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6. *Rates of Change*

The capital asset, stocks, is a means to the end of production and consumption of goods. Its absolute size is relevant to its capacity to perform this function, as is its relation to the flows of output that it serves. This was the point of view on which the previous two chapters focused, since they examined the levels of stocks and stock-output ratios.

But stocks are not merely an enabling factor. Their increase or decrease can itself be a target, or at least a consequence, of production. As such they are directly involved in the dynamics of business decisions. These decisions have a direct effect on employment and income; they may have many indirect effects. The magnitude of the impact often depends on the *rate of change* of stocks over a period of time.

For example, the time-rate of change in stocks, inventory investment, measures the direct impact of stocks on the flow of goods and of incomes in the economy. During a specified time interval, incomes are paid out to generate an addition to stock, other things the same; a decrease in stock absorbs income (to effectuate their purchase) without creating it by the payments associated with the production of the goods purchased. Further effects of the time-rate of change in stock (and here the level of stocks is doubtless also significant) include their influence on expectations, on tensions in markets and on prices. The various sorts of initial impacts ripple in rings of subsequent or "multiplier" effects, and this applies not only to the much discussed income multiplier but to expectational and market-impact multipliers as well.

Rates of change in outstanding orders, unlike stocks, do not constitute the measure of some aggregate direct impact on the relation between current income and product flows. They may have this effect later if their deliveries result, other things the same, in larger or smaller stocks. In any case, they have many other direct and indirect effects which may take place immediately or subsequently. For one thing, they represent a commitment on the part of the seller to undertake future production. Present implications include influences on market conditions, on prices, and on producers' judgments as to whether to increase or decrease production, buying or selling. But consideration of these complicated effects of change in materials on hand and on order had best be put off until their behavior has been visualized.

For the purpose of describing the time-rates of change, we select one month as the basic period. Because month-to-month change is characterized by a heavy erratic component, all data are smoothed by a five-month moving average.[1] I use the term "investment" interchangeably with that of "change" or "rate of change" and all apply, of course, to either or both change in stocks on hand or on order.

[1] The period has been selected without experimentation. In general, different series "need" different degrees of smoothing, but it was not feasible to arrive at these particularized techniques. Moreover the criterion of "need" is tricky when, as here, the subject under study is one for which quite short-term change is relevant. Ideally, I would like to remove choppiness caused by irrelevant influences, such as seasonal patterns in working days, weather, promotional occurrences, length of the business day, bunching of business. I would not like to remove choppiness that might

DURABLE GOODS MANUFACTURING

Conformity and Timing

The second curve of Chart 6 pictures the course of rates of change in materials ownership for manufacturers of durable goods. There were five clear cycles; a sixth one, the expansion that interrupted the decline following the Korean War, was not strong enough to select as a specific cycle, but does nevertheless warrant attention as a minor movement.

Cycles of ownership investment have a recurrent pattern—troughs occur no later than the middle of business cycle contractions. There is a fast upward movement as, first, the rate of decline slackens and, then (as the curve crosses the zero line), the rate of rise accelerates. Peaks in the rate of investment tend to occur within ten months after business expansion begins.[2] But though the rate of rise does not continue to accelerate, ownership itself continues to rise and at a rapid rate (though not at an increasing rate) for the periods of ten to eighteen months previously noted as characterizing the first spurt of expansion.

The net result is that the rate of change in ownership has an irregular pattern over business cycle expansion after the first spurt has slowed. The rise may continue for a while and then actually reverse, as was the case in the first postwar expansion and during the Korean period; it may continue, though at a declining rate, and this may take place for a short or for a long period of time. These often long and irregular periods of declining rate of rise cause peaks in ownership investment to bear an irregular relation to the following peak in business. Table 18, lines 1 and 2, shows a median lead of 22 months and an average deviation from the median of 8 months; if the subcycle reference frame is used, the median lead is 13 months and the deviation almost as great.

The high volatility of outstanding orders means that it is the order segment that determines the basic characteristics of changes in ownership in the durable goods industries. Consequently, most of what has just been said concerning conformity and timing of changes in ownership applies to changes in outstandings alone. Table 18, line 4, shows that the timing in change of ownership and outstanding orders is virtually identical.

Changes in materials stocks lead turns in general business (Table 18, lines 6 and 7), though of course by shorter intervals than do outstandings. At troughs the average lead is very short indeed.

Rates of change in ownership or outstandings, like the data proper, lead turns in materials stocks. The median lead for all turns is four and five months respectively—eight months at peaks (lines 3 and 8 with signs reversed). Here, as in the case of the level of stocks and outstandings, the lead seems surprisingly long. Fluctuations in change in stocks

