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Volume Title: Inventories and Business Cycles, with Special Reference to Manufacturers' Inventories

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Volume Publisher: NBER

Volume ISBN: 0-870-14087-6

Volume URL: http://www.nber.org/books/abra50-1

Publication Date: 1950

Chapter Title: Investment in Stocks of Finished Goods Made from Nonagricultural Materials

Chapter Author: Moses Abramovitz

Chapter URL: http://www.nber.org/chapters/c9142

Chapter pages in book: (p. 399 - 423)

Chapter 18

Investment in Stocks of Finished Goods Made from Nonagricultural Materials

The analysis of inventories of finished goods in Chapters 11 and 12 showed that this general category comprises several classes whose behavior during business cycles differs. One distinction is between goods made to order and to stock. A manufacturer's inventory of made-to-order goods consists of products already sold; production has been completed and the goods merely await shipment. The volume of such goods in the hands of sellers depends principally on the volume of production and shipments. The larger the volume of orders the larger will be the volume of made-to-order goods awaiting delivery to customers.

Goods made to stock, on the contrary, are not related to the rate of manufacturing activity in the same simple fashion but differ among themselves in at least two respects: the production of some is responsive chiefly to changes in demand; that of others to changes in the supply of raw materials. Stocks of goods in the first class, provided they are staples, tend to move inversely to the rate of manufacturing activity during expansions and contractions of short or moderate duration. In long phases they vary inversely only during the first part of the phase. Before the end of a long expansion stocks tend to reverse direction and to move together with production and shipments. The same applies to long contractions. During the first part of the phase stocks accumulate when production falls off, but before the trough is reached they begin to be liquidated. Moreover, since the production cycles of these commodities are governed principally by cycles of demand, they conform closely to business cycles. The relation between stocks and

business cycles is, therefore, similar to that between stocks and output or shipments.

As stated, these generalizations probably apply only to durable and staple commodities. If the goods are subject to deterioration, either physically or in style-worth, manufacturers obviously cannot afford to let stocks accumulate for long when business is declining. When a manufacturer of perishables finds sales falling and stocks increasing, he will curtail output drastically enough to liquidate his inventory. This qualification, however, is probably of only minor importance. Because such goods are risky to hold, they tend to be produced to order and unsold stocks are kept at a minimum.

The other important category of finished goods, whose output cycles are influenced chiefly by changes in the supply of crude materials, are fabricated farm products.[1] Stocks of finished goods in this category tend to conform positively, with a lag, to output cycles. Since the latter are strongly influenced by cycles in the output of agricultural materials, stocks of finished goods either behave irregularly during business cycles or show some tendency to inverted conformity, again with a lag.

These distinctions are obviously relevant to an understanding of fluctuations in investment in stocks of finished goods. The data permit me to develop the behavior characteristics of goods made to order and of two of the three categories of goods made to stock: demand-dominated staples, which I identify initially with staple goods made from nonfarm materials; and supply-dominated goods, which I identify initially with goods made from materials of agricultural origin. Investment in goods made to order and to stock from nonagricultural materials are studied in this chapter; Chapter 19 deals with goods made from agricultural materials.

1 *Finished Goods Made to Order*

The output of goods made to order is undoubtedly very large. It includes goods that must be fabricated to the purchaser's specifications, expensive commodities of which few of a kind are made, and many types of fashion goods that cannot safely be produced for stock in any considerable quantity. But since goods made to

[1] It will be recalled, however, that not all fabricated farm products have output cycles governed principally by the supply of raw materials.

order are typically delivered promptly upon completion, stocks are usually small relative to their rate of production. I have estimated very roughly that they comprise 15-25 percent of all finished goods and 6-10 percent of all manufacturers' stocks.

Stocks of finished goods made to order are a sort of goods 'in process'—in process of delivery. Their volume is presumably controlled by technical factors such as the time required for packing, for the accumulation of economical units of shipment, e.g., carload lots, and by the time required for transportation if title passes at the customer's location rather than at that of the shipper. Cancellations may affect the volume of such stocks when business drops sharply or purchasers may request delay in deliveries. The latter consideration would operate to make stocks larger relative to output and sales during contractions than during expansions. Its importance, however, cannot be measured with the few data at our disposal. For the time being, it seems best to assume, as a first approximation, that the interval between production and shipments remains fairly constant and that stocks of finished goods remain in roughly constant ratio to production and shipments over the cycle.

The implications of such an assumption for inventory investment were explored in Chapter 16 for goods in process. If the interval between the production and shipment of a unit of output is short, as it undoubtedly is in most manufacturing industries, investment in stocks of finished goods made to order will vary positively with the rate of change in production and shipments without a significant lead or lag. In the absence of direct evidence, the movements of the rate of change in output serve to indicate the cyclical movements of investment in finished goods made to order, as they do also for goods in process. The results of the study of the cyclical timing of the rate of change in manufacturing output in Chapter 15 may be applied to investment in finished goods if it is valid to assume that the cyclical behavior of the output of goods made to order is, at least in the aggregate, the same as that of manufactured goods in general. The assumption is plausible, but at present there is no way of confirming its validity.

Our collection of inventory data contains one example of a stock of finished goods made to order: steel sheets. It is especially

interesting because we can compare the inventories of goods made to order and to stock. Chart 76 shows that there is a general similarity between the patterns of rates of change in shipments and in stocks of goods made to order. This is true in both the patterns taken cycle by cycle and in the average. In the four-cycle averages both stocks and shipments reach their peak rates of growth in the third quarter of expansion and their peak rates of decline in the fourth quarter of contraction. This similarity is consistent with the theory just set forth. On the other hand, there are some noticeable, though slight, dissimilarities. In neither the individual cycles nor the averages are the minor movements in the rate of change in shipments matched by stocks, nor do the peak and trough values come in the same stage in every cycle. I cannot account for these dissimilarities satisfactorily. The theory I have advanced may neglect at least secondary aspects of the behavior of investment in goods made to order. Or the discrepancies may be traceable to inaccuracies in the original data, to the correction for seasonal influences, or to intermingling of small differences between the patterns of shipments of sheets made to order and to stock in the total figures for shipments.

Whatever the truth of this matter, stocks of sheets made to order and to stock behave differently. Investment in the former traces a cyclical pattern generally similar to the rate of change in shipments; investment in the latter is markedly inverse to the rate of change in shipments. This contrast leads naturally to a general analysis of investment in finished goods made to stock.

