Volume Title: Orders, Production, and Investment: A Cyclical and Structural Analysis

Volume Author/Editor: Victor Zarnowitz

Volume Publisher: NBER

Volume ISBN: 0-870-14215-1

Volume URL: http://www.nber.org/books/zarn73-1

Publication Date: 1973

Chapter Title: Patterns and Diffusion of Cyclical Movements

Chapter Author: Victor Zarnowitz

Chapter URL: http://www.nber.org/chapters/c3559

Chapter pages in book: (p. 588 - 640)

12

PATTERNS AND DIFFUSION OF CYCLICAL MOVEMENTS

IN THIS CHAPTER, the analysis of the behavior of manufacturers' orders during business cycles is completed and is related to cyclical changes in several variables representing production, the successive stages of business investment, and financing. The measures presented refer to stages of general economic fluctuations. They are designed to distill the major features of those changes in the processes described that occur during expansions, downturns, contractions, and upturns of the economy at large. The focus is on typical patterns, but in some cases the deviations from them in individual historical episodes are also examined. Attention is given particularly to certain factors that are presumed to contribute to the early downturns and upturns in orders and contracts for plant and equipment and in purchases of materials and supplies.

In addition, in this chapter the diffusion of new orders is considered, that is, how the movements in them spread among the different industries during business expansions and contractions. This analysis shows systematic early changes in the scope of the demand for industrial products and how these changes are related to those in the diffusion of production and some other activities.

Manufacturers' Orders and Production During Business Cycles

Reference Cycle Patterns for Durable Goods Aggregates

Reference cycle patterns provide an instructive device for describing the movements of a series during business cycles. They are similar

to the specific-cycle patterns presented in Chapter 3, but are computed for periods defined by major fluctuations in aggregate economic activity rather than in the particular processes represented by the given series.[1]

Chart 12-1 presents the patterns for new orders received by durable goods manufacturers. It is based on the three compilations of order data described in the preceding chapter (see Chart 11-1 and the text) and covers each of the nine business cycles of the four decades 1921–61. As noted before, the data for the earlier years have a rather narrow coverage, and this limits the comparability of interwar and postwar patterns. A joint evaluation of these measures is thereby impaired but not entirely invalidated.[2]

The huge movements of the thirties stand out conspicuously in two of the patterns: The 1927–33 cycle is dominated by a long and steep decline; and the 1933–38 cycle, by the protracted rise from the nadir of the depression. The pattern for the war cycle, 1938–45, shows another fluctuation of extraordinarily large amplitude. Although the expansion part of this cycle lasted eighty months and the contraction only eight months, the rapid fall of orders in the latter phase matched the amplitude of their rise in the former phase. Relative to their average levels in each episode, new orders for durable goods fluctuated much less during the other business cycles covered. However, their rises during the early expansion stages in the cycle of 1921–24 and again in the two cycles of 1945–54 were vigorous enough; it was the ensuing declines that were brief and shallow. Very mild fluctuations, with shorter rises and longer declines, characterized the behavior of durables orders in the 1924–27 cycle and the two recent cycles of 1954–61.

[1] The series is divided into segments, each of which covers one business ("reference") cycle usually dated from the initial to the final trough. A pattern is computed for each of these successive reference segments. It consists of nine figures, one for each of the consecutive stages of the reference cycle. Stages I, V, and IX are three-month periods centered on the initial, middle, and terminal turns of a business cycle, respectively. Stages II, III, and IV cover successive thirds of the expansion, and stages VI, VII, and VIII cover similar portions of the contraction. All measures are in "reference cycle relatives"—percentages of the average standing of the data during the given business cycle. Thus the construction of a reference cycle pattern is fully analogous to the construction of a specific-cycle pattern (cf. Chapter 3, note 34). For full discussion of the method, see A. F. Burns and W. C. Mitchell, *Measuring Business Cycles*, New York, NBER, 1946, pp. 160–70.

[2] The Commerce-NBER index, mainly reflecting new orders for steel, lumber, and textile products, covers the three cycles of 1921–33. Its behavior in 1929–33 resembled rather well the concurrent behavior of the broader NICB index (Chart 11-1). The NICB index is used in the pattern for the 1933–38 cycle, and the aggregative OBE-Census series cover the five cycles of 1938–61. (The NICB index for 1929–38 was linked to the OBE data, which go back to 1939, by converting the former to a series in millions of current dollars through multiplication by a level-adjustment factor of 18.303.) Considerable similarity is also observed in the movements of the NICB index and the OBE series through most of their overlap period, that is, 1939–41.

Chart 12-1 also confirms the familiar tendency of new orders for durable goods to turn ahead of business cycle peaks and troughs, although some of the leads observed in the monthly data are too short to register as cycle stages. Leads of one to three stages account for six of the nine comparisons at peaks, and leads of one to two stages account for seven of the nine comparisons at troughs.[3]

The nine-point pattern computed by averaging the individual reference cycle patterns of a series stage by stage is designed to bring out the typical features in the behavior of the activity concerned during the business cycle. The assumption of the procedure is that cyclical behavior does have such persistent traits and that they are important; the more valid this assumption is, the more useful the method.

Averages of the single-cycle patterns of new orders (N) of durable goods manufacturers for three selected subperiods and for the total period covered are shown in Chart 12-2, together with the corresponding average patterns for production (Z). The typical expansion interval for new orders covers stages VIII–IV in each case, which involves one-stage leads at both peaks and troughs.[4] The typical expansion interval in production is I–V throughout, which means average simultaneous-stage timing in each subperiod. The correspondence of the patterns for N and Z is impressively close.

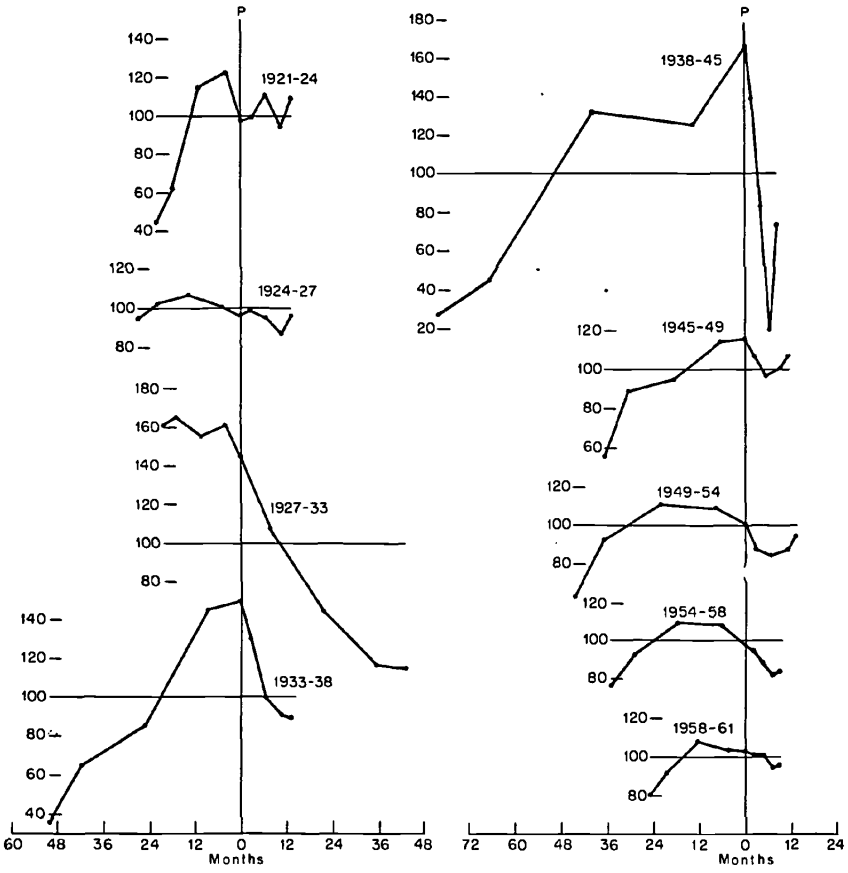
Since the specific-cycle amplitudes are typically larger for new orders than for production, one may expect an analogous relationship between the amplitudes of the average reference cycle patterns; but this need not be so, because of timing differences. The average pattern for the postwar cycles in new orders does have a larger rise-and-fall amplitude than its counterpart for production (the figures in reference cycle relatives are 57 and 47, respectively). In some of the earlier cycles this does not hold, but this could be because the series do not strictly correspond.

Comprehensive coverage of manufacturers' unfilled orders is avail-

[3] It should be clear that the reference cycle patterns can provide only a general picture of how the major fluctuations in a given series are timed relative to the business cycles, and a rather imprecise and difficult-to-interpret picture at that. This is because the reference cycle stages are often too long for a sensitive timing analysis and, particularly, because they differ in duration as do the individual business cycles. Measures in fixed calendar-time units are therefore definitely preferable for timing studies, and my use of reference cycle patterns for this purpose is strictly peripheral.

[4] When the 1945–49 cycle, which includes the early postwar reconversion period, is excluded, a two-stage lead at the peak is obtained in the average pattern for 1949–61 (i.e., the typical expansion interval for the most recent cycles is VIII–III).

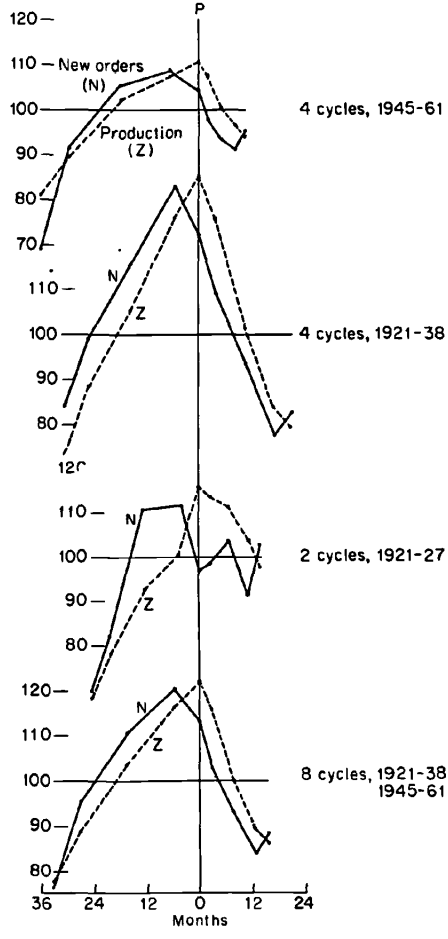
Chart 12-1
Reference Cycle Patterns in Value of New Orders Received by Durable Goods Manufacturers, 1921–61



able only for the post-World War II period. Chart 12-3 shows the behavior of total backlogs of durable goods orders in the four reference cycles of the period 1945–61. The patterns characteristically increase in stages I–IV (but the expansion phase includes only stages I–III in the 1945–49 cycle and only stages II–IV in the 1958–61 cycle). As a corollary, declines in the patterns typically extend at least through the interval between stages IV and IX.

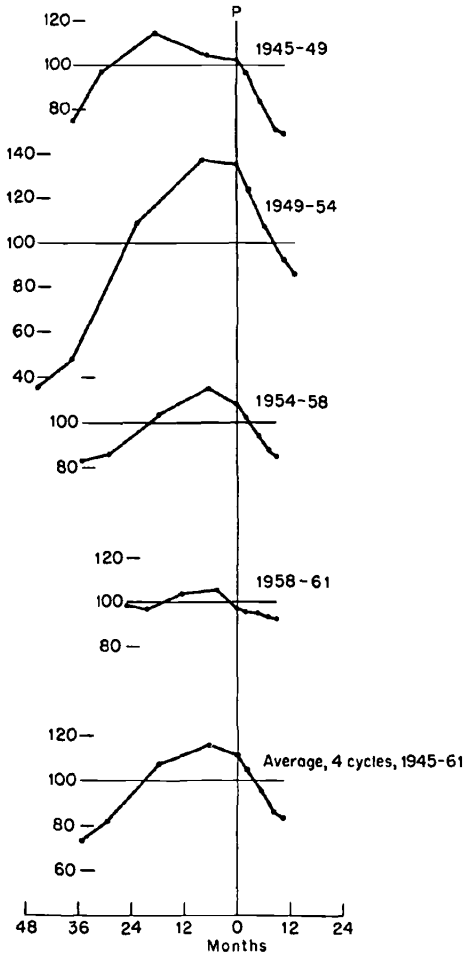
The facts implied by these diagrams have already been encountered earlier in this study, although they were brought out by different

Chart 12-2
Average Reference Cycle Patterns in New Orders and Production of Durable Goods Manufacturers, 1921–38 and 1945–61



methods and in different forms. Clearly, backlogs of durables orders turned down early at the recent business recessions. Here it is shown that their leads amounted to one or two long expansion stages. At troughs, the timing of the backlogs was in these terms coincident. The patterns retain the intracycle trends, which were downward in the first and last of these episodes. Their amplitudes are large, except for the 1958–61 cycle.

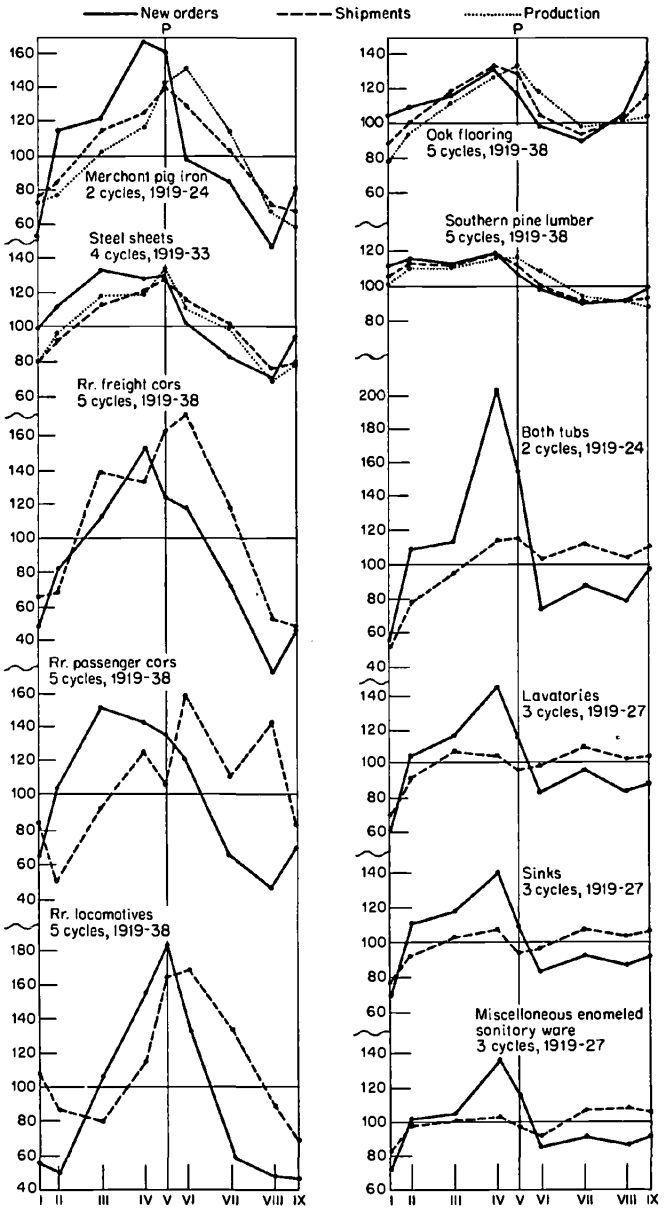
Chart 12-3
Reference Cycle Patterns in Manufacturers' Unfilled Orders, Durable Goods Industries, 1945–61



Summary Measures for Selected Products

Chart 12-4 presents average reference patterns for twenty-six series on new orders, production, and shipments, divided into eleven groups for as many commodities. Comparability is assured in that the graphs for the same product cover the same business cycles. The data are for 1919–38. The horizontal scales are drawn up uniformly, ignoring the differences in duration between the cycles covered by the averages.

