NATURE, OBJECTIVES, AND USES
OF PROGRAMMED
BUSINESS CYCLE ANALYSIS

NATURE AND OBJECTIVES

THE TERM BUSINESS CYCLE ANALYSIS is broad and generic, and encompasses many approaches to the understanding of business cycles, among them construction of theories or of analytical models, historical investigations, statistical inquiries, evaluation of current business conditions, and short-term forecasting.

This book only deals with certain techniques of quantitative description and summarization of cyclical fluctuations in economic time series, which have been developed and used for many years by the National Bureau of Economic Research. Specifically, it concentrates on three basic procedures and related computer programs used in the analysis of cyclical fluctuations in time series. These three procedures, turning point determination, standard business cycle analysis, and recession-recovery analysis, have been described and discussed in other publications. The present exposition (1) gives a concise description of the approaches and their rationale; (2) explains the differences between programmed and conventional procedures; (3) provides a guide for the interpretation and use of the computer output containing descriptive and analytical measures; (4) incorporates the lessons learned from sustained experience with the traditional and the computerized approaches; and (5) provides procedural guidance for the practical use of the programs.

In recent years aggregative measures of economic activity have undergone only mild fluctuations and occasional retardations of growth. Hence it is important to point out that the procedures treated in this

study refer to individual activities which often continue to show distinct cyclical movements.

The National Bureau's business cycle studies have, of course, been concerned with business cycles in a broad sense, and with the interaction of the forces impinging upon general business activity. The standardized statistical description of many individual economic activities permits us to study their interrelations, to summarize their behavior, and to use their typical or atypical performance for the characterization of business cycles. The summarizing of cyclical processes and the use of regression models are examples of approaches used by the National Bureau but not discussed here. Descriptive summarization of cyclical behavior is omitted because of the wide variety of summary measures—diffusion indexes, frequency distributions of cyclical changes or turning points, indexes of amplitude adjusted indicators with similar timing characteristics, and so forth.[1] Regression analysis, on the other hand, is such a general tool that its use for cyclical analysis is only incidental and its inclusion would transcend the specified scope of the present inquiry.

TURNING POINT DETERMINATION

The determination of cyclical turning points, which is usually performed on seasonally adjusted time series, is an essential element of the National Bureau's business cycle analysis. The identification of peaks and troughs in individual economic time series permits the analytically important distinction between expansions and contractions in these series; serves as a basis for determining cyclical turns in general business conditions; and is a prerequisite for other types of analysis, including the two approaches described in this paper. The determination of cyclical turning points is the only process described here in which the programmed approach differs substantially from previously used techniques, which rely heavily on impressionistic judgments and are subject to a number of procedural constraints. By contrast, the programmed approach operates through a preliminary determination of cycles and a gradual narrowing down of neighborhoods within which

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[1] Descriptions of these approaches can be found in *Business Cycle Indicators,* Geoffrey H. Moore, ed., New York, NBER, 1961, Chapters 2 and 8 (diffusion indexes); Arthur F. Burns in *New Facts on Business Cycles,* 30th Annual Report, New York, NBER, 1950 (distribution of turning points); and Wesley C. Mitchell, *What Happens During Business Cycles: A Progress Report,* New York, NBER, 1951 (distribution of cyclical changes).

turning points are selected. The process involves several weighted and unweighted moving averages of varying flexibility. In spite of the difference in approach, the program-selected turning points are close enough to the previously determined turning points that broad findings about timing characteristics of individual series are largely unaffected. The principles and problems of the determination of turning points in general, as well as the programmed approach to this determination, will be discussed in Chapter 2.

STANDARD BUSINESS CYCLE ANALYSIS

Standard business cycle analysis provides an historical description of the cyclical behavior of individual economic time series and its relation to swings in aggregate economic activity. It is predicated on the availability of such series during several complete cycles and summarizes cyclical behavior with regard to turning points and to fluctuations during expansions, contractions, and their subperiods. Cyclical behavior is described in terms of conformity of cyclical movements in the individual activity to those in general business conditions, durations and amplitudes of cycles and cycle phases, intracycle patterns, and secular changes from cycle to cycle. Since these measures are frequently based on complete cycles or at least on complete cycle phases, the standard analysis, though strong in summarizing historical behavior, is not particularly adapted to the analysis of current business conditions, where the identification of the cyclical position may be the very problem at issue. The Bureau's standard business cycle analysis could be almost completely converted to programmed procedures, the only exception being parameters that measure the conformity of fluctuations in individual time series to those in general business activity. The computerized analysis allows the speedy processing of a great many series, permits investigation of the consequences of different options, and makes the use of the method available to those who have no experience with its computational intricacies. Standard business cycle analysis and its programmed equivalent form the subject matter of Chapter 3.