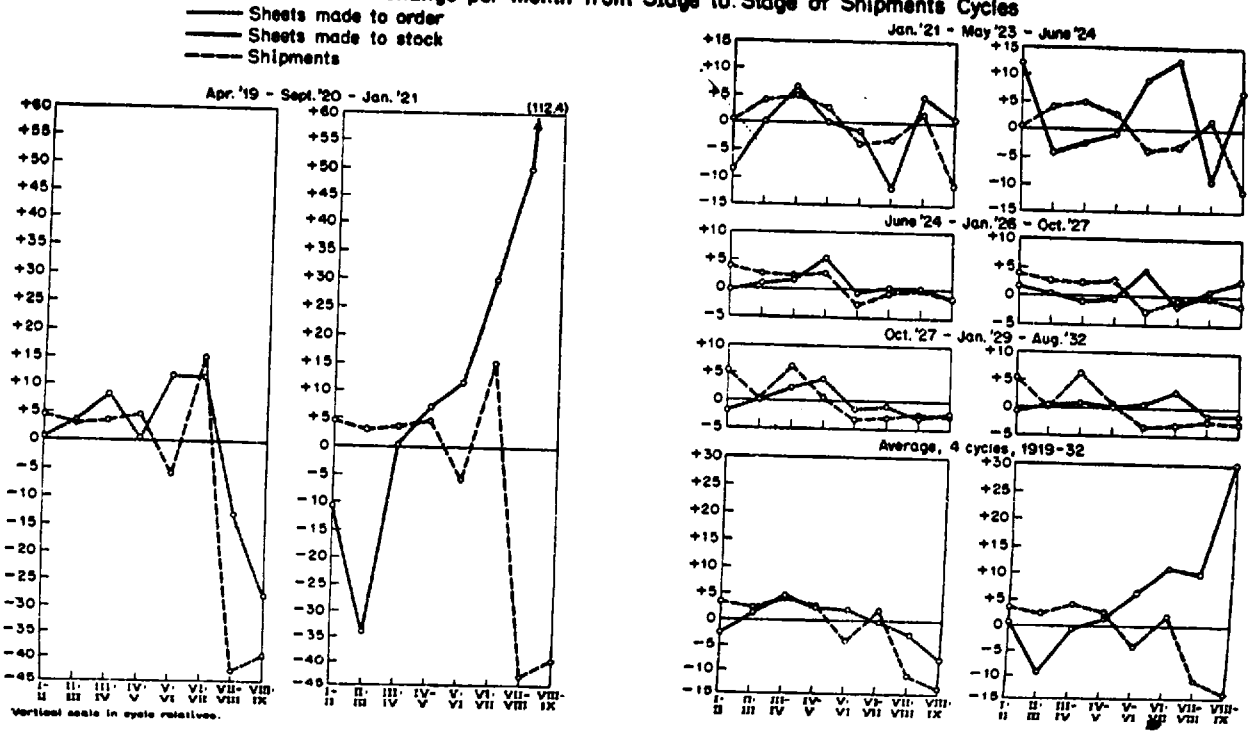
2 *Finished Goods Made to Stock*

Steel sheets made to stock are an example of a larger class of finished goods—a class that accounts for half or more of all finished goods, and, therefore, for 20-25 percent of manufacturers' total stocks. The class has three significant characteristics. Output cycles are controlled principally by impulses from the side of demand, the commodities are durable and staple, and they are sold from stock. As explained in Chapters 11 and 12, this combination of qualities causes stocks to move inversely during cycles in business and in manufacturing activity. This tendency is subject to an important qualification: if an expansion or contraction is long, say, over two

Chart 76

Steel Sheets Stocks and Shipments

Rates of Change per Month from Stage to Stage of Shipments Cycles



years, stocks tend to reverse direction and to move together with production and shipments during the latter portion of the phase. How do cycles in the rate of accumulation of these stocks behave? Let us examine, first, the behavior of the rate of change in stocks during cycles of shipments (or some equivalent indicator of manufacturing activity) in the industries holding the goods. As a second step, we shall study the movements of the rate of change in stocks during business cycles and trace the connections between these two aspects of cyclical behavior.

RATES OF CHANGE DURING MANUFACTURING ACTIVITY CYCLES

Table 77 presents the average patterns of the rates of change per month in the finished goods inventories of 18 commodities during cycles marked off by the turning points of cycles in manufacturing activity. A composite measure of the behavior of this sample, the median rates of change, is plotted in Chart 77, together with the median rates of change in the associated series representing manufacturing activity.

Chart 77 is, of course, a highly summarized version of the joint behavior of the 18 commodities. It must be checked by other measures, but on its face it suggests the following. Between the last quarter of contraction in manufacturing activity (stages VIII-IX) and the first quarter of expansion (stages I-II), the rate of accumulation slumps sharply.[2] This decline in the rate of growth continues during the first part of expansion until accumulation gives way to

[2] This is suggested, although not accurately measured, by the difference in the rates of change shown on the chart. The inaccuracy arises in part from the fact that the National Bureau standard measures are computed from trough to trough. Hence the calculated difference between the rates of change in the first quarter of expansion and those in the last quarter of contraction represents the difference between the first and last quarters of the same cycles, not the difference between the last quarter of one cycle and the first quarter of the next. To compare accurately the rate of change between stages VIII-IX and I-II of succeeding cycles it is necessary to compute measures for cycles marked off from peak to peak. The true difference may be either larger or smaller than the apparent difference in Chart 77. In this case, the true difference (based on medians) was slightly smaller. It indicates a 2.4 drop in the rate of accumulation in reference cycle relatives between stages VIII-IX and I-II, whereas the apparent difference shown in the chart was −2.7.

Whenever, in this chapter, the rate of change between stages VIII-IX and I-II is compared, the necessary recalculation was made to measure the true difference. Comparisons between other stages are free from this difficulty.

