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Statistical Indicators of Cyclical Revivals

WESLEY C. MITCHELL and ARTHUR F. BURNS

I. THE AIMS OF THIS BULLETIN

THIS bulletin rests upon an analysis of the timing of cyclical revivals in the United States of 487 statistical series in monthly or quarterly form, of which many cover the post-War period alone, while a few run back to the 1880's or earlier. What we have to offer is a digest of past experience, which we take to be on the whole the best teacher of what to expect in the near future.[1]

But one of the clearest teachings of experience is that every business cycle has features that are peculiar to it. Accordingly, no one who knows the past expects that what happened during any earlier business revival will repeat itself exactly during the next revival. Even average experience over several revivals establishes no more than a presumption concerning the general character of the developments that may be anticipated when next the business tide begins to rise. Whatever judgments are formed ought to be based, not upon the behavior of one or two indexes of business conditions, but upon the behavior of a considerable number of statistical series that represent a wide variety of economic processes, and upon a careful study of the salient factors that are influencing current business policies.

Hence we have drawn up a list of statistical series differing widely in other respects but alike in that each has proved in the past to be a fairly consistent indicator of cyclical movements in general business. We regard this list not as a 'forecasting' machine, but rather as a registering device that may be useful to those who are trying to interpret the general drift of current fluctuations in different types of business activity.

Unfortunately the list is rather cumbersome to use. It is not an automatic guide, but requires the exercise of judgment. Also we must burden the reader with technical explanations about the way in which the results were obtained and the precautions to be taken in interpreting them.[2] But it is wiser to face frankly the real complexities and uncertainties that attend upon all efforts to determine when a cyclical revival is getting under way than to indulge in simplifications that may prove treacherous.

II. THE DATING OF CYCLICAL REVIVALS AND RECESSIONS

Before we can determine what series have been reliable indicators of cyclical revivals and recessions, we must determine when these turns in the tides of business activity occurred.

That problem we have treated by successive approximations. Reports in trade and financial periodicals give the opinions of contemporary observers upon current changes in business conditions. We check the concensus of these opinions by studying whatever statistical series are available for the periods under examination, and select tentative dates to mark the troughs and peaks of successive business cycles. After removing seasonal variations, our one adjustment of the original data, we fix the dates of the peaks and troughs of the cycles in each series. Of course we find a considerable scatter of the dates on which different series make their turns in a given business cycle. From these scattered arrays we attempt to approximate the months around which the cyclical revivals and recessions in individual series centered. To that end we compare the timing of the cyclical turns in individual series with our tentative dates of the peaks and troughs of business cycles, and then revise these tentative dates in whatever way the first results suggest. Some series lead with considerable regularity the turning dates that we accept for business

[1] This bulletin was originally prepared as a memorandum at the request of a public agency. In response to several inquiries, it is here published as originally written except for minor revisions. The results are highly tentative, as Section VI stresses.

In the National Bureau's study of business cycles, of which this bulletin is a minor by-product, the writers have been assisted by D. M. Cook, H. Irving Forman, Frances Goldberg, K. G. Laubenstein, G. L. Miron, Sophie Sakowitz, Denis Volkenau, and several others no longer with us. Thanks are due also to Simon Kuznets and to Milton Friedman for criticisms of our first draft.

[2] For fuller explanations of the National Bureau's methods of measuring cyclical behavior, see *Bulletin 57*.

cycles; some coincide with them on the average, others commonly or always lag behind.

As this statement implies, a business-cycle revival is not an event that happens in a single month, but a complicated series of changes that occur cumulatively in various economic processes during a period that may last a year or more. We are vague concerning the duration of revivals because we have no need to mark off this phase of a business cycle from the contraction out of which it develops or from the expansion into which it grows. But we do need to determine the order in which different activities join the procession of revival, and for that purpose it is desirable to have basing points in time from which to measure 'leads' and 'lags'. The most convenient basing point to use for a revival is the month around which cluster the cyclical upturns in different types of production, construction work, transportation, commodity prices, merchandising, employment, disbursements of incomes, profits, security prices, investments, the pecuniary volume of business, interest rates, banking operations, and other economic variables of which we have statistical records. Though a mean is not an adequate description of the array from which it is computed, it is an exceedingly useful tool in studying that array. Similarly, the monthly dates by which we identify business-cycle revivals and business-cycle recessions are not adequate statements of the timing of these shifts from contraction to expansion and from expansion back to contraction; but they are exceedingly useful tools for systematic study of a long array of changes, some of which occur months earlier than the month we choose, others during that month, others months later.

Table 1 shows what we call 'reference dates' of business cycles in the United States from January 1855 to March 1933.[3] As yet we have not attempted to fix the date on which the current cycle reached its peak, though we suppose that this date was late in 1936 or in the spring of 1937.

The leads and lags of individual series at revivals or recessions are determined by comparing the dates of the

[3] Once our analysis of time series is completed we shall subject our reference dates to a searching test. In theory the operations described in the text should be repeated until no further improvement seems possible with the available data. We expect that revisions will be necessary but that they will be minor. In *Bulletin 61* we noted that the trough in 1927 should have been dated November instead of December.

In fixing reference dates of business cycles we not infrequently find that the peaks are 'double-topped' or that the troughs are 'double-bottomed'. Our general rule, in cases of doubt, is to take the later date as marking the cyclical turn. Of course, this practice results in a bias in our timing measurements of individual series in the sense that leads are more numerous than lags.

Any error that we may make in fixing the reference dates affects the absolute magnitude of the timing measures, but it in no way affects the sequence in time of the cyclical turns that occur in individual series during a business-cycle revival or recession. Also the average sequence of individual series is unaffected by errors in our reference dates when the series cover indentical periods. But when the series cover different periods the average sequence will be affected by errors in the dating of those business cycles that are not covered by all the series included in the comparison.

TABLE 1

REFERENCE DATES AND DURATIONS OF BUSINESS CYCLES
UNITED STATES, 1855-1933

Expansion		Contraction		Duration in months		
Revival	Peak	Recession	Trough	Expansion	Contraction	Full cycle
Jan. 1855	June 1857	July 1857	Dec. 1858	30	18	48
Jan. 1859	Oct. 1860	Nov. 1860	June 1861	22	8	30
July 1861	Apr. 1865	May 1865	Dec. 1867	46	32	78
Jan. 1868	June 1869	July 1869	Dec. 1870	18	18	36
Jan. 1871	Oct. 1873	Nov. 1873	Mar. 1879	34	65	99
Apr. 1879	Mar. 1882	Apr. 1882	May 1885	36	38	74
June 1885	Mar. 1887	Apr. 1887	Apr. 1888	22	13	35
May 1888	July 1890	Aug. 1890	May 1891	27	10	37
June 1891	Jan. 1893	Feb. 1893	June 1894	20	17	37
July 1894	Dec. 1895	Jan. 1896	June 1897	18	18	36
July 1897	June 1899	July 1899	Dec. 1900	24	18	42
Jan. 1901	Sept. 1902	Oct. 1902	Aug. 1904	21	23	44
Sept. 1904	May 1907	June 1907	June 1908	33	13	46
July 1908	Jan. 1910	Feb. 1910	Jan. 1912	19	24	43
Feb. 1912	Jan. 1913	Feb. 1913	Dec. 1914	12	23	35
Jan. 1915	Aug. 1918	Sept. 1918	Apr. 1919	44	8	52
May 1919	Jan. 1920	Feb. 1920	Sept. 1921	9	20	29
Oct. 1921	May 1923	June 1923	July 1924	20	14	34
Aug. 1924	Oct. 1926	Nov. 1926	Dec. 1927	27	14	41
Jan. 1928	June 1929	July 1929	Mar. 1933	18	45	63
Average duration, 20 cycles				25	22	47

cyclical turns in each series with the corresponding reference dates in Table 1. Of course the reference dates are subject to error, particularly in the earlier decades, for which few monthly series are available. Also the cyclical turns in some series are so obscured by erratic movements that they are hard to fix. Though we include few such series in this bulletin, we cannot be sure that all the specifc turning points we have taken are correct. Other possible sources of mistakes are imperfect adjustments for seasonal variations, and errors in the original data. Hence our leads and lags are not to be trusted implicitly. All that we can claim for them is that they represent the best judgments that we could form after a study of a considerable body of statistical evidence.[4]

