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reference troughs seem to have a small bias in the early years, long series are in fact not treated on precisely the same basis as short, in respect of their behavior at troughs. The reference dates in 1919-38 are more firmly established and in any event fixing the period eliminates the difficulty.

The conformity and timing probabilities (for the full period covered by the series and for 1919-38) are the measures so far developed and applied in this study. Both types of measure contribute useful information about the quality of a series as an indicator. While they are not strictly independent in a statistical sense, they utilize the data in quite different ways, and the two together contribute more information than either alone. Nevertheless, by themselves they will not yield a wholly satisfactory set of indicators. For one thing, the acceptance levels we have set are met by very many series, and a long list of indicators is practically a serious inconvenience. But we did not wish to set the levels much higher (see, however, note 15), for that would mean giving disproportionate weight to what are, in and of themselves, rather rough measures of behavior. We plan, instead, to apply additional criteria to achieve a finer selection. Some consideration, for example, should be given to the length of the average lead or lag; this is done only indirectly and crudely by the timing probabilities (see Sec. 5). Again, a series may get a low conformity and a low timing probability, yet have such large erratic movements as to be of little value as an indicator. Moreover, account has not been taken directly of how closely the movements of a series match the variations in amplitude of successive business cycles. Consequently, the classifications of series based upon the probability measures, which we present and utilize in Sections 5 and 6, must be taken as provisional and subject to elaboration and revision.

5

Classification of Series According to Conformity and Timing

The 801 monthly and quarterly time series for the United States analyzed in connection with the National Bureau's general investigation of business cycles are the foundation of this study.[17] Assembled over a period of years for a variety of purposes, they

[17] Included are 57 series on the status of national banks at 5 irregularly spaced 'call dates' within the year; 61 'short' series are excluded (see text).

cover a wide range of economic activities. The measures of cyclical behavior computed for each series on a standard plan have been subjected to the techniques described in the preceding section. We now show how groups of series on different economic processes are classified by these techniques.

As our monthly and quarterly reference dates cover 1854-1938 the cyclical measures for an individual series do not go beyond these dates. Most series, of course, begin much later than 1854 and some end before 1938. Since the behavior of discontinued series may provide clues to useful series that are or might become currently available, we have included them in our tabulations. We have excluded, for the time being, some 61 series that cover less than four business cycle expansions and four contractions, on the ground that our simple procedures, devised to achieve a rough grading of the great mass of series, are inadequate to assess the value of very short series. These, together with other series that have come into being since 1938, should be considered as candidates in a final selection of indicators, and some attention is given them in Section 7.

In general, the highly uneven distribution of series according to the type of economic activity represented (Table 5, col. 2 and 3) is the result of variations in both the availability of data and the degree of intensity with which certain parts of the National Bureau's business cycles research program have been pursued. These exigencies, of course, affect the selection of indicators, for we cannot select indicators from types of activity for which we do not have any series. Some of these deficiencies, fortunately, can be made up from data that have become available in recent years and cover only a brief period.

Eighty-two of the 576 'rejected' series (col. 2), or about 10 percent of the collection, conform so irregularly to business cycles that no expansion or contraction interval seems typical; e.g., contracts for public construction, production of foodstuffs, railroad rates and fares, and certain classes of inventories. These series are not without significance for business cycle analysis, for processes that fluctuate more or less independently of business cycles are part of the economic environment and may exert sufficient force to alter substantially the course of a business cycle. Nevertheless, it is important to separate them from the more reliable indicators.

An additional 315 series in column 2 fail to meet our minimum standard for conformity, although they conform better than the 82 series just mentioned. All told 397, or nearly half, of the

801 series are rejected on grounds of irregular conformity, while 404 have 'acceptable' conformity when behavior during the entire period of the series is considered. Applying the test for consistency in timing to these 404 series we reject 179 series. That is, 179 series fail to meet the timing test at either reference peaks or troughs or both. These, added to the 397 series rejected for conformity, make up the 576 series in column 2. The remaining 225 series (col. 3) show acceptable, but not necessarily similar, timing at both turns.