TABLE 77

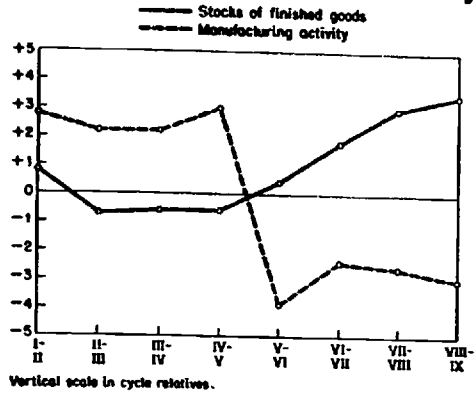
Stocks of Eighteen Finished Nonagricultural Products
Average Rates of Change per Month from Stage to Stage of Manufacturing Activity Cycles

	NO. OF CYCLES	AVERAGE CHANGE PER MONTH IN CYCLE RELATIVES BETWEEN STAGES							
		I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
Paper, all grades, 1919-33	4	+1.0	−0.6	−1.5	−2.0	−1.7	+0.9	+3.0	+0.8
Newsprint at mills, U. S. & Canada, 1919-33	3	+0.9	+0.9	−0.2	−0.8	+0.7	+1.2	+5.7	+3.1
Southern pine lumber, 1919-38	6	−0.02	−0.8	−1.6	−1.4	−0.6	+0.8	+0.4	+2.3
Oak flooring, 1913-37	6	−1.1	−2.5	−0.1	−1.2	+1.8	+5.7	+5.6	+4.9
Portland cement, 1912-38	6	+0.7	+0.1	−2.4	−3.1	+2.8	+0.2	−1.1	+2.4
Bath tubs, 1918-24	2	+3.8	−4.6	−10.0	+1.6	+8.7	+3.3	+14.5	+34.2
Lavatories, 1919-24	2	+1.2	+1.0	+1.1	−3.8	−0.2	−5.2	+3.8	+5.0
Kitchen sinks, 1919-24	2	+2.1	+0.9	−7.1	−3.2	−5.4	+9.8	+4.4	+15.8
Misc. enameled sanitary ware, 1919-24	1	+2.3	+1.8	−2.5	+2.4	−6.4	−7.4	−9.4	−1.6
Gasoline at refineries, 1918-38	6	−1.1	+0.4	+0.5	+1.4	+3.3	+2.3	+2.1	+0.7
Lubricants at refineries, 1919-40	7	−0.7	−1.0	−0.6	+0.4	+1.2	+1.8	+3.0	+1.7
Pig iron at merchant furnaces, 1919-24	2	−4.9	−9.1	−2.6	−0.4	+11.0	+20.6	+0.4	+0.4
Steel sheets made to stock, 1919-32	4	+0.6	−9.4	−0.6	+1.4	+6.4	+11.0	+10.0	+30.2
Refined copper, N. & S. Am., 1919-38	3	+0.8	−1.3	−0.03	−2.8	−0.4	+3.7	+7.4	+6.2
Lead at smelteries & refineries, 1923-38	3	−0.2	+0.1	+0.3	+0.9	+0.1	+0.9	+2.1	+0.1
Slab zinc at refineries, 1921-38	5	+1.7	−3.1	−2.8	−5.1	+2.8	+8.6	+9.0	+8.6
Auto. tires, 1921-38	4	−1.7	+0.3	+0.9	+1.2	−1.2	+1.8	+1.6	+3.9
Auto. inner tubes, 1921-38	3	+0.9	+0.6	+0.2	+1.2	−1.6	+1.8	−1.9	+8.1
Median for all commodities		+0.8	−0.7	−0.6	−0.6	+0.4	+1.8	+3.0	+3.5

For series used as indicators of manufacturing activity see Table 49.

Chart 77

Eighteen Finished Nonfarm Products
Medians of Average Rates of Change per Month in Stocks and in Manufacturing Activity from Stage to Stage of Manufacturing Activity Cycles



Vertical scale in cycle relatives.

liquidation. In the second half liquidation continues at a fairly constant rate. With the beginning of contraction, liquidation is soon replaced by accumulation. The rate of growth rises in the second and third quarters of contraction, but again at the end of the phase there is evidence that it begins to moderate.

The medians of the average patterns are suggestive, but they do not tell us anything about the consistency with which the composite pattern is followed by the average patterns of the individual commodities or about the regularity with which the composite pattern is repeated in the individual cycles upon which the averages are based. Table 78 attempts to make good these deficiencies, at least in part. It shows the number and percentage of all the series in the sample whose average rates of change rose, declined, or remained constant between successive interstage intervals. This bears on the first question: the consistency with which the composite pattern is followed by the average patterns of the individual commodities. The same information for all cycles covered by the series in the sample bears on the second question: the regularity with which the composite pattern is found in the individual cycles upon which the commodity averages are based. In interpreting the table the reader must remember that an increase in the rate of change may mean either of two things: when stocks are increasing, the rate of growth is rising; when stocks are falling, the rate of decline

TABLE 78

Stocks of Eighteen Finished Nonagricultural Products

Direction of Movement of Rates of Change per Month between Interstage Intervals of Manufacturing Activity Cycles

	DIRECTION OF MOVEMENT BETWEEN INTERSTAGE INTERVALS																							
	I-II to II-III			II-III to III-IV			III-IV to IV-V			IV-V to V-VI			V-VI to VI-VII			VI-VII to VII-VIII			VII-VIII to VIII-IX			VIII-IX to I-II		
	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−
BASED ON AVERAGE PATTERNS OF 18 COMMODITIES																								
No. of series	3		15	11		7	11		7	13		5	13		5	8		10	9	1	8	2		16
Percentage	17		83	61		39	61		39	72		28	72		28	44		56	50	6	44	11		89
BASED ON ALL CYCLES COVERED BY 18 COMMODITIES																								
No. of cases	35		40	38		37	34	2	39	45	1	24	43	2	27	31		41	32	2	38	19	1	41
Percentage	47		53	51		49	45	3	52	65	1	34	59	3	38	43		57	44	3	53	31	2	67

is diminishing. Similarly, a decline in the rate of change may mean either of two things: when stocks are falling, the rate of decline is accelerating; when stocks are rising, the rate of growth is diminishing.

Both sets of calculations bear out the general impressions gained from the composite patterns of Chart 77. In the measures based on the average patterns, for example, the rate of growth of a large preponderance of the series declined between intervals VIII-IX and I-II, that is, between the end of contraction and the beginning of expansion in manufacturing activity. The same is true as we move from the first to the second quarter of expansion. Thereafter, the situation changes. The average patterns of at least small majorities of the series show increases in the rate of growth between the second and third and the third and fourth quarters of expansions. This suggests that disinvestment is near its peak about the middle of expansion and that, in the second half, the pace of liquidation changes little or actually declines. With the transition from expansion to contraction, the proportion of series with rising rates of growth increases further and becomes a considerable majority. This change, of course, represents the end of inventory liquidation and the beginning of the accumulation that accompanies the downturn in manufacturing activity. Acceleration in the rate of accumulation is widely characteristic of the next quarter of expansion. In the last two quarters of contraction, however, the rates of growth of about as many series decline as rise. This may be taken to indicate that the rate of accumulation in this class of stocks in the aggregate does not change notably in the second half of contractions.

