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## Appendix B

### Measures of the Cyclical Behavior of Selected Business Cycle Series

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#### MONTHLY AMPLITUDES AND RELATED MEASURES

The measures shown in Table B-1 relate only to the monthly series used in this report. A brief definition of these measures is given below; more complete explanations appear in my "Electronic Computers and Business Indicators," *Business Cycle Indicators*, Volume I, Chapter 17.

$\bar{C}\bar{I}$  is the average month-to-month percentage change without regard to sign in the seasonally adjusted series.

$\bar{I}$  is the same for the irregular component.

$\bar{C}$  is the same for the cyclical component which is a smooth, flexible moving average.

MCD represents months for cyclical dominance. Percentage changes of the irregular and cyclical factors are computed for consecutive months (January-February-March, etc.), two-month spans (January-March, February-April, etc.), three-month spans (January-April, February-May, etc.), and so on. MCD is the first interval of months for which the average (without regard to sign) percentage change of the irregular factor is less than that of the cyclical factor and remains so.

$\bar{I}/\bar{C}$  is a measure of the relative smoothness (or irregularity) of the seasonally adjusted series. It is shown for one-month spans and for spans of the period of MCD. This ratio is approximately equal for all MCD periods except where MCD is one, in which case the  $\bar{I}/\bar{C}$  ratio may be relatively low, or where MCD is given as six but is really greater, in which case the  $\bar{I}/\bar{C}$  ratio may be relatively high. The program does not compute the  $\bar{I}/\bar{C}$  ratio for the MCD period when this period is greater than six.

Average duration of run is a measure of smoothness, and is equal to the average number of consecutive monthly changes in the same direction, disregarding zeros, in any series of observations.

TABLE B-1  
MONTHLY AMPLITUDES AND RELATED MEASURES FOR FIFTY-FIVE MONTHLY BUSINESS CYCLE SERIES

	$\bar{C}_I$	$\bar{I}$	$\bar{C}$	$\bar{I}/\bar{C}$	MCD	$\bar{I}/\bar{C}$ for MCD Curve	Average Duration of Run			
							CI	I	C	MCD
<i>Leading Series</i>										
*1. Average workweek, mfg.	1.55	.34	.22	1.55	2	.81	2.81	1.89	9.31	4.49
*2. Accession rate, mfg.	6.03	5.72	2.44	2.34	3	.85	2.37	1.67	8.77	5.88
30. Nonagricultural placements, total	3.41	3.14	1.35	2.33	3	.55	1.86	1.49	8.67	4.53
*3. Layoff rate, mfg.	13.59	11.90	5.88	2.02	3	.74	2.37	1.64	7.45	4.90
4. Temporary layoffs	19.43	17.91	4.88	3.67	5	.81	1.66	1.49	7.10	3.37
5. Initial claims	8.67	7.86	2.96	2.66	3	.89	1.84	1.48	7.82	3.87
*6. Mfrs.' new orders, durables	5.58	5.00	2.00	2.50	3	.75	1.94	1.48	10.64	3.34
24. Mfrs.' new orders, mach. and equip.	6.07	5.55	2.19	2.53	3	.73	1.68	1.47	12.82	3.56
*9. Construction contracts, comm. and indus. build.	12.37	11.94	2.75	4.34	5	.80	1.62	1.49	8.28	3.45
10. New investment orders and contracts	6.37	5.94	2.19	2.71	3	.79	1.59	1.37	8.56	3.55
27. Buying policy, capital expend.	7.56	7.12	2.36	3.02	4	.71	1.82	1.69	10.14	5.23
*7. New private nonfarm dwelling units	4.09	3.39	2.01	1.69	3	.67	2.29	1.67	11.46	4.46
29. New pvt. housing units, bldg. permits	3.90	3.44	1.67	2.06	3	.60	1.93	1.53	12.43	3.70
*12. Net change, no. of businesses	12.15	15.46	7.29	2.12	3	.84	2.71	1.80	10.64	4.08
13. New business incorporations	3.04	2.57	1.30	1.98	3	.65	2.19	1.69	9.31	3.50
*14. Liab. of bus. failures	16.32	16.05	2.81	5.71	6	1.57	1.42	5.32	2.22	2.82
15. Large business failures	17.30	17.36	3.26	5.33	6	1.54	1.54	1.39	6.21	2.82
17. Price-labor cost index	.93	.74	.44	1.68	3	.73	2.52	2.12	8.94	4.68
*19. Index of stock prices	2.58	1.90	1.49	1.28	2	.79	2.40	1.73	13.55	3.36
26. Buying policy, prod. mater.	6.17	5.53	2.76	2.00	3	.66	1.90	1.61	11.55	4.63
32. Vendor performance	11.30	8.12	7.20	1.13	2	.77	3.18	2.01	9.94	3.59
*23. Industrial materials prices	2.15	1.39	1.52	.91	1	.91	2.61	1.84	11.46	2.61
<i>Roughly Coincident Series</i>										
*41. Employees in nonagric. establish.	.40	.23	.29	.79	1	.79	3.10	1.86	12.42	3.10
42. Total nonagric. employment	.40	.32	.24	1.33	2	.69	2.04	1.62	13.55	4.00
*43. Unemployment rate	4.91	3.52	2.85	1.24	2	.73	2.44	1.57	7.84	3.15
44. Unemployed, number of	5.02	3.61	2.84	1.27	2	.75	2.53	1.64	7.84	3.29
45. Insured unemployment	5.63	2.80	4.12	.68	1	.68	3.47	2.44	8.28	3.47
46. Help-wanted advertising	3.28	2.10	2.26	.93	1	.93	2.30	1.40	8.13	2.30

