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Volume Author/Editor: Gerhard Bry and Charlotte Boschan

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STANDARD BUSINESS CYCLE ANALYSIS OF ECONOMIC TIME SERIES

GENERAL APPROACH

THE BUSINESS CYCLE ANALYSIS of the National Bureau of Economic Research was originally designed by Wesley C. Mitchell; it was perfected by Arthur F. Burns and Mitchell and is described in detail in their *Measuring Business Cycles,* published by the Bureau in 1946. The following brief description of the method is not, of course, intended as a substitute for that volume, with its wealth of information and discussion. Rather it presents, in skeleton form, the approach and the major measures so that the reader may judge whether they should be considered for his purposes. For basic enlightenment on the analysis, the reader must go back to the original source.[1]

The National Bureau's analysis is designed to be objective, in the sense that different investigators should be able to obtain similar results; it is designed to be stable, in the sense that extension of time coverage should not invalidate the measures previously computed for individual cycles. These two characteristics distinguish the analysis from other approaches that may result in cyclical measures, for any given cycle, that are sensitive to the period selected. The requirement of objectivity facilitates the programming of the analysis for electronic computers. The programmed analysis need not lead to a more rigid procedure since the program contains a great number of options which require exercise of judgment with regard to inclusiveness of analysis, type of measures computed, and variations in the approach selected.

[1] A brief description of parts of the technique may also be found in Wesley C. Mitchell, *What Happens During Business Cycles,* New York, NBER, 1951, pp. 9–25.

The analysis was designed, before the computer age, as a standard method for mass application—that is, a statistical technique whose application could be delegated to persons who did not necessarily have any substantive knowledge of the activity analyzed. The application of the approach, furthermore, led to a set of decision rules for a variety of special circumstances. These features of the analysis also facilitated programming.

It is important to emphasize again that this approach is mainly a scheme to describe, summarize, and compare historical behavior. It was not primarily designed as a method of analyzing current business conditions—although the general results can make distinct contributions toward that end. Analysis of levels or changes during a given period cannot be carried through before the cyclical phase (expansion or contraction) of which that period is a part has been recognized as completed. This involves determination of a terminal turning point, which can be identified only after some time has elapsed. Students whose interest centers around the speedy evaluation of current business conditions must turn to different approaches, such as the recession and recovery analysis described later in this study.

TREATMENT OF TIME SERIES COMPONENTS

In terms of the familiar decomposition of the complete time series into seasonal, trend, cyclical, and irregular components, the National Bureau's measures refer only to the cycle and trend elements. The seasonal component is estimated and then eliminated before a series is subjected to the standard business cycle analysis. This seasonal adjustment process is now, in most cases, carried out by electronic computer. The effect of the random component (minor irregular factors) on the cyclical measures is minimized or at least reduced by various forms of averaging. The effect of episodic events (major irregular factors) is not segregated.

An important characteristic of the standard business cycle analysis is that its cyclical measures include intracyclical trend forces. A separation of cyclical and trend forces is difficult, both conceptually and operationally. It can of course be argued that a rough approximation of such separation is better than none, and that for some purposes—such as demonstrating cyclical characteristics even in rapidly expanding activities—one may wish to observe the cyclical elements with growth excluded.[2] But for many purposes, and particularly when we are concerned with the interrelations among various activities and with their contribution to general business activity, we may want to deal with the "cycle of experience" (albeit after adjustment for seasonal variations). For the maintenance of GNP levels during a contraction, for example, it is more important that state and local government expenditures show strong growth and only small fluctuations in rates of growth than that they show actual declines after removal of trend. General cyclical volatility, on the other hand, is affected by the failure of an activity to maintain its rate of expansion, whether or not this leads to actual declines. Differential growth during expansions and contractions can be measured without previous adjustment for long-term trends. In any case, the basic technique of business cycle analysis can be applied to either trend-adjusted or unadjusted data. Intercycle trends, that is, long-term changes between cycle averages, are described by the secular measures which form part of the business cycle analysis. These will be examined later in this paper.

Erratic movements, such as those occasioned by strikes and natural disasters, as well as randomly distributed smaller irregular movements, may complicate cyclical analysis. In fact, even the first step toward business cycle analysis, the determination of cyclical peaks and troughs in a given activity, may be beset by the problem of irregular highs and lows. Basically, the National Bureau approach tries to deal with the problem of irregular movements by averaging and, in the case of turning point determination, by sometimes disregarding erratic observations. As will be seen below, measures based on levels for a single month are almost never used in the analysis.

SPECIFIC CYCLE AND REFERENCE CYCLE ANALYSIS

The business cycle analysis is carried out within two different frameworks—a specific cycle and a reference cycle framework. In *specific cycle analysis,* cyclical swings of an economic activity are analyzed against a chronological framework that is marked by the upper and

[2] To some extent this can be achieved by analyzing first differences or rates of change. Indications of intracycle trend are also given by the difference between initial and terminal standings in cycle patterns (see pp. 73 ff.) and by the difference between amplitudes during expansions and contractions (pp. 87 ff.). Furthermore, recognition is given to intracycle trend in the computation of full-cycle conformity measures (pp. 107 ff.).

lower turns of the activity itself. This means that the duration or the amplitude of a specific decline is measured between a peak and the succeeding trough of the specific activity, and measurements of full cycles and their subdivisions are based on the same framework. *Reference cycle analysis,* in contrast, measures the behavior of a given economic activity against a chronological framework marked by the peaks and troughs of a reference activity—usually that of business activity at large. (Reference cycle analysis based on other chronologies will be discussed later.) The somewhat ambiguous term—reference cycle amplitude—does not denote the amplitude of fluctuations in the reference activity, but the fluctuations of a specified activity during reference expansions and contractions, that is, between peaks and troughs of the reference activity.

Figure 1 illustrates that the amplitude of a reference cycle contraction (P_r to T_r) cannot, as a rule, be larger than the amplitude of a specific cycle contraction (P_s to T_s) that corresponds to the same business cycle phase, and the same holds for expansions. This is because the specific amplitudes are measured between the extreme highs and lows of the series and can be equal to reference amplitudes only if the peaks and troughs of the specific activity and those of general business conditions coincide. The results of the specific cycle analysis

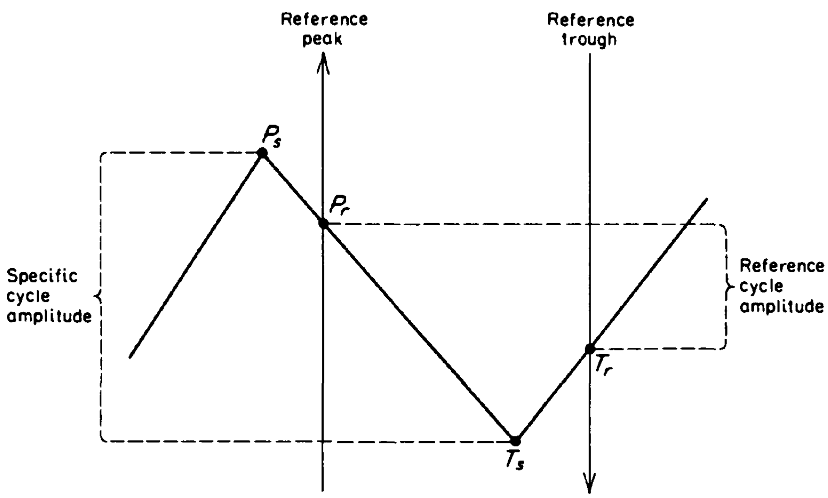


FIGURE 1

and those of the reference cycle analysis are given in two separate sets of tables.

The National Bureau's reference cycle chronology serves as the framework for reference cycle analyses of individual activities, apart from its function of specifying when, in the Bureau's best judgment, general business conditions experienced cyclical peaks and troughs. These reference cycle peaks and troughs are listed, on a monthly, quarterly, and annual basis, in Table 6. They are determined by a rather complex and not very rigidly defined process. In addition to various measures of output (price-deflated GNP, industrial production, and so forth), other activities are considered, such as inputs (of labor and capital), underemployment of resources (human and other), price behavior (in various markets), and monetary phenomena (volume of transactions by check). Some aspects of this determination are discussed in an exchange of views between George W. Cloos and Victor Zarnowitz.[3] For purposes of the analysis of time series against a reference cycle framework, small differences in the business cycle chronology are of little consequence and large changes have rarely been suggested. The most consequential decisions in the establishment of a chronology relate not so much to the precise dating of a particular turning point but to the recognition of a given fluctuation in economic activity as a business cycle. The National Bureau's decision not to recognize the brief decline in many economic activities about a year after the onset of the Korean War as a business cycle contraction is an example. In this case many of the more volatile economic activities registered cyclical contractions, but most of the large aggregates did not. Recognition of that episode as a business cycle contraction would have affected many cyclical measures. For some research purposes it is valuable to include fluctuations such as these in the analysis. In such cases it may be advisable to use reference dates from the subcycle chronology developed by Ruth P. Mack or the growth-cycle chronology developed by Ilse Mintz, both of which contain turning points for short-term fluctuations.[4]

The use of a reference cycle framework for the analysis of economic time series constitutes one way of making comparisons among different

[3] *Journal of Business,* January, April, and July 1963.

[4] See, for instance, NBER, *38th Annual Report,* New York, 1958, p. 31. For growth cycles, see "Dating American Growth Cycles," in *The Business Cycle Today* (forthcoming).

TABLE 6

DATES OF PEAKS AND TROUGHS OF BUSINESS CYCLES IN THE UNITED STATES, 1854–1961

Monthly		*Quarterly*		*Calendar Year*		*Fiscal Year Ending June 30*	
Trough	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*
				1834	1836		
				1838	1839		
				1843	1845		
				1846	1847		
				1848	1853		
December 1854	June 1857	IV 1854	II 1857	1855	1856		
December 1858	October 1860	IV 1858	III 1860	1858	1860		
June 1861	April 1865	III 1861	I 1865	1861	1864		
December 1867	June 1869	I 1868	II 1869	1867	1869	1868	1869
December 1870	October 1873	IV 1870	III 1873	1870	1873	1871	1873
March 1879	March 1882	I 1879	I 1882	1878	1882	1878	1882
May 1885	March 1887	II 1885	II 1887	1885	1887	1885	1887
April 1888	July 1890	I 1888	III 1890	1888	1890	1888	1890
May 1891	January 1893	II 1891	I 1893	1891	1892	1891	1893
June 1894	December 1895	II 1894	IV 1895	1894	1895	1894	1896
June 1897	June 1899	II 1897	III 1899	1896	1899	1897	1900
December 1900	September 1902	IV 1900	IV 1902	1900	1903	1901	1903
August 1904	May 1907	III 1904	II 1907	1904	1907	1904	1907
June 1908	January 1910	II 1908	I 1910	1908	1910	1908	1910
January 1912	January 1913	IV 1911	I 1913	1911	1913	1911	1913
December 1914	August 1918	IV 1914	III 1918	1914	1918	1915	1918
March 1919[a]	January 1920	I 1919[a]	I 1920	1919	1920	1919	1920
July 1921[a]	May 1923	III 1921	II 1923	1921	1923	1922	1923
July 1924	October 1926	III 1924	III 1926	1924	1926	1924	1927
November 1927[a]	August 1929[a]	IV 1927	III 1929[a]	1927	1929	1928	1929
March 1933	May 1937	I 1933	II 1937	1932	1937	1933	1937
June 1938[a]	February 1945	II 1938	I 1945	1938	1944	1939	1945
October 1945	November 1948	IV 1945	IV 1948	1946	1948	1946	1948
October 1949	July 1953	IV 1949	II 1953	1949	1953	1950	1953
August 1954	July 1957	III 1954	III 1957	1954	1957	1954	1957
April 1958	May 1960	II 1958	II 1960	1958	1960	1958	1960
February 1961		I 1961		1961		1961	

Source: Burns and Mitchell, *Measuring Business Cycles,* Table 16, except for revisions noted and dates since 1938.

[a] Revised.

activities. If the length of the average workweek leads a reference turn by four months and employment leads by one month, obviously the workweek leads employment by three months. Cyclical patterns and amplitudes of two activities for identical periods can also be compared on the basis of the measures derived by the Bureau's reference cycle analysis. However, on occasion one might want to know how the workweek changed as employment declined from employment peaks to employment troughs, how prices changed while inventories accumulated, or perhaps how inventories changed during periods of cyclical price declines. Here the period of comparison would be based on the turning points of a single series. It is possible to make such comparisons by using the peaks and troughs of the comparative series (such as employment in our first example) as a reference framework. Technically, this is done by simply substituting the specific turning points of the reference series for the turns in general business conditions.[5]

SUBDIVISION OF CYCLES

Expansions and Contractions, TPT and PTP Cycles. The elementary division of cycles (business cycles or specific cycles) into two phases—expansions and contractions—has been mentioned. Historically, the National Bureau analysis combined these phases into trough-peak-trough (TPT) cycles, that is, into cycles encompassing an expansion and the subsequent contraction. Mitchell and his associates were always aware of the fact that contractions breed recoveries no less than expansions breed recessions, so that peak-trough-peak (PTP) cycles would form equally acceptable—albeit equally artificially delineated—units of measurement and analysis. Only conservation of time and effort prevented this consideration from being reflected in a generalized analysis on both bases, TPT and PTP. The business cycle computer program now provides both types of analysis optionally. This, incidentally, has the practical advantage that a complete recent cycle can also be analyzed when the last-experienced phase is an expansion. Furthermore, the use of both analyses, that is, analyses for overlapping TPT and PTP cycles, may help to overcome the artificial segmentation of dynamic events into separate cycles with somewhat restricted comparability. Now every phase can be compared, on a common cycle base, with the contiguous preceding and subsequent phases.

Indeed, in many economic series the amplitude of given expansions is more highly correlated with preceding than with subsequent con-

[5] For an example of this use of a reference framework, see Thor Hultgren, *Cost, Prices, and Profits: Their Cyclical Relations*, New York, NBER, 1965, especially pp. 56–57.

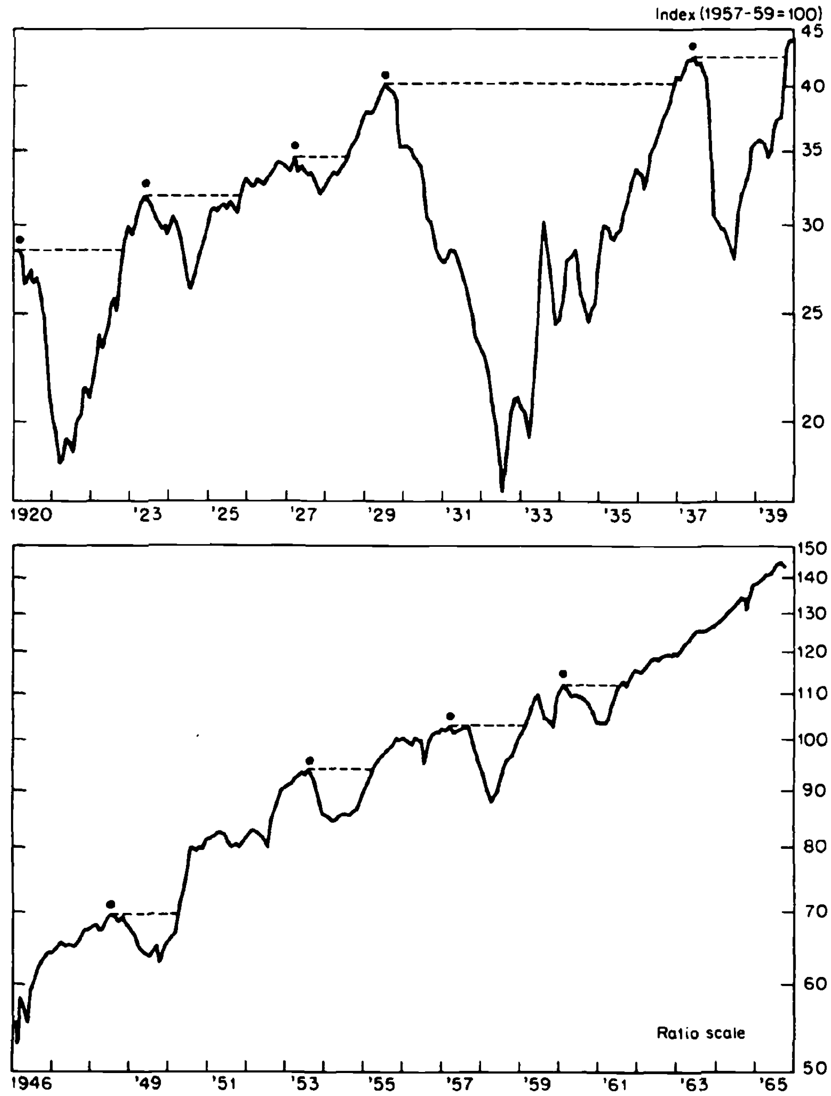
tractions. "What goes down will come up" seems to be more regularly true in economic activities than "what goes up must come down." This suggests that the peak-to-peak cycle may be a more homogeneous unit than the trough-to-trough cycle, and upon reflection this appears plausible. The degree of underutilization of resources, in a rough way, measures both the opportunity for and the short-term limits of expansion. After a deep recession, recovery to previous peak levels is expected, at the least, as well as some making up for postponed investment in producer and consumer goods and some further growth in response to population, labor force, and productivity increases. The situation is not analogous during recessions. High peak levels—except if accompanied by highly speculative booms in construction, overbuilding of equipment and inventories, and blatant overvaluation of assets —may not tell much about the severity of the following contraction. However, the matter is further complicated when short and mild contractions but long and vigorous expansions are experienced. Here the recovery phase—that is, the period during which economic activities regain former peak levels—covers a relatively small portion of the total expansion, and the recovery amplitude forms a small portion of the total upswing. This tends to loosen the relation between contractions and subsequent expansions. Chart 6, showing the fluctuations of the Federal Reserve Board Index of Industrial Production during the interwar and the postwar periods, illustrates this point. During the interwar period, the recovery segment tended to account for a large part of the full expansion. This is related to the occurrence of severe contractions as well as to the relative weakness of growth. By contrast, the postwar expansions are strongly affected, even dominated, by the growth segments. This is particularly the case for the long expansions of 1949–53 and the one beginning in 1961.

It is, of course, possible to regard each cyclical expansion phase and each cyclical contraction phase as a basic unit of measurement and analysis. This has been done in the past, particularly for amplitude comparisons.[6] One advantage of this procedure is that the amplitude

[6] In this case the phase average could serve as the base for the computation of relative amplitudes (peak minus trough, divided by phase average). As a shortcut, the average between the peak and trough standings has frequently been taken instead of the full-phase average. For a discussion of this measure, see Julius Shiskin, *Signals of Recession and Recovery,* New York, NBER, 1961, p. 123. For an application, see Gerhard Bry and Charlotte Boschan, *Economic Indicators for New Jersey,* New Jersey Department of Labor and Industry,

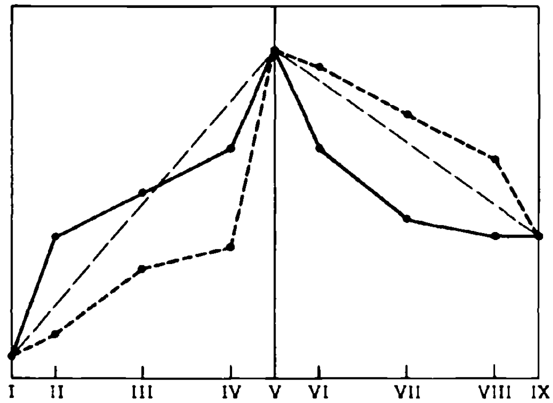
CHART 6

RECOVERY SEGMENTS AND
GROWTH SEGMENTS OF EXPANSIONS,
FEDERAL RESERVE INDEX OF INDUSTRIAL PRODUCTION,
1920–39 AND 1946–65



Note: Adjusted for seasonal variations.

CHART 7
REFERENCE CYCLE PATTERNS
OF SIMILAR AMPLITUDE



measure for one phase is not affected by the average standing of contiguous phases. Another is that trend measures, which are sometimes computed on the basis of overlapping full-cycle averages (see p. 111, below), could be simplified by basing them on successive phase averages. A disadvantage, however, is that contiguous phase-amplitudes do not have a common base.

Cycle Stages. The division of cycles into two phases permits the computation of durations and amplitudes for expansions, contractions, and full cycles, but it gives little information on intermediate movements. Any detailed analysis of cyclical movements should certainly distinguish behavior such as that illustrated by the two curves of Chart 7—curves that differ, although they may have the same duration and phase amplitude.

The approach of Burns and Mitchell is to divide the cycle—both reference and specific—into nine stages. The three-month averages centered at the initial trough, the subsequent peak, and the terminal trough are termed stages I, V, and IX, respectively. The intervals between stages I and V are divided (as equally as possible) into three

Division of Employment Security, 1964, p. 23. Currently, Milton Friedman and Anna J. Schwartz are using phase averages instead of cycle averages as bases for business cycle and trend analysis. Tables containing these measures are incorporated into the program on an optional basis.

parts, and the average standing for each of these parts is the standing of stages II, III, and IV, respectively. Similarly, the intermediate thirds between stages V and IX provide the standings for stages VI, VII, and VIII. The intervals between the midpoints of I and II, IV and V, V and VI, and VII and IX are smaller than those between the other adjoining stages. All this can be clearly seen in Chart 7.

Phase Fractions Versus Chronological Measures. An important aspect of the approach just described is that the division of phases into stages is based on fractions of the phase rather than on fixed chronological time spans. That is, phase fractions rather than months form the bases of the stage standings. It is implicitly assumed that the early thirds, the middle thirds, and the late thirds of expansions (or contractions) have more in common than, say, the first six months, the middle six months, and the last six months of different cycles. It is possible that generalizations concerning, say, the characteristics of the late periods of expansion may be more nearly valid when expressed in chronological units (a fixed number of months) than in fractions of a phase (which may last as little as two months for a short phase and a year or more for a long one). Whether this is so or not may change from activity to activity or from cycle to cycle. It could be made a subject of research (1) if comparisons are made between the patterns derived by the National Bureau's recession and recovery analysis (which is carried out in units of chronological time) and those of the standard business cycle analysis; or (2) if leads and lags measured in months were compared with leads and lags measured as a fraction of the cycle phase. In any event, an advantage of the present procedure is that each cycle has the same number of stages (nine), which is convenient for comparing cycles and averaging the patterns of different cycles.

RELATIVES AND AVERAGES

Cycle Relatives. The average standings for each stage of the nine-stage patterns are first expressed in the original units of the series subjected to analysis. These units may be short tons, dollars, percentages, utilization rates, or any others. Occasionally one may wish to use information in this form. If, let us say, the components of an aggregate such as GNP or the dollar sales of different products are being analyzed, it may be desirable to make comparisons in original units, which can be added up. Or, if different interest-rate series are being compared, the relevant comparison may be in terms of the original units, as when differentials in terms of "basis points" are derived. On the other hand, the diversity of units in which economic series are expressed has severe disadvantages if we attempt to compare cyclical behavior in different cycles, different activities, or different regions. It would be difficult indeed to state whether employment or weekly earnings have larger intracyclical movements as long as their cycle standings are expressed in different units.

This problem might be attacked by computing percentage changes or perhaps "relatives" that describe amplitudes independently of the original units of measurement. Here another difficulty must be faced—that of the changing base in terms of which the percentage or the relative is expressed. A price change from 60 to 90 cents per pound would be expressed as a 50 per cent increase, while the same absolute change from 90 to 60 cents would be only a 33⅓ per cent decrease. Thus, in percentage terms as well as in terms of relatives, the same change in absolute units would seem to loom larger if measured as expansion than if measured as contraction.

Both problems—differing units and percentage-base bias—can be solved by expressing the original values as percentages of a common base. The National Bureau's business cycle analysis takes the average for any full cycle as a base and expresses the cycle standings as relatives with respect to this base, that is, the cycle standings are converted into cycle relatives (Output Table 3A-4).[7] The cycle averages can be computed for peak-to-peak or for trough-to-trough cycles.[8] At this point, the choice of one or the other method may lead to differences in results. Thus, if resources permit, the analysis should be performed on both bases. Output Table 3A-3 contains stage standings in their original units, Output Table 3A-4 contains cycle relatives on a trough-to-trough basis, and Output Table 3A-11 has cycle relatives on a peak-to-peak basis.

[7] Output tables are the end result of electronic computer programs. The output table numbers cited in this paper refer to the output tables reproduced in the appendixes. A given output table number may not always refer to the same part of the analysis, depending on the option chosen. (The program provides for consecutive numbers irrespective of table content.) In the following analysis, the tables will be referred to without regard to their sequence, since this is largely determined by purely computational requirements.

[8] In order to avoid overweighting of peaks in peak-to-peak cycles and of troughs in trough-to-trough cycles, the first and last months of each cycle are given only a half weight in the computation of cycle averages. This also ensures that the individual cyclical standings are compatible with the original data and their over-all average.