Similar measures based on all cycles of manufacturing activity taken individually constitute a final check. The general picture is the same: a marked increase in the proportion of series with declining rates of growth when manufacturing activity in individual industries passes from contraction to expansion; thereafter in expansions, about equal proportions of cases of increasing and declining rates of growth; as contraction begins, the proportion of series with accelerating rates of growth rises sharply; and finally in the second half of contraction, investment becomes relatively stable again.

In general, we may say that when the shipments of a staple manufactured commodity begin to decline or rise, the rate of growth in its finished stock tends to turn sharply in the opposite direction. The rate of accumulation or liquidation tends to accelerate for a time, but in the second half of expansions and contractions of activity it levels off. There is some evidence that toward the end of a phase it begins to decline, but the indications are too faint to be trusted.

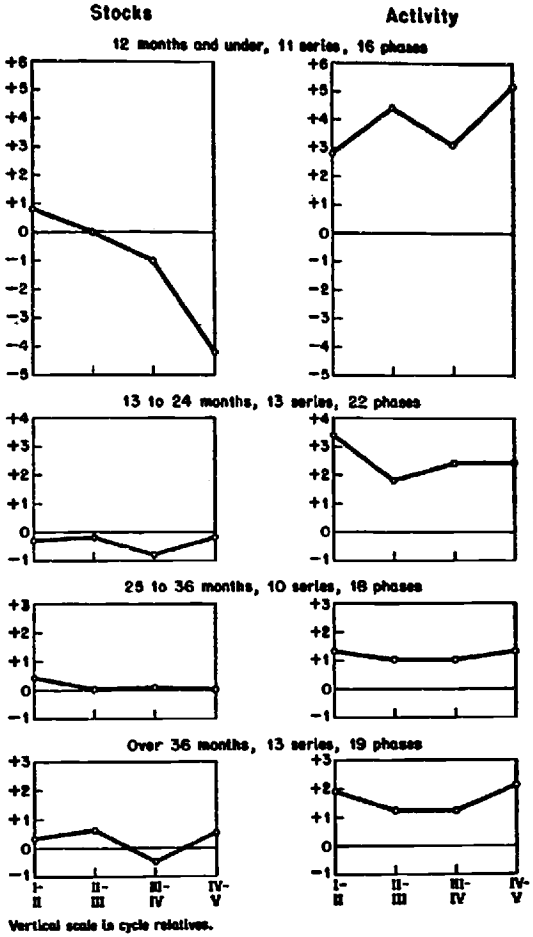
There is an important qualification to this rule. The behavior of the rate of change seems to vary with the length of the expansion or contraction in manufacturing activity. To examine this question, we divided the data into four classes according to the length of the cyclical phases in the indicators of manufacturing activity: cycles of 12 months or less, 13-24 months, 25-36 months, and over 36 months. Two measures were then made. First, medians were calculated of the rates of change in stocks and in the associated indicators of activity during phases within a given duration class (Charts 78 and 79). Next, the number of instances in which the rate of growth rose, declined, or remained constant between the interstage intervals of phases in a given class was tallied (Table 79).

A rather sharp contrast is apparent between the behavior of the rate of change in stocks during relatively short and long phases. During expansions (Chart 78) the rate of liquidation proceeds at an ever faster pace during phases of 12 months or less. During longer expansions the rate of decline (or growth) remains fairly constant throughout the phase. This 'fairly constant' level, of course, is considerably lower than the rate of accumulation during the preceding contraction. (The decline is not represented on the chart, but we may be confident of the fact on the basis of the calculations set forth in Chart 77 and Table 78). Once the drop that accompanies the transition from contraction to expansion has occurred, however, it appears that, except in the shortest expansions, the pace of liquidation accelerates only slightly, then retards in the last quarter of the phase.

The same contrast between the behavior of inventory investment in shorter and longer phases of manufacturing activity can be discerned in contractions of activity (Chart 79). In contrac-

Chart 78

Finished Nonfarm Products
Median Rates of Change per Month from Stage to Stage of Expansions of Different Length in Manufacturing Activity



Vertical scale is cycle relatives.

tions of less than a year, the pace of investment accelerates sharply from the beginning to the end of the phase. In phases of 13-24 months the rise is more moderate and interrupted by a decline. In contractions exceeding three years the picture is quite different.[3] The median rates of change indicate that the relatively high

[3] Measures for contractions of 25-36 months are not presented because only two series in our sample had contractions of that length and then only once each.

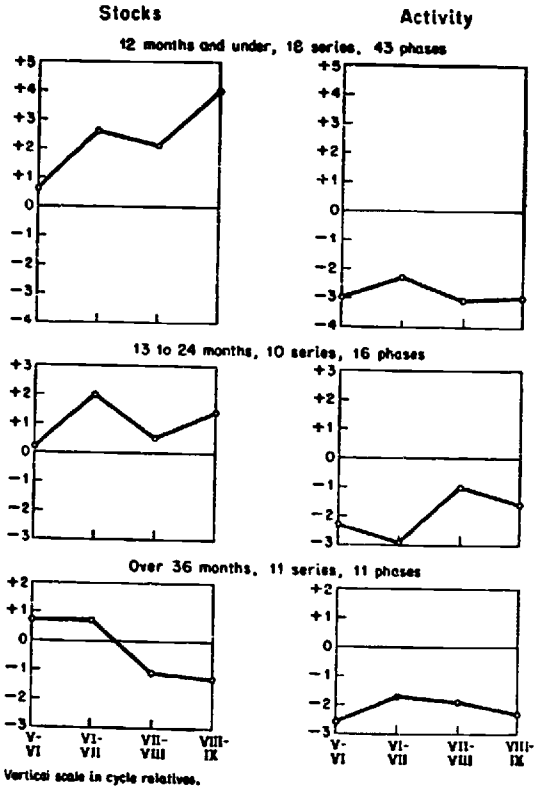
rate of growth with which such phases open is maintained into the second quarter, but that in the third and fourth quarters the rate of accumulation falls, even becomes negative.