Chart 12-4
Average Reference Cycle Patterns in New Orders, Production, and Shipments, Eleven Commodities, 1919–38



A close look at the chart reveals that in most cases new orders exceed shipments and production in the average amplitude of their movements during business cycles (all patterns are drawn to the same vertical scale). In some instances the differences are very pronounced, in others small (e.g., compare the patterns for locomotives with those for steel sheets). The patterns on the left-hand side of the chart have larger amplitudes on the whole than those on the right. The left-hand patterns represent in part goods made largely to the specifications of industrial buyers and in part heavy equipment produced only upon advance orders. Those on the right represent staples made for sale to builders.

Numerical measures supporting the visual impressions conveyed by Chart 12-4 are presented in Table 12-1. The average reference cycle amplitude (column 3) is computed from the standings of the series in its typical trough and peak stages, as identified in column 2.[5] This figure is in each case smaller than the corresponding measure of the average specific-cycle amplitude (cf. columns 3 and 4). The ratios of the two measures (column 5) roughly indicate the closeness of the relation in time between the specific cycles of a series and the cycles in general business.

Fluctuations in new orders exceed those in shipments and production not only in specific-cycle but also in reference cycle measurements (columns 6 and 7). The three exceptions to this rule (lines 10, 14, and 15) can be traced to loose relationships between the business cycles and specific cycles of the series involved.

Comparisons of the typical expansion intervals in column 2 indicate that new orders for railroad equipment and metal products, which are made to order, led production and shipments by one or two (in one case by three) reference stages. On the other hand, the timing of new orders for the staples used in construction (lines 13–24) was in terms of the reference cycle stages coincident with the timing of output and deliveries.[6]

[5] Each entry in column 3 is the sum of two average amplitude measures, one for the phase matched with expansions and the other for the phase matched with contractions, with signs disregarded. Cf. Wesley C. Mitchell, *What Happens During Business Cycles: A Progress Report*, New York, NBER, 1951, pp. 51–52 and 100–102.

[6] According to Table 12-1, column 2, eight types of division of reference cycles into "expansion" and "contraction" are found for the series included (the total number of possible divisions in 24; of the schemes that are not represented, all but four indicate typical *lags* at business revivals and/or recessions). It is clear from these calculations that all new-order series lead at both peaks and troughs, while for the series on shipments and production as a group, only half of the measures indicate leads.

Table 12-1
Typical Expansion Intervals and Average Cyclical Amplitudes of New Orders, Shipments, and Production, Ten Commodities, 1919–38

Commodity, Reference Cycle Period, and Series [a]	Specific-Cycle Period [b] (1)	Expansion Interval [c] (2)	Average Amplitude, rise + fall (reference cycle relatives)		Ratios of Average Amplitudes (per cent)		
			Reference Cycles [d] (3)	Specific Cycles [e] (4)	Ref. Cycles to Specific Cycles [f] (5)	Shipments or Prod. to New Orders: Ref. Cycles [g] (6)	Shipments or Prod. to New Orders: Spec. Cycles [h] (7)
MERCHANT PIG IRON, 1919–24 (2)							
1. New orders	1919–24 (2)	VIII–IV	262.0	373.8	70.1		
2. Shipments	1919–24 (2)	I–V	135.1	162.6	83.1	51.6	43.5
3. Production	1919–24 (2)	I–V	149.7	200.4	74.7	57.1	53.6
STEEL SHEETS, 1919–33 (4)							
4. New orders	1919–32 (4)	VIII–III	120.7	187.9	64.2		
5. Shipments	1919–32 (4)	I–V	100.3	130.4	76.9	83.1	69.4
6. Production	1919–33 (4)	VIII–V	115.9	154.8	74.9	96.0	82.4
FREIGHT CARS, 1919–38 (5)							
7. New orders	1919–38 (7)	VIII–IV	249.4	571.4	43.6		
8. Shipments	1919–38 (6)	I–V	209.9	540.6	38.8	84.2	94.6

	RAILROAD PASSENGER CARS, 1919–38 (5)							
9.	New orders	1919–37 (7)	VIII–IV	196.0	498.0	39.4		
10.	Shipments	1919–39 (6)	I–V	39.2	557.3	7.0	20.0	111.9
	RAILROAD LOCOMOTIVES, 1919–38 (5)							
11.	New orders	1919–37 (7)	VIII–IV	214.4	537.6	39.9		
12.	Shipments	1920–38 (6)	III–VI	152.1	328.2	46.3	70.9	61.0
	OAK FLOORING, 1919–38 (5)							
13.	New orders	1920–37 (5)	VII–III	64.3	194.9	33.0		
14.	Shipments	1920–37 (5)	VII–IV	88.7	145.3	61.0	137.9	74.6
15.	Production	1921–38 (4)	VII–IV	77.6	148.7	63.8	120.7	76.3
	SOUTHERN PINE LUMBER, 1919–38 (5)							
16.	New orders	1920–37 (5)	VII–IV	50.7	106.7	47.5		
17.	Shipments	1919–38 (6)	VII–IV	41.6	83.0	50.1	82.0	77.8
18.	Production	1918–38 (5)	I–IV	44.1	84.0	52.5	87.0	78.7
	BATH TUBS, 1919–24 (2)							
19.	New orders	1918–23 (2)	VIII–IV	295.6	381.1	77.6		
20.	Shipments	1918–24 (2)	VIII–IV	86.1	156.4	55.0	29.1	41.0
	LAVATORIES, 1919–27 (3)							
21.	New orders	1918–28 (3)	VIII–IV	156.6	226.7	69.1		
22.	Shipments	1919–24 (2)	VIII–IV	44.0	160.4	27.4	28.1	70.8
	SINKS, 1919–27 (3)							
23.	New orders	1918–28 (3)	VIII–IV	135.2	209.0	64.7		
24.	Shipments	1919–24 (2)	VIII–IV	40.6	148.2	27.4	30.0	70.9

Notes to Table 12-1

[a] The same series are included as in Chart 12-3, except for new orders and shipments of miscellaneous enameled sanitary ware (each of these series covers one complete specific cycle only). The longest reference cycle period covered by each of the series (new orders, shipments and, wherever available, production) relating to the same commodity is the one shown. The number of cycles covered is shown in parentheses.

[b] The specific-cycle periods listed are those that best match the reference cycle period for the given commodity. The number of cycles covered is shown in parentheses.

[c] Each expansion interval is based on the patterns for *all* reference cycles covered by the given series (as of the time the series was analyzed in the business cycle unit of the National Bureau). The intervals for the following series are based on longer reference-cycle periods than those listed in the table.

New orders: Railroad freight cars, 1879–1938, 16 reference cycles (the expansion interval for the six reference cycles, 1914–38, is also VIII–IV, however); railroad passenger cars, 1870–1938, 17 reference cycles; railroad locomotives, 1879–1938, 16 reference cycles; oak flooring, 1914–38, 6 reference cycles.

Shipments: Oak flooring, 1914–38, 6 reference cycles.

Production: Oak flooring, 1919–49, 7 reference cycles.

[d] Based on the reference-cycle periods listed in the table beside the commodity name.

[e] Based on the specific-cycle periods listed in column 1.

[f] Percentage ratio of the corresponding entries in columns 3 and 4. [= (average reference cycle amplitude ÷ average specific-cycle amplitude) × 100].

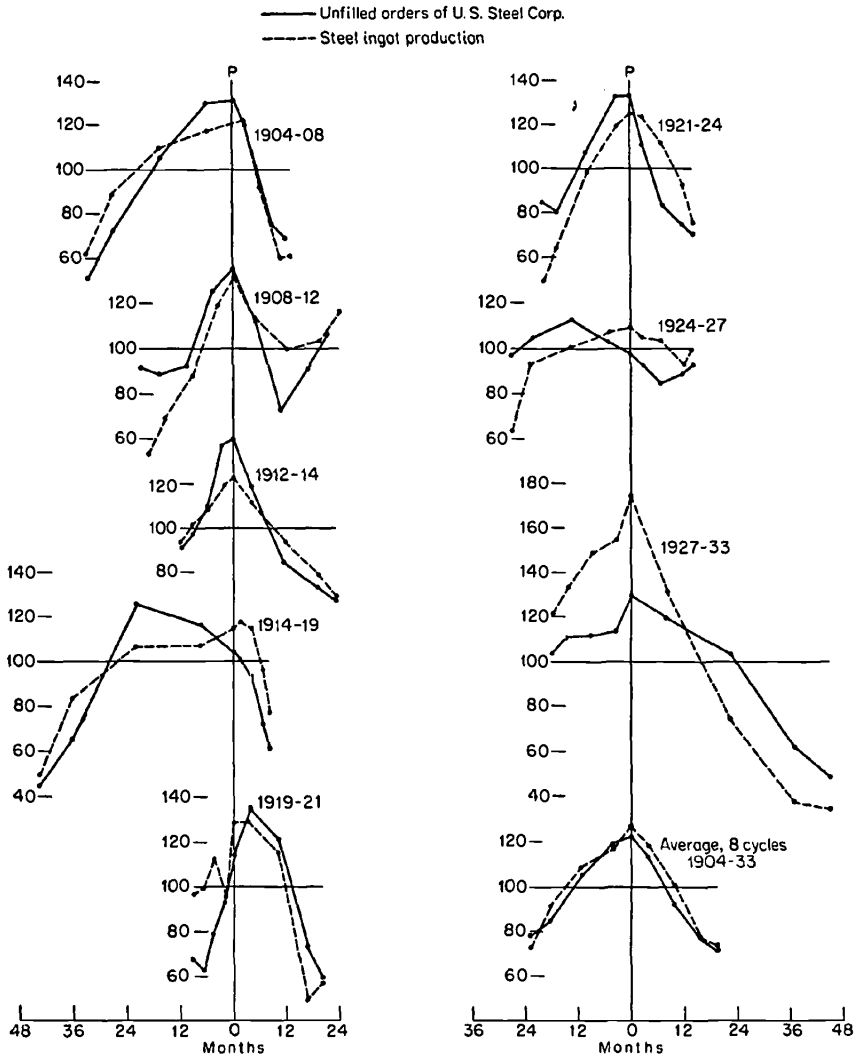
[g] Average reference cycle amplitude of shipments or production as percentage of average reference cycle amplitude of new orders. Based on corresponding entries in column 3.

[h] Average specific-cycle amplitude of shipments or production as percentage of average specific-cycle amplitude of new orders. Based on corresponding entries in column 4.

For additional historical perspective, Chart 12-5 shows the reference cycle patterns for unfilled orders of the U.S. Steel Corporation and for steel ingot production, 1904–33. These patterns indicate that new orders for steel must have been increasing in each expansion and decreasing in each contraction at rates substantially exceeding those of output and shipments. The change in backlogs of steel orders was typically positive in expansions and negative in contractions, and these cyclical movements were usually large. This confirms the familiar thesis that the effective demand for steel has long been very sensitive to fluctuations in aggregate economic activity.

The steel industry produces thousands of products, most of which are made according to buyers' specifications regarding shape, dimension, and chemical composition. To the diversity of these made-to-order items corresponds a diversity of their prices and other sales

Chart 12-5
Reference Cycle Patterns in Unfilled Orders of U.S. Steel Corporation and in Steel Ingot Production, 1904–33



terms including delivery periods. The movements of quantities demanded and produced are no doubt far from simultaneous for these different products; yet their confluence is apparently pronounced, judging from the large amplitudes of the aggregate patterns. At certain times, steel users buy well beyond their current production requirements and build up large stocks; steel output rises then, but typically not fast enough to prevent an expansion in steel order backlogs. In contrast to these boom developments, users' stocks are liquidated during a slump, and current orders shrink; production is cut back, though not as much, eating into the accumulated orders on hand.

The paired patterns in Chart 12-5 show substantial similarity, reflecting the high correlation between unfilled orders and production of steel during each successive cycle. This can be observed very distinctly in the chart, because the patterns for either series vary considerably between the different cycles covered. The timing of the two variables in terms of reference cycle stages was most often synchronous, but production clearly lagged behind backlogs at the peak of the 1914–19 cycle and at both the peak and terminal trough of the 1924–27 cycle. The lag at the height of the large backlog accumulation during World War I was notably long. The reference cycle amplitudes were larger for unfilled orders than for production in the five cycles during 1904–21, but the opposite is true for the last three cycles covered (1921–33). In particular, steel ingot output fluctuated much more than U.S. Steel backlogs (relative to their respective cycle bases) in 1927–33. These results are presumably connected with the trend toward hand-to-mouth buying in the twenties and the associated decrease in the size and role of the backlogs.

Diffusion of Changes in New Orders and Production

Timing analysis reveals that various series on new orders tend to expand and contract at about the same time and in conformity to the movements of the economy at large. Yet considerable dispersion among the corresponding turning points in these series is also evident. Thus cyclical movements in new orders become widely diffused throughout the manufacturing sector of the economy, but it takes time for them to spread from one commodity, firm, industry, or region to another.

How they spread can be summarized by means of diffusion indexes, which can be constructed in various ways. A simple measure of diffusion records only the direction, and not the magnitude, of changes in the component series. It shows in percentage form how many of these series expand at a given time. Two methods of determining when a series is expanding are in use: (1) Historically, specific-cycle expansions and contractions in the series can be dated and used; or, (2) on a more current basis, rises in moving averages of the series can be defined as expansions; and falls, as contractions. Each method presents its own problems and has its own limitations.[7]

Diffusion indexes based on series that reach their peaks and troughs in the vicinity of downturns and upturns in aggregate economic activity (and not much later) persistently lead at these business revivals and recessions, although by variable intervals.[8] Clearly, a diffusion index built from series which lead the reference dates (e.g., new orders) should itself show longer leads than an index representing tardier activities (e.g., production or shipments).

Many diffusion indexes based on short-period moving averages are very choppy. This occurs clearly in indexes computed from data with large, short fluctuations, such as the individual new-order series. Cumulation provides an effective way of suppressing the smaller irregular movements and bringing out the larger cyclical movements in these diffusion indexes. To be sure, the method also reduces substan-

[7] In an historical index (1), a positively conforming series is said to expand in each month that falls between a specific trough and a specific peak in the data; it is said to contract in each month situated between a peak and a trough. This is a simple principle designed radically to smooth out all movements shorter than cyclical, but dating the specific cycles often involves considerable uncertainty. The alternative (2) is to smooth the seasonally adjusted component series by means of moving averages, so as to reduce their irregular, and bring out their cyclical, components. Month-to-month increases or decreases in the smoothed series would then be taken to indicate cyclical expansion and contraction.