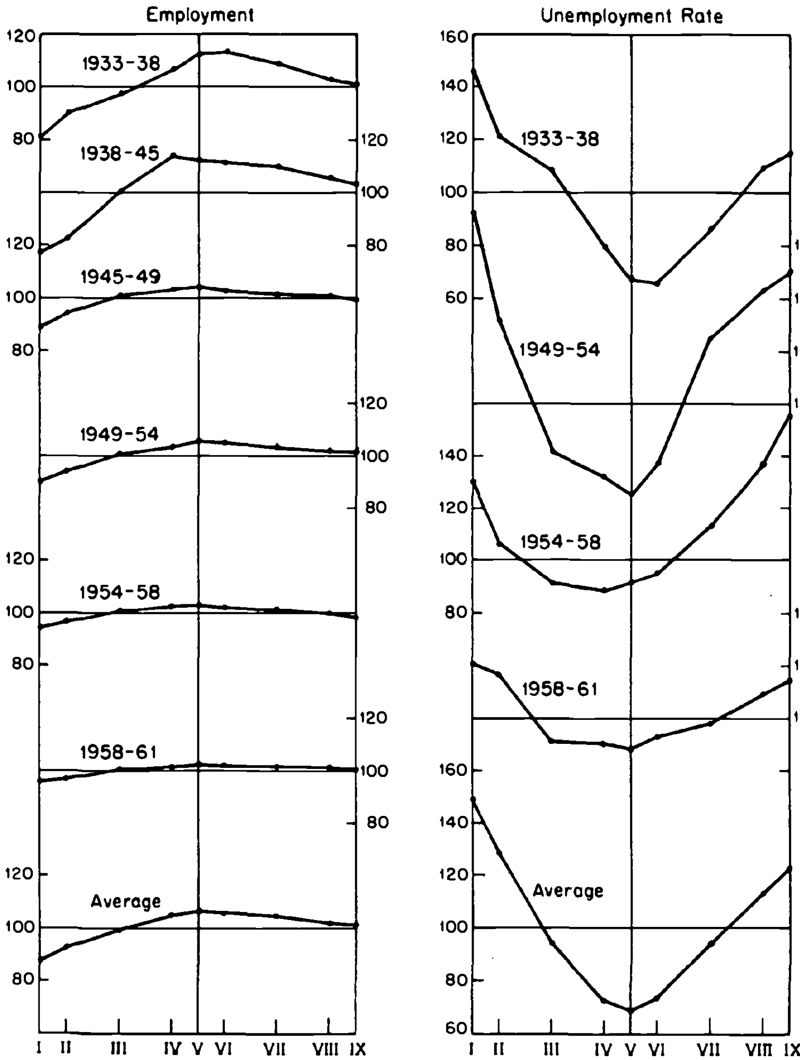
The conversion to cycle relatives makes it possible, for instance, to derive amplitude measures for expansions and contractions by simply computing the differences between the cycle relatives at peaks and at troughs. In nonagricultural employment, for example, the amplitude of the 1933–37 expansion is thus +31.2 (peak, 112.3, minus preceding trough, 81.1) and that of the subsequent contraction 1937–38 is −11.2 (trough, 101.1, minus preceding peak, 112.3), both expressed as a percentage of the average standing during the cycle running from 1933 to 1938. The full-cycle amplitude is 42.4, obtained by subtracting the amplitude of contraction from that of expansion. These amplitude measures will be found in Output Table 3A-2.

The magnitude of changes between different stages can also be derived by the same process. Thus in Output Table 3A-5 the rise between stages II and III of the same cycle is measured as 6.9 (i.e., 97.1 minus 90.2, as given in Output Table 3A-4). Ordinarily the rate of change per month is of more interest than the total change between given cycle stages. To obtain such measures, the changes are put on a monthly basis by simply dividing them by the number of months covered between the midpoints of the stages compared. The resultant monthly amplitudes are part of the regular program output (see, for instance, Output Tables 3A-6 and 3A-13). They indicate, for example, whether employment increases slow down as an expansion proceeds.

Averaging of Cycles. The subdivision of each cycle into an equal number of phases and stages and the expression of the standings (average levels) during these stages in terms of cycle relatives provide a basis for summarizing and averaging. If cycle stages are regarded as functionally comparable (standardization of time relative to cycle phases), and if standings are regarded as comparable when expressed as a percentage of cycle averages (standardization of levels relative to cycle averages), summarizing the cyclical behavior of a given activity over several cycles is a meaningful procedure. Chart 8 illustrates the process by presenting cycle patterns for several separate cycles and the average cycle pattern for all the cycles included. The average cycle pattern is of course beset with the problem inherent in all averages based on a relatively small number of observations—the problem of representativeness. Average cycle patterns for the interwar period may be dominated by the strong decline and the correspondingly steep recovery of the Great Depression and its aftermath, and the averaging

CHART 8

REFERENCE CYCLE PATTERNS, NONAGRICULTURAL EMPLOYMENT AND UNEMPLOYMENT RATE, 1933–61



Note: War cycles are not charted separately for the unemployment rate, but are included in the average pattern.

of that cycle pattern and of adjoining milder cycles may produce an average pattern that represents neither the mild nor the strong cycle. In principle it is possible to exclude unusual cycles, such as war cycles, from the averages—or several sets of averages may be computed.

An average is merely a summarizing device, and it is necessary to look not only at the average but also at the dispersion around it and at the behavior of the contributing elements. The output tables of the National Bureau's business cycle analysis always offer all these measures, and the corresponding charts contain both average cycle patterns and those of the individual cycles that comprise the averages.

PROGRAMMED MEASURES OF CYCLICAL CHARACTERISTICS

One way to become acquainted with the results of the National Bureau's business cycle analysis is to go, step by step, through the output tables provided by the computer program and reproduced in the appendixes. This is done here for two sample series describing the number of employees in nonagricultural establishments (Appendix 3A) and unemployment as a percentage of the civilian labor force (Appendix 3B). These series illustrate several versions of business cycle analysis. One version is illustrated by a positively conforming series (nonagricultural employment); the other (unemployment rate) represents an inversely conforming activity. The analysis of the latter, furthermore, is based on absolute changes of rates rather than on changes in cycle relatives. This will be further explained below in the systematic discussion of output tables.

The basic time series are reproduced in Output Tables 3A-1 and 3B-1. With respect to these tables, it should be noted that:

1. All business cycle measures are based on seasonally adjusted data.[9]

2. The number in the upper right-hand corner is an identification number.

[9] The process of seasonal adjustment used can be performed on an electronic computer. See Julius Shiskin and Harry Eisenpress, *Seasonal Adjustments by Electronic Computer Methods,* New York, NBER, Technical Paper 12, 1958; Shiskin, *Electronic Computers and Business Indicators,* New York, NBER, Occasional Paper 57, 1957; and *Tests and Revisions of the Census Methods Seasonal Adjustments,* Washington, D.C., Bureau of the Census, Technical Paper No. 5, 1961.

3. The output is printed without decimal points and may thus appear in unconventional units. (The unemployment rate, for example, is usually stated as a percentage of the civilian labor force but is here printed as per cent $\times$ 100.) The units specified are printed under the title.

4. The words "absolute changes" provided after the table heading of the unemployment rate mean that in this analysis measures are computed in terms of differences rather than ratios. This is done because unemployment rates are expressed as a percentage of the civilian labor force—i.e., they are already in relative form and in this respect their levels are comparable over time.

It has been proposed that business cycle analysis should be based on a smoothed rather than unsmoothed version of the seasonally adjusted data. For example, one might analyze a short-term moving average of the seasonally adjusted data (such as the MCD curve of the seasonal adjustment program) or a weighted long-term moving average (such as a Spencer or a Henderson curve). It can be argued in favor of such a procedure that (1) the series, after adjustment for seasonal and irregular movements, constitute conceptually the better approximation to the subject of analysis, that is, cycles and trend; (2) turning point determination is less affected by irregular movements; (3) cyclical characteristics appear more clearly if freed from nonsystematic influences. There are also some considerations, mainly of a practical nature, that militate against the proposal: (1) a uniform smoothing term for a heterogeneous series may not effectively screen out the irregular component; (2) moving averages tend to cut off some of the cyclical amplitude, produce rounded peaks and troughs, and often distort timing relationships; (3) different smoothing terms may produce different cyclical measures; and (4) considerable smoothing is already incorporated in the analysis. For series with highly irregular movements, such as series for individual companies, analysis based on smoothed data may be advantageous. The use of MCD curves would tend to reduce all series to an equivalent degree of smoothness.[10] Irregular series should perhaps be analyzed both in smoothed and unsmoothed form.

[10] For an explanation and illustration of MCD curves, see Shiskin, *Electronic Computers and Business Indicators,* pp. 236–243, or U.S. Department of Commerce, "Description and Procedures," *Business Cycle Developments* (any issue). For the effects of smoothing on cyclical measures, see Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles,* New York, NBER, 1946, Chapter 8.

TIMING AND DURATION OF CYCLES

Timing and duration measures require prior determination of specific turning points (assuming reference dates are given). The process of turning point determination and an experimental computer program for such determination were described in Chapter 2.

Timing Comparisons. Timing measures describe the relation between specific turning points of a time series and corresponding business cycle turning points or other cyclical benchmarks. These measures are convenient, since relating specific turns of many series to common benchmarks makes it possible to compare the timing of turns, for any number of series, without getting entangled in a web of individual comparisons. The study of timing relations for economic activities has many applications. It helps in understanding the mounting and lessening pressures within the economic system in the neighborhood of the crucial periods around business cycle peaks and troughs. Knowing that labor income decreases promptly around business cycle peaks but wage rates decline late (or not at all) permits an understanding of how profit margins are squeezed simultaneously by reduced demand and rigid cost elements. The sequence of turns in economic activities may also reveal something about the causal sequence of economic events. However, great caution must be exercised in the interpretation. The example of maintained wage rate levels illustrates how economic effects may be induced by the very absence of change in a variable. Timing relations are also highly useful for purposes of current business condition analysis and forecasting. Knowledge about the typical timing behavior of economically strategic activities forms the basis of the "indicator approach" to forecasting.[11]

Once specific turns are established, one can determine timing relations for those turns that can be related positively (specific peaks corresponding to reference peaks) or invertedly (specific peaks corresponding to reference troughs) to business cycle turns. Whether a series should be related positively or invertedly can be established either by general considerations, visual inspection, or computation of formal measures. (These so-called conformity measures are discussed later in this section.) This decision can become difficult when the activity conforms only irregularly to business cycles or when it tends to precede

[11] See Geoffrey H. Moore, ed., *Business Cycle Indicators,* Princeton, N.J., Princeton University Press for NBER, 1961, 2 vols.

or to follow general business activity by substantial intervals. In the latter case a problem arises as to whether the series should be regarded as leading on a positive basis or as lagging on an inverted basis, and vice versa.[12] This problem does not exist in the sample series. Employment conforms positively, unemployment rates conform invertedly, and the leads and lags are not large enough to shed doubt on this relationship.

Even after the issue of conformity is settled, the matching of specific turns and reference turns can be problematic. Problems may occur if there is no one-to-one relationship between matching peaks or between matching troughs. Under those circumstances it may be difficult to determine which specific turn should be related to which reference turn. These decisions involve many considerations such as proximity, typical timing behavior at other turns, and relative amplitudes. This is why the timing measures described in the present study are based on visual matching rather than on computerized matching.[13]

Schematic timing charts—which show, for a specific series, leads (−), lags (+), and coincidences (0) in months for each turn—are reproduced in Chart 9. This and the following tabulation permit both a visual and arithmetic evaluation of the relation of specific to reference cycle turns.

	Employees in Nonagricultural Establishments, 1939–61		*Unemployment Rate, 1933–61*	
	Mean	*Median*	*Mean*	*Median*
Peak	−3.3	−1	−3.8	−4
Trough	0.0	0	+2.3	+2

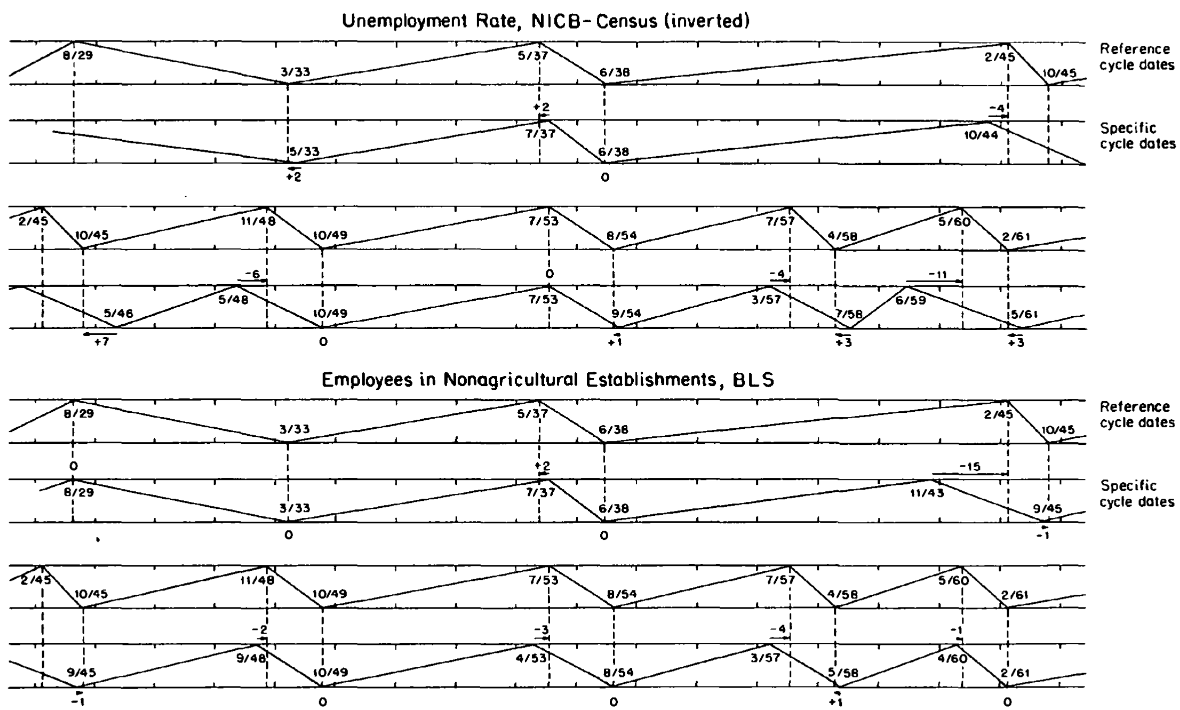
In the case of employees in nonagricultural establishments, 1929–61, troughs coincide, on the average, with business cycle troughs, and

[12] Examples of series which may be regarded as positively lagging or inversely leading are manufacturers' inventories of finished goods, unit labor cost in manufacturing, and bank rates on business loans. For a brief discussion of the economic rationale of treating them either way, see Geoffrey H. Moore and Julius Shiskin, *Indicators of Business Expansions and Contractions*, New York, NBER, Occasional Paper 103, 1967, pp. 30–31.

[13] Since the completion of the present study we have developed an approach to a fully computerized derivation of timing measures. See NBER, *Annual Report*, 1970.

CHART 9

TIMING OF TURNING POINTS RELATIVE TO BUSINESS CYCLE TURNS, NONAGRICULTURAL EMPLOYMENT AND UNEMPLOYMENT RATE, 1929-61



peaks show a mean lead of 3.3 months and a median lead of one month. However, the series can hardly be regarded as typically leading at peaks since the mean is largely affected by a fifteen-month lead during World War II. If that were excluded, the mean lead would shrink to little more than one month. Stronger systematic deviations from reference cycle turns are apparent in the timing charts for the unemployment rate. The tabulation shows substantial mean and median leads at peaks and short lags at troughs. Reference to Chart 9 shows that these average timing characteristics prevail, with few exceptions, throughout the period for which data are available. The averages are not dominated by one or two exceptionally long leads or lags.

The tabulation of the average timing relations of employment and unemployment relative to reference turns permits direct comparisons between the two variables. On the average, unemployment leads employment by 0.5 months (3.8 minus 3.3) at peaks (that is, there is no significant difference), while it lags employment by 2.3 months at troughs. In this sort of comparison between the timing of several variables, care must be taken that the same periods (or rather the same reference turns) are covered. Furthermore, the timing measures will be truly comparable only if there is a one-to-one correspondence between the specific turns compared. In comparing the timing of several activities, additional evidence on timing relations can sometimes be adduced by inclusion of cycles they have in common, even though these cycles do not correspond to business cycles. If such common nonconforming cycles pervade a whole collection of series—as may happen in the analysis of regional data or data for a specific industry or company—it may be preferable to relate the turning points of the component series to the turns of a series representing the cyclical behavior in the particular segment rather than in the economy as a whole (see pp. 68–70).

Some comments are in order on the statistical and economic meaning of these measures. That total nonagricultural employment shows little systematic deviation from business cycle turns is plausible enough. Not only would labor input, as reflected in the number of persons employed, be expected to fluctuate with general business conditions, but the behavior of the employment series is one among several comprehensive measures considered in the dating of business cycle turns. However, the systematic lead of the unemployment rate around business cycle peaks and its lag around troughs require explanation. Such timing behavior might be expected, for statistical reasons, from any inverted series with rising trend—and the unemployment rate does indeed exhibit such a trend during the recent postwar period. However, this trend was relatively mild and has been clearly discernible only since the mid-1950's, whereas the described timing pattern was also discernible before the mid-1950's. Let us therefore look at the timing behavior of the unemployment rate from another point of view.

The number of unemployed is the difference between the number in the civilian labor force and the number employed. The labor force grows relatively steadily, with only mild cyclical variations in its rate of growth. Employment, on the other hand, shows pronounced and relatively smooth cycles. Before the peak in employment, a period generally occurs during which employment rises only slightly while the labor force continues to grow at about the same rate as before. This causes unemployment to increase before employment begins to decline. Expressing unemployment as a rate (relative to the labor force) may cut this lead a little but does not obliterate it. After the trough in employment, there is a roughly analogous situation. The continuing growth of the labor force tends, for a short while, to exceed the employment rise; thus unemployment continues to increase. However, since the characteristic pattern is that of a stronger response of employment to recovery forces than to contracting forces (see Output Tables 3A-22 and 3B-22), the lag of the unemployment rate at business cycle troughs tends to be shorter than its lead at peaks. This explanation, admittedly, does not go much beyond the mechanics of the timing relationship. However, to analyze the causes of the cyclical and growth characteristics of labor force, employment, and unemployment would exceed the scope of this book.

Duration Measures. Reference was made earlier to the connection between timing relations and the duration of expansions and contractions. A well-conforming series without skipped or extra cycles and with roughly coincident timing (or with similar timing at peaks and at troughs) will, of course, show cyclical durations of expansions and contractions close to those of business cycles during the corresponding period. Thus the average duration of cycle phases in employment for the years 1933–61 was rather close to those of business cycles, particularly if the war cycle 1938–45 is excluded. By contrast, the lead of unemployment before business cycle peaks and its lag after troughs makes for longer specific contractions—that is, for a lengthening of the period during which unemployment rises.

The evidence for these observations is summarized in Table 7 and stems from Output Tables 3A-29, 3B-29, 3A-36, and 3B-36 of the electronic computer program for specific cycle durations, and from Output Tables 3A-9, 3B-9, 3A-16, and 3B-16 for reference cycle durations. Care must be exercised that in the comparison of duration and other measures among different activities, comparable time periods are used. The time periods need not be identical, since the specific turns at the beginning and end of the period may differ from activity to activity. Also, the number of specific cycles is not necessarily the same, since an activity may skip cycles or show extra cycles. For certain purposes one might want to compare only corresponding cycles. That summary measures are given in the same computer run and, hence, presumably cover the same over-all time period is no guarantee of the comparability of the cyclical measures. Take, for instance, the duration measures (or for that matter, any other mea-

TABLE 7

DURATION OF EXPANSIONS, CONTRACTIONS, AND FULL CYCLES, NONAGRICULTURAL EMPLOYMENT AND UNEMPLOYMENT RATE, 1933–61

	Average Duration (months)		
	Expansions	*Contractions*	*Full Cycles*
ALL CYCLES			
Employees, nonagricultural establishments	41.7	14.2	55.8
Unemployment rate (inverted)[a]	38.3	17.7	56.0
Business cycles	45.3	10.5	55.8
EXCLUDING WAR CYCLE, 1938–45			
Employees, nonagricultural establishments	37.0	12.6	49.6
Unemployment rate (inverted)[a]	30.8	17.4	48.2
Business cycles	38.4	11.0	49.4

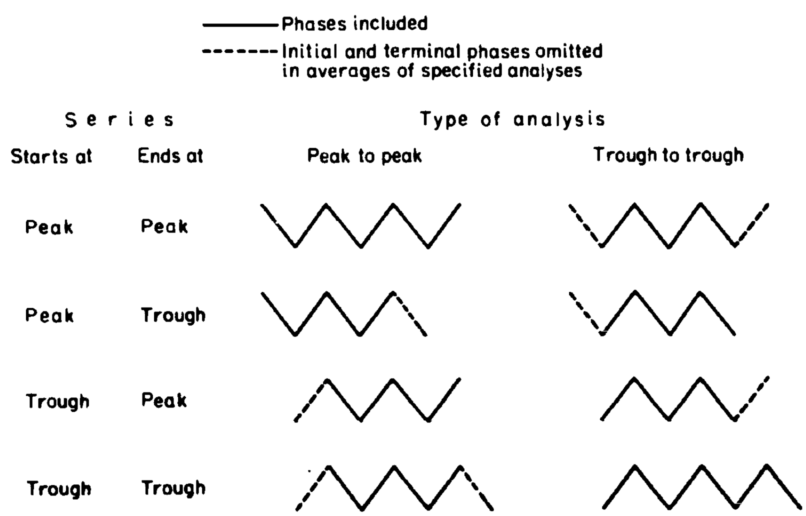
[a] Since unemployment is inversely related to business cycles, the duration measures for expansions, given above, refer to the number of months during which the unemployment rate declines, and those for contractions to the period during which the rate rises.

sures) of the unemployment rate for peak-to-peak cycles as given in Output Table 3B-16 for reference cycles and in Output Table 3B-36 for specific cycles. The summary measures do not refer to corresponding cycles, since the specific analysis omits the 1929–37 cycle because no specific turn could be established in 1929. Note, incidentally, that the whole 1929–37 cycle, and not only the 1929–33 contraction, was omitted. This occurred because the electronic output tables contain duration measures only for full cycles, be they trough-to-trough or peak-to-peak cycles. This means that a cycle phase at the beginning and at the end of any series will be neglected either by the PTP or by the TPT analysis, though not by both.

Chart 10 shows, in schematic fashion, the phases included in the average duration measures of the standard output tables. Note that the duration measures of the PTP analysis include all phases of series starting and ending with peaks, but omit initial expansions of all series starting with troughs, and terminal contractions of all series ending with troughs. The duration measures included in the TPT analyses show analogous inclusions and omissions. The averages provided by

CHART 10

PHASES INCLUDED IN AVERAGES,
PEAK-TO-PEAK AND TROUGH-TO-TROUGH ANALYSES



the computer program have the merit of consistency—that is, the average expansion plus the average contraction equals the average full cycle (barring rounding discrepancies). However, if instead it is desired that the averages of phase durations include all available information, this can be easily done on the basis of the schematic drawings in Chart 10. For series beginning and ending at a like turn, the computed averages of one or the other analysis can be used. For series beginning and ending at unlike turns, the average has to be recomputed to include an initial or terminal phase duration. The duration measures for these phases are, of course, provided by the computer run.

The preceding comments have a broader implication that should be made explicit: summary measures, whether electronically computed or otherwise, should not be used without a meticulous check on their composition. The computer output, with its detailed information on intermediate values, component measures, measures derived by alternative approaches, and so forth, facilitates comparisons and interpretations. However, this output must be competently utilized, otherwise the huge output that is generated by programmed analyses may become the massive support of dubious conclusions.

AMPLITUDES DURING EXPANSIONS AND CONTRACTIONS

Value of Amplitude Measures and Variety of Approaches. How large are the cyclical swings in employment and unemployment? Are they growing or declining in size? The general importance of amplitude measures can be readily understood by reference to these variables. The magnitude of cyclical swings in employment are relevant for understanding the socioeconomic aspects of fluctuations in market demand, the labor-input limitations of expansions, the fluctuations in income and expenditures, unemployment changes, and many other phenomena. A similar list could easily be drawn up to illustrate the importance of measuring the amplitudes of the unemployment rate. Amplitude measures, in general, by quantifying an important aspect of cyclical behavior, facilitate description, comparison, and understanding of past behavior, permit evaluation of current developments in terms of historical experience, and assist in the anticipation of future fluctuations in specific activities.

The amplitudes of expansions, contractions, and full cycles in economic time series can be measured in a variety of ways. For example, they might be measured in original units, that is, in terms of absolute differences between standings at peaks and troughs. They might be measured as percentage changes between two adjacent turning points, as the difference between adjacent turns relative to their average or relative to some other base. In the selection of amplitude measures, it is desirable that such measures be comparable among different series, among different cycles of the same series, and among different cycle phases. Furthermore, amplitudes should be measured in toto as well as per time unit, and the measures should be reasonably free from the effect of random movements.