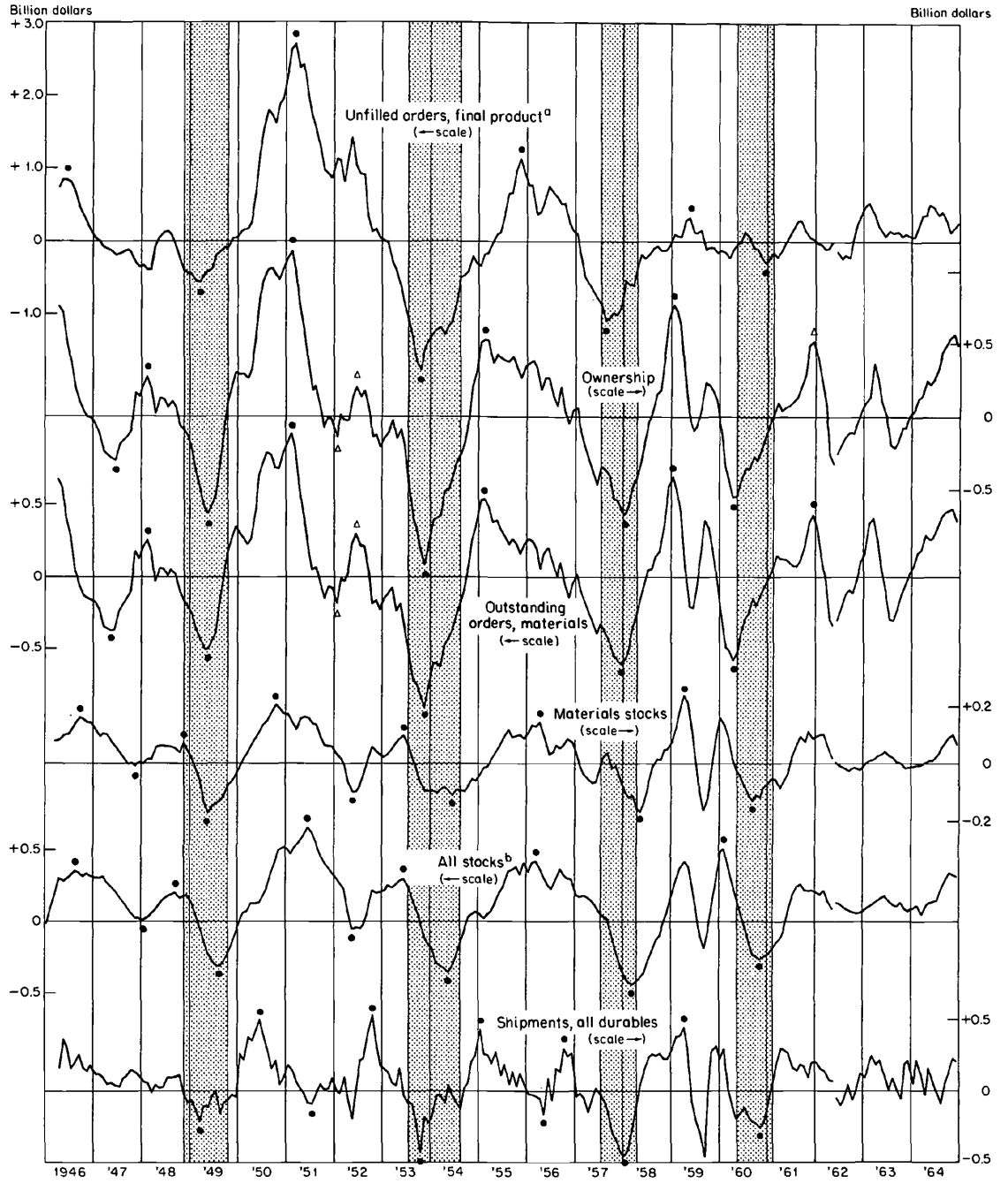
represent, for example, a tendency for certain months of the year to be characterized by unusually strong buying in good years and unusually weak buying in poor years.

I am saying, in other words, that hand-tailored smoothing is a complicated problem, and I have not undertaken it except in isolated cases. The five-month average seems to achieve enough smoothing to make it feasible to study the time series. Also it may be reasonably realistic in that business procedures associated with planning and review may average experience over a number of months and thus in effect perform a similar smoothing operation.

[2] The peak in investment took place seven months after the 1947 trough, six months after 1954, nine months after 1958, and ten months after the 1961 trough. The extraordinarily heavy speculative movement during the Korean episode was associated with a somewhat later peak—sixteen months after the trough in 1949.

CHART 6

*Rates of Change * in Stocks and Unfilled Orders, Durable Goods Manufacturers, 1946–64*



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

* Five-month centered moving average of monthly change.

[a] Final product industries are the machinery and transportation equipment industries.

[b] Finished, in process, and materials stocks of all durable goods manufacturers.

TABLE 18

Timing: Change in Stocks on Hand and on Order, Durable Goods Manufacturers, 1946–62

Line	Reference Series[c]	Section A: Months Lead (−) or Lag (+) for Matched Turns[a] Chronology[b] 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
	Specific Series: Change in Ownership												
1	Business cycles			−9	−5			−29	−9	−29	−3	−16[r]	−10[r]
2	Subcycles	⊕	−1	−9	−5	0	−5[r]	−13[r]	−9	−29	−3	−16[r]	−10[r]
3	Change materials stocks	⊕	−5	−9	0	+4	−4	−12	−7	−14	−4	−3	−5
4	Change in outstanding orders	⊙	+1	0	0	0	0	0	0	0	+1	0	0
5	Change shipments	⊙	⊗	⊗	+2	+8	+6	−4	+1	+1	0	−3	−7
	Specific Series: Change in Stocks, Materials												
6	Business cycles			0	−5			−1	−2	−15	+1	−13	−5
7	Subcycles	−4	+4	0	−5	−4	−1	−1	−2	−15	+1	−13	−5
8	Change in Outstanding orders	⊗	+6	+9	0	−4	+4	+12	+7	+14	+5	+3	+5
9	Change all stocks	+1	−2	+2	−3	−8	0	0	+1	+1	+2	−10	−2
10	Change shipments	⊗	⊗	⊗	+2	+4	+10	+8	+8	+15	+4	0	−2
11	Shipments	⊗	⊗	−1	−5	−5	−2	−1	−4	−9	+1	−2	−4
	Specific Series: Change in Outstanding Orders												
12	Business cycles			−9	−5			−29	−9	−29	−4	−16[r]	−10[r]
13	Subcycles	⊕	−2	−9	−5	0	−5[r]	−13[r]	−9	−29	−4	−16[r]	−10[r]
14	Change unf. orders final products	⊕	⊗	⊗	+2	−1	⊗	⊙	+1	−9	+4	−4	−8
15	Change shipments	⊗	⊗	⊗	+2	+8	+6	−4	+1	+1	−1	−3	−7
	Specific Series: Change in Unfilled Orders, Final Product												
16	Business cycles			−29	−7			−28	−10	−20	−8	−12	−3
17	Subcycles	−7	⊕	⊕	−7	+1	⊕	⊕	−10	−20	−8	−12	−3
	Specific Series: Change in All Stocks												
18	Business cycles			−2	−2			−1	−3	−16	−1	−3	−3
19	Subcycles	−5	+6	−2	−2	+4	−1	−1	−3	−16	−1	−3	−3
	Specific Series: Change in Shipments All Durables												
20	Business cycles			⊕	−7			−9	−10	−9	−3	−13	−3
21	Subcycles	⊕	⊕	⊕	−7	−8	−11	−9	−10	−9	−3	−13	−3

