Volume Title: Federal Receipts and Expenditures During Business Cycles, 1879-1958

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Volume Publisher: Princeton University Press

Volume ISBN: 0-691-04129-6

Volume URL: http://www.nber.org/books/fire60-1

Publication Date: 1960

Chapter Title: The Problem and the Technique of Analysis

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Chapter URL: http://www.nber.org/chapters/c2399

Chapter pages in book: (p. 1 - 7)

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The Problem and the Technique of Analysis

This study aims to provide a basic, quantitative description of the cyclical behavior of federal cash receipts, expenditures, and surpluses and deficits since 1879. Certain broad sources of receipts—customs revenues, miscellaneous internal revenues, and income and profit tax receipts—will be studied separately; expenditures, however, will be considered only in the aggregate. Changes in both receipts and expenditures are largely influenced by business conditions, wars, and the changing economic philosophy of government. In the course of our economic evolution, changes in tax receipts result from alterations in our tax rate structure and the objects of taxation, and, on the expenditure side, by changes in the services that our government provides. Although it would be desirable to measure separately the influence of each of the causative factors, our aim is less ambitious. It is to show the combined effect of all these factors in the context of the swings of business activity actually experienced by the economy.

We recognize, of course, that we thereby side-step a host of intricate problems. To isolate the variation in revenues produced by rate changes from that produced by cyclical sensitivity of a given tax structure is exceedingly difficult.[1] The design of appropriate models would require assumptions concerning the level of receipts and of business activity under hypothetical tax structures. There would be the still unsolved problem of determining the altered course of the business cycle resulting from the assumed levels of governmental revenues and expenditures, and the resultant effect on government fiscal policy. However, although these interactions might not have been pronounced during 1879-1914, when federal taxation was only a very small proportion of gross national product (less than 1 per cent), that

[1] However, Table 4, which analyzes the timing and direction of changes in the revenue laws during business cycles, reveals that these changes have displayed little or no countercyclical tendency.

situation no longer prevails. The effect on individual industries of changes in the amount of tariff protection is also hard to assess. Even a small change in the total federal revenues produced by a significant change in the tariff rates for the products of some key industry might well alter the economic strength of that industry and of related industries as well. The attitude of Congress toward appropriations and expenditures could, in turn, be affected by the altered climate. In later periods, the growth and more intricate organization of the economy, enlargement of the government's role, and changing policies increase these difficulties.

It was decided, therefore, that the fiscal experience of the federal government be examined as it actually developed in the framework of the country's business cycle history. What the government spends and collects has become, of course, an increasingly important factor in the business situation. What have been the chief features of this role?

The National Bureau of Economic Research has, for more than a third of a century, studied a wide variety of economic processes in order to understand better how business cycles come about. It is fundamental to an understanding of business cycles to know which are the leading and the lagging processes and which processes conform to the cycle in highly regular fashion, and to have some basic measures of their performance in successive cycles. The present study is one in a series of reports that deal with the cyclical behavior of particular economic processes. It does not pretend to do more than sketch in broad outline the sector it deals with, but by so doing we hope to enhance the larger canvas.

Since federal receipts and expenditures data are published currently under several accounting systems, it is desirable to consider briefly the relation of the data analyzed in this paper to others commonly used. The earliest (continuous) form is that which is derived from the *Daily Treasury Statement.* These data are called successively "unrevised receipts and expenditures" through fiscal 1942, "current cash basis" through fiscal 1947, and "Daily Treasury Statement basis" since 1948. Figures derived from this source without further adjustment are now called "budget receipts and expenditures" and constitute the basic data analyzed in this paper. They should not be confused with "administrative budget" data (see below).

A second accounting system, which is prepared by the Office of Business Economics (OBE), is known as "federal receipts from and payments to the public (consolidated cash receipts and expenditures)." These data differ from budget receipts and expenditures in that intra-governmental transactions have been eliminated and trust fund receipts and expenditures, such as those for social security, civil service retirement, etc., have been added.

A third accounting system, also prepared by the OBE, represents a tabulation of "Receipts and Expenditures in the National Income Accounts."

These accounts, like the consolidated cash budget, include the transactions of trust accounts. Unlike either of the accounts defined above, they exclude certain capital and lending transactions. In general, they do not use the cash basis for transactions with business. Instead, such items as corporate profit taxes are included in receipts on an accrual, instead of a cash, basis; expenditures are timed with the delivery of, instead of the payment for, goods and services; and Commodity Credit Corporation (CCC)-guaranteed, price-support-crop loans financed by banks are counted as expenditures when the loans are made, not when the CCC redeems them.

Lastly, attention is directed to the concept of the "administrative budget." This budget is based on authorized taxes and appropriations for a given year on an accrual basis. Appropriations authorized in one year (and included in the administrative budget) may appear as disbursements in several succeeding budgets until the obligations assumed have been met. The administrative budget does not reflect changes in social security taxes or in motor fuel taxes that go into the highway trust fund.