For further explanation of these and other measures of diffusion, and applications to new orders and related data, see Victor Zarnowitz, "The Timing of Manufacturers' Orders During Business Cycles," in Geoffrey H. Moore, ed., *Business Cycle Indicators*, Princeton for NBER, 1961, Vol. I, pp. 459–73.

[8] Some time prior to the culmination of business expansion the percentage of series reaching peaks begins to exceed the percentage of series reaching troughs, and when this develops the proportion of series expanding starts declining. It does not turn up again until the percentage reaching troughs exceeds that reaching peaks, which happens some time before the central month of the business contraction. This explains the diffusion lead in general terms. Depending on the duration of the "zones" of peaks and troughs and the graduation of the transitions between them, indexes of diffusion will show more or less continuous cyclical fluctuations. See Arthur F. Burns, "New Facts on Business Cycles," in Moore, ed., *Business Cycle Indicators*, Vol. I, pp. 13–44.

tially the leads of the indexes at business cycle turns.[9] Nevertheless, the diffusion indexes of new orders retain a comfortable lead even after cumulation, as illustrated in Chart 12-6.

The first curve in this chart represents an index based on Commerce series on new orders for twenty-three manufacturing industries. The second shows the diffusion of changes in twenty-four components of the Federal Reserve Board index of industrial production.[10] The strong difference in trends between the two curves is due to technical factors and is of no real interest.[11] The indicated one-to-one correspondence between the diffusion cycles in new orders and production, however, is confirmed by other measures, and I am prepared to accept it as a "real" and significant phenomenon. The movements of new orders preceded those of output at peaks, with leads ranging from two to six months and averaging four. At troughs, the timing of the two indexes was nearly synchronous. It is possible that these comparisons somewhat understate the diffusion index lead of new orders relative to production.[12]

The third and fourth curves in Chart 12-6 record the results of the monthly business survey of the National Association of Purchasing Agents (NAPA) on new orders and production. These indexes are based on 200–225 member reports that reflect in general the conditions in the firms with which the respondents are associated; they are presumably directly comparable, being compiled from materials with a

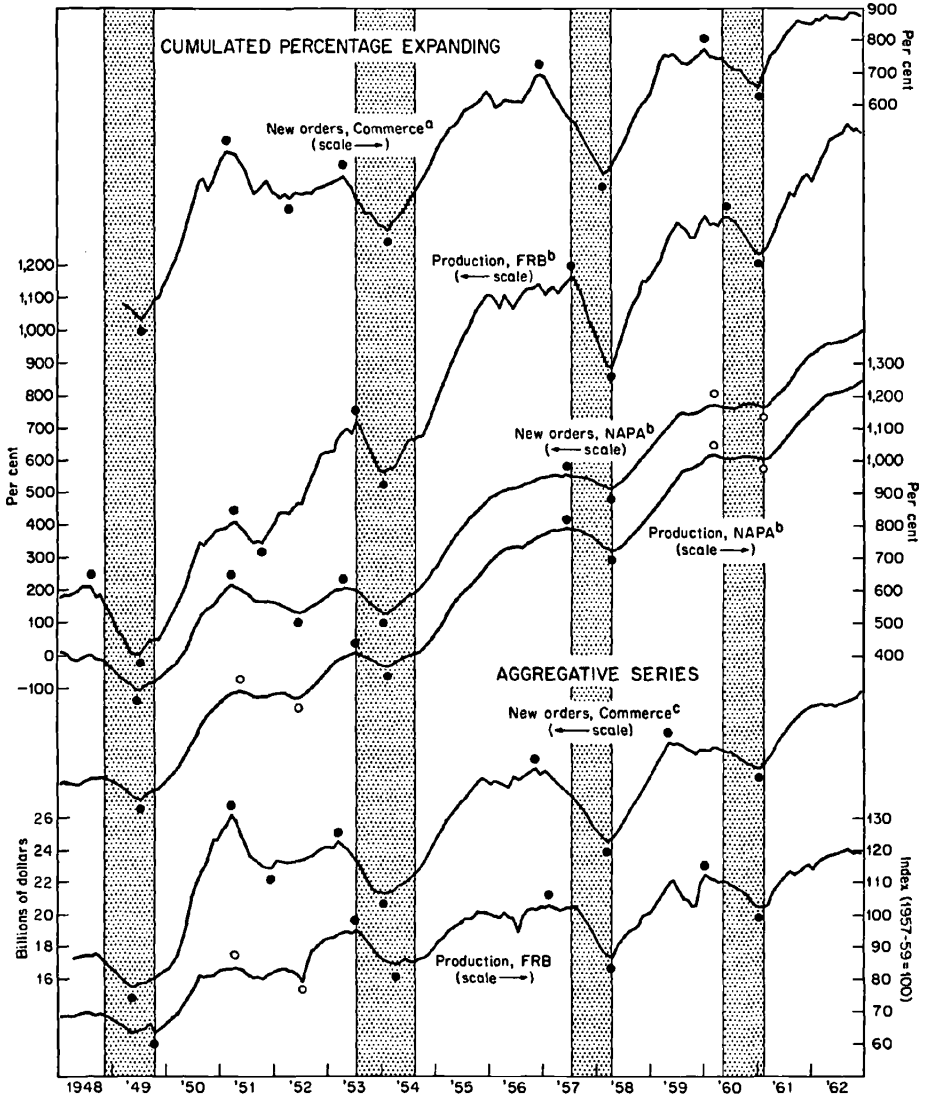
[9] The cumulated figures are derived by taking the deviations of percentage expanding from 50, or the deviations of the average duration of run from 0, and adding each month's deviation to the sum of the deviations for all preceding months. Hence the peaks in the cumulated figures occur when the deviations shift from positive to negative, and the troughs when they shift from negative to positive.

[10] The production series cover ten durable goods and ten nondurable goods industries as well as four minerals; consequently, the combined weight of the durables is much less here than in the new-order index, which includes the series for the nondurable goods aggregates with and without unfilled orders but mainly reflects the behavior of durables. Month-to-month changes in seasonally adjusted production series (1957–59 = 100) are used, whereas three-month moving averages are applied to the more volatile new-order series.

[11] In the early fifties, new orders contracted while production experienced only a temporary retardation in several industries. Thus the percentage expanding of the new-order series declined below 50 more often in 1951 than did the corresponding measure for the output series, and then, in 1952–53, exceeded that level by smaller margins. This accounts for the stronger upward trend in the output index compared to the new-order index.

[12] The figures for new orders involve considerable smoothing, while those for production do not. One effect of smoothing is to shift the turning points to later dates, thereby reducing the length of the measured leads compared to the true leads. In earlier work, I used somewhat differently constructed indexes of cumulated percentage expanding, which yielded short leads of new orders vis-à-vis output at troughs as well as peaks (see Moore, ed., *Business Cycle Indicators*, Vol. I, pp. 470–73, with Chart 14.9 and Table 14.11).

Chart 12-6
Cumulated Percentage Expanding and Aggregative Series, New Orders and Production, All Manufacturing Industries, 1948–62



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles; circles, minor turns or retardations.

[a] Based on three-month moving averages.

[b] Based on month-to-month change.

[c] Six-month moving average centered.

Table 12-2
Timing of Cumulated Diffusion Indexes and Aggregates of New Orders and Production, All Manufacturing Industries, 1949–61
[lead (–) or lag (+), in months]

Date of Business Cycle Turn	Cumulated Diffusion Index				Aggregate Series	
	New Orders		Production			
	Commerce[a] (1)	NAPA[b] (2)	FRB[c] (3)	NAPA[b] (4)	Value of New Orders[d] (5)	Index of Mfg. Prod. (FRB) (6)
Trough Oct. 1949	–3	–4	–3	–3	–5	0
Peak July 1953	–3	–3	0	0	–4	0
Trough Aug. 1954	–6	–7	–7	–6	–7	–4
Peak July 1957	–6	–1	0	–1	–8	–5
Trough Apr. 1958	–2	0	0	0	–1	0
Peak May 1960	–4	–2	+1	–2	–12	–4
Trough Feb. 1961	–1	0	–1	0	–1	–1
Average timing						
Peaks	–4.3	–2.0	+0.3	–1.0	–8.0	–3.0
Troughs	–3.0	–2.8	–2.8	–2.2	–3.5	–1.2
All turns	–3.6	–2.4	–1.4	–1.7	–5.4	–2.0

[a] Based on three-month moving averages of 23 seasonally adjusted series.

[b] Computed from diffusion data yielded by the Monthly Business Survey of the National Association of Purchasing Agents, after seasonal adjustment.

[c] Based on month-to-month changes in 24 seasonally adjusted series for the major-industry components of the FRB index of industrial production.

[d] Six-month moving averages centered on the fourth month. The average lead of unsmoothed data for 1949–61 for all turns is a little longer (6.0 months as compared with 5.4 months in the table).

common source, in the same ways (unsmoothed) and for the same time spans (monthly).[13]

The NAPA indexes are very smooth and show well-defined cyclical

[13] The indexes show the cumulated percentage of survey participants reporting an increase plus half the percentage reporting no change from the previous month. The main effect of this treatment here is to raise the level of the figures being cumulated without appreciably altering their cyclical pattern, because the "no change" answers, while often very numerous, constitute a relatively stable series. Two other features of these data may be noted. First, the findings of the NAPA survey are available very early, even before the end of the report month. Second, the seasonal components are very weak in these data, although the survey replies are not explicitly adjusted for seasonal variation. (The series in Chart 12-6 are adjusted; see *ibid.*, p. 471, Chart 14.9, for graphs of unadjusted indexes, 1948–58.)

movements in general conformity to the chronology of the concurrent business fluctuations. However, they closely resemble each other in a way that is difficult to explain or accept as plausible, especially since durable goods manufacturers are well represented in the NAPA surveys. The turning points in the two indexes have been simultaneous since 1954, and the timing of new orders was occasionally sluggish.

Chart 12-6 also demonstrates the close parallelism between cumulated diffusion indexes for new orders and production and the corresponding aggregates. The comparisons, whether for new orders or production, confirm other evidence of high correlations between the scope and the over-all magnitude of cyclical movements in economic aggregates.[14]

Table 12-2 shows the timing of each of the six series included in Chart 12-6 at each successive business turn. According to the Commerce data, both the cumulated percentage expanding and the aggregate of new orders led on each occasion (columns 1 and 5). The FRB data for production, on the other hand, show coincidences or shorter leads at most turns, again both for the cumulated diffusion index and the aggregate (columns 3 and 6). Short leads and coincidences also dominate the timing of the NAPA indexes, where the differences between new orders and production are few and small (columns 2 and 4).

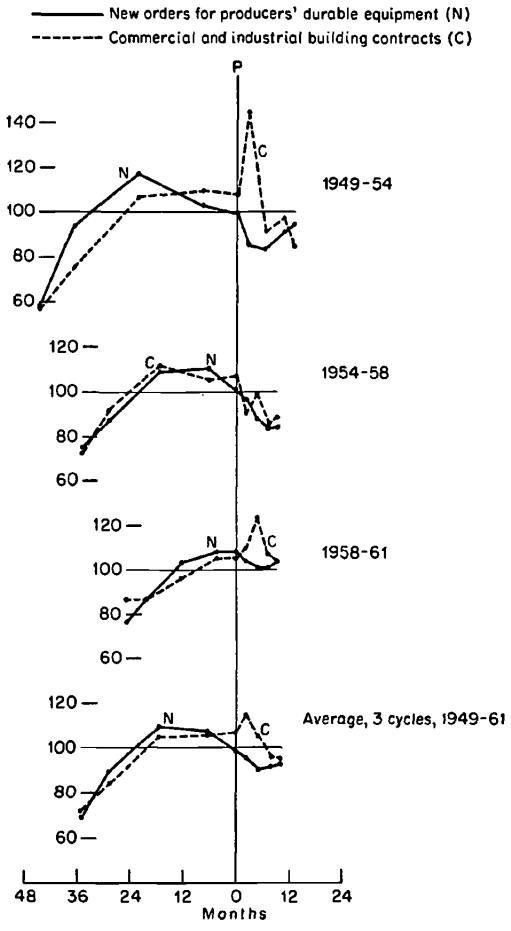
Cyclical Behavior of Investment Commitments and Realizations

New Orders, Construction, and Expenditures for Plant and Equipment

The series on new investment orders and contracts discussed in Chapters 9 and 10 make it possible to construct reference cycle patterns of business commitments on capital account for three complete cycles, 1949–61. Chart 12-7 compares the behavior of the two components of these commitments. It shows that new orders for producer durable equipment and the contracts for industrial and commercial plant construction had rather different patterns of change during the

[14] The burden of proof here is on the Commerce and FRB data, since surveys concerned only with directions of change (such as those of the NAPA) provide no basis for any meaningful aggregation. See *ibid.*, pp. 465–66, with Chart 14.7, for a comparison of interwar data in the same form.

Chart 12-7
Reference Cycle Patterns in Value of New Orders for Producers' Durable Equipment and of Commercial and Industrial Building Contracts, 1949–61



recent business cycles. Contracts ran high early in the contractions of the 1949–54 and 1958–61 cycles. Equipment orders increased faster than plant contracts in the early recovery stages of these cycles, and declined earlier to reach trough levels in mid-contraction—just when contracts were very high. In the 1954–58 cycle, however, the behavior of orders and contracts was rather similar. In the average pat-

terns for 1949–61, the expansion periods were stages I–VI for plant contracts and VII–III for equipment orders.

Monthly figures on construction contracts are highly erratic (see Chart 9-1, above), and even averages based on them are occasionally strongly affected by chance concentrations of large contracts. The averages based on a few monthly values would presumably be especially prone to such random influences, and the contraction stages are typically short in mild or moderate cycles such as those examined here. There may be little more than this to the peculiar peaks in the patterns for the value of contracts in the contractions of 1953–54 and 1960–61. Since 1919, both commercial and industrial building contracts have led business cycle peaks by 5–6 months and troughs by 1–2 months, on the average. The combined value aggregate had mean leads of 4 months at peaks and 2.8 months at troughs.[15]

Contracts for factory, business office, or store construction are, of course, influenced by financial market conditions and other cost elements as well as by demand factors, though they appear to be less sensitive to the former and more to the latter than are the contracts for residential construction. Historically, long-term interest rates have lagged, as have building costs. Hence, late expansion and the beginning of contraction are unfavorable cycle stages for construction starts, and late contraction and the beginning of expansion are favorable. These are presumably important reasons for the tendency of contracts to lead. Indeed, residential construction contracts or starts have led by such long intervals at some recent business peaks that much of the time they followed a countercyclical course. This behavior has been attributed in the literature to the high sensitivity of the housing market to the supply of mortgage credit. But the leads in industrial and commercial building contracts were much shorter and traces of inverted behavior much weaker than in the residential sector. The big companies that account for the major share of industrial building generate large cash flows of their own and are particularly valuable customers of financial institutions, with high credit ratings and ample

[15] The monthly figures are somewhat less erratic for floor space than for the value estimates of the contracts, and it is the former series that is included in the National Bureau list of "leading indicators." For the timing record of commercial and industrial contracts (floor space) in the period 1919–59, see *ibid.*, App. B. A comprehensive compilation of the principal time series on construction, including the contracts data, is provided in Robert E. Lipsey and Doris Preston, *Source Book of Statistics Relating to Construction*, New York, NBER, 1966.

access to loanable funds most of the time. They are likely to be less deterred by high and rising costs of building and financing than the smaller decision-making units that are active in the residential construction field, and may have stronger motivations against retrenchment.[16]

Chart 12-8 compares new orders for producer durable equipment with the corresponding aggregate for shipments. While equipment orders had their highest standing in stage III or IV, shipments had theirs in stage V. Usually, the lowest values for orders fell in stages VII and VIII; the lowest values for shipments, in stages VIII and IX. In the average patterns, the expansion period for orders is VII–III (indicating two-stage leads at peaks and troughs), while the expansion period for shipments is I–V (coincident timing).