One other remark is necessary. The durations of business cycles as shown in Table 1 differ so much and so irregularly that they give little help in judging when the next cyclical turn may occur. And the durations of cyclical contractions appear to be even more variable than those of cyclical expansions. If our reference dates are correct, since 1855 there have been two cyclical contractions as short as eight months: one at the outbreak of the Civil War, one at the close of the World War. If we set these instances aside on the ground that they were dominated by random factors, there remain five contractions lasting only 10, 13, or 14 months. At the other extreme are the long contraction of the 1870's (65 months) and the 'Great Depression' of 1929-33 (45 months). Thus we cannot tell from experience as recorded in Table 1 that the present contraction may not end within a few months, or that it may not drag on for several years.

[4] Difficulties are inevitably encountered in matching specific-cycle troughs (that is, the cyclical troughs in individual series) with reference troughs, but they do not occur frequently in the group of series presented in this bulletin. When either of two specific-cycle troughs may be related to a reference trough, our general rule is to choose that specific-cycle trough which deviates from the reference trough by a smaller percentage of the duration of the reference phase within which it falls. This mechanical rule at times gives obviously false results, and we have not used it in the few instances where that happened.

A puzzling question is raised in three or four other instances when mechanical matching of specific-cycle troughs with reference troughs yields leads that are longer than a full reference phase; that is to say, the trough in the series comes earlier than the reference peak preceding the reference trough with which the trough in the series is compared. At first blush, it seems that such cases are absurd and that they should be dropped. But when a series usually leads at cyclical revivals by a substantial interval, random factors are as likely to produce leads that are slightly longer than a full reference phase as they are to produce short lags. To give random factors an opportunity to cancel out, it therefore seems better to include all instances, and that is what we have done. Of course, this liberty can be taken only in series with specific cycles that conform very closely to business cycles.

III. CRITERIA FOR SELECTING TRUSTWORTHY STATISTICAL INDICATORS OF CYCLICAL REVIVALS AND RECESSIONS

An ideal statistical indicator of cyclical revivals and recessions would have the following characteristics:

1) It would cover half a century or longer, thus showing its relation to business cycles under a variety of conditions.
2) It would lead the month around which cyclical revival centers by an invariable interval—say three months, or better, six months. It would also lead the central month of every cyclical recession by an invariable interval, which might differ from the lead at revival.
3) It would show no erratic movements; that is, it would sweep smoothly up from each cyclical trough to the next cyclical peak and then sweep smoothly down to the next trough, so that every change in its direction would herald the coming of a revival or recession in general business.
4) Its cyclical movements would be pronounced enough to be readily recognized, and give some indication of the relative amplitude of the coming change.
5) It would be so related to general business activity as to establish as much confidence as the nature of such things allows that its future behavior in regard to business cycles will be like its past behavior.

Even if we could fix the central month of every revival and recession with assurance, we could find no series that possesses all these characteristics. What we have done is to accept our reference dates as fair working approximations to these central months, and then to select those series that approach the 'ideal' statistical indicator most closely. Most of the series are shorter than we like; the intervals of the leads or lags always vary appreciably from cycle to cycle, and all the long series that usually lead at revivals or recessions lag occasionally; all show some erratic movements, so that an upturn during a cyclical contraction may not mean that a general revival is 'just around the corner', and a downturn during expansion may not mean that a general recession is imminent; the relation of the series that we have selected to general business activity is such as to establish a presumption of their diagnostic, and perhaps in some measure of their prognostic, value; but we can never be sure that unusual circumstances may not make any series behave in an unprecedented fashion at the next revival or recession.

It is because of the past shortcomings of the most trustworthy indicators we have been able to find that we think it unsafe to base judgments of current conditions upon the behavior of any one series, or of a few series. The likelihood of being misled is reduced, though not eliminated, if one uses a considerable number of series, each with a good past record as an indicator, and representing in the aggregate a wide range of business activities.

IV. STATISTICAL SERIES THAT HAVE BEEN RELATIVELY CONSISTENT INDICATORS OF BUSINESS-CYCLE REVIVALS

From the 487 American monthly or quarterly series analyzed, we have selected 71 that have been tolerably consistent in their timing in relation to business-cycle revivals and that at the same time are of sufficiently general interest to warrant some attention by students of current economic conditions. Most of these series are fairly good indicators also of cyclical recessions; but we confine this bulletin to indicators of cyclical revivals.

These 71 series are listed in Table 2 in the order of the average timing of their cyclical upturns, beginning with the series that lead the procession of revival by the longest average intervals and ending with the series that lag farthest behind. These averages are based upon whatever periods the series cover. The series entered on lines 1 to 49 have *led* at two-thirds or more of the reference revivals that occurred within the periods covered by the data. The series entered on lines 65 to 68, and 71 to 75 have *lagged* at two-thirds or more of the reference revivals that occurred within the periods covered.[5] Series that have made their cyclical upturns within three months or less of the reference dates for revivals in two-thirds or more of the instances are also included; for these series have considerable consistency in cyclical timing, whether they alternate between leads and lags or show a marked tendency to turn upward shortly before or shortly after the reference dates.[6]

To facilitate the reading of Table 2 we explain the captions and symbols column by column.

Column 3, 'Period covered by specific cycles', gives the date of the initial trough of the first specific cycle that we recognize in the series and the date of the terminal trough of the cycle with which our analysis closes. By specific cycles we mean the cyclical movements found in an individual series, as distinguished from business cycles, which are the whole congeries of cyclical movements in most of the economic activities of a nation.

Columns 4 and 5, 'Number of cycles', show how many specific cycles occurred in each series during the period marked off by the dates in column 3, and how many business cycles occurred during approximately the same period. The entries in columns 4 and 5 are the same in about two-thirds of the series. In a few series this identity is fortuitous; one specific cycle may stretch over the period occupied by two business cycles and at another time two specific cycles may occur within the period occupied by one business cycle. Those series which show a one-to-one correspondence between specific cycles and business cycles are marked with an asterisk in column 4.

Column 6, 'Average lead or lag', reports the average timing of the specific-cycle revivals in each series in relation to the reference dates of business-cycle revivals. A minus (—) indicates that revivals in the series occur earlier on the average than the corresponding reference revivals. A plus (+) indicates that revivals in the series occur later on the average than the corresponding reference revivals. An entry of zero means that the timing of specific-cycle revivals is coincident on the average with the timing of reference revivals.

