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**COMPOSITE INDEXES
OF LEADING, COINCIDING
AND LAGGING INDICATORS, 1948-67**

Julius Shiskin and Geoffrey H. Moore

A Supplement to National Bureau Report 1



**NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.
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In order to provide convenient summaries of the current movements in important indicators of economic activity, the National Bureau has experimented over the years with various statistical techniques. One of the most satisfactory is the "amplitude-adjusted" index, developed by Julius Shiskin and first published in *Signals of Recession and Recovery* (1961). The latest version of this type of index was published early in 1967 in Moore and Shiskin's *Indicators of Business Expansions and Contractions* (NBER Occasional Paper 103). Since considerable interest has been expressed in the recent movement of these indexes, the appended chart and table have been prepared.

The several National Bureau studies devoted to evaluating the relevance and reliability of economic indicators for observing and forecasting short-term movements in aggregate economic activity have produced (a) a set of explicit criteria of performance, formalized in an objective scoring plan, and (b) a classification of indicators according to cyclical timing and type of economic process represented. These results make it possible to combine the indicators in a given class into weighted indexes representative of the class. Thus, series that usually lead in the business cycle can be combined into one index, coincident series into another, and lagging series into a third. Similarly, in the leading group, series that represent orders or commitments for capital investment projects can be combined into one index, those representing inventory investment or materials purchasing

into a second, and those representing sensitive flows of money or credit into a third.

The series selected for inclusion in each of the indexes are homogeneous in a special sense, namely, they measure related aspects of business change, are sensitive to business cycles, and experience similar timing behavior during cyclical fluctuations. While the series included in each index are heterogeneous in that they are not expressed in a common unit, the index nevertheless provides a simple measure of a significant complex of economic activities which experience business cycle fluctuations with roughly similar timing. From this point of view some of the best known aggregates are heterogeneous. For example, gross national product includes the change in inventories, a leading indicator; consumption expenditures, a coincident indicator; and investment expenditures, a lagging indicator. The indexes presented here concentrate upon homogeneity in cyclical behavior.

The practice in index number construction is to utilize weights that are directly related to the purpose of the measure being compiled. For example, in constructing an index of market output, value-added or value of product weights are used, but where indexes of output are constructed to determine man-hour requirements, man-hour weights are utilized. Similarly, in constructing a forecast of, say, gross national product by means of an econometric model, a number of variables expressed in heterogeneous units are weighted by coefficients that, directly or indirectly, express their estimated effect upon GNP. The analo-

gous procedure here is to apply weights based upon the component series' value in forecasting or identifying short-term movements in aggregate economic activity. Such weights, in the form of scores ranging up to 100, were developed for each of the series in *Indicators of Business Expansions and Contractions*, and are applied in constructing the amplitude-adjusted indexes.

The amplitude-adjusted index can be constructed for any group of indicators in five simple steps: (1) compute the month-to-month percentage changes in each indicator; (2) standardize these percentage changes so that their average, without regard to sign, for each indicator over a period of years is equal to unity (1.0 per cent per month); (3) average the adjusted percentages for a given month for the several indicators, using as weights the scores described above; (4) adjust this average so that it too will equal 1.0 per cent per month over a period of years; and (5) cumulate these adjusted average percentage changes into a monthly index. The adjustment factors for steps 2 and 4, and the weights for step 3, are provided from historical data.

What this procedure does is allow for the fact that some indicators, such as new orders, typically move in wide swings while others, such as the average workweek, experience narrow (but nevertheless significant) fluctuations. Standardizing makes the percentage changes in the several indicators comparable in size, on the average. It answers the question whether the current change in an indicator is large or small *relative to its usual movement*. For example, when the standardized, or amplitude-adjusted, percentage increase is 2.0, the indicator is rising twice as fast as its average rate of change in the past; if the increase is 0.5, it is rising only half as fast as the historical average.