The National Bureau's standard business cycle analysis meets most of these specifications by expressing the difference between peaks and troughs in relation to the cycle average, by measuring amplitudes both as total rise or fall and as amplitudes per month, and, wherever possible, by measuring amplitudes between three-month averages centered on peaks and troughs. Within this framework, there are still a variety of amplitude measures that can be computed. They may be relative or absolute, i.e., expressed in terms of ratios to the cycle base or in terms of deviations from the cycle base. They may be measured between standings at business cycle turns (reference cycle amplitudes) or between actual peaks and troughs of the analyzed activity (specific cycle amplitudes). Finally, they may be measured by reference to trough-to-trough or to peak-to-peak cycle bases. These various measures, all of which are part of the programmed business cycle analysis, are discussed below.

Computation of Amplitudes. Since the derivation of each of the several amplitude measures is similar in principle to every other, as is the format of the amplitude tables, it will suffice to analyze one output table in detail, showing the derivation of the various measures, interpreting the output, and discussing the problems that may arise. Let us use Output Table 3A-2, which shows relative reference cycle amplitudes for trough-to-trough cycles in employment. Relative amplitudes, that is, amplitudes relative to the cycle base, are the measures provided by the standard analysis.[14] That reference cycle analysis is being dealt with can be seen from the notation "reference cycle analysis" in the upper left-hand corner of Output Table 3A-2. The

[14] If the whole analysis is on an "absolute" basis (requiring a different program), this is indicated by the words "absolute changes" in the title of the first table of the analysis and by the words "cycle deviations" in the amplitude tables.

trough-peak-trough base for the cycle measures, finally, is indicated by the heading of the table, "Cyclical Amplitudes, Trough-to-Trough Analysis," and by the arrangement of the stub (extreme left-hand column), which gives in each line the three dates that delineate a TPT reference cycle. (The reference cycle chronology containing these dates must be provided as input for the electronic analysis.)

The first three columns of Output Table 3A-2 provide cycle relatives of the average values of the standings of the series at three reference turns. Ordinarily, a three-month average of the seasonally adjusted data (Output Table 3A-1) is computed and printed in the relevant trough-peak-trough columns I, V, and IX of Output Table 3A-3 (which is called "Cycle Patterns, Standings in Original Units").[15] These average standings at troughs and peaks are divided by their cycle base, that is, by the average of all original values included in the particular cycle. This cycle base is given in the last column of Output Table 3A-3, and the average standings expressed as cycle relatives are given in columns 1 to 3 of Output Table 3A-2. From these standings at reference cycle turns, amplitudes (columns 4, 5, and 6) are computed. The *rise* is computed by subtracting the standing at the initial trough from that at the peak, the *fall* by subtracting the peak standing from that of the terminal trough, and the *total* amplitude by adding the two movements, i.e., by subtracting the amplitude of the fall (including the sign) from that of the rise (column 4 minus column 5).[16] Under these definitions, total reference cycle amplitudes may be positive or negative, depending on the direction and magnitudes of changes during reference expansions and contractions. On the other hand, total specific cycle amplitudes (Output Tables 3A-22 and 3A-30) will always be positive for positively conforming and negative for inverted series.[17]

[15] If the series begins or ends at a reference turn, the program automatically computes a two-month average and prints it as an estimate of the missing month at the end of Output Table 3A-1. If it is desired to substitute two-month averages or the value of the middle month for three-month averages (as might be done in case of step functions or presmoothed series), such substitution must be specified by the exercise of certain options which will be described in a later section.

[16] The amplitudes are derived by simple subtraction because the standings are expressed as percentage relatives, with the cycle base equaling 100 per cent.

[17] Reference cycle amplitudes can be computed for series that do not show actual cyclical reversals in direction. These series may portray activities with strong secular trends that experience cyclical decelerations only. Even without

Columns 7, 8, and 9 of Output Table 3A-2 give amplitudes per month. These are derived by dividing the full amplitudes by the corresponding phase durations (as given in Output Table 3A-9). The amplitudes per month are rate-of-change measures, showing the vigor of the expansions and the sharpness of the contractions. These measures help to describe and to compare the impact of cyclical changes during short and long cycle phases. Both full amplitudes and amplitudes per month are analytically important. While the largest total fall in employment during the period under review occurred during the 1937–38 business contraction, by far the sharpest monthly fall happened during the demobilization period at the end of World War II.

The bottom lines of amplitude tables such as Output Table 3A-2 contain some summary measures that should be briefly explained. The total is important only computationally—as a step toward the average given in the next line. The print-out of the totals is convenient in case one wishes to modify the summary measures, say, by omitting war cycles or by adjusting the time period in order to facilitate comparison between different activities. The averages are, of course, of utmost importance, since they provide an approximation to the typical amplitude of the analyzed series. On the average, employment in nonagricultural establishments tended to rise 18.6 and to fall 5.5 per cent (of the cycle base) during business cycles in the period covered. In case of amplitudes per month, both simple and weighted averages are provided. For the latter the durations of the phases covered, in months, serve as weights. The average deviation, finally, provides a measure that permits gauging the representativeness of the average amplitude measures and the dispersion around them. It is computed by taking the mean of the absolute deviations, i.e., the differences between the amplitude of each phase and the mean of all phases.

The deviation measures call attention to the fact that scanning of summary measures is no substitute for detailed examination. The sum-

trend adjustment, differential behavior during business cycle expansions and contractions can be ascertained by comparing a series' reference phase amplitudes; and cyclical volatility can be measured by full-cycle amplitudes. Amplitudes for any given phase must always be compared with those of the preceding and succeeding phases; full-cycle amplitudes must be measured on both a TPT and a PTP basis. This is necessary so that the difference between contraction amplitudes and those of the preceding expansions is not regarded as cyclical, while it may, in fact, be due to a secular trend with a declining rate of growth.

mary measures do not reveal the tendency toward decreasing amplitudes of rises and falls in employment during the thirty years under review. Nor do they show to what extent the magnitudes, and perhaps the trend of the amplitudes, were influenced by the 1938–45 war cycle. It is the possibility of studying the individual measures, of adjusting the averages for nontypical events or for differences in time coverage, that makes the voluminous output of computer runs so valuable for research and analysis.

Relative and Absolute Amplitude Measures. The amplitude measures just discussed are part of an analysis in which most measures and all changes are expressed as relatives of their cycle base. This procedure is the most common version of business cycle analysis. However, there are situations in which this approach is not the only possible one; nor is it necessarily preferred or even feasible. An alternative consists of expressing cycle standings as absolute deviations from, rather than as relatives to, the cycle base and measuring amplitudes (and other changes) as differences between these absolute deviations in original units. This is equivalent to using stage standings in original units, without reference to the cycle base. The expression of standings as deviations from cycle averages, however, may be convenient for some analytical purposes.

Let us briefly review the conditions under which it might be preferable to compute absolute changes. One group of cases is that of rates, such as rates of unemployment, interest rates, or perhaps rates of change. In these cases the observations are already in relative terms, although the base for these relatives may be another variable. This permits intercycle comparisons of amplitudes in terms of absolute differences without converting the data to relatives of the cycle base. In other cases the conversion of rates into relatives of their cycle base may not be particularly meaningful, or both types of measures may be desired. For example, if components of GNP are being analyzed, it may be desirable to have analyses both in dollars and in relatives, since the effect of each component upon the aggregate can be measured in dollars. Another reason is operational: If the original data contain negative values, the computation of cycle relatives may not be feasible.[18]

[18] It might be feasible if the negative values disappear in the averaging process involved in the computation of stage standings. However, if there are several negative values close to each other, they may not average out, especially if they become the locations of specific cycle troughs.

A business cycle analysis of unemployment rates, in terms of absolute changes, is presented as Appendix 3B. It should be remembered that the unemployment rate is an inverted series; that is, its increases match business cycle contractions and its decreases match business cycle expansions. Again, Output Table 3B-2 contains reference cycle amplitude measures. Note, however, that the first three columns are cycle deviations (instead of cycle relatives),[19] and that hence negative values appear (in this case, because of the inverted behavior, in the peak column). The amplitudes are again derived by subtracting the initial trough from the peak standings for the rise column, and the peak from the terminal trough value for the fall column.[20]

Before substantive results of the amplitude computations are discussed, it should be remembered that the data are printed in units of per cent times 100. The amplitude measures show that between 1933 and 1937 the unemployment rate was reduced by about 14.8 percentage points (from 27.5 per cent to 12.7 per cent of the labor force), and that it rose between 1960 and 1961 by about 1.5 percentage points. The summary lines of the amplitude table demonstrate particularly forcefully the inadequacy of regarding average amplitudes (or other average measures) as typical, without examining dispersion and component behavior. In case of rises the average deviation (in either direction) of amplitudes from their average is 7 percentage points—almost as large as the average amplitude itself. And the component amplitudes range from a decrease of 20 per cent (relative to labor force totals) during 1938–45 to an increase of .02 per cent from 1945 to 1948. Examination of measures during individual cycles shows also the large differences between the amplitudes before and after World War II. This must of course be understood in terms of the general mildness of recent cycles.

The differences in cyclical measures resulting from the analysis of absolute changes and the analysis of relative changes can be illus-

[19] These deviations are derived from columns 1, 5, 9, and 10 of Output Table 3B-3, as are the cycle relatives of the other version.

[20] This requires strict regard to signs. Subtracting the negative peak deviation in 1937 (−615.2) from the positive trough deviation in 1938 (+291.5) results in a positive amplitude during the fall (+906.7). Note also that the rise column, which contains mostly negative values (i.e., decreases in the unemployment rate), also has one positive value (20.0) for the business cycle expansion of 1945–48. This means, of course, that the unemployment rate rose slightly between the immediate postwar trough and the business cycle peak of 1948.

trated by applying both analyses to the unemployment rate. The absolute amplitudes listed in Table 8 show, for instance, that during the recovery from the Great Depression unemployment declined by about 15 percentage points. This amounts to about three-fourths of the unemployment decline (20.6 points) during the next expansion in general business activity—from 1938 to the business cycle peak of World War II (see column 1). By contrast, the ratio of the two corresponding relative measures was only about one-third (78.5/229.1, column 4). This difference between the absolute and the relative measures is due to the change in the base of the relatives. During the first cycle, which includes the recovery from the Great Depression, unemployment was still comparatively high. Thus, the change from trough to peak, expressed relative to this cycle base, appears to be small. By contrast, the very low level of unemployment, during the war cycle,

TABLE 8
REFERENCE CYCLE AMPLITUDES
IN THE UNEMPLOYMENT RATE,
ABSOLUTE AND RELATIVE CHANGES, 1933–61

Reference Cycle Dates			*Absolute Changes (per cent of labor force)*			*Relative Changes (per cent of cycle averages)*		
T	*P*	*T*	*Rise* (*1*)	*Fall* (*2*)	*Total* (*3*)	*Fall* (*4*)	*Rise* (*5*)	*Total* (*6*)
3/33	5/37	6/38	−14.8	+9.1	−23.8	−78.5	+48.2	−126.6
6/38	2/45	10/45	−20.6	+2.6	−23.1	−229.1	+28.8	−257.9
10/45	11/48	10/49	+0.2	+3.0	−2.8	+4.6	+69.4	−64.8
10/49	7/53	8/54	−4.4	+3.3	−7.7	−108.2	+81.8	−190.0
8/54	7/57	4/58	−1.7	+2.9	−4.6	−36.9	+63.5	−100.5
4/58	5/60	2/61	−1.9	+1.5	−3.4	−31.7	+25.6	−57.3
Average			−7.2	+3.7	−10.9	−80.0	+52.9	−132.9
Average deviation			7.0	1.8	8.4	59.1	18.7	60.7

Note: Unemployment shows an inverted cyclical relationship, i.e., specific cycle peaks correspond to reference troughs and specific cycle troughs to reference peaks. Rise and fall denote expansions and contractions in general business conditions. Total equals rise minus fall.

caused the next cycle base to be low and, hence, changes relative to that base to be large.

Another illustration of the different results obtained from absolute and relative measures is provided by comparison of the 1957–58 and 1937–38 contractions. The absolute analysis shows the rise of the unemployment rate during 1957–58 to be only a third as great as that during 1937–38 (2.9 vs. 9.1). In relative terms the rise in 1957–58 is greater than that during 1937–38 (63.5 vs. 48.2). Note also that, in the case of absolute changes, the average deviation of the total amplitude is about 77 per cent of the average over all cycles (column 3); the corresponding figure for the relative analysis is 46 per cent (column 6). The importance of such differences can only be evaluated in the context of a particular research problem. The object of the preceding illustration is to point to the availability of the two analyses and to the differences in the measures generated.

Reference and Specific Amplitudes. All amplitude measures considered so far describe changes during expansions and contractions in general business activity; that is, they are reference cycle measures. These amplitudes are characteristically smaller than the full cyclical swings of an economic activity between its own peaks and troughs. The differences in amplitudes are caused by differences in the dates of specific turns and business cycle turns. When these turns coincide, as they do occasionally, the reference cycle and specific cycle amplitudes are, of course, identical. When they do not, the reference cycle amplitude describes less than the full change between the highs and the lows of the series itself.

The amplitude measures describing changes between the turning points established for specific activities are called specific cycle amplitudes. They are found in the section of the computer runs headed "specific cycle analysis." There are two amplitude tables in that section—Output Table 3B-22 for trough-to-trough and Output Table 3B-30 for peak-to-peak analysis. The derivation of these tables is strictly analogous to that described for reference cycles except, of course, for the selection of turns.

Specific cycle amplitudes cannot be readily computed if series do not show actual cyclical increases and declines. In such cases, some trend adjustment is necessary if specific cycle analysis is desired. This may be particularly important for data with cycles that cannot be readily related to an existing reference chronology (foreign data, pre-

1850 data, data with atypical changes in growth rates). There are several ways to determine cyclical characteristics of such data: computation of deviations from trend, derivation of measures of change and rates of change, or establishment of cyclical steps in first differences and growth rates. None of these procedures is part of the National Bureau's standard business cycle analysis. However, once specific cycle turns or their equivalents are established, the programmed specific cycle analysis can be applied.

Comparison between Output Tables 3B-22 and 3B-2 and Output Tables 3B-30 and 3B-10 shows, as expected, that for every comparable cycle phase specific amplitudes are larger than, or at least as large as, the corresponding reference cycle amplitudes. The difference is rather small in case of employment, since the timing difference between specific and reference cycles is small; in the unemployment rate it is somewhat larger, since here the turns deviate more markedly from those in general business conditions. It is again important to watch the comparability of the printed summary measures, which are reproduced in Tables 9 and 10. In the case of the employment series, there is no problem. Amplitude averages for reference and specific cycles refer to similar time periods, and, as expected, the summary measures show reference cycle amplitudes to be smaller than specific cycle amplitudes. For the unemployment rate, however, in case of peak-to-peak analysis, average specific cycle amplitudes are smaller than average reference cycle amplitudes—for both cycle phases and for the full cycle. The cause for this seeming anomaly lies in the different coverage of years and cycle phases. As can be seen in Table 10, reference cycle amplitudes, on a peak-to-peak basis, are averaged over the span 1929–60, while those for specific cycles are averaged over the years 1937–59. Thus neither the Great Depression nor the subsequent recovery is included in the specific cycle averages. Their exclusion readily explains the smaller average for specific cycles.

Monthly specific cycle amplitudes are not necessarily larger than monthly reference cycle amplitudes, even if corresponding cycle phases are compared. Examples of such occurrences can be found in monthly amplitudes of falls for the two illustrative series in the relevant output and summary tables. This situation is not particularly surprising. Per month amplitudes are ratios of phase amplitudes to phase durations. If the durations are long, per month amplitudes become correspondingly smaller. Phase durations are a consequence of the location of

TABLE 9

AVERAGE AMPLITUDES IN NONAGRICULTURAL EMPLOYMENT, RELATIVE CHANGES

Output Table No.		Standings in Cycle Relatives at Business Cycle Turns				Amplitudes during Business Cycle				Amplitudes per Month during Business Cycle			
		T	*P*	*T*	*P*	*Rise*	*Fall*	*Rise*	*Total*	*Rise*	*Fall*	*Rise*	*Total*
	REFERENCE CYCLES (NO RECOGNITION OF TIMING DIFFERENCES)												
3A-2	Trough-to-trough (1933–61)	+88.0	+106.5	+101.0		+18.5	−5.5		+24.1	+0.38	−0.54		+0.40
3A-10	Peak-to-peak (1929–60)		+100.4	+89.7	+108.7		−10.7	+19.0	−29.7		−0.58	+0.39	−0.44
	REFERENCE CYCLES (TIMING DIFFERENCES RECOGNIZED)[a]												
3A-18	Trough-to-trough (1933–61)	+88.0	+106.5	+101.0		+18.5	−5.5		+24.1	+0.39	−0.49		+0.40
3A-20	Peak-to-peak (1929–60)		+100.5	+89.8	+108.8		−10.7	+19.0	−29.7		−0.54	+0.40	−0.44
	SPECIFIC CYCLES												
3A-22	Trough-to-trough (1933–61)	+88.2	+107.1	+101.2		+18.9	−5.9		+24.8	+0.41	−0.42		+0.41
3A-30	Peak-to-peak (1929–60)		+101.5	+90.5	+110.0		−11.0	+19.5	−30.6		−0.49	+0.43	−0.45

[a] Trough not shifted, peak shifted by −1 month.

TABLE 10

AVERAGE AMPLITUDES IN THE UNEMPLOYMENT RATE, ABSOLUTE CHANGES

Output Table No.		Deviations from Cycle Base at Business Cycle Turns				Amplitudes during Business Cycle				Amplitudes per Month during Business Cycle			
		T	*P*	*T*	*P*	*Rise*	*Fall*	*Rise*	*Total*	*Rise*	*Fall*	*Rise*	*Total*
	REFERENCE CYCLES (NO RECOGNITION OF TIMING DIFFERENCES)												
3B-2	Trough-to-trough (1933–61)	+4.38	−2.81	+0.93		−7.18	+3.74		−10.92	−0.13	+0.34		−0.17
3B-10	Peak-to-peak (1929–60)		−3.46	+4.50	−2.69		+7.95	−7.18	+15.14		+0.42	−0.13	+0.20
	REFERENCE CYCLES (TIMING DIFFERENCES RECOGNIZED)[a]												
3B-18	Trough-to-trough (1933–61)	+4.44	−2.69	+0.95		−7.13	+3.64		−10.77	−0.15	+0.22		−0.17
3B-20	Peak-to-peak (1929–60)		−3.23	+4.55	−2.58		+7.77	−7.13	+14.90		+0.29	−0.15	+0.20
	SPECIFIC CYCLES												
3B-22	Trough-to-trough (1933–61)	+4.70	−2.90	+1.21		−7.59	+4.11		−11.70	−0.17	+0.28		−0.19
3B-30	Peak-to-peak (1937–59)		−0.98	+3.57	−2.42		+4.55	−5.99	+10.54		+0.32	−0.14	+0.18

Note: This is an inverted series; specific peaks correspond to reference troughs, and specific troughs to reference peaks.

[a] Trough shifted by 2 months, peak by −4 months.

turning points, which, as was pointed out, is highly sensitive to small variations in level, subject to fringe decisions in case of double turns, and so forth. It follows that in computing average monthly amplitudes, large full amplitudes can be easily accompanied and compensated or overcompensated by long durations. It also follows that average monthly amplitudes are much more dependent on turning-point determination, and hence less stable, than the full-phase amplitudes.

Output Tables 3B-18 and 3B-20 and Tables 9 and 10 contain information on adjusted reference cycle amplitudes, i.e., on amplitudes after recognition of timing differences. These amplitudes are conceptually somewhere between simple reference cycle amplitudes and specific cycle amplitudes, in that they shift the reference dates at peaks and at troughs by the median lead or lag of the series at these turns. If the average timing showed no dispersion at all, these amplitudes would be identical with specific cycle amplitudes. This, of course, cannot often be observed. However, when leads or lags are only moderately dispersed, the adjusted reference cycle amplitudes are generally larger than ordinary reference but smaller than specific cycle amplitudes. In so far as the leads or lags are systematic, the adjusted amplitude represents the extent of the series' reaction to business cycles better than the other measures of amplitude do.

Table 9 shows that for nonagricultural employees, the amplitudes before and after recognition of timing differences are the same. This is because the series has virtually coincident timing. Table 10 shows distinct differences between the amplitudes of unemployment rates before and after recognition of timing differences (Output Tables 3B-2 and 3B-18, 3B-10 and 3B-20). However, the differences are not in the expected direction—that is, the average amplitudes after recognition of timing differences are smaller than before such recognition, although the same time period is covered. To understand why this may happen, let us compare the individual entries in the rise columns of Output Tables 3B-2 and 3B-18. The first table requires no comment. The latter table contains the notation "timing diffs. recognized by shifting ref. dates, trough 2 months, peak −4 months." These are the median number of months by which, over the period of observation, cyclical turns in the unemployment rate tended to precede peaks and to lag behind troughs in general business activity. The relatively smaller amplitudes, after recognition of timing differences, are brought about by the dispersion of individual leads and lags around their median. At the 1949 trough, for example, the peak in unemployment (7.8 per cent) coincided with the business cycle trough, while two months later (the interval of the median lag) unemployment had dropped considerably (to 6.8 per cent). Since the alternative trough values of unemployment (at the business cycle peak and four months before the peak) were about the same, the change during the actual reference phase was larger than that during the adjusted reference phase. This, together with a similar occurrence around the 1937 business cycle peak, caused the average adjusted amplitudes to be smaller than average reference cycle amplitudes. Such unexpected decreases in amplitude after adjustment for average timing differences are most likely to occur if the average lead or lag is relatively short and the dispersion is large.

Some peculiar problems can arise in the computation of amplitudes after shifting reference turns for typical timing behavior. Since the shifting is done by average (median) monthly leads or lags at peaks and at troughs, the shift in a given cycle may lead to an inversion of the proper order of turns; that is, if a trough is shifted forward and the subsequent peak backward, the shifts can overlap so that the peak is shifted to an earlier date than the trough, and the cycle phase disappears. In such a case the shifting does not make sense, nor would the computed amplitudes. If such overlapping occurs, the program omits computation of average amplitudes and indicates this fact, in footnotes to Output Tables 18 and 20. It is not clear, however, that actual overlapping is the proper criterion for disregarding amplitudes. The results may become valueless also if, after adjustment for average timing, the reference phases shrink to one, two, three, or so months. Whether such short phases make sense depends on the duration of the reference cycle, and perhaps also on that of the specific cycle. Thus, the program provides Output Table 3B-19, which gives durations for each adjusted reference cycle phase. This table, then, makes it possible to evaluate the meaning of the amplitudes, after recognition of timing differences, presented in Output Table 3B-18. The problem of overlapping phases could be avoided if the median lead or lag, and hence the shifting of reference dates, were expressed as a percentage of the average cycle phase rather than in months. This procedure would correspond more closely to the division of cycles into stages in computing reference cycle patterns.

The possibility of using alternative cycle bases (TPT cycles or PTP cycles) was discussed in the general description of the National Bureau's approach to business cycle analysis. Most previous illustrations were based on TPT output tables and termed "Trough-to-Trough Analysis," which corresponds to what is called "positive plan" in Burn's and Mitchell's *Measuring Business Cycles* and in some earlier versions of business cycle analysis. The alternative amplitude computations are contained in the section called "Peak-to-Peak Analysis," which corresponds to what Burns and Mitchell called "inverted plan." Reference cycle amplitudes on a PTP basis are given in Output Tables 3A-10 and 3B-10 (straight chronology) and 3A-26 and 3B-26 (timing differences recognized); specific cycle amplitudes are found in Output Tables 3A-30 and 3B-30. The results can be conveniently compared with those derived from TPT analysis, on the basis of the summary measures offered in Tables 9 and 10. For present purposes it suffices to state that the amplitude measures derived by use of alternative cycle bases are rather similar. This similarity provides some insurance that the type of cycle base chosen did not exercise any undue influence on research results. Also, when amplitudes of successive cycle phases are being compared, it may be desirable to have the amplitudes computed on the same base, in which case both sets of measures are needed.

Perhaps the statement bears repetition that the PTP and the TPT analysis do *not* cover the same period. Only full TPT or PTP cycles are included in the computation of amplitude and other measures (see Chart 10). Thus, there may be odd phases left at the beginning or end of periods that could be included in the phase averages if desired.

CYCLE PATTERNS

Use and Concept. Up to this point, all the analytic measures discussed have pertained to turning points—their identification and dating, their timing relation to business cycle turns, the levels which a given time series assumes at specific and reference turns, and the changes between these levels. This concentration of attention on the few, admittedly important, moments at which time series change their cyclical direction disregards all information about cyclical behavior between turning points. The analytical measures used to summarize such intraphase behavior are the so-called cycle patterns. As briefly described before, each cycle is divided into nine stages. Three-month averages around initial trough, peak, and terminal trough form stages I, V, and IX, and the intermediate stages are averages for thirds of expansions (II, III, IV) and thirds of contractions (VI, VII, VIII).[21]

The uses of cycle patterns are manifold. The standardized summarization of cyclical behavior serves descriptive and analytical purposes, such as comparisons between cyclical characteristics of different industrial activities or between different cycles of the same activities. The question of whether cycle patterns of the same activity show stable characteristics can be studied on the basis of such measures. Cycle patterns may also prove useful for the testing of broad theoretical hypotheses on cyclical behavior. Are the cycles of major industrial activities sinusoidal, and do the nine-stage patterns reflect sinusoidal characteristics such as points of inflection? Do investment series show the rapid (and synchronous) declines that may be expected from hypotheses such as that of the collapse of the marginal efficiency of capital? Is it true that the periods of early recovery and late boom are characterized by particularly rapid changes and that consequently the patterns of expansion show a leveling off in the middle—a phenomenon sometimes labeled "mid-expansion retardation"? There may also be more practical applications of cycle patterns. If the patterns of a particular activity show, in most cycles, sufficiently homogeneous features—such as early spurts or slow starts—these regularities can be used in the interpretation of current behavior and as a guide to impending events.

