

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Information, Expectations, and Inventory Fluctuations: A Study of Materials Stock on Hand and on Order

Volume Author/Editor: Mack, Ruth P.

Volume Publisher: UMI

Volume ISBN: 0-870-14478-2

Volume URL: <http://www.nber.org/books/mack67-1>

Publication Date: 1967

Chapter Title: Inventory-Purchase Cycles and Business Cycles

Chapter Author: Ruth P. Mack

Chapter URL: <http://www.nber.org/chapters/c1414>

Chapter pages in book: (p. 241 - 268)

## 12. *Inventory-Purchase Cycles and Business Cycles*

The previous three chapters have analyzed the processes that appear to generate fluctuations within the complex of events central to purchasing and stock-carrying functions. Thus they concern primarily the first of the two sets of problems mentioned at the outset—the dynamics of inventory fluctuation viewed as a syndrome of causally interrelated phenomena. This chapter focuses on the second set of problems: how stocks and associated activities participate in economic instability.

The central fact about the objectives, problems, perceptions, and techniques associated with stock carrying and purchasing is that they tend to produce fluctuation in stocks on hand and on order and in their rates of change. But most other aspects of economic life are also subject to fluctuation, and to these instabilities inventory movements have the usual double relationship. On the one hand, they are influenced by fluctuations that are, at least in the first instance, external to the “inventory cycle.” For example, we have previously explored how changes in levels and in rates of change in final demand, in planned

utilization and various other shifts in costs and in market conditions, impinge on the process whereby stocks rise and fall. On the other hand, the levels of stocks on hand and on order, and particularly the rates at which they change, impinge on other aspects of the economy (including the ones just mentioned) and the manner in which they fluctuate.

The specifics of the impact differ, of course, for each aspect, and therefore cannot be examined here. It will, however, be instructive to make use of a general framework for business fluctuation and describe how the events primarily associated with the inventory-purchase complex join the configuration. I discuss first the timing of the events central to inventory-purchase movements, and second the amplitude of their impact on earlier as contrasted with later stages of production. The last section surveys how the inventory-purchase syndrome plays into the process whereby the forces of contraction cumulate and moderate, how expansion sets in, develops, and recedes.

### *BUSINESS CYCLE PATTERNS OF INVENTORY WAVES*

Since World War II, many economists have felt that fluctuations in stocks have played a more dominant role in business fluctuation at large than previously had been the case. The reason is rather that other sources of instability have moderated than that inventories are becoming more unruly. It is not surprising, then, to find a high order of con-

formity to the National Bureau business cycle reference chronology of the activities involved in purchasing and inventory fluctuation.

#### *Three Characteristics*

*Conformity:* Table 42 gives reference cycle timing measures for the five series most cen-

## SEARCH FOR EXPLANATIONS

TABLE 42

*Average Business Cycle Reference Timing of Materials Stocks and Purchasing,  
Durable Goods Manufacturers and Department Stores, 1948-62<sup>a</sup>*

	Median Leads (-) Or Lags (+), Months				Number Of Matched Turns					
	At Peaks		At Troughs		Dur. Mfrs.			Dept. Stores		
	Dur. Mfrs.	Dept. Stores	Dur. Mfrs.	Dept. Stores	-	+	0	-	+	0
	(1)	(2)	(3)	(4)	(5)			(6)		
1. Change in outstanding orders	-22.5	-14.0	-7.0	-9.0	8	0	0	8	0	0
2. Change in ownership	-22.5	-12.5	-7.0	-8.0	8	0	0	8	0	0
3. Change in stocks	-7.0	-9.5	-3.5	-3.0	6	1	1	8	0	0
4. Materials orders	-10.5	-7.5	-2.0	-4.0	7	0	1	8	0	0
5. Materials receipts	-4.5	-4.5	-1.0	-3.5	5	1	2	8	0	0
6. Outstanding orders	-8.0	-7.0	+0.5	-2.5	8	0	0	8	0	0
7. Ownership	-4.5	-0.5	+0.5	-2.5	6	2	0	5	1	2
8. Stocks	+0.5	+0.5	+4.0	+0.5	1	6	1	1	4	3
Average lines 1-5	-13.4	-9.6	-4.1	-5.5						
Average all lines	-9.9	-6.9	-1.9	-4.0						

	Skipped Reference Turns		Number of Extra Turns		Early Peak As High Or Higher Than Second Peak			
	Dur. Mfrs.	Dept. Stores	Dur. Mfrs.	Dept. Stores	in 1947		in 1951	
	(7)	(8)	(9)	(10)	Dur. Mfrs.	Dept. Stores	Dur. Mfrs.	Dept. Stores
	(7)	(8)	(9)	(10)	(11)		(12)	
1. Change in outstanding orders	0	0	2 <sup>b</sup>	4	Yes	Yes	Yes	Yes
2. Change in ownership	0	0	1 <sup>b</sup>	4	Yes	Yes	Yes	Yes
3. Change in stocks	0	0	4	4	Yes	Yes	Yes	Yes
4. Materials orders	0	0	2	4	No	Yes	Yes	Yes
5. Materials receipts	0	0	2	4	No	Yes	No	Yes
6. Outstanding orders	0	0	2 <sup>b</sup>	4	Yes	Yes	No	Yes
7. Ownership	0	0	2	4	Yes	Yes	No	Yes
8. Stocks	0	0	0 <sup>b</sup>	4	No	No	No	Yes

<sup>a</sup>For source tables, see corresponding lines of Table 43.

<sup>b</sup>In addition there were two extra minor specific cycle turns.

trally involved in inventory cycles and their impact on the economy. They are rates of change in ownership and in its two parts, and orders for materials and their shipment to the purchaser. The level of the three stockpiles is also shown in the table. For both durable goods manufacturers and department stores, all reference turns during the period examined (there were eight marked) were invariably matched by corresponding specific cycle turns.

*Leads:* Virtually all turns for the five series lead the business cycle chronology. For the two sorts of enterprises, eighty individual timing comparisons were made; two of these were lags, four synchronous,<sup>1</sup> and seventy-four leads. For outstandings proper, leads are also universal. Only for stocks proper are lags common. Average leads tended to be long, and longer at peaks than at troughs. The difference was far more marked for the durable goods industries than for department stores.

*Extra Cycles:* The table summarizes a further characteristic of the series. They tend to have additional specific cycle turns at one or both of the times when hesitations or minor reversals in business cycles have been noted. I refer to the two brief recessions which interrupted, on the one hand, the rise to the 1948 business peak and, on the other hand, interrupted the rise to the peak in 1953 after the first impact of the Korean War. Columns 9 and 10 of Table 42 show that department store inventory and purchase data all had these four specific subcycle phases. The durable goods inventory data usually had them, though often marked as a minor movement, whereas the book value of orders and shipments rose uninterrupted during the first years of postwar demand, though it dipped after Korea. In general, then, for this whole group of activities, two of the three periods of business cycle expansion between 1946 and 1961 were interrupted by temporary setbacks.<sup>2</sup>

<sup>1</sup> The individual timing comparisons are given in the source tables for each line of Table 42.

Indeed, the earlier of the two peaks in each of the interrupted business expansion phases was for the department store data, with one exception, uniformly as high or higher than the second, the one associated with the peak in general business.

The characteristic interruptions also have implications with respect to techniques of analysis. By using the subcycle reference scheme, more comparisons can be made, and the timing of individual turns becomes less erratic. These measures, summarized in Table 43, show again the almost universal presence of leads for the ownership investment data (columns 7 and 8) and likewise for materials orders. The tendency for average leads to be longer (or lags shorter) at peaks than at troughs is indicated (without the disruption of the very long leads relative to the business cycle turn in 1953).

#### *Similarities and Differences in Timing for the Two Groups of Enterprises*

By and large one is struck by the similarities in the timing comparisons for department stores and durable goods manufacturers. However, Table 43 does reveal, on closer examination, that for department stores median leads at troughs are invariably longer, or lags shorter, than for durables. This is perhaps no surprise in view of the tendency for retail sales to recover promptly during the postwar cycles.<sup>3</sup>

However, the similarities and differences in timing of events associated with the merchandise buying of department stores and with the materials buying of durable goods manufacturers deserve more careful study, for they bear on the important problem of whether

<sup>2</sup> There appears also to have been an interruption at the turn of the year 1961-62, but, as previously explained, my figures need a thorough overhauling in order to deal reliably with this period.

<sup>3</sup> Compare lines 1 and 2 in Tables 6 and 15.