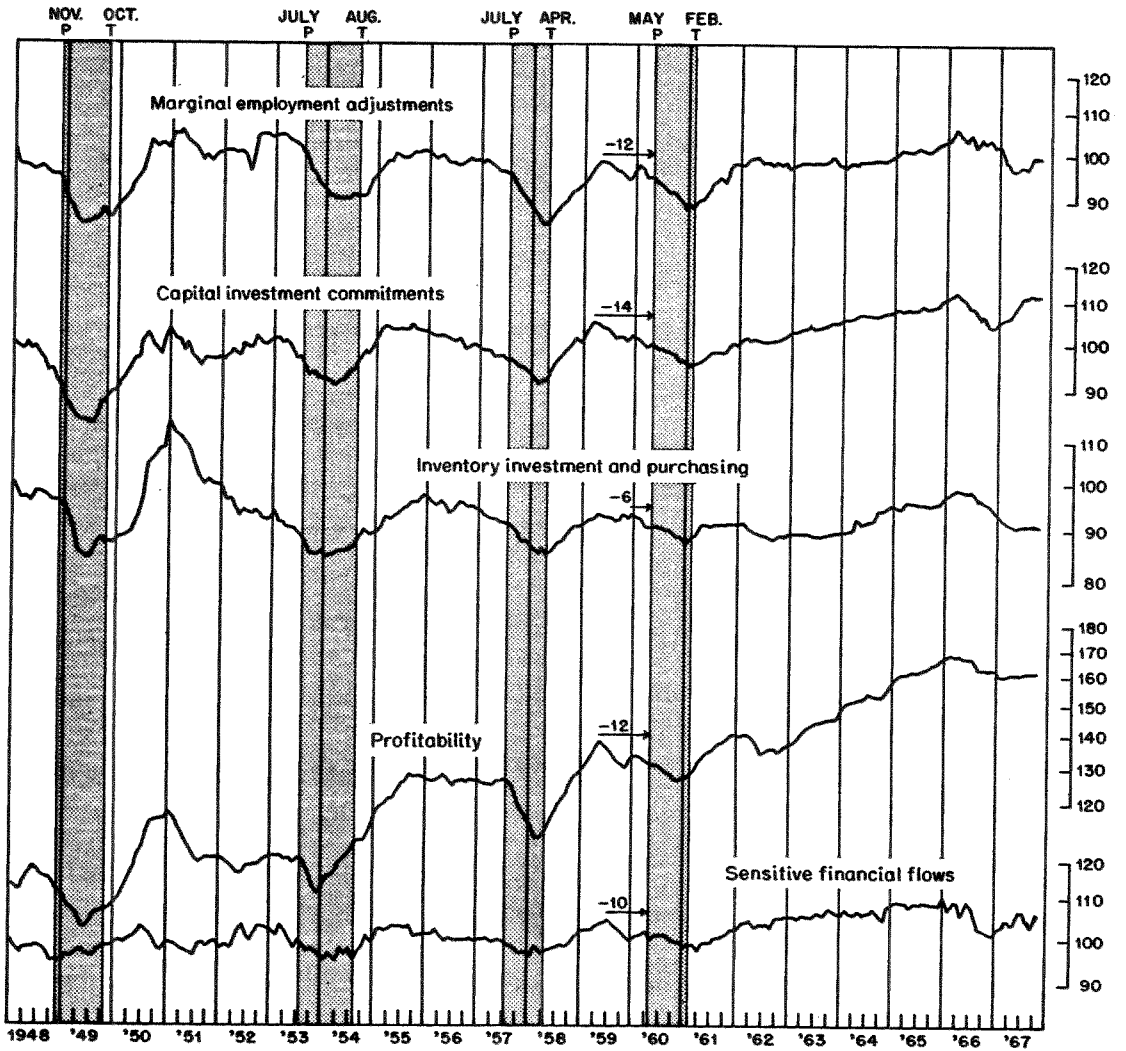
Each indicator included in the average of the amplitude-adjusted changes for a group has, apart from its weight, an equal opportunity to influence the average, since the

adjusted changes for each indicator center around 1.0. The average itself, however, will generally be less than unity, because a rise in some indicators is often offset by a decline in others. Hence the average for each group is also subject to an amplitude-adjustment (step 4, above), to make its value over a long period equal to 1.0. The swings in each of the indexes constructed by chaining these adjusted average changes together will then be of roughly the same magnitude, and can readily be compared.

The index for the leading group is also subject to a further adjustment, designed to make its long-run trend the same as that of the index of coincident series. This "reverse trend-adjustment" has the effect of shortening leads at business cycle peaks and lengthening them at troughs, as well as making the leads more uniform from cycle to cycle. It improves the cyclical comparability among the leading, coincident and lagging indexes by removing most of the differences in long-run trend. The major difference that remains is in cyclical timing, with the leading index typically moving first, the coincident index next, and the lagging index last. A detailed explanation of the reverse trend-adjustment procedure is given in Shiskin's paper on this subject in *The Review of Economic and Statistics*, February 1967.