Columns 7 and 8, 'Average deviation' and 'Range of leads or lags', show how variable the timing of specific-cycle revivals has been in relation to business cycles. The average deviation of the leads or lags from their mean is entered in column 7. The limits within which the leads or lags fall are entered in column 8. This range shows vividly how much more fickle the behavior of some series has been than that of others; but it must be borne in mind that a series that covers a dozen cycles represents reactions under a greater variety of conditions than does a series that covers only four or five cycles.

Columns 9 to 12 supply additional details on the timing of the series in our list. They show the number of timing observations that lead, lag or coincide with the reference dates, and the number that fall within three months of these dates. When the specific cycles in a series bear a one-to-one correspondence to business cycles the sum of the entries in columns 9 to 11 must be larger by one than the number of business cycles covered as shown in column 5; for we make observations both at the trough with which each business cycle starts and at the trough with which it ends. If a series 'skips' one business cycle, the sum of entries in columns 9 to 11 is equal to the entry in column 5; if it skips two business cycles, the sum is one less than the entry in column 5. When there is a break in the data, caused by the omission of certain cycles, these relations apply to each segment of the series taken by itself, not to the series as a whole.

Columns 13 and 14 report upon the erratic movements to which each series is subject. Erratic movements are the criss-cross fluctuations that occur within the cyclical expansions and contractions of economic time series. We judge the intensity of the erratic movements in a series by comparing roughly the amplitude of their rise and fall with the amplitude of the rise and fall of the specific cycles. Column 13 indicates these relative intensities by a scale that runs from mild to moderate, pronounced and very pronounced.[7] Column 14 indicates the average number of

[5] As later explained, we make a double analysis of several series; hence the discrepancy between the number of series and the number of entries in the table.

[6] The two-thirds rule was relaxed slightly in the case of total imports, power production, number of failures of trading companies, the price of copper and zinc, and the index of prices of metals and metal products.

[7] When the erratic movements are of mild amplitude relatively to the amplitude of specific cycles, they usually disappear when we divide each cycle into nine stages and take averages of the months falling within each stage (see the description of Tables

months in which the seasonally-adjusted data of each series move in the same direction, and thus indicates the frequency with which erratic movements run counter to the direction of a specific-cycle expansion or contraction.[8]

Columns 15 to 20 show the average amplitudes of the cyclical movements found in each series, together with the average deviations of the amplitudes. The amplitude of a specific cycle is measured by: (1) turning the seasonally-adjusted data for that cycle into relatives of their average value; (2) computing the average of the relatives for the three months centered on the initial trough of the specific cycle, on the peak, and on the terminal trough; (3) finding the rise from the average for the three months centered on the initial trough of the specific cycle to the average for the three months centered on its peak, the fall from the average at the peak to the average for the three months centered on the terminal trough, and summing the rise and fall so computed. Thus the amplitude measures state essentially the range of fluctuations of cyclical movements in the form of percentages of the average value of the items composing a series during a specific cycle. Columns 15-17 show the average rise, fall, and combined rise and fall of the specific cycles found in each series. Columns 18-20 show the average deviations of the amplitude measures of these cycles about their means.

Series that tend to decline when general business expands and to advance when general business contracts are marked in columns 2, 6, 15 and 16 by the symbol '*i*' to show that they have an inverted relation to business cycles. In all such instances the entry in column 6 shows the average number of months that the recessions of specific cycles lead or lag at reference revivals; the entry in column 15 shows the average fall of the specific cycles, not the rise; and the entry in column 16 shows the average rise, not the fall.[9]

A series that usually makes its cyclical turns near the middle of reference expansions and near the middle of reference contractions can be treated as having either a positive or an inverted relation to business cycles. Three series on bond yields appear at the bottom of Table 2 because they have exceptionally long lags at reference revivals. But when a process reacts fairly consistently to business cycles, long lags of its specific-cycle revivals at reference revivals must mean that its specific-cycle recessions lead the reference revivals by substantial intervals. Hence the timing of bond yields is shown in Table 2 on an inverted as well as on a positive basis. For a similar reason a double set of entries is made for bond sales on the New York Stock Exchange.[10]

V. A LIST OF THE MOST TRUSTWORTHY INDICATORS OF BUSINESS-CYCLE REVIVALS

Critical examination of Table 2 shows the respects in which and the degrees to which the different series fall short of the requirements of an ideal indicator of business conditions that were set forth above. No doubt each of the 71 series may make a contribution to judgments about the occurrence of a cyclical revival. But some are more trustworthy indicators than others and merit special consideration on that ground. If we can determine which these series are we shall have a much shorter list—and the brevity will be an advantage, provided that it is not gained by reducing overmuch the variety of activities represented.

We have considered the following factors in making this final selection from our materials: Other things equal, a series is more useful as an early indicator of revivals in general business,

1) The longer its average leads at past revivals
2) The more uniform are these leads in occurrence and length
3) The closer its specific cycles come to having a one-to-one correspondence to business cycles
4) The more clearly defined its specific cycles

(footnote[7] concluded)
A4 and A5 in *Bulletin 57*). But this rarely happens when the erratic movements are relatively violent. Therefore, a simple though indirect method of judging the amplitude of the erratic movements in a series relatively to the amplitude of its specific cycles is to compare the number of irregularities in its successive specific-cycle patterns with the number of possible irregularities. Any decline from stages I to II, II to III or III to IV, or any rise from stages V to VI, VI to VII or VII to VIII was treated as an irregularity in all series analyzed 'positively'. The number of irregularities was summated for each series and expressed as a ratio to the number of specific cycles. Then the scale of these ratios was divided arbitrarily into four parts: ratios of .25 or under being taken as indicative of mild erratic movements, .26 through .50 as moderate, .51 through .75 as pronounced, and .76 or over as very pronounced. These judgments were checked against independent judgments made from the graphs of the seasonally-adjusted data of each series, and in a few instances revised in the light of the graphs. We recognize the roughness of our method by using descriptive statements instead of numerical values.

[8] In series reported as aggregates, the frequency of erratic movements can be reduced by adjusting the figures for variations in the number of working days before eliminating the seasonal variations. Experience teaches that the reduction usually is slight. We have not made such adjustments, though a few of the series that we analyze come to us so adjusted. See Table 2, note 3.

[9] The amplitudes of the series that are analyzed invertedly are computed like the amplitudes of the positive series, except that they are expressed as percentages of the average value of a series from the peak of one specific cycle to the peak of the next specific cycle.

[10] Of course, all series having long leads or lags might be subjected to a double analysis, as are bond yields and bond sales. Thus we might have added an inverted analysis for orders of fabricated structural steel and a positive analysis for business failures. But, from a logical standpoint, these series are best treated as now shown. Further, an inverted analysis for the former and a positive analysis for the latter yield much more irregular timing measures.