TABLE 43

*Average Subcycle Reference Timing of Materials Stocks and Purchasing,  
Durable Goods Manufacturers and Department Stores, 1946-62*

Series		Median Leads (-) Or Lags (+), Months							
		Peaks		Troughs		All Turns			
		Dur. Mfrs. (1)	Dept. Stores (2)	Dur. Mfrs. (3)	Dept. Stores (4)	Dur. Mfrs. (5)	Dept. Stores (6)		
Dept. Stores	Durables								
<i>Change in Ownership</i>									
Outstandings	Outstandings	-12.7	-13.0	-5.0	-10.5	-7.7	-11.5		
Ownership	Ownership	-12.7	-11.5	-5.0	-9.5	-7.7	-11.0		
Stocks	Stocks	-4.0	-8.0	-1.5	-3.0	-3.0	-6.0		
<i>Purchase Data</i>									
Merch. Orders	Materials Orders	-7.3	-7.5	-2.7	-5.5	-4.5	-7.0		
Merch. Receipts	Materials Receipts	-2.7	-4.5	-0.7	-3.5	-0.5	-3.5		
<i>Stock Proper</i>									
Outstandings	Outstandings	-6.0	-6.5	+0.5	-2.5	-2.5	-3.5		
Ownership	Ownership	-4.0	-0.5	+1.0	-2.5	-1.5	-2.0		
Stocks	Stocks	+1.3	+0.5	+3.7	0	+3.0	0		
Average lines 1-5		-7.9	-8.9	-3.0	-6.4	-4.7	-7.8		
Average all lines		-6.0	-6.4	-1.2	-4.6	-3.0	-5.6		
		Number Of Matched Turns		Skipped Reference Turns		Source Tables			
		Dur. Mfrs.	Dept. Stores	Dur. Mfrs.	Dept. Stores	Dur. Mfrs.	Dept. Stores	Table Line	Table Line
		- + 0	- + 0	Mfrs.	Stores	Mfrs.	Stores	(11)	(12)
		(7)	(8)	(9)	(10)				
<i>Change in Ownership</i>									
Outstandings	Outstandings	10 0 1	12 0 0	1	0	18	13	20	14
Ownership	Ownership	10 0 1	12 0 0	1	0	18	2	20	2
Stocks	Stocks	9 2 1	12 0 0	0	0	18	7	20	8
<i>Purchase Data</i>									
Merch. Orders	Materials Orders	9 0 1	12 0 0	2	0	28	9	22	11
Merch. Receipts	Materials Receipts	5 2 3	12 0 0	2	0	28	2	22	6
<i>Stock Proper</i>									
Outstandings	Outstandings	8 4 0	12 0 0	0	0	1	11	9	11
Ownership	Ownership	7 3 0	8 1 3	2	0	1	2	9	2
Stocks	Stocks	1 8 1	3 5 4	2	0	1	6	9	6

there is a tendency for inventory-purchase cycles to occur at the same time in diverse markets. Table 44 explores the question in terms of direct comparisons between department stores and durable goods manufacturers for the various stock and flow data, grouped in pairs, on as nearly a comparable basis as can be contrived.

The first eight lines refer to the same pairs of series for which the reference timing was given in Tables 42 and 43. The direct comparisons show, of course, the same tendency for department store stocks or outstandings, and their rates of change, to reach troughs ahead of those of durable goods manufacturers. Moreover, for rates of change, the average leads of three or four months are very consistent: average deviation ranged between 1.4 and 2.0 months for the three inventory investment series. Lines 11 and 12 indicate that one reason for the lead may be that, at troughs, department stores' sales also lead shipments of all durable goods manufacturers or those in the heavy industries. But the need for very close control of merchandise stocks doubtless also plays a part.

We saw in the previous tables that actions associated with the inventory-purchase syndrome caused department store merchandise orders to lead at cyclical turns as much or more than did the materials orders of durable goods manufacturers. Apparently, at only two of the ten matched turns (line 4) did the purchase orders of department stores turn later than those of durable goods manufacturers. The tendency for department store inventory investment and buying to turn early even relative to the most sensitive durable goods manufacturers' stocks, those of purchased materials, offers food for thought.

But perhaps even more interesting than the lead itself is the regularity of the association for the two sorts of enterprises. The series that represent the most direct influence of stocks on the economy as a whole are the rates of change in the stock aggregates, materials orders, and (via their influence on inventory

fluctuation) the rates of change in shipments (sales). Of these, the timing for the inventory investment and order data have already been discussed. For change in shipments (lines 13 and 14), the table shows a surprisingly close correspondence when the rates of change in department store sales are compared with either shipments of all durable goods manufacturers or those of the heavy industries only. Allowing for a lead of between two and zero months, 79-81 per cent of the months were in like phase for the whole period or, because of differences in the immediate postwar behavior, 83-86 per cent for the period beginning in 1948. Peaks occur at virtually the same time, the average deviation for the four matched peaks are .5 and .2 months respectively. For the five matched troughs, none are more than four months apart. Note that the timing is not nearly as similar for the data proper (lines 11 and 12), though the absence of turns in either series in the early years boosts the months in phase for the period as a whole (not for the post-January 1948 segment).

I might add, in view of the common assumption that differencing reduces collinearity, that it is common for comparable data for any of the stock and flow series for the two sorts of enterprises to have more months in phase when converted to rates of change than for the data proper.<sup>4</sup>

<sup>4</sup> The percentage of months in phase was compared for department stores and durable goods manufacturers as shown by first differences and by data proper in three stock series given in lines 1 to 3 and 6 to 8 of Table 44, and for the flow series for which the data proper are given in lines 9, 11, 4, 10 and 12. (The matching rates of change are given in the table only for lines 11 and 12.) This gave sixteen comparisons—eight pairs for percentage of months in phase for data proper and for their first differences; using the two periods, 7/46 to 12/61 and 1/48 to 12/61, produced sixteen pairs. Of these sixteen, the months in phase for department stores and durables were higher for first differences in thirteen cases, the same in one, and smaller in two. Timing also tends to be more nearly synchronous for the first differences in six of the eight pairs, the same in one, and longer in one.

I have not systematically examined whether, when other sorts of comparisons are made, the parallelism is

TABLE 44

*Timing: Selected Series, Department Stores Compared with Comparable Data for Durable Goods Manufacturers, 1946-61*

		Section A: Months Lead (-) or Lag (+) for Matched Turns <sup>a</sup>											
		Chronology <sup>b</sup>											
Line	Reference Series, Durables <sup>c</sup>	P 1947	T 1947	P 1948	T 1949	P 1951	T 1952	P 1953	T 1954	P 1957	T 1958	P 1960	T 1961
<i>Specific Series: Change in Ownership, Dept. Stores</i>													
1	Outstandings	-2	-6	-8	-3	-6	-6	+1	-5	+6	-3	+5	0
2	Ownership	-7	-6	-8	-3	⊘	⊘	+9	-5	+5	-1	+4	0
3	Stocks	⊘	⊘	-3	-5	-11	-2	0	-4	+5	0	+6	-3
<i>Specific Series: Purchasing, Dept. Stores</i>													
4	Materials, orders	⊘	⊘	-12	-1	-6	-8	0	0	+6	-3	+14	-1
5	Materials, receipts	⊘	⊘	-11	-3	-4	-9	-6	-4	+6	-3	+10	-1
<i>Specific Series: Stock Proper, Dept. Stores</i>													
6	Outstandings	⊘	-8	-5	-14	-8	<u>-8</u>	<u>+2</u>	-2	+7	-3	+2	+6
7	Ownership	⊘	-7	-4	-6	-8	<u>-6</u>	<u>+2</u>	-2	+8	-2	+4	+6
8	Stocks	-4	-6	-11	+1	0	-8	-7	-7	-4	-3	+11	+3
<i>Specific Series: Demand, Dept. Stores</i>													
9	Orders, final product	⊙	⊙	+4	+1	0	<u>-5</u>	<u>+5</u>	+1	+12	-2	+10	0
10	Orders, all dur.	⊙	⊙	+4	0	0	-5	+4	+1	+20	0	+10	⊘
11	Shipments, final product	⊙	⊙	-2	-5	⊘	⊘	-2	-9	+7	-2	+9	0
12	Shipments, all durables	⊙	⊙	-2	-3	<u>-2</u>	<u>-15</u>	-2	-9	+7	-2	+10	0
<i>Specific Series: Change in Sales, Dept. Stores</i>													
13	Change shipments, final product	⊘	⊘	⊘	+4	-1	-2	0	-4	0	-2	0	-1
14	Change shipments, all durables	⊘	⊘	⊘	+4	-1	-3	0	-4	0	-1	+1	0

(continued)

TABLE 44 (concluded)

Section B: Average Timing of Turns											Section C: Percentage of Months in Like Phase <sup>d</sup>			
Line	Reference Series, Durables <sup>c</sup>	Number Matched			Median <sup>e</sup>			Average Deviation <sup>f</sup>				Timing Adjust-ment <sup>g</sup>	% Mos. 7/46-12/61	% Mos. 1/48-12/61
		-	+	0	P	T	All	P	T	All Turns				
										Wt'd				
<i>Specific Series: Change in Ownership, Dept. Stores</i>														
1	Outstandings	8	3	1	-0.5	-4.0	-3.0	4.7	1.8	3.4	3.2	-3	78	78
2	Ownership	6	3	1	+0.7	-3.0	-2.0	6.5	2.0	4.6	4.2	-1, -2	71	75
3	Stocks	6	2	2	+0.7	-3.0	-2.5	5.1	1.4	3.5	3.3	-2	77	79
<i>Specific Series: Purchasing, Dept. Stores</i>														
4	Materials, orders	6	2	2	0	-1.7	-1.0	7.6	2.1	4.9	4.9	-1	72	71
5	Materials, receipts	8	2	0	-1.3	-3.3	-3.5	7.1	1.9	4.3	4.5	-3, -4	71	74
<i>Specific Series: Stock Proper, Dept. Stores</i>														
6	Outstandings	7	4	0	-0.3	-5.5	-3.3	4.9	5.2	5.3	5.0	-2, -3	69	69
7	Ownership	7	4	0	+0.7	-4.0	-2.7	5.1	3.5	4.5	4.2	-2	74	74
8	Stocks	8	3	1	-4.0	-4.5	-4.0	4.8	3.7	4.2	4.2	-4	73	71
<i>Specific Series: Demand<sup>h</sup>, Dept. Stores</i>														
9	Orders, final product	2	6	2	+6.3	-0.3	+1.0	3.9	1.9	3.8	2.9	+1	80	77
10	Orders, all dur.	1	5	3	+6.0	0	+1.7	5.6	1.5	4.9	3.8	+1	71	68
11	Shipments, final product	5	2	1	+2.5	-3.5	-2.0	5.0	3.0	4.0	4.0	-2	81	79
12	Shipments, all durables	7	2	1	+1.0	-4.7	-2.0	4.8	4.7	4.4	4.8	-2	76	74
<i>Specific Series: Change in Sales<sup>h</sup>, Dept. Stores</i>														
13	Change shipments, final product	5	1	3	0	-1.7	-0.7	0.2	1.9	1.5	1.1	-1	81	86
14	Change shipments, all durables	4	2	3	0	-1.3	-0.3	0.5	2.3	1.6	1.5	0	79	84

*Notes to Table 44*

<sup>a</sup>Specific series are data for department stores. They are matched against the reference frame of the corresponding series for durable goods manufacturers in accordance with the standard NBER rules. A double relaxation of rules is marked r; it applies to cases for well-conforming series in which two like turns are matched, though an unlike turn lies between them. The figure is underlined when subcycle chronology is the reference series, a minor cycle in the specific series has entered a comparison; or, when two individual series are compared, a minor cycle in either series has entered a comparison. When the business cycle chronology provides the reference, minor specific cycle turns are ignored. The meaning of other symbols are:

⊕ turn in the reference series does not appear in the specific series.