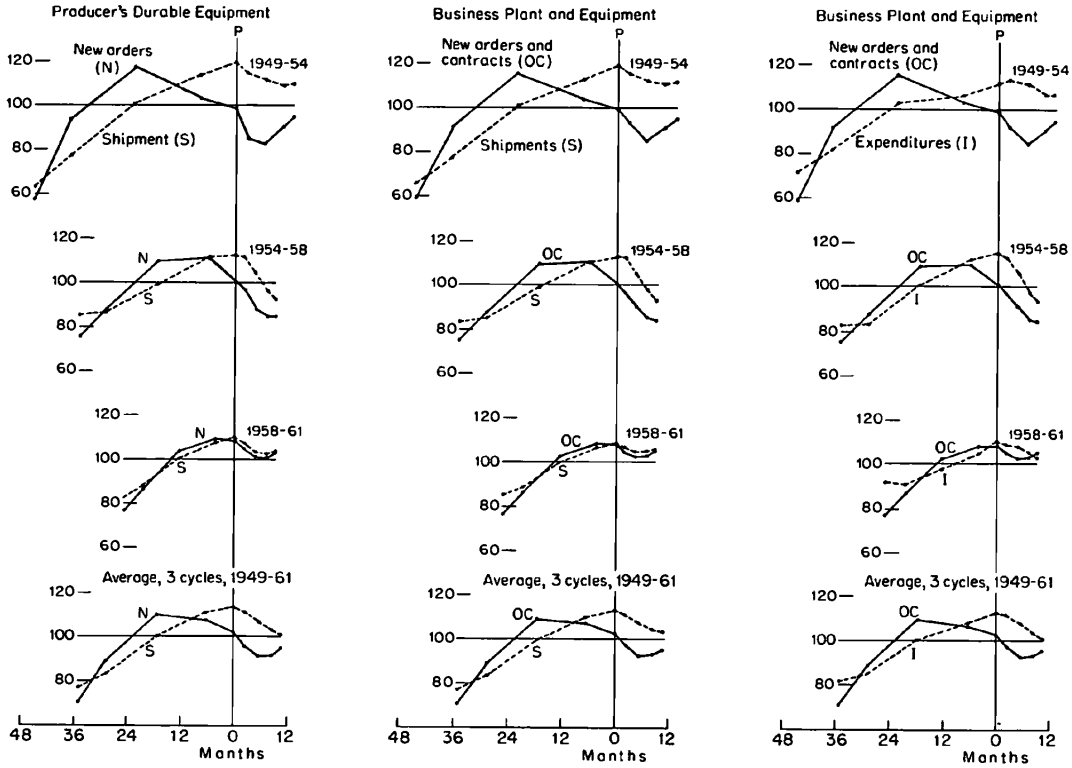
When contracts for industrial and commercial plant (including privately owned utilities) are added to equipment orders, the patterns for the resulting estimates of aggregate fixed-investment commitments (*OC*) differ but slightly from those computed for only the equipment component (*N*), as shown by the corresponding patterns in the first two columns of diagrams in Chart 12-8. This similarity reflects the heavy weight of equipment in *OC* and is somewhat reduced when the reweighted aggregate OC_r is used instead. Even then, however, a considerable family resemblance between these diagrams remains, which presumably testifies to the genuinely large importance of the equipment component within the aggregate of fixed-investment commitments of business.

The value-of-output counterpart to the combined orders-contracts series for plant and equipment is compiled by adding to shipments of equipment-producing manufacturers the value of industrial, commercial, and privately owned utilities construction put in place. Here again the inclusion of the construction estimates apparently has remarkably weak effects, since the *S* and *OC* patterns in the first and second

[16] In an early (about 1936) unpublished manuscript on building construction, Arthur F. Burns suggested the following reasons for the observed difference in timing: (1) Costs of building and financing usually form a smaller part of total costs for an industrial firm than in residential construction. (2) The incentive to expand plant capacity is greater than the incentive to expand housing capacity, because commodity prices tend to rise faster than rents during a cyclical expansion. (3) The capacity of an industrial plant can typically be modified by changes in the intensity of utilization, whereas the capacity of a house is relatively well defined and less adjustable. Other, more speculative reasons were also mentioned, namely, (4) potential long-run losses of customers' business due to inadequate plant are of greater concern to an industrial company than to an apartment house owner; and (5) big firms, which account for a relatively large proportion of industrial building, often move more sluggishly than do smaller decision-making units.

Chart 12-8

Reference Cycle Patterns in New Investment Orders and Contracts, Value of Capital Goods Shipments and Business Construction Put in Place, and Business Expenditures on Plant and Equipment, 1949–61



columns of Chart 12-8 are very similar. Yet there must be much less of an undercoverage bias on the construction side in this aggregate of investment realization than in the commitments series, since figures for the value of construction put in place give better representation to the plant component than do the building contracts data.[17]

The diagrams on the right-hand side of Chart 12-8 reproduce the patterns for investment orders and contracts and compare them with the patterns for business expenditures on plant and equipment. The behavior of the latter in each of the three cycles since 1949 has been remarkably similar to the behavior of the value-of-investment series, i.e., the combined aggregate of equipment shipments and construction put in place (cf. the second and third columns of diagrams in the chart). There are several slight lags of expenditures relative to the value of investment goods output, each of one short stage adjoining the business turn (at the peak of 1953 and the troughs of 1954, 1958, and 1961). Some lags of this sort would be expected. The average patterns of the two series, however, hardly differ. This appears sensible, since expenditures on plant and equipment should be closely correlated with the value of output of the capital goods covered. However, there is no reason for the overrepresentation of equipment relative to plant outlays (or vice versa) in the expenditure series. The value-of-output estimates presumably do have this bias, but the similarity of their cyclical behavior to that of expenditures seems to suggest that in this case the bias is not very disturbing.

According to the average patterns (lower-right diagram in Chart 12-8), new orders and contracts for plant and equipment led at both peaks and troughs of the business cycle by two stages (expansion period VII–III), while business fixed-investment outlays tended to coincide (expansion period I–V). Actually, the typical timing of plant and equipment expenditures differs from that of investment orders even more than this measurement in reference cycle stages would suggest. Turns in quarterly data for expenditures tend to *lag* behind business cycle peaks and troughs by short intervals (Chart 9-2).

Both new orders for equipment and business construction contracts usually decline well below their average cyclical levels during contractions in aggregate economic activity (i.e., they fall below the base line

[17] Although it should be noted, too, that the use of shipments instead of orders data does nothing to correct any overstatement bias on the equipment side.

of 100 in our diagrams). In contrast, the value of plant and equipment produced and of expenditures on plant and equipment held up well in the mild postwar recessions. The rise-and-fall amplitude in the patterns is considerably larger for new orders and contracts than for the corresponding expenditures or shipments. For example, the averages in reference cycle relatives for 1949–61 are 56 for capital orders and 43 for expenditures.

The Evidence of Historical Series

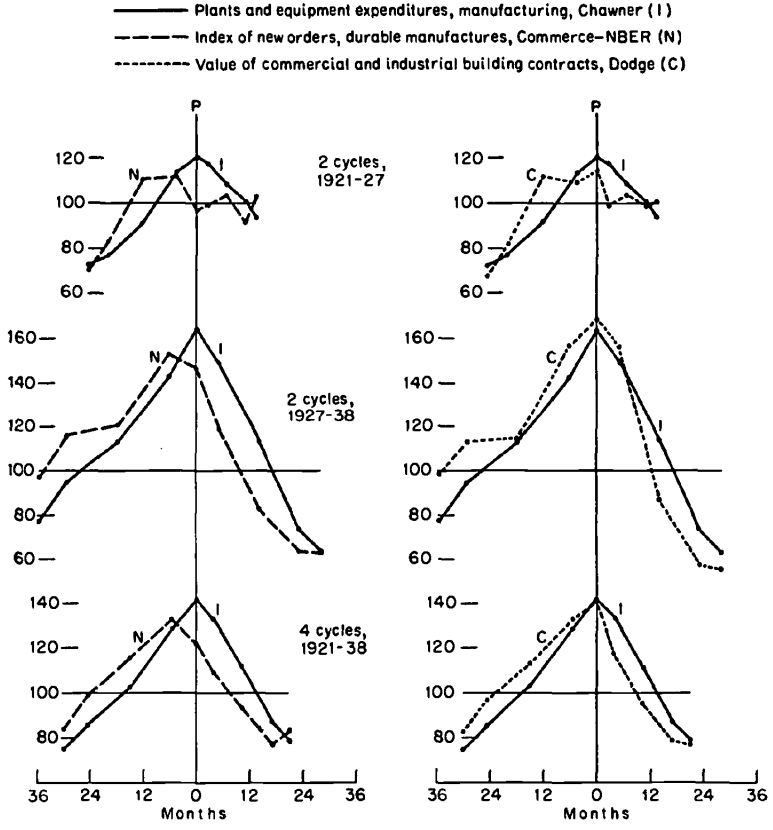
For the years before World War II, quarterly estimates of plant and equipment expenditures by manufacturers are available, but there is no series on aggregate investment orders. Therefore, the patterns for Chawner's expenditure series [18] are compared with those for the early Commerce-NBER index of orders for durables, 1921–33, and the NICB index of new orders for durable goods, 1933–38 (Chart 12-9). In the two weak cycles of 1921–27 manufacturers' capital outlays for productive facilities typically expanded in stages I–V, showing the same type of average coincident timing as the postwar capital outlays of private nonagricultural business enterprises. In the mild contractions of 1923–24 and 1926–27 and in the sharp but short contraction of 1937–38, manufacturers' expenditures for plant and equipment dipped only slightly below the base line in the immediate vicinity of the terminal trough. This feature, too, broadly recalls the behavior of business capital outlays during the postwar recessions, although investment generally displayed more strength on the later occasions.

The one-stage leads of durables orders are already familiar. The average amplitude of rise and fall was less in these orders than in manufacturers' plant and equipment expenditures. This is probably due to the heavy weight in the orders figures of nonequipment items with smaller cyclical amplitudes, as well as to the use of physical rather than current-value series in the earlier orders index. These estimates of new orders for durable goods are after all far from perfect as a proxy for producer equipment orders.

Chart 12-9 also includes the patterns for the value of commercial

[18] U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce. See Lowell J. Chawner, "Capital Expenditures for Manufacturing Plant and Equipment—1915 to 1940," *Survey of Current Business*, March 1941, pp. 9–15, and further descriptions in *ibid.*, December 1961 and May 1962.

Chart 12-9
Average Reference Cycle Patterns in New Orders for Durable Goods, Value of Commercial and Industrial Building Contracts, and Expenditures on Plant and Equipment, 1921–27 and 1927–38



and industrial building contracts for the same groupings of interwar business cycles. Here the typical trough-peak-trough stages are I-V-IX, the same coincident timing as that of expenditures. More sensitive comparisons in monthly terms would be necessary to reveal a tendency for the contracts to lead by short intervals.

It is possible that new investment orders placed with manufacturers had shorter and less regular leads at business cycle turns in the interwar period than after World War II. This is suggested, particularly for

the peaks and omitting the two cycles in 1921–27, by comparisons of the patterns for the durable goods orders in Chart 12-1, and also, as a broad approximation, by Charts 12-8 and 12-9. Further evidence comes from new orders for machine tools, for which a relatively long and continuous series is available, which enjoyed early recognition as one of the timeliest indicators of the demand for capital goods.

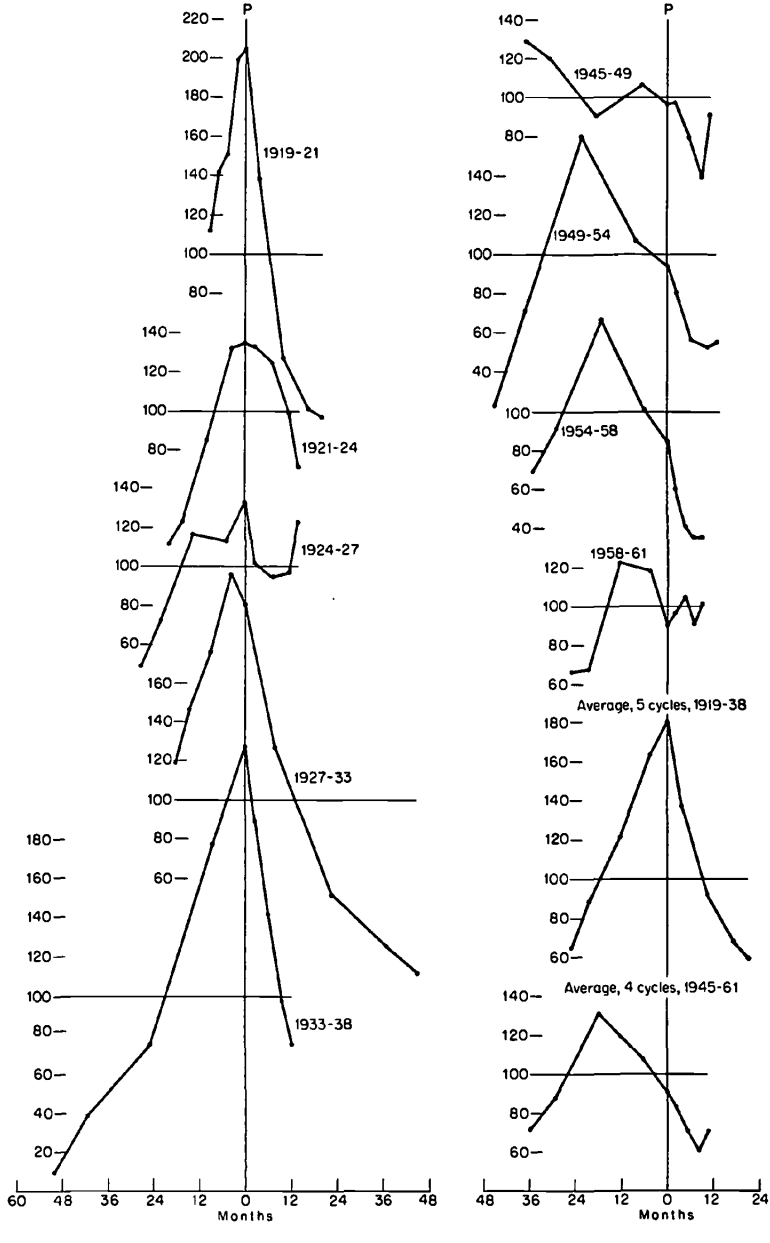
As shown in Chart 12-10, the demand for machine tools (which, of course, are produced largely to specific orders) has a very high degree of cyclical conformity and sensitivity. The patterns bring out well the contrast between investment behavior in mild cycles (such as 1921–24, 1924–27, and 1958–61) and in other cycles including the most severe ones in 1919–21 and the 1930's.