TABLE 2

TIMING OF 71 SERIES AT BUSINESS-CYCLE REVIVALS IN THE UNITED STATES, THEIR ERRATIC MOVEMENTS AND THEIR CYCLICAL AMPLITUDES

(The series are listed in the order of their average leads at business-cycle revivals)

Line number	Series[1]	Period covered by specific cycles[2]	No. of cycles: Specific	No. of cycles: Business	Average lead (−) or lag (+) (months)	Average deviation of leads or lags (months)	Range of leads or lags (months)	Number of timing observations that are: Leads	Lags	Coincidences	Within 3 mos. of revivals	Erratic movements: Relative intensity	Erratic movements: Av. no. of mos. in which data move in same direction[3]	Amplitude of specific cycles: Average: Rise	Average: Fall	Average: Rise and fall[4]	Average deviation: Rise	Average deviation: Fall	Average deviation: Rise and fall	Line number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	Orders of fabricated structural steel	Nov10-Jan32	8	6	−10	5	−15 to −1	7	0	0	2	Pronounced	2.1	78	78	156	30	32	44	1
2	Yields of 15 high grade industrial bonds (*i*)	Sep00-Jun32	9	9	*i*−10	4	−16 to −3	9	0	0	1	Mild	2.6	*i*8	*i*16	24	5	12	12	2
3	Yields of 15 high grade public utility bonds (*i*)	Oct00-Jun32	9	9	*i*−9	3	−17 to −2	9	0	0	1	Mild	2.9	*i*9	*i*12	21	6	8	8	3
4	Yields of railroad bonds, Macaulay (*i*)	Oct57-Jun32	21	19	*i*−9	10	−64 to +23	13	4	1	1	Mild	2.8	*i*14	*i*12	26	9	7	11	4
5	Business failures, total liabilities (*i*)	Apr84-Oct31	13	12	*i*−9	3	−17 to +6	13	1	0	0	Pronounced	1.5	*i*117	*i*126	243	83	78	110	5
6	Business failures, all commercial liabilities (*i*)	Oct75-Apr32	13	13	*i*−8	3	−13 to +5	13	1	0	0	Pronounced	1.6	*i*120	*i*136	256	62	60	103	6
7	Bond sales, N. Y. Stock Exch.	Feb94-Nov32	13	11	−8	6	−22 to +16	11	1	0	0	Moderate	1.7	86	78	163	39	37	68	7
8	Index of industrial stock prices, Dow-Jones	May97-Jun32	9	10	−7	5	−18 to 0	9	0	1	4	Mild	2.9	55	47	102	23	27	49	8
9	Index of railroad stock prices, Macaulay	Oct57-Jun32	18	19	−7	8	−32 to +12	14	4	0	5	Mild	2.7	36	32	67	20	17	36	9
10	Building plans, Manhattan	Dec69-Mar33	17	16	−7	4	−19 to +3	13	1	2	4	Pronounced	1.5	111	111	223	50	49	89	10
11	Passenger car production	Oct13-Oct32	5*	5	−6	4	−14 to −1	6	0	0	2	Moderate	2.6	104	96	200	23	29	34	11
12	Inner tube production	Dec20-Mar33	3*	3	−6	5	−12 to 0	3	0	1	2	Moderate	1.8	66	52	117	38	28	29	12
13	Bank clearings, N.Y.C.	Feb55-Apr33	23	20	−6	5	−16 to +2	17	3	1	9	Mild	1.7	53	43	95	25	20	40	13
14	Price of hides, Chicago	Jun92-Jun32	11	10	−6	6	−20 to +13	10	2	0	3	Moderate	2.3	44	45	90	19	23	35	14
15	Index of prices of hides and leather	Aug94-Feb33	8	9	−5	5	−15 to +7	8	2	0	4	Mild	3.6	17	18	35	6	12	17	15
16	Railroad operating income, total	May08-Jul32	5*	5	−5	4	−13 to 0	5	0	2	3	Mild	1.8	72	51	123	54	28	70	16
17	Orders of steel sheets	Mar19-Mar33	4*	4	−5	5	−12 to 0	4	0	1	3	Very pronounced	1.8	95	95	190	16	30	26	17
18	Number of shares sold, N.Y. Stock Exch.	Feb78-Mar33	15*	15	−5	5	−19 to +7	12	2	2	8	Pronounced	1.8	98	92	190	32	31	56	18
19	Paper production, total	Mar19-Jan33	4*	4	−5	4	−11 to −1	5	0	0	3	Mild	1.7	32	26	57	11	17	14	19
20	Book paper production	Dec18-Jul32	4*	4	−4	2	−8 to +1	4	1	0	1	Moderate	1.7	34	31	66	10	24	23	20
21	Steel sheet production	Mar19-Aug32	4*	4	−4	3	−8 to −1	5	0	0	3	Pronounced	2.1	70	76	146	17	34	24	21
22	Truck production	Sep14-Aug32	6	5	−4	2	−8 to −1	6	0	0	3	Moderate	2.0	85	55	140	20	39	37	22
23	Freight hauled, ton-miles	Feb08-Aug32	5*	5	−4	3	−11 to −1	7	0	0	4	Mild	2.4	26	28	54	7	18	13	23
24	Total building contracts, floor space	Jan19-Dec32	4*	4	−4	3	−9 to +1	4	1	0	3	Mild	2.0	74	86	160	31	46	44	24
25	Residential building contracts, floor space	Jan19-Dec32	4*	4	−4	3	−9 to 0	4	0	1	3	Mild	1.9	97	105	202	39	68	80	25
26	Commercial building contracts, floor space	Jan19-Oct32	4*	4	−4	3	−9 to 0	4	0	1	3	Moderate	1.7	66	80	146	8	48	52	26
27	Food factories building contracts, value	Jan19-Sep32	4*	4	−4	2	−7 to −1	5	0	0	3	Moderate	1.5	84	105	190	8	41	49	27
28	Orders of oak flooring	Dec13-Mar34	5	5	−4	6	−12 to +12	4	1	0	0	Moderate	1.9	101	111	212	38	33	39	28
29	Average hours worked, 'all' wage earners	Feb21-Aug32	3*	3	−4	3	−7 to 0	3	0	1	2	Mild	2.3	8	16	23	4	13	10	29
30	Index of wholesale prices, Bradstreet's	Jun96-Feb33	8*	8	−4	4	−12 to +5	9	1	0	4	Mild	3.4	17	18	34	7	13	14	30
31	Index of deposits activity, Snyder	Dec78-Jan33	14	15	−4	4	−16 to +4	13	2	0	8	Moderate	3.9	29	30	59	12	17	27	31
32	Bank clearings, outside N.Y.C.	May78-Mar33	13*	13	−4	4	−11 to +4	11	1	3	8	Moderate	1.7	30	19	49	10	17	20	32
33	Index of business activity, Ayres	Dec54-Jul32	21	20	−3	4	−12 to +3	14	2	5	13	Mild	3.1	19	22	41	5	8	11	33
34	Index of business activity, Pittsburgh district	Jan85-Mar33	15	14	−3	3	−9 to +1	12	1	2	10	Moderate	3.2	29	31	60	8	12	15	34
35	Clearings index of business, Snyder	Jan79-May33	15	15	−3	2	−8 to +2	11	1	3	11	Mild	3.2	16	18	34	6	9	10	35
36	Index of industrial production, F.R. Bd.	Mar19-Jul32	4*	4	−3	3	−8 to 0	4	0	1	3	Mild	3.3	28	34	62	9	18	18	36