(continued)

TABLE B-1 (concluded)

	$\bar{C}I$	$\bar{I}$	$\bar{C}$	$\bar{I}/\bar{C}$	MCD	$\bar{I}/\bar{C}$ for MCD Curve	Average Duration of Run				
							CI	I	C	MCD	
*47. Industrial production index	1.32	.82	.88	.93	1	.93	3.92	2.92	9.31	3.92	
*51. Bank debits outside NYC	1.56	1.42	.70	2.03	3	.58	1.82	1.55	10.64	4.32	
*52. Personal income	.69	.43	.54	.80	1	.80	3.39	1.69	21.29	3.39	
53. Labor income, industrial	1.12	.69	.84	.82	1	.82	3.63	1.80	13.55	3.63	
*54. Sales of retail stores	1.58	1.43	.56	2.55	4	.70	1.84	1.67	8.77	3.56	
*55. Wholesale price index (excl. farm and foods)	.35	.13	.31	.42	1	.42	5.32	2.26	11.46	5.32	
<i>Lagging Series</i>											
*62. Labor cost/unit of output	.84	.64	.43	1.49	2	.88	2.53	1.77	13.55	3.29	
*64. Mfrs.' inventories, total	.88	.27	.40	.34	1	.34	7.84	2.16	13.55	7.84	
65. Mfrs.' inventories, finished goods	.99	.49	.84	.58	1	.58	6.48	2.61	13.55	6.48	
*66. Consumer installment debt	1.30	.32	1.23	.26	1	.26	11.46	1.94	21.29	11.46	
<i>Other U.S. Series with Business Cycle Significance</i>											
81. Index of consumer prices	.35	.21	.27	.78	1	.78	4.06	1.97	15.33	4.06	
82. Payments to the public	7.17	6.91	1.31	5.27	5	.92	1.47	1.39	7.59	2.30	
83. Receipts from the public	7.49	7.23	1.46	4.95	5	.96	1.70	1.52	5.96	2.55	
86. Exports, total U.S., excl. military	3.72	3.39	1.52	2.23	3	.69	1.89	1.51	7.84	4.08	
87. Imports, total U.S., general	3.52	3.02	1.32	2.29	3	.79	1.71	1.57	6.21	3.06	
94. Index, constr. contracts, total value	8.29	8.06	2.22	3.63	4	.96	1.67	1.47	7.26	2.93	
90. Defense Dept. oblig., procurement	40.72	38.97	9.18	4.25	6	1.41	1.46	1.46	8.09	2.40	
91. Defense Dept. oblig., total	15.88	15.31	3.02	5.07	5	.98	1.46	1.46	8.09	2.58	
92. Military contract awards	29.75	29.94	6.14	4.88	6	1.51	1.51	1.44	5.75	2.68	
<i>International Comparisons of Industrial Production</i>											
121. O.E.E.C. countries	1.32	1.03	.68	1.51	2	.82	2.91	1.95	17.11	5.28	
122. United Kingdom	1.29	1.29	.49	2.63	3	.87	2.41	1.93	15.40	6.91	
126. France	1.79	1.63	.65	2.51	3	.80	2.20	1.70	17.00	5.09	
47. United States	1.32	.82	.88	.93	1	.93	3.92	2.92	9.31	3.92	
125. Germany	1.76	1.35	1.15	1.17	2	.65	3.04	2.01	31.00	6.16	
127. Italy	1.70	1.61	.81	1.99	3	.63	2.27	1.67	22.00	9.50	
123. Canada	.98	.88	.52	1.69	2	.98	3.44	2.27	15.50	6.13	
128. Japan	1.87	1.09	1.27	.86	1	.86	5.13	2.31	16.86	5.13	