The application of the conformity and timing criteria eliminates all the wholesale sales series, exports, contracts for public construction, production of foods, prices of farm products and foods, and Federal Reserve Bank and member bank series. In general, the percentage of acceptable indicators varies strikingly among different types of economic process (Table 5, col. 4, and Tables 6 and 7). This percentage is useful in pointing to areas in which a search for indicators is likely to be rewarded. But it is merely a guide. In the great majority of groups some series are 'acceptable' and others are not. The individual series must be examined to find out which is which. Moreover, the position of a group in the array is affected by the particular types of series that get into it. The timing and conformity of the wholesale sales group would undoubtedly be better were the series available for a longer period; most of the series in this group are too short to get included in the table, and the others are not representative of wholesale sales in general. The better showing of the national bank than of the member bank series must be interpreted in the light of the fact that all except one of our national bank series end in 1914, while our sample of member bank series not only covers a later period and a different banking system but also a narrower range of banking processes. The larger percentages of acceptable employment and payroll series than of production series (see Table 7) are probably partly accounted for by the wider coverage of the individual employment and payroll series. The percentages, therefore, require careful interpretation, but they are at least suggestive.

The various types of economic process distinguished in Table 5 differ not only in potency as sources of acceptable indicators but also in the kind of timing the acceptable series exhibit (col. 5-9). By separating series that have an acceptable number of both leads and rough coincidences from those that have an acceptable number of leads only we can get a crude indication of the size of the lead: series of the latter type are likely to lead by longer in-

TABLE 5

Classification of All Series Examined for Acceptability as Indicators

Group (1)	NUMBER OF SERIES Rejected (2)	NUMBER OF SERIES Accepted (3)	% ACCEPTED (4)	NUMBER OF SERIES[a] ACCEPTED FOR: Leads only (5)	Leads & rough coin. (6)	Rough coin. only (7)	Lags & rough coin. (8)	Lags only (9)
Retail sales	9	3	25	..	..	1	..	2
				..	..	2	..	1
Wholesale sales	6	..	0	..	..	..	..	..
				..	..	..	..	..
Imports	10	3	23	..	1	1	..	1
				..	..	2	..	1
Exports	7	..	0	..	..	..	..	..
				..	..	..	..	..
New orders	8	7	47	7	..	..	..	..
				6	1	..	..	..
Const. contracts & permits								
Public & private	7	7	50	7	..	..	..	..
				7	..	..	..	..
Private	12	15	56	12	1	1	..	1
				10	2	3	..	..
Public	16	..	0	..	..	..	..	..
				..	..	..	..	..
Inventories	54	2	4	1	..	..	..	1
				1	..	..	..	1
Production								
General indexes	7	16	70	3	3	3	5	2
				2	6	8	..	..
Foodstuffs	45	..	0	..	..	..	..	..
				..	..	..	..	..
Other perishables	21	5	19	1	..	1	..	3
				2	2	1	..	..
Semidurables	20	5	20	1	..	3	..	1
				5	..	..	..	..
Durables	29	15	34	5	1	3	3	3
				7	4	4	..	..
Trans. & commun.								
Traffic	10	1	9	..	..	1	..	..
				..	1	..	..	..
Rates & fares	7	1	12	1	..	..	..	..
				..	..	..	..	1
Other series	15	6	29	..	6	..	..	..
				1	5	..	..	..
Employment								
General indexes	..	5	100	..	1	1	2	1
				3	..	1	1	..
Perish. goods indust.	8	2	20	..	..	..	1	1
				..	..	1	1	..
Semidur. goods indust.	9	6	40	1	..	3	1	1
				6	..	..	..	..
Dur. goods indust.	5	6	55	1	..	2	3	..
				..	1	3	2	..
Av. hours worked per week	3	6	67	4	..	1	1	..
				5	..	1	..	..
Earnings per employee	18	1	5	..	..	..	..	1
				..	1	..	..	..