While the measures discussed so far (timing, duration, amplitudes) are rather straightforward and the assertion of their relevance is not based on any particularly controversial assumptions, this is less true for the cycle patterns. The basic problem is, of course, whether fixed fractions of cycle phases of varying chronological lengths (such as thirds of expansions) are analytically meaningful units. (This is apart from the question of whether the tripartite division is the best possible one.) Consider the recent expansion starting in 1961. If it had ended around mid-1962, a supposition which is not beyond reason, stage III would have lasted about six months and extended from about August 1961 to about January 1962. If it ended in November 1969, stage III would have lasted thirty-four months and extended from January 1967

[21] Technical detail, such as the distribution of cycle phases that are not divisible by three, is handled by the program. The rule for this particular decision is that phases III and VII are lengthened or shortened to absorb odd months.

to October 1969. If one concedes that the end of an expansion is not fully predetermined but is influenced by many economic or noneconomic factors that develop during the expansion itself, it is difficult to assume that stages, the delineation of which depends on the eventual location of cyclical turns, are homogeneous. On the other hand, the periods immediately before and after cyclical turns must be expected to have characteristics different from, say, stages III or VII, no matter how long the phase, and one way to find these characteristics is to segment phases in accordance with the National Bureau analysis. Stage measures of some kind are also necessary for a systematic investigation of how the cyclical characteristics of phase segments are most efficiently described.[22]

Reference and Specific Patterns. The business cycle program yields a variety of measures pertaining to cycle patterns. Information on intraphase behavior is provided in the output tables of Appendixes 3A and 3B. The table numbers are listed below.

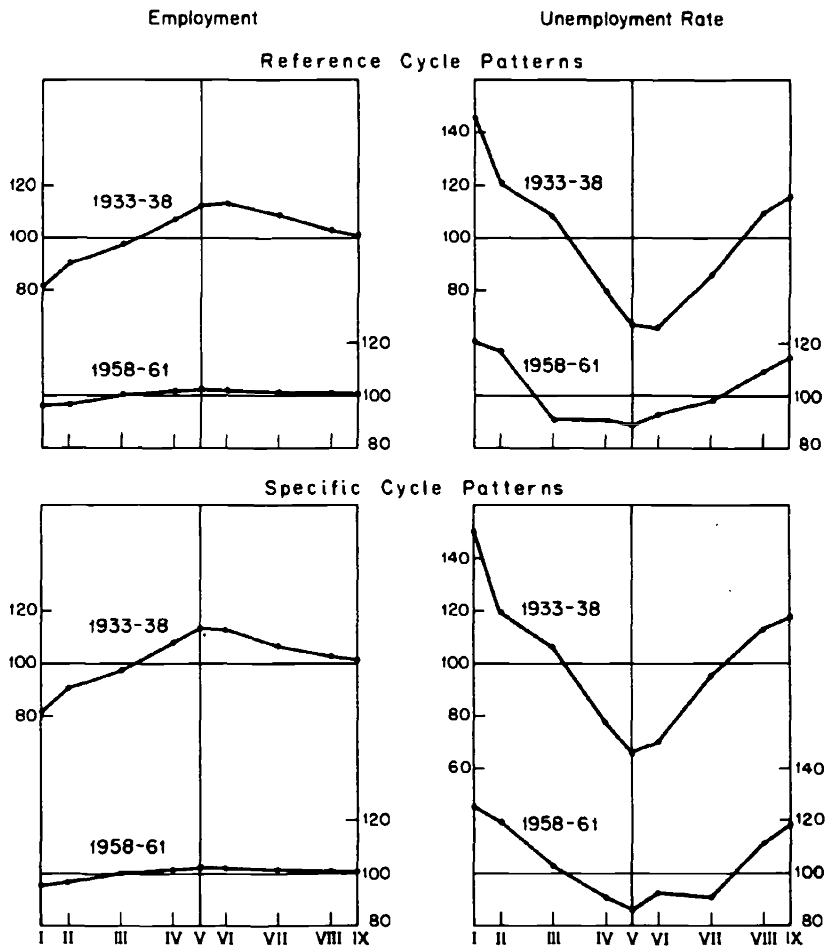
Measures	*Reference Cycles*		*Specific Cycles*	
	TPT	PTP	TPT	PTP
1. Standings in original units	3	—	23	—
2. Standings as cycle relatives or as deviations from cycle base	4	11	24	31
3. Stage-to-stage change of standings, total change	5	12	25	32
4. Stage-to-stage change of standings, change per month	6	13	26	33
5. Intervals between midpoints of cycle stages	7	14	27	34

Measures 2, 3, and 4 are, analytically, the most important; 1 and 5 are mainly required in the derivation of the former. To demonstrate the type of knowledge that can be extracted from these patterns, emphasis will be placed on the trough-to-trough patterns for 1933–38 and 1958–61. Chart 11 shows these patterns for the series on employ-

[22] The measurement of cyclical changes during chronological stretches of given length (in months) will be discussed in Chapter 4. Segmentation could, in principle, also be based on other criteria such as inflection points, points of maximum diffusion, attainment of previously experienced levels, relations to other series, and so forth.

CHART 11

REFERENCE AND SPECIFIC CYCLE PATTERNS DURING TWO CYCLES, NONAGRICULTURAL EMPLOYMENT AND UNEMPLOYMENT RATE, 1933–38 AND 1958–61



ment and on the unemployment rate. To make the measures comparable, cycle relatives are used for both series.

Horizontal distances between stage standings are standardized, without reference to chronological stage duration.[23] The upper panel of the chart contains reference cycle and the lower panel specific cycle patterns. Some of its features, such as the inverted character of the unemployment rate, the larger relative amplitudes of unemployment compared with employment, and the milder fluctuation during the postwar as compared to the interwar cycle, are also apparent from the amplitude tables. Note the smoother contour of employment as compared with unemployment cycles and the greater resemblance between reference and specific patterns in case of nonagricultural employment (which of course is due to the practically coincident timing). Note also that the peculiar timing characteristics of the unemployment rate (its lag at troughs and lead at peaks) become obscured by the process of averaging over cycle stages, and so do the traces of midexpansion retardation that may be found in the original data (see Chart 1 in Chapter 2). Actually, the cycle patterns contained in Chart 11 do not show any dramatic deviations from a simple triangular pattern shared by both cycles. However, two cycles are certainly not enough to detect pervasive characteristics, and the activities chosen, because of their nature and broad coverage, are not likely to display strong intraphase idiosyncrasies. Illustrations of such idiosyncrasies can be found in most collections of cycle patterns.[24]

A few comments are in order on stage-to-stage changes as found in the eight output tables listed opposite items 3 and 4 above. Being first differences, these changes tend to display considerably more instability than the cycle relatives from which they were derived. For the same reason, they emphasize the comparative lack of smoothness in the unemployment patterns. Nevertheless they show, particularly in the form of monthly changes, a tendency of the unemployment rate to come down sharply at the beginning of business expansions but to change more slowly after peaks. This difference between early expan-

[23] This is not the only way to chart cycle patterns. Burns and Mitchell, *Measuring Business Cycles,* contains many illustrations in which cycle patterns are charted on scales that represent the chronological duration of phases and stages (see, for example, pp. 155 and 165).

[24] See, for example, Burns and Mitchell, p. 173; Mitchell, *What Happens During Business Cycles*, pp. 32–49; Moses Abramovitz, *Inventories and Business Cycles,* New York, NBER, 1950, pp. 274, 282–283, *et passim.*

sions and contractions is less pronounced in the stage-to-stage changes of employment patterns.

Average Pattern. The division of the cycle into stages makes it possible to average stage standings over cycles and to compute average cycle patterns that may be expected to describe some pervasive cyclical characteristics of a given variable.

These average patterns must be used with great care. They are averages (over several cycles) of averages (stage standings) that refer to periods of different duration and cycles of widely varying amplitudes; they are averages composed of relatively few cycles, so that a single large fluctuation (such as the 1929–37 cycle) may dominate the average pattern; and they are averages that may cover a varying number of phases and cycles. From all this, it follows that average patterns must always be scrutinized for representativeness, coverage, and comparability, and that they should be used only in conjunction with component cycles. On the other hand, average patterns do bring out common characteristics and can be valuable for comparative analysis. R. A. Gordon, for instance, used cycle patterns very effectively to compare cyclical behavior of economic activities before and after World War II.[25] He found important differences in cyclical characteristics. Note also that the average cycle patterns based on the postwar experience are clearly more representative of their component cycles than the prewar average patterns are of theirs.

CONFORMITY MEASURES

General. In the cyclical analysis of economic activities, an obvious concern is the way in which fluctuations in any particular variable are related to fluctuations in business conditions at large. Are the fluctuations of the variable positively or invertedly related to business cycles? Can every specific cycle be matched with a reference cycle? Are there extra cycles or have some been skipped in the particular activity? How close is the correspondence of cycles in a specific activity and in general business conditions? These questions are not only of interest for the analysis of particular variables, but their resolution for many variables indicates the degree of consensus of cyclical movements in different sectors of the economy and in the economy at large.

Some information about the correspondence of specific cycles to business cycles—that is, information about their conformity—can be

[25] *Business Fluctuations,* New York, 1961, pp. 265 ff.

extracted from several of the approaches and measures already discussed, such as inspection of time series plotted against a reference cycle grid, comparisons of timing and duration measures for specific and reference cycles, or comparisons of specific and reference cycle patterns. However, explicit measures describing conformity are desirable. Indeed, conformity measures become indispensable if the behavior of whole groups of activities is to be summarized. The question of the relative conformity of agricultural as compared to industrial prices can hardly be answered without some systematic approach to the measurement of conformity, such as the approach of the National Bureau's analysis.

Conformity measures are designed to describe and summarize the differential behavior of given economic activities during business cycle expansions, contractions, and full cycles and to establish whether the cyclical fluctuations of given activities are characteristically related positively, invertedly, or not at all to business cycles. They are also designed to measure the degree of conformity and to measure changes in this degree when typical leads and lags in the cyclical turning points of given activities are taken into account.[26]

Conformity Without Regard to Timing Differences. Conformity measures are part of the reference cycle analysis; in the specific cycle analysis, time series are not related to business cycles at large. The meaning of these measures will be explained on the basis of Output Table 3A-17 of the programmed analysis of nonagricultural employment (p. 143). The upper part of the table contains average changes per month, in terms of reference cycle relatives, during expansions and during contractions—in the left half of the table for trough-to-trough cycles and in the right half for peak-to-peak cycles. Note that during every business cycle expansion there was an increase in employment and during every contraction there was a decline, indicating a clear-cut case of perfect positive cyclical conformity. This is expressed by the index of 100 for all expansion, contraction, and full-cycle conformities. Conformity indexes are derived in Output Table 3A-17 as described below.

1. Indexes of *expansion conformity* are computed by counting the number of increases during reference expansions (procyclical movements), subtracting the number of decreases (countercyclical move-

[26] For a more detailed description and interpretation of these measures, see Burns and Mitchell, pp. 31–38, 176–197.

ments), and expressing the difference as a percentage of all entries including no changes. The result is the expansion conformity index, shown (in the row marked "expansions") for TPT cycles under the expansion column on the left, for all covered expansions in the middle column, and for PTP cycles under the corresponding column on the right of the table. In the present case, both expansion indexes indicate 100 per cent conformity. The use of net indexes (deduction of decreases from increases) permits the construction of a measure that fluctuates around zero, with negative figures indicating inverse conformity.[27]

2. Indexes of *contraction conformity* are computed analogously. Here the number of increases during business cycle contractions (countercyclical movements) are deducted from the number of decreases (procyclical movements), resulting in an index that is positive if the series generally falls during business cycle contractions.

3. *Full-cycle conformity* measures are based on the difference between the average monthly changes during expansions and during preceding or subsequent contractions. The difference is computed as contraction change minus expansion change (signs considered), which implies that positive conformity is indicated by a negative sign and vice versa. The difference is reported for TPT cycles in the column headed "con. minus preced. exp.," and for PTP cycles in the column headed "con. minus succed. exp." If contraction changes are negative and expansion changes positive, as in the present case, the resulting difference will be a negative entry larger than the average change in contractions or expansions alone. In series with strong trends, conformity with business cycles may be reflected in differential rates of growth (milder monthly increase in contractions in case of an upward trend) rather than in actual increases and decreases. If the response to business cycle contractions is just a deceleration of growth, the entries for contractions minus expansions would still be negative but smaller than the entries in either contraction or expansion alone. Full-cycle conformity indexes are computed by summarizing the consistency in the changes reported in the "con. minus preced. exp." and "con. minus succed. exp." columns. Again, the number of plus signs is subtracted

[27] The alternative—expressing the number of increases as a percentage of all entries—would lead to a measure fluctuating between 0 and 100. The percentage deviation of that measure from 50 would lead to the measure described in the text.

from the number of minus signs and the difference expressed as a percentage of all entries.

4. *Total full-cycle conformity* finally is measured as the weighted average (weighted by number of cycles covered) of the PTP and the TPT full-cycle conformity indexes. The total index is reported in the last line of the table. It can vary between +100 (total perfect positive conformity) and −100 (total perfect inverse conformity). An index of zero denotes absence of consistent conformity of a series to business cycles.

Nonagricultural employment presents such a straightforward case of uniformly perfect conformity that the corresponding table (Output Table 3A-17) of the reference cycle analysis of the unemployment rate should be examined also. Here most average monthly changes during expansions are negative and all changes during contraction positive, indicating inverse conformity. Consequently, the entries in the full-cycle column "con. minus preced. exp." are all positive (since unemployment rises more in contractions than in expansions) and, with the one exception of the 1945–49 cycle, numerically larger than those in the preceding two columns. This situation is reflected in the negative signs for the expansion, contraction, and full-cycle conformity indexes. One example of less than perfect conformity may be used for illustrating the derivation of the index. During the 1945–48 expansion, the unemployment rate went up a little, so that unemployment decreased in only five of six expansions. Hence, the conformity indexes for TPT cycle expansions, computed as described, is

$$\left(\frac{1-5}{6}\right)100 = -67.$$

Note that the less than perfect (inverse) expansion conformity does not necessarily affect the full-cycle conformity. During the exceptional 1945–49 TPT cycle, the rise of the unemployment rate in the contraction was still stronger than the rise in the preceding expansion (left side of Output Table 3A-17); and during the 1945–48 TPT cycle, the rise of the rate during the contraction was stronger than that in the following expansion. Hence, in both cases the full-cycle entries were uniformly positive, leading to perfect inverse conformity indexes of −100. For a fuller understanding, one may consider what the conformity index would be if the entry during the 1945–48 expansion were 54.00 instead of .54. Then the monthly change for the full 1945–

49 TPT cycle would be −26.42 (i.e., 27.58 − 54.00) and for the 1945–48 PTP cycle −21.75 (i.e., 32.25 − 54.00). Consequently, the full-cycle conformity would be reduced to −66.7, reflecting the hypothetical condition that the unemployment rate not only rose in one of the six expansions but rose more than during the preceding and subsequent contractions.

Conformity Measures Recognizing Timing Differences. Suppose that the turning points of an economic time series led those of business conditions as a whole by about half a phase, or a quarter of a cycle. Then the conformity measures so far discussed may show little conformity despite the fact that each specific cycle can be readily matched with a corresponding reference cycle. This is so because the leading series may have declined so much by the time the reference peak is reached, and risen so much by the time the reference trough is reached, that there would be little difference between the two levels. This possibility points to the need for conformity measures that make allowance for the typical timing relation of the measured economic activity to business cycles. Burns and Mitchell developed an approach that involves determination of the business cycle stages during which an activity tends to expand and those during which it tends to contract. Graphs of business cycle patterns with standardized time scales [28] help to determine the reference stages of typical rise. Once these stages have been determined, conformity measures can be derived which are conceptually analogous to those previously discussed but are based on the changes of reference cycle relatives during phases of typical expansion and contraction. The typical expansion period is indicated in the table titles by noting that, for the analyzed series, expansions cover, say, stages II–VI and that, in case of positive conformity, specific expansions are matched with reference expansion.

For purposes of electronic computations, this procedure presents some drawbacks, since either the computations would have to be interrupted for the determination of the reference phases during which the series typically expands, or this determination would have to be formalized, possibly modified, and programmed. This would be a formidable task. Burns and Mitchell suggested alternative approaches,[29] among them one that took care of timing differences in terms of months rather than of cycle stages or cycle fractions. This alternative

[28] See Chart 8 and Burns and Mitchell, p. 187.
[29] *Ibid.*, p. 194.

was not pursued at the time, partly because the use of stages fitted the general analytical framework closely, and partly because the alternative involved recomputation of cycle averages, peak and trough standings, amplitudes, and so forth. The required computations, which are cumbersome if performed on desk calculators, are easily carried out with the aid of electronic computers. Thus, in the programmed version of the analysis, this general approach is employed.

Since nonagricultural employment shows perfect conformity in all measures and since the series is known to have virtually synchronous timing, the conformity measures, after consideration of timing relationships, can hardly be expected to differ much from those computed without consideration of timing. The relevant conformity table (Output Table 3A-21) shows, as expected, perfect positive conformity after consideration of typical timing—an average lead of two months at peaks and coincidence at troughs. The description of the programmed procedure will therefore be based on the analysis of the unemployment rate of Output Tables 3B-18 through 3B-21.

These tables, which are all part of the derivation of conformity measures after consideration of average leads and lags, carry the legend "timing diffs. recognized by shifting ref. dates, trough 2 months, peak −4 months." Note that the reference dates, rather than the time series itself, are shifted. This is done not only for computational convenience but of necessity because peaks and troughs are shifted by a different number of months, in accordance with the median timing of the series at the two types of reference turns. That is, since the unemployment rate tends to lag by two months at troughs and to lead by four months at peaks, reference troughs are uniformly shifted two months backward and reference peaks four months forward toward the specific turn, in order to compensate for the differential timing. The programmed reference cycle analysis is then applied, using the shifted reference dates.

New cyclical amplitudes, durations, and amplitudes per month are computed for TPT cycles (Output Tables 3B-18 and 3B-19), corresponding amplitude measures are derived for PTP (Output Table 3B-20), and new conformity measures are contained in Output Table 3B-21. The compensation for timing differences changes the unusual entry for the 1945–48 expansion from a small positive change (+.54 per cent of the civilian labor force) before recognition of timing differences to a small negative change (−1.56), indicating decrease of unemployment during this phase, after adjustment for typical timing. Consequently, all expansion entries have the same sign and the expansion conformity becomes perfect, on an inverted basis, for both TPT and PTP cycles.

The improvement of the conformity measures, after adjustment for timing differences, is plausible enough. However, the procedure is not quite as free from problems as may appear from our exposition. As noted earlier, if reference peaks are shifted forward and reference troughs backward, it can happen that the durations of the adjusted reference contractions become unreasonably short, become zero, or even become negative. The programmed procedure does not prevent such occurrence;[30] however, it offers a safeguard against unreasonable interpretation. By referring to Output Table 3B-19, which reports duration after adjustment for timing, the analyst can check for uncommonly short, zero, or negative durations. If these appear, these phases must be omitted, or the conformity indexes, after adjustment for timing differences, must be disregarded.

After adjustment for timing differences, conformity measures can also be lower than before consideration of such differences. All reference peaks are uniformly shifted by the median lead or lag of the given series, and the same is done for all reference troughs. This adjustment does not, of course, necessarily shift reference turns to specific turns. Since economic time series often have strong intraphase fluctuations, the uniform shift of, say, all peaks may lead in some instances to standings lower than those at the original reference peak. If the differences in levels are large enough to cause changes in the direction of movement, they may adversely affect phase conformity and total conformity. If these differences do not cause changes in direction but affect amplitudes relative to those of adjoining phases, they may still lead to changes in total conformity. Furthermore, the shift in timing affects the durations and thus the average monthly changes on which the conformity indexes are based. Thus, amplitude and duration changes may combine to bring about changes in conformity measures that may deviate from those expected on general grounds and possibly lead to lower conformity, after adjustment.[31] Such a deterioration of conform-

[30] If phases with zero and negative durations occur, no averages are computed.

[31] The effect of irregular intraphase movements on conformity can for analogous reasons also be positive, i.e., lead to spurious improvements in conformity indexes.

ity measures can usually be traced from the detailed output tables to particular phases and circumstances.

Concluding Remarks on Conformity. A conformity index can be regarded as a type of nonparametric correlation measure that describes the degree to which cycles in specific activities are associated with cycles in general activity. Similar to conventional correlation coefficients (except for the expression as percentage), the index varies between plus and minus 100, indicating a continuum from perfect positive to perfect inverse association. Like the correlation coefficient, the conformity index

> states the degree to which errors can be reduced in estimating the direction of movement of a series by taking account of its conformity to business cycles instead of guessing. . . . The greater the number of observations and the firmer the rational analysis, the greater our confidence in the significance of a coefficient of correlation, and so it is also with indexes of conformity. An index of conformity as low as +33 indicates that instances of positive conformity preponderate over instances of inverted conformity in the ratio of 2 to 1; but the index commands more serious attention when the cycles number ten than when they number three, and when they number thirty than when they number ten.[32]

The analogy suggests that conformity measures, like correlation coefficients, may be subjected to significance tests. Such tests have, indeed, been used in the evaluation of business cycle indicators.[33]

Conformity indexes as measures of correlation between cycles can also be employed when interest centers on the association between individual activities or groups of activities. The cyclical responsiveness (as distinguished from other shorter- or longer-term responses) of strike activity to unemployment rates, or of building activity to mortgage interest rates, may well be described by using the cyclical turns of unemployment or interest rates as a reference system and measuring the cyclical conformity of the related variables to this system. This is not to suggest that conformity indexes are the only or the best way to measure the cyclical aspect of the association. Nevertheless, they do focus on that aspect, and can be used to describe the behavior of one activity in relation to the specific cycles of another.

[32] Burns and Mitchell, p. 183.

[33] See Geoffrey H. Moore, *Statistical Indicators of Cyclical Revivals and Recessions,* New York, NBER, 1950; reprinted in Moore (ed.), *Business Cycle Indicators,* Vol. I, p. 206.

MEASURES OF SECULAR GROWTH

The standard business cycle analysis of time series does not provide measures of cyclical movements separate from longer-run trends. The analysis contains, however, measures that indicate changes from cycle to cycle, and thus intercycle trends. They describe changes between the cycle averages that form the bases for many of the cyclical measures in the National Bureau's analysis. These cycle averages, it will be remembered, are computed in several forms, for reference cycles as well as for specific cycles, for trough-to-trough as well as for peak-to-peak cycles; intercycle changes are computed for all these variants.

The output tables of Appendixes 3A and 3B that are relevant for the analysis of trends in employment and unemployment are:

Output Table	*Type of Cycle*
8	Reference, TPT
15	Reference, PTP
28	Specific, TPT
35	Specific, PTP

All these tables have average monthly standings, in original units, for each expansion, each contraction, and each full cycle. They also contain percentage changes between average standings for contiguous phases and contiguous cycles. The percentage changes between cycle averages are computed on two bases—as percentages of the earlier cycle and of the average of the two compared cycles. The latter measure has the advantage of avoiding the "percentage-base bias." The percentage changes between full cycles, finally, are computed as total and as average monthly changes. The tables also provide grand averages for the percentage changes (unweighted and weighted by duration) between adjoining full cycles.[34]

The secular measures can be utilized in a variety of ways. Average intercycle growth before World War I, during the interwar period, and during the period after World War II may be compared. The slackening of intercycle growth during recent postwar cycles in series such as

[34] For analyses based on absolute deviations, absolute changes rather than percentage changes are computed. This eliminates, of course, the need for two types of measures of cycle-to-cycle changes. See the output tables for analysis of unemployment rates.

nonagricultural employment can be observed—a finding, incidentally, that would have to be modified if the expansion that began in 1961 were included in the cyclical measures.

One can also combine the average phase standings or the average cycle standings into a time series of secular levels that can be charted and further analyzed. Some students have used overlapping TPT and PTP cycles, centered at the middle of the respective time spans.[35] Computation of percentage changes between overlapping cycles, incidentally, is an option available in the programmed analysis. For present purposes, it is not necessary to detail the numerous potential applications of the described secular measures to analysis of economic growth. The main point is that the various measures of average cyclical standings provide the student with levels that are reasonably free from short-cycle, seasonal, and irregular elements and thus permit him to measure and comment on long-term changes in economic activities in more detail and, perhaps, with more realism than that provided by the boldly general parameters of mathematically fitted trend equations.