When the five interwar patterns are combined into one by averaging, an almost symmetrical inverted V pattern is obtained, but this is because the large rises in some of these cycles are nearly balanced by large declines in others. A coincident timing of machine-tool orders at peaks and troughs in general economic activity is suggested. Actually, the analysis of monthly data reveals a slight prevalence of leads over coincidences, but the leads are mostly too short (1–2 months) to show up in longer units such as the reference stages (see Table 11-5, lines 47–48).

The patterns for the postwar cycles have a considerably different appearance. The first one (1945–49) is dominated by a downward trend because of the discontinuation of high wartime demand, but it already shows a distinct lead of orders at the terminal trough. The 1949–54 and the 1954–58 patterns both have sharp peaks in stage III —two stages before the business downturn—and both show retardations before the troughs. The pattern for the 1958–61 cycle is flatter and less regular, but it suggests a similar lead at the peak. Short leads at the troughs of 1954 and 1961 are also visible in these schematized pictures. According to the average pattern for the four postwar cycles, 1945–61, the typical expansion interval for machine-tool orders in this period consisted of stages VIII–III.

If the leads at business cycle peaks of new orders placed with manufacturers increased since World War II compared with the interwar period, two factors may be responsible: (1) Production and shipments of the goods ordered may have acquired leads or longer leads at the recent recessions. The importance of manufacturing has declined;

Chart 12-10
Reference Cycle Patterns for New Orders of Machine Tools, 1919–38 and 1945–61



therefore, a downturn in the output of this sector no longer has the prompt and strongly depressing effect upon the economy it used to have. (2) The lags of output and deliveries behind new orders may have lengthened because of greater backlog accumulations in the postwar expansions. The first effect is a structural and presumably long-lasting one. The cyclical role of investment is affected to the extent that capital goods are supplied by the manufacturing sector. The second effect is cyclical, depending on the intensity of demand during the preceding expansion. It is particularly important for investment, since capital goods are produced largely to order, with substantial but variable delivery periods. In the 1940's and 1950's both factors became effective, but there is of course no necessary link between them.

The long leads of machine-tool orders at the postwar recessions can be traced mainly to extensions of the delivery periods, as revealed by the increase in the lags of shipments behind new orders. The timing of machine-tool shipments tends to be roughly coincident, with some tendency toward short leads at business recessions and short lags at revivals.[19]

Fluctuations in Orders, Profits, and Investment

Purchases of Durable Goods and Corporate Profits

One of the factors that may account for the early decline in aggregate new orders during business expansions is the deterioration, from the viewpoint of those who place the orders, of the cost-price relations.[20] Changes in corporate profits after taxes reflect the net over-all effect of changes in cost-price differentials but depend also on changes in the volume of transactions.

According to quarterly estimates by Harold Barger,[21] net corporate profits coincided at two peaks and led at two peaks in the period 1923–37, yielding an average lead of two months. New orders for durable goods (NBER-Commerce and NICB) had leads at all four

[19] For summary measures in monthly terms, see Table 11-9, line 8. At the first three postwar recessions, shipments also reached their top levels at least several months ahead of the measures of aggregate economic activity. However, this factor appears definitely less important in accounting for the long leads of new orders than does the factor of extended delivery periods.

[20] Cf. Geoffrey H. Moore, "Leading and Confirming Indicators of General Business Changes," in Moore, ed., *Business Cycle Indicators*, p. 65.

[21] *Outlay and Income in the United States, 1921–38*, New York, NBER, 1942, pp. 297–99.

peaks, which averaged six months. However, in the postwar period, for which more comprehensive and reliable data are available from the Commerce Department, the lead of orders at turns in profits implied in the earlier comparisons disappears and may even be slightly reversed. Both series led at each of the four recessions of 1948–60, and profits showed longer leads on three of these occasions; but the differences between these measures were mostly small and the mean leads closely similar (8 months for profits and 7.5 months for orders).

Profits, like new orders, also led at business recoveries. In the interwar period, the mean leads at troughs differed very little from those at peaks for both variables; again, orders turned earlier in most cases. At the four postwar recoveries, 1949–61, profits led three times and coincided once. New orders led four times, twice by slightly shorter intervals than profits. The mean leads in this period were 4 months for profits and 3.5 months for orders.[22]

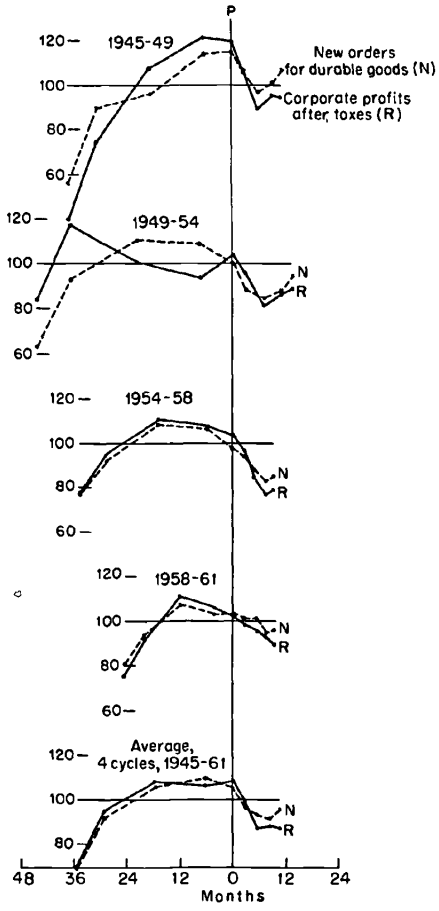
Chart 12-11 indicates that a close positive association exists between purchases of durables—mainly materials inputs and producer equipment—and total net profits of what is no doubt the major group of purchasers, namely, U.S. corporations. Certainly the similarity of reference cycle patterns in new orders for durable goods and in corporate profits for the two most recent cycles (1954–61) is striking. In the two earlier cycles (1945–54), there are larger divergences between these patterns, but the correspondence is still very marked. It is, in fact, more pronounced than would appear from cycle-stage averages, because in the early fifties both orders and profits had a double-peak pattern, which in Chart 12-11 is visible only in profits. According to the diagrams, profits led orders at the 1948 peak and the early downturns in the Korean period, and lagged slightly at the revival of 1961 (all these are one-stage timing differences). At the other revivals covered, in 1949, 1954, and 1958, as well as the recessions of 1957 and 1960, the two series turned in the same business cycle stage.[23]

Of course, even a very high correlation does not necessarily denote a meaningful direct association. Thus, new orders and profits could both be jointly determined by some third factor, e.g., sales of the ordering firms. Furthermore, should the association be in fact a direct

[22] For a detailed record of leads and lags of these series through 1948, see Moore, ed., *Business Cycle Indicators*, Vol. I, App. B.

[23] For a graph of corporate profits after taxes, seasonally adjusted, 1948–61, see Chart 10-4.

Chart 12-11
Reference Cycle Patterns in New Orders for Durable Goods and Corporate Profits After Taxes, 1945–61



one, the familiar problem of the direction of causation must be faced. Rising profits may stimulate orders; but rising orders, too, may have strong stimulating effects and lead to higher levels of activity and higher profits.

Mutual interaction in partnership with other important factors is no doubt the broadest and, hence, the most accommodating concept for this relation (as for so many others), but to acknowledge this does not deny that proximate cause-and-effect connections may be involved.

What is suggested, rather, is that a search for such connections here is likely to be difficult. Cyclical developments are cumulative, and factors involved in them may alternate in the roles of "cause" and "effect," depending on the span of time considered or the stage of the process. If this is the case, timing comparisons, which sometimes provide helpful clues to the direction of causation, are apt to give mixed results of limited informational value. At least, however, it is clear that the cyclical movements in orders and profits are closely correlated; the relationship is important and it deserves further exploration, especially in the context of the determination of investment (Chapter 10).

Profit Variables and Investment Commitments

The chain of influence running from profits to orders is widely believed to be particularly important for investment goods. The decision to invest depends on the profits expected from the contemplated investment—this much is neither questioned nor as such is an operational statement. The expected profits depend on the demand for the products concerned, on the technologically determined capital requirements (production function), and the relative prices of factors of production—all as perceived by the decision maker who must try to predict these elements over a span of the future, given limited knowledge even of the past and the necessity of facing risk and uncertainty.[24] This list does not include current and past profits, but then the determinants that it does include are not directly observable (which is usually the case for variables required by purely theoretical analysis). In any empirical application, proxy variables must be used, and profits are frequently cast in this role. It has been argued that this lacks theoretical justification, at least "at the level of the individual firm with free access to capital markets," but with the qualification that "it is possible that the supply of money capital may itself be a function of current profits. . . . For lack of better information, investors of funds may be guided considerably by current and past profits in their estimates of the return and risk on contemplated investment. One might

[24] See Robert Eisner and Robert H. Strotz, "Determinants of Business Investment," in Commission on Money and Credit, *Impacts of Monetary Policy*, Englewood Cliffs, N.J., 1963, Chaps. I and II; and Robert Eisner, "The Aggregate Investment Function," *International Encyclopedia of the Social Sciences*, 1968, Vol. 8, pp. 185–94.

expect that in the case of large firms, however, it would pay the market to sustain the cost of securing better information." [25]

As a practical proposition, in a world of imperfect and costly information, the guiding role of past and present profit experience in the formation of profit expectations could well be considerable. But this, in any event, is a hypothesis about empirical regularities, and its validity can only be tested against the data; it cannot be determined on a priori grounds. It is true that the past may offer no relevant information for the basic decision on whether or not a new investment project is worth undertaking, and that such judgments should probably seldom be strongly affected by the record on profits. However, in addition to this basic decision there are subsidiary decisions, including a major one that concerns the choice of the proper *time* for the implementation of an investment project that has already been approved. This timing decision is likely to depend more on profits. This is so inasmuch as the net impact of changes in sales and in cost-price relations registers in the financial record which the firm uses to appraise its current and near prospects.

Lags may be expected to occur in this process, if only because it takes time for the firm to evaluate changes in its income and expenditure flows, but such lags need not be long and may be quite variable, even if the influence of profits were strong. Thus it is conceivable that some firms treat their current profits, which were realized on past investments, as unbiased estimates of profits expected from planned investments. Then, for them, current profits alone would be decisive, the variability of the underlying conditions being such that historical experience is considered no longer relevant.[26] In other cases, however, past experience may, on the contrary, carry considerable weight in the implementation of investment decisions. Implementation may be delayed until past changes add up to trends on which expectations can more safely be based. This would be so where short-term changes are viewed as too volatile to be relied upon, but longer changes are not. Limited information and discounting for risk and uncertainty would work in this direction.

There are no good reasons for expecting much uniformity in these

[25] Eisner and Strotz, "Determinants," pp. 124–25.

[26] Compare the "implicit expectations" analysis in Edwin S. Mills, *Price, Output, and Inventory Policy*, New York, 1962, Chap. 3.

relations across different industries, types of investment projects, business conditions, etc. However, firms may often view the movements in industry- and economywide aggregates as more "permanent" than deviating movements in their own microdata for the same variables (e.g., sales).[27] If this is so in the present context, then the influence on business investment of *aggregate* profits may well be considerably stronger than the presumably varying relationships among the corresponding microvariables would seem to imply.

A different reason for viewing profits as a determinant of investment lies in any preferences for internal financing that may exist. If imperfections are present in the capital market, such preferences acquire an objective basis. This argument may appear unconvincing, particularly for the large corporations which usually have easy access to sources of money capital. It also implicitly gives more weight to cash flow, a more comprehensive factor than (net) profits.[28]

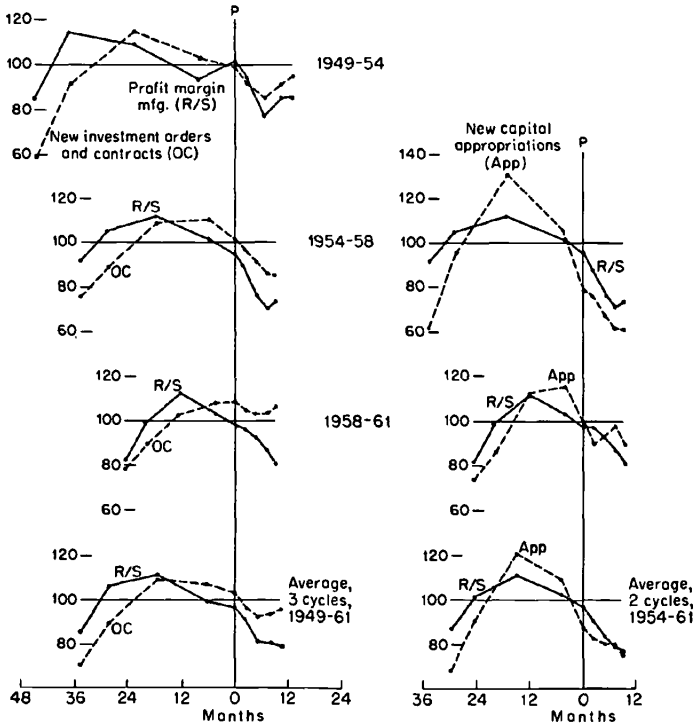
Data on profit margins (profits before taxes per dollar of sales, R/S) will now be used, to de-emphasize the financial aspect of profits and to focus instead on the role of profits as an indicator of price-cost relations and of prospects for investment projects. This also serves to make some allowance for the role of sales. Chart 12-12 compares the reference cycle patterns for R/S with those for new investment orders and contracts, OC. The R/S series refers to all corporations and is compiled by the Federal Trade Commission–Securities and Exchange Commission; the OC series is familiar from Chapters 9 and 10.

Given moderately rising marginal cost curves and fairly rigid short-run price behavior in the manufacturing sector, profits would tend to be a positive function of sales, since fluctuations in sales are paralleled by changes in the degree of capacity utilization. However valid this common explanation, positive correlations between profits and sales are often observed and accepted as a feature of short-term business developments. But R is definitely much more variable than S; therefore, the R/S ratios reflect much more the changes in R than in S. Indeed, the cyclical patterns for R/S in Chart 12-12 strongly resemble

[27] This hypothesis was found by Eisner to be consistent with his regression estimates of investment functions based on firm and industry data from the McGraw-Hill capital expenditure surveys. See references in note 24 above and in Chapter 10, note 46.

[28] The two variables are as a rule highly correlated in the short run. There is, however, some evidence that profits are more effective than cash flow in influencing investment commitments (Chapter 10).

Chart 12-12
Reference Cycle Patterns in New Capital Appropriations, New Investment Orders and Contracts, and Profits per Dollar of Sales, 1949–61 and 1954–61



the corresponding patterns for total after-tax profits in Chart 12-11. They show that forces causing deterioration (from the producer's point of view) of cost-price relations can become effective enough in the mid-stages of a business expansion to result in an early downturn in profit margins. The peaks in the patterns for *R/S* fall in stage III (except in the 1949–54 cycle when the series had two peaks, the first in stage II, which was early in the Korean War period, and the second, much lower one in stage V). Thus *R/S* led by two long cycle-stages relative to the recent peaks in aggregate economic activity and by one or two stages relative to the peaks in new investment orders and contracts, *OC*.