Group (1)	NUMBER OF SERIES Rejected (2)	Accepted (3)	% ACCEPTED (4)	NUMBER OF SERIES[a] ACCEPTED FOR Leads only (5)	Leads & rough coin. (6)	Rough coin. only (7)	Lags & rough coin. (8)	Lags only (9)
Payrolls & other income payments								
General indexes	1	2	67	..	..	..	2	..
				..	..	1	1	..
Perish. goods indust.	5	4	44	..	..	..	..	4
				..	..	1	2	1
Semidur. goods indust.	8	6	43	..	..	1	4	1
				5	..	1	..	..
Dur. goods indust.	3	5	62	..	..	..	2	3
				1	..	1	3	..
Prices of commodities								
General indexes	9	3	25	1	2	..	..	..
				1	1	1	..	..
Farm products & foods	51	..	0	..	..	..	..	..
				..	..	..	..	..
Other perishables	19	2	10	1	..	..	..	1
				1	..	..	..	1
Semidurables	14	4	22	..	..	2	..	2
				1	..	..	..	3
Durables	34	10	23	4	2	2	1	1
				2	1	1	2	4
Banking & money								
National Bank series	37	21	36	6	..	1	..	14
				10	1	2	..	8
Fed. Reserve member bank series	16	..	0	..	..	..	..	..
				..	..	..	..	..
Fed. Reserve Bank series	9	..	0	..	..	..	..	..
				..	..	..	..	..
Other monetary series	3	1	25	..	..	..	..	1
				..	..	..	..	1
Interest rates & bond yields	15	8	35	..	..	1	..	7
				..	..	..	..	8
Stock exchange transactions	..	3	100	2	..	..	..	1
				2	..	..	..	1
Stock prices	..	6	100	6	..	..	..	..
				6	..	..	..	..
Security issues, corporate	10	4	29	3	..	..	..	1
				3	..	..	..	1
Business profits	4	7	64	1	3	3	..	..
				5	1	..	1	..
Business failures	6	8	57	8	..	..	..	..
				8	..	..	..	..
Bank clearings & debits	..	5	100	..	2	..	3	..
				4	1	..	..	..
Bus. activity indexes	..	12	100	1	2	5	4	..
				2	10	..	..	..
Unclassified	6	2	25	1	..	..	..	1
				1	..	..	..	1
All series	576	225	28	78	24	36	32	55
				107	38	34	13	33

[a] First line is the distribution of series according to their behavior at peaks; second line, the distribution at troughs.

The classification of series by type of activity was designed by Wesley C. Mitchell and used in his forthcoming volume, *What Happens during Business Cycles*. The term 'accepted' means accepted for conformity and for timing at both peaks and troughs (see text).

TABLE 6

Percentage of Series with Acceptable Conformity and Timing, by Economic Groups

Group	No. of Series in Group	% Accepted
Employment, general indexes	5	100
Stock exchange transactions	3	100
Stock prices	6	100
Bank clearings & debits	5	100
Business activity indexes	12	100
Production, general indexes	23	70
Average hours worked per week	9	67
Payrolls, general indexes	3	67
Business profits	11	64
Payrolls, durable goods industries	8	62
Business failures	14	57
Private construction contracts & permits	27	56
Employment, durable goods industries	11	55
Public & private construction contracts & permits	14	50
New orders	15	47
Payrolls, perishable goods industries	9	44
Payrolls, semidurable goods industries	14	43
Employment, semidurable goods industries	15	40
National bank series	58	36
Interest rates & bond yields	23	35
Production, durables	44	34
Transportation & communication, other series	21	29
Security issues, corporate	14	29
Retail sales	12	25
Commodity prices, general indexes	12	25
Other monetary series	4	25
Unclassified series	8	25
Imports	13	23
Commodity prices, durables	44	23
Commodity prices, semidurables	18	22
Production, semidurables	25	20
Employment, perishable goods industries	10	20
Production, other perishables	26	19
Transportation & communication, rates & fares	8	12
Commodity prices, other perishables	21	10
Transportation & communication, traffic	11	9
Earnings per employee	19	5
Inventories	56	4
Wholesale sales	6	0
Exports	7	0
Public construction contracts	16	0
Production, foodstuffs	45	0
Prices, farm products & foods	51	0
Federal Reserve member bank series	16	0
Federal Reserve Bank series	9	0
All series	801	28

Source: Table 5.

