceding and in the following expansions. Every such comparison in which the rate of decline in contraction turns out to be smaller (or the rate of rise larger) than that in expansion is counted as an instance of nonconformity. The number of such instances is deducted from the number of instances of conformity and the difference expressed as a percentage of the total number of comparisons.

Amplitude of Expansions, Contractions, and Full Cycles

The amplitude of expansions is measured by the difference between the standing of the series at the cycle peak and that at the preceding trough, expressed as a percentage of the average value of the series over the full cycle. The corresponding measure is used for contractions. The full-cycle amplitude is the arithmetic sum of the phase movements when one is a rise and the other a fall. It is the difference between the phase movements when both are advances or both are declines.

Weighted Averages of Annual Rates of Change in Expansions, Contractions, and Full Cycles

The sum of the amplitudes in all individual expansions covered divided by the total number of expansion years gives the weighted annual percentage change in expansions. Annual change in contractions and in full cycles is derived in the same fashion.[2]

[2] It is customary at the National Bureau to give monthly rather than annual rates of change. However, annual rates seem more immediately meaningful today in view of their constant use in discussions of economic change.

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Cycle Stages

For more detailed analysis, each cycle phase is divided into three stages of equal duration. Together with the stage of the cycle peaks and those of the initial and terminal troughs, this makes nine stages. The cyclical behavior of a series in a given cycle is described by its relative standings at these stages. These standings are the averages of the monthly or quarterly values comprised in the stage expressed as a percentage of the average value of the series over the full cycle.

The Average Cycle Pattern

The average cycle pattern describes the typical behavior of the series for all cycles covered. It is obtained by averaging the relative standings of the series in a given cycle stage for all individual cycles covered. Since we deal in this study with a rather erratic series, we have made greater use of a five-point than of the nine-point cycle pattern; that means we usually compare the average standings of the series at the initial trough, in the middle third of the expansion, at the peak, in the middle third of the contraction, and at the final trough.

Average Annual Rates of Change Between Stages (Intraphase Changes)

This is the measure most emphasized in the present study. To obtain the weighted average rate of change in, say, the second half of an expansion, we subtract for each cycle the relative standing of the series at stage III (the middle third of the expansion) from the relative standing at stage V (the peak). We then sum these differences for all cycles and divide by the total number of years between the midpoints of stages III and V.

Average Annual Rate of Change in Co- and Counter-Phases or Their Segments

This measure, devised for the present study, is similar to the rate of change between cycle stages. The difference between the value of the series in the last and in the first quarter of a phase (or phase-segment) is divided by the average value of the series during that phase (or segment). The resulting percentage changes in individual, say, co-expansions are summed and divided by the number of years of co-expansion.