MEASURES FOR QUARTERLY AND ANNUAL SERIES

Quarterly Series. Frequently time series of economic activities are available only in quarterly form. The national income accounts, many series pertaining to profits or the flow of funds, and many derived from anticipations and other surveys are examples. The standard business cycle analysis developed by Burns and Mitchell contains a variant especially designed for quarterly series.[36] In the computer program the need for a separate quarterly routine is avoided by converting all quarterly series to monthly form. Each quarterly figure is repeated three times—once for each month of the quarter. All turning points must be specified as occurring in the middle month of the quarter, and the chronology used for reference analysis must be a quarterly chronology (with quarters identified by the middle month). In other respects, the monthly analysis is performed as previously described. A few features that distinguish the programmed quarterly analysis from that of Burns and Mitchell are pointed out below.

The output measures are close to, but not exactly the same as those obtained by the quarterly Burns and Mitchell approach. The main

[35] Moses Abramovitz, *Evidences of Long Swings in Aggregate Construction Since the Civil War*, New York, NBER, 1964.

[36] Burns and Mitchell, pp. 197–202.

reason for the difference is that the patterns are derived on the basis of somewhat different interpolation rules.[37]

The amplitude measures obtained by the quarterly analysis, as programmed, are the same as those obtained by the Burns and Mitchell analysis of quarterly data. They are usually, but not always, smaller than the amplitudes obtained by the analysis of comparable monthly data (i.e., where the quarterly series is derived by summing the monthly series). This is because in the monthly analysis the turning point stages (I, V, and IX) are derived from three-month averages centered at the turns. If these turns are in the middle of the quarter, the resulting stage levels are the same as those derived from the programmed version of the quarterly analysis. If the turns are not in the middle of the quarter, the difference in levels is small. A simple illustration will clarify this point (panels A and B of Chart 12) and also the circumstances under which the amplitudes may deviate. Panel C shows why the conversion from the quarterly to the monthly series is done by a step function rather than by straight-line interpolation. Linear interpolation between the quarterly observations, coupled with three-month averaging at turning points, would obviously lead to smaller amplitudes.

It is highly unlikely that the individual leads and lags computed from quarterly data would be the same as those derived from comparable monthly data. This is so for two reasons: The timing of quarterly series is forced into multiples of three months, and the quarterly turn may be located in another quarter than the monthly turn (see Chart 12, panel D). However, there is no reason to assume that shifts of timing induced by the use of quarterly data would occur predominantly in one direction. Thus, the average timing of quarterly data can be expected to be fairly close to that of the corresponding monthly data, particularly if the average covers a long period. Experience shows that this is indeed the case.[38]

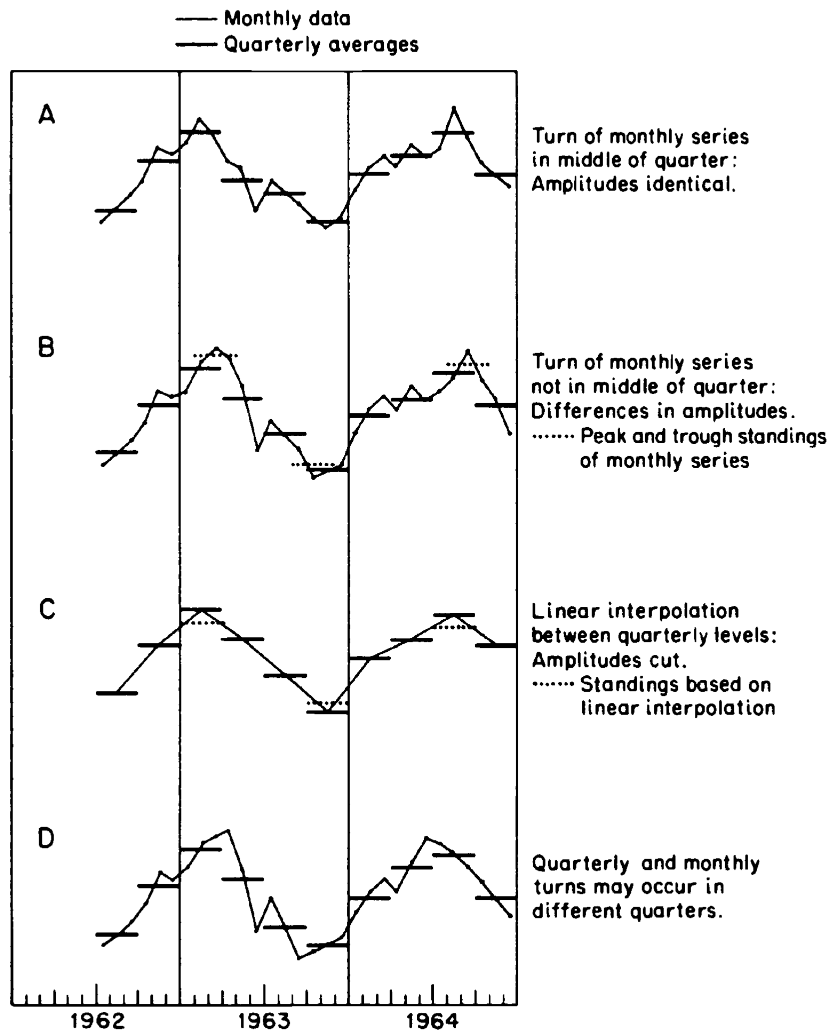
The user of the program for quarterly series should note the following technical points: (1) input cards in the required form (seasonally adjusted data, thrice repeated per quarter) can be obtained as output of the National Bureau's quarterly seasonal adjustment program; (2)

[37] For the interpolation rules used in the quarterly Burns and Mitchell approach, see *ibid.*, p. 199. In the programmed quarterly analysis the rules used are those of the monthly analysis.

[38] For illustrations, see *ibid.*, pp. 226–228.

CHART 12

AMPLITUDES IN PROGRAMMED MONTHLY AND QUARTERLY ANALYSES



a quarterly, rather than a monthly, chronology must be used as reference cycle framework; (3) the median leads and lags for the B-4 analysis (conformity measures after allowance for timing differences) must be stated in multiples of three months to be compatible with the described procedures. In other respects, the technical instructions for monthly series can be applied to the business cycle analysis of quarterly time series after their conversion to monthly form.

Annual Series. As one goes back to economic statistics available before the turn of the century, monthly and quarterly information becomes rare and economic research often has to be based on information in annual form. Even today certain data (such as those presented in governmental budgets, the *Annual Survey of Manufactures,* some demographic surveys, and so forth) are available only in annual form. The question arises to what extent these annual series can be subjected to cyclical analysis.

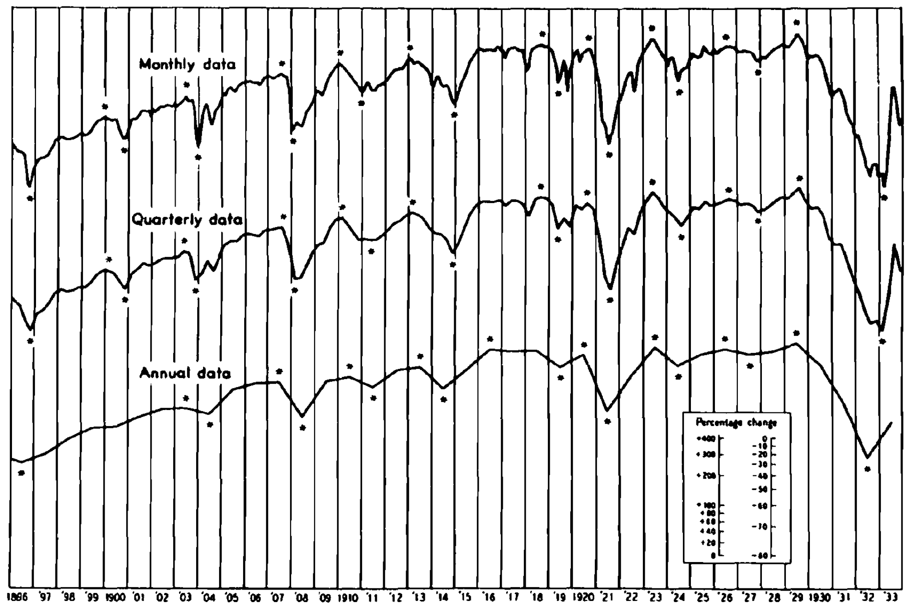
It is clear that annual data present great handicaps for the derivation of useful cyclical measures. Some cycles may entirely disappear; leads and lags of others may be obscured, durations distorted, amplitudes averaged out, and cyclical patterns oversimplified. Nevertheless, as reference to Chart 13 shows, annual data can show cycles which may lend themselves to analysis.[39]

Most of the problems mentioned in the preceding paragraph are caused by the short duration of business cycles relative to the time unit of measurement. The problems are less severe if the major objective of the analysis is merely to measure apparent amplitudes and secular trends, or if the fluctuations to be analyzed are not the Mitchellian business cycles but longer fluctuations, such as the fifteen- to twenty-year swings in construction or long swings in rates of economic growth (Kuznets cycles).

The program treats annual data somewhat differently from monthly data. For instance, the annual observations themselves, rather than three-point averages around the turn, are used as standings at peaks and troughs. Averaging is unnecessary since, in annual data, short-term irregularities are already smoothed out. Another difference is that the program permits substitution of a five-stage pattern for the usual nine-stage pattern. The reason is, of course, that it may be difficult to partition short cycles containing a few annual observations into mean-

[39] *Ibid.,* Chapter 7.

CHART 13
CYCLES IN MONTHLY, QUARTERLY, AND ANNUAL SERIES, PIG IRON PRODUCTION, 1896–1933



Note: The monthly and quarterly figures are seasonally adjusted. Asterisks identify peaks and troughs of specific cycles.

Source: Burns and Mitchell, *op. cit.*, p. 209.

ingful nine-stage patterns. In the five-stage pattern, partitioning is radically simplified. The two intermediate standings between peak and trough standings are based on weighted averages of the observations between peaks and troughs, or—for one-year phases—on the peak and trough observations themselves.[40]

Finally, the analysis of annual data does not provide B-4 tables, that is, tables with conformity measures after adjustment for average timing differences. The reason is that measures of leads and lags based on annual data are too crude to provide a basis for useful adjustments —a fact mentioned earlier in this section. Simple conformity measures, without adjustment for timing differences are, however, available in the cyclical analysis of annual data.

[40] *Ibid.*, p. 199. The substitution of five-stage patterns is optional since the user may wish to obtain nine-stage patterns, particularly in the analysis of long cycles. Incidentally, only a nine- or a five-stage pattern can be opted. If the user wants both, the analysis has to be repeated.

Source: Burns and Mitchell, *op. cit.*, p. 209.

APPENDIX TO CHAPTER 3

A

SAMPLE RUN, BUSINESS CYCLE ANALYSIS, NONAGRICULTURAL EMPLOYMENT

Output Table 3A-1

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

SAMPLE RUN

BASIC TIME SERIES

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1929	32606	32595	32789	32885	32961	33057	33186	33348	33133	32971	32724	32294	394549
1930	31918	31692	31423	31284	31069	30757	30434	30015	29725	29424	29134	28865	365740
1931	28639	28456	28263	28220	28016	27747	27500	27166	26844	26478	26156	26048	329533
1962	54695	55003	55162	55411	55502	55565	55657	55673	55767	55802	55874	55881	665992
1963	55900	56044	56187	56368	56511	56601	56763	56768	56868	57070	57101	57291	679472

DATA FOR 1929-38 RAISED TO THE LEVEL OF DATA FOR 1939-61
BY THE RATIO OF 1.0704

Output Table 3A-2

REFERENCE CYCLE ANALYSIS

CYCLICAL AMPLITUDES TROUGH TO TROUGH ANALYSIS

CYCLE DATES			CYCLE RELATIVES			AMPLITUDES			AMPLITUDES PER MONTH		
TROUGH	PEAK	TROUGH	TROUGH	PEAK	TROUGH	RISE	FALL	TOTAL	RISE	FALL	TOTAL
1933 3	1937 5	1938 6	81.0	112.3	101.1	31.2	-11.2	42.4	.62	-.86	.67
1938 6	1945 2	1945 10	77.4	112.5	103.9	35.1	-8.6	43.7	.44	-1.07	.50
1945 10	1948 11	1949 10	89.1	104.1	99.8	15.0	-4.3	19.3	.41	-.39	.40
1949 10	1953 7	1954 8	90.2	105.1	101.6	15.0	-3.5	18.4	.33	-.27	.32
1954 8	1957 7	1958 4	94.3	102.7	98.7	8.3	-3.9	12.2	.24	-.44	.28
1958 4	1960 5	1961 2	96.0	102.5	100.6	6.5	-1.8	8.3	.26	-.20	.24
TOTAL			528.0	639.1	605.8	111.1	-33.3	144.4	2.29	-3.23	2.41
AVERAGE			88.0	106.5	101.0	18.5	-5.5	24.1	.38	-.54	.40
AVERAGE DEVIATION			5.8	3.9	1.3	9.8	2.9	12.6	.11	.29	.12
WEIGHTED AVERAGE									.41	-.53	.43

Output Table 3A-3

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE IN ORIGINAL UNITS									
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1927 11	1929 8	1933 3	.0	.0	.0	.0	33222.3	31347.4	27680.9	24031.7	23030.7	.0
1933 3	1937 5	1938 6	23030.7	25621.6	27580.0	30308.1	31903.7	32044.3	30813.5	29260.0	28725.0	28411.3
1938 6	1945 2	1945 10	28725.0	30664.5	37473.8	42129.1	41740.0	41498.5	40886.7	39353.5	38559.3	37092.4
1945 10	1948 11	1949 10	38559.3	40908.7	43657.9	44756.9	45077.3	44706.0	43936.5	43544.7	43215.0	43294.0
1949 10	1953 7	1954 8	43215.0	45071.3	47978.4	49480.3	50377.7	50109.3	49371.0	48854.8	48710.7	47921.9
1954 8	1957 7	1958 4	48710.7	49728.4	51826.8	52855.0	53004.3	52834.0	52428.5	51577.0	50975.7	51618.9
1958 4	1960 5	1961 2	50975.7	51318.4	53154.1	53960.5	54414.3	54239.3	54028.5	53654.0	53465.3	53109.9

Output Table 3A-4

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE IN CYCLE RELATIVES									
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1933 3	1937 5	1938 6	81.0	90.2	97.1	106.7	112.3	112.8	108.4	103.0	101.1	28411.3
1938 6	1945 2	1945 10	77.4	82.7	101.0	113.6	112.5	111.9	110.2	106.1	103.9	37092.4
1945 10	1948 11	1949 10	89.1	94.5	100.8	103.4	104.1	103.3	101.5	100.6	99.8	43294.0
1949 10	1953 7	1954 8	90.2	94.0	100.1	103.2	105.1	104.5	103.0	101.9	101.6	47921.9
1954 8	1957 7	1958 4	94.3	96.3	100.4	102.4	102.7	102.3	101.6	99.9	98.7	51618.9
1958 4	1960 5	1961 2	96.0	96.6	100.1	101.6	102.5	102.1	101.7	101.0	100.6	53109.9
TOTAL			528.0	554.2	599.5	630.8	639.1	636.9	626.4	612.4	605.8	
AVERAGE			88.0	92.4	99.9	105.1	106.5	106.1	104.4	102.1	101.0	
AVERAGE DEVIATION			5.8	4.0	1.0	3.3	3.9	4.1	3.3	1.6	1.3	

Output Table 3A-5

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			STAGE TO STAGE CHANGE OF CYCLE RELATIVES, TOTAL CHANGE							
TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 5	1938 6	9.1	6.9	9.6	5.6	.5	-4.3	-5.5	-1.9
1938 6	1945 2	1945 10	5.2	18.4	12.5	-1.0	-.6	-1.7	-4.1	-2.1
1945 10	1948 11	1949 10	5.4	6.4	2.5	.8	-.9	-1.8	-.9	-.8
1949 10	1953 7	1954 8	3.9	6.1	3.1	1.9	-.6	-1.5	-1.1	-.3
1954 8	1957 7	1958 4	2.0	4.1	2.0	.3	-.3	-.8	-1.7	-1.2
1958 4	1960 5	1961 2	.7	3.5	1.5	.9	-.3	-.4	-.7	-.4
TOTAL			26.2	45.3	31.3	8.3	-2.2	-10.5	-14.0	-6.6
AVERAGE			4.4	7.5	5.2	1.4	-.4	-1.7	-2.3	-1.1
AVERAGE DEVIATION			2.2	3.6	3.9	1.6	.3	.9	1.6	.6

Output Table 3A-6

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			STAGE TO STAGE CHANGE OF CYCLE RELATIVES CHANGE PER MONTH							
TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 5	1938 6	1.07	.42	.58	.66	.20	-1.08	-1.37	-.76
1938 6	1945 2	1945 10	.38	.69	.47	-.08	-.43	-.66	-1.66	-1.43
1945 10	1948 11	1949 10	.83	.53	.21	.12	-.43	-.51	-.26	-.38
1949 10	1953 7	1954 8	.48	.42	.21	.23	-.22	-.39	-.27	-.12
1954 8	1957 7	1958 4	.33	.36	.17	.04	-.16	-.31	-.66	-.59
1958 4	1960 5	1961 2	.14	.43	.19	.19	-.17	-.16	-.29	-.18
TOTAL			3.24	2.84	1.84	1.16	-1.21	-3.11	-4.50	-3.44
AVERAGE			.54	.47	.31	.19	-.20	-.52	-.75	-.57
AVERAGE DEVIATION			.27	.09	.14	.17	.16	.23	.51	.35
WEIGHTED AVERAGE			.56	.51	.35	.18	-.18	-.55	-.73	-.53

Output Table 3A-7

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES
IN MONTHS TROUGH TO TROUGH ANALYSIS

CYCLE DATES	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3 1937 5 1938 6	8.5	16.5	16.5	8.5	2.5	4.0	4.0	2.5
1938 6 1945 2 1945 10	13.5	26.5	26.5	13.5	1.5	2.5	2.5	1.5
1945 10 1948 11 1949 10	6.5	12.0	12.0	6.5	2.0	3.5	3.5	2.0
1949 10 1953 7 1954 8	8.0	14.5	14.5	8.0	2.5	4.0	4.0	2.5
1954 8 1957 7 1958 4	6.0	11.5	11.5	6.0	2.0	2.5	2.5	2.0
1958 4 1960 5 1961 2	4.5	8.0	8.0	4.5	2.0	2.5	2.5	2.0
TOTAL	47.0	89.0	89.0	47.0	12.5	19.0	19.0	12.5
AV.	7.8	14.8	14.8	7.8	2.1	3.2	3.2	2.1

Output Table 3A-8

MEASURES OF SECULAR MOVEMENTS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE MONTHLY STANDING			PERCENT CHANGE FROM PRECEDING PHASE		PERCENT CHANGE FROM PRECEDING CYCLE ON BASE OF PRECEDING CYCLE		AVERAGE OF GIVEN AND PRECEDING CYCLE	
TROUGH	PEAK	TROUGH	EXP-N	CONT-N	FULL CYCLE	EXP-N	CONT-N	TOTAL	PER MO	TOTAL	PER MO
1927 11	1929 8	1933 3	.0	27695.8	.0	.0	.0	.0	.00	.0	.00
1933 3	1937 5	1938 6	27822.5	30675.5	28411.3	.5	10.3	.0	.00	.0	.00
1938 6	1945 2	1945 10	36745.5	40561.4	37092.4	19.8	10.4	30.6	.40	26.5	.35
1945 10	1948 11	1949 10	43072.0	44041.0	43294.0	6.2	2.2	16.7	.25	15.4	.23
1949 10	1953 7	1954 8	47479.6	49452.8	47921.9	7.8	4.2	10.7	.20	10.1	.19
1954 8	1957 7	1958 4	51462.3	52227.7	51618.9	4.1	1.5	7.7	.15	7.4	.15
1958 4	1960 5	1961 2	52804.7	53957.9	53109.9	1.1	2.2	2.9	.07	2.8	.07
TOTAL										62.4	.99
AVERAGE										12.5	.20
AVERAGE DEVIATION										6.8	.07
WEIGHTED AVERAGE											.218

Output Table 3A-9

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES	EXPANSION	CONTRACTION	FULL CYCLE
1933 3 1937 5 1938 6	50	13	63
1938 6 1945 2 1945 10	80	8	88
1945 10 1948 11 1949 10	37	11	48
1949 10 1953 7 1954 8	45	13	58
1954 8 1957 7 1958 4	35	9	44
1959 4 1960 5 1961 2	25	9	34
TOTAL	272	63	335
AVERAGE	45.3	10.5	55.8
AVERAGE DEVIATION	13.1	1.8	13.8

Output Table 3A-10

8268 EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

I-IX
2.5
1.5
2.0
2.5
2.0
2.0
12.5
2.1

CYCLE DATES PEAK	TROUGH	PEAK	CYCLICAL AMPLITUDES CYCLE RELATIVES PEAK	TROUGH	PEAK	PEAK TO PEAK ANALYSIS AMPLITUDES FALL	RISE	TOTAL	AMPLITUDES PER MONTH FALL	RISE	TOTAL
1929 8	1933 3	1937 5	119.6	82.9	114.9	-36.7	32.0	-68.7	-.85	.64	-.74
1937 5	1938 6	1945 2	88.9	80.0	116.3	-8.9	36.3	-45.1	-.63	.45	-.48
1945 2	1945 10	1948 11	97.9	90.4	105.7	-7.5	15.3	-22.8	-.93	.41	-.51
1948 11	1949 10	1953 7	96.3	92.3	107.6	-4.0	15.3	-19.3	-.36	.34	-.34
1953 7	1954 8	1957 7	98.9	95.6	104.1	-3.3	8.4	-11.7	-.25	.24	-.24
1957 7	1958 4	1960 5	100.6	96.8	103.3	-3.8	6.5	-10.4	-.43	.26	-.30
TOTAL			602.3	538.1	651.9	-64.2	113.8	-178.0	-3.51	2.35	-2.62
AVERAGE			100.4	89.7	108.7	-10.7	19.0	-29.7	-.58	.39	-.44
AVERAGE DEVIATION			6.5	5.5	4.6	8.7	10.1	18.2	.24	.11	.14
WEIGHTED AVERAGE									-.66	.42	-.48

Output Table 3A-11

RECEDING
OF GIVEN
NG CYCLE
PER MO
.00
.00
.35
.23
.19
.15
.07
.99
.20
.07
.218

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES			PEAK	AVERAGE IN CYCLE RELATIVES II	III	IV	TROUGH	VI	VII	VIII	PEAK	CYCLE
1929 8	1933 3	1937 5	119.6	112.9	99.7	86.5	82.9	92.3	99.3	109.1	114.9	27763.9
1937 5	1938 6	1945 2	88.9	89.3	85.8	81.5	80.0	85.4	104.4	117.3	116.3	35897.0
1945 2	1945 10	1948 11	97.9	97.3	95.9	92.3	90.4	96.0	102.4	105.0	105.7	42625.7
1948 11	1949 10	1953 7	96.3	95.5	93.9	93.0	92.3	96.3	102.5	105.7	107.6	46804.2
1953 7	1954 8	1957 7	98.9	98.4	97.0	95.9	95.6	97.7	101.8	103.8	104.1	50918.1
1957 7	1958 4	1960 5	100.6	100.3	99.6	97.9	96.8	97.5	100.9	102.5	103.3	52651.9
TOTAL			602.3	593.7	571.8	547.3	538.1	565.0	611.3	643.4	651.9	
AVERAGE			100.4	99.0	95.3	91.2	89.7	94.2	101.9	107.2	108.7	
AVERAGE DEVIATION			6.5	5.1	3.6	4.8	5.5	3.6	1.2	4.0	4.6	

Output Table 3A-12

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES PEAK	TROUGH	PEAK	STAGE TO STAGE CHANGE OF CYCLE RELATIVES, TOTAL CHANGE I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	-6.7	-13.2	-13.2	-3.6	9.3	7.1	9.8	5.8
1937 5	1938 6	1945 2	.4	-3.4	-4.3	-1.5	5.4	19.0	13.0	-1.1
1945 2	1945 10	1948 11	-.6	-1.4	-3.6	-1.9	5.5	6.5	2.6	.8
1948 11	1949 10	1953 7	-.8	-1.6	-.8	-.7	4.0	6.2	3.2	1.9
1953 7	1954 8	1957 7	-.5	-1.4	-1.0	-.3	2.0	4.1	2.0	.3
1957 7	1958 4	1960 5	-.3	-.8	-1.6	-1.1	.7	3.5	1.5	.9
TOTAL			-8.6	-21.9	-24.5	-9.1	26.9	46.3	32.1	8.5
AVERAGE			-1.4	-3.7	-4.1	-1.5	4.5	7.7	5.3	1.4
AVERAGE DEVIATION			1.8	3.2	3.1	.8	2.3	3.7	4.0	1.6