⊗ turn in the specific series does not appear in the reference series.

⊙ there is no turn in either series in the neighborhood of the chronology date.

<sup>b</sup>Chronology gives the approximate time when the specific turns in the reference series occurred.

<sup>c</sup>Each line compares the specified data for department stores (the specific series) with the data for durable goods manufacturers (the reference series). Also, see note f.

<sup>d</sup>The number of months during which the specific series is in like phase with the reference series is expressed as a percentage of the total number of months covered between dates as given.

<sup>e</sup>Median is the average timing of the center two or three turns.

<sup>f</sup>Average deviation from the median. The "weighted" (wt'd) average is the deviation from the median for peaks and for troughs separately, weighted by the number of turns.

<sup>g</sup>In determining months in like phase, a timing adjustment is made which maximizes confluence. Before counting the months in phase, the specific series is in effect moved to the right to allow for a lead and to the left to allow for a lag if by so doing the percentage of months in like phase (as rounded) is increased. If the months in phase are as large or larger without an adjustment, this is indicated by a "timing adjustment" of 0.

<sup>h</sup>The specific series for all comparisons is retail sales of department stores since this is both orders for and shipments of final product. The reference series for final products is, for line 9, orders for the machinery and transportation equipment industries and, for lines 11 and 13, shipments for those industries. Lines 10, 12, and 14 apply to all durable goods manufacturers.

**BACKWARD TRANSMISSION OF FLUCTUATION**

The rate of change in a stock and its relation to the flows that fill or empty the stock reservoir determine whether fluctuation in final demand is magnified or subdued at earlier levels of the economy. The potential acceleration or magnification can affect flows of information, such as orders; or flows of goods,

also greater for rates of change than for data proper. For example, instead of pairing two sorts of enterprises, one might compare flows variously defined (e.g., orders and shipments) or at various stages (e.g., shipments for final product and for materials). However, the few comparisons that were made did not necessarily show percentage of months in phase higher for these other sorts of relationships when represented by rates of change than by data proper, as was the

such as shipments; or flows of activity and associated income, such as those which production implies. Each pair of flows may be studied in association with change in the appropriate stock (on hand or on order). What evidence is readily available bearing on the character of this backward transmission of fluctuation?

case for the comparisons between the two sorts of enterprises.

Clearly, however, it is not correct to assume for the purpose of econometric analysis that differencing systematically reduces collinearity. It typically does so, of course, insofar as sawtooth irregularities are amplified; but if these are smoothed, cyclical collinearity among various first-difference series may be greater rather than less than for data proper.

*Retail Sales and Two Stages of Production, Consumer Durables*

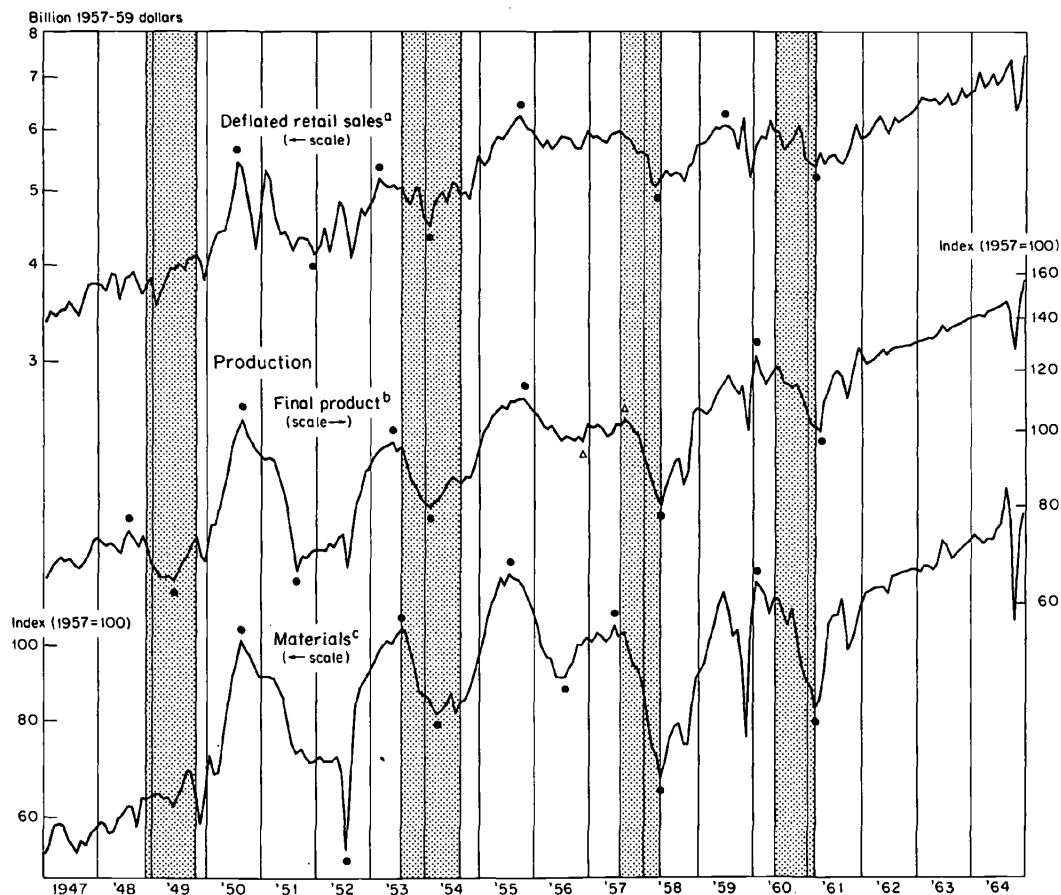
One piece of evidence was examined in Chapter 7—the relation between orders placed by department stores and sales to final consumers. (The latter can be thought of as either orders by or shipments to consumers.) We saw that orders placed by retailers for merchandise lead retail sales by an average of seven months at peaks and were nearly syn-

chronous at troughs (Table 22, line 12). Retailers' suppliers, in other words, feel the downturn of business substantially earlier than do retailers. Thus demand, defined as orders, accelerates at peaks as it moves backward. It also is greatly magnified. Specific fluctuations in new orders for merchandise were about twice as strong as those of retail sales, the orders of consumers (see Table 23 or Table 24, line 1).

There is no way of isolating the firms that

CHART 18

*Retail Sales and Two Stages of Production, Consumer Durable Goods, 1947-64*



Note: Shaded areas represent business contractions. Specific cycle turns are marked by dots, additional minor turns by triangles.

<sup>a</sup> Retail sales of durable goods stores deflated by retail price of durable goods (1957-59 = 100).

<sup>b</sup> Production of automotive and home goods, FRB data.    <sup>c</sup> Consumer durable materials, FRB data.

data.

TABLE 45

*Timing: Retail Sales and Two Stages of Production, Consumer Durable Goods, 1947-1961*

Section A: Months Lead (-) or Lag (+) for Matched Turns <sup>a</sup>														
Chronology <sup>b</sup>														
Line	Reference Series <sup>c</sup>	P (1/47)	T (7/47)	P 11/48	T 10/49	P (2/51)	T (6/52)	P 7/53	T 8/54	P 7/57	T 4/58	P 5/60	T 2/61	
<i>Specific Series: Retail Sales</i>														
1	Business cycles			⊕	⊕			-5	-7	-22	-1	-11	0	
2	Subcycles	⊕	⊕	⊕	⊕	-7	-6	-5	-7	-22	-1	-11	0	
<i>Specific Series: Production, Final Product (Automotive &amp; Home Goods)</i>														
3	Business cycles			-4	-5			-2	-7	-21	0	-4	+1	
4	Subcycles	⊕	⊕	-4	-5	-6	-10	-2	-7	-21	0	-4	+1	
5	Retail sales	⊙	⊙	⊗	⊗	+1	-4	+3	0	+1	+1	+7	+1	
<i>Specific Series: Production, Materials, Consumer Durables</i>														
6	Business cycles			⊕	⊕			0	-5	-24 <sup>r</sup>	0	-4	0	
7	Subcycles	⊕	⊕	⊕	⊕	-6	+1	0	-5	-24 <sup>r</sup>	0	-4	0	
8	Retail sales	⊙	⊙	⊙	⊙	+1	+7	+5	+2	-2	+1	+7	0	
9	Production, final product	⊙	⊙	⊕	⊕	0	+11	+2	+2	-3	0	0	-1	
Section B: Average Timing of Turns													Section C: Percentage of Months in Like Phase <sup>d</sup>	
Line	Reference Series <sup>c</sup>	Number Matched			Median <sup>e</sup>			Average Deviation <sup>f</sup>				Timing Adjust-ment <sup>g</sup>	% Mos. 7/46-12/61	
		-	+	0	P	T	All	P	T	Wt'd				
<i>Specific Series: Retail Sales</i>														
1	Business cycles	5	0	1	-12.7	-2.7	-6.0	6.2	2.9	5.7	4.6		-6, -7	64
2	Subcycles	7	0	1	-9.0	-3.5	-6.5	5.2	3.0	4.4	4.1		-6, -7	73
<i>Specific Series: Production, Final Product (Automotive &amp; Home Goods)</i>														
3	Business cycles	5	2	1	-3.0	-2.5	-3.0	1.8	3.2	2.5	2.5		-3, -4	75
4	Subcycles	8	1	1	-4.7	-4.0	-4.6	4.3	3.8	4.0	4.1		-4, -5	76
5	Retail Sales	1	6	1	+2.0	+0.5	+1.0	2.0	1.5	1.8	1.8		+1	86
<i>Specific Series: Production, Materials, Consumer Durables</i>														
6	Business cycles	3	0	3	-9.3	-1.7	-2.0	9.8	2.2	5.5	6.0		-1, -2, 0	62
7	Subcycles	4	1	3	-5.0	0	-2.0	6.5	1.5	5.0	4.0		-1, -2, 0	70
8	Retail sales	1	6	1	+3.0	+1.5	+1.5	3.2	2.0	2.6	2.6		+1, +2	88
9	Production, final product	2	3	3	0	+1.0	0	1.2	3.5	2.4	2.4		0	83

For notes a, c through g, see Table 44.