TABLE 7

Percentage of Series with Acceptable Conformity and Timing
Prices, Production, Employment, and Payrolls

Group	Commodity Prices	Production	Employment	Payrolls
Foodstuffs*	0	0	} 20	} 44
Other perishables	10	19		
Semidurables	22	20	40	43
Durables	23	34	55	62
General indexes	25	70	100	67

Source: Table 5.

* In the case of commodity prices this group includes farm products.

tervals. Hence the five timing groups in Table 5 indicate roughly series whose timing is characterized by 'long leads', 'short leads', 'short leads or lags', 'short lags', and 'long lags'.

Before we consider the differences among the economic groups we must note one peculiarity of the over-all totals—the rough symmetry in the distribution of series at peaks and the decided asymmetry at troughs. That is, while at peaks the leaders somewhat outnumber the laggards, at troughs nearly three times as many series lead as lag. It is evidently easier to find advance indicators of revivals than of recessions.

Why this should be we are not entirely sure. Several reference troughs may have been postdated a few months, whereas it seems that errors in reference peaks are more evenly distributed (cf. Sec. 6). But these errors occur before 1919; since then the reference dates are determined from better statistical materials, have been reviewed more carefully, and seem substantially correct. Yet the results of classifying series according to their timing in 1919-38 (see Table 8) are similar to those in Table 5, which utilize the entire period covered by the series. When the timing comparisons of all series with acceptable conformity are put together, leads outnumber lags at only 3 of the 5 reference peaks in 1919-38 but at 5 of the 6 troughs (the exception is November 1927). This difference between peaks and troughs seems to be characteristic, however, only of the series whose timing is acceptable. Among the rejected series leads outnumber lags at 3 of the 5 reference peaks and at 3 of the 6 reference troughs. The roughly symmetrical behavior of the rejected series seems to dispose of the question of a bias in the reference dates in this period (though not, of course, of errors in individual dates).

A plausible hypothesis is that our sample is biased, containing an undue proportion of series that turn up early in revival for

economic reasons.[18] This can hardly be due to a concentration in the sample of a particular type of economic process, however, since the distribution of many groups of series at troughs in Table 5 is biased towards leads as compared with their distribution at peaks. The effect is noticeable in production, employment, payrolls, money and banking series, profits, bank clearings and debits, and business indexes. The only sizeable group that tends in the opposite direction is commodity prices.

Strong upward trends might produce such a widespread effect. But it must be remembered, first, that the reference dates also are influenced by trends—they are not determined exclusively from trend-adjusted data. Second, if upward trends produced leads at troughs they might well, though not necessarily, produce lags at peaks.[19] This, however, is not what we find. Upward trends, coupled with a tendency towards sharp cyclical declines after peaks and gradual declines before troughs, would have the required asymmetrical effect. Whether investigation will show this type of specific cycle pattern to be prevalent we do not know.

Whatever the explanation there can be no doubt that the distribution of turning points in many types of economic process in this country is on the average different for troughs and peaks. At revivals, the upturn in aggregate economic activity is typically preceded by upturns in a substantial majority of these processes. At recessions, on the other hand, there is no such rule.

Two other features of Table 5 are fundamental. First, the series within a given economic group frequently tend to have similar timing at peaks and at troughs. In some groups this is

[18] In the accepted group the preponderance of leads at both peaks and troughs is greater than in the rejected group, as the accompanying figures show. No doubt the explanation is that leading series tend to be more sensitive to business cycles than lagging series, hence larger proportions qualify under our tests.