Output Table 3A-13

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES			STAGE TO STAGE CHANGE OF CYCLE RELATIVES CHANGE PER MONTH							
PEAK	TROUGH	PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	-.90	-.94	-.94	-.48	1.10	.43	.59	.68
1937 5	1938 6	1945 2	.16	-.86	-1.08	-.60	.40	.71	.49	-.08
1945 2	1945 10	1948 11	-.38	-.57	-1.44	-1.25	.85	.54	.21	.12
1948 11	1949 10	1953 7	-.40	-.47	-.24	-.36	.50	.43	.22	.24
1953 7	1954 8	1957 7	-.22	-.36	-.25	-.12	.34	.36	.17	.05
1957 7	1958 4	1960 5	-.16	-.30	-.65	-.57	.14	.44	.19	.19
TOTAL			-1.89	-3.51	-4.59	-3.38	3.32	2.90	1.88	1.19
AVERAGE			-.31	-.58	-.77	-.56	.55	.48	.31	.20
AVERAGE DEVIATION			.24	.21	.38	.24	.28	.09	.15	.17
WEIGHTED AVERAGE			-.47	-.72	-.80	-.51	.57	.52	.36	.18

Output Table 3A-14

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES

IN MONTHS PEAK TO PEAK ANALYSIS

CYCLE DATES			I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	7.5	14.0	14.0	7.5	8.5	16.5	16.5	8.5
1937 5	1938 6	1945 2	2.5	4.0	4.0	2.5	13.5	26.5	26.5	13.5
1945 2	1945 10	1948 11	1.5	2.5	2.5	1.5	6.5	12.0	12.0	6.5
1948 11	1949 10	1953 7	2.0	3.5	3.5	2.0	8.0	14.5	14.5	8.0
1953 7	1954 8	1957 7	2.5	4.0	4.0	2.5	6.0	11.5	11.5	6.0
1957 7	1958 4	1960 5	2.0	2.5	2.5	2.0	4.5	8.0	8.0	4.5
TOTAL			18.0	30.5	30.5	18.0	47.0	89.0	89.0	47.0
AV.			3.0	5.1	5.1	3.0	7.8	14.8	14.8	7.8

Output Table 3A-15

CYCLE DATES			MEASURES OF SECULAR MOVEMENTS AVERAGE MONTHLY STANDING			PEAK TO PEAK ANALYSIS PERCENT CHANGE FROM PRECEDING PHASE		PERCENT CHANGE FROM PRECEDING CYCLE ON BASE OF PRECEDING CYCLE		AVERAGE OF GIVEN AND PRECEDING CYCLE	
PEAK	TROUGH	PEAK	CONT-N	EXP-N	FULL CYCLE	CONT-N	EXP-N	TOTAL	PER MO	TOTAL	PER MO
1929 8	1933 3	1937 5	27695.8	27822.5	27763.9	.0	.5	.0	.00	.0	.00
1937 5	1938 6	1945 2	30675.5	36745.5	35897.0	10.3	19.8	29.3	.31	25.6	.27
1945 2	1945 10	1948 11	40561.4	43072.0	42625.7	10.4	6.2	18.7	.27	17.1	.25
1948 11	1949 10	1953 7	44041.0	47479.6	46804.2	2.2	7.8	9.8	.19	9.3	.19
1953 7	1954 8	1957 7	49452.8	51462.3	50918.1	4.2	4.1	8.8	.17	8.4	.16
1957 7	1958 4	1960 5	52227.7	52804.7	52651.9	1.5	1.1	3.4	.08	3.3	.08
1960 5	1961 2		53957.9	.0	.0	2.2	.0	.0	.00	.0	.00
TOTAL										63.8	.95
AVERAGE										12.8	.19
AVERAGE DEVIATION										6.9	.06
WEIGHTED AVERAGE											.209

Output Table 3A-16

8268

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			CONTRACTION	EXPANSION	FULL CYCLE
1929 8	1933 3	1937 5	43	50	93
1937 5	1938 6	1945 2	13	80	93
1945 2	1945 10	1948 11	8	37	45
1948 11	1949 10	1953 7	11	45	56
1953 7	1954 8	1957 7	13	35	48
1957 7	1958 4	1960 5	9	25	34
TOTAL			97	272	369
AVERAGE			16.2	45.3	61.5
AVERAGE DEVIATION			8.9	13.1	21.0

Output Table 3A-17

CONFORMITY TO BUSINESS CYCLES

AVERAGE CHANGE PER MONTH, IN CYCLE RELATIVES

ON TROUGH-PEAK-TROUGH BASIS: CYCLE DATES TROUGH	PEAK	TROUGH	DURING EXPANSION	DURING CONT.N	CON.MINUS PRECED. EXP.		ON PEAK-TROUGH-PEAK BASIS: CYCLE DATES PEAK	TROUGH	PEAK	DURING CONT.N	DURING EXPANSION	CON.MINUS SUCCED. EXP.
							1929 8	1933 3	1937 5	-.85	.64	-1.49
1933 3	1937 5	1938 6	.62	-.86	-1.48		1937 5	1938 6	1945 2	-.68	.45	-1.13
1938 6	1945 2	1945 10	.44	-1.07	-1.51		1945 2	1945 10	1948 11	-.93	.41	-1.35
1945 10	1948 11	1949 10	.41	-.39	-.80		1948 11	1949 10	1953 7	-.36	.34	-.70
1949 10	1953 7	1954 8	.33	-.27	-.60		1953 7	1954 8	1957 7	-.25	.24	-.49
1954 8	1957 7	1958 4	.24	-.44	-.67		1957 7	1958 4	1960 5	-.43	.26	-.69
1958 4	1960 5	1961 2	.26	-.20	-.46							
AVERAGE			.38	-.54	-.92					-.58	.39	-.97
AVERAGE DEVIATION			.11	.29	.38					.24	.11	.35
RATIO OF CONFORMITY TO REFERENCE												
EXPANSIONS			100			100					100	
CONTRACTIONS				100		100				100		
FULL CYCLES, TROUGH TO TROUGH					100							
FULL CYCLES,PEAK-TO-PEAK												100
FULL CYCLES,BOTH WAYS						100						

Output Table 3A-18

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

-TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES,TROUGH MONTH, PEAK -1 MONTH

CYCLICAL AMPLITUDES TROUGH TO TROUGH ANALYSIS

CYCLE DATES			CYCLE RELATIVES			AMPLITUDES			AMPLITUDES PER MONTH		
TROUGH	PEAK	TROUGH	TROUGH	PEAK	TROUGH	RISE	FALL	TOTAL	RISE	FALL	TOTAL
1933 3	1937 4	1938 6	81.0	112.0	101.1	30.9	-10.9	41.8	.63	-.78	.66
1938 6	1945 1	1945 10	77.4	112.6	103.9	35.1	-8.6	43.8	.44	-.96	.50
1945 10	1948 10	1949 10	89.1	104.2	99.8	15.1	-4.4	19.5	.42	-.36	.40
1949 10	1953 6	1954 8	90.2	105.2	101.6	15.0	-3.5	18.6	.34	-.25	.32
1954 8	1957 6	1958 4	94.3	102.7	98.7	8.3	-3.9	12.3	.24	-.39	.28
1958 4	1960 4	1961 2	96.0	102.5	100.6	6.5	-1.9	8.4	.27	-.19	.25
TOTAL			528.0	639.1	605.8	111.1	-33.3	144.3	2.35	-2.94	2.41
AVERAGE			88.0	106.5	101.0	18.5	-5.5	24.1	.39	-.49	.40
AVERAGE DEVIATION			5.8	3.8	1.3	9.7	2.8	12.5	.11	.25	.12
WEIGHTED AVERAGE									.42	-.48	.43

Output Table 3A-19

-TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES,TROUGH MONTH, PEAK -1 MONTH

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			EXPANSION	CONTRACTION	FULL CYCLE
1933 3	1937 4	1938 6	49	14	63
1938 6	1945 1	1945 10	79	9	88
1945 10	1948 10	1949 10	36	12	48
1949 10	1953 6	1954 8	44	14	58
1954 8	1957 6	1958 4	34	10	44
1958 4	1960 4	1961 2	24	10	34
TOTAL			266	69	335
AVERAGE			44.3	11.5	55.8
AVERAGE DEVIATION			13.1	1.8	13.8

Output Table 3A-20

8268 EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

REFERENCE CYCLE ANALYSIS

-TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES, TROUGH MONTH, PEAK -1 MONTH

MONTH
TOTAL
.66
.50
.40
.32
.28
.25
2.41
.40
.12
.43

CYCLE DATES			CYCLICAL AMPLITUDES CYCLE RELATIVES			PEAK TO PEAK ANALYSIS AMPLITUDES			AMPLITUDES PER MONTH		
PEAK	TROUGH	PEAK	PEAK	TROUGH	PEAK	FALL	RISE	TOTAL	FALL	RISE	TOTAL
1929 7	1933 3	1937 4	119.5	82.9	114.5	-36.6	31.6	-68.2	-.83	.65	-.73
1937 4	1938 6	1945 1	88.9	80.2	116.7	-8.7	36.4	-45.1	-.62	.46	-.48
1945 1	1945 10	1948 10	98.1	90.6	106.0	-7.5	15.4	-23.0	-.84	.43	-.51
1948 10	1949 10	1953 6	96.6	92.5	107.9	-4.1	15.4	-19.5	-.34	.35	-.35
1953 6	1954 8	1957 6	99.1	95.8	104.2	-3.3	8.4	-11.8	-.24	.25	-.24
1957 6	1958 4	1960 4	100.7	96.9	103.5	-3.8	6.6	-10.4	-.38	.27	-.30
TOTAL			602.9	538.9	652.8	-64.0	113.9	-177.9	-3.24	2.41	-2.62
AVERAGE			100.5	89.8	108.8	-10.7	19.0	-29.7	-.54	.40	-.44
AVERAGE DEVIATION			6.4	5.5	4.5	8.6	10.0	18.0	.22	.11	.14
WEIGHTED AVERAGE									-.62	.43	-.48

Output Table 3A-21

CONFORMITY TO BUSINESS CYCLES

AVERAGE CHANGE PER MONTH, IN CYCLE RELATIVES

CYCLE DATES			ON TROUGH-PEAK-TROUGH BASIS				CYCLE DATES			ON PEAK-TROUGH-PEAK BASIS		
TROUGH	PEAK	TROUGH	DURING EXPANSION	DURING CONT.N	CON.MINUS PRECED. EXP.		PEAK	TROUGH	PEAK	DURING CONT.N	DURING EXPANSION	CON.MINUS SUCCED. EXP.
							1929 7	1933 3	1937 4	-.83	.65	-1.48
1933 3	1937 4	1938 6	.63	-.78	-1.41		1937 4	1938 6	1945 1	-.62	.46	-1.08
1938 6	1945 1	1945 10	.44	-.96	-1.40		1945 1	1945 10	1948 10	-.84	.43	-1.27
1945 10	1948 10	1949 10	.42	-.36	-.78		1948 10	1949 10	1953 6	-.34	.35	-.69
1949 10	1953 6	1954 8	.34	-.25	-.59		1953 6	1954 8	1957 6	-.24	.25	-.48
1954 8	1957 6	1958 4	.24	-.39	-.64		1957 6	1958 4	1960 4	-.38	.27	-.66
1958 4	1960 4	1961 2	.27	-.19	-.46							
AVERAGE			.39	-.49	-.88					-.54	.40	-.94
AVERAGE DEVIATION			.11	.25	.35					.22	.11	.33
RATIO OF CONFORMITY TO REFERENCE												
EXPANSIONS			100			100					100	
CONTRACTIONS				100		100				100		
FULL CYCLES, TROUGH TO TROUGH					100							
FULL CYCLES, PEAK-TO-PEAK												100
FULL CYCLES, BOTH WAYS						100						

Output Table 3A-22

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 826A

THOUSAND PERSONS

SPECIFIC CYCLE ANALYSIS

CYCLICAL AMPLITUDES TROUGH TO TROUGH ANALYSIS

CYCLE DATES			CYCLE RELATIVES			AMPLITUDES			AMPLITUDES PER MONTH		
TROUGH	PEAK	TROUGH	TROUGH	PEAK	TROUGH	RISE	FALL	TOTAL	RISE	FALL	TOTAL
1933 3	1937 7	1938 6	81.0	112.8	101.1	31.8	-11.8	43.6	.61	-1.07	.69
1938 6	1943 11	1945 9	77.5	115.0	105.3	37.5	-9.7	47.2	.58	-.44	.54
1945 9	1948 7	1949 10	90.4	104.2	100.0	13.8	-4.2	18.0	.41	-.28	.37
1949 10	1953 7	1954 8	90.2	105.1	101.6	15.0	-3.5	18.4	.33	-.27	.32
1954 8	1957 3	1958 5	94.4	102.8	98.6	8.5	-4.3	12.8	.27	-.31	.28
1958 5	1960 4	1961 2	95.6	102.4	100.5	6.7	-1.8	8.6	.29	-.18	.26
TOTAL			529.1	642.4	607.2	113.3	-35.2	148.5	2.49	-2.55	2.46
AVERAGE			88.2	107.1	101.2	18.9	-5.9	24.8	.41	-.42	.41
AVERAGE DEVIATION			6.0	4.6	1.5	10.5	3.2	13.8	.12	.22	.14
WEIGHTED AVERAGE									.45	-.41	.44

Output Table 3A-23

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE IN ORIGINAL UNITS									
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
	1929 8	1933 3	.0	.0	.0	.0	33222.3	31347.4	27680.9	24031.7	23030.7	.0
1933 3	1937 7	1938 6	23030.7	25694.7	27692.6	30593.8	32068.3	31925.0	30300.3	29133.7	28725.0	28411.3
1938 6	1943 11	1945 9	28725.0	30361.4	35008.5	41295.1	42642.0	42159.3	41664.4	41108.7	39059.0	37077.1
1945 9	1948 7	1949 10	39059.0	40324.4	43410.5	44443.1	45029.7	45083.0	44334.8	43621.6	43215.0	43194.8
1949 10	1953 7	1954 8	43215.0	45071.3	47978.4	49490.3	50377.7	50109.3	49371.0	48854.8	48710.7	47921.9
1954 8	1957 3	1958 5	48710.7	49615.8	51604.7	52592.7	53079.3	53023.8	52671.8	51411.8	50867.7	51602.2
1958 5	1960 4	1961 2	50867.7	51389.3	53154.1	53875.6	54444.3	54302.7	54085.3	53654.0	53465.3	53177.8

Output Table 3A-24

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE IN CYCLE RELATIVES									
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1933 3	1937 7	1938 6	81.0	90.4	97.5	107.7	112.8	112.4	106.6	102.5	101.1	28411.3
1938 6	1943 11	1945 9	77.5	81.9	94.4	111.4	115.0	113.7	112.4	110.8	105.3	37077.1
1945 9	1948 7	1949 10	90.4	93.3	100.5	102.9	104.2	104.4	102.6	101.0	100.0	43194.8
1949 10	1953 7	1954 8	90.2	94.0	100.1	103.2	105.1	104.5	103.0	101.9	101.6	47921.9
1954 8	1957 3	1958 5	94.4	96.1	100.0	101.9	102.8	102.8	102.1	99.6	98.6	51602.2
1958 5	1960 4	1961 2	95.6	96.6	99.9	101.3	102.4	102.1	101.7	100.9	100.5	53177.8
TOTAL			529.1	552.4	592.4	628.3	642.4	639.8	628.4	616.8	607.2	
AVERAGE			88.2	92.1	98.7	104.7	107.1	106.6	104.7	102.8	101.2	
AVERAGE DEVIATION			6.0	4.0	1.9	3.2	4.6	4.3	3.2	2.7	1.5	

Output Table 3A-25

8268 EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

SPECIFIC CYCLE ANALYSIS

MONTH
TOTAL
.69
.54
.37
.32
.28
.26
2.46
.41
.14
.44

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

STAGE TO STAGE CHANGE OF CYCLE RELATIVES, TOTAL CHANGE

CYCLE DATES TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 7	1938 6	9.4	7.0	10.2	5.2	-.5	-5.7	-4.1	-1.5
1938 6	1943 11	1945 9	4.4	12.5	17.0	3.6	-1.3	-1.3	-1.5	-5.5
1945 9	1948 7	1949 10	2.9	7.2	2.4	1.3	.1	-1.7	-1.7	-.9
1949 10	1953 7	1954 8	3.9	6.1	3.1	1.9	-.6	-1.5	-1.1	-.3
1954 8	1957 3	1958 5	1.8	3.9	1.9	.9	-.1	-.7	-2.4	-1.1
1958 5	1960 4	1961 2	1.0	3.3	1.4	1.1	-.3	-.4	-.8	-.4
TOTAL			23.3	40.0	36.0	14.0	-2.6	-11.4	-11.6	-9.6
AVERAGE			3.9	6.7	6.0	2.3	-.4	-1.9	-1.9	-1.6
AVERAGE DEVIATION			2.0	2.2	5.1	1.4	.3	1.3	.9	1.3

Output Table 3A-26

CYCLE
.0
8411.3
7077.1
3194.8
7921.9
1602.2
3177.8

CYCLE PATTERNS TROUGH TO TROUGH ANALYSIS

STAGE TO STAGE CHANGE OF CYCLE RELATIVES CHANGE PER MONTH

CYCLE DATES TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 7	1938 6	1.04	.41	.60	.57	-.24	-1.63	-1.17	-.73
1938 6	1943 11	1945 9	.40	.58	.79	.33	-.33	-.19	-.21	-1.38
1945 9	1948 7	1949 10	.49	.65	.22	.22	.05	-.38	-.37	-.31
1949 10	1953 7	1954 8	.48	.42	.21	.23	-.22	-.39	-.27	-.12
1954 8	1957 3	1958 5	.32	.38	.19	.17	-.04	-.15	-.54	-.42
1958 5	1960 4	1961 2	.25	.44	.18	.27	-.13	-.14	-.27	-.18
TOTAL			2.98	2.89	2.19	1.80	-.92	-2.89	-2.83	-3.14
AVERAGE			.50	.48	.36	.30	-.15	-.48	-.47	-.52
AVERAGE DEVIATION			.18	.09	.22	.10	.11	.38	.26	.35
WEIGHTED AVERAGE			.54	.49	.44	.32	-.16	-.43	-.44	-.60

Output Table 3A-27

CYCLE
8411.3
7077.1
3194.8
7921.9
1602.2
3177.8

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES

IN MONTHS TROUGH TO TROUGH ANALYSIS

CYCLE DATES			I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 7	1938 6	9.0	17.0	17.0	9.0	2.0	3.5	3.5	2.0
1938 6	1943 11	1945 9	11.0	21.5	21.5	11.0	4.0	7.0	7.0	4.0
1945 9	1948 7	1949 10	6.0	11.0	11.0	6.0	3.0	4.5	4.5	3.0
1949 10	1953 7	1954 8	8.0	14.5	14.5	8.0	2.5	4.0	4.0	2.5
1954 8	1957 3	1958 5	5.5	10.0	10.0	5.5	2.5	4.5	4.5	2.5
1958 5	1960 4	1961 2	4.0	7.5	7.5	4.0	2.0	3.0	3.0	2.0
TOTAL			43.5	81.5	81.5	43.5	16.0	26.5	26.5	16.0
AV.			7.3	13.6	13.6	7.3	2.7	4.4	4.4	2.7

Output Table 3A-28

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS — 826B

THOUSAND PERSONS

SPECIFIC CYCLE ANALYSIS

MEASURES OF SECULAR MOVEMENTS — TROUGH TO TROUGH ANALYSIS

CYCLE DATES			AVERAGE MONTHLY STANDING			PERCENT CHANGE FROM PRECEDING PHASE		PERCENT CHANGE FROM PRECEDING CYCLE ON BASE OF			
								PRECEDING CYCLE		AVERAGE OF GIVEN AND PRECEDING CYCLE	
TROUGH	PEAK	TROUGH	EXP-N	CONT-N	FULL CYCLE	EXP-N	CONT-N	TOTAL	PER MO	TOTAL	PER MO
	1929 8	1933 3	.0	27695.8	.0	.0	.0	.0	.00	.0	.00
1933 3	1937 7	1938 6	27983.6	30433.0	28411.3	1.0	8.8	.0	.00	.0	.00
1938 6	1943 11	1945 9	35548.4	41593.8	37077.1	16.8	17.0	30.5	.41	26.5	.35
1945 9	1948 7	1949 10	42697.5	44322.0	43194.8	2.7	3.8	16.5	.24	15.2	.22
1949 10	1953 7	1954 8	47479.6	49452.8	47921.9	7.1	4.2	10.9	.20	10.4	.19
1954 8	1957 3	1958 5	51259.0	52362.1	51602.2	3.7	2.2	7.7	.15	7.4	.14
1958 5	1960 4	1961 2	52816.3	54009.3	53177.8	.9	2.3	3.1	.08	3.0	.08
TOTAL										62.5	.99
AVERAGE										12.5	.20
AVERAGE DEVIATION										6.7	.07
WEIGHTED AVERAGE											.218

Output Table 3A-29

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			EXPANSION	CONTRACTION	FULL CYCLE
1933 3	1937 7	1938 6	52	11	63
1938 6	1943 11	1945 9	65	22	87
1945 9	1948 7	1949 10	34	15	49
1949 10	1953 7	1954 8	45	13	58
1954 8	1957 3	1958 5	31	14	45
1958 5	1960 4	1961 2	23	10	33
TOTAL			250	85	335
AVERAGE			41.7	14.2	55.8
AVERAGE DEVIATION			12.3	2.9	13.5

Output Table 3A-30

CYCLICAL AMPLITUDES — PEAK TO PEAK ANALYSIS

CYCLE DATES			CYCLE RELATIVES			AMPLITUDES			AMPLITUDES PER MONTH		
PEAK	TROUGH	PEAK	PEAK	TROUGH	PEAK	FALL	RISE	TOTAL	FALL	RISE	TOTAL
1929 8	1933 3	1937 7	119.3	82.7	115.1	-36.6	32.4	-69.0	-.85	.62	-.73
1937 7	1938 6	1943 11	92.1	82.5	122.5	-9.6	40.0	-49.6	-.87	.62	-.65
1943 11	1945 9	1948 7	100.9	92.4	106.5	-8.5	14.1	-22.6	-.38	.42	-.40
1948 7	1949 10	1953 7	96.4	92.5	107.9	-3.9	15.3	-19.2	-.26	.34	-.32
1953 7	1954 8	1957 3	99.3	96.0	104.6	-3.3	8.6	-11.9	-.25	.28	-.27
1957 3	1958 5	1960 4	100.8	96.6	103.4	-4.2	6.8	-11.0	-.30	.29	-.30
TOTAL			608.8	542.7	660.0	-66.1	117.3	-183.4	-2.91	2.57	-2.67
AVERAGE			101.5	90.5	110.0	-11.0	19.5	-30.6	-.49	.43	-.45
AVERAGE DEVIATION			5.9	5.2	5.9	8.5	11.1	19.2	.25	.13	.16
WEIGHTED AVERAGE									-.56	.47	-.50

Output Table 3A-31

8268 EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

SPECIFIC CYCLE ANALYSIS

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES	PEAK	AVERAGE IN CYCLE RELATIVES II	III	IV	TROUGH	VI	VII	VIII	PEAK	CYCLE
1929 8 1933 3 1937 7	119.3	112.5	99.4	86.3	82.7	92.3	99.4	109.8	115.1	27853.3
1937 7 1938 6 1943 11	92.1	91.7	87.0	83.7	82.5	87.2	100.6	118.6	122.5	34808.0
1943 11 1945 9 1948 7	100.9	99.7	98.6	97.3	92.4	95.4	102.7	105.1	106.5	42263.9
1948 7 1949 10 1953 7	96.4	96.5	94.9	93.4	92.5	96.5	102.8	106.0	107.9	46690.2
1953 7 1954 8 1957 3	99.3	98.8	97.3	96.3	96.0	97.8	101.7	103.7	104.6	50725.4
1957 3 1958 5 1960 4	100.8	100.7	100.0	97.7	96.6	97.6	101.0	102.3	103.4	52644.5
TOTAL	608.8	600.0	577.3	554.6	542.7	566.8	608.1	645.5	660.0	
AVERAGE	101.5	100.0	96.2	92.4	90.5	94.5	101.3	107.6	110.0	
AVERAGE DEVIATION	5.9	4.4	3.5	5.0	5.2	3.2	1.0	4.4	5.9	

Output Table 3A-32

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES — STAGE TO STAGE CHANGE OF CYCLE RELATIVES, TOTAL CHANGE

PEAK TROUGH PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8 1933 3 1937 7	-6.7	-13.2	-13.1	-3.6	9.6	7.2	10.4	5.3
1937 7 1938 6 1943 11	-.4	-4.7	-3.3	-1.2	4.7	13.3	18.0	3.9
1943 11 1945 9 1948 7	-1.2	-1.2	-1.3	-4.9	3.0	7.3	2.5	1.4
1948 7 1949 10 1953 7	.1	-1.6	-1.5	-.9	4.0	6.2	3.2	1.9
1953 7 1954 8 1957 3	-.5	-1.4	-1.0	-.3	1.8	3.9	2.0	1.0
1957 3 1958 5 1960 4	-.1	-.7	-2.4	-1.0	1.0	3.4	1.4	1.1
TOTAL	-8.8	-22.7	-22.7	-11.9	24.1	41.3	37.5	14.5
AVERAGE	-1.5	-3.8	-3.8	-2.0	4.0	6.9	6.2	2.4
AVERAGE DEVIATION	1.8	3.4	3.1	1.5	2.1	2.4	5.3	1.4