RECESSION AND RECOVERY ANALYSIS

The analysis of current business conditions is the broad objective of recession and recovery analysis. This analysis measures percentage changes in economic time series from benchmarks (such as previous

peaks or troughs) over given chronological spans (such as periods of three, four, or six months). Comparisons of changes during a current expansion or contraction with those during corresponding phases of several preceding cycles permit some judgment about current economic developments—their relative strength or weakness and their typical or distinctive character relative to previously experienced patterns. Judging current against prior experiences in several strategic activities may make it possible to evaluate current business cycle conditions and to pinpoint differential characteristics. The fact that this analysis can be performed on a computer assumes special significance in this era of fine adjustments and subtle changes in governmental policy mix. The approach permits the use of a large number of time series and the speedy availability of results. This approach to the analysis of business conditions is described in Chapter 4.

All three approaches are illustrated by the analysis of monthly time series of economic activities. Employees in nonagricultural establishments (referred to as nonagricultural employment in this study) and the unemployment rate are used as examples, except when problems are more effectively illustrated by other evidence. Thus, the turning point determination presented in Chapter 2 is illustrated by data on bituminous coal production. Data on nonagricultural employment and the unemployment rate provide the basis for the output tables found in the appendixes to Chapters 3 and 4.

The reader who is primarily interested in a concise summary of the basic approaches should concentrate on the first few sections of Chapters 2, 3, and 4. If his interest is centered on the modification of procedures and on the interpretation of output, he should consult the subsequent sections of each chapter. Users of the programs who have to choose among options and prepare input should ask for the mimeographed program descriptions and input instructions.

APPLICATION TO REGIONS, INDUSTRIES, AND BUSINESS ENTERPRISES

Most of the series subjected to cyclical analysis by the National Bureau are national series and were analyzed for the purpose of understanding nationwide economic events. Many of the analyzed series measure broad facets of the national economy, such as total employment, unemployment, income, production, prices, and profits. But even when

the series relate to prices of single commodities, hours of work in individual states, or labor costs in a specified manufacturing industry, the analysis can still be directed toward the understanding of the business cycle as a whole—and of business conditions for the nation as a whole—during past and current fluctuations.

The methods need not be restricted in their application, however, and recent developments make wider applications more feasible. State governments, universities, trade associations, and large companies engage in ever-expanding research activities; statistical time series have become more abundant and more detailed; finally, and most important from our present point of view, electronic computers have become widely available. These changes make it appear fruitful to reevaluate the usefulness of business cycle analysis on regional, industrial, and company levels.

Business cycle analysis of regional, state, or area data can contribute to an understanding of cyclical fluctuations in general, as well as to the understanding of the role and fortunes of particular geographical areas. For the general purpose of understanding economic change, this sort of analysis may elucidate important problems, such as the differential susceptibility of various areas to cyclical swings, their differential sensitivity to government policies, the relation of growth to cyclical instability, and the possibility of constructing sensitive indicators of current and prospective economic changes. For local purposes, cyclical analysis of regional activities may help public and private agencies to establish typical relations between local and national activity, to observe past and current deviations from these relations, to anticipate impending cyclical behavior in a given region relative to that of the national economy, and to instigate remedial action where necessary. In all such cases, both historically oriented techniques and techniques designed to assist analysis of current business conditions should be used. As a matter of fact, recession and recovery analysis is already being used in some periodical publications concerned with business conditions on the state level.[2]

Knowledge of the cyclical characteristics of specific industries can also be advanced by the application of business cycle analysis to in-

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[2] See, for example, *New Jersey Economic Indicators*, published jointly by the Department of Labor and Industry, State of New Jersey, and by the Bureau of Economic Research of Rutgers University. See also Gerhard Bry and Charlotte Boschan, *Economic Indicators for New Jersey*, New Jersey Department of Labor and Industry, Division of Employment Security, 1964.

dustry data. Trade associations and business enterprises concerned with the economic affairs of their industries may well apply the tools of business cycle analysis to industry output, sales, prices, and so on. Some cyclical analyses in the field of industry economics have shown interesting and promising results.

Potentially most important, but probably least explored, are the applications of business cycle analysis to the fortunes of individual business enterprises. The technical obstacles that have prevented such applications in the past are clear enough: the lack of comparable records, the scarcity of trained statisticians, and the prohibitive cost of preliminary statistical preparations (such as seasonal adjustment and smoothing). It is also true that the sales or profit experiences of certain companies, departments, and products may be more influenced by managerial policies, comparative product characteristics, specific sales efforts, or irregular factors, than by forces that produce cyclical fluctuations. Presumably, cyclical analyses would be more useful for product classes or business activities broad enough so that noncyclical product-specific factors become submerged. They may also be more useful in some industries (such as machine tools) than in others (such as food products), and more effectively applied to smoothed than to unsmoothed data. We do not presume to evaluate, generally or specifically, the usefulness of various forms of cyclical analysis applied to company activities. What should be stressed is that some of the obstacles to such analysis have largely disappeared, and that the availability of computers and programmed analytical approaches has opened the door to fruitful experimentation.

As in the case of regional articulation, the application of business cycle analysis to industries and individual companies may enrich our knowledge of cyclical processes. The whole question of homogeneity of cyclical experiences and the differential impact of aggregative change and government policies cannot be approached without analysis of regional, industrial, and company detail. And this detail can be provided and analyzed only with the help of computerized procedures.