37	Pig iron production	Jan79-Mar33	15*	15	−3	3	−13 to +1	12	1	3	10	Mild	3.3	62	[illegible]	117	15	21	27	37
38	Steel ingot production	Oct00-Aug32	9*	9	−3	3	−8 to +6	8	1	1	5	Moderate	2.7	65	6[illegible]	126	15	23	25	38
39	Bituminous coal production	Apr08-Jul32	7*	7	−3	4	−11 to +10	7	1	0	3	Pronounced	1.9	36	39	76	14	13	21	39
40	Cotton consumption	Aug14-Jul32	6	5	−3	4	−9 to +4	5	1	0	2	Moderate	1.4	32	35	68	14	8	14	40
41	Price of copper, N.Y.C.	Jan68-Feb33	13	15	−3	5	−21 to +10	10	3	1	7	Moderate	3.6	42	50	92	19	29	46	41
42	Imports, semi-manufactures	Feb08-Feb33	5*	5	−3	4	−10 to +1	5	1	1	4	Moderate	1.7	54	51	105	20	37	46	42
43	Industrial building contracts, floor space	Feb19-Jul32	4*	4	−3	2	−8 to 0	4	0	1	4	Mild	1.5	109	130	239	38	67	93	43
44	Price of zinc, N.Y.C.	Apr95-Jul32	8	9	−2	5	−19 to +10	7	2	1	5	Mild	2.8	39	38	77	12	17	21	44
45	Index of physical volume of business, Babson	Oct04-Mar33	8*	8	−2	3	−12 to +2	6	1	2	7	Mild	2.6	29	24	53	7	13	14	45
46	Coke production, total	Nov14-Aug32	5*	5	−2	2	−7 to +1	4	1	1	5	Mild	2.9	56	61	117	21	23	27	46
47	Electric power production	Mar19-Mar33	3	4	−2	1	−4 to 0	3	0	1	3	Mild	2.0	35	12	47	12	7	17	47
48	Freight cars loaded	Mar19-Aug32	4*	4	−2	2	−7 to 0	4	0	1	4	Moderate	1.8	17	25	42	6	20	17	48
49	Railroad operating revenue, freight	May08-Jul32	5*	5	−2	3	−8 to +3	5	1	1	5	Moderate	1.9	21	24	46	6	18	14	49
50	Index of machine tool orders	Feb19-Mar33	4*	4	−2	2	−8 to 0	3	0	2	4	Mild	1.8	110	129	239	15	72	81	50
51	Total imports	Jan68-Feb33	16	15	−2	4	−12 to +8	9	5	2	11	Moderate	1.7	38	33	71	12	17	23	51
52	New corporate issues, industrial	Apr19-Jun32	4*	4	−2	3	−9 to +2	2	1	2	4	Pronounced	1.6	142	162	303	64	94	158	52
53	Index of business activity, A. T. & T.	Apr79-Mar33	15*	15	−2	3	−8 to +1	8	1	7	11	Mild	3.4	23	26	49	5	10	12	53
54	Production of producers' goods, F.R. Bk. of N.Y.	Mar19-Jun32	4*	4	−2	3	−9 to +2	2	1	2	4	Mild	2.9	24	39	63	5	19	17	54
55	Index of industrial production, Stand. Stat. Co.	May19-Mar33	4*	4	−1	2	−6 to +1	2	1	2	4	Mild	4.4	32	36	68	12	22	20	55
56	Department store sales	Jan19-Mar33	4*	4	−1	2	−3 to +3	2	1	2	5	Mild	1.9	16	18	34	8	18	20	56
57	Railroad expenses on maintenance of way and structures	Mar08-Apr33	5*	5	0	4	−9 to +8	3	4	0	5	Mild	2.3	19	29	48	7	27	22	57
58	Raw cotton stocks at mills	Oct14-Mar33	7	5	0	4	−10 to +9	2	2	2	4	Mild	2.9	34	32	66	16	11	24	58
59	Factory payrolls, total	Mar19-Mar33	4*	4	0	1	−1 to +2	2	1	2	5	Mild	3.4	27	44	71	11	31	30	59
60	Factory employment, total	Jan15-Mar33	5*	5	0	1	−2 to +1	2	2	2	6	Mild	5.1	16	24	40	6	16	13	60
61	Factory payrolls, iron and steel	May19-Mar33	4*	4	0	1	−2 to +1	1	2	2	5	Mild	2.5	42	62	104	19	42	36	61
62	Factory employment, iron and steel	May19-Mar33	4*	4	0	1	−2 to +1	1	3	1	5	Moderate	3.6	25	39	64	14	25	21	62
63	Factory employment, N.Y. State	Jan15-Mar33	5*	5	+1	2	−1 to +5	1	3	2	5	Mild	3.4	15	25	40	7	15	11	63
64	Factory payrolls, machinery	Jun-19-Mar33	4*	4	+1	1	0 to +2	0	3	2	5	Mild	2.7	46	63	109	12	46	51	64
65	Factory employment, machinery	Jun-19-Mar33	4*	4	+1	1	0 to +2	0	4	1	5	Mild	6.3	31	46	76	10	31	30	65
66	Business failures, number of trading cos. (*i*)	Sep96-Aug32	9	10	*i*+1	5	−9 to +17	3	7	0	4	Mild	1.6	*i*42	*i*50	92	30	26	46	66
67	Factory payrolls, N.Y. State	Jan15-Mar33	5*	5	+2	2	0 to +4	0	4	2	4	Mild	2.8	34	33	67	18	25	27	67
68	Magazine advertising	Apr15-Apr33	5*	5	+2	3	−4 to +9	2	4	0	3	Mild	1.9	35	33	68	14	24	30	68
69	Index of retail prices of foods, B.L.S.	Sep22-Feb33	3*	3	+3	5	−2 to +12	2	2	0	3	Moderate	2.4	8	20	28	3	20	19	69
70	Index of prices of metals and metal products	Mar95-Apr33	8	9	+3	4	−2 to +11	5	5	0	7	Mild	4.0	23	24	46	15	7	21	70
71	Index of prices of fuel and lighting	Jun92-May33	10	10	+5	4	−6 to +13	1	9	1	4	Moderate	2.9	24	24	49	14	8	20	71
72	Bond sales, N.Y. Stock Exch. (*i*)	May92-Feb34	14	12	*i*+7	7	−11 to +22	2	11	0	2	Moderate	1.7	*i*70	*i*92	162	34	48	68	72
73	Yields of 15 high grade public utility bonds	Apr01-Apr28	7	8	+10	8	−2 to +25	1	7	0	1	Mild	2.9	11	10	21	7	7	10	73
74	Yields of 15 high grade industrial bonds	Jul02-Jan28	7	8	+10	8	−8 to +19	1	7	0	2	Mild	2.6	10	9	19	5	5	9	74
75	Yields of railroad bonds, Macaulay	Aug60-Dec27	19	18	+12	7	−6 to +27	2	14	1	1	Mild	2.8	10	13	23	5	8	10	75

[1] All series are monthly, except total liabilities of business failures, reported by quarters before 1893, and liabilities of commercial business failures, quarterly before 1896. The three series on bond yields and the series on bond sales appear near the top and again at the bottom of the table; see the text for explanation.

[2] The period from about 1915 to 1921, depending upon the dating of the specific-cycle turns, is omitted from all series on prices of commodities, value of foreign trade, railroad revenues and expenses, liabilities of business failures, and bank clearings outside New York. The period from 1911 to 1919 is omitted from ton-miles of freight hauled, because data are lacking from July 1914 to March 1916.

[3] Based on experience during 1919-33, except in series for which we omit the cycle from 1919 to 1921. Horizontal movements were not considered a change in direction; thus a rise followed by a horizontal movement and another rise was counted as a single rise.

[4] This column is computed directly from the individual cycles; hence the slight discrepancies between the entries on 'rise and fall' and the sum of the entries on 'rise' and 'fall'. The figures are expressed in units of specific-cycle relatives, as explained in the text.

(*i*) Series is treated as 'inverted'; see text for explanation.