TIMING COMPARISONS, 1919-1938

	NUMBER OF				RATIO:
	Leads	Exact coin.	Lags	Total	LEADS TO LAGS
	At Five Reference Peaks				
Rejected group	314	68	319	701	.98
Accepted group	420	124	364	908	1.15
	At Six Reference Troughs				
Rejected group	374	105	328	807	1.14
Accepted group	521	256	297	1074	1.75

[19] See *Measuring Business Cycles*, pp. 276-8.

obvious from the entries in the table, even though the individual series are not identified. For example, 6 of the 7 accepted series in the new orders group are classified 'leads only' at both peaks and troughs, while one is classified 'leads only' at peaks and 'leads and rough coincidences' at troughs. For some other groups the situation is much less clear. In a cross-tabulation of all 225 acceptable series, however, 113 series are classified in precisely the same timing group at peaks and at troughs: 64 are 'leads only', 9 'leads and rough coincidences', 8 'rough coincidences only', 6 'lags and rough coincidences', and 26 'lags only'.[20] The result is similar in a simpler cross-tabulation, involving only 3 classes (leads, lags, and rough coincidences) instead of 5. Classifying each of the 225 acceptable series by its most common type of timing,[21] at peaks and troughs separately, we find that 75 series lead at peaks and at troughs, 29 roughly coincide, and 30 lag. On this basis 60 percent of the acceptable series have similar timing at revivals and recessions. Other things being equal, indicators of this sort have distinct advantages since one can use the same series continuously, instead of shifting from one set to another. We shall have occasion to examine these three groups of series in Sections 6 and 7; the individual series are listed in Appendix B.

The second fundamental fact revealed by Table 5 is that economic processes differ strikingly in timing. The differences among groups are more distinct at peaks than at troughs, because of the bias toward leads at troughs. Nevertheless, combining the classifications at the two turns, we can say that the acceptable series in the following groups tend to be classified mainly as leaders (col. 5): new orders, private construction contracts and permits, hours of work per week, stock exchange transactions and prices, security issues, and business failures. Groups in which the series are classified largely as leaders or rough coinciders (col. 5, 6, and 7) are: transportation, business profits, bank clearings and debits,

[20] If it were equally likely that a series would be in any one of the 5 classes and the results at peaks and troughs were independent, we would expect only 45 series to be classified identically at peaks and troughs. Allowing for the actually observed unequal distributions of series at peaks and at troughs raises the expected figure to 57. Both are far below the observed number, 113.

[21] When the number of leads and rough coincidences is the same, a series is classified as a leader; when the number of lags and rough coincidences is the same, a lagger.

TABLE 8

Distribution of Acceptable Series by Timing Classifications Based upon the Full Period Covered and on 1919-1938

	NUMBER OF SERIES ACCEPTED FOR					
	Leads only	Leads & rough coin.	Rough coin. only	Lags & rough coin.	Lags only	Total No. of Series
ALL SERIES						
Full period class. of timing at						
Peaks	78	24	36	32	55	225
Troughs	107	38	34	13	33	225
1919-38 class. of timing at						
Peaks	42	16	30	26	29	143
Troughs	57	26	36	16	8	143
SERIES THAT DO NOT COVER 1919-1938						
Full period class. of timing at						
Peaks	21	3	2	3	15	44
Troughs	27	5	3	..	9	44
SERIES THAT COVER 1919-1938 ONLY						
Full period & 1919-38 class. of timing at						
Peaks	27	9	16	19	18	89
Troughs	38	18	20	10	3	89
SERIES THAT COVER MORE THAN 1919-1938						
Accepted both full period and 1919-38						
Full period class. of timing at						
Peaks	11	7	10	6	9	43
Troughs	20	9	8	3	3	43
1919-38 class. of timing at						
Peaks	11	6	9	7	10	43
Troughs	16	6	14	4	3	43
Accepted full period, rejected 1919-38						
Full period class. of timing at						
Peaks	19	5	8	4	13	49
Troughs	22	6	3	..	18	49
Rejected full period, accepted 1919-38						
1919-38 class. of timing at						
Peaks	4	1	5	..	1	11
Troughs	3	2	2	2	2	11

