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Volume Author/Editor: Moses Abramovitz

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Chapter Author: Moses Abramovitz

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Appendix Note

The National Bureau Method of Calculating Cyclical Patterns

The method by which the measures underlying Charts 1 and 2 were derived involves the following steps:

1) The seasonally corrected data of a given series are divided into cycle segments, which may be marked off according to any one of several plans. For example, if the purpose is to portray the cyclical behavior that is peculiar to a given series, the segments are marked off by the dates of the lower turning points, or troughs, of the series itself. (If a series typically behaves inversely during business cycles, the segments are marked off by its upper turning points.) In Chart 1, for instance, the cycle segments in the series representing the processing of raw materials (auto tire production, silk deliveries to mills, newsprint paper consumption, and sugar meltings) were marked off in this way. To show the behavior of a given series during the cycles in some related activity, the segments are marked off by the lower turning points in the related series. This is the procedure followed with the various stock series in Chart 1, with the two series in Figure 1 of Chart 2, and with the various series whose average patterns are represented by the broken lines in Figures 2 and 3 of Chart 2.

To show the behavior of a given series during cycles in general business the cycle segments are marked off by the trough dates of business at large as fixed by the National Bureau chronology of business cycles. This is the procedure followed with the various series whose average patterns are represented by the solid lines in Figures 2 and 3 of Chart 2. Whatever plan is used to mark off cycle segments, the succeeding steps are identical.

2) Within each cycle segment the average of the monthly values is computed, and the monthly values are converted into percentages of this average. The resulting figures are called 'cycle relatives'.

3) Each cycle segment is then divided into nine stages. Stage I covers the three months centered on the date of the initial trough, determined by the date of the trough of the given series if the segments are marked off according to the first plan described above, and by the date of the trough of the related series or of general business if the second or third plan is used. Stage V covers the three months centered on the peak, and stage IX the three months centered on the terminal trough. The peak and terminal trough are again dated according to the turns of the given series, the related series, or general business, as the case may be. Stages II to IV cover successive thirds of expansion, that is, the interval between the initial trough and peak. Stages VI to VIII cover successive thirds of contraction, that is, the interval between the peak and terminal trough.

4) The cycle relatives for the months included in each stage are averaged, yielding a nine-stage pattern for each cycle segment.

5) The average standings in each stage are averaged for the various cycle segments covered by a series to yield average cycle patterns. These are the graphs displayed in Charts 1 and 2.

6) For purposes of summary illustration, the averaging process was carried one step further in Chart 2, Figures 2 and 3, where the average patterns of several series for different commodities are combined into grand averages.

The National Bureau method of deriving business cycle measures is described in detail in *Measuring Business Cycles,* by A. F. Burns and W. C. Mitchell (National Bureau of Economic Research, 1946). The arithmetical computations are performed by a more direct and economical method than that sketched above, which, though accurate, is roundabout.