(continued)

TABLE 18 (concluded)

Line	Reference Series[c]	Section B: Average Timing of Turns — Number Matched (− + 0)	Median[e] P	Median[e] T	Median[e] All	Average Deviation[f] P	Average Deviation[f] T	Average Deviation[f] All Turns Wt'd	Section C: Per Cent of Months in Like Phase[d] — Timing Adjustment[g]	% Mos. 7/46–12/61
		Specific Series: Change Ownership								
1	Business cycles	8 0 0	-22.5	-7.0	-9.5	8.2	2.8	7.2 5.5	-9, -10	57
2	Subcycles	10 0 1	-12.7	-5.0	-7.7	7.3	3.3	5.8 5.1	-9	63
3	Change materials stocks	9 1 1	-8.0	-4.5	-3.7	5.6	1.5	3.9 3.4	-5	77
4	Change in outstanding orders	0 2 9	0	0	0	0	0.3	0.2 0.2	0	99
5	Change shipments	3 5 1	-1.0	+1.0	+0.7	4.0	3.0	3.5 3.4	+1, 0	73
		Specific Series: Change Stocks, Materials								
6	Business cycles	6 1 1	-7.0	-3.5	-3.5	6.7	2.2	4.5 4.5	-4, -5	63
7	Subcycles	9 2 1	-4.0	-1.5	-3.0	4.5	2.7	3.9 3.6	-3, -4	75
8	Change in outstanding orders	1 9 1	+8.0	+5.0	+5.3	5.6	1.5	3.7 3.4	+5	79
9	Change all stocks	5 5 2	+0.5	-1.0	0	3.7	1.7	2.7 2.6	-2 to +1	83
10	Change shipments	1 7 1	+11.5	+7.3	+8.7	6.5	4.3	4.9 5.3	+4, +5	68
11	Shipments	9 1 0	-2.7	-3.3	-3.0	2.5	1.7	2.2 2.1	-2, -3, -4	81
		Specific Series: Change Outstanding Orders								
12	Business cycles	8 0 0	-22.5	-7.0	-9.5	8.2	2.5	7.1 5.4	-9, -10	61
13	Subcycles	10 0 1	-12.7	-5.0	-7.7	7.3	2.2	5.7 4.5	-9	64
14	Change unf. orders, final product	4 3 0	-4.7	+1.5	-1.3	2.9	3.2	4.0 3.1	-1, 0	77
15	Change shipments	4 5 0	-1.0	+0.7	+0.7	4.0	3.3	3.6 3.6	+1, 0	72
		Specific Series: Change Unfilled Orders, Final Product								
16	Business cycles	8 0 0	-24.0	-7.5	-11.0	6.2	2.0	7.6 4.1	-11	58
17	Subcycles	7 1 0	-9.5	-7.5	-7.5	6.5	2.0	4.2 4.2	-7, -8	66
		Specific Series: Change All Stocks								
18	Business cycles	8 0 0	-2.5	-2.5	-2.5	4.0	0.8	2.4 2.4	-2, -3	75
19	Subcycles	10 2 0	-2.5	-1.5	-2.0	4.2	2.0	3.1 3.1	-2	80
		Specific Series: Change Shipments All Durables								
20	Business cycles	7 0 0	-10.3	-5.0	-8.3	1.8	2.8	2.8 2.3	-9	57
21	Subcycles	9 0 0	-9.0	-6.7	-8.7	1.2	3.1	2.5 2.2	-9	68

Notes to Table 18

[a]Specific series are matched with the indicated reference series (see note c) 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 is:

⊕ = Turn in the reference series does not appear in the specific series.

ȣ = Turn in the specific series does not appear in the reference series.

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

[b]Chronology dates are business cycle reference dates. In addition, four minor subcycle dates, enclosed in parentheses, are added to form a subcycle chronology.

[c]Reference series are of three sorts: (1) the business cycle chronology as shown in column heads, excluding the dates in parentheses; (2) the subcycle chronology as shown in all column heads; (3) particular series whose specific cycles and minor cycles constitute the reference dates for the comparison.

[d]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.

[e]Median is the average timing of the center two or three turns.

[f]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.

[g]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.

In some cases we wish to know the percentage of months in phase on a synchronous basis, regardless of whether the percentage in phase is thereby maximized. If so, the "timing adjustment" is given as "none."

and outstandings have 79 per cent of the months in like phase after allowing for the five-month lead (line 8, Section C).