Only series accepted for conformity and for timing at peaks and troughs are included. The 1919-38 classifications are based on cyclical measures ending with 1938 and beginning 1919, 1920, or 1921, depending upon when the series starts and whether the first cycle following World War I is omitted.

and indexes of business activity. In only one group do laggers (col. 9) plainly predominate: interest rates and bond yields. But payrolls are classified mainly as laggers or rough coinciders (col. 7, 8, 9), and retail sales might be put tentatively in this category, too. The production series do not concentrate heavily in any timing group, though leaders outnumber laggers. Employment and commodity price series also are fairly evenly scattered, while the national bank series tend either to lead or to lag by long intervals.

So much for a general view of the results obtained by applying our standards of conformity and timing to the full record of each series. Now let us consider briefly the results of applying these standards to 1919-38 alone.

Since a large proportion of our series begin in 1919 or shortly before, we should not expect these results, in the aggregate, to differ greatly from the previous ones. In 1919-38, 143 series have acceptable conformity and timing at peaks and troughs and of these 89 cover 1919-38 only (Table 8). As in the full period analysis leaders preponderate, and more at troughs than at peaks. However, the proportion of series that lead or lag by long intervals ('leads only' or 'lags only') is considerably smaller in 1919-38. This is clearly due to the prevalence of long leaders and laggers in two groups of series: the 44 acceptable series that do not cover 1919-38 and the 49 series that are accepted on the basis of the full period but rejected in 1919-38. In the other groups long leaders or laggers do not predominate so much.

The timing characteristics of the 44 series that end some time before 1938 are intriguing, but they must be reserved for later investigation. Nearly half are national bank series, which we have not compiled beyond 1914. On the other hand, the timing classification of the 49 series that are accepted for the full period but rejected for 1919-38 poses a question we cannot ignore. Did this substantial group of series behave in a significantly different way after 1919?

Table 9 is designed to answer the question. Section A shows the timing of this group before and after 1919. For comparative purposes Section B shows the timing before and after 1919 of the 54 series that were accepted in 1919-38 and extend back of 1919 (including 11 series rejected on the basis of their full period behavior). Since the latter series are classified solely on the basis of their timing in 1919-38, the pre-1919 data are strictly independent of the data used to classify the series.

TABLE 9

Timing Observations Before and After 1919, Two Groups of Series

A Series Accepted for the Full Period, but Rejected 1919-1938[a]

	TIMING CLASSIFICATION, FULL PERIOD				
	Leads only	Leads & rough coin.	Rough coin. only	Lags & rough coin.	Lags only
TIMING AT PEAKS BEFORE 1919					
Number of series	19	4[b]	8	4	13
Total ref. turns covered	168	30	73	34	111
Total timing observations	161	30	70	34	101
Number of					
Leads exceeding 3 months	93	10	11	1	4
Leads of 3 months or less	31	11	16	4	2
Exact coincidences	8	4	10	3	2
Lags of 3 months or less	13	4	21	17	21
Lags exceeding 3 months	16	1	12	9	72
Av. lead (—) or lag (+), mo.	—6.7	—2.8	—0.1	+2.8	+6.7
TIMING AT PEAKS, 1919-1938					
Number of series	19	4[b]	8	4	13
Total ref. turns covered	88	16	37	18	61
Total timing observations	79	15	33	16	48
Number of					
Leads exceeding 3 months	41	4	8	..	6
Leads of 3 months or less	15	6	12	5	6
Exact coincidences	4	2	2	3	1
Lags of 3 months or less	6	1	6	4	8
Lags exceeding 3 months	13	2	5	4	27
Av. lead (—) or lag (+), mo.	—4.7	—3.2	—1.5	+1.1	+3.1
TIMING AT TROUGHS BEFORE 1919					
Number of series	22	6	3	..	17[c]
Total ref. turns covered	199	50	12	..	152
Total timing observations	192	50	12	..	141
Number of					
Leads exceeding 3 months	124	22	4	..	13
Leads of 3 months or less	42	26	3	..	10
Exact coincidences	10	2	1	..	7
Lags of 3 months or less	6	..	3	..	18
Lags exceeding 3 months	10	..	1	..	93
Av. lead (—) or lag (+), mo.	—6.6	—3.9	—1.7	..	+8.2
TIMING AT TROUGHS, 1919-1938					
Number of series	22	6	3	..	17[c]
Total ref. turns covered	124	33	16	..	89
Total timing observations	108	32	14	..	72
Number of					
Leads exceeding 3 months	55	2	..	..	13
Leads of 3 months or less	16	8	3	..	5
Exact coincidences	7	16	2	..	8
Lags of 3 months or less	12	5	5	..	13
Lags exceeding 3 months	18	1	4	..	33
Av. lead (—) or lag (+), mo.	—2.7	—0.5	+2.3	..	+5.8