The general showing of the charts is supported by Table 79. With one exception the difference in the behavior of inventory investment in shorter and longer phases is as clear in these data for individual cycles as in the medians. The exception is in the shortest contractions. The medians suggested that the rate of investment continues to rise to the end of the phase. The present tally, however, shows that in a small majority of cases, the rates of growth declined between the interstage intervals VII-VIII and VIII-IX.

This exception is somewhat disturbing to one's confidence in the generalization that inventory investment varies with the length

Chart 79

Finished Nonfarm Products
Median Rates of Change per Month from Stage to Stage of Contractions of Different Length in Manufacturing Activity



Vertical scale is cycle relatives.

TABLE 79

Stocks of Eighteen Finished Nonagricultural Products

Cases in Which Rates of Change per Month between Interstage Intervals of Manufacturing Activity Cycles Rise (+), Remain Constant (o), or Fall (−), Classified by Length of Phase of Activity Cycles

LENGTH OF PHASE OF ACTIVITY, MONTHS	EXPANSION									CONTRACTION					
	I-II to II-III			II-III to III-IV			III-IV to IV-V			V-VI to VI-VII			VI-VII to VII-VIII			VII-VIII to VIII-IX		
	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−
	NUMBER OF CASES																	
12 & under	4	12	8	8			8	1	12	28	1	14	22		21	18	1	24
13-24	8	14	11	11			12	1	9	11		5	6		10	9		7
25-36	10	8	10	8			9		9			2			2	2		
Over 36	13	6	9	10			10		9	4	1	6	5		8	8	1	7
No. of cases	35	40	38	37			34	2	39	43	2	27	31		41	32	2	38
	PERCENTAGE OF CASES																	
12 & under	25	75	59	50			19	6	75	65	2	33	51		49	42	2	56
13-24	36	64	50	50			54	5	41	69		31	38		62	56		44
25-36	56	44	56	44			50		50			100			100	100		
Over 36	68	32	47	53			53		47	36	9	55	27		73	27	9	64
% of all cases	47		53	51	49		45	3	52	59	3	38	43		57	44	3	53

of the phase. Another disturbing consideration is that all the observations on contractions longer than 36 months are associated with a single business contraction, the slump of 1929-32. Was the contrast between the movement of investment in this long contraction and in shorter contractions perhaps due not to the length of the phase but to other characteristics of the 1929-32 episode? In expansions, however, the contrast between the behavior of investment in short and long phases is not confined to any one period.

Still another source of doubt, this time affecting the behavior of investment during expansions, is the associated behavior of the rate of change in manufacturing activity. Turning back to Chart 78, we see that during expansions of 12 months or less, the rate of increase in output was considerably higher than during longer expansions. Moreover, it tended to rise sharply. During longer expansions the tendency for the rate of increase in output to rise, if there was one, was much less marked. Is it not the behavior of the rate of increase in output that accounts for the difference between the behavior of inventory investment in long and short expansions rather than the difference in the length of the phase? Of course, if a high and accelerating rate of increase in output is regularly associated with short expansions—and it may be—the

problem would lose something in importance. But if it is not, the difference in the behavior of stocks in our sample would be fortuitous.

Were additional data available, these questions could be settled by suitable cross-classification. This cannot now be done, and our conclusions must remain subject to these patent uncertainties. Meanwhile, it is important to notice that if we abandon the generalization that the behavior of inventory investment is related to the length of the phase, the alternative appears to be to accept several special explanations to account for the observed differences between the patterns of rates of change in stocks in different cycles. The length of phase hypothesis, on the other hand, provides a unified explanation. It is, moreover, an explanation consistent with our earlier finding that the timing of finished goods stocks during cycles in manufacturing activity varies with the length of the phase. As shown in Chapter 11, after short contractions in manufacturing activity, stocks of finished goods tend to turn down only after shipments turn up. The longer the contraction, however, the earlier the downturn in stocks relative to the upturn in shipments, and in contractions longer than three years, stocks tended to turn down long before shipments turned up. Exactly the same tendencies were apparent in expansions of different lengths. The hypothesis now being considered—that the time the rate of investment in stocks is at a peak during contractions (or the rate of disinvestment is at a peak during expansions) depends upon the length of the phase and that it comes earlier (relative to the turning point in manufacturing activity) the longer the phase—is, of course, closely related to our hypothesis concerning the cyclical turning points of stocks themselves. For if stocks tend to reach a peak relatively early in long contractions, the rate of accumulation cannot reach a peak later and is likely to do so still earlier. If our previous hypothesis is valid—and the empirical support for it is strong—it tends, as far as it goes, to support our present hypothesis about rates of change in stocks of finished goods and the length of contractions and expansions in manufacturing activity.

Another supporting argument is that the considerations that served to explain why stocks should reach peaks (or troughs) together with or slightly after troughs (or peaks) of manufacturing

activity when cycles are short, but should tend to lead activity during longer cycles, serve to explain also differences in the timing of the rate of accumulation of stocks (Ch. 11). The longer a contraction, the greater the burden of accumulating stocks. Manufacturers are, therefore, first moved to bring production more closely into line with shipments (thereby reducing the rate of accumulation) and eventually to cut production below shipments (thereby initiating the liquidation of stocks). Other things being equal, both steps will be taken many months before the end of contraction if the decline lasts long enough, while if it is sufficiently short, not even the first will be taken.

These considerations argue for accepting tentatively the hypothesis that the rate of accumulation of stocks of staple and durable finished goods tends to reach a peak during contractions of manufacturing activity and a trough (peak of disinvestment) during expansions. In an extremely short contraction the peak may not come until the very end of the phase, but in longer contractions it will tend to come earlier. And similarly with troughs of investment during expansions.

The evidence presented above suggests that the pattern of investment in stocks of individual commodities during cycles in manufacturing activity has the following characteristics: (a) when manufacturing activity turns down, inventory investment turns up sharply; (b) by the middle of contraction the rate of inventory investment reaches a level close to the peak for the cycle; thereafter it may continue to rise at a greatly reduced pace, or even tend to fall; (c) in relatively long contractions the tendency for inventory investment to begin to decline before the revival in business is stronger than in short contractions; (d) these generalizations are statements of tendencies characteristic of most commodities in their average behavior during cycles in manufacturing activity and also of most individual cyles, but many a commodity does not behave in this fashion in some cycles; (e) in expansions of manufacturing activity, the behavior pattern of investment is similar but opposite in direction.