Amplitude

The swings in changes in ownership were typically quite substantial. The average specific cycle rise or fall—that is, the average algebraic difference between the monthly rate of rise at peaks and the rate of fall at troughs—was $1,338 million [3] (Table 19). This represented 6.5 per cent of the average level of ownership proper. It represents 11.8 per cent of the level of shipments of all durable goods manufacturers. The total swing from low to high and back again was, of course, about twice these figures.

[3] The figure is obtained in the following way. Standings are five-month averages of month-to-month change centered at months of turn. Rates of rise have a positive, and of fall a negative, sign. The rise during expansion is, algebraically, the rate of rise at a peak minus the rate of fall at the previous trough. The fall during contraction is the rate of fall at a trough minus the rate of rise at the following peak.

Total average phase amplitude is the algebraic sum of rises minus falls divided by the number of phases. The figure is, therefore, one-half of the full cycle amplitude and, implicitly, positive for expansions and negative for contractions. The average amplitude per month is obtained by dividing total amplitude by the number of months from the first to the last turn covered.

TABLE 19

Average Specific Cycle Amplitude of Monthly Change in Stocks on Hand and on Order, Durable Goods Manufactures, 1946-62

	Date of First and Last Peak or Trough (1)	Amplitude Per Phase ($ million) (2)	Amplitude Per Phase % of Data Proper (Col. 2÷6) (3)	Amplitude Per Month, Rise or Fall[a] ($ million) (4)	Amplitude Per Month, Rise or Fall[a] % of Data Proper (Col. 4÷6) (5)	Average Level of Data Proper 1946-62 ($ million) (6)
Ownership	T 6/47 to P 12/61	1,338	6.54	69.2	.34	20,456
Materials stocks	P 9/46 to P 11/61	267	3.85	17.6	.25	6,931
Outstanding orders	T 5/47 to P 12/61	1,212	8.97	62.3	.46	13,508[b]
All stocks	P 8/46 to P 9/61	633	2.68	42.0	.18	23,630
Unfilled orders, final Product	P 6/46 to P 9/61	2,110	6.84	92.2	.30	30,842

[a]Peak or trough standings are five-month averages centered. Specific cycle fall during contraction is added to the rise during expansion, summed for all cycles, and divided by the number of months between initial and terminal turns. For further description see text, note 3.

[b]Shipments of durable goods manufacturers in the materials group averaged $5,382 mil. per month 1946-61. For outstanding orders, which are the unfilled sales orders of the same group, the amplitude per phase (col. 3) average 22.5 per cent of shipments, and per month (col. 5), 1.2 per cent.

Of the two components of ownership, changes in stocks on hand (curve 4) and changes of stocks on order (curve 3), the latter, Chart 6 suggests, fluctuates several times as vigorously as the former. (Note that changes in stocks are drawn on twice the scale of outstandings.) We see in Table 19 that change in materials stocks rose or fell during its specific cycles by an average of $17.6 million a month; the corresponding figure for outstandings was $62.3 million, three and a half times as large. It may be recalled that for the data proper outstandings were about four times as unstable as materials stocks (see Table 3)—roughly speaking, about the same as for rates of change. The far larger instability of outstandings is due in part to the higher level of outstandings proper (Table 19, column 4), but even on a relative basis they fluctuate twice as much (column 3).

The economic significance of cycles in inventory investment is a function, among other things, of the size of the swings relative to that of the flows that fill and empty the inventory pools; and a similar remark, though with "other things" playing a more important part, applies to change in outstandings orders. Shipments by manufacturers of durable goods *materials* may be used as a very rough indication of the size of one of these flows (the outlet).

Rises or falls per month during specific cycles in change in outstandings represented 1.2 per cent of the monthly level of shipments

of materials producers; the amplitude per phase represented 22.5 per cent of the monthly level of shipments (see Table 19, note). Some notion of the meaning of these figures is suggested by the fact that the amplitude of specific cycles in materials shipments itself was about the same—1.4 per cent per month and 23.2 per cent per phase.

Other Comparisons

Parenthetically, I want to call attention to two additional relationships. The first concerns outstanding orders for materials and unfilled orders for final products, the third and top curves in Chart 6. Note, first, the precipitous rate at which unfilled orders for final products built up during the Korean episode and the 1955–56 expansion; the scale for the final products curve is two times that of materials outstanding. The shape as well as amplitude of the movements appear to differ. Materials show five well-developed movements and a minor additional one. (I ignore, as always, the strike episode in 1959.) Final products miss the two extra cycles; [4] their movements since 1958 have been minimal. For such movements as were shared by both rates-of-change series, the persistent lead of materials noted in the data proper seems to have disappeared. At peaks, rate of increase in outstanding orders for materials do seem to start down before those for final products; but at troughs, the rate of decline in outstandings tends to decelerate after that of final products (Table 18, line 14).[5]

[4] The hesitation in the rate of deceleration of final-product backlogs in 1952 may seem similar to the contemporaneous movement in materials outstandings. But note that final-product backlogs were rising heavily throughout the period, while materials outstandings actually fell (crossed the zero line) and then rose again.

[5] Retardation precedes turns in the data proper for unfilled orders for final products by unusually long intervals—nine to twenty-two months for the five comparisons that can be made—the median lead is thirteen months. For unfilled orders for materials, the range is two to eighteen months, with a median of six months for the twelve comparisons.

In spite of the long production period of many final products, the rate of change per month in these unfilled orders, though larger in dollar amounts, is smaller relative to unfilled orders proper than is the case for the relation of the rate of change in outstanding orders for materials to these data proper; rates of change, as a percentage of the data proper, are .3 and .5 respectively (Table 19, column 5).