<sup>b</sup>Chronology dates are business cycle reference dates. In addition, four minor subcycle dates, enclosed in parentheses, are added to form a subcycle chronology.

supply department stores so as to examine orders received and placed in the next earlier stage; accordingly, this chain of events moves out of sight.

However, three stages can be compared for home goods (including major appliances) and automobiles. Chart 18 depicts the physical quantities of goods moving to consumers, and goods completing production at the finished stage and at the materials stage.<sup>5</sup> Matching information for orders is not available.<sup>6</sup> Thus we can examine flows of activity, but not flows of the associated information.

Table 45, line 5, shows that retail sales in constant dollars tended to turn rather consistently a bit earlier than did production of the finished goods. For the next earlier stage there was no further acceleration, though retail sales also led materials for consumer durables by an average of one or two months (line 8).

Amplitude of fluctuation was magnified at earlier stages—the average specific phase amplitude for production of finished consumer durables was two-thirds again as large as that of retail sales (Table 46, line 4, columns 1 to 3). The amplitude of materials production was well over twice as large (line 5), and the figure would doubtless be larger had the

<sup>5</sup> Retail sales are deflated by the retail price index for consumer durables. The production series are those developed by the Federal Reserve Board. The index for consumer materials production does not include the output of primary metals producers.

<sup>6</sup> Automobile companies do not report unfilled orders, and the company basis of reporting does not make it possible to isolate orders for major consumer appliances. The new divisional reports take an important step in this direction and may make it feasible to examine for later years the patterns of sales orders for at least the final product stage. However, the new tabulations do not separate producers supplying materials to the finished consumer durables industries from those supplying them to the producer durables industries.

appropriate portion of the output of primary metals been included (see footnote 5).

Chart 18 shows that there were spurts in consumer buying, starting when business as a whole reached troughs, and continuing for a year, more or less. Their cessation constitutes in each case a specific cycle peak. The dates seem to conform fairly well to those of the early thrusts that the inventory-purchase data have exhibited. These thrusts in consumer buying have their counterparts in more than proportional thrusts in the output of the finished goods and materials used in their manufacture. The magnification on a per-month basis is slightly greater for the thrusts than for all expansion months (compare, Table 46, columns 5 and 4, lines 4 and 5).

The magnification of contractions is still larger (column 6), but this could reflect no more than the arithmetic of the differential impact of an upward trend on series with different cyclical characteristics.<sup>7</sup> Even so, it suggests that an upward trend tends to cause the backward transmission of demand to intensify drops in output relatively more than rises in output.

These figures, like the ownership and stock data, suggest that magnification exceeds the requirements of efficient servicing of sales, other things the same. To illustrate, a calculation can be made assuming, for example, that the efficient stock-sales relationship consisted of an incremental stock-sales ratio of 2. The stockpile concerned would implicitly be that of stocks of retail stores plus finished stocks of manufacturers of the finished articles. The average rise of retail sales during expansion

<sup>7</sup> Consider three series. All have phases of two-year duration and upward trends of one index point a year. Series A has a cyclical component of two index points a year, series B one of four points, and series C one of eight points.

Series	Standings			Rise or Fall		Amplitude as % of Series A	
	Trough	Peak	Trough	Expansion	Contraction	Expansion	Contraction
A	100	106	104	6	2	100	100
B	100	110	104	10	6	167	300
C	100	118	104	18	14	300	700

TABLE 46

*Average Amplitude of Specific Cycle Fluctuation, Retail Sales and  
Two Stages of Production, Consumer Durable Goods, 1949-1961*

	Average Phase Amplitude Cycle Relatives <sup>a</sup>			Per Month Amplitude Cycle Relatives <sup>a</sup>		
	Expansion (1)	Contraction (2)	All Phases (3)	Expansion (4)	Thrust (5)	Contraction (6)
1. Retail sales, consumer durables constant prices	21.0	11.7	16.3	1.23	1.27	.61
2. Production, final product: automobile and home goods	32.6	21.0	26.8	1.75	2.04	1.57
3. Production mate- rials, consumer durables <sup>b</sup>	39.3	31.5	35.4	2.55	2.71	1.80
4. % final product to retail sales (line 2 ÷ line 1)	155	179	164	142	161	257
5. % materials to retail sales (line 3 ÷ line 1)	187	269	217	207	213	295
6. % materials to final products (line 3 ÷ line 2)	121	150	132	146	133	115

<sup>a</sup>Expressed as relatives of the average peak and trough standings for each phase. Standings are five-month averages centered at month of turn. Averages cover four expansion and four contraction phases starting with the trough in 1949 and ending with a peak in 1961. For retail sales there was no specific trough that corresponded to the business cycle trough in 1949; therefore the contraction point in that year was used instead.

<sup>b</sup>A specific cycle phase with a trough in 1956 and peak in 1957 was ignored in order to keep the measured comparable for the three series.

was 21.0 per cent of its average level (Table 46, column 1), and production of final products would presumably also need to increase in the same proportion as well as enough to accommodate the additions to stocks that are required. Stocks, we assume, must increase each month by twice the monthly increment in sales—1.23 index points (column 4). Assuming for the moment a triangular course of

sales, this means that production would have had to rise during expansion by 21.0 index points plus 2.46 points, or 23.5. This figure may be a bit low,<sup>8</sup> but contrast it with the

<sup>8</sup>The pattern of sales is not triangular, and therefore its rate of change (and, by the same token, the stock increments each month) is, at its maximum rate, larger than 1.23. But the maximum rate of change in sales does not typically occur at the same time that sales proper reaches its peak, so that the combined

actual figure of 32.6. For contractions, the difference that must be explained in terms of factors other than the efficient sales link is far larger still.

*Durable Goods Manufacturing, Two Stages of Production, Shipments and Orders*

For the range of commodities with which we have been concerned there is no other readily available sequence of aggregate data showing sales to final users and earlier stages of the economic processes that the goods undergo. However, two of the intermediate stages can be viewed for all durable goods.

Judging from the consumer durable sequence, most of the magnification took place between the retail and final processing stage (compare Table 48, lines 4 and 6). There is, I believe, a reason for this which is implicit in the difference in the acceleration process for manufacturers and for department stores, as described in the previous chapter. But first let us examine the character of the relation between the two manufacturing stages.

In Chart 19 the final-products industries, machinery and transportation equipment, are compared with all of the rest of the durables group industries which hypothetically make materials or parts used by the former group. Needless to say, the hypothesis is a long way from the truth, though the production data come much closer to it than do the others.<sup>9</sup> Table 47 shows that in terms of physical volume of output, final products and materials have no systematic tendency to lead or lag one another (line 5). A similar statement applies to new orders for the two groups, although

impact is less than the total rise in sales (replacement demand) plus the maximum rate of rise in sales times 2 (inventory investment requirement).

<sup>9</sup>The production indexes, which are compiled by the Federal Reserve Board, are based on establishment data, whereas the OBE-Census figures for shipments and orders are, as previously explained, based on corporate reports. Also, in the FRB production indexes, industry breakdowns are finer and construction materials are excluded from the materials group.

the timing relationship was considerably closer than for production (line 13). For shipments, materials tended to lead by short and quite regular intervals (line 8). Broadly speaking, then, the two stages move together on the average.

The amplitude of matching specific cycle fluctuations in the two groups of industries are compared in Table 48. The magnification of fluctuation as demand moves to the materials stage seems quite strong in the production data. On the average, materials undergo specific cycle phases with almost half again as much amplitude as that of final products (line 7, column 3). The per-month amplitude during the periods of thrust is substantially larger than for expansions as a whole, and more so for materials than for final production (compare columns 4 and 5, lines 1 and 2). Indeed, for materials, 86 per cent of the entire rise during expansions took place in the three relatively short early periods.