The series that are analyzed in this paper are the only series that are available on a monthly basis as far back as 1879. They represent the receipts and expenditures, on a cash basis, for carrying on the government's day-to-day business. Their most important limitation arises from the fact that they exclude receipts and expenditures in which the government acts as a trustee. The trust account disbursements, which have grown and continue to grow very rapidly as the social security system is expanded, are financed out of past and current contributions or taxes levied specifically for the purpose of financing these programs. For many purposes, it is desirable to include these transactions in the analysis of the government's fiscal position, but we have not done so in this report.

The method of cyclical analysis used in this study has been fully described by Arthur F. Burns and Wesley C. Mitchell in *Measuring Business Cycles* (1947). Here we content ourselves with a brief résumé, adapted largely from Mitchell's account in *What Happens During Business Cycles* (1951). Readers familiar with the technique may turn directly to Chapter 2.

Reference Cycles

First, the seasonal variations in the monthly receipts and expenditures series are measured and removed by the "ratio-to-twelve-month-moving-average method." The seasonally corrected surplus or deficit series is derived by taking the algebraic difference between seasonally corrected receipts and expenditures. Next, the series are broken into segments known as "reference cycles." A reference cycle covers the period from trough to trough of each business cycle. These business cycles have been identified in the first instance by a consensus of the findings of financial journalists, business

analysts, and statisticians. It is a rough consensus; the dates, and even the lists, of cycles differ; nevertheless, they give indications of the periods within which clusters of peaks or troughs of individual economic series have occurred. When a definite cluster has been found, it is accepted as the culmination of a business cycle expansion or contraction; and the month within the clustering zone when economic activity reached its largest (or smallest) volume is designated as a reference peak (or trough). These months constitute a tentative set of "reference dates" which purport to

TABLE 1

Reference Dates for United States Business Cycles, 1879-1958

Trough	Peak	Trough	Expansion	Contraction	Full Cycle
			number of months		
Mar. 1879	Mar. 1882	May 1885	36	38	74
May 1885	Mar. 1887	Apr. 1888	22	13	35
Apr. 1888	July 1890	May 1891	27	10	37
May 1891	Jan. 1893	June 1894	20	17	37
June 1894	Dec. 1895	June 1897	18	18	36
June 1897	June 1899	Dec. 1900	24	18	42
Dec. 1900	Sept. 1902	Aug. 1904	21	23	44
Aug. 1904	May 1907	June 1908	33	13	46
June 1908	Jan. 1910	Jan. 1912	19	24	43
Jan. 1912	Jan. 1913	Dec. 1914	12	23	35
Dec. 1914	Aug. 1918	Mar. 1919 [a]	44	7	51
Mar. 1919 [a]	Jan. 1920	July 1921 [a]	10	18	28
July 1921 [a]	May 1923	July 1924	22	14	36
July 1924	Oct. 1926	Nov. 1927 [a]	27	13	40
Nov. 1927 [a]	Aug. 1929 [a]	Mar. 1933	21	43	64
Mar. 1933	May 1937	June 1938 [a]	50	13	63
June 1938 [a]	Feb. 1945	Oct. 1945	80	8	88
Oct. 1945	Nov. 1948	Oct. 1949	37	11	48
Oct. 1949	July 1953	Aug. 1954	45	13	58
Aug. 1954	July 1957	Apr. 1958	35	9	44

[a] Revised. The analyses in this report were carried out on the basis of unrevised reference dates, which were as follows: T, April 1919; T, September 1921; T, December 1927; P, June 1929; T, May 1938. Since the revisions involve shifts of only one or two months, they cannot appreciably affect the results of this study.

show the troughs and peaks of successive business cycles (Table 1). The word "tentative" is to be taken seriously; the NBER chronology, at least for the period prior to World War I, was developed at a time when its collection of series, its methods of analysis, and its knowledge concerning the cyclical behavior of different activities were far less complete than they are today. Yet, an examination of the reference dates shows that they agree well with the findings of other investigators, and they yield significant results when used as the time scale for analyzing the movements of the many hundreds of series. Breaking a series into reference cycle segments on the basis of the reference dates makes possible the observation of its behavior during successive business cycles.

To compare different activities, the data expressed in tons, cubic feet, gallons, dozens, dollars, hours, or other units must be put into similar form. This is done by turning the seasonally adjusted data for each reference cycle into percentages of their average value. The average value is called a "cycle base"; percentages of the average value are "cycle relatives." The cycle relatives also render comparable the early and late cycles in the same series, however different the levels on which they run. The cycle relatives eliminate, in stepwise fashion, "intercycle" trends, but not "intracycle" trends. When a series is growing rapidly, the cycle relatives have an upward tilt reflecting whatever secular changes occur within the limits of each cycle. In a declining series, the cycle relatives tilt downward. (Thus, cyclical movements are not separated from secular movements by the usual method of fitting trend lines and treating wave-like deviations from them as cyclical fluctuations.) The inclusion of intracycle trends in cycle relatives helps to reveal and to explain what happens during business cycles. Rapidly growing economic activities may play a different role in business cycles than do those that are stable or declining.