The second parenthetical observation concerns the basic similarity between investment in all durable goods stocks and in durable stocks of materials (compare Chart 6, curves 4 and 5). Thomas Stanback has observed that the pattern of investment in goods in process and in finished stocks is very similar to that of materials alone. Comparing all stocks with those of materials only, our Table 18 (line 9) shows that 83 per cent of the months are in like phase, matched synchronously. This hints that if we could learn more about why stocks of materials change, in part, perhaps, via further understanding of the role of unfilled orders, the knowledge would help to illuminate the aggregate behavior of investment in total stocks. These fluctuations, of course, vary far more in absolute amount (though less as a percentage of the level of stocks) than do materials, which represent about 30 per cent of the total in book value.[6]

Stocks and Shipments

Analysis of management problems in Chapter 2 suggested that incremental relations between sales and stocks might, under several circumstances, tend to be constant when rela-

[6] The relative importance of materials stocks is underplayed by book-value figures. Stanback's figures, based on book value, are 30, 40, and 30 per cent for materials, in process, and finished stocks for durable goods manufacturing (*Postwar Cycles,* p. 25). But to convert the proportions to the number of weeks of shipments for which they constitute the supply, an allowance must be made for the value added to book value. If materials are taken to be 50 per cent of their finished value and in process 75 per cent, the adjusted proportions are 40, 40, 20.

tions between sales and stocks proper might not.

Because rates of change may be positive or negative, it is awkward to examine the degree of their relationship as we did for the data proper for which ratios could be used. Accordingly, it will suffice for the moment to ask the less exacting question: How much of the time do rates of change in shipments and in the several stockpiles rise or fall together and what are their characteristic sequences?

The bottom curve in Chart 6 shows monthly change in shipments of all durable goods manufacturers smoothed by a five-month centered average. Its turns inevitably lead those of the business cycle or subcycle chronology, beginning in 1949 (Table 18, lines 20 and 21). Before 1949, the rise in shipments tapered off slowly, so that rates of change underwent no cycles of their own. It is exceedingly interesting also that there appear to be no clear fluctuations in the rate of rise in shipments, 1961–64. For the nine turns matched with the subcycle chronology, leads averaged about nine months with quite moderate variability; indeed, at peaks average deviation was only 1.2 months.

If investment in stocks on hand responded to these monthly amounts of increase or decrease in shipments, they often did so quite slowly. The median lag was nine months (line 10). Changes in outstandings, on the other hand (line 15), turned sooner about as often as later than changes in shipment. The correspondence in terms of the percentage of months in like phase was poor, 72 per cent. Changes in ownership, of course, behaved in virtually the same way (line 5). In chapters 9 and 11, we return to these relationships for more careful scrutiny and explanation in terms of business objectives and achievements. In the meantime, one cannot help questioning whether they express a determined effort to keep stocks firmly linked to shipments, other things the same, and whether, if so, other things actually tend to be the same.

DEPARTMENT STORES

Conformity and Timing

Information for department stores about rates of change in stocks, outstanding orders, and ownership as a whole is shown in Chart 7. Change in ownership had five clear cycles. Peaks and troughs tended to lead the reference dates on the average by almost a year (Table 20, lines 1 and 2). Indeed, the peak in ownership investment occurred about a year after business contraction ended, not far from the times, previously observed, when the spurts in buying begin to recede.[7] There are no rules for the last two-thirds of the expansion phase of business cycles—ownership investment may drop to a trough and rise again (the first two expansions), or continue a retarding or irregular rate of rise.

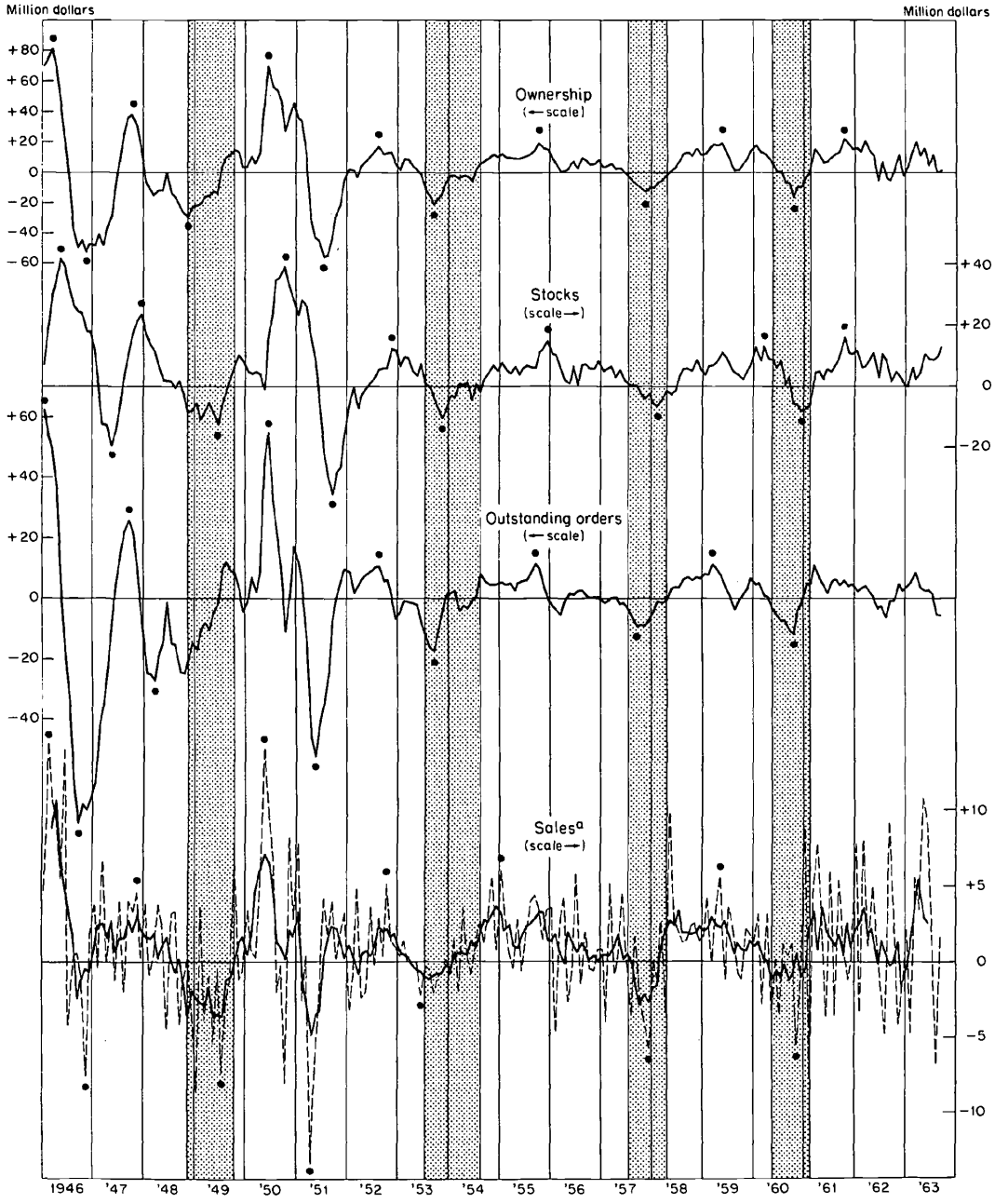
Once again we see, this time for the rate of change, materials on order reaching peaks and troughs well ahead of those on hand (Table 20, line 9). The median lead is four months at peaks and troughs. The intervals again seem long in view of the fact that outstanding orders constituted only about one month's supply on the average. But in spite of this there appears to be a rather substantial similarity, after allowing for the average lead of four months, in the timing of fluctuation in the rates at which outstanding orders and stocks rise and fall. Eighty-three per cent of all months were in like phase.