It is noteworthy that when the scoring system used to provide weights for the individual indicators is applied to the amplitude-adjusted indexes, the scores earned by the indexes are higher than those for any of the component indicators and significantly higher than the average. For a full account of the indexes and the component indicators, their properties, uses and limitations, see *Indicators of Business Expansions and Contractions* by Moore and Shiskin. Current data for each of the component indicators and related series are charted monthly by the United States Department of Commerce in *Business Cycle Developments*.

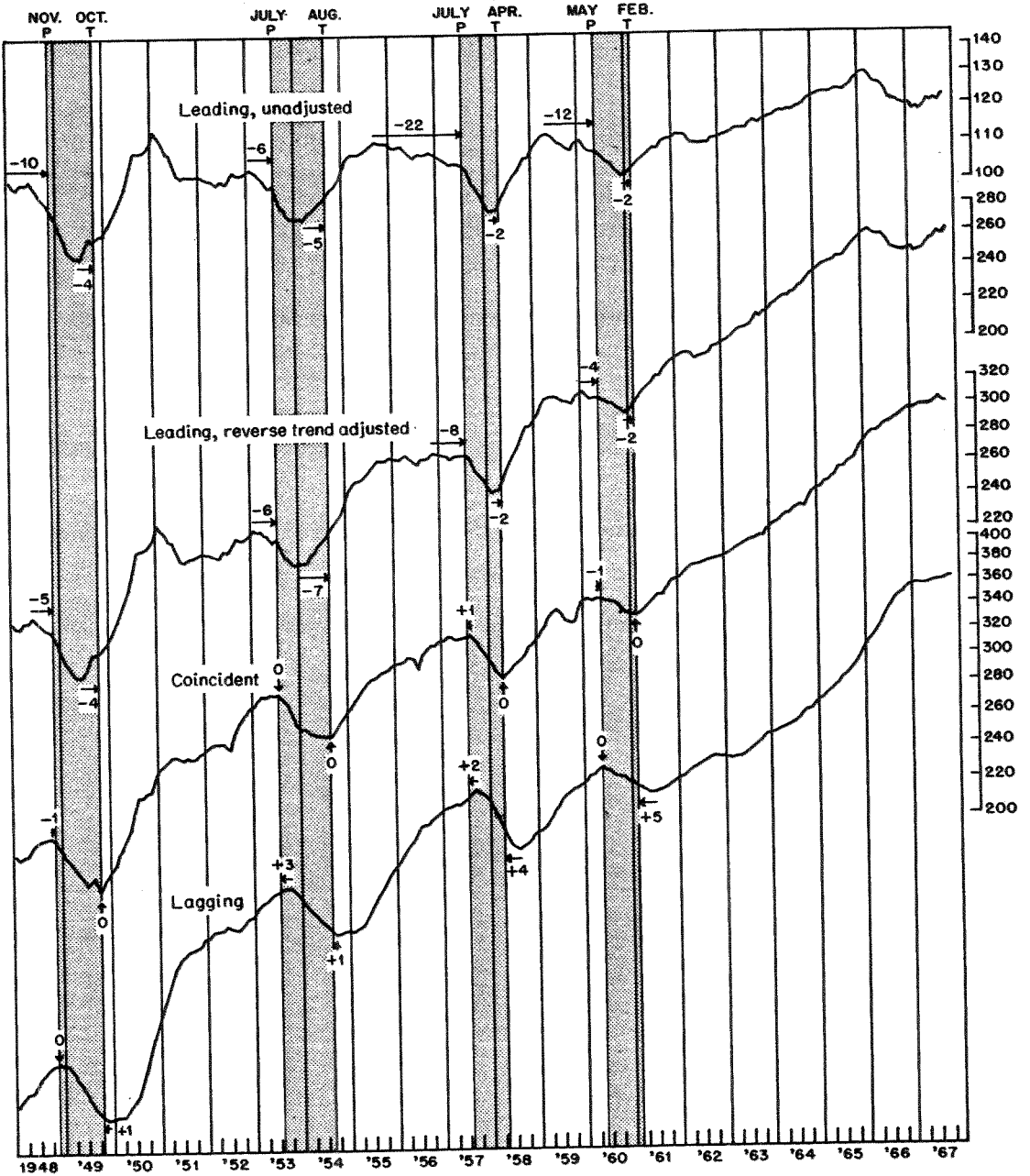
CHART 1
Composite Indexes of Leading, Coincident, and Lagging Indicators
a. Leading Indicator Subgroup Indexes (Jan. 1948:100)



Numbers entered with arrows indicate months of lead (-) or lag (+) from business cycle peak and trough dates at top of chart. Shaded areas are business cycle contractions; white areas are expansions.