The tendency of *R/S* to lead at troughs is barely evident in the pat-

terns, nor does *R/S* turn up ahead of *OC*; at the 1961 recovery the opposite was, in fact, the case.

New capital appropriations by manufacturers (*App*) had larger amplitudes of rise and fall than *OC* in the two business cycles covered by these data (1954–61). They also led *OC* at peaks by one cycle-stage, as can be seen by comparing the corresponding patterns in the two columns of Chart 12-12. At peaks in *R/S*, capital appropriations had either roughly coincident or lagging timing, but they definitely led at the 1961 trough.[29]

Profits and profit margins, then, have patterns of cyclical behavior that are substantially similar to the patterns of durable goods orders and investment commitments. The timing of these series is either approximately simultaneous or, at least at peaks, it is the profit variables that lead On the aggregate level, considering the chain of influence that is running in the opposite direction, i.e., from orders to profits, it would seem that the time dimension of this feedback effect is likely to be quite different. Sustained increases in new orders will be translated into higher gross revenues and probably also into higher net revenues, while sustained decreases will have the contrary effects. Since the realization and recording of profits takes time, the process can be expected to involve significant lags.[30] This is particularly true of investment orders–contracts, which often require considerable time to be taken into production, executed, and paid for—facts suggesting that these commitments can generate profits only with distributed and frequently long lags. Since our data provide no evidence of such lags of profits, a tentative inference from them is that in the short run the effect of profits on orders and contracts is stronger than the feedback

[29] See Thomas M. Stanback, Jr., and Howard Sherman, "Cyclical Behavior of Profits, Appropriations and Expenditures: Some Aspects of the Investment Process," *Proceedings of the Business and Economic Statistics Section*, American Statistical Association annual meeting, September 1962, pp. 274–86. Using quarterly data for 1953–61 (NICB series on appropriations and FTC-SEC series on profits), Stanback and Sherman concluded (p. 284) that "there appears to be a significant similarity in the patterns of cyclical movements in profits and appropriations for the aggregate and most of the industry series. Among the industry series conformity is highest with appropriations lagged one quarter in over half of the cases, with coincident timing in most of the remainder. . . . There is some evidence . . . that the relationship between the two variables is more consistent at downturns than at upturns. The relationship also improves when rises or declines in profits are widespread among the various manufacturing industries."

[30] Note that this refers directly to the firms that receive orders, whereas the earlier argument about the likelihood of relatively short lags in the chain of influence running from realized profits to investment commitments referred to the behavior of the firms that place orders. For the aggregate of all firms, of course, orders received equal orders placed; hence, no operational distinction can be made along these lines.

effect running in the opposite direction. However, profits and investment commitments may well be subject to common influences and they doubtless interact; hence, one must beware of any simple assertions of unidirectional causal relations among these variables.

New Orders Received and Capital Appropriations and Outlays

A sustained rise in demand will tend to increase profits and stimulate expectations and investment, but the process, as suggested above, is probably often a protracted one. Thus the curves in Chart 12-13 suggest that cyclical fluctuations in industry expenditures on plant and equipment (I) follow with long lags the fluctuations in new orders for products of the given industry (N).[31] A positive association between N and I seems to exist in each of the several major manufacturing industries covered, but at times the lags are so long that the series appear to be related in an almost inverted fashion (see the graphs for primary metals in 1958–61 or for electrical machinery in 1953–55). At times, too, new orders experienced short cyclical movements which could not be matched with similar lagged movements in the corresponding investment outlay series (e.g., the 1952–53 rise in primary metals orders).

Clearly, investment in plant and equipment depends on various other factors in addition to the course of demand for the investor's output. Hence, one would not expect it to be closely related to new orders, and in fact the relations are not close. Nevertheless, the cyclical fluctuations in the paired series show a high degree of conformity, as indicated by a comparison of the numbers of turns covered and matched. The matched peaks and troughs represent 88 per cent of all turning points covered in the expenditure series and 80 per cent of those covered in the new-order series. All but three of the forty-six timing comparisons made, or 93 per cent, were leads of orders. By industries, the mean leads vary from two to three quarters, except for one lead of 11 months in primary metals. On the average for eleven industries, new orders led expenditures by 8 months, with a mean deviation of 4 months. The series on investment expenditures show a preponderance of lags at business cycle troughs, but at peaks the series are for the most part roughly coincident and not very regular, with leads nearly as frequent as lags.

[31] This analysis is based on the major-industry data published prior to the 1963 revision of the Industry Survey series for new orders, etc.

Chart 12-13
New Orders Received and Expenditures on Plant and Equipment, Seven Major Manufacturing Industries, 1948–61

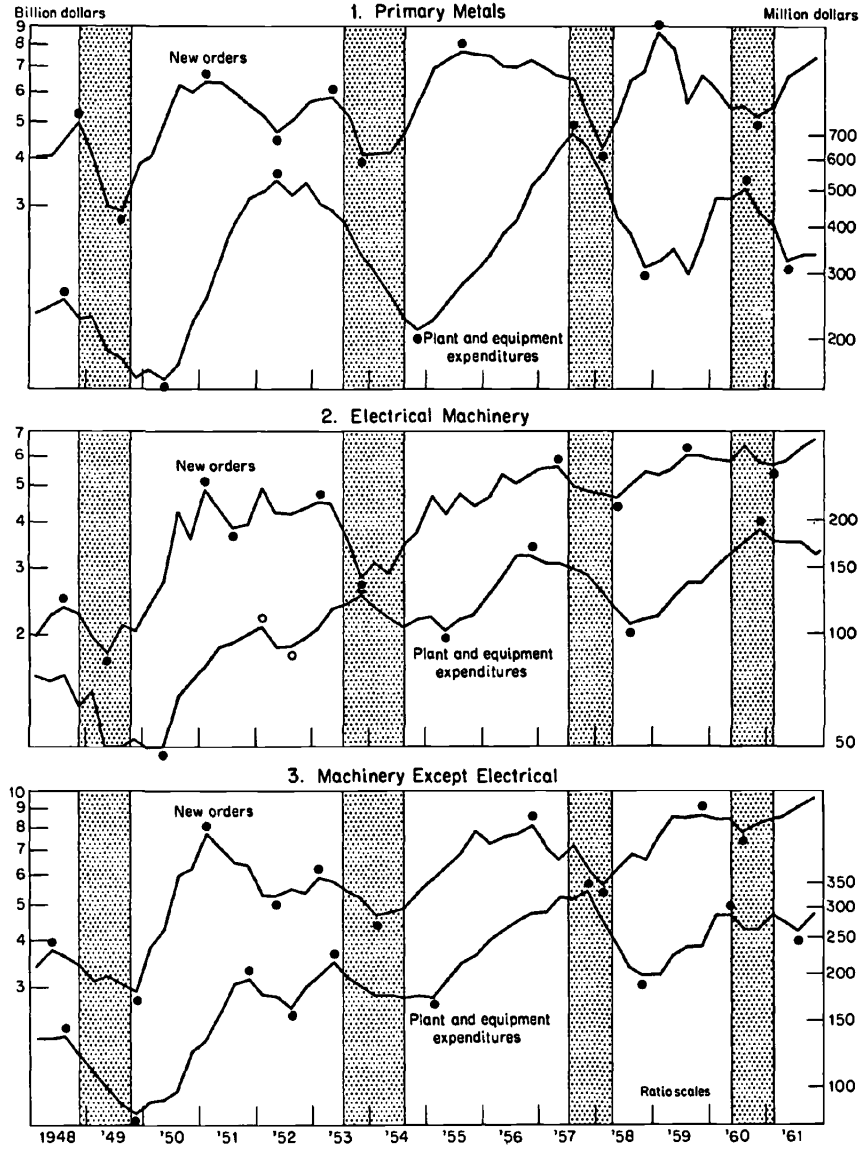
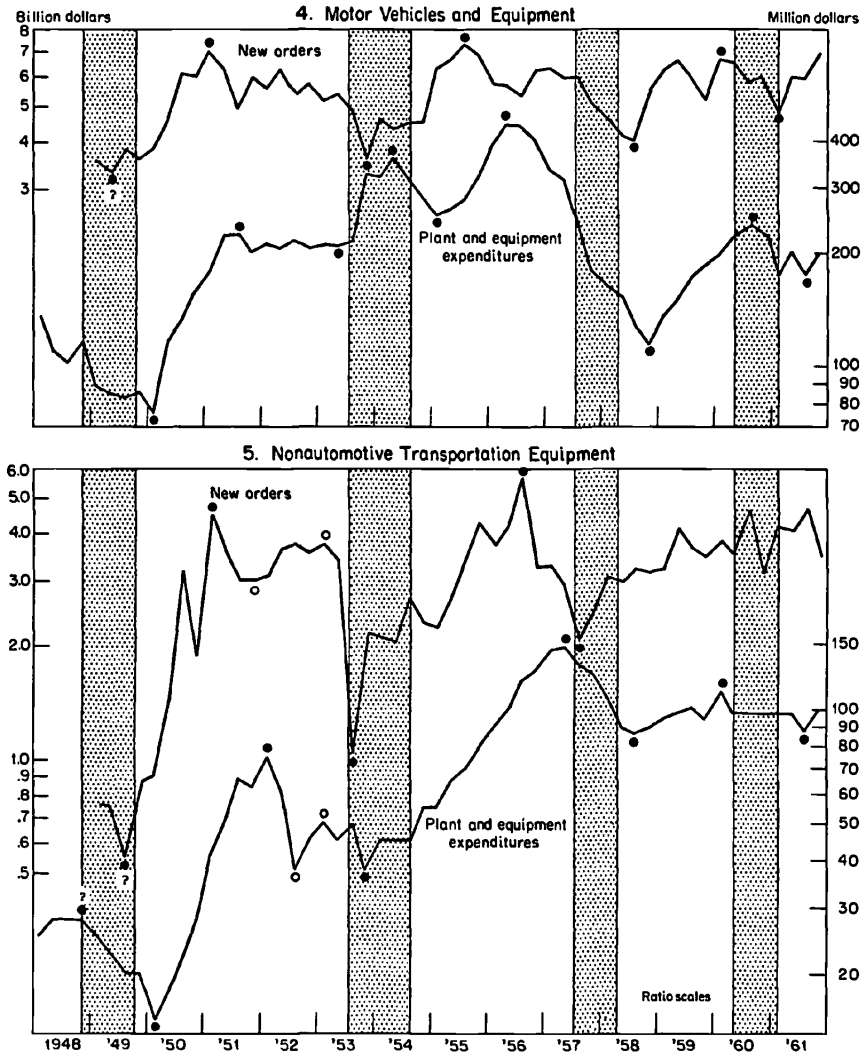
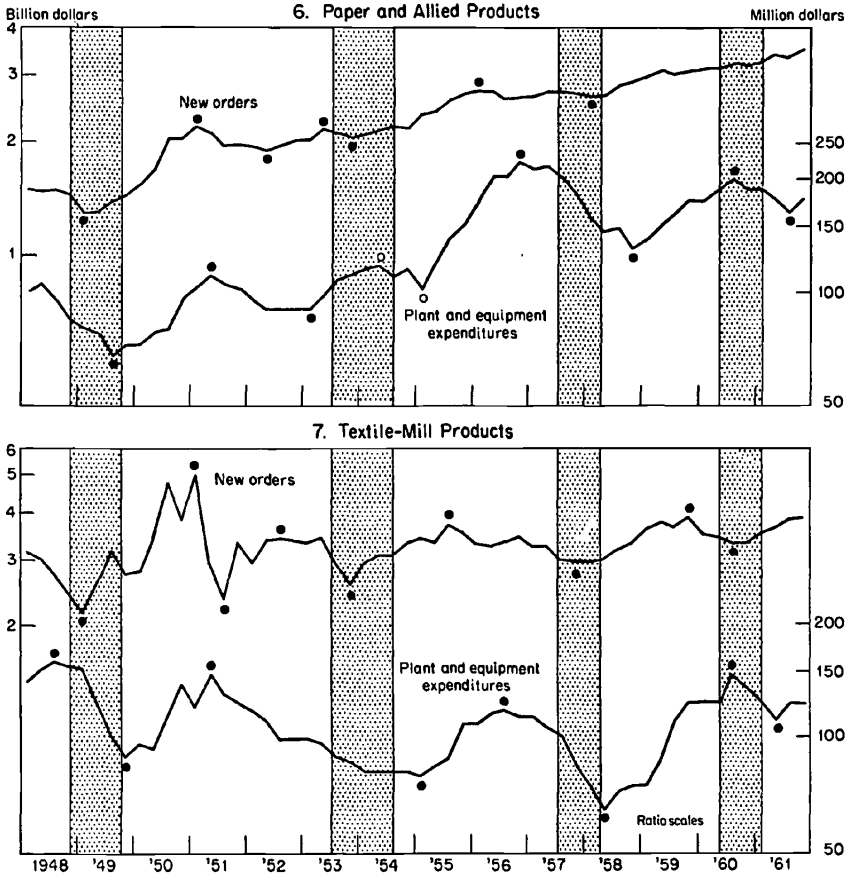


Chart 12-13 (continued)



New orders received by such industries as nonelectrical machinery and nonautomotive transportation equipment reflect decisions to acquire capital goods by private domestic producers. Outlays on such goods are a major component of equipment expenditures. It is of interest to note that the relations between new orders and fixed-investment outlays are closer for these industries (especially nonelectrical

Chart 12-13 (concluded)



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles; circles identify minor turns or retardations.

Source: Securities and Exchange Commission and U.S. Department of Commerce, Office of Business Economics.

machinery) than for the others. The weakest association is found for motor vehicles in the period approximately through 1954.[32]

[32] In these years, mainly under the impact of heavy defense spending, new orders and shipments for the motor vehicles industry followed considerably different time-paths (see Chart 4-3; for civilian motor vehicles these *N* and *S* series are nearly alike). Plant and equipment outlays of motor vehicle manufacturers were then much better correlated with *S* than with *N*. Since 1955, *N* and *S* for this group moved rather closely together, and both series show a definite association with fixed-investment expenditures.