Stage-by-Stage Comparison

From the cycle relatives, "cyclical patterns" are prepared. For that purpose, each reference cycle is divided into nine stages. Stage I covers three months centered on the initial trough; stage V, three months centered on the peak; and stage IX, three months centered on the terminal trough. The expansion phase between stages I and V is divided into thirds, and these constitute stages II, III, and IV. The contraction phase is similarly divided into stages VI, VII, and VIII. Successive cycles overlap: stage I of a cycle includes the same months as stage IX of its predecessor. An average of the cycle relatives of all months covered by each stage is computed, thereby reducing the influence of erratic movements on the patterns. By observing how a series behaves as it passes through the nine stages of successive reference cycles, it is possible to obtain a detailed picture of its rela-

tion to individual business cycles and, also, to compare it with other series covering the same cycle. Finally, to determine what behavior is "characteristic" of the series, the measures of the individual cycles are averaged.

In deriving the cyclical patterns, differences in the duration of cycles are disregarded for the moment. One cycle is a unit of experience to be assembled with other units in an array, from which, it is hoped, the features characteristic of the species can be learned.

Amplitude and Conformity Measures

When charted, the average reference cycle patterns show vividly how different series conform to business cycles; but explicit measures of this trait are needed. For that purpose, the amount of rise (or fall) in a series from the trough to the peak of each reference cycle expansion and the amount of fall (or rise) from the peak to the trough of each contraction is computed. The amplitudes of these responses are measured in reference cycle relatives (percentages of reference cycle bases). The regularity of the responses from cycle to cycle is measured by an "index of conformity." Thus, a rise from stage I to stage V is marked +100, a fall is marked −100, and no change, 0. The arithmetic mean of these marks yields an index of conformity to reference expansions. It ranges from +100 (indicating positive conformity in every expansion), through 0 (indicating no change in any expansion, or an equal number of positive and inverted responses), to −100 (indicating inverse movement in every expansion). The index of conformity to reference contractions is made in the same way except that the signs are reversed.

Some series with intracycle trends sloping steeply upward continue to rise throughout reference contractions, yielding indexes of +100 in expansion and −100 in contraction. But if the rise in contraction is uniformly slower than the rise in the preceding and following expansions, the series plainly conforms after a fashion to business cycles. Rapidly falling trends sometimes have the opposite effect. Even moderate trends may produce lapses from conformity to mild reference contractions when tilted upward, and lapses in mild expansions when tilted downward. To measure the regularity of these relations, the rate of change in a series during each contraction is compared with its rate of change during the preceding and also during the subsequent expansion. This is recorded in a third index, "conformity to business cycles." Here, +100 signifies a rise in every expansion and a fall in every contraction, or a rise in expansion and no change in contraction, or no change in expansion and a fall in contraction, or a rise in both phases but at a slower pace in contraction, or a fall in both phases but at a faster pace in contraction. Opposite behavior yields an index of conformity to business cycles of −100.

The three indexes of conformity—one for reference expansion, a second for reference contraction, and a third comparing the movements in the two phases—are useful in all instances, and adequate for series that follow the standard timing scheme closely or depart from it in random fashion; but they do not represent clearly the behavior of series that usually lead or lag behind the cyclical procession. For these numerous and highly interesting series, a second set of conformity indexes is made, based upon their typical cyclical timing (see below). When a series shows no regular timing relation to business cycles, only the first set of indexes on the standard basis of expansion in stages I-V and contraction in V-IX is computed.

The numerical values of the conformity indexes differ from ordinary percentages. The indexes show not the percentage of business cycles covered by a series in which its movements conform to the cyclical tides but the percentage of conforming minus contrary movements. A lapse in any cycle will make the index lower than the corresponding percentage as usually computed; and the fewer the cycles covered by a series, the larger will be the difference caused by a single lapse. For example, if a series spanning 3 reference cycles conforms positively to 2 and inversely to the third, the percentage of positive conformity would be 67; but the index is +33. If instances of no change are ignored, an index of +50 means positive conformity in 3 cycles out of 4, an index of −60 means inverse conformity in 4 out of 5, +80 means positive conformity in 9 out of 10, and +90, positive conformity in 19 out of 20.

Timing Measures

Another measure of importance is that of cyclical timing. The patterns traced by a series during successive reference cycles are plotted one above another, so that likenesses and differences can readily be seen. Seldom do the troughs of these patterns invariably fall in the same stage; not much oftener do the peaks. But, usually, there is a substantial preponderance of troughs in some one stage, and of peaks in another. Such preponderances fix a tentative judgment concerning the timing characteristic of the series, which is then tested by comparisons with other arrangements of the data. Then the lead, coincidence, or lag implied by the selected timing is determined, showing the characteristic timing. (When the behavior differs so erratically from one cycle to the next that there is serious doubt whether the series is correlated at all with business cycles, the timing is classified as "irregular.") The timing measures, which are in terms of cycle stages, are used in computing the second set of conformity indexes referred to above. Leads and lags based on cyclical turns in the monthly data are also computed but are not used in this study.