B Series Accepted 1919-1938[a]

	Leads only	Leads & rough coin.	Rough coin. only	Lags & rough coin.	Lags only
	TIMING CLASSIFICATION, 1919-1938				
	TIMING AT PEAKS BEFORE 1919				
Number of series	15	7	13[b]	7	10[b]
Total ref. turns covered	69	51	62	45	52
Total timing observations	52	43	53	42	49
Number of					
Leads exceeding 3 months	17	11	12	11	10
Leads of 3 months or less	15	11	8	6	7
Exact coincidences	4	4	7	8	5
Lags of 3 months or less	5	9	15	7	6
Lags exceeding 3 months	11	8	11	10	21
Av. lead (—) or lag (+), mo.	—4.2	—1.2	—0.2	—0.4	+0.9
	TIMING AT PEAKS, 1919-1938				
Number of series	15	7	13[b]	7	10[b]
Total ref. turns covered	69	30	64	35	50
Total timing observations	66	30	63	35	50
Number of					
Leads exceeding 3 months	39	7	6	1	5
Leads of 3 months or less	19	18	18	2	1
Exact coincidences	3	3	16	11	5
Lags of 3 months or less	2	2	18	17	22
Lags exceeding 3 months	3	..	5	4	17
Av. lead (—) or lag (+), mo.	—5.4	—3.9	—0.6	+1.2	+2.8
	TIMING AT TROUGHS BEFORE 1919				
Number of series	14[d]	7[c]	15[c]	5[c]	5
Total ref. turns covered	49	64	73	35	44
Total timing observations	46	56	64	25	42
Number of					
Leads exceeding 3 months	23	20	25	12	6
Leads of 3 months or less	9	19	15	6	10
Exact coincidences	9	8	12	3	1
Lags of 3 months or less	3	7	4	2	8
Lags exceeding 3 months	2	2	8	2	17
Av. lead (—) or lag (+), mo.	—3.6	—3.7	—1.5	—1.9	+1.9
	TIMING AT TROUGHS, 1919-1938				
Number of series	14[d]	7[c]	15[c]	5[c]	5
Total ref. turns covered	79	41	86	28	28
Total timing observations	76	41	86	27	28
Number of					
Leads exceeding 3 months	48	9	10	2	4
Leads of 3 months or less	13	14	14	3	1
Exact coincidences	5	15	35	1	3
Lags of 3 months or less	4	3	22	16	8
Lags exceeding 3 months	6	..	5	5	12
Av. lead (—) or lag (+), mo.	—4.4	—1.6	—0.2	+1.7	+4.8

[a] 'Accepted' means accepted for conformity and for timing at peaks and troughs. Only series that cover reference turns before 1919 and through 1938 are included. War cycle observations are omitted in certain series.
[b] One series beginning 1914 is omitted here since the war cycle (1918) peak is omitted; the series is included in the distributions for troughs.
[c] One series beginning 1918 is omitted here but included in the distributions for peaks.
[d] Five series beginning 1918 are omitted here but included in the distributions for peaks.