RATES OF CHANGE DURING BUSINESS CYCLES

The crucial questions about investment in finished staples are whether it tends to rise (or whether disinvestment tends to decline) before the peak in business and whether it tends to fall before the trough in business. The significance of these questions will be appreciated when we recall some conclusions of preceding chapters. Aggregate investment apparently rises and falls with business activity and does not give any evidence of a tendency to lead or lag. But since our measures of aggregate investment are annual, a short lead or lag, not longer than, say, three months, cannot be excluded. This behavior, of course, is the resultant of diverse patterns in the components of the total. We have seen that investment in goods in process and finished goods made to order usually, though not always, turns down early in expansion and turns up early in contraction. And meager evidence, combined with *a priori* speculation, suggests a shorter lead for investment in raw materials. Since these three classes account for 65-70 percent of all manufacturers' stocks, we should expect aggregate investment also to display a significant lead relative to business cycles, unless there is still another class of stocks whose behavior offsets the leads in the first three. Finished staples might play such a role if investment in such stocks normally rises (or disinvestment declines) toward the end of expansions and falls toward the end of contractions.

In view of its behavior during cycles in activity in individual industries, how should we expect investment in finished goods to behave during business cycles? Since cycles of shipments and production in industries making goods from nonagricultural materials conform generally to the rise and fall of the business tide, inventory investment in stocks of finished goods held by these industries may reasonably be expected to display much the same movements during cycles in business as during cycles in manufacturing activity. But not quite the same. Cycles in the production and shipments of particular commodities in this class sometimes run counter to the business tide, sometimes skip a business cycle, and often have peaks and troughs that do not coincide closely with the turning points in business at large. The irregularities already discerned in the behavior of inventory investment during cycles in manufacturing activity may, therefore, be expected to be

even more prominent in its behavior during business cycles. And they should manifest themselves especially strongly in the behavior of a small sample of series during individual business cycles, as contrasted with the group's average behavior in several cycles.

These expectations are borne out, in general, by the data; but as we shall see, this is not the whole story. Table 80 presents the average patterns of the rates of change per month in the finished goods inventories of 18 commodities during business cycles as well as a summary measure of the behavior of all the commodities in the collection. As in Table 77, this composite pattern is gotten from the medians of the average rates of change of the individual commodities. It is shown in Chart 80 along with the composite behavior of the same series during cycles of manufacturing activity.

Comparison of the two composite patterns of Chart 80 suggests two tentative conclusions. First, investment acts during business cycles much as it does during cycles in manufacturing activity. Second, it seems to act quite differently in the last quarter of both expansions and contractions. During cycles in manufacturing activity the rate of inventory investment tends to reach a level close to a peak for the cycle by the middle of contraction and a level close to a trough for the cycle by the middle of expansion. Thereafter it continued to increase at a slower rate during contractions and to decline at a slower rate during expansions. More doubtfully, I thought that investment might tend to fall toward the end of contractions and to rise toward the end of expansions. An indication of this tendency for the investment curve to level off near the end of expansions and contractions of manufacturing activity appears in the composite pattern, and other evidence was cited above. Chart 80 suggests that this feature is even stronger during business cycles. The composite pattern shows investment rising between the third and fourth quarters of expansion and falling between the third and fourth quarters of contraction. If these indications could be confirmed, we could conclude that finished staples do play the balancing role described above; that their tendency to rise toward the end of expansion helps to overcome the tendency for investment in other categories to fall at this stage of the cycle. Similarly, we could say that the tendency for investment in finished staples to fall toward the end of contraction helps to

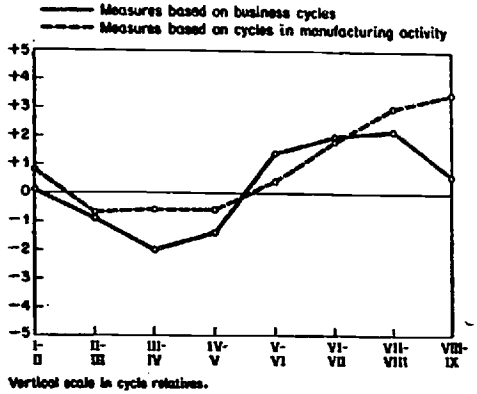
TABLE 80

Stocks of Eighteen Finished Nonagricultural Products
Average Rates of Change per Month from Stage to Stage of Business Cycles

	NO. OF CYCLES	AV. CHANGE PER MO. IN REF. CYCLE RELATIVES BETWEEN STAGES							
		I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
Paper, all grades, 1919-33	4	+0.2	−0.8	−1.7	−2.7	+1.5	+1.8	+1.6	−0.2
Newsprint at mills, U.S. & Canada, 1919-33	4	−1.0	−0.6	−5.1	−1.6	+3.9	+3.8	+3.4	+0.6
Southern pine lumber, 1919-38	5	−1.3	−1.0	+0.7	−0.7	+2.3	+1.4	−0.1	−0.5
Oak flooring, 1912-38	7	−1.5	−0.5	+1.0	−0.4	+4.7	+3.6	−0.3	−1.4
Portland cement, 1912-38	7	+0.1	−0.2	−2.6	+0.1	+0.9	+0.8	+1.4	+1.7
Bath tubs, 1919-27	3	−2.3	−4.1	−4.7	−4.0	+1.0	+3.6	+7.8	−0.03
Lavatories, 1919-27	3	−0.4	−7.2	−8.2	−8.2	+0.7	+2.3	+6.6	+7.3
Kitchen sinks, 1919-27	3	+1.0	−5.9	−5.5	−3.8	+0.8	+1.4	+3.8	+8.9
Misc. enameled sanitary ware, 1919-27	3	+2.6	−3.5	−2.9	−5.6	−1.7	+1.1	+5.6	+7.0
Gasoline at refineries, 1919-38	5	+0.8	+0.7	+1.3	+1.2	+0.7	+0.6	+1.2	+0.2
Lubricants at refineries, 1919-38	5	+0.3	+0.1	−0.8	−1.0	+0.4	+1.0	+2.2	+0.6
Pig iron at merchant furnaces, 1919-24	2	+3.2	−8.3	−5.3	−4.2	+8.2	+9.6	+4.2	+0.1
Steel sheets made to stock, 1919-33	4	−2.0	−6.2	+5.8	−2.4	+2.9	+5.2	+5.8	+2.3
Refined copper, N. & S. Am., 1919-38	5	−1.4	−4.0	−0.9	−1.3	+1.8	+4.2	+2.2	+0.6
Lead at smelteries & refineries, 1924-38	3	+0.03	0	+0.3	−0.6	+0.7	+3.4	+1.5	+1.5
Slab zinc at refineries, 1921-38	4	−7.4	−5.4	−2.3	−3.6	+6.4	+8.4	+5.4	+9.1
Auto. tires, 1921-38	4	+1.6	+0.7	+2.2	+1.7	+2.0	−2.7	−1.0	−1.4
Auto. inner tubes, 1921-38	4	+2.4	+0.7	+1.8	+1.3	+1.3	−2.4	−1.8	−1.8
Median for all commodities		+0.1	−0.9	−2.0	−1.4	+1.4	+2.0	+2.2	+0.6