\*Series included in the National Bureau 1960 list of 20 indicators.

The summary measures in Table B-1 were computed by a special adaptation of the standard time series program which bypassed the seasonal adjustment routine because the series either had been seasonally adjusted previously or were free of seasonality. This is accomplished by using the standard program with a subroutine, which substitutes a series of numbers equal to 100 for each of the seasonal factors after they are computed. As a result, the original observations (here seasonally adjusted series or series free of seasonality) reappear in the table (13) of the computer program showing the final seasonally adjusted series, and, therefore, all the subsequent operations are performed on these observations. A program to compute similar measures for quarterly series is being prepared.

### LEADS AND LAGS

The leads and lags of each business cycle series are shown in Table B-2 for the period since 1947. These measures show the number of months by which each specific cycle peak or trough in each series leads or lags behind the corresponding business cycle peak or trough. For quarterly series, the intervals are from the midmonth of the specific peak or trough quarter to the business cycle peak or trough month. For an explanation of the procedures used in identifying specific cycle turns and matching them with business cycle turns, see Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, New York, NBER, 1946, pp. 56-66 and 116-128.

The leads and lags for the period before World War II are given for most of these series in *Business Cycle Indicators*, Volume I, Appendix B, pp. 672-686.

For summary measures of leads and lags pertaining to the entire period covered by the series, see Table 1 in the text.