The 49 series of Section A plainly deteriorated somewhat in quality as indicators after 1919. Whereas before 1919 there was a corresponding specific turn at 95 percent of all the reference peaks covered by the entire group of series, after 1919 the percentage was only 87; similarly, the percentage at troughs declined from 96 to 86. Indeed, every timing group has fewer timing observations relative to the number of reference turns covered after 1919 than before. In other words, the cycles in these series did not match the reference cycles as well after 1919 as before. Moreover, the proportion of leads shown by the leading series and of lags by the lagging series declined considerably, though not sufficiently to obscure the broad differences in the timing of the different groups. The leaders tended to lead and the laggers to lag after as well as before 1919.

We may conclude, first, that classification of the 49 series on the basis of their full period behavior is not wholly misleading with respect to their recent behavior; second, that while our technique has identified series that have in general deteriorated in quality or altered their timing, we would do well to examine each series more closely before deciding that its behavior has altered significantly.[22] On the average, the 49 series covered nearly twice as many reference turns before 1919 as after, so that the full period test was based on about three times as much information as the 1919-38 test. As the table demonstrates, the pre-1919 information was definitely useful in determining the nature of the timing relationships among these series. Ignoring that information may make for errors in classification. By the same token it would seem particularly desirable in the case of short series to supplement our simple measures of conformity and timing by more information about the same series or by information about related series.

Even when the information utilized in classifying series is confined to 1919-38, however, the results are not without utility outside of this period. The pre-1919 behavior of the 54 series classified in Section B of Table 9 resembles their behavior during

[22] Of the 329 series that cover more than 1919-38 only 54, or 16 percent, are accepted on the basis of their behavior during 1919-38, whereas 92, or 28 percent, are accepted on the basis of their full period behavior. In itself, this does not necessarily mean that the series deteriorated after 1919. Even if each series behaved in exactly the same way after 1919 as before we should expect the percentage accepted for 1919-38 to be smaller than for the full period because the levels of acceptable conformity and timing are higher the shorter the period (see Sec. 4).

1919-38, though the differences among the groups are less sharp. The timing relationships among economic processes evidently have some degree of stability.

6

Behavior of Selected Groups of Indicators, 1885-1940

We have not found any single series that bears an invariant relation to business cycles as defined by our reference dates. The series classified in the timing group 'rough coincidences' have the smallest variations in timing. But even here variations do occur, and some series have extra cycles or 'skip' reference turns. Moreover, the more interesting indicators of revivals and recessions are the leaders or (as we shall see) the laggers, and for them the variations in timing are larger. Few long series that tend to lead have a perfect record of leads without lags, and none leads by a constant interval.

Evidently it would be unwise to place sole reliance upon a single indicator of revivals or recessions. Special circumstances can always arise that will cause it to fail. But what of the alternative —using several indicators? To answer this question let us examine the behavior in successive business cycles of the groups of series obtained by applying our conformity and timing criteria.

We have already presented in Chart 3 the percentage of the 404 series with 'acceptable' conformity reaching a specific cycle peak or trough in each month 1885-1940, together with the derived percentage expanding. And we have noted the clustering of specific cycle peaks around reference peaks and of specific troughs around reference troughs. No reference peaks or troughs are skipped by these concentrations, nor do appreciable concentrations appear outside the vicinity of the reference dates, except possibly in 1933-35 (cf. note 8). This is to be expected, of course, if the reference dates are accurate. The really noteworthy feature of Chart 3 is that these clusters are spread over a considerable period, usually a year or more, and in phases of moderate length the clusters of peaks begin at about the time the clusters of troughs end, and vice versa. Hence the intriguing possibility presents itself that we may be able to recognize the clusters well before the peak or trough in aggregate economic activity.[23]

[23] Some interesting experiments along this line were reported by C. Ashley Wright in a paper presented at the Conference on Business Cycles Research, National Bureau of Economic Research, November 25-27, 1949.