CHART 1 (concl.)

b. Leading, Coincident, and Lagging Indexes (Jan. 1948:100)



Current Changes in the Indicators and Amplitude-Adjusted Indexes

Series ^a (1)	Unit (2)	Weight (3)	Basic Data ^a				Av. Per Cent Change, Without Sign, 1953-66 ^b (7)	Current Per Cent Change ^c		Amplitude-Adj. Per Cent Change ^d	
			Aug. 1967 (4)	Sept. 1967 (5)	Oct. 1967 (6)	Aug. to Sept. 1967 (8)		Sept. to Oct. 1967 (9)	Aug. to Sept. 1967 (10)	Sept. to Oct. 1967 (11)	
			LEADING INDICATORS								
Marginal employment adjustments											
1. Av. workweek, prod. workers, mfg.	Hours	66	40.7	40.8	40.6	0.5	+0.2	-0.5	+0.5	-1.0	
30. Nonagr. placements, all industries	Thousands	68	487	471	474	2.0	-3.3	+0.6	-1.7	+0.3	
5. Initial claims, unemploy. insur. (1)	Thousands	73	211	200	202	5.1	+5.4	-1.0	+1.1	-0.2	
Average or index, 3 series	Jan. '48=100	-	98.9	98.9	98.5	0.8	-	-	-0.02	-0.4	
Capital investment commitments											
38. Index of net business formation	1957-59=100	68	110.3	110.2	n.a.	0.8	-0.1	n.a.	-0.1	n.a.	
6. New orders, durable goods industries	Bil. dollars	78	23.73	23.42	23.36	3.6	-1.3	-0.3	-0.4	-0.1	
10. Contracts & orders, plant & equipment	Bil. dollars	64	6.16	5.74	5.99	4.6	-7.1	+4.3	-1.4	+0.9	
29. New bldg. permits, Pvt. housing units	1957-59=100	67	99.4	102.3	106.1	3.8	+2.9	+3.6	+0.7	+0.9	
Average or index, 4 series	Jan. '48=100	-	111.8	111.4	112.2	0.8	-	-	-0.4	+0.7	
Inventory investment and purchasing											
31. Mfg. & trade inventories, change in book value ^c	An. rate, bil. \$	65	+9.4	-0.7	+5.0	3.6	-10.1	+5.7	-2.8	+1.6	
37. Purchased materials, % of companies reporting higher inventories	Per cent	62	43	45	47	6.5	+4.5	+4.3	+0.7	+0.6	
25. Change in unfilled orders, durable goods industries ^c	Bil. dollars	68	+0.09	+0.43	+1.04	0.47	+0.34	+0.61	+0.8	+1.4	
23. Industrial materials prices (u)	1957-59=100	67	98.1	97.8	97.7	1.3	-0.3	-0.1	-0.2	-0.1	
Average or index, 4 series	Jan. '48=100	-	91.6	91.1	92.3	0.7	-	-	-0.6	+1.3	
Profitability											
19. Stock prices, 500 common stocks (u)	1941-43=10	81	94.49	95.81	95.66	2.5	+1.4	-0.2	+0.6	-0.1	
16. Corporate profits after taxes, Q	An. rate, bil. \$	68	47.2	...	...	5.4	...	...	...	...
17. Ratio, price to unit labor cost, mfg.	1957-59=100	69	99.8	99.2	99.4	0.6	-0.6	+0.2	-1.0	+0.3	
Average or index, 3 series	Jan. '48=100	-	160.3	159.9	160.2	0.8	-	-	-0.2	+0.2	