TABLE B-2

LEADS (—) AND LAGS (·) OF SIXTY-TWO<sup>a</sup> BUSINESS INDICATORS, 1948-60

Series	From Business Cycle Peak					From Business Cycle Trough			
	Nov. 1948	July 1953	July 1957	May 1960	Oct. 1949	Aug. 1954	Apr. 1958		
	( months )								
<b>29 LEADING SERIES</b>									
<i>Sensitive Employment and Unemployment Indicators</i>									
°1. Average workweek, manufacturing (M)	n.c.	-9	-20	-12	-6	-3	0		
°2. Accession rate, manufacturing (M)	-35	-30	-23	-14	-6	-4	-2		
30. Nonagric. placements, all industries (M)	-5	-5	-20	-3	-3	-3	-1		
°3. Layoff rate, manufacturing (M) <sup>b</sup>	-27	-8	-20	-12	-5	-4	-3		
4. Temporary layoffs, all industries (M) <sup>b</sup>	n.c.	-35	-13	-13	0	-9	-1		
5. Initial claims for unemployment insurance, state programs (M) <sup>b</sup>	-11	-10	-22	-13	-2	+1	0		
<i>New Investment Commitments</i>									
°6. Mfrs.' new orders, durable goods (M)	-5	-6	-8	-11	-3	-8	-2		
24. Mfrs.' new orders, mach. and equip. (M)	n.a.	-29	-8	-5	-6	-7	-2		
°9. Construction contracts, comm. and indus. build. (M)	-32	n.c.	-16	n.c.	-2	n.c.	+2		
10. New investment orders and contracts (M)	n.a.	-26	-6	-5	-6	-5	-1		
11. Newly approved capital approx., 602 mfg. corp. (Q)	n.a.	+1	-17	-6	n.a.	-6	+1		
27. Buying policy, capital expenditures, NAPA (M)	n.a.	n.a.	-17	-4	n.a.	n.a.	+4		
°7. New nonfarm dwelling units started (M)	-13	n.c.	-31	-13	-8	n.c.	-2		
29. New private housing units, local build. permits (M)	n.a.	n.a.	-29	-18	n.a.	n.a.	-2		
<i>New Businesses and Business Failures</i>									
°12. Net changes in operating businesses (M)	n.c.	-14	-19	-12	-3	-5	-2		
13. New business incorporations, no. of (M)	-28	n.c.	-17	-12	-8	n.c.	-5		
°14. Current liabilities, business failures (M) <sup>b</sup>	n.c.	-28	-26	-12	-6	-5	0		
15. No. of large business failures (M) <sup>b</sup>	-5	-35	-33	-11	-2	-10	-1		

*Profits and Stock Prices*

*16. Corporate profits after taxes (Q)	6	-2	-12	-5	9	2
17. Price-labor cost index (M)	5	-30	-12	5	8	0
18. Profits (before taxes) per \$ of sales, all mfg. corp. (Q)	21	-2	-12	5	9	2
*19. Index of stock prices, Standard and Poor's (M)	5	6	-10	4	11	4

*Inventory Investment, Buying Policy, and Sensitive Prices*

*21. Change in business inventories (Q)	3	-26	-3	1	9	2
31. Changes in book value of mfg. and trade inventories (M)	28	0	4	5	1	0
20. Changes in book value of mfrs.' inventories, purchased materials (M)	n.c.	-2	-11	4	6	2
26. Buying policy, production materials, NAPA (M)	n.a.	n.a.	-12	n.a.	n.a.	2
32. Vendor performance, Chicago PAA (M)	1	-12	7	7	8	4
25. Change in mfrs.' unfilled orders, durable goods (M)	5	-30	-15	4	11	6
*23. Index of industrial materials prices (M)	10	-29	-6	4	6	0

15 ROUGHLY COINCIDENT SERIES

*Employment and Unemployment*

*41. Employees in nonagric. establishments (M)	0	-1	+2	0	-1	0
42. Total nonagric. employment, labor force survey (M)	4	-4	0	3	1	0
*43. Unemployment rate (M) <sup>b</sup>	10	-2	-3	0	1	4
44. Unemployed, number of (M) <sup>b</sup>	12	-2	-3	0	1	4
45. Average weekly insured unemployment, state programs (M) <sup>b</sup>	10	-2	-11	0	1	1
46. Help-wanted advertising in newspapers (M)	n.c.	-4	-3	1	1	0

*Production and Demand*

*47. Index of industrial production (M)	4	0	-4	0	5	0
*49. Gross national product in current dollars (Q)	0	-2	0	5	3	2
*50. Gross national product in 1954 dollars (Q)	0	-2	0	5	3	2
57. Final purchases (Q)	n.c.	+1	n.c.	n.c.	-3	2

*Income, Trade, and Prices*

*51. Bank debits outside New York City (M)	3	n.c.	+3	-2	n.c.	2
*52. Personal income (M)	2	+3	+5	0	5	2