* Specific cycles show one-to-one correspondence to business cycles; see text for explanation.

5) The less intense its erratic movements in comparison with the amplitude of its specific cycles
6) The fewer the changes in the direction of its month-to-month movements
7) The smaller and more regular the seasonal variations that have to be 'eliminated' before the specific cycles can be studied
8) The larger the number of past revivals covered by the series
9) The farther back in time any irregularities in conformity to business-cycle revivals occurred
10) The broader the range of activities represented by the series
11) The more stable the economic significance of the process represented

But other things never are equal. When a series ranks high as judged by one or two of these criteria, it ranks lower as judged by others. Hence we have drawn up an annotated list of the series that seem to us to be the most trustworthy indicators of revivals. We include series that may have some prognostic value on account of their long average leads, and also series that have short average leads or no leads, but that show notably narrow ranges in their cyclical timing and therefore have confirmatory value concerning the occurrence of a general business revival. The annotations show both the respects in which the series merit high rank and their shortcomings. We state also the line in Table 2 on which each series may be found and the source in which it is currently reported.

TOTAL LIABILITIES OF BUSINESS FAILURES (Line 5)
Average lead 9 months. A long series that moves invertedly. Our analysis covers 12 business cycles, but 14 revivals. Thirteen leads, one lag. Range of timing, —17 to +6 months. Leads consistently long, shortest being 6 months. Extra specific cycle and single lag occur before 1901. Erratic movements are pronounced and changes in direction frequent; but in neighborhood of cyclical revivals the erratic movements are moderate. Seasonal large but tolerably stable. These remarks are based upon Bradstreet's compilations which were discontinued in January 1933. Data of somewhat narrower coverage compiled for many years by Dun's (line 6 in Table 2) behave in much the same way; see *Dun's Statistical Review.*

DOW-JONES INDEX OF INDUSTRIAL STOCK PRICES (Line 8)
Average lead 7 months. A long series; covers 10 business cycles. No lags, but one coincidence. Timing ranges from —18 to 0 months. Erratic movements mild. Reversals of direction relatively infrequent. No seasonal. Skips the cyclical decline of 1926-27, but shows marked retardation in 1926 and early 1927. Source: *Wall Street Journal.*

PASSENGER CAR PRODUCTION (Line 11)
Average lead 6 months. No lags or coincidences. Covers only 5 cycles but they bear a one-to-one correspondence to business cycles. Leads range from 1 to 14 months; they are smaller in the last three than in the first three revivals. Reversals of direction relatively infrequent; but erratic movements moderate, and seasonal large and unstable. Source: Bureau of the Census, *Automobiles.*

INNER TUBE PRODUCTION (Line 12)
Average lead 6 months. No lags, one coincidence. One-to-one correspondence, but covers only 3 cycles. Timing ranges from —12 to 0. Erratic movements moderate, but reversals of direction relatively frequent and seasonal fairly large and changing. Source: *Survey of Current Business.*

TOTAL RAILROAD OPERATING INCOME (Line 16)
Average lead 5 months. No lags, two coincidences. One-to-one correspondence. Covers 5 cycles, two of them pre-War. Timing ranges from —13 to 0. Erratic movements mild on the whole except during 1918-24; but they are of uneven intensity, and reversals rather frequent. Seasonal stable but large. Source: Interstate Commerce Commission, *Operating Revenues and Operating Expenses of Class I Steam Railways.*

TOTAL PAPER PRODUCTION (Line 19)
Average lead 5 months. No lags or coincidences. One-to-one correspondence. Covers only 4 cycles. Leads range from 1 to 11 months. Erratic movements generally mild but reversals of direction rather frequent. Further, the cyclical decline of 1926-27 is not clearly reflected in this series. Seasonal small and relatively stable. Source: *Survey of Current Business.*

TRUCK PRODUCTION (Line 22)
Average lead 4 months. No lags or coincidences. Covers 5 cycles. Timing range narrow, —8 to —1. Shows an extra specific cycle, but it was of slight amplitude and occurred during the War. Erratic movements moderate. Seasonal large but smaller than in passenger cars; however, reversals of direction in data more frequent. Source: Bureau of the Census, *Automobiles.*

TON-MILES OF FREIGHT HAULED (Line 23)
Average lead 4 months. No lags or coincidences. One-to-one correspondence. Covers 5 cycles, one of them pre-War. Timing range, —11 to —1. Erratic movements mild. Reversals of direction relatively infrequent. Seasonal relatively small and stable. Principal defect is that three of the seven leads are only one month. Source: Interstate Commerce Commission, *Freight Train Performance of Class I Steam Railways.*

TOTAL RESIDENTIAL BUILDING CONTRACTS, FLOOR SPACE (Line 25)
Average lead 4 months. No lags, but one coincidence. One-to-one correspondence. Covers only 4 cycles. Timing measures range from —9 to 0. Erratic movements usually mild, but occasionally substantial; reversals of direction

rather frequent. Seasonal large but tolerably stable. Source: F. W. Dodge Corporation, published in *Survey of Current Business.*

AVERAGE HOURS WORKED, 'ALL' WAGE EARNERS (Line 29)
Average lead 4 months. No lags, one coincidence. Timing range, —7 to 0. One-to-one correspondence. Erratic movements mild; changes in direction relatively infrequent; seasonal slight. But the record is brief—covers only 3 cycles. Source: National Industrial Conference Board, *Conference Board Service Letter.*

INDEX OF WHOLESALE PRICES, BRADSTREET'S (Line 30)
Average lead 4 months. Nine leads, one lag. Range of timing, —12 to +5. Covers 8 cycles, maintaining one-to-one correspondence. Erratic movements mild and changes of direction infrequent. No seasonal. The one lag is five months at the cyclical trough of December 1900. This series was discontinued (see *Dun's Statistical Review*) at the close of 1937. We do not know whether it has a current equivalent, but we list it as an item that may have suggestive value.

BANK CLEARINGS OUTSIDE NEW YORK (Line 32)
Average lead 4 months. Long series, 13 cycles. One-to-one correspondence. Eleven leads, one lag, three coincidences. Range of timing, —11 to +4. Seasonal small and rather stable. However, erratic movements moderate, changes in direction rather frequent, and two or three cyclical movements are of such mild amplitude that they do not stand out clearly. Another defect is that four out of fifteen observations are not leads. Source: *Commercial and Financial Chronicle.*

INDEX OF INDUSTRIAL PRODUCTION, FEDERAL RESERVE BOARD (Line 36)
Average lead 3 months. No lags, one coincidence. Range of timing, —8 to 0. One-to-one correspondence, but covers only 4 cycles. Erratic movements mild, changes of direction infrequent. Reliable indicator; but of slight prognostic value since three of the five timing observations are zero or —1. Source: *Federal Reserve Bulletin.*

PIG-IRON PRODUCTION (Line 37)
Average lead 3 months. Covers 15 cycles, maintaining one-to-one correspondence throughout. One lag, three coincidences. Range of timing, —13 to +1. Erratic movements mild and changes of direction infrequent. Seasonal small and tolerably stable. Principal defect is that the one lag and three coincidences have all occurred since 1914. Source: *Iron Age.*

STEEL-INGOT PRODUCTION (Line 38)
Average lead 3 months. Record shorter than pig iron (9 cycles compared with 15). One-to-one correspondence. One lag, one coincidence. Range —8 to +6. Erratic movements somewhat more intense, changes in direction more frequent and seasonality larger, than in pig iron. Chief advantage over pig iron is that its trend is more representative of the iron and steel industry. Source: *Iron Age.*

INDUSTRIAL BUILDING CONTRACTS, FLOOR SPACE (Line 43)
Average lead 3 months. No lags, one coincidence. One-to-one correspondence, but covers only 4 cycles. Range of timing, —8 to 0. More closely integrated in time with business cycles than any other construction series. Erratic movements mild but reversals frequent; seasonality pronounced and unstable. However, rise from cyclical troughs is very sharp. Principal defects are brevity of the record and the short average lead. Source: data obtained directly from F. W. Dodge Corporation.