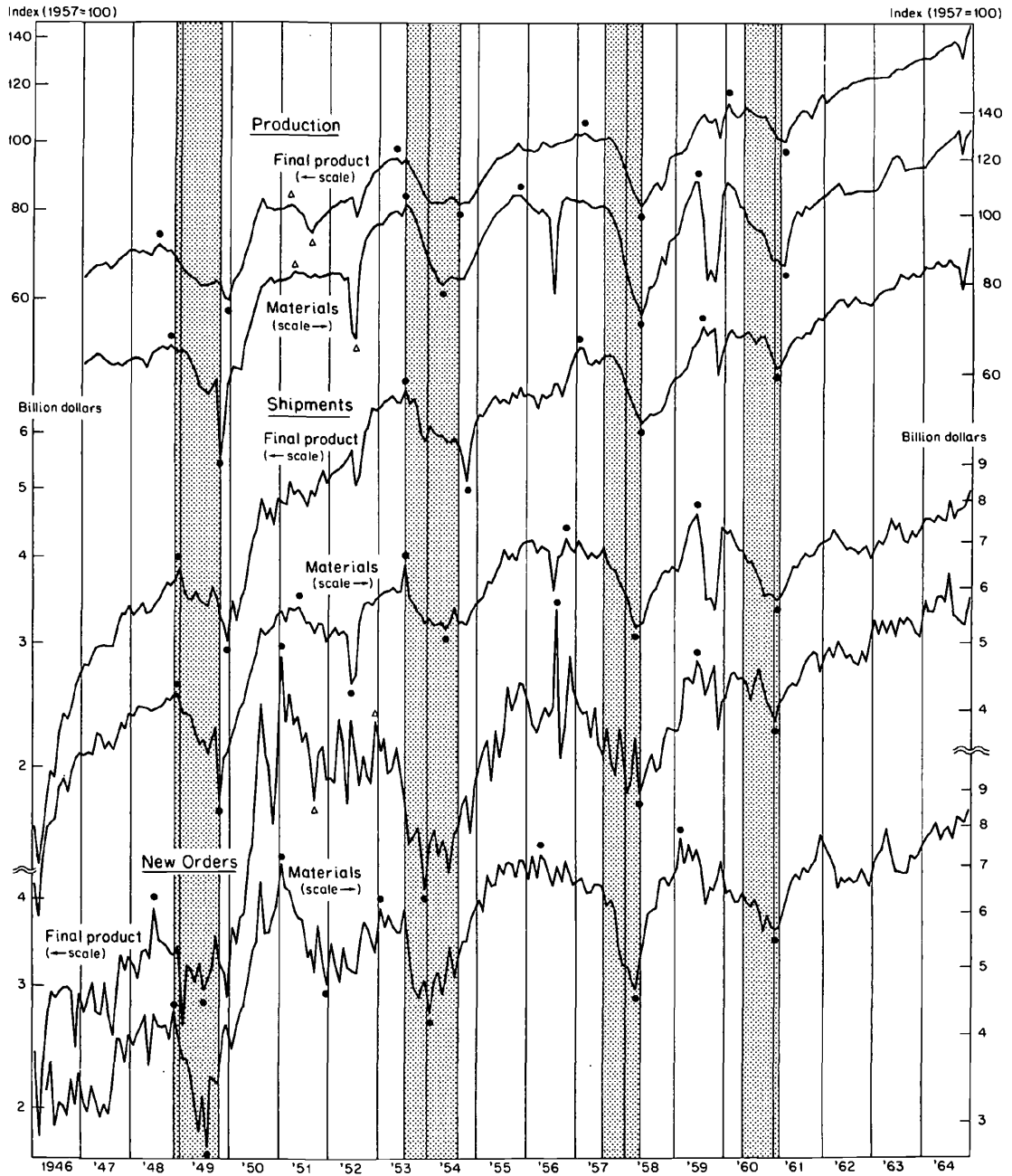
When the relationships are viewed in terms of shipments at book value, the magnification for expansion as a whole disappears, though it remains for the period of thrust (line 8). New orders do not portray any of these several characteristics.

I do not know how seriously to take these figures. Technical difficulties might well account for disparities in the story of backward transmission as told by the shipments compared with the production data.<sup>10</sup> But for orders the differences are strong enough to demand respect. Moreover, the analysis of process that has been presented seems consistent with the statistical evidence.

<sup>10</sup>The underlying data for shipments and new orders are corporate reports, and this is, of course, far too gross a reporting unit to provide the appropriate industrial distinctions between materials and finished products. For example, in the transportation equipment industries, the automotive group includes auto parts, and corporate reports include much more. The establishment data of the production statistics are more nearly capable of the required separations, including the exclusion of construction materials. The book-value attributes of the shipments and order data raise further problems.

CHART 19

*Production, Shipments, and Orders, Final Products and Materials, Durable Goods Manufacturers, 1946-64*



Note: Shaded areas represent business contractions. Specific cycle turns are marked by dots, additional minor turns by triangles.

TABLE 47

*Timing: Production, Shipments, and Orders, Final Products and Materials,  
Durable Goods Manufacturers, 1946-1961*

		Section A: Months Lead (-) or Lag (+) for Matched Turns <sup>a</sup>											
		Chronology <sup>b</sup>											
Line	Reference Series <sup>c</sup>	P (1/47)	T (7/47)	P 11/48	T 10/49	P (2/51)	T (6/52)	P 7/53	T 8/54	P 7/57	T 4/58	P 5/60	T 2/61
<i>Specific Series: Production, Materials</i>													
1	Business cycles			-1	0			0	-4	-20	0	-11	+1
2	Subcycles	⊕	⊕	-1	0	<u>+2</u>	<u>+1</u>	0	-4	-20	0	-11	+1
<i>Specific Series: Production, Final Product</i>													
3	Business cycles			-4	+2			-2	0	-5	0	-4	+1
4	Subcycles	⊕	⊕	-4	+2	<u>+1</u>	<u>-10</u>	-2	0	-5	0	-4	+1
5	Production, materials	⊙	⊙	-3	+2	<u>-1</u>	<u>-11</u>	-2	+4	+15	0	+7	0
<i>Specific Series: Shipments, Final Product</i>													
6	Business cycles			+1	+2			0	+2	-6	0	-10	-1
7	Subcycles	⊕	⊕	+1	+2	⊕	⊕	0	+2	-6	0	-10	-1
8	Shipments materials	⊙	⊙	0	+2	⊗	⊗	0	+5	+3	+1	+1	0
9	New orders, final product	⊙	⊙	+6	+6	⊕	<u>⊕</u>	<u>+7</u>	+10	+5	0	+1	0
10	Production, final product	⊙	⊙	+5	0	<u>⊕</u>	<u>⊕</u>	+2	+2	-1	0	-6	-2
<i>Specific Series: Orders, Final Product</i>													
11	Business cycles			-5	-4			<u>-7</u>	-8	-11	0	-11	-1
12	Subcycles	⊕	⊕	-5	-4	-1	<u>-9</u>	<u>-7</u>	-8	-11	0	-11	-1
13	Orders, materials	⊙	⊙	-5	-1	0	<u>-3</u>	<u>-1</u>	-1	+4	+1	+4	0
<i>Specific Series: Shipments, Materials</i>													
14	New orders, materials	⊙	⊙	+1	+3	+4	+6	+6	+4	+6	0	+4	0
15	Production, materials	⊙	⊙	+2	0	<u>+1</u>	<u>-1</u>	0	+1	+11	-1	0	-2

(continued)

## SEARCH FOR EXPLANATIONS

TABLE 47 (concluded)

Line	Reference Series <sup>c</sup>	Section B: Average Timing of Turns									Section C: Percentage of Months in Like Phase <sup>d</sup>		
		Number Matched			Median <sup>e</sup>			Average Deviation <sup>f</sup>				Timing Adjust-ment <sup>g</sup>	% Mos. 7/46-12/61
								All Turns					
		-	+	0	P	T	All	P	T	Wt'd			
<i>Specific Series: Production, Materials</i>													
1	Business cycles	4	1	3	-6.0	0	-0.5	7.5	1.2	4.6	3.9	-1,0	72
2	Subcycles	4	3	3	-4.0	+0.3	0	7.2	1.3	4.0	4.2	0	75
<i>Specific Series: Production, Final Product</i>													
3	Business cycles	4	2	2	-4.0	+0.5	-1.0	0.8	0.8	2.2	0.8	-1,-2,0	88
4	Subcycles	5	3	2	-3.3	+0.3	-1.0	1.7	2.7	2.9	2.2	-1,-2,0	81
5	Production, materials	4	4	2	+1.3	+0.7	0	5.9	3.5	4.5	4.7	0	76
<i>Specific Series: Shipments, Final Product</i>													
6	Business cycles	3	3	2	-3.0	+1.0	0	4.2	1.2	2.8	2.8	0	88
7	Subcycles	3	3	2	-3.0	+1.0	0	4.2	1.2	2.8	2.8	0	76
8	Shipments, materials	0	5	3	+0.5	+1.5	+1.0	1.0	1.5	1.2	1.2	+1	88
9	New orders, final product	0	6	2	+5.5	+3.0	+5.5	1.8	4.0	2.9	2.9	+5	83
10	Production, final product	3	3	2	+0.5	0	0	3.5	1.0	2.2	2.2	0	88
<i>Specific Series: Orders, Final Product</i>													
11	Business cycles	7	0	1	-9.0	-2.5	-6.0	2.5	2.8	3.4	2.6	-5,-6,-7	81
12	Subcycles	9	0	1	-7.7	-4.3	-6.0	3.3	3.3	3.5	3.3	-5,-6,-7	78
13	Orders, materials	5	3	2	+1.0	-0.7	-0.5	3.0	1.1	2.0	2.0	0	89
<i>Specific Series: Shipments, Materials</i>													
14	New orders, materials	0	8	2	+4.7	+2.3	+4.0	1.5	2.1	1.8	1.8	+4	90
15	Production, materials	3	4	3	+1.0	-0.7	0	2.6	0.9	1.9	1.7	0	90

For notes a to g see Table 44.

TABLE 48

*Average Amplitude of Specific Cycle Fluctuation, Final Products and Materials, Durable Goods Manufacturers, 1949-1961*

	Average Phase Amplitude Cycle Relatives <sup>a</sup>			Per Month Amplitude Cycle Relatives			Amplitude of Thrust as Percentage of Total Expansion Amplitude (7)
	Expansion (1)	Contraction (2)	All Phases (3)	Expansion (4)	Thrust (5)	Contraction (6)	
<i>Production</i>							
1. Final product	29.6	12.9	20.1	.99	1.43	.87	67.0
2. Materials	38.8	21.5	28.9	1.60	2.08	1.43	86.1
<i>Shipments</i>							
3. Final product	41.8	13.7	25.7	1.69	1.68	.94	55.7
4. Materials	34.0	17.0	24.3	1.23	2.02	1.25	94.1
<i>Orders</i>							
5. Final product	51.9	20.9	34.2	2.58	2.79	.95	95.5
6. Materials	47.6	27.2	35.9	2.81	2.78	1.54	101.1
<i>Percentage of Materials to Final Product</i>							
7. Production (line 2 ÷ line 1)	131	167	144	162	145	164	
8. Shipments (line 4 ÷ line 3)	81	124	95	73	120	133	
9. Orders (line 6 ÷ line 5)	92	130	105	109	100	162	
<i>Percentage of Orders to Shipments</i>							
10. Final product (line 5 ÷ line 3)	124	153	133	153	166	101	
11. Materials (line 6 ÷ line 4)	140	160	148	228	138	123	

<sup>a</sup>Expressed as relatives of the average peak and trough standings for each phase. Standings are five-month averages centered at month of turn. Averages cover four contractions and three expansions starting in 1948 and ending in 1961.