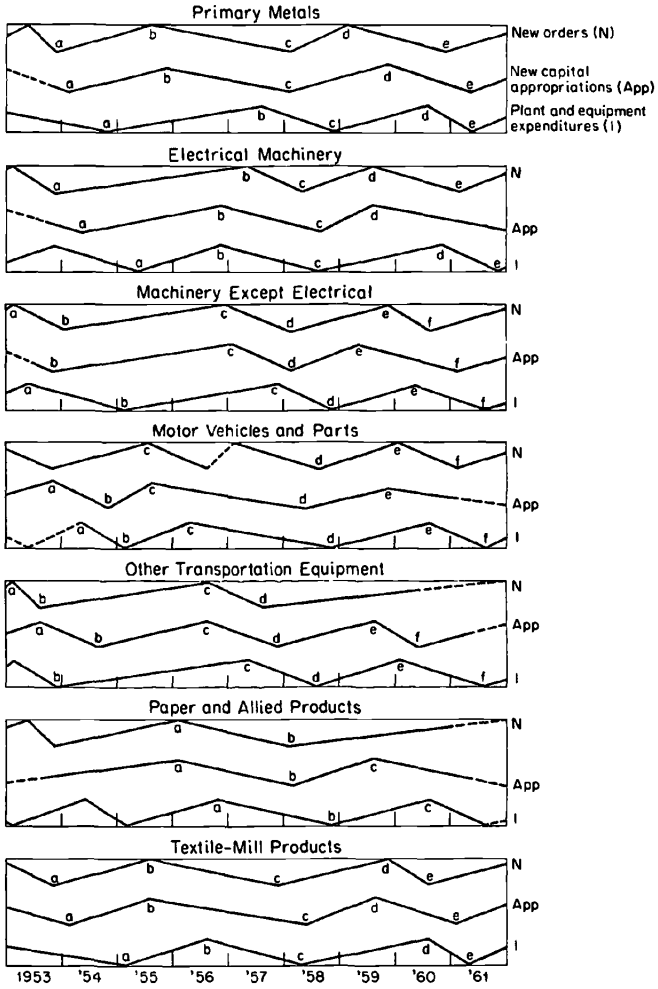
The finding that cyclical movements in incoming business typically begin and end several months ahead of the corresponding movements in plant and equipment expenditures becomes more significant when these leads are either as long or longer than the intervals between investment decisions and expenditures. The evidence appears in comparisons of the OBE series on new orders with data from NICB new capital appropriations, and with the OBE-SEC figures on capital outlays. Chart 12-14 presents the sequences of related turning points in these series. It suggests a tendency for appropriations (*App*) to lag behind orders received by the same industry (*N*), though the timing relations between these variables are rather irregular. In 1953–61, *App* lagged behind *N* in fourteen instances, but there were as many as nine coincidences. Although there were only four leads of *App* over *N*, they were long enough to offset the lags in two industries and to outweigh them in one. Capital outlays (*I*) lagged behind *N* and *App* in each industry by similar intervals. As shown by the accompanying figures, these intervals averaged six to ten months for most industries.

Timing Comparisons: Average Lead (−) or Lag (+), in Months, 1953–61

	Prim. Met.	*Elec. Mach.*	*Mach. exc. Elec.*	*Motor Veh. and Equip.*	*Other Trans-port. Equip.*	*Paper and Allied Prod.*	*Tex-tile-Mill Prod.*
N and *App*	−4.2	−0.8	0.0	+2.0	−5.2	0.0	−2.4
App and *I*	−9.6	−6.8	−10.2	−6.6	−4.0	−10.0	−7.8
N and *I*	−13.8	−7.8	−9.0	−6.0	−8.0	−9.0	−10.2

Limitations of materials and technique prohibit any firm inferences from these figures. But they seem at least consistent with the notion that sufficiently pronounced and prolonged expansions in new orders for manufacturers' output stimulate, and contractions discourage, the approval and implementation of capital expenditure projects of the companies concerned. This result is, of course, anything but surprising. It would be expected on any version of the flexible-accelerator hypothesis but also on the hypothesis that investment responds positively to rising and negatively to falling profits. If manufacturers'

Chart 12-14
Timing of Cycles in New Orders Compared with Cycles in New Capital Appropriations and in Plant and Equipment Expenditures, Seven Major Manufacturing Industries, 1953–61



Note: Identical letters denote cycle turns that can be matched. Broken lines between points indicate retardations; broken lines at the beginning or end of the period covered indicate uncertainty regarding the direction of cyclical movement.

Source: U.S. Department of Commerce, Office of Business Economics; Securities and Exchange Commission; and National Industrial Conference Board.

profits tend to move with output and sales, the short-term expectations of profits should be much influenced by changes in new orders, which anticipate the movements of production. The business climate in the period covered by these comparisons was probably not conducive to the development of any sharp differences between the short-run and the longer-term business outlook. It was a period in which business conditions were mostly favorable and capacity utilization rates mostly high; the external disturbances impinging upon the economy were relatively short and not very strong, except during the Korean War. Hence, there are good reasons why the trends in new orders, through their effects upon actual and anticipated profits, should have had a major influence on the industrial producers' decisions regarding investment in plant and equipment.

Diffusion Indexes for Orders, Profits, and Investment

Chart 12-15 assembles some diffusion indexes based on series for the variables now under discussion: new capital appropriations (*App*), new orders for durable goods (*N*), corporate profits (*R*), and business expenditures on plant and equipment (*I*). These indexes show the percentages of series in the given group that undergo expansion; they are based on moving averages, like the indexes in Chart 12-6, but unlike the latter are not cumulated.

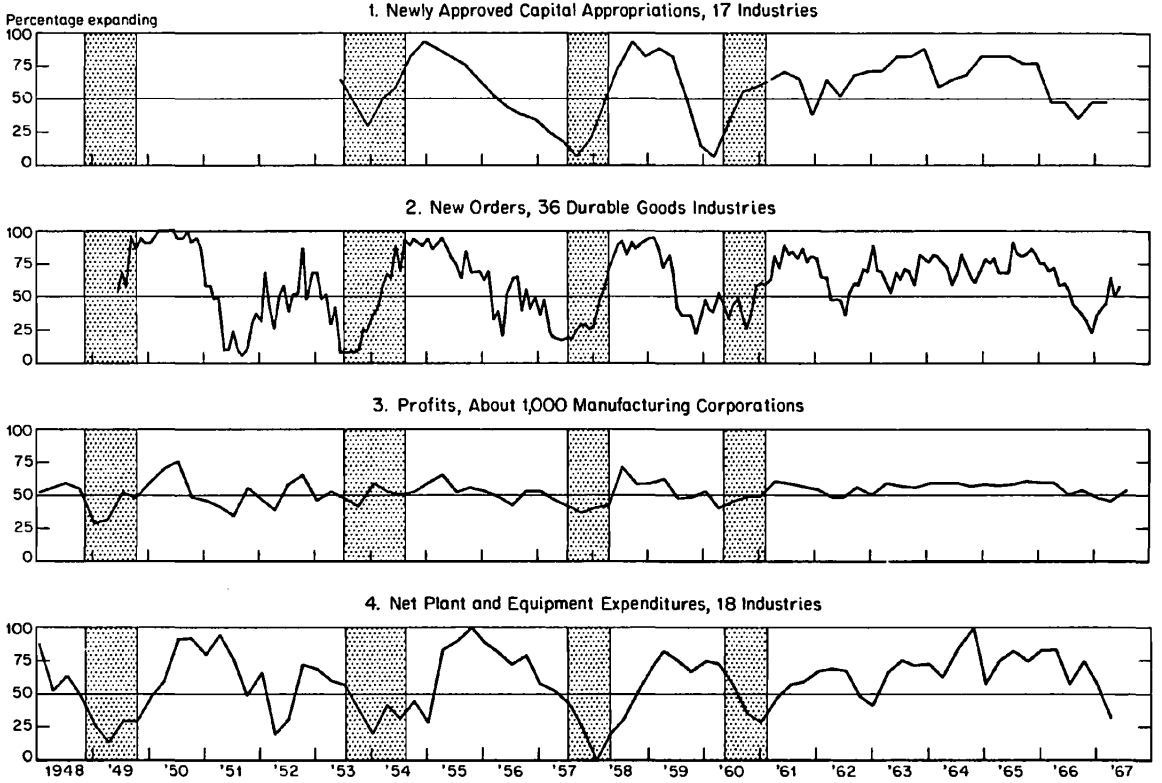
The monthly index for *N* includes 36 series for durable goods industries and is presented in the form of percentages of series expanding over nine-month spans.[33] There is a very definite correspondence of cyclical movements in this index and in the diffusion index of new capital appropriations (compare the first two curves in Chart 12-15). The index for appropriations, being quarterly, is of course considerably smoother than the monthly index for orders, but the two show similar broad fluctuations of approximately coincident timing.[34]

Also included in Chart 12-15 is a diffusion index of profits based on the quarterly financial reports of large numbers of manufacturing cor-

[33] The index is plotted in the sixth month of the span. Its component series are not separately published, but the index itself is released regularly and charted in the monthly *Business Conditions Digest* (Bureau of the Census). The other index series shown in Chart 12-15 are published in the same source. All series are seasonally adjusted. I am indebted to the Bureau of the Census for the historical data for the series.

[34] The appropriations index is based on three-quarter changes and plotted in the third month of the second quarter. The two indexes thus have spans of equal length (nine months) and are similarly centered.

Chart 12-15
Diffusion Indexes of Capital Appropriations, New Orders for Durable Goods, Corporate Profits, and Industrial Production, 1948–67



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions.

Source: (1) National Industrial Conference Board; (2) U.S. Department of Commerce, Bureau of the Census; (3) First National City Bank of New York; (4) U.S. Department of Commerce, Office of Business Economics, and the Securities and Exchange Commission. Series 1, 2, and 3 are currently published in Bureau of the Census, *Business Conditions Digest*.

porations (approximately 600 in the fifties, presently about 1,000). This index refers to one-quarter spans and thus involves no smoothing (it is plotted in the first month of the second quarter). It fluctuates within a relatively narrow range, most of the time between 35 and 65 per cent and never beyond the 25–75 per cent band, which primarily reflects the large size of the samples covered.[35] Nevertheless, these percentages, too, show clusters of locally high values in the expansion years (1950, 1955, 1958–59, and 1961) and of locally low values in the recession or retardation periods (1949, 1951, 1953, 1957–58, 1960, 1962, and 1967). And the timing of these maxima and minima tends to be roughly synchronous with the timing of the corresponding values in the indexes for new orders and capital appropriations.

The index shown on the last line of Chart 12-15 is based on the quarterly surveys of business expenditures on new plant and equipment conducted by the Department of Commerce–Securities and Exchange Commission (OBE-SEC). It has one-quarter spans and is plotted in the first month of the second quarter. Since it is not smoothed and is calculated from a limited number of industry series, it shows relatively frequent, large, and irregular oscillations, but its longer, cyclical movements are for the most part clearly recognizable. These movements are much earlier than those in the corresponding aggregate of business fixed-capital outlays. The latter shows roughly coincident timing at business cycle peaks and short lags at troughs, while the diffusion index leads at peaks by long, and at troughs by intermediate or short, intervals.[36] However, the diffusion indexes for new investment commitments are even earlier leaders than those for expenditures, reflecting the timing sequence of the corresponding aggregates. The cyclical reversals in the percentage-expanding series for business capital outlays lag systematically behind the reversals in the indexes for new capital appropriations and new orders for durable goods (curves 1, 2, and 4 in Chart 12-15). The lags relative to the appropriations index average 8.5 months at peaks and 6 months at troughs in the period

[35] For a given type of economic process, unit of analysis, etc., it is clearly far more likely that 10 component series would all expand or contract simultaneously than that 500 would do so. But here there are other sources of difference as well, since the indexes refer to different variables and units (industries, firms).

[36] The leads of the index at peaks ranged from 13 to 27 months and averaged about 20 months; the leads at troughs ranged from 1 to 7 months and averaged about 4 months.

1954–61; the lags relative to the new-order index average 6 months at peaks and nearly 5 months at troughs in the period 1950–61.[37]

Materials Purchases, Inventory Changes, and Credit Conditions

Moore has suggested that "tight credit conditions and piling up of inventories" contribute to the early declines in orders during business expansions, along with "unfavorable cost-price relations."[38] The last factor was considered in the previous sections; the first two factors will be given some attention now.

New orders for materials increase sharply in the initial stage of a business expansion. Total stocks of purchased materials usually continue to decline in this stage, but the rate of disinvestment begins decreasing late in the contraction. At that time, new orders turn up for many products of the firms holding the inventories, giving rise to or reinforcing expectations of an upswing in demand. Then, an increasing number of firms, facing the upswing, hasten to end further disinvestment and to build up their working inventories. Shipments of materials rise too, but at a lower rate than new orders, so that producers' order books lengthen, i.e., commitments to supply materials increase. Purchasers, however, not only add to their outstanding orders but presently succeed in increasing their stocks on hand. In fact, the largest increases in these stocks take place early in expansion, in stage-to-stage intervals I–II and II–III.

All this is indicated by the patterns in the first two columns of Chart 12-16, which are based in part on grouped pre-1963 OBE data on new orders and shipments. The patterns for the purchased materials inventories (M) refer to the Commerce series in book values.[39] Studies of the cyclical behavior of inventories support this analysis.[40]

In the late stages of expansion, the pace of increases in demand typically slackens. Though it is by no means demonstrated, it is plausible that the very increases in inventories which occurred during the

[37] All in all, these comparisons yield twelve lags of the investment expenditures index and one case of coincidence. But the lags, while persistent, varied considerably in length (from 1 to 13 months). It should be noted that some of the dates involved in these observations represent marginal and inevitably uncertain selections.

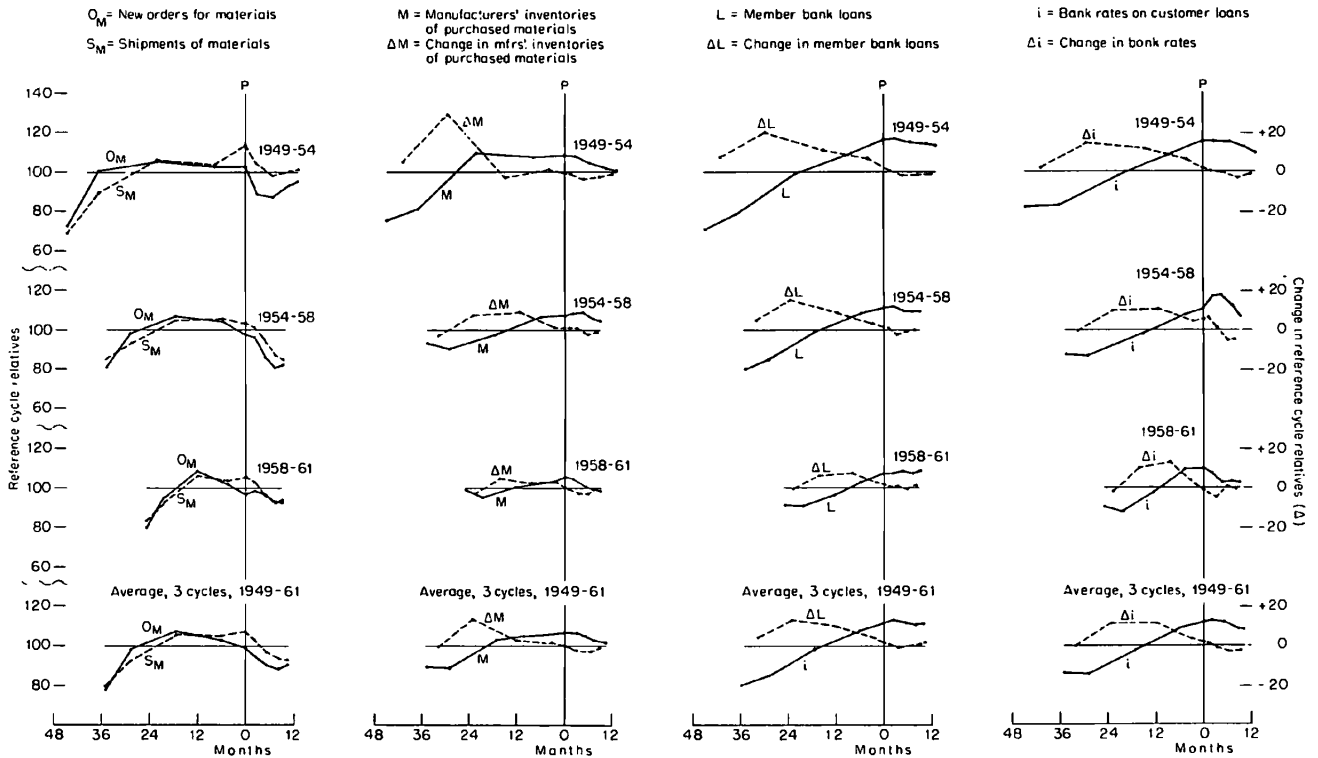
[38] "Leading and Confirming Indicators," p. 65. He adds that "opposite conditions are associated with the early upturns in new orders during contractions."