Let me pause for a procedural note. Why is 83 per cent of months in like phase a

[7] The periods from business cycle trough to the following peak in change in ownership were eight months after the 1949 trough, fourteen months after 1954, and thirteen months after 1958.

CHART 7

Rates of Change in Sales and Ownership and Its Parts, Department Stores, 1946–63



Note: Shaded areas represent business contractions. Specific cycle turns are marked by dots.

[a] Dashed line is five-month centered average of month-to-month change in seasonally corrected monthly sales; turns are marked in these data. Solid line is a nine-month weighted average.

TABLE 20

Timing: Change in Stocks on Hand and on Order, Department Stores, 1946–62

Line	Reference Series[c]	Section A: Months Lead (-) or Lag (+) for Matched Turns[a] Chronology[b] 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
		Specific Series: Change in Ownership											
1	Business cycles			-13[r]	-11[r]			-11	-11	-21	-5	-12	-4
2	Subcycles	-10[r]	-8[r]	-13[r]	-11[r]	-8	-11	-11	-11	-21	-5	-12	-4
3	Change stocks	-2	-6	-2	-7	-4	-2	-3	-2	-2	-3	-10	-2
4	Change in outstanding orders	+2	+2	+1	+8	0	+2	0	0	+1	+2	+2	0
5	Change in sales	+1	0	-1	-8	+1	+3	-2	+3	+9	-1	0	-1
6	Change in ownership, durables	⊠	-7	-4	-6	-8	-6	+2	-2	+8	-2	+4	+6
		Specific Series: Change in Stocks											
7	Business cycles			-11	-4			-8	-9	-19	-2	-2	-2
8	Subcycles	-8	-2	-11	-4	-4	-9	-8	-9	-19	-2	-2	-2
9	Change in outstanding orders	+4	+8	+3	+15	+4	+4	+3	+2	+3	+5	+12	+2
10	Change in sales	+3	+6	+1	-1	+5	+5	+1	+5	+11	+2	+10	+1
11	Change in materials stocks, dur.	-4	-6	-11	+1	0	-8	-7	-7	-4	-3	+11	+3
12	Sales	⊠	⊠	-10	-1	-3	+5	-6	-2	-20	0	-1	-1
		Specific Series: Change in Outstanding Orders											
13	Business cycles			-14[r]	-19[r]			-11	-11	-22	-7	-14	-4
14	Subcycles	-12[r]	-10[r]	-14[r]	-19[r]	-8	-13	-11	-11	-22	-7	-14	-4
15	Change in sales	-1	-2	-2	-16	+1	+1	-2	+3	+8	-3	-2	-1
16	Change outstanding orders, dur.	⊠	-8	-5	-14	-8	-8	+2	-2	+7	-3	+2	+6
		Specific Series: Change Sales											
17	Business cycles			-12	-3			-9[r]	-14[r]	-30	-4	-12	-3
18	Subcycles	-11[r]	-8[r]	-12	-3	-9	-14	-9[r]	-14[r]	-30	-4	-12	-3
19	Change in shipments, durables	⊠	⊠	⊠	+4	-1	-3	0	-4	0	-1	+1	0

(continued)

TABLE 20 (concluded)