Assume that manufacturers of finished products receive sales orders which have cyclical fluctuations of a stipulated sort. Their shipment will tend to lag orders, particularly at peaks, when positions are extended; they will also tend to have a narrower range of fluctuation. The reason for this pattern in

the case of products distributed by retailers was outlined in the acceleration model for department stores in the previous chapter. For heavy equipment sold to final users, an important part of the work of the machinery and transportation equipment industries, a lead of sales orders must result from the long

periods required to complete production; concerning the amplitude of the early thrust, one can only guess that users have selected "a good time to buy" and flashed a go-ahead signal for plans which are already virtually ready to go, and indeed may have been so for some time.

But these sales orders, when received by the manufacturer of final products, constitute forecasting instruments of considerable power. For made-to-order heavy equipment, the character of the forecast is obvious—the order is prerequisite to the start of production which may take months if not years to complete. Other ways in which orders provide forecasts of requirements were discussed at the start of Chapter 11. In any event, as a consequence of this foreknowledge, producers are in a position to place orders with suppliers in a fashion calculated to validate whatever inventory objective for materials they choose (providing suppliers will cooperate). There are a wide number of alternatives, as we have seen, depending on what changes, other than the change in expected sales, are deemed to have occurred or to be likely to occur.

For example, if physical service efficiency were the only consideration, these manufacturers would presumably purchase in a pattern which would cause materials to be available at the time they were needed for production, plus whatever change in stock was required for efficient service. If there were no reason to expect delays in deliveries of materials or changes in prices, this pattern ought to look more like that of shipments (actually something between that and production starts) than like the pattern of new sales orders.

On the other hand, if there was reason to buy ahead of the actual production needs—reason such as fear of slow deliveries, poor selections, rising prices, and so on—the pattern of materials orders could duplicate that of sales orders or have even more amplitude. A pattern of materials orders of this sort implies the presence of market expectations that

*parallel sales* and evidence examined in the previous chapter suggested that that parallelism may be common. Table 47, line 13, shows that orders for the two groups of industries, hypothetically sales and purchase orders of the final-products group, tend to reach peaks and troughs at much the same time. Six of the ten matched turns are within one month of one another; study of Chart 19 reinforces the picture of confluence.

In the context of backward transmission of fluctuation, this discussion makes two points. First, fluctuations in materials orders, which parallel sales orders and fluctuate more than a simple service function implies, bespeak the presence of expected or actual market-oriented materials buying which tends to parallel fluctuations in final demand. The general parallelism, and approximately equal amplitude of fluctuation, of orders for materials and for final products is explicable in these terms, in view of the far smaller amplitude of shipments for the two types of enterprises.

The second point is a corollary of the first. Once sales orders take on two characteristics—forecasting competence, and fluctuations which are wide relative to those of shipments—no further magnification of *orders* in additional backward sequences is essential to further magnification or even acceleration in *shipments or production*. This could result simply from a tendency for firms at earlier stages to match their shipments (or production) more closely to the pattern of their sales orders than is the case for firms at the more finished stages.

The evidence has suggested that the double characteristic of materials orders—market orientation and sales-forecasting competence—could very well be formed at the final marketing stage—that of retailers' purchase of merchandise or industries' purchase of heavy equipment for their own use.

How the physical flows actually do behave and what sort of acceleration actually does or does not occur is a function of the particulars, quantitatively defined, in each situa-

tion. Just what these are is an intriguing question, the investigation of which requires more trustworthy data for economic sequences than are available.<sup>11</sup>

The matter deserves study, for my argument implies that the pattern of acceleration is not prescribed by time-consuming sequences in flows of goods and changes in stocks, with

lag building on lag and amplification on amplification. Instead, the potentially almost instantaneous transmission of orders can provide a common stem of information upon which the pattern of physical operations sprouts at each stage in whatever form is dictated by the particular economic and physical problems that characterize the stage.

### *THE INVENTORY-PURCHASE SEQUENCE IN BUSINESS CYCLES*

I have considered an inventory cycle in terms of a sequence of causally related events resulting in changes in stock on order as well as on hand. Relative to the usual formulation, this construction changes the "system" to which inventory fluctuations belong.

On the one hand, it changes the emphasis: it throws attention toward actions that govern the size of stocks at the stage where the *inflow* into the stockpile is governed—the point where materials are purchased. This perhaps tends to underplay (but it in no sense needs to) the traditional interest in actions at the outflow stage—price changes which adjust

stocks by speeding or inhibiting the outflow, sales. On the other hand, the system to which inventory fluctuation belongs is defined to include the placing of orders for materials and the factors that govern their size, rather than, simply, the receipt of merchandise. Changes in the size of materials orders affect expectations, market conditions, prices; changes in orders carry information, and soon affect shipments, production, and consequently stock on hand and also income flows. Accordingly, the inventory-purchase "system" reaches out to include more directly a wider group of events sooner than does the inventory cycle more conventionally conceived.

<sup>11</sup> Study of Chart 19 and of a work table on the basis of which Table 48 was constructed shows much variety in the phase-by-phase relationship for orders of the final-products and of the materials industries. If one had confidence in the comparability of the data, these differences and similarities would be most interesting to explore. For these very inadequate data, suffice it to note that the average deviation of phase amplitudes of new orders for materials industries is much smaller than for those of final products—an index of 10.1 in cycle relatives (the average phase amplitude was 35.9) as contrasted with an index of 17.6 for final products (the average amplitude was 34.2). For shipments, on the other hand, average deviation was virtually the same—between 8 and 9 in cycle relatives for both materials and final products. The amplitude of materials orders tends, in a rough sort of way, to be large relative to that of final products for phases when absolute amplitudes for both groups of industries are relatively small. This accords with previously reported observations based on outstandings-sales ratios and rates of change in ownership which suggested that materials markets seem more routinely sensitive to changes in the volume of activity than do final-products markets. The post-1960 behavior was a particular case in point.

It will be useful to place the critical events associated with the inventory-purchase cycle in the framework of general economic fluctuation. This will serve to summarize the part of this investigation which asks how inventory-centered events participate in economic instability. I use the convention of average or typical sequences, thereby impoverishing description in the interest of comprehensibility.

#### *Decline and Its Cessation*

Recession is about half over. Series central to the inventory syndrome are shown in Table 49, where their troughs are matched with the previous business cycle reference peaks. Thus, in the "P" columns we ask how soon after business has started to decline each of the series begins to improve. Obviously the question is only relevant to the systematically

## SEARCH FOR EXPLANATIONS

TABLE 49

*Timing of Troughs and Peaks of Selected Series at Business Cycle  
Reference Peaks and Troughs<sup>a</sup>,  
1948-1961*

		Months Lead (-) Or Lag (+) Of Specific Peak (Or Trough) Compared To Reference Trough (Or Peak)								Median Timing		
Reference Dates:		P	T	P	T	P	T	P	T			
Duration of Following Reference Phase:		11/48	10/49	7/53	8/54	7/57	4/58	5/60	2/61	T		
Line		11	45	13	35	9	25	9		Excl.	Incl.	
									P	1961	1961	
<i>Change in Sales</i>												
1.	Dept. stores	+8	+7	-1	+5	+5	+13	+6	+11 <sup>e</sup>	+5.5	+8.3	+9.0
2.	Durables, shipments	+4	+8	+3	+5	+6	+12	+6	+2 <sup>e</sup>	+5.0	+8.3	+6.5
3.	Durables, R: (inverted) materials stocks to shipments	+3	+10	+4	+11	+8	+12	+8	+6 <sup>e</sup>	+6.0	+11.0	+10.5
<i>Change in Outstandings for Materials</i>												
4.	Dept. stores		+8	+2	+13	+2	+11	+5	+6 <sup>e</sup>	+3.0	+10.7	+9.5
5.	Durables, materials	+6	+16	+4	+6	+5	+9	-1	+10	+4.5	+10.3	+9.5
6.	Unfilled orders, final products	+4	+17	+3	+15	+1	+13	+7	⊕	+3.5	+15.0	
<i>Change in Ownership</i>												
7.	Dept. stores	0	+8	+2	+14	+4	+13	+5	+8	+3.0	+11.7	+10.5
8.	Durables, materials	+6	+16	+4	+6	+6	+9	-1	+10	+5.0	+10.3	+9.5
<i>Change in Stocks</i>												
9.	Dept. stores	+7	+12	+4	+16	+7	+23	+7	+8	+7.0	+17.0	+14.0
10.	Durables, materials	+6	+12	+11	+20	+10 <sup>r</sup>	+12 <sup>r</sup>	+4	+9	+8.0	+14.7	+12.0

(continued)

TABLE 49 (concluded)