Output Table 3A-33

CYCLE PATTERNS PEAK TO PEAK ANALYSIS

CYCLE DATES — STAGE TO STAGE CHANGE OF CYCLE RELATIVES CHANGE PER MONTH

PEAK TROUGH PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8 1933 3 1937 7	-.90	-.94	-.94	-.48	1.06	.42	.61	.59
1937 7 1938 6 1943 11	-.20	-1.33	-.96	-.59	.43	.62	.84	.35
1943 11 1945 9 1948 7	-.29	-.17	-.18	-1.22	.50	.66	.22	.23
1948 7 1949 10 1953 7	.04	-.36	-.34	-.30	.50	.43	.22	.24
1953 7 1954 8 1957 3	-.21	-.36	-.26	-.12	.33	.39	.20	.17
1957 3 1958 5 1960 4	-.04	-.14	-.53	-.42	.25	.45	.18	.27
TOTAL	-1.60	-3.30	-3.20	-3.12	3.06	2.97	2.27	1.65
AVERAGE	-.27	-.55	-.53	-.52	.51	.49	.38	.31
AVERAGE DEVIATION	.22	.39	.27	.25	.18	.10	.23	.11
WEIGHTED AVERAGE	-.41	-.60	-.60	-.55	.55	.51	.46	.33

:DING
:IVEN
:YCLE
:R MO
.00
.00
.35
.22
.19
.14
.08
.99
.20
.07
.218

MONTH
TOTAL
-.73
-.65
-.40
-.32
-.27
-.30
-2.67
-.45
.16
-.50

Output Table 3A-34

EMPLOYEES IN NONAGRICULTURAL ESTABLISHMENTS, BLS 8268

THOUSAND PERSONS

SPECIFIC CYCLE ANALYSIS

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES IN MONTHS PEAK TO PEAK ANALYSIS

CYCLE DATES	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8 1933 3 1937 7	7.5	14.0	14.0	7.5	9.0	17.0	17.0	9.0
1937 7 1938 6 1943 11	2.0	3.5	3.5	2.0	11.0	21.5	21.5	11.0
1943 11 1945 9 1948 7	4.0	7.0	7.0	4.0	6.0	11.0	11.0	6.0
1948 7 1949 10 1953 7	3.0	4.5	4.5	3.0	8.0	14.5	14.5	8.0
1953 7 1954 8 1957 3	2.5	4.0	4.0	2.5	5.5	10.0	10.0	5.5
1957 3 1958 5 1960 4	2.5	4.5	4.5	2.5	4.0	7.5	7.5	4.0
TOTAL	21.5	37.5	37.5	21.5	43.5	81.5	81.5	43.5
AV.	3.6	6.3	6.3	3.6	7.3	13.6	13.6	7.3

Output Table 3A-35

CYCLE DATES			MEASURES OF SECULAR MOVEMENTS AVERAGE MONTHLY STANDING			PEAK TO PEAK ANALYSIS PERCENT CHANGE FROM PRECEDING PHASE		PERCENT CHANGE FROM PRECEDING CYCLE ON BASE OF PRECEDING CYCLE		AVERAGE OF GIVEN AND PRECEDING CYCLE	
PEAK	TROUGH	PEAK	CONT-N	EXP-N	FULL CYCLE	CONT-N	EXP-N	TOTAL	PER MO	TOTAL	PER MO
1929 8	1933 3	1937 7	27695.8	27983.6	27853.3	.0	1.0	.0	.00	.0	.00
1937 7	1938 6	1943 11	30433.0	35548.4	34808.0	8.8	16.8	25.0	.29	22.2	.26
1943 11	1945 9	1948 7	41593.8	42697.5	42263.9	17.0	2.7	21.4	.32	19.3	.29
1948 7	1949 10	1953 7	44322.0	47479.6	46690.2	3.8	7.1	10.5	.18	10.0	.17
1953 7	1954 8	1957 3	49452.8	51259.0	50725.4	4.2	3.7	8.6	.17	8.3	.16
1957 3	1958 5	1960 4	52362.1	52816.3	52644.5	2.2	.9	3.8	.09	3.7	.09
1960 4	1961 2		54009.3	.0	.0	2.3	.0	.0	.00	.0	.00
TOTAL										63.5	.98
AVERAGE										12.7	.20
AVERAGE DEVIATION										6.5	.07
WEIGHTED AVERAGE											.210

Output Table 3A-36

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES	CONTRACTION	EXPANSION	FULL CYCLE
1929 8 1933 3 1937 7	43	52	95
1937 7 1938 6 1943 11	11	65	76
1943 11 1945 9 1948 7	22	34	56
1948 7 1949 10 1953 7	15	45	60
1953 7 1954 8 1957 3	13	31	44
1957 3 1958 5 1960 4	14	23	37
TOTAL	118	250	368
AVERAGE	19.7	41.7	61.3
AVERAGE DEVIATION	8.6	12.3	16.1

APPENDIX TO CHAPTER 3

B

SAMPLE RUN, BUSINESS CYCLE ANALYSIS, UNEMPLOYMENT RATE

Output Table 38-1

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

SAMPLE RUN

BUSINESS CYCLE ANALYSIS, ABSOLUTE CHANGES

BASIC TIME SERIES

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1929				76	181	227	87	4	100	254	208	229	1366
1930	243	343	399	396	373	415	552	730	857	991	1185	1308	7792
1931	1229	1283	1295	1313	1353	1432	1522	1651	1741	1842	1974	2100	18735
1962	580	553	553	561	551	549	543	574	564	543	583	549	6703
1963	573	595	565	567	589	566	561	554	554	560	591	549	6824

Output Table 38-2

REFERENCE CYCLE ANALYSIS

CYCLICAL AMPLITUDES POSITIVE PLAN

CYCLE DATES			CYCLE DEVIATIONS			AMPLITUDES			AMPLITUDES PER MONTH		
TROUGH	PEAK	TROUGH	TROUGH	PEAK	TROUGH	RISE	FALL	TOTAL	RISE	FALL	TOTAL
1933 3	1937 5	1938 6	862.1	-615.2	291.5	-1477.3	906.7	-2384.0	-29.55	69.74	-37.84
1938 6	1945 2	1945 10	1276.8	-779.6	-521.6	-2056.3	258.0	-2314.3	-25.70	32.25	-26.30
1945 10	1948 11	1949 10	-61.2	-41.2	262.2	20.0	303.3	-283.3	.54	27.58	-5.90
1949 10	1953 7	1954 8	295.7	-141.0	189.3	-436.7	330.3	-767.0	-9.70	25.41	-13.22
1954 8	1957 7	1958 4	131.9	-38.5	254.5	-170.3	293.0	-463.3	-4.87	32.55	-10.53
1958 4	1960 5	1961 2	119.6	-69.4	83.3	-189.0	152.7	-341.7	-7.56	16.96	-10.05
TOTAL			2624.9	-1684.8	559.2	-4309.7	2244.0	-6553.7	-76.84	204.50	-103.84
AVERAGE			437.5	-280.8	93.2	-718.3	374.0	-1092.3	-12.81	34.08	-17.31
AVERAGE DEVIATION			421.3	277.7	208.2	699.0	177.6	837.9	9.88	11.89	9.84
WEIGHTED AVERAGE									-15.84	35.62	-19.56

Output Table 38-3

CYCLE PATTERNS POSITIVE PLAN

STANDINGS, IN ORIGINAL UNITS

CYCLE DATES												
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1927 11	1929 8	1933 3	.0	.0	.0	.0	63.7	435.0	1516.3	2516.9	2745.0	.0
1933 3	1937 5	1938 6	2745.0	2275.6	2045.0	1502.1	1267.7	1243.8	1613.5	2063.8	2174.3	1882.9
1938 6	1945 2	1945 10	2174.3	1801.8	925.6	174.2	118.0	115.0	148.7	270.0	376.0	897.6
1945 10	1948 11	1949 10	376.0	430.6	405.2	371.4	396.0	445.7	555.3	655.7	699.3	437.2
1949 10	1953 7	1954 8	699.3	533.3	325.5	291.2	262.7	303.8	509.0	571.0	593.0	403.7
1954 8	1957 7	1958 4	593.0	490.1	423.3	408.7	422.7	450.7	498.0	629.3	715.7	461.1
1958 4	1960 5	1961 2	715.7	699.0	542.4	540.0	526.7	554.0	586.5	650.0	679.3	596.0

Output Table 3B-4

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

CYCLE PATTERNS POSITIVE PLAN
STANDINGS, DEVIATIONS FROM CYCLE BASE

CYCLE DATES												
TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1933 3	1937 5	1938 6	862.1				-615.2				'291.5·	1882.9
				392.8	162.1	. -380.8		-639.1	-269.4	180.9		
1938 6	1945 2	1945 10	1276.8				-779.6				-521.6	897.6
				904.3	28.0	-723.4		-782.6	-748.9	-627.6		
1945 10	1948 11	1949 10	-61.2				-41.2				262.2	437.2
				-6.6	-32.0	-65.7		8.5	118.1	218.5		
1949 10	1953 7	1954 8	295.7				-141.0				189.3	403.7
				129.7	-78.2	-112.5		-99.9	105.3	167.3		
1954 8	1957 7	1958 4	131.9				-38.5				254.5	461.1
				29.0	-37.9	-52.4		-10.5	36.9	168.2		
1958 4	1960 5	1961 2	119.6				-69.4				83.3	596.0
				103.0	-53.7	-56.0		-42.0	-9.5	54.0		
TOTAL			2624.9	1552.1	-11.6	-1390.9	-1684.8	-1565.6	-767.5	161.3	559.2	
AVERAGE			437.5	258.7	-1.9	-231.8	-280.8	-260.9	-127.9	26.9	93.2	
AVERAGE DEVIATION			421.3	259.9	64.7	213.5	277.7	299.9	254.1	218.2	208.2	

Output Table 3B-5

CYCLE PATTERNS POSITIVE PLAN
STAGE TO STAGE CHANGE OF STANDINGS, TOTAL CHANGE

CYCLE DATES										
TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 5	1938 6	-469.4	-230.6	-542.9	-234.4	-23.9	369.8	450.3	110.6
1938 6	1945 2	1945 10	-372.5	-876.3	-751.4	-56.2	-3.0	33.7	121.3	106.0
1945 10	1948 11	1949 10	54.6	-25.4	-33.8	24.6	49.7	109.6	100.4	43.7
1949 10	1953 7	1954 8	-166.0	-207.8	-34.3	-28.5	41.1	205.3	62.0	22.0
1954 8	1957 7	1958 4	-102.9	-66.8	-14.5	13.9	28.0	47.3	131.3	86.3
1958 4	1960 5	1961 2	-16.7	-156.6	-2.4	-13.3	27.3	32.5	63.5	29.3
TOTAL			-1072.9	-1563.6	-1379.3	-293.9	119.2	798.1	928.8	397.9
AVERAGE			-178.8	-260.6	-229.9	-49.0	19.9	133.0	154.8	66.3
AVERAGE DEVIATION			161.4	205.2	278.2	64.2	22.2	103.0	98.5	34.6

Output Table 38-6

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

CYCLE PATTERNS POSITIVE PLAN

CYCLE DATES			STAGE TO STAGE CHANGE OF STANDINGS, CHANGE PER MONTH							
TROUGH	PEAK	TROUGH	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 5	1938 6	-55.2	-14.0	-32.9	-27.6	-9.6	92.4	112.6	44.2
1938 6	1945 2	1945 10	-27.6	-33.1	-28.4	-7.1	-.0	13.5	48.5	70.7
1945 10	1948 11	1949 10	8.4	-2.7	.0	2.5	24.8	31.3	28.7	21.8
1949 10	1953 7	1954 8	-20.8	-14.3	-2.8	.0	16.4	51.3	15.5	8.8
1954 8	1957 7	1958 4	-17.1	.0	-1.7	1.3	14.0	18.9	52.5	43.2
1958 4	1960 5	1961 2	.0	-19.6	.0	-1.3	13.7	13.0	25.4	14.7
TOTAL			-112.3	-83.6	-65.7	-32.2	59.4	220.4	283.2	203.4
AVERAGE			-18.7	-13.9	-11.0	-5.4	9.9	36.7	47.2	33.9
AVERAGE DEVIATION			15.8	8.4	13.1	8.0	9.8	23.4	24.0	18.8
WEIGHTED AVERAGE			-22.8	-17.6	-15.5	-6.3	9.5	42.0	48.9	31.8

Output Table 38-7

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES

IN MONTHS POSITIVE PLAN

CYCLE DATES			I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 3	1937 5	1938 6	8.5	16.5	16.5	8.5	2.5	4.0	4.0	2.5
1938 6	1945 2	1945 10	13.5	26.5	26.5	13.5	1.5	2.5	2.5	1.5
1945 10	1948 11	1949 10	6.5	12.0	12.0	6.5	2.0	3.5	3.5	2.0
1949 10	1953 7	1954 8	8.0	14.5	14.5	8.0	2.5	4.0	4.0	2.5
1954 8	1957 7	1958 4	6.0	11.5	11.5	6.0	2.0	2.5	2.5	2.0
1958 4	1960 5	1961 2	4.5	8.0	8.0	4.5	2.0	2.5	2.5	2.0
TOTAL			47.0	89.0	89.0	47.0	12.5	19.0	19.0	12.5
AV.			7.8	14.8	14.8	7.8	2.1	3.2	3.2	2.1

Output Table 3B-8

8292 UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

MEASURES OF SECULAR MOVEMENTS POSITIVE PLAN

CYCLE DATES			AVERAGE MONTHLY STANDING			ABSOLUTE CHANGE FROM PRECEDING PHASE		ABSOLUTE CHANGE FROM PRECEDING CYCLE	
TROUGH	PEAK	TROUGH	EXP-N	CONT-N	CYCLE	EXP-N	CONT-N	TOTAL	PER MONTH
1927 11	1929 8	1933 3	.0	1487.2	.0	.0	.0	.0	.00
1933 3	1937 5	1938 6	1944.4	1646.2	1882.9	457.2	-298.2	.0	.00
1938 6	1945 2	1945 10	969.1-	182.4	897.6	-677.2	-786.6	-985.3	-13.05
1945 10	1948 11	1949 10	401.9	555.9	437.2	219.4	154.0	-460.4	-6.77
1949 10	1953 7	1954 8	387.7	459.0	403.7	-168.2	71.3	-33.5	-.63
1954 8	1957 7	1958 4	442.1	535.0	461.1	-16.9	92.9	57.5	1.13
1958 4	1960 5	1961 2	595.2	598.4	596.0	60.2	3.3	134.9	3.46
TOTAL					4678.4			-1286.8	-15.87
AVERAGE					779.7			-257.4	-3.17
AVERAGE DEVIATION					407.0			372.4	5.39
WEIGHTED AVERAGE									-4.492

Output Table 3B-9

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			EXPANSION	CONTRACTION	FULL CYCLE
1933 3	1937 5	1938 6	50	13	63
1938 6	1945 2	1945 10	80	8	88
1945 10	1948 11	1949 10	37	11	48
1949 10	1953 7	1954 8	45	13	58
1954 8	1957 7	1958 4	35	9	44
1958 4	1960 5	1961 2	25	9	34
TOTAL			272	63	335
AVERAGE			45.3	10.5	55.8
AVERAGE DEVIATION			13.1	1.8	13.8

Output Table 38-10

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100 ·

REFERENCE CYCLE ANALYSIS

CYCLICAL AMPLITUDES INVERTED PLAN

CYCLE DATES						CYCLE DEVIATIONS			AMPLITUDES			AMPLITUDES PER MONTH		
PEAK		TROUGH		PEAK		PEAK	TROUGH	PEAK	FALL	RISE	TOTAL	FALL	RISE	TOTAL
1929	8	1933	3	1937	5	-1669.4	1012.0	-465.4	2681.3	-1477.3	4158.7	62.36	-29.55	44.72
1937	5	1938	6	1945	2	203.9	1110.6	-945.7	906.7	-2056.3	2963.0	69.74	-25.70	31.86
1945	2	1945	10	1948	11	-244.9	13.1	33.1	258.0	20.0	238.0	32.25	.54	5.29
1948	11	1949	10	1953	7	-24.7	278.6	-158.1	303.3	-436.7	740.0	27.58	-9.70	13.21
1953	7	1954	8	1957	7	-184.0	146.3	-24.0	330.3	-170.3	500.7	25.41	-4.87	10.43
1957	7	1958	4	1960	5	-156.6	136.4	-52.6	293.0	-189.0	482.0	32.55	-7.56	14.18
TOTAL						-2075.6	2697.1	-1612.6	4772.7	-4309.7	9082.4	249.89	-76.84	119.68
AVERAGE						-345.9	449.5	-268.8	795.4	-718.3	1513.7	41.65	-12.81	19.95
AVERAGE DEVIATION						441.1	407.9	291.2	665.7	699.0	1364.7	16.27	9.88	12.23
WEIGHTED AVERAGE												49.20	-15.84	24.61

Output Table 38-11

CYCLE PATTERNS INVERTED PLAN
STANDINGS, DEVIATIONS FROM CYCLE BASE

CYCLE DATES						PEAK	II	III	IV	TROUGH	VI	VII	VIII	PEAK	CYCLE
1929	8	1933	3	1937	5	-1669.4				1012.0				-465.4	1733.0
							-1298.0	-216.7	783.8		542.6	312.0	-231.0		
1937	5	1938	6	1945	2	203.9				1110.6				-945.7	1063.7
							180.0	549.8	1000.0		738.1	-138.2	-889.6		
1945	2	1945	10	1948	11	-244.9				13.1				33.1	362.9
							-247.9	-214.2	-92.9		67.7	42.3	8.6		
1948	11	1949	10	1953	7	-24.7				278.6				-158.1	420.7
							24.9	134.5	234.9		112.6	-95.2	-129.5		
1953	7	1954	8	1957	7	-184.0				146.3				-24.0	446.7
							-143.0	62.3	124.3		43.4	-23.5	-38.0		
1957	7	1958	4	1960	5	-156.6				136.4				-52.6	579.3
							-128.6	-81.3	50.1		119.8	-36.9	-39.3		
TOTAL						-2075.6	-1612.4	234.4	2100.3	2697.1	1624.2	60.6	-1318.7	-1612.6	
AVERAGE						-345.9	-268.7	39.1	350.1	449.5	270.7	10.1	-219.8	-268.8	
AVERAGE DEVIATION						441.1	343.1	209.8	361.3	407.9	246.4	111.4	227.0	291.2	

Output Table 3B-12

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

CYCLE PATTERNS INVERTED PLAN

CYCLE DATES			STAGE TO STAGE CHANGE OF STANDINGS, TOTAL CHANGE							
PEAK	TROUGH	PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	371.3	1081.3	1000.6	228.1	-469.4	-230.6	-542.9	-234.4
1937 5	1938 6	1945 2	-23.9	369.8	450.3	110.6	-372.5	-876.3	-751.4	-56.2
1945 2	1945 10	1948 11	-3.0	33.7	121.3	106.0	54.6	-25.4	-33.8	24.6
1948 11	1949 10	1953 7	49.7	109.6	100.4	43.7	-166.0	-207.8	-34.3	-28.5
1953 7	1954 8	1957 7	41.1	205.3	62.0	22.0	-102.9	-66.8	-14.5	13.9
1957 7	1958 4	1960 5	28.0	47.3	131.3	86.3	-16.7	-156.6	-2.4	-13.3
TOTAL			463.2	1846.9	1865.9	596.7	-1072.9	-1563.6	-1379.3	-293.9
AVERAGE			77.2	307.8	311.0	99.5	-178.8	-260.6	-229.9	-49.0
AVERAGE DEVIATION			98.0	278.5	276.3	48.8	161.4	205.2	278.2	64.2

Output Table 3B-13

CYCLE PATTERNS INVERTED PLAN

CYCLE DATES			STAGE TO STAGE CHANGE OF STANDINGS, CHANGE PER MONTH							
PEAK	TROUGH	PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	49.5	77.2	71.5	30.4	-55.2	-14.0	-32.9	-27.6
1937 5	1938 6	1945 2	-9.6	92.4	112.6	44.2	-27.6	-33.1	-28.4	-7.1
1945 2	1945 10	1948 11	-.0	13.5	48.5	70.7	8.4	-2.7	.0	2.5
1948 11	1949 10	1953 7	24.8	31.3	28.7	21.8	-20.8	-14.3	-2.8	.0
1953 7	1954 8	1957 7	16.4	51.3	15.5	8.8	-17.1	.0	-1.7	1.3
1957 7	1958 4	1960 5	14.0	18.9	52.5	43.2	.0	-19.6	.0	-1.3
TOTAL			95.2	284.7	329.3	219.1	-112.3	-83.6	-65.7	-32.2
AVERAGE			15.9	47.4	54.9	36.5	-18.7	-13.9	-11.0	-5.4
AVERAGE DEVIATION			14.4	26.2	24.8	16.2	15.8	8.4	13.1	8.0
WEIGHTED AVERAGE			25.7	60.5	61.2	33.1	-22.8	-17.6	-15.5	-6.3

Output Table 3B-14

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES

IN MONTHS INVERTED PLAN

CYCLE DATES			I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1929 8	1933 3	1937 5	7.5	14.0	14.0	7.5	8.5	16.5	16.5	8.5
1937 5	1938 6	1945 2	2.5	4.0	4.0	2.5	13.5	26.5	26.5	13.5
1945 2	1945 10	1948 11	1.5	2.5	2.5	1.5	6.5	12.0	12.0	6.5
1948 11	1949 10	1953 7	2.0	3.5	3.5	2.0	8.0	14.5	14.5	8.0
1953 7	1954 8	1957 7	2.5	4.0	4.0	2.5	6.0	11.5	11.5	6.0
1957 7	1958 4	1960 5	2.0	2.5	2.5	2.0	4.5	8.0	8.0	4.5
TOTAL			18.0	30.5	30.5	18.0	47.0	89.0	89.0	47.0
AV.			3.0	5.1	5.1	3.0	7.8	14.8	14.8	7.8

Output Table 3B-15

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 829₂

PER CENT X 100

REFERENCE CYCLE ANALYSIS

MEASURES OF SECULAR MOVEMENTS INVERTED PLAN

CYCLE DATES			AVERAGE MONTHLY STANDING			ABSOLUTE CHANGE FROM PRECEDING PHASE		ABSOLUTE CHANGE FROM PRECEDING CYCLE	
PEAK	TROUGH	PEAK	CONT-N	EXP-N	CYCLE	CONT-N	EXP-N	TOTAL	PER MONTH
1929 8	1933 3	1937 5	1487.2	1944.4	1733.0	.0	457.2	.0	.00
1937 5	1938 6	1945 2	1646.2	969.1	1063.7	-298.2	-677.2	-669.3	-7.20
1945 2	1945 10	1948 11	182.4	401.9	362.9	-786.6	219.4	-700.9	-10.16
1948 11	1949 10	1953 7	555.9	387.7	420.7	154.0	-168.2	57.9	1.15
1953 7	1954 8	1957 7	459.0	442.1	446.7	71.3	-16.9	26.0	.50
1957 7	1958 4	1960 5	535.0	595.2	579.3	92.9	60.2	132.5	3.23
1960 5	1961 2		598.4	.0	.0	3.3	.0	.0	.00
TOTAL					4606.3			-1153.8	-12.48
AVERAGE					767.7			-230.8	-2.50
AVERAGE DEVIATION					420.4			363.5	4.95
WEIGHTED AVERAGE									-3.777

Output Table 3B-16

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			CONTRACTION	EXPANSION	FULL CYCLE
1929 8	1933 3	1937 5	43	50	93
1937 5	1938 6	1945 2	13	80	93
1945 2	1945 10	1948 11	8	37	45
1948 11	1949 10	1953 7	11	45	56
1953 7	1954 8	1957 7	13	35	48
1957 7	1958 4	1960 5	9	25	34
TOTAL			97	272	369
AVERAGE			16.2	45.3	61.5
AVERAGE DEVIATION			8.9	13.1	21.0

:CEDING PER MONTH
.00
-7.20
·10.16
1.15
.50
3.23
.00
·12.48
-2.50
4.95
·3.777

Output Table 3B-17

8292 UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

CONFORMITY TO BUSINESS CYCLES

AVERAGE CHANGE PER MONTH

CYCLE ON DATES TROUGH	PEAK	TROUGH	TROUGH-PEAK-TROUGH BASIS DURING EXPANSION	DURING CONT.N	CON. MINUS PRECED. EXP.	CYCLE ON DATES PEAK	TROUGH	PEAK	PEAK-TROUGH-PEAK BASIS DURING CONT.N	DURING EXPANSION	CON. MINUS SUCCED. EXP.
						1929 8	1933 3	1937 5	62.36	-29.55	91.90
1933 3	1937 5	1938 6	-29.55	69.74	99.29	1937 5	1938 6	1945 2	69.74	-25.70	95.45
1938 6	1945 2	1945 10	-25.70	32.25	57.95	1945 2	1945 10	1948 11	32.25	.54	31.71
1945 10	1948 11	1949 10	.54	27.58	27.04	1948 11	1949 10	1953 7	27.58	-9.70	37.28
1949 10	1953 7	1954 8	-9.70	25.41	35.11	1953 7	1954 8	1957 7	25.41	-4.87	30.28
1954 8	1957 7	1958 4	-4.87	32.55	37.42	1957 7	1958 4	1960 5	32.55	-7.56	40.11
1958 4	1960 5	1961 2	-7.56	16.96	24.52						
AVERAGE			-12.81	34.08	46.89				41.65	-12.81	54.45
AVERAGE DEVIATION			9.88	11.89	21.15				16.27	9.88	26.15
RATIO OF CONFORMITY TO REFERENCE											
EXPANSIONS			-.667							-.667	
CONTRACTIONS				-1.000					-1.000		
FULL CYCLES, TROUGH-TO-TROUGH					-1.000						
FULL CYCLES, PEAK-TO-PEAK											-1.000
FULL CYCLES, BOTH WAYS						-1.000					