[39] The stage-to-stage changes in inventories (ΔM) are plotted at points in time separating the stages (the values of the reference cycle patterns in M are centered on the stage intervals).

[40] See Chapter 8 for references to the work by Abramovitz, Stanback, and others, and for an account of other aspects of inventory behavior at each stage of fabrication.

Chart 12-16

Reference Cycle Patterns in New Orders and Shipments of Manufacturers of Materials, Inventories of Purchased Materials, Bank Loans, and Bank Interest Rates, 1949–61



recovery on an impressive scale now act as a deterrent against further massive stockpiling. Certainly pronounced retardations are evident in inventory fluctuations. The stage-to-stage changes in materials inventories form an almost inverted pattern relative to that of inventories proper in Chart 12-16. Thus, in the second half of expansion new orders for materials begin to decline, while output and deliveries of materials flatten out. Inventories continue to rise throughout the expansion but at a declining rate; inventory investment turns down early.

Inventory purchases and financing are a major source of the demand for business loans, which brings up a point about the influence of credit conditions. From stage to stage of the business cycle, the pattern of movement in commercial bank loans (L) has a very similar appearance to the course followed by purchased-material inventories (compare the diagrams for totals and changes in the two middle columns of Chart 12-16).[41] The similarity extends to the patterns of stage-to-stage changes (L and M). The differences between the patterns are in part of technical origin and not essential as far as the cyclical aspect of this relation is concerned.[42]

The patterns in bank interest rates on short-term business loans, i (a quarterly series of the Federal Reserve Board), also bear a strong family resemblance to the patterns in L and M. (Compare the corresponding diagrams in the last three columns of Chart 12-16.) These high positive correlations in each successive cycle among inventories, loans, and interest rates indicate strong influences arising from shifts of demand. To finance the net additions to inventories (and for other business purposes), increasing amounts of loans are sought, which drives up interest rates. Banks strive to satisfy the loan demands of regular customers as far as possible, even when funds are scarce.[43]

[41] The patterns for commercial bank loans are based on the monthly FRB series for *total* loans of reporting member banks. Inventory borrowing is known to represent a large part of total business borrowing and a major use of *short-term* bank credit. Close associations between manufacturers' inventories and short-term bank loans have been shown and analyzed in Doris M. Eisemann, "Manufacturers' Inventory Cycles and Monetary Policy," *Journal of the American Statistical Association*, September 1958, pp. 680–88.

[42] The most significant difference observable is that loans often start rising earlier than inventories and start declining later. The average expansion period in the chart is VII–VI for loans (L) and II–V for inventories (M). This seems largely due to trend differences, which are only partially eliminated by the adopted technique since the patterns abstract from the intercycle but retain the intracycle trend components. The timing discrepancies are decreased when first differences in the patterns are calculated to obtain the diagrams for ΔL and ΔM, a step that further reduces the effect of trends.

[43] They do so by reducing excess reserves, selling securities, and borrowing. (See Phillip Cagan, "Interest Rates and Bank Reserves—A Reinterpretation of the Statistical Association," Jack M.

But one can also see in these patterns some elements of a simple negative relation between price and quantity demanded. The largest decreases in the interest rates ($-\Delta i$) occur in mid- or late contraction, and the lowest levels of the rates are observed at the end of the downswing and early in the recovery. The credit ease may contribute to the fact that new orders for materials firm up shortly before the business trough and show the highest rate of rise between the first two stages of expansion (I–II), while ΔL and ΔM both reach their peaks in the interval II–III. Again, the largest increases in the bank interest rates ($+\Delta i$) occur in mid-expansion, in the stage intervals II–III and III–IV, a timing which agrees with that of the early weaknesses or declines in new orders and with slowdowns in the rate of borrowing and inventory investment.

Forward Buying and Supply Conditions

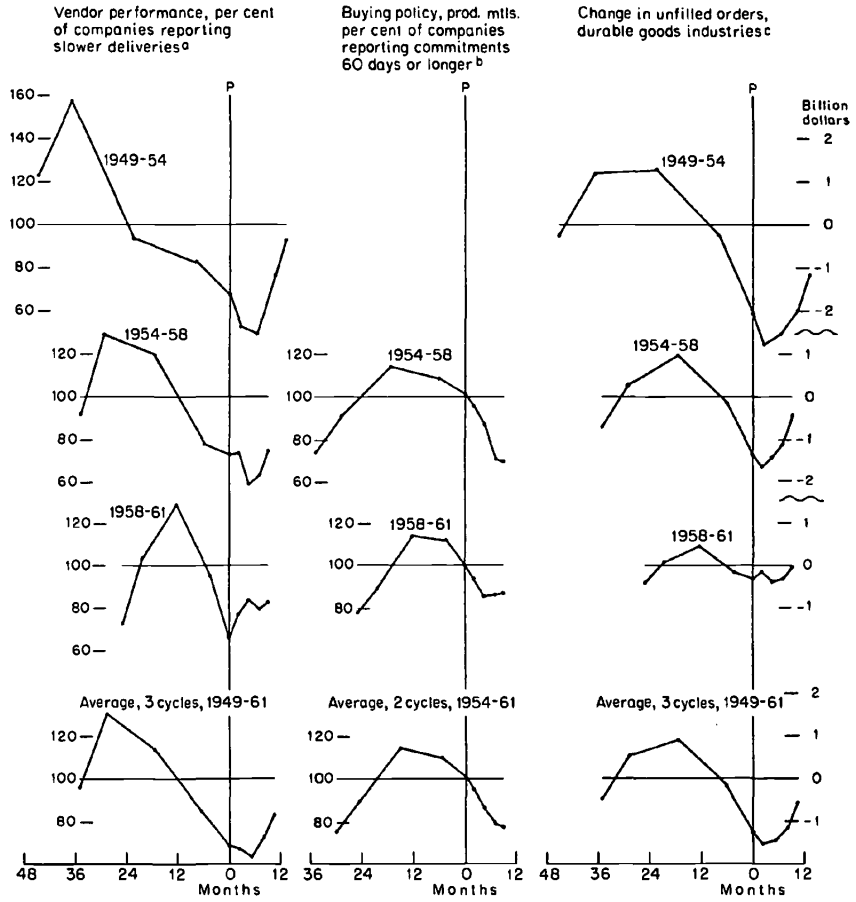
The early spurts of new orders in postwar business recoveries, visible in the patterns for durable goods and the market category of materials (Charts 12-1 and 12-16), have been accompanied by definite shifts toward slower deliveries by the "vendors." The graphs of cyclical movements in the vendor performance index [44] show in most cases an increase between stages VII and II (Chart 12-17). Thus, according to a sample of purchasing agents, suppliers have increasingly quoted longer times to delivery even before the general business upturn. The post-Korean patterns show the largest values of this index in the expansion stages II and III and relatively low values around the business peaks and in contractions.

The increase in the quoted lead times to delivery induces, with short lags, a protective reaction on the part of the industrial purchasers. Thus, in the initial stages of business expansions more companies report ordering at least sixty days in advance of anticipated needs than at other times, according to survey data of the National

Guttentag and Phillip Cagan, eds., *Essays on Interest Rates*, New York, NBER, 1969, Vol. I, pp. 223–71.) Elsewhere Cagan has shown that interest rates on bank loans, along with other rates, have a generally lagged timing at business cycle turns, but that the lags have become shorter and less differentiated over the years, indicating increasing sensitivity of the financial markets to cyclical business developments; see his "Changes in the Cyclical Behavior of Interest Rates," *Review of Economics and Statistics*, August 1966, reprinted as Occasional Paper 100, New York, NBER, 1966.

[44] This index, based on the monthly survey of members of the Purchasing Agents Association of Chicago, was introduced in Chapter 8 (see Chart 8-2 and text).

Chart 12-17
Reference Cycle Patterns in Indexes of Vendor Performance and Buying Policy and Changes in Unfilled Orders, 1949–61



[a] Chicago Purchasing Agents Association.
[b] National Association of Purchasing Agents.
[c] OBE-Census. Deviations from cycle base.

Association of Purchasing Agents (Chart 12-17). The patterns for this buying policy index rise fairly sharply to their highest relative standings in stages III and IV, then decline similarly to level off before the end of contraction.[45]

[45] For a discussion of a related purchasing policy index of the PAA of Chicago, see Chart 8-2 and text in Chapter 8.

Delivery slowdowns and increases in backlogs of unfilled sales orders are symptoms of rising demand pressures as seen from the suppliers' side; increases in the average time covered and total amounts of outstanding purchase orders are the corresponding symptoms as seen from the buyers' side. Changes in unfilled orders (outstanding orders) for durable goods are shown in the patterns of deviations from the cycle base (last column of Chart 12-17). These patterns certainly resemble the others in the chart, particularly those of the vendor performance index. The largest cyclical increases in backlogs occurred at mid-expansion or earlier, in stages II and III; the largest decreases, shortly after the peak of business activity, in stages VI and VII.

It is an important fact that these indicators of relative demand pressure start declining so early during a business expansion and start rising so early during a contraction or recovery. Well before the general downturn, the rate and scope of the rise in demand (new orders) begin to decline, and this reduces first the growth and then the level of uncompleted orders and contracts. The decline in unfilled orders is accompanied by speedier deliveries, which causes firms to reduce forward buying of materials and parts. The first signs of weakness may be connected with residential construction or new investment commitments of the business sector, but suppliers of consumer goods may be involved as well.[46] Stronger efforts are then made to adjust inventories downward, and investment in inventories begins declining (although total stocks on hand still increase). *Mutatis mutandis*, analogous (but not symmetrical) developments tend to accompany the process of recovery.

Summary

Most reference cycle patterns for new orders for durable goods register leads that vary from one to three cycle-stages. Contrasts between business contractions of different severity, and between business expansions of different vigor, are strongly reflected in the amplitudes of these patterns. Reference cycle patterns for production show smaller amplitudes than the corresponding constructs for new orders, and a

[46] See Arthur F. Burns, "Business Cycles," in *International Encyclopedia of the Social Sciences*, 1968, Vol. 2, pp. 238–39, for an account of these components of the "gathering forces of recession."

more nearly coincident timing. The patterns for unfilled orders demonstrate that in business cycles with vigorous expansions the typical sequence is first a rapid rise in the backlog and then an early and slow decline continuing through the contraction stages. By contrast, in "weak" cycles that fail to include a full-grown boom, the backlog rise is smaller and slower, often reaching its highest point in the peak stage.

New orders and contracts for plant and equipment attained their highest cyclical standing at or after the midpoint of recent business expansions, in stage III or IV; but shipments and installations, as well as the corresponding capital outlays, continued to rise until the peak or the early-recession stage (V or VI). While new investment commitments had their lowest cyclical standing either in mid-contraction or in the next stage (VII or VIII), investment realizations, whether measured by the value of output or expenditures, had theirs in the trough stage. The amplitudes of rise and fall over the business cycle, as shown by the typical patterns, are considerably larger in fixed-investment commitments than in realizations.

The evidence for the period between the two world wars, which is rather fragmentary, suggests that the timing of new orders was then less often leading and more often coincident than in the post-World War II cycles; this is so according to the patterns for durable goods and, particularly, for such capital goods as machine tools. To the extent that this represents a systematic change, it can be related to (1) the lead of manufacturing output at peaks in recent business cycles (in the past, when manufacturing had greater weight in the economy, declines in this sector had stronger and prompter effects and therefore more nearly coincident timing); (2) the long lags of production behind new orders at the recessions of the 1940's and 1950's because of very large accumulations of unfilled order backlogs in the preceding expansions.

The reference cycle patterns in new orders of durable goods manufacturers and in corporate profits after taxes show marked similarities, and so do the patterns in corporate profit margins and in new investment commitments (orders and contracts and capital appropriations). In the postwar cycles for which these measures are available, profit margins turned down earlier than investment commitments.

The influence of profits may be due to their acting as proxies for

changes in internal funds, cost-price relationships, and business expectations, so that the role of this variable, even though apparently strong, is ambiguous. However, the use of profit margins presumably helps to reduce the financial aspect and to bring out more strongly the other aspects of the profit-investment relationship.

Orders and profits may well be jointly determined by other factors, and they certainly interact. Sustained increases (decreases) in new orders received are apt to be translated, via output and sales, into higher (lower) profits. However, this process is likely to involve relatively long lags of profits behind orders received, whereas the causal chain that "starts" with profits suggests that profits should lead or coincide with orders placed. For the aggregate of all firms the distinction between orders received and placed is immaterial. The fact that aggregate profits seldom lag but frequently lead or coincide with orders suggests that the influence of profits on orders is the stronger one.

The cyclical fluctuations in industry expenditures on plant and equipment tend to follow with long lags the more pronounced and prolonged expansions and contractions in new orders received by the given industry. New capital appropriations tend to coincide approximately with, or lag shortly behind, these orders, for most of the major industries covered. These results are consistent with both the flexible accelerator and the profits hypotheses about investment determination.

New orders for materials usually turn up ahead of the business cycle trough, then increase sharply in the initial stage of expansion, while stocks still decline but at considerably lower rates. Although shipments of materials rise more slowly than orders, purchasers soon succeed in adding not only to their stocks on order but also to stocks on hand. In the later stages of business expansion, there is typically a retardation in purchasing, which may partly represent reactions to the earlier massive stockpiling. Both the levels and stage-to-stage changes in the cyclical patterns for commercial bank loans and bank interest rates on short-term business loans resemble quite well the patterns for purchased-material stocks. These relations reflect the shifts in demand for bank credit by business and the effects of such shifts on interest rates. But there is also evidence that the largest increases (decreases) in bank interest rates occur in mid-expansion (mid-contraction), and this may contribute to the similar timing of the

first declines (rises) in purchases of materials and parts. Still another reason for such early declines in new orders during business expansions lies in the concurrent reductions of delivery lags and of forward buying.

Diffusion indexes show that the percentage of industries with rising new orders typically turns up early in a business contraction and turns down early in an expansion. The *scope* of cyclical movements in the demand for industrial outputs evidently undergoes large fluctuations of its own that lead the fluctuations in aggregate demand by long intervals. The percentage-expanding indexes for new orders received by durable goods industries show roughly coincident timing with the indexes for new investment commitments and profits. Such diffusion series based on leading indicators can be particularly helpful in revealing and locating the strengths and weaknesses that often develop early in business contractions and expansions. The percentage-expanding indexes for production and business capital outlays lag behind those for new orders and capital appropriations and profits (although they, too, have considerably earlier timing than the corresponding aggregates of output and investment expenditures).