Series ^a (1)	Unit (2)	Weight (3)	Basic Data ^a				Av. Per Cent Change, Without Sign, 1953-66 ^b (7)	Current Per Cent Change ^c		Amplitude-Adj. Per Cent Changed	
			Aug. 1967		Sept. 1967			Aug. 1967	Sept. 1967	Aug. 1967	Sept. 1967
			(4)	(5)	(6)	(8)		(9)	(10)	(11)	
LEADING INDICATORS (concl.)											
Sensitive financial flows											
98. Change in money supply & time dep. ^c	An. rate, bil. \$	68	+12.96	+6.12	+9.72	2.56	-6.84	+3.60	-3.2	+1.7	
33. Change in mortgage debt ^c	An. rate, bil. \$	43	+22.84	+20.84	n.a.	1.49	-2.00	n.a.	-1.0	n.a.	
113. Change in consumer instalment debt ^c	An. rate, bil. \$	63	+4.13	+3.41	+3.73	0.86	-0.72	+0.32	-0.9	+0.4	
112. Change in bank loans to businesses ^c	An. rate, bil. \$	53	-9.44	-2.36	+5.36	2.08	+7.08	+7.72	+3.2	+3.5	
Average or index, 4 series	Jan. '48=100	57	103.2	102.2	105.9	0.52	-	-	-0.9	+3.6	
Index, 18 Leading Indicators, unadjusted	Jan. '48=100	-	121.6	120.9	122.6	0.5	-	-	-0.6	+1.4	
Index, 18 Leading Indicators, reverse trend adjusted ^e	Jan. '48=100	-	258.0	257.4	261.7	-	-	-	-0.3	+1.7	
ROUGHLY COINCIDENT INDICATORS											
41. Employees in nonagr. establishments	Thousands	81	66,190	66,055	66,231	0.3	-0.2	+0.3	-0.7	+1.0	
43. Unemployment rate, total (i)	Per cent	75	3.8	4.1	4.3	3.9	-7.6	-4.8	-2.0	-1.3	
50. Gross national product, 1958 \$, Q	An. rate, bil. \$	73	672.0	...	...	1.3	...	...	...	...
47. Industrial production index	1957-59=100	72	158.1	156.8	156.4	1.0	-0.8	-0.3	-0.8	-0.2	
52. Personal income	An. rate, bil. \$	74	631.6	634.4	636.0	0.5	+0.4	+0.3	+0.8	+0.5	
816. Manufacturing and trade sales	Mil. dollars	71	89,295	88,783	87,917	1.0	-0.6	-1.0	-0.5	-0.9	
Average or index, 6 series	Jan. '48=100	-	304.3	302.1	301.4	0.9	-	-	-0.7	-0.2	
LAGGING INDICATORS											
502. Unemployment rate, persons unempl. 15 weeks and over (i)	Per cent	69	0.6	0.6	0.6	6.1	0.0	0.0	0.0	0.0	
61. Bus. expenditures, new plant and equipment, Q	An. rate, bil. \$	86	60.90	...	...	3.2	...	...	...	...
71. Mfg. & trade inventories, book val.	Bil. dollars	71	138.19	138.13	138.54	0.5	-0.04	+0.3	-0.1	+0.6	
62. Labor cost per unit of output, mfg.	1957-59=100	68	107.0	108.0	107.7	0.6	+0.9	-0.3	+1.7	-0.5	
72. Commercial and industrial loans outstanding	Mil. dollars	57	62,944	63,309	63,592	0.9	+0.6	+0.4	+0.6	+0.4	
67. Bank rates on short-term business loans, Q (u)	Per cent	60	5.94	...	...	2.1	...	...	...	...
Average or index, 6 series	Jan. '48=100	-	355.3	357.7	358.7	0.9	-	-	+0.7	+0.3	

- a The list of indicators is a modification of the 1966 NBER "short list" of 12 leading, 7 roughly coincident, and 6 lagging indicators. Six leading indicators (nos. 5, 37, 25, 98, 33, 112) are included in addition to the twelve on the short list in order to make the subgroup indexes more representative; one roughly coincident indicator on the short list (retail sales) is omitted since it is included in series 816. Series are seasonally adjusted except for those series, indicated by (u), that appear to contain no seasonal movement. Figures for quarterly series (Q) are placed in the middle month of the quarter. Those series, designated (i), that usually fall when general business activity rises and rise when business falls are inverted so that in cols. 8 to 11 rises are shown as declines and declines as rises. Per cent changes for all series are computed using the average of the initial and terminal figures as the base, rather than the initial figure alone. This makes the range of percentage increases and decreases the same, namely ± 100 . The weights (col. 3) applied to the amplitude-adjusted changes (cols. 10, 11) are the scores earned by each indicator as given in Indicators of Business Expansions and Contractions, Table 6, col. 3.
- b The period varies among the series; however, for most series, the period covered is 1953-66.
- c Where the basic data for a series are expressed in plus or minus amounts, the changes are month-to-month differences expressed in the same unit of measure as the basic data, rather than in percentages.
- d Computed by dividing cols. 8 and 9 by col. 7. The entries for the indexes are the weighted averages of the amplitude-adjusted changes for the component series divided by the entry for the index in col. 7.
- e The amplitude-adjusted changes in the unadjusted index (cols. 10 and 11) are increased by 0.32, which is the difference between the monthly rates of secular trend in the indexes of the leading and the roughly coincident groups.
- Note: In the computation of averages and indexes, per cent changes are computed to more decimals than are shown here.

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