Chart 80

Stocks of Eighteen Finished Nonfarm Products
Medians of Average Rates of Change per Month from Stage to Stage of Cycles in Business and in Manufacturing Activity

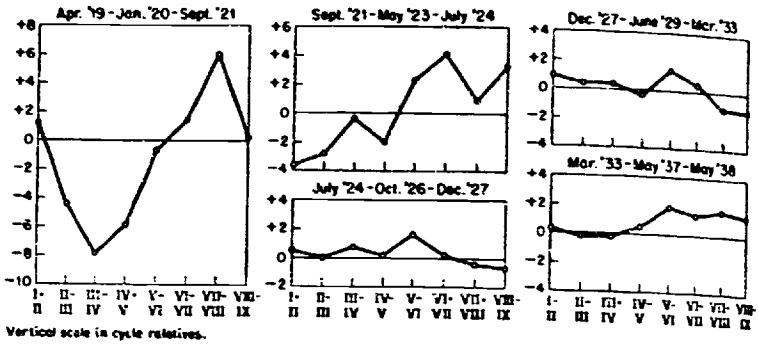


overcome the tendency for other categories to rise at that time. The behavior of this class of goods would help explain the absence of a substantial lead of total inventory investment at cyclical turning points. Unfortunately, the facts are not so simple. The evidence now available suggests merely that this description of aggregate investment in finished goods would often have been valid, and nearly as often invalid. In addition, questions about the inferences to be drawn from the behavior of the sample remain.

Evidence of irregular behavior is provided by Chart 81 which shows the median rates of change in inventories during each of the five business cycles of the interwar period.[4] It is immediately apparent that the pattern of median measures based on the average rate of change in the various series (Chart 80) is largely shaped by the behavior of inventory investment in the cycle immediately following World War I, that is, 1919-21. Only in this cycle does the pattern of investment display both the timing and the amplitude characteristic of the pattern for all cycles. Nevertheless, other salient features of the average pattern do repeat themselves. For example, if we ask simply whether investment was rising toward the end of expansion and falling toward the end of contraction, we find that this was true in two expansions, 1919-20 and 1933-37, and in four contractions, 1920-21, 1926-27, 1929-33, and 1937-

[4] Too few of our series cover earlier periods to make the inclusion of cycles before 1919 possible.

Chart 81
Stocks of Eighteen Finished Nonfarm Products
Median Rates of Change per Month from
Stage to Stage of 5 Business Cycles



38. Thus, as said above, investment in the stocks in our sample, as revealed by median rates of change, has often risen toward the end of expansion and declined toward the end of contraction. And nearly as often the reverse has been true.

The reliability of these median measures, however, may be questioned. Comparison of Table 81 with Chart 81 shows two things. First, the movement of the composite patterns from stage to stage is, in a majority of instances, consistent with the movements of the component series in Table 81. That is, in most cases, when the composite pattern rises (or declines) the rates of change in a considerable majority of the individual series also rise (or decline). When the movement of the composite pattern is very small, the number of series whose rates of change increase or decline is usually evenly divided. To this extent, the composite patterns appear to be reliable indicators of the behavior of the sample. Moreover, the similar action of many individual series adds to our confidence in the behavior of the sample as an indicator of the behavior of the class. Second, in many instances a decided movement in the composite pattern (that is, in the median rate of change in the component series) was the result of a fairly even division in the direction of movement of the rates of change in individual series. In a few cases the component pattern moved in one direction when a majority of the individual series moved in the opposite direction.

From these measures I conclude that the sample does not clearly indicate that investment in this class of finished stocks acts in a

TABLE 81

Stocks of Eighteen Finished Nonagricultural Products
Direction of Movement of Rates of Change per Month between Interstage Intervals
5 Business Cycles, 1919-1938

BUSINESS CYCLE	DIRECTION OF MOVEMENT BETWEEN INTERSTAGE INTERVALS																							
	I-II to II-III			II-III to III-IV			III-IV to IV-V			IV-V to V-VI			V-VI to VI-VII			VI-VII to VII-VIII			VII-VIII to VIII-IX			VIII-IX to I-II		
	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−	+	o	−
	NUMBER OF CASES																							
4/1919– 9/1921	2		12	3		11	7		7	12		2	12		2	12		2	1		13	4		10
9/1921– 7/1924	10		7	14		3	6		11	16		1	8	1	8	8		9	12		5	6		11
7/1924–12/1927	6		11	8		9	6	1	10	9	1	7	8		9	10		7	8		9	9		8
12/1927– 3/1933	1	1	11	8		5	5		8	9		4	4		9	3	1	9	6	1	6	9		4
3/1933– 5/1938	5	1	4	4	1	5	6		4	8		2	6		4	5		5	3		7	4		6
Av. cycle measures[a]	4	1	13	12		6	6	1	11	16	1	1	11		7	10		8	5	1	12	5		13
	PERCENTAGE OF CASES																							
4/1919– 9/1921	14		86	21		79	50		50	86		14	86		14	86		14	7		93	29		71
9/1921– 7/1924	59		41	82		18	35		65	94		6	47	6	47	47		53	71		29	35		65
7/1924–12/1927	35		65	47		53	35	6	59	53	6	41	47			59		41	47		53	53		47
12/1927– 3/1933	8	8	84	62		38	38		62	69		31	31		69	23		77	46	8	46	69		31
3/1933– 5/1938	50	10	40	40	10	50	60		40	80		20	60		40	50		50	30		70	40		60
Av. cycle measures[a]	22	6	72	67		33	33	6	61	89	6	6	61		39	56		44	28	6	66	28		72

[a] The data in this line show the distribution of series whose average rates of change move in the direction specified when averages are based on all cycles covered by a given series.

significantly different fashion during cycles in business and in the activity of individual commodities. In particular, it is not clearly established that investment typically turns up toward the end of business expansions and down toward the end of contractions. Such differences as we do observe should be attributed, I think, largely to the irregularities in the behavior of investment during cycles in manufacturing activity together with departures in the latter from perfectly synchronous conformity with business cycles.