INDEX OF BUSINESS ACTIVITY, AMERICAN TELEPHONE AND TELEGRAPH COMPANY (Line 53)
Average lead 2 months. Covers 15 cycles, maintaining one-to-one correspondence. Eight leads, one lag, seven coincidences. Timing range, —8 to +1. Erratic movements mild, and changes of direction infrequent. Source: American Telephone and Telegraph Company, *Summary of Business Conditions.*

INDEX OF PRODUCTION, STANDARD STATISTICS COMPANY (Line 55)
Average lead 1 month. Two leads, one lag, two coincidences. Timing range —6 to +1. One-to-one correspondence. A reliable indicator since 1919, the period to which our analysis is confined. Erratic movements mild. Changes in direction less frequent than in Federal Reserve Board index of production or in the A.T. & T. index of business. Source: Standard Statistics Company, *Standard Trade and Securities: Current Statistics.*

DEPARTMENT STORE SALES (Line 56)
Average lead 1 month. Two leads, one lag, two coincidences. One-to-one correspondence. All five turns occur within three months of reference revivals. Seasonality large and changing, but the changes are fairly continuous. Erratic movements mild, but changes in direction rather frequent. A tolerably good indicator; but covers only 4 cycles and does not reflect very clearly the cyclical decline of 1926-27. Source: *Federal Reserve Bulletin.*

FACTORY EMPLOYMENT, TOTAL (Line 60)
Average timing 0. Timing range very narrow, —2 to +1. Two leads, two lags, two coincidences. One-to-one correspondence. Erratic movements mild, changes in direction exceptionally infrequent. One of the most consistent indicators of revival. Chief limitation is that the record covers only 5 cycles. Source: *Federal Reserve Bulletin.*

OTHER EMPLOYMENT SERIES
Several other employment or payroll series in Table 2 are almost or quite as consistent in their cyclical timing as the series on total factory employment, but they cover 4 cycles

instead of 5. The timing of factory employment in the machinery group (line 65) has been slightly more consistent than that of total employment. Reversals of direction in machinery employment are even less frequent than in total employment. Source: *Federal Reserve Bulletin.*

While we regard the series listed in this section as the most trustworthy indicators of cyclical revivals that our present study of past records establishes, we must stress the difficulties that will be encountered and the precautions that should be observed in forming judgments about current conditions from our list.

VI. CAUTIONS NECESSARY IN JUDGING CYCLICAL REVIVALS

A person who attempts to determine by studying the series we have listed whether or not any trustworthy indications of a cyclical revival exist at a given time will find that he must equip himself with a great deal of additional information before he can reach a reasoned judgment.

The first obstacle he will encounter is that monthly statistical records are never up to date. The monthly series may tell him what the status of business was a month or two ago; they cannot tell him what the status of business is today. The only way to meet the obstacle of tardy monthly reports is to use weekly or daily figures when available. Although data by such short time units are likely to be of little direct use in judging cyclical turns, they make it possible to estimate the standing of individual series in the current month.

A second difficulty arises in treating seasonal components. When seasonal variations change from year to year, the problem of making satisfactory adjustments for current months is hard to solve. The shift in the seasonal pattern of automobile production since the fall of 1935 is merely an extreme instance of a common difficulty. The larger the seasonal variations in a series relatively to the amplitude of its specific cycles, the more serious will be the results of an erroneous seasonal adjustment. A poor seasonal adjustment may produce an upturn that is readily misinterpreted as cyclical or may cancel for a month or more a genuine cyclical upturn. We know no protection against this danger other than a careful comparison of the original and seasonally-adjusted data, plotted on the same chart.

Even when a series is free of seasonal variations, it is difficult to recognize a cyclical turn at the time it actually occurs. A series that has made cyclical upturns usually, if not consistently, some months before our reference dates for revival seems to have high prognostic value, but the chances are fair that it has merely historical value. The reason is that the cyclical movements of economic series are diversified by erratic fluctuations. Table 2 demonstrates that most series typically keep the same direction only two or three months. Once a cyclical decline is well advanced, there is no way of deciding at the time a rise occurs in monthly data whether the rise will prove to be a minor interruption of the downward movement or the beginning of a cyclical expansion.

Mechanical smoothing cannot cope with this problem. It is better to analyze the available data closely than to trust mechanical devices to tell whether a given change in the direction of a statistical series represents an erratic or a cyclical movement. For example, 'aggregate' building permits rose very sharply in the spring of 1929. But that rise was due entirely to the rush by New York City builders to file plans for apartment houses and hotels in time to escape limitations on height and other restrictions of the Multiple Dwelling Act about to be enacted. When New York City is eliminated from the figures, the sharp rise is replaced by a sizable decline. It is often possible thus to break down a statistical series into several component parts, and through study of the parts to arrive at a considered opinion concerning the nature of the movement shown by the total. And it is desirable to supplement such intensive tests by extensive tests. We think that it is wise to test judgments based upon our short list of series by seeing whether they are confirmed by the longer list in Table 2. Also there probably are good business indicators among the series carried by the *Survey of Current Business* and other publications but not included among the 487 series that we have analyzed, because they cover only two cycles as yet or for other reasons. Of course the probable value of short series must be judged by criteria other than consistency of performance.

Another difficulty is that no sequence of average leads of time series in past cyclical revivals can tell what the exact sequence will be at the next revival. The measures of dispersion in Table 2 show that the cyclical behavior of most economic series is highly variable. The variations are at times irregular; at others they reflect secular or structural changes. Business failures lag six months at the cyclical upturn in 1901, although they lead reference revivals by a longer average interval than any other series in our compact list. Truck production made its cyclical upturn after passenger car production at the revivals of 1914 and 1919; at the next three revivals the two moved coincidently, while at the revival of 1933 trucks turned up before passenger cars. The cyclical behavior of money markets has changed so profoundly in recent years that past records do not seem to be valuable guides to the near future. We recognize this fact in Table 2 by stopping the comparison of like cyclical turns of interest rates and general business in 1927.[11] To cite another example, if a study like the present one had been made thirty or forty years ago,

[11] If we tried to compare *like* cyclical turns after 1927, we should have to relate the trough of bond yields in January 1937 with the trough in general business in March 1933—obviously a useless comparison. However, the comparison of *opposite* cycli-

it would have been impossible to include automobile production, but it surely would have been desirable to include railroad purchases in a table like Table 2, though perhaps not in a more compact list, since the erratic fluctuations in railroad purchasing have always been exceptionally violent. Today we must exclude railroad purchases, for their tendency to lead vigorously at cyclical revivals has disappeared. Such changes in cyclical timing are full of instruction to the student of business cycles. They are important also to the man of affairs; he must be alert to changes in the making, eschew simple formulas, test his judgments by study of numerous statistical series, and stand ready to revise his list of indicators as the economic environment changes.