Section B: Average Time of Turns

Line	Reference Series[c]	Number Matched			Median[e]			Average Deviation[f]				Section C: Percentage of Months in Like Phase[d]	
										All Turns		Timing Adjustment[g]	% Mos. 7/46–12/61
		–	+	0	P	T	All	P	T		Wt'd		
	Specific Series: Change Ownership												
1	Business cycles	8	0	0	-12.5	-8.0	-11.0	2.8	3.2	3.2	3.0	-11	76
2	Subcycles	12	0	0	-11.5	-9.5	-11.0	2.8	2.7	2.8	2.8	-11	82
3	Change in stocks	12	0	0	-2.5	-2.5	-2.5	1.8	1.7	1.8	1.8	-2	89
4	Change outstanding orders	0	8	4	+1.0	+2.0	+1.5	0.7	1.7	1.3	1.2	+2	91
5	Change sales	5	5	2	+0.5	-0.5	0	2.3	2.7	2.5	2.5	0	84
6	Change ownership, durables	7	4	0	+0.7	-4.0	-2.7	5.1	3.5	4.5	4.2	-2	74
	Specific Series: Change Stocks												
7	Business cycles	8	0	0	-9.5	-3.0	-6.0	5.0	2.2	4.6	3.6	-6	68
8	Subcycles	12	0	0	-8.0	-3.0	-6.0	4.0	2.7	4.0	3.3	-6	73
9	Change in outstanding orders	0	12	0	+3.5	+4.5	+4.0	1.8	3.3	2.6	2.6	+4	83
10	Change sales	1	11	0	+4.0	+3.5	+4.0	3.5	2.3	2.9	2.9	+4,+3	81
11	Change materials stocks, durables	8	3	1	-4.0	-4.5	-4.0	4.8	3.7	4.2	4.2	-4	73
12	Sales	8	1	1	-6.3	-0.7	-1.5	5.3	1.7	4.3	3.5	-1	71
	Specific Series: Change Outstanding Orders												
13	Business cycles	8	0	0	14.0	-9.0	-12.5	2.8	4.8	4.5	3.8	-12,-13	73
14	Subcycles	12	0	0	-13.0	-10.5	-11.5	3.2	3.7	3.6	3.4	-12,-13	77
15	Change sales	8	4	0	-1.5	-1.5	-1.5	2.3	4.0	3.2	3.2	-2	80
16	Change outstanding orders, dur.	7	4	0	-0.3	-5.5	-3.3	4.9	5.2	5.3	5.0	-3	69
	Specific Series: Change Sales												
17	Business cycles	8	0	0	-12.0	-3.5	-10.5	5.2	3.0	6.1	4.1	-10	66
18	Subcycles	12	0	0	-11.5	-6.0	-10.0	4.2	4.3	4.8	4.2	-10	69
19	Change shipments, durables	4	2	3	0	-1.3	-0.3	0.5	2.3	1.6	1.5	0	79

Notes: See Table 18.

"rather substantial similarity"? For data proper I have passed over confluence of this order. There is inevitably a substantial judgmental element in what does or does not seem noteworthy confluence. But two chief considerations influence the judgment. First the more phases a series has the harder it is to reach a given confluence score. Thus, here there are 12 turns compared over 186 months. An average deviation of only 2.6 months at each turn would account for the 17 per cent of the months which are out of phase, even if there were no unmatched phases. Had there been only eight turns matched, the corresponding per cent in phase would have been 89. Second a given percentage of months in phase is more noteworthy for series that do not move generally with the business tides than for those that do (see Chapter 9, note 2 below). Both considerations tend to imply that a given score for rates of change tends to be more impressive than the same score for data proper.

Amplitude

In spite of the relatively smooth course of retail sales, the swings in ownership investment were quite substantial. The figures are given in Table 21. The average rise or fall was plus or minus $70 million. This represented 4.1 per cent of the average level of ownership proper (column 3) and, incidentally, 16.3 per cent of the average level of sales or receipts. On a monthly basis the rate of rise or fall averaged $4.4 million, or .26 per cent of the average level of ownership proper. Contrast the latter with the corresponding figure of .34 per cent for durable goods manufacturing.

The very substantial character of these fluctuations is also indicated by their relation to the level of department store sales or receipts, which averaged, almost identically, $427 million a month from 1946 to 1962. Month-to-month change in ownership represented 1.03

TABLE 21

Average Specific Cycle Amplitude of Monthly Change in Stocks on Hand and on Order, Department Stores, 1946-62

		Amplitude of Rise or Fall					
		Per Phase		Per Month[a]			
	Date of First and Last Peak or Trough	($ million)	% of Data Proper (col. 2 ÷ col. 7)	($ million)	% of Data Proper (col. 4÷7)	Per Month, % of Level of Receipts, 1946-62[b]	Average Level of Data Proper 1946-62 ($ million)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ownership	P 3/46 to T 10/60	69.6	4.11	4.4	.26	1.03	1,694
Stocks	P 5/46 to T 12/60	38.7	3.25	2.4	.20	.57	1,191
Outstanding orders	P 1/46 to T 10/60	60.5	12.03	3.8	.75	.89	503

[a]Peak or trough standings are five-month averages centered. Specific cycle fall during contraction is added to the rise during expansion, summed for all cycles, and divided by the number of months between initial and terminal turns. For further description see text, note 3.

[b]Receipts average $427 million from 1946 to mid–1962. The figures in column 4 are divided by this figure to give the data in column 6.

per cent of the average level of receipts (column 6).

Of the two parts of investment in ownership, change in stocks and in outstandings both contributed materially to the pattern. The absolute size of fluctuations in dollar terms was larger for outstandings than for stocks. This was true of the rise or fall during the whole phase or on a monthly basis, for which it was $2.4 million for change in stocks and $3.8 million for outstandings. This per month fluctuation in rates of change in outstandings represents 158 per cent of those of stocks; the corresponding figure for the data proper was 118 per cent (Table 11). Since stocks were substantially larger than outstandings proper, this meant, as would be expected from what we observed in the previous chapter, that the rate of change in outstandings relative to outstandings proper was substantially higher than for stocks relative to stocks proper—.75 and .20 per cent respectively (column 5).