At the same time, another feature of our observations during cycles in both manufacturing activity and business should not be overlooked. There is evidence that investment often rose toward the end of expansions and declined toward the end of contractions. In a larger sample the tendency might well emerge clearly above the irregular movements of individual commodities. Moreover, as far as it exists, the tendency would be stronger during cycles in business than during cycles in manufacturing activity, owing to a combination of two causes. The first has to do with the behavior of the rate of change in stocks just before and just after the turns of activity. It will be recalled that the first part of the expansion was marked by liquidation at an increasing rate. As the phase proceeded, however, the increase in the rate of liquidation tended to fall off. There was even some indication that the rate retards toward the end of the phase. When activity begins to decline, the rate of liquidation falls sharply and accumulation begins. The rate of accumulation increases for a time, but toward the end of the phase levels off, and finally drops sharply when activity turns up again.

The second factor is the behavior of manufacturing production during business cycles. During expansions the number of industries whose output is expanding tends to decline before business at large (or total output) reaches a peak. Similarly, during contractions the number of industries whose output is falling tends to decline before business reaches its low point. This tendency emerges clearly from a study of the 57 production series described in Chapter 15. Table 82 shows the excess of the number of series rising between successive stages of business cycles over the number falling as a percentage of the total. During contractions, of course, the number rising is typically a minority of the series, as the negative signs preceding the figures indicate. Figures with negative sign, in effect,

TABLE 82

Fifty-seven Production Series: Excess of Series Rising between Stages of Business Cycles as Percentage of All Series 5 Cycles, 1919-1938

BUSINESS CYCLE	EXCESS OF SERIES RISING BETWEEN STAGES							
	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
4/1919– 9/1921	50	56	24	28	−19	−36	−11	30
9/1921– 7/1924	32	66	88	40	−36	−6	−26	−36
7/1924–12/1927	76	50	23	40	−28	6	−20	−10
12/1927– 3/1933	18	32	66	37	−56	−82	−90	−53
3/1933– 5/1938	84	62	86	74	−38	−64	−46	−30
Av. for 5 cycles	53	52	57	43	−35	−36	−39	−19

show the percentage excess of series falling over series rising. If we judge by the average behavior of this sample in the five interwar cycles, the preponderance of rising series is largest between stages III and IV of business expansions. Between stages IV and V the proportion of rising series begins to fall. Again during contractions the proportion of falling series is largest between stages VII and VIII, and begins to fall between VIII and IX. Except in two expansions, one of which, 1919-20, is a borderline case, and in one contraction, the rule holds that the proportion of rising series falls in the last stage of expansion and rises in the last stage of contraction (Chart 82). From Table 83 we can see that the same pattern characterized the 18 commodities in our inventory sample.

Now it will readily be apparent that the movement of investment during cycles in manufacturing activity and of production during business cycles should, in combination, produce a tendency for inventory investment in finished goods stocks to rise toward the end of business expansions and to fall toward the end of contractions. For toward the end of each phase, investment is the resultant of two forces. In the commodities whose production and shipments continue to rise toward the end of an expansion, the acceleration in the rate of inventory liquidation should be leveling off, or even falling. At the same time, the production and shipments of some commodities begin to fall. Inventory liquidation in these commodities should drop sharply, perhaps even be transformed into inventory accumulation. The rate of liquidation in all finished goods should decline. Near the end of contractions the reverse should be true.

As we have already seen, the effect of this influence was not clearly apparent in the investment patterns of the 18 inventory

Chart 82
Fifty-seven Production Series
Excess of Series Rising between Stages
of 5 Business Cycles as Percentage of All Series, 1919-1938

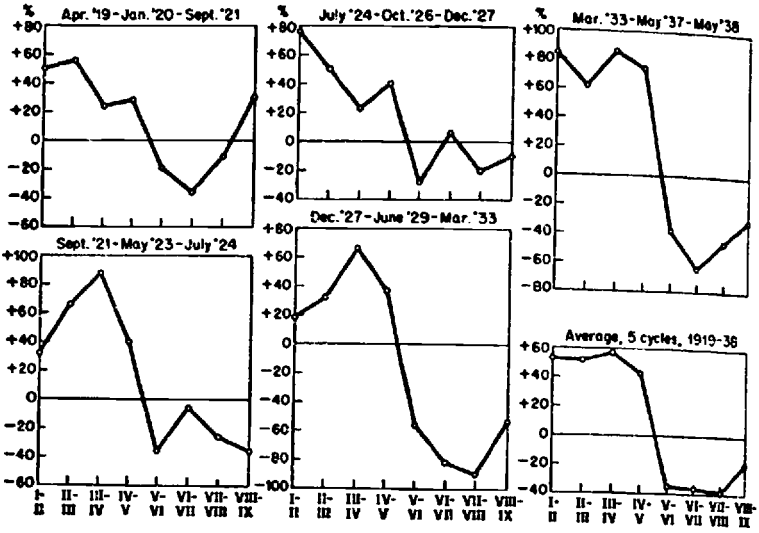


TABLE 83

Manufacturing Activity: Eighteen Nonagricultural Products
Excess of Series Rising between Stages of Business Cycles as
Percentage of All Series, 5 Cycles, 1919-1938

BUSINESS CYCLE	EXCESS OF SERIES RISING BETWEEN STAGES							
	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
4/1919- 9/1921	86	58	58	42	0	−14	−42	86
9/1921- 7/1924	52	100	100	12	−42	64	−12	−30
7/1924-12/1927	100	88	−6	46	−30	−42	36	30
12/1927- 3/1933	38	54	24	0	−54	−100	−100	−92
3/1933- 5/1938	100	100	100	60	−40	−60	−40	−20
Av. for 5 cycles	75	80	55	32	−33	−30	−32	−5

series. The patterns were sometimes consistent with the expectations just set forth, sometimes not. The difficulty may be due to irregularities in the behavior of a small sample. Hence, although the only possible verdict on the basis of the data is 'not proven', I think it useful not to discard the hypothesis that the timing of inventory investment in finished staples made from nonagricultural materials acts to offset the tendency of other categories of inventory investment to lead at business cycle turns. The data are not inconsistent with the theory; there are good reasons to suppose that it may be valid, and additional data may lend it empirical support.