In Table 2 we have indicated only those phases of behavior with respect to business-cycle revivals that can be easily measured, or graded on the basis of measurements. One who wishes to form reasoned judgments about current business prospects should carry his analysis further than we have carried ours in this bulletin. He should plot on large charts the original and seasonally-adjusted data for every series that appears from our preliminary sorting to have prognostic or diagnostic value, preferably using not only the series included in our compact list but all or most series in Table 2. Then he should scrutinize with care the movements of each series during the later stages of past contractions and the earlier stages of past expansions. In this way he may find characteristic behavior traits that are not revealed by our measures. For example, the specific cycles of some series usually show a marked decline in the rate of contraction for some months before they make their cyclical upturns, while in other series the specific cycles usually have sharp V-shaped troughs. Knowledge of such differences may lead to a selection of indicators of revival that differs from our list, and is nearly sure to be helpful in putting the proper interpretation upon the new figures that come month by month.

An investigator can use these charts also to test the value that the series have for him. Let him see what success he might have achieved in trying to interpret the figures that would have been available six months, four months and two months before the last several reference dates for revival. Are there instances in which he could not have discerned a change in the cyclical tide until after it had begun to flow strongly in the new direction? What revivals would he have predicted that proved abortive? If these exercises be performed conscientiously without allowing judgment of the data available at a past time to be shaped by 'hindsight', a difficult feat in self-control, the investigator should learn something about the 'probable error' of his current judgments.[12] But a high score in 'spotting' past revivals at an early stage would not of itself justify great confidence in present anticipations. Indeed, a thoughtful worker would be likely to suspect that a high score represented partly his inability to interpret the data available during past contractions without subconsciously using his knowledge of what happened later.

Many students of current business developments are concerned, not with the cyclical fluctuations of the economy as a whole, but with the prospects of a particular industry, trade or enterprise. On the numberless detailed tasks of this sort we have shed little light, except in so far as the cyclical revivals in the given industry, trade or enterprise are influenced directly or indirectly by business-cycle revivals. Of course this exception constitutes the rule. Nevertheless, cyclical behavior is so variable from industry to industry that an investigator concerned principally with the fortunes of some industry or firm probably will want to find out what other time series, economically related to his own, have commonly or invariably turned up at earlier dates.

An obvious suggestion for reducing the labor and the uncertainties attaching to the use of a list of series such as we have given is to combine the best 'business barometers' into an index number. Whether an index can be made that will be both a prompter and a more trustworthy indicator of business-cycle revivals than any series available at present, we do not know. Five indexes of 'business activity'[13] are included in Table 2, of which only one is admitted to our briefer list, and that index has average leads of only two months. Of course these business indexes were not made for the specific purpose of forecasting revivals. A compiler who set himself this task doubtless could put together an index that turned upward several months before each of our reference dates since the War. But an index made on this strictly empirical basis would have to demonstrate its trustworthiness over several future cycles before it could command much confidence.[14] Such quasi-mechanical methods of trying to improve prognoses seem

(footnote[11] concluded)

cal turns can be formally extended through 1933; that is, the extraordinary peak in bond yields in June 1932 may be compared with the reference trough of March 1933. We make this comparison in Table 2, chiefly to preserve objectivity.

[12] In making such a test, each past year must be treated strictly as if it were a current year, and the seasonal factors applied to that year must therefore be estimated on the basis of preceding years; but it will be difficult here as elsewhere not to be influenced by 'hindsight'.

[13] Series entered on lines 33, 34, 35, 45 and 53. Perhaps Carl Snyder's index of deposits activity also belongs in this group; it is regarded thus by Snyder.

[14] Perhaps the most promising thing that might be done along these lines is to start with the hypothesis that the new orders placed today will be the output of tomorrow, and that a forecasting index might therefore be made by combining reports on orders in many lines of business, including also contracts for construction. In analyzing time series we have found the rough rule to hold, that orders for commodities and construction con-

to us less promising than efforts to learn about the interrelations among the cyclical movements of different economic processes. Towards this end the National Bureau has been making a detailed analysis of cyclical fluctuations as registered in time series covering many years in this country and Western Europe. If these efforts prosper, they should become a better guide than we have at present to the best methods of anticipating the future.

To sum up: Table 2 demonstrates that the cyclical upturns in a considerable number of American time series have been distributed fairly consistently around the months that we have selected as reference dates for revival. Certain series have led most or all of the dates with which comparisons can be made; but they have led by intervals that have varied from one instance to the next. Because of these variations, we cannot trust the indications of any single series concerning the month which will later be chosen as the reference date around which the revival centered. The least unsafe way to form judgments about this future date is to follow with care the current movements of a collection of series representing different types of economic activity and selected on the basis of the relative regularity with which they have turned upward in earlier revivals.

The chief hazard in forming judgments from such a collection is that cyclical depressions not uncommonly end in a 'double bottom'. Several of the depressions of which we have fair statistical knowledge show two troughs about equally low separated by a mild upturn. The behavior of general business in 1932-33 is a notable example. Business reached a trough about July 1932, experienced a substantial upturn in the autumn, a relapse in the winter, and a new low point in March 1933. A large proportion of the most trustworthy indicators of business conditions participated in the abortive upturn of the autumn of 1932 and in the relapse that followed.

(*footnote*[14] *concluded*)
tracts make cyclical upturns and downturns before corresponding reference dates for revivals and recessions. But the data on orders now available are so scanty that the most important practical problem is to extend the scope of such data and to supplement them with data on cancellations. A person who attempted to construct an index of orders would want to give careful attention to the rate of growth of the industries covered. If he found, for example, that declining industries are excessively numerous in his sample, he would perhaps find it desirable to assign a weight to them smaller than is suggested by their gross or net output. The large erratic fluctuations found in most series on orders are another source of difficulty; it may prove desirable to take also this factor into account in assigning weights, series with relatively mild erratic fluctuations receiving increased weight and series with exceptionally violent erratic fluctuations receiving reduced weight. It is not worth while to carry speculation very far at this time. But it should be noticed that a good index of orders is likely to prove a better forecaster of business-cycle recessions than of business-cycle revivals.

So far as we know, there is no certain way of telling at the time it begins whether an incipient revival will suffer a relapse or develop into a cyclical expansion. Yet the occasions are frequent when speculation about the future course of business is demanded by pressing present needs.[15] Those whose hard duty it is to make these guesses have the best chance of being substantially right if they combine analysis of current business data with some knowledge of the history of business cycles, such information as is available concerning important factors arising outside the realm of business, and a firm determination not to let their hopes and fears color their judgments more than is inevitable.

[15] Henry S. Dennison, one of the Directors of the National Bureau who knows the necessity and the difficulty of business forecasting from long experience, points out the close analogy between the problems of an executive confronting a cyclical contraction and a physician treating an illness.

"Thousands of business men," Mr. Dennison writes, "are taking and must take steps based upon their diagnoses of the situation and their prognoses of what is to come. They may be willing or unwilling, well or ill equipped, act consciously or unconsciously, they still must act. No two cycles are alike,—neither are any two cases of typhoid. The doctor is helped if he knows the 'generality' of cases and all the best (though all imperfect) indicators, yet must watch and treat his one case in hand as unique. So must the business economist and the business manager. The doctor even today must face troubles the causes and exact nature of which are unknown and in which prognosis is uncertain or impossible; some years ago this was true in most of his cases; progress has been made because it *had* to be made."