Stocks and Shipments

The rate at which department store sales rise or fall is shown in the bottom curve of Chart 7. The dotted line smooths the month-to-month change by means of a five-month centered average. The very sawtooth character of curve reflects the character of the underlying data—a series which is itself relatively insensitive to cyclical fluctuation, yet has a strong seasonal and perhaps random component. To make the material more manageable, I have added a second smoothing, a five-month average of the first average.[8] However, to preserve consistency with other data, the turns were kept as they had been marked in the series having the single smoothing.

Retail sales (Table 20, lines 17 and 18) reach their fastest rate of increase typically nine months to a year before business cycles or subcycles reach their peak. At troughs, turns are likewise early, though the intervals are quite irregular.

The maximum rate at which retailers increase or decrease their stocks on hand tends to occur about a third of a year after sales have reached their maximum rates of increase or decline, respectively. Eighty-one per cent of months are in like phase after allowing for a three- or four-month lag (line 10).

For change in ownership, however, a much prompter reaction to sales appears possible. Line 5 of the table shows timing which is synchronous on the average, with 84 per cent of the months in like phase. I state these facts baldly, though they obviously are rich in meaning. But we will be in a better position to extract it after the other facts are in.

SUMMARY

Rates of change in stocks measure the difference in the flow of goods into and out of a stockpile. If the inflow is greater than the outflow in a given month, the rate of change in stock between the beginning and end of the month is positive. The larger the excess of inflow, the larger the rate of increase of stock. Analogous but opposite remarks apply to an inflow that is smaller than the outflow and rates at which stocks decline. In this sense, then, rates of change provide a most appropriate measure of the impact on the economy of business behavior that causes stocks to rise or fall. Since the findings of this chapter have generally repeated those based on the data proper, they chiefly expand upon just how the behavior of ownership and its parts may be expected to influence the flows of goods in the economy. However, they also throw

[8] The double smoothing provides a graduation covering nine months. The center five months carry 76 per cent of the total weight.

some light on our other major preoccupation —why stocks behave as they do. A quick review is in order.

1. Specific major and minor cycles in change in ownership and its parts, outstandings and stocks, for durables and department stores all conform to each postwar cycle and minor cycle.

2. Change in ownership for both sorts of enterprise lead the turns in general business, especially at peaks; the median lead at all peaks (including the minor ones) is about a year, and at troughs half to three-quarters of a year. More or less the same statements apply to change in outstandings. Changes in stocks also anticipate turns in the business cycles or subcycle chronology; the median lead is longer for department stores than for durable good manufacturers—about six and three months respectively.

3. Investment in stocks on hand and on order ordinarily rises sharply during the first year or fifteen months of business expansion. Thus rates of change conform to the periods of thrust (if only because they were taken into account in delineating them).

In several ways, then, the stimulating impact of positive investment in ownership starts early. It begins in outstandings, which slacken their rate of decline while recession is in full swing; it is reinforced by stocks before general business starts to improve. Total ownership accelerates during the first year of expansion. This set of influences, in other words, seem to work behind the scenes to help turn the tides of business decline.

4. Because backlogs of final products often start to retard a long while before they begin to decline or to rise, rates of change in purchase orders for materials do not clearly lead rates of change in backlogs of sales orders, as was the case for the two sorts of unfilled orders proper. For orders proper, materials inevitably lead final products by three to nine months for the eight matched turns; rates of change lag almost as often as they lead.

5. For durable goods manufacturers, the relation between the two parts of ownership was characterized by the same long lead of change in outstandings relative to changes in stock that appeared for the data proper. But for department stores, the trough figures only were similar. At troughs the median leads of outstandings relative to stocks ranged from three to five months whether for durables or department stores, data proper or rates of change. At peaks the median leads, as registered for both sorts of enterprises and forms of data, was seven or eight months except for rates of change for department stores. Apparently, though stocks proper continued to rise for seven months on the average after outstandings turned down, merchants succeeded in getting the rate of change in stocks under control more swiftly; the interval averaged three and a half months. Nevertheless, for rates of change as well as for the data proper, the figures present the same puzzle. Why is the lead so long?

The question is the more insistent because rates of change seem to reaffirm the tendency observed in the data proper for considerable parallelism (after allowing for a lag in stock) of fluctuation in the two parts of ownership. This was clearly true of rates of change for department stores, though somewhat less so for durable goods manufacturers.

6. The amplitude of fluctuation in rates of change in ownership is such as to contribute materially to an increase in instability as demand moves from the final consumer to earlier stages of production. The specifics of this manifestation will be further developed in the next two chapters.

7. The far greater instability of investment in outstandings relative to that of investment in stocks for both materials goods manufacturers and department stores repeats our findings for the data proper. Expressed as a percentage of the average level of each stockpile, monthly instability of stocks is again about the same for the two sorts of enterprises. For

outstandings, first differences showed relative fluctuation somewhat larger for department stores than for durables. Perhaps the safer conclusion is simply that on the basis of both types of statistics these figures are surprisingly alike for the two sorts of enterprises.

8. Timing comparisons and similarity in movement of rates of change in "demand" on the one hand and in stocks on the other give a further dimension to the basic description of how stocks respond to changes in demand. The chapter has shown that, for department stores, change in ownership, which can be swiftly adjusted to desired levels, appears to be kept closely parallel to the rate of change in sales. For durable goods manufacturers, where it would seem that adjustment is potentially more facile, the empirical picture is somewhat ambiguous.