Months Lead (-) Or Lag (+) Of Specific Peak (Or Trough) Compared To Reference Trough (Or Peak)												
Line	Reference Dates: Duration of Following Reference Phase:	P	T	P	T	P	T	P	T	Median Timing		
		11/48	10/49	7/53	8/54	7/57	4/58	5/60	2/61	T		
		11	45	13	35	9	25	9	P	Excl. 1961	Incl. 1961	
<i>New Orders, Materials</i>												
11.	Dept. stores	+7	+9	+6	+26	+5	+24	+7	+15 <sup>e</sup>	+6.5	+19.7	+19.5
12.	Dept. stores, trend adjusted	+7	+9	+6	+15	+5	+14	+7	+15 <sup>e</sup>	+6.5	+12.7	+14.5
13.	Durables	+8	+15	+6	+20	+8	+10	+8	+10 <sup>e</sup>	+8.0	+15.0	+12.5
14.	Durables, deflated	+8	+15	+6	+10	+8	+10	+8	+10 <sup>e</sup>	+8.0	+11.7	+10.0
<i>Market Conditions</i>												
Purchase orders												
15.	Change average term	+4	+9	+1	+10	-6	+11	-3	+10 <sup>e</sup>	-1.0	+10.0	+10.0
16.	Average term proper	+7	+15	+9	+13	+8	+20	+10 <sup>r</sup>	+12 <sup>e</sup>	+8.5	+16.0	+14.0
17.	Vendor performance D. I.	+4	+11	+5	+14	+5	+18	-2	+12 <sup>e</sup>	+4.5	+14.3	+13.0
18.	Spot prices, metals	+16 <sup>r</sup>	+15 <sup>r</sup>	+7	+20	+9 <sup>r</sup>	+19	+7	+7	+8.0	+18.0	+17.0
19.	Corp. profits, durables	+6	+13	+4	+15	+10 <sup>r</sup>	+13	+9 <sup>r</sup>	+12 <sup>e</sup>	+7.5	+13.7	+13.0
<i>Outstandings-Sales Ratio</i>												
20.	Dept. stores	+7	+10	+10	+16	+10 <sup>r</sup>	+27 <sup>rb</sup>	+6	+15 <sup>e</sup>	+8.5	+17.7 <sup>b</sup>	+15.5 <sup>b</sup>
21.	Durables	+10	+21	+12	+23	+17 <sup>r</sup>	+19	⊕	⊕	+13.0	+21.0	
<i>Final Products, Shipments or New Orders</i>												
22.	Dept. store sales	+8	+15	+6	+36 <sup>r</sup>	+7	+24	+8	⊕	+7.5	+25.0	
23.	Orders, dur.	+7	+15	+5	+24	+9 <sup>r</sup>	+14	+8	⊕	+7.5	+17.7	
24.	Shipments, dur.	+13 <sup>r</sup>	+45 <sup>r</sup>	+15 <sup>r</sup>	+29 <sup>r</sup>	+9 <sup>r</sup>	+15 <sup>r</sup>	+8	⊕	+11.0	+29.7	

*Notes to Table 49*

Timing comparisons under relaxed rules: "r" signifies a like reference turn has preceded the unlike reference turn for which the specific comparison is given. In other words, on a direct basis, the turn lagged rather than led the reference scheme. "e" refers to an extra turn marked at the cessation of the first rise following the business cycle trough of February 1961 when a specific cycle peak has not been located at that point. The points are included whenever a clear leveling or drop in activity seems evident; many if not most of the points would not qualify as candidates

"leading" series, and only these are covered in the table.<sup>12</sup>

Materials buying has been curtailed in response to falling demand by customers of both department stores and durable goods manufacturers (lines 11 and 13). Materials held on order have also been reduced for some time; indeed, curtailments had started before recession set in and the rate at which they are falling has already slowed up a bit (lines 4 and 5). Stocks on hand are declining and at an accelerating rate (lines 9 and 10). But sales are typically falling as fast or faster, so that the number of months' sales that stocks represent has usually not started to decline (see Charts 3 and 5). Sensitive prices are plummeting. Deliveries are moving toward a hand-to-mouth basis.

In spite of all these dreary occurrences, several things soon begin to modify the situation, even at this early stage when contraction is on the average about a half a year old. For one thing, the deterioration in aggregate sales to consumers or in shipments of durable goods manufacturers to industrial customers has begun to slow up (lines 1 and 2). And we have just seen that this influence occurs at close to the same time in retail sales and in durable goods shipments (Table 44, lines 13 and 14).

A deceleration in aggregate decline is likely

<sup>12</sup> For the method of dealing with exceptions, see Table 49, note a, paragraph on timing comparisons under relaxed rules.

for specific major or even minor turns. In any event, the change in the data beginning in 1962 inhibits accurate comparison with the rest of the series.

<sup>a</sup>A specific trough is matched with the previous business cycle reference peak, and similarly a specific peak is matched with the previous trough.

<sup>b</sup>The ratio for department stores virtually ceased to rise twelve months after the 4/58 trough. Replacing the +27 by the +12 figure, the trough averages for turns excluding 2/61 are 13.5; including it, they are 12.7.

to imply two sorts of occurrences: the amount of decline for enterprises whose sales are falling becomes smaller; more enterprises begin to experience a rise. In either case the downward spiral of buying is subjected to modifying influences.

In the first case, the processes at work were discussed at length in the previous chapter. In a word, for department stores, the firm and precise stock objective, and the tendency for current sales to provide the basis of the sales forecast, tend, as retardation sets in, to cause buying frequently to underestimate demand and therefore to require upward revision. For manufacturers, the leavening influence may work through the tendency for "excess stocks" to decline and consequently to soften the efforts to reduce stocks further.

In the second case, the response to deceleration is in a sense exaggerated by the fact of an actual increase in sales. Increases in sales must be frequent, since sales proper is close to its trough. For department stores, lows occurred between six and eight months after the previous business cycle peak (line 22). For durables, at least new orders for final products, the output of machinery and transportation equipment industries reached lows between five and nine months after the previous peak (line 23). Though the sales orders of these goods with long production periods have an ambiguous relation to materials procurement, it is nevertheless interest-

ing to see that they reach their lows close to the same time as consumer buying at department stores.

Changes tending to stimulate buying also take place in materials markets. The number of suppliers offering swifter deliveries has been increasing for some time, so that now fast delivery is the rule. This is evidenced by the fact that the average term of purchase orders is approaching its lowest level (line 16). Prices of materials are likewise in the neighborhood of cyclical lows (line 18). These slack market conditions are not a reason for buying in anticipation of needs, but they certainly do not inhibit the response of purchasing agents to current operating requirements when the need occurs.

Furthermore, reduction of materials stocks on hand and on order no longer provides an easy substitute for new buying. The rate of decline in total ownership has been declining for a month or so (lines 7 and 8), and even disinvestment in stocks on hand has started to slow up (lines 9 and 10).

The basic picture, then, reveals mixed experience; but a gradual increase in the experience of rises relative to falls in materials buying. The rises can result from an increase in purchasing by consumers or orders for heavy machinery; or they can result from correction of underprocurement, or from particular instances of optimistic expectations, or fears of shortages. The falls can result from declines in movement of goods to consumers, with the wish to curtail extended market positions in goods on order and on hand. The diffusion of falls in buying is waning, and of rises waxing, until the rises are more numerous than the falls. In consequence, materials buying proper starts to rise.

For both department stores and durable goods manufacturers the trough in materials buying (lines 11 and 13) occurred on all occasions no less than five months and no more than eight months after the previous peak in business.

At this point, then, in the late phases

of contraction, prices are low, sellers are hungry, buyers are cautious, spirits are depressed, but orders start to rise.

#### *Expansion's First Thrust*

Orders rise very rapidly for a number of months. The phenomenon of the upward thrust has appeared at every level of this study. It characterizes consumer buying in department stores, and in a far more extreme form it characterizes the buying of merchandise by department stores. It characterizes orders for machinery and transportation equipment. It characterizes about equally the orders for materials placed by these enterprises; and this is the more notable since the buyer of heavy equipment *must* anticipate his receipt of the equipment by orders placed many months or even semesters in advance, whereas no such necessity prompts the equally strong rise in materials orders.

Materials outstanding rise not only absolutely but in terms of the number of months' sales covered, those of department stores somewhat sooner than those of durable goods manufacturers (lines 20 and 21). Stocks also rise before long. And the similarity in the cycles in outstandings and stocks supports the logic of a causal connection between extensions in stock on order and on hand.<sup>13</sup> Before long (for both sorts of enterprises the period averages about half a year after prosperity begins) materials stocks also begin to rise faster than shipments.

Conditions in materials markets encourage the eagerness of buyers: spot-market prices rise; vendor performance begins to deteriorate; the average term of purchase orders increases. Thus various parts of the inventory-purchase complex stimulate and support one another in a cumulative round of cause and effect. As buying spurts upward, events and expectations stimulate behavior that affects markets and output, which in turn stimulates

<sup>13</sup> See Chapter 5, summary paragraph 13, and Chapter 6, summary paragraph 5, and supporting discussions.

further expectations and related behavior. Cumulation, in other words, takes place at the level of information, expectations, and associated action in the fashion discussed in the previous chapter.

It takes place also at the level of actions which affect output, which in turn affects income and consequent spending along the lines suggested in income-multiplier notions of the conventional sort.

In view of the potential interplay of these several autocumulating elements, the mystery as I see it is why the upward surge is so strong, lasts for the particular period that it does (a bit over a year on the average), and ceases so abruptly while prosperity is still in sway.

The duration of the periods of thrust was defined in Chapter 4 on several bases. For department stores and for the durable goods industries, outstanding purchase orders provided the criterion: thrusts covered, as that chapter stated, "the months when, in the course of its first specific cycle rise in reference expansion, the rate of rise in outstandings has reached its maximum and declined to the half-way mark between its maximum and zero." For a generalized set of dates, the peaks of the minor cycles of the subcycle chronology were used and supplemented by two additional points in 1955 and 1959, when declines or retardations in numerous series had previously been observed. These durations are reviewed in columns 2-4 of Table 50. Omitting the two extreme entries, they range from between 16 and 11 months, they average 14 months, which is two-fifths of the average period of the three expansions—35 months.