FOR 8-4 ANALYSIS

FIRST MONTH ESTIMATED AT 129

Output Table 3B-18

TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES, TROUGH 2 MONTHS, PEAK -4 MONTHS

CYCLICAL AMPLITUDES POSITIVE PLAN

CYCLE DATES TROUGH	PEAK	TROUGH	CYCLE DEVIATIONS TROUGH	PEAK	TROUGH	AMPLITUDES RISE	FALL	TOTAL	AMPLITUDES PER MONTH RISE	FALL	TOTAL
1933 5	1937 1	1938 8	928.1	-510.3	240.1	-1438.3	750.3	-2188.7	-32.69	39.49	-34.74
1938 8	1944 10	1945 12	1244.8	-744.2	-439.6	-1989.0	304.7	-2293.7	-26.88	21.76	-26.06
1945 12	1948 7	1949 12	-31.9	-80.2	221.4	-48.3	301.7	-350.0	-1.56	17.75	-7.29
1949 12	1953 3	1954 10	271.1	-132.6	173.1	-403.7	305.7	-709.3	-10.35	16.09	-12.23
1954 10	1957 3	1958 6	105.9	-67.4	272.9	-173.3	340.3	-513.7	-5.98	22.69	-11.67
1958 6	1960 1	1961 4	147.2	-77.8	103.8	-225.0	181.7	-406.7	-11.84	12.11	-11.96
TOTAL			2665.2	-1612.5	571.8	-4277.7	2184.3	-6462.0	-89.29	129.88	-103.96
AVERAGE			444.2	-268.8	95.3	-712.9	364.1	-1077.0	-14.88	21.65	-17.33
AVERAGE DEVIATION			428.2	239.0	178.3	667.1	128.8	776.1	9.93	6.33	8.72
WEIGHTED AVERAGE									-18.13	22.06	-19.29

Output Table 38-19

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES,TROUGH 2 MONTHS, PEAK -4 MONTHS

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			EXPANSION	CONTRACTION	FULL CYCLE
1933 5	1937 1	1938 8	44	19	63
1938 8	1944 10	1945 12	74	14	88
1945 12	1948 7	1949 12	31	17	48
1949 12	1953 3	1954 10	39	19	58
1954 10	1957 3	1958 6	29	15	44
1958 6	1960 1	1961 4	19	15	34
TOTAL			236	99	335
AVERAGE			39.3	16.5	55.8
AVERAGE DEVIATION			13.1	1.8	13.8

Output Table 38-20

CYCLICAL AMPLITUDES INVERTED PLAN

CYCLE DATES			CYCLE DEVIATIONS			AMPLITUDES			AMPLITUDES PER MONTH		
PEAK	TROUGH	PEAK	PEAK	TROUGH	PEAK	FALL	RISE	TOTAL	FALL	RISE	TOTAL
1929 4	1933 5	1937 1	-1554.2	1107.4	-330.9	2661.7	-1438.3	4100.0	54.32	-32.69	44.09
1937 1	1938 8	1944 10	237.2	987.5	-1001.5	750.3	-1989.0	2739.3	39.49	-26.88	29.46
1944 10	1945 12	1948 7	-225.9	78.7	30.4	304.7	-48.3	353.0	21.76	-1.56	7.84
1948 7	1949 12	1953 3	-59.0	242.7	-161.0	301.7	-403.7	705.3	17.75	-10.35	12.59
1953 3	1954 10	1957 3	-167.1	138.5	-34.8	305.7	-173.3	479.0	16.09	-5.98	9.98
1957 3	1958 6	1960 1	-166.3	174.0	-51.0	340.3	-225.0	565.3	22.69	-11.84	16.63
TOTAL			-1935.4	2729.0	-1548.7	4664.4	-4277.7	8942.0	172.09	-89.29	120.58
AVERAGE			-322.6	454.8	-258.1	777.4	-712.9	1490.3	28.68	-14.88	20.10
AVERAGE DEVIATION			410.6	395.1	272.0	628.1	667.1	1286.2	12.15	9.93	11.12
WEIGHTED AVERAGE									35.07	-18.13	24.23

Output Table 3B-21

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

REFERENCE CYCLE ANALYSIS

TIMING DIFFS RECOGNIZED BY SHIFTING REF. DATES, TROUGH 2 MONTHS, PEAK -4 MONTHS

CONFORMITY TO BUSINESS CYCLES

AVERAGE CHANGE PER MONTH

CYCLE ON DATES: TROUGH	PEAK	TROUGH	TROUGH-PEAK-TROUGH BASIS: DURING EXPANSION	DURING CONT.N	CON. MINUS PRECED. EXP.	CYCLE ON DATES: PEAK	TROUGH	PEAK	PEAK-TROUGH-PEAK BASIS: DURING CONT.N	DURING EXPANSION	CON. MINUS SUCCED. EXP.
						1929 4	1933 5	1937 1	54.32	-32.69	87.01
1933 5	1937 1	1938 8	-32.69	39.49	72.18	1937 1	1938 8	1944 10	39.49	-26.88	66.37
1938 8	1944 10	1945 12	-26.88	21.76	48.64	1944 10	1945 12	1948 7	21.76	-1.56	23.32
1945 12	1948 7	1949 12	-1.56	17.75	19.30	1948 7	1949 12	1953 3	17.75	-10.35	28.09
1949 12	1953 3	1954 10	-10.35	16.09	26.44	1953 3	1954 10	1957 3	16.09	-5.98	22.06
1954 10	1957 3	1958 6	-5.98	22.69	28.67	1957 3	1958 6	1960 1	22.69	-11.84	34.53
1958 6	1960 1	1961 4	-11.84	12.11	23.95						
AVERAGE			-14.88	21.65	36.53				28.68	-14.88	43.56
AVERAGE DEVIATION			9.93	6.33	15.92				12.15	9.93	22.08
RATIO OF CONFORMITY TO REFERENCE											
EXPANSIONS			-1.000							-1.000	
CONTRACTIONS				-1.000					-1.000		
FULL CYCLES, TROUGH-TO-TROUGH					-1.000						
FULL CYCLES, PEAK-TO-PEAK											-1.000
FULL CYCLES, BOTH WAYS						-1.000					

Output Table 3B-22

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

CYCLICAL AMPLITUDES POSITIVE PLAN

CYCLE DATES: TROUGH	PEAK	TROUGH	CYCLE DEVIATIONS: TROUGH	PEAK	TROUGH	AMPLITUDES: RISE	FALL	TOTAL	AMPLITUDES PER MONTH: RISE	FALL	TOTAL
1933 5	1937 7	1938 6	937.6	-620.7	321.6	-1558.3	942.3	-2500.7	-31.17	85.67	-40.99
1938 6	1944 10	1946 5	1311.4	-749.6	-416.6	-2061.0	333.0	-2394.0	-27.12	17.53	-25.20
1946 5	1948 1	1949 10	7.7	-69.0	260.7	-76.7	329.7	-406.3	-3.83	15.70	-9.91
1949 10	1953 5	1954 9	292.2	-140.8	188.2	-433.0	329.0	-762.0	-10.07	20.56	-12.92
1954 9	1957 3	1958 7	119.3	-76.1	264.6	-195.3	340.7	-536.0	-6.51	21.29	-11.65
1958 7	1959 6	1961 5	148.6	-82.4	106.6	-231.0	189.0	-420.0	-21.00	8.22	-12.35
TOTAL			2816.8	-1738.6	725.1	-4555.3	2463.7	-7019.0	-99.70	168.96	-113.02
AVERAGE			469.5	-289.8	120.9	-759.2	410.6	-1169.8	-16.62	28.16	-18.84
AVERAGE DEVIATION			436.7	263.6	183.9	700.3	177.2	851.7	9.81	19.17	9.51
WEIGHTED AVERAGE									-19.81	23.24	-20.89

Output Table 3B-23

UNEMPLOYED RATE. NICB. CENSUS (INVERTED) 8292

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

CYCLE PATTERNS POSITIVE PLAN

STANDINGS. IN ORIGINAL UNITS

CYCLE DATES TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1933 5	1937 7	1938 6	2790.3	2211.7	1969.2	1451.7	1232.0	1281.7	1769.8	2096.3	2174.3	1852.7
1938 6	1944 10	1946 5	2174.3	1809.2	1023.0	206.0	113.3	114.2	225.3	430.2	446.3	863.0
1946 5	1949 1	1949 10	446.3	425.5	402.3	389.0	369.7	376.0	413.8	598.3	699.3	438.7
1949 10	1953 5	1954 9	699.3	544.7	330.9	295.9	266.3	277.2	478.0	577.0	595.3	407.1
1954 9	1957 3	1958 7	595.3	477.9	417.9	419.3	400.0	415.0	499.4	704.2	740.7	476.1
1958 7	1959 6	1961 5	740.7	710.3	607.8	533.0	509.7	544.6	536.6	661.3	698.7	592.0

Output Table 3B-24

CYCLE PATTERNS POSITIVE PLAN

STANDINGS. DEVIATIONS FROM CYCLE BASE

CYCLE DATES TROUGH	PEAK	TROUGH	TROUGH	II	III	IV	PEAK	VI	VII	VIII	TROUGH	CYCLE
1933 5	1937 7	1938 6	937.6				-620.7				321.6	1852.7
				359.0	116.5	-401.0		-571.1	-83.0	243.6		
1938 6	1944 10	1946 5	1311.4				-749.6				-416.6	863.0
				945.2	160.1	-656.9		-748.8	-637.6	-432.8		
1946 5	1949 1	1949 10	7.7				-69.0				260.7	438.7
				-13.2	-36.4	-49.7		-62.7	-24.8	159.6		
1949 10	1953 5	1954 9	292.2				-140.8				188.2	407.1
				137.6	-76.2	-111.2		-129.9	70.9	169.9		
1954 9	1957 3	1958 7	119.3				-76.1				264.6	476.1
				1.8	-58.2	-56.8		-61.1	23.3	228.1		
1958 7	1959 6	1961 5	148.6				-92.4				106.6	592.0
				118.3	15.7	-59.0		-47.5	-55.4	69.3		
TOTAL			2816.8	1548.8	121.6	-1334.6	-1738.6	-1621.0	-706.6	437.7	725.1	
AVERAGE			469.5	258.1	20.3	-222.4	-289.8	-270.2	-117.8	72.9	120.9	
AVERAGE DEVIATION			436.7	262.6	78.7	204.4	263.6	259.9	173.3	169.8	183.9	

Output Table 3B-25

8292 UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

CYCLE PATTERNS POSITIVE PLAN

CYCLE	CYCLE DATES TROUGH	PEAK	TROUGH	STAGE TO STAGE CHANGE OF STANDINGS, TOTAL CHANGE I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1852.7	1933 5	1937 7	1938 6	-578.6	-242.5	-517.5	-219.7	49.7	488.1	326.6	78.0
863.0	1938 6	1944 10	1946 5	-366.1	-785.2	-817.0	-92.7	.8	111.2	204.8	16.2
438.7	1946 5	1948 1	1949 10	-20.8	-23.2	-13.3	-19.3	6.3	37.8	184.5	101.0
407.1	1949 10	1953 5	1954 9	-154.6	-213.8	-35.0	-29.6	10.9	200.8	99.0	18.3
476.1	1954 9	1957 3	1958 7	-117.4	-60.0	1.4	-19.3	15.0	84.4	204.8	36.5
592.0	1958 7	1959 6	1961 5	-30.3	-102.6	-74.8	-23.3	34.9	-7.9	124.7	37.4
	TOTAL			-1268.0	-1427.2	-1456.2	-404.0	117.6	914.3	1144.3	287.4
	AVERAGE			-211.3	-237.9	-242.7	-67.3	19.6	152.4	190.7	47.9
	AVERAGE DEVIATION			174.0	184.0	283.0	59.2	15.1	128.0	54.7	27.8

Output Table 3B-26

CYCLE PATTERNS POSITIVE PLAN

CYCLE	CYCLE DATES TROUGH	PEAK	TROUGH	STAGE TO STAGE CHANGE OF STANDINGS, CHANGE PER MONTH I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1852.7	1933 5	1937 7	1938 6	-68.1	-14.7	-31.4	-25.8	24.8	139.5	93.3	39.0
863.0	1938 6	1944 10	1946 5	-28.2	-31.4	-32.7	-4.3	.6	18.5	34.1	6.9
438.7	1946 5	1948 1	1949 10	.0	-1.2	-3.1	-2.3	.0	1.2	28.4	25.3
407.1	1949 10	1953 5	1954 9	-20.6	-15.3	.0	-1.1	2.7	40.2	19.8	5.3
476.1	1954 9	1957 3	1958 7	-21.4	-2.9	2.1	-3.3	.0	16.9	41.0	12.1
592.0	1958 7	1959 6	1961 5	-15.2	-29.3	-21.4	-11.7	8.7	-1.6	16.6	9.3
	TOTAL			-153.4	-94.8	-86.4	-48.4	36.8	214.6	233.2	97.9
	AVERAGE			-25.6	-15.8	-14.4	-8.1	6.1	35.8	38.9	16.3
	AVERAGE DEVIATION			15.0	9.7	14.1	7.1	7.1	36.0	18.8	10.5
	WEIGHTED AVERAGE			-31.7	-19.0	-19.4	-10.1	6.0	27.3	34.2	14.7

Output Table 3B-27

INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES

IN MONTHS POSITIVE PLAN

CYCLE DATES			I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1933 5	1937 7	1938 6	8.5	16.5	16.5	8.5	2.0	3.5	3.5	2.0
1938 6	1944 10	1946 5	13.0	25.0	25.0	13.0	3.5	6.0	6.0	3.5
1946 5	1948 1	1949 10	3.5	6.5	6.5	3.5	4.0	6.5	6.5	4.0
1949 10	1953 5	1954 9	7.5	14.0	14.0	7.5	3.0	5.0	5.0	3.0
1954 9	1957 3	1958 7	5.5	9.5	9.5	5.5	3.0	5.0	5.0	3.0
1958 7	1959 6	1961 5	2.0	3.5	3.5	2.0	4.0	7.5	7.5	4.0
TOTAL			40.0	75.0	75.0	40.0	19.5	33.5	33.5	19.5
AV.			6.7	12.5	12.5	6.7	3.3	5.6	5.6	3.3

Output Table 3B-28

UNEMPLOYED RATE, NICB, CENSUS (INVERTED)

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

MEASURES OF SECULAR MOVEMENTS POSITIVE PLAN

CYCLE DATES			AVERAGE MONTHLY STANDING			ABSOLUTE CHANGE FROM PRECEDING PHASE		ABSOLUTE CHANGE FROM PRECEDING CYCLE	
TROUGH	PEAK	TROUGH	EXP-N	CONT-N	CYCLE	EXP-N	CONT-N	TOTAL	PER MONTH
1933 5	1937 7	1938 6	1882.0	1719.6	1852.7	.0	-162.4	.0	.00
1938 6	1944 10	1946 5	1014.2	258.0	863.0	-705.4	-756.2	-989.8	-12.69
1946 5	1948 1	1949 10	405.8	470.0	438.7	147.8	64.3	-424.3	-6.24
1949 10	1953 5	1954 9	393.5	443.6	407.1	-76.5	50.1	-31.6	-.63
1954 9	1957 3	1958 7	441.2	541.5	476.1	-2.4	100.4	69.0	1.31
1958 7	1959 6	1961 5	617.1	580.0	592.0	75.6	-37.1	116.0	2.90
TOTAL					4629.6			-1260.7	-15.35
AVERAGE					771.6			-252.1	-3.07
AVERAGE DEVIATION					390.8			363.9	5.12
WEIGHTED AVERAGE									-4.370

Output Table 3B-29

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES			EXPANSION	CONTRACTION	FULL CYCLE
1933 5	1937 7	1938 6	50	11	61
1938 6	1944 10	1946 5	76	19	95
1946 5	1948 1	1949 10	20	21	41
1949 10	1953 5	1954 9	43	16	59
1954 9	1957 3	1958 7	30	16	46
1958 7	1959 6	1961 5	11	23	34
TOTAL			230	106	336
AVERAGE			38.3	17.7	56.0
AVERAGE DEVIATION			18.0	3.3	15.7

Output Table 3B-30

CYCLICAL AMPLITUDES INVERTED PLAN

CYCLE DATES			CYCLE DEVIATIONS			AMPLITUDES			AMPLITUDES PER MONTH		
PEAK	TROUGH	PEAK	PEAK	TROUGH	PEAK	FALL	RISE	TOTAL	FALL	RISE	TOTAL
1937 7	1938 6	1944 10	128.6	1070.9	-990.1	942.3	-2061.0	3003.3	85.67	-27.12	34.[illegible]
1944 10	1946 5	1948 1	-220.4	112.6	35.9	333.0	-76.7	409.7	17.53	-3.83	10.[illegible]
1948 1	1949 10	1953 5	-49.0	280.7	-152.3	329.7	-433.0	762.7	15.70	-10.07	11.[illegible]
1953 5	1954 9	1957 3	-175.7	153.3	-42.0	329.0	-195.3	524.3	20.56	-6.51	11.[illegible]
1957 3	1958 7	1959 6	-172.3	168.3	-62.7	340.7	-231.0	571.7	21.29	-21.00	21.[illegible]
TOTAL			-488.8	1785.9	-1211.1	2274.7	-2997.0	5271.7	160.74	-68.53	89.[illegible]
AVERAGE			-97.8	357.2	-242.2	454.9	-599.4	1054.3	32.15	-13.71	17.[illegible]
AVERAGE DEVIATION			110.1	285.5	299.1	195.0	584.6	779.6	21.41	8.28	7.[illegible]
WEIGHTED AVERAGE									27.41	-16.65	20.[illegible]

Output Table 3B-31

UNEMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

CYCLE PATTERNS INVERTED PLAN
STANDINGS, DEVIATIONS FROM CYCLE BASE

CYCLE DATES	PEAK	II	III	IV	TROUGH	VI	VII	VIII	PEAK	CYCLE
1937 7 1938 6 1944 10	128.6	178.3	666.3	992.9	1070.9	704.8	-80.4	-897.4	-990.1	1103.4
1944 10 1946 5 1948 1	-220.4	-219.6	-108.4	96.4	112.6	91.7	68.5	55.2	35.9	333.8
1948 1 1949 10 1953 5	-49.0	-42.6	-4.8	179.7	280.7	126.1	-87.7	-122.7	-152.3	418.6
1953 5 1954 9 1957 3	-175.7	-164.8	36.0	135.0	153.3	35.9	-24.1	-22.7	-42.0	442.0
1957 3 1958 7 1959 6	-172.3	-157.3	-72.9	131.9	168.3	138.0	35.4	-39.3	-62.7	572.3
TOTAL	-488.8	-406.1	516.2	1535.9	1785.9	1096.5	-88.2	-1026.9	-1211.1	
AVERAGE	-97.8	-81.2	103.2	307.2	357.2	219.3	-17.6	-205.4	-242.2	
AVERAGE DEVIATION	110.1	119.2	225.2	274.3	285.5	194.2	55.7	276.9	299.1	

Output Table 3B-32

CYCLE PATTERNS INVERTED PLAN
STAGE TO STAGE CHANGE OF STANDINGS, TOTAL CHANGE

CYCLE DATES PEAK TROUGH PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1937 7 1938 6 1944 10	49.7	488.1	326.6	78.0	-366.1	-785.2	-817.0	-92.7
1944 10 1946 5 1948 1	.8	111.2	204.8	16.2	-20.8	-23.2	-13.3	-19.3
1948 1 1949 10 1953 5	6.3	37.8	184.5	101.0	-154.6	-213.8	-35.0	-29.6
1953 5 1954 9 1957 3	10.9	200.8	99.0	18.3	-117.4	-60.0	1.4	-19.3
1957 3 1958 7 1959 6	15.0	84.4	204.8	36.5	-30.3	-102.6	-74.8	-23.3
TOTAL	92.7	922.3	1019.7	250.0	-689.4	-1184.8	-938.6	-184.3
AVERAGE	16.5	184.5	203.9	50.0	-137.9	-236.9	-187.7	-36.9
AVERAGE DEVIATION	13.3	128.0	49.8	31.6	98.0	219.3	251.7	22.3

Output Table 3B-33

CYCLE PATTERNS INVERTED PLAN
STAGE TO STAGE CHANGE OF STANDINGS, CHANGE PER MONTH

CYCLE DATES PEAK TROUGH PEAK	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1937 7 1938 6 1944 10	24.8	139.5	93.3	39.0	-28.2	-31.4	-32.7	-4.3
1944 10 1946 5 1948 1	.6	18.5	34.1	6.9	.0	-1.2	-3.1	-2.3
1948 1 1949 10 1953 5	.0	1.2	28.4	25.3	-20.6	-15.3	.0	-1.1
1953 5 1954 9 1957 3	2.7	40.2	19.8	5.3	-21.4	-2.9	2.1	-3.3
1957 3 1958 7 1959 6	.0	16.9	41.0	12.1	-15.2	-29.3	-21.4	-11.7
TOTAL	28.1	216.2	216.6	88.6	-85.3	-80.1	-55.0	-22.6
AVERAGE	5.6	43.2	43.3	17.7	-17.1	-16.0	-11.0	-4.5
AVERAGE DEVIATION	7.7	38.5	20.0	11.5	7.6	11.5	12.8	2.9
WEIGHTED AVERAGE	5.3	35.5	39.2	16.1	-21.9	-20.3	-16.0	-5.8

Output Table 3B-34

UNFMPLOYED RATE, NICB, CENSUS (INVERTED) 8292

PER CENT X 100

SPECIFIC CYCLE ANALYSIS

CYCLE DATES	INTERVALS BETWEEN MIDPOINTS OF CYCLE STAGES IN MONTHS INVERTED PLAN							
	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1937 7 1938 6 1944 10	2.0	3.5	3.5	2.0	13.0	25.0	25.0	13.0
1944 10 1946 5 1948 1	3.5	6.0	6.0	3.5	3.5	6.5	6.5	3.5
1948 1 1949 10 1953 5	4.0	6.5	6.5	4.0	7.5	14.0	14.0	7.5
1953 5 1954 9 1957 3	3.0	5.0	5.0	3.0	5.5	9.5	9.5	5.5
1957 3 1958 7 1959 6	3.0	5.0	5.0	3.0	2.0	3.5	3.5	2.0
TOTAL	15.5	26.0	26.0	15.5	31.5	58.5	58.5	31.5
AV.	3.1	5.2	5.2	3.1	6.3	11.7	11.7	6.3

Output Table 3B-35

MEASURES OF SECULAR MOVEMENTS INVERTED PLAN

CYCLE DATES			AVERAGE MONTHLY STANDING			ABSOLUTE CHANGE FROM PRECEDING PHASE		ABSOLUTE CHANGE FROM PRECEDING CYCLE	
PEAK	TROUGH	PEAK	CONT-N	EXP-N	CYCLE	CONT-N	EXP-N	TOTAL	PER MONTH
1937 7	1938 6	1944 10	1719.6	1014.2	1103.4	-162.4	-705.4	.0	.00
1944 10	1946 5	1948 1	259.0	405.8	333.8	-756.2	147.8	-769.6	-12.22
1948 1	1949 10	1953 5	470.0	393.5	418.6	64.3	-76.5	84.9	1.65
1953 5	1954 9	1957 3	443.6	441.2	442.0	50.1	-2.4	23.4	.42
1957 3	1958 7	1959 6	541.5	617.1	572.3	100.4	75.6	130.3	3.57
1959 6	1961 5		580.0	.0	.0	-37.1	.0	.0	.00
TOTAL					2870.1			-531.1	-6.57
AVERAGE					574.0			-132.8	-1.64
AVERAGE DEVIATION					211.8			318.4	5.29
WEIGHTED AVERAGE									-2.578

Output Table 3B-38

DURATION OF CYCLICAL MOVEMENTS IN MONTHS

CYCLE DATES	CONTRACTION	EXPANSION	FULL CYCLE
1937 7 1939 6 1944 10	11	76	87
1944 10 1946 5 1948 1	19	20	39
1948 1 1949 10 1953 5	21	43	64
1953 5 1954 9 1957 3	16	30	46
1957 3 1959 7 1959 6	16	11	27
TOTAL	83	180	263
AVERAGE	16.6	36.0	52.6
AVERAGE DEVIATION	2.7	18.8	19.3