(continued)

TABLE B-2 (concluded)

Series	From Business Cycle Peak				From Business Cycle Trough			
	Nov. 1948	July 1953	July 1957	May 1960	Oct. 1949	Aug. 1954	Apr. 1958	
	( months )							
53. Labor income in mining, mfg., and construc. (M)	- 2	0	0	0	0	0	0	0
*54. Sales of retail stores (M)	n.c.	0	0	- 1	n.c.	- 7	- 1	- 1
55. Index of wholesale prices excl. farm and foods (M)	- 2	n.c.	n.c.	- 1	+ 3	n.c.	n.c.	n.c.
7 LAGGING SERIES								
*61. Business expendit., new plant and equip. (Q)	0	+ 1	+ 1	0	+ 1	+ 6	+ 4	+ 4
*62. Wage and salary cost per unit of output, mfg. (M)	+ 6	+ 5	+ 9	n.c.	+ 9	+ 13	+ 13	+ 13
63. Labor cost per dollar of real GNP (Q)	+ 3	+ 10	+ 7	n.c.	+ 4	+ 6	+ 7	+ 7
*64. Manufacturers' inventories, book value (M)	+ 3½	+ 1½	+ 1½	+ 1½	+ 1½	+ 1½	+ 8½	+ 8½
*65. Mfrs. inventories, finished goods, book value (M)	+ 5½	+ 8½	+ 5½	n.c.	+ 10½	+ 1½	+ 9½	+ 9½
*66. Consumer instalment debt (M)	n.c.	+ 7½	+ 6½	n.c.	n.c.	- 1½	+ 5½	+ 5½
*67. Bank rates on short-term business loans (Q)	+ 7	+ 5	+ 5	- 5	+ 5	+ 7	+ 2	+ 2
14 OTHER U.S. SERIES WITH BUSINESS CYCLE SIGNIFICANCE <sup>a</sup>								
81. Consumer price index (M)	- 3	+ 7	n.c.	n.c.	+ 3	+ 10	n.c.	n.c.
82. Federal cash payments to the public (M)	n.c.	- 1	n.c.	n.c.	+ 10	+ 3	n.c.	n.c.
83. Federal cash receipts from the public (M)	- 7	- 15	- 3	0	- 6	+ 4	0	0
84. Net federal cash surplus or deficit (M)	- 7	- 27	- 15	0	+ 5	0	+ 9	+ 9
85. Rate of change in total U.S. money supply (M)	n.c.	- 20	- 29	- 23	- 17	- 11	- 7	- 7
93. Free reserves (M) <sup>b</sup>	n.c.	- 8	- 15	- 10	n.c.	- 1	+ 1	+ 1
86. U.S. exports, total, excl. military (M)	- 18	n.c.	- 4	n.c.	+ 6	n.c.	+ 10	+ 10
87. U.S. general imports, total (M)	+ 1	- 3	0	- 8	- 3	+ 2	- 2	- 2
88. Merchandise trade balance (M) <sup>b</sup>	n.c.	- 3	- 20	- 12	n.c.	+ 2	- 16	- 16
89. Excess of receipts or payments in U.S. balance of payments (Q)	n.a.	n.c.	- 5	- 3	+ 10	n.c.	+ 16	+ 16
94. Index of construc. contracts, total value, Dodge (M)	- 12	n.c.	- 4	- 23	- 9	n.c.	- 2	- 2

<sup>a</sup>No timing comparisons have been made for the seven foreign industrial production indexes (series 121-128); the three Defense Department series (90-92) have been omitted because of their brevity and the irregularity of their movements.

<sup>b</sup>Specific cycle troughs are compared with business cycle peaks and specific cycle troughs with business cycle troughs.

<sup>c</sup>Series included in the National Bureau's 1960 list of 26 indicators.

n.c. = no corresponding turn. n.a. = not available.