As the thrust subsides, many manifestations associated with the inventory-purchase complex tend to snub the economic expansions. Table 50 assembles some of these facts in convenient form. Outstanding orders and total ownership by definition no longer increase as rapidly as before, and thereby the speed with which orders outrun shipments slows down. The slower pace of extension appears in

fewer reports of lengthening order terms. It is soon followed by, or perhaps evidenced in, more reports of improvement in vendor performance (column 5). Other developments include shortening average order terms (column 6), falling corporate profits in durable goods industries (column 7), and, a bit later, falling spot-market prices of metal (column 8).

The slower rate of extension is of sufficient quantitative importance to cause the aggregate level of orders for materials to begin to slow down very markedly about the same time as the thrusts terminate. Physical volume of new orders for durable goods materials actually declined at this early point in the long postwar expansions (column 11). And the declines are also apparent in trend-corrected orders for department stores (column 12).

A decline in new orders need not, of course, have a counterpart in decline in output. For one thing, inventory investment in stocks of all sorts may still be accelerating, though investment in department store stocks and durable materials has about reached its peak (columns 9 and 10). Nevertheless, as Charts 18 and 19 indicate, declines or flat areas did typically appear in the production or shipments of durable goods materials. Shipments to department stores by their suppliers, like the orders placed, fell sharply in 1951 and flattened at the end of 1955. Apparently the hesitation reflected in the flows of information embodied in new orders had counterparts in the flows of goods and income.

#### *Continued Expansion*

However, other forces capable of lifting activity were sufficiently rugged to outlast the impact of these depressant influences. Many illustrations spring to mind in connection with aspects of the economy other than those connected with the inventory data examined in this book. A prime example is the ground swell of consumer buying of foods and services

TABLE 50

*Lag Relative to Reference Cycle Troughs of Termination of Period of Thrust and of Peaks in Specific Cycles in Selected Data, 1947 to 1962, Months*

Business Cycle Reference Trough	Duration of:				Lag Relative to Reference Trough:				
	Reference Expansion (1)	Period of Thrust <sup>a</sup>			D.I. Vendor Performance (5)	Av. Term of Purchase Order (6)	Profits Dur. Mfrs. (7)	Spot Mkt. Metals Prices (8)	
		Chronology (2)	Dur. Mfrs. (3)	Dept. Stores (4)					
October 1949	45	16	18	16	11	15	13	15	
August 1954	35	16	10	16	14	13	15	20	
April 1958	25	11	11	15	18	20	13	19	
February 1961 <sup>c</sup>			12	13	12	12	12	7	
Average for three phases		14	13	16	14	16	13	18	

Lag Relative to Reference Trough:										
Inventory Investment		Materials Orders				Final Prdt. Orders <sup>b</sup>		Final Prdt. Shipments <sup>b</sup>		
Dur. Materials (9)	Dept. Stores (10)	Dur. Mfrs. De- flated (11)	Dept. Trend Adj. (12)	Dur. Mfrs. (13)	Dept. Stores (14)	Dur. Mfrs. (15)	Dept. Store Sales (16)	Dur. Mfrs. (17)	Dept. Store Sales (18)	
October 1949	12	12	15	9	15	9	15	15	45	15
August 1954	20	16	10	15	20	26	24	36	29	36
April 1958	12	23	10	14	10	24	14	24	15	24
February 1961 <sup>c</sup>	9	8	10	15	10	15	⊕	⊕	⊕	⊕
Average for three phases	15	17	12	13	15	20	18	25	30	25

<sup>a</sup>Figures in columns 2 to 4 are from Tables 4, 5, and 14 respectively.

<sup>b</sup>For department stores, both orders and shipments of final products are their "sales". For durable goods manufacturers they are the new sales orders and shipments of the machinery and transportation equipment industries.

<sup>c</sup>All figures in this line are highly tentative, as previously explained; slighter movements than would be selected as specific troughs have frequently been identified here.

and of the structures and services provided by governments. But even in the area of department store sales and durable goods manufacturing, the movement of final products continued to rise. Sales of department stores

continued uninterruptedly upward for an average of twenty-five months during the three expansions. Moreover, it showed no significant hesitation in early 1962 (see Chart 8). Shipments of final products in the heavy indus-

tries continued to rise throughout most of the long expansion; the average period was thirty months. A similar remark applies, with one qualification, to the volume of production (see Chart 19).<sup>14</sup> Here, too, it is interesting that there was little suggestion of hesitation in early 1962. These hardy trends in both 1952 and 1956 reactivated the procurement sectors of the economy and produced a second round of boosts in buying and investment in materials on hand and on order.

However, the latter episodes were somewhat different from the first in that the market-oriented elements seemed weaker relative to the need for simply replenishing the supply of materials on hand and materials flowing into new production or sales. Charts 6, 7, 10, and 11 speak to these points and are worth a moment's review. It is particularly interesting, in view of the traditional emphasis

on declines in profits as harbingers of cyclical reversal, that in the durable goods industries, in each of the three complete business cycle expansions pictured, profits did not regain the highs reached at the end of the first year of expansion. It is interesting also that the recent experience constitutes a sharp exception (see Chart 17).

But such peaks as were attained as a result of a second lift in the materials-inventory syndrome occurred well before the peaks in business. Summary figures were given in Table 45. In this period of half a year or a year prior to the time when declines in general business started, and on into the early months of contraction, a declining rate of investment in stocks both on hand and on order and other market-oriented phenomena contributed to eventual pessimistic expectations and reduction in output.

### SUMMARY

Events associated with materials purchasing tend to reverse their impact on the economy before general business reaches peaks or troughs. Rates of change in materials stocks proper lead by short intervals; those in stock outstanding by longer ones.

The pattern of output that is implied causes fluctuation at earlier stages to be stronger than at the later stages, those close to the consumer. The *amplification* is greater than the efficient servicing of sales would seem to require. However, there is no consistent tendency for the *timing* of turns in production to differ at successive stages of manufacture.

The information conveyed by new orders undergoes a major amplification between the buying of consumers and of retailers—the orders received by manufacturers of finished

goods that supply retailers. We cannot picture what further amplification may result as these producers place orders for materials. However, for all durables the amplification in new orders from one manufacturing stage to the next does not stand out: the orders for final products (machinery and transportation equipment) do not seem to have clearly less cyclical amplitude than do those for durable goods materials (unlike the amplitude of production for the two stages).

The major acceleration in new orders—the earlier turns—also takes place between consumers' and retailers' buying. But this anticipatory capability of distributors' orders, well maintained at earlier stages, makes it possible for production starts to increase or decrease at much the same time throughout a sequence of vertical stages in the preparation of goods. Finished production may lag when the production process is lengthy.

The force exerted by the inventory-pur-

<sup>14</sup> Production hesitated sufficiently after the Korean War boom to have a minor turn marked at that time (see Chart 19). However, new highs were being reached by early 1952.

chase complex differs at various stages of business cycles:

1. Prior to business cycle peaks and during the early months of contraction, its influence is depressant.

2. Midway in the brief business contractions that have characterized the postwar economy, its leavening influence sets in. This influence gains force during late contraction and still more so during the first year of expansion. Then it is sharply subdued.

3. During the rest of expansion its course varies. It tends to be depressant while the readjustments following the cessation of the buying surge take place. But in 1951-52, 1955-56, and again in 1962 the economic situation was strong enough to overcome these elements of hesitation and reactivate further investment in merchandise or materials. However, the market expansion which characterized the second round of episodes appears to have been more moderate than the first, though the 1964-66 situation has turned out to be an exception in which the usual sequence has been reversed.

This pattern reflects in part the complex ways in which the conditions in the economy at large affect stocks on hand and on order and how they change. For one thing, not only the level but, very significantly, the rates of change in final demand influence the appropriate service level of stocks. And note that rates of change in demand tend to be sharp at the two times when the influence of the inventory syndrome is strong—paragraphs 1 and 2 above. For another thing, these changes in demand, given the perceptions, objectives, and techniques available to businessmen, produce problems in enforcing objectives which imply further fluctuations in stocks on hand and on order.

Finally, changes take place in the relative costs of carrying stocks on hand, and also on order, compared with other ways of serving the business ends which stocks serve. These changes, particularly those associated with

market conditions and available funds, imply further shifts in ownership position. The specifics of these several impacts on stock and their resultant patterns of fluctuation were discussed in Chapter 10.

Let me underscore again the importance of rates of change in this entire group of events. It means that the influences originate in what Arthur F. Burns has called the "unseen cycle" of diffusion, in contrast to the "seen cycle" in aggregates proper. Diffusion involves the dispersion of increases and decreases in individual business units. It involves also dispersion of retardations and accelerations in these units.

The participation of stocks in business fluctuation involves also an opposite stream of causality—one that concerns the impact of the inventory-purchase syndrome on the economy. The impact takes place at two levels.

The first level involves flows of information which influence the plans producers make, the expectations with which they live, the tone and substance of their negotiations with customers and suppliers. What happens at this level sends off further messages. The process can produce what one might call an expectations multiplier. Occurrences at the level of flows of information and expectation are a second type of "unseen cycle" which, like the cycle of diffusion, is counterpoint and often causally antecedent to the themes of the "seen" cycle.

The second level involves flows of output and associated income—that is, the actions upon which aggregative economics has focused. Positive inventory investment generates income which is not absorbed in the purchase of the goods produced. This additional income, spent and respent, stimulates productive activity and further income, in line with multiplier influences of the traditional sort.

The two levels—that of information or expectation and of production or income flows—often supplement one another. Thus information leading to the expectation that

markets may tighten can motivate an increase in stock. Often they mute one another. Thus a rise in stock that occurs because sales were lower than expected conveys pessimistic expectations which in turn depress subsequent buying and production.<sup>15</sup> All too obviously, then, the two worlds—the world of informa-

tion, of expectations, and the world of income and output, of action—interact.

<sup>15</sup> This notion has been expressed in the context of unintended and intended inventory investment. See, for example, Ragnar Nurkse, "The Cyclical Pattern of Inventory Investment," *Quarterly Journal of